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JOHN GORDON DRIVE EXTENSION TO MOLONGLO 2 FORWARD DESIGN

DOCUMENT READINESS (DR) REPORT

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1 INTRODUCTION

The objective of this project is to provide access to the Molonglo 2 development area, including the proposed Group Centre, via the extension of John Gorton Drive.

In February 2011, Shared Services Procurement (formerly ACT Procurement Solutions) engaged Brown Consulting to carry out design and construction tender for John Gorton Drive (JGD) from the end of Molonglo Infrastructure Stage 1D (Chainage 13,700) to a new connection to Coppins Crossing Road, a total length of approximately 500 meters to facilitate the planned land release of up to 1500 dwellings to 2014-15. The project included a new signalised intersection at around Chainage 13,900.

In April 2011, this project was put on hold pending upon the completion of the concurrent Draft Planning and Development Framework (PDF) Study for Molonglo Stage 2 development. This was to ensure the design of JGD Extension was in accordance with the outcomes of the planning study.

In September 2011, the scope of this project was revised incorporating recommendations outlined in the Draft PDF report for Molonglo Stage 2. It was also understood that the revised scope of works was triggered due to an increase in number of blocks to 3000 dwellings noted in the revised ACT Government Indicative Land Release Program. The revised scope of works includes:

- The design of approximately 1.5km long section of JGD from Chainage 13,600 to Chainage 15,100.
- A total of three (3) intersections including Pond Road, Commercial Street and the East-West Arterial.
- A new water quality pond, including landscaping and structures.

Subsequently, the ACT Shared Services Procurement (SSP) requested Brown Consulting to undertake design and construction tender documentation of the revised scope outlined above. This section of John Gorton Drive is referred to as JGDE Stage 2A.

An Engineering Value Management Workshop (EVMW) attended by key stakeholders of the ACT Government Agencies was also convened on 30th of November 2011 to evaluate the design, cost and delivery optimisations for the project. A copy of the EVMW report is included in the appendices.

Brown Consulting completed the Preliminary Sketch Plan (PSP) of the project in March 2012.

Subsequent to the submission of PSP documentation, Brown Consulting (BC) undertook a feasibility study investigating the impacts of the changes to the road network around the proposed Group Centre. The general findings of the study indicating that the proposed changes are viable and allow satisfactory operation of JGDE Stage 2A and associated intersections.

This Document Readiness (DR) documentation adopts the proposed changes to the road network around the Group Centre and incorporating PSP comments discussed in Section 2.

The DR drawings are included in a separate volume.

2 COMMENTS FROM PREVIOUS DESIGN STAGES

2.1 Preliminary Sketch Plan (PSP) Comments

The PSP comments received as part of PSP circulation have been compiled and included in the appendices.

These comments have been discussed with Economic Development Directorate (EDD), Environment and Sustainable Development Directorate (ESDD) and the ACT Shared Services Procurement (SSP) as the client agencies and the main comments incorporated in the FSP documentation are highlighted below:

- Design speed north of Pond Road shall be 70km/hr for 60km/hr posted speed.
- On street parking on the eastern verge, north of Commercial Street.
- Blisters between on-street parking bays.
- 1.5 meter wide on-road cycle lane with 3.5 meter traffic lane for each direction of traffic on Commercial Street.
- Right hook turn for buses into Commercial Street.
- Safety barriers adjacent to the proposed trees located within the clear zones.
- Water Quality Control Pond Strategy 3 to be explored.

2.2 Final Sketch Plan (FSP) and Development Application (DA) Comments

FSP documentation was presented to TAMS on 15th of May 2012. The main outcomes of discussion and comments are listed below. The record of minutes of meeting is included in the appendices.

- Water quality control pond strategy 3 was not available as the drawings were being developed.
- Roads ACT concurred with the installation of safety barriers.
- TAMS concurred with the finishes (decomposed granite) at the parking blisters.
- It is TAMS preference to retain the existing excellent value of tree 13039 by allowing the spill of earthworks within the dripline of the tree.
- Indented bus bays are not required. However, additional bus stop on Pond Road was requested.

Prior to DA submission, the Client Agency requested the following amendments in the design resulted from discussions with the ACT Government stakeholders:

- Safety barriers will not be constructed as part of this project until the trees are mature and safety barriers are warranted.
- Pedestrian crossing to be included mid block between East West Arterial and the northern end of the project.
- Parking blisters to be planted with small to medium size trees.

The above comments have been incorporated in the DA documentation.

Main matters discussed regarding the water quality control pond post DA submissions are outlined below. Discussions regarding the matters are incorporated in the Water Quality Control Pond report in the appendices.

- Concern with the batter slope steeper than 6H:1V below the water levels.
- TAMS concurrence on the arrangement of the sediment drying basin.

3 DESCRIPTION OF THE WORKS

The key features of the works are as follows:

- Construction of new northbound and southbound carriageways with two lanes of general traffic and provision for on road-cycling in each direction
- Connection to existing JGD Stage 1D and demolition of existing tie-in to Coppins Crossing Road at southern end of the project.
- Construction of a new tie-in to Coppins Crossing Road at northern end of project.
- Construction of a new signalised T-intersection at Pond Road including stub.
- Construction of a new signalised T-intersection at Commercial Street including stub.
- Construction of a new signalised T-intersection at Road 1 including stub.
- Construction of a new signalised four way intersection at the East-West Arterial including stubs.
- Construction of a new water quality control pond located south west of Pond Road intersection.
- Installation of utility services, street lighting, footpaths and landscaping in road verges

Refer to drawing **C10104-003** for the General Arrangement.

4 BACKGROUND INFORMATION

John Gorton Drive (known previously as the North-South Arterial) is the main arterial road through the proposed development of Molonglo. When complete it will connect Cotter Road at the southern end, to William Hovell Drive at the northern end and will include a new bridge crossing over the Molonglo River.

The extension of JGD into Molonglo 2 will involve construction of a 1.5km section of dual carriageway from the end of Molonglo Stage 1, (just after Holden's Creek) at CH 13600 and will continue to Chainage 15,100. This section of JGD will provide access to Suburbs 3 and 4 and the proposed Group Centre in Molonglo Stage 2.

The future East-West Arterial (EWA) will connect with John Gorton Drive, at approximately Chainage 14,650, and will be a major intersection in the Group Centre. When constructed the East West Arterial road will continue east over the Molonglo River connect Molonglo to the Tuggeranong Parkway.

The Draft Planning and Design Framework Study (PDF) for Molonglo Valley Stage 2 investigated a number of alignments for JGD. The preferred alignment was chosen to address planning requirements and environmental concerns while still satisfying the design standards required for an arterial road in the ACT. The Draft PDF formed the basis of the Planning and Design Framework Report, Molonglo Valley Stage 2 which is approved in April 2012. The preferred alignment and intersection locations as documented in the draft PDF has been adopted as the basis for JGD design for this project.

Some minor horizontal and vertical realignment of JGD has been incorporated during design development to suit changes to the layout of the Group Centre.

Changes to the road network around the Group Centre were proposed in the Molonglo Valley Stage 2 Group Centre and Environs PDF Urban Design Component Project. A feasibility study investigating the impacts of these changes from an engineering perspective was also undertaken subsequent to the submission of the PSP documentation of this project. The general findings of the study indicating that the proposed changes are viable and allow satisfactory operation of JGDE Stage 2A and associated intersections. The main changes assessed in the study and adopted in this FSP are:

- The eastern leg of the pond road intersection with John Gorton Drive is removed.
- The Commercial Street intersection with John Gorton Drive is located further south.
- Northbound buses turn right from the left lane with a bus only phase at Commercial Street.
- An additional intersection with John Gorton Drive is included between Commercial Street and the East-West Arterial for general traffic (referred to in the drawings as 'Road 1').

5 STUDIES AND INVESTIGATIONS

5.1 Molonglo Stage 2 Background Investigation

AECOM prepared Molonglo Stage 2 Background Investigation report in October 2010. The report produced background information for the preparation of a future concept plan for part of Molonglo Stage 2, largely the eastern side of JGD corridor, in line with the principles of the Territory Plan and relevant ACT Planning policies.

The report includes traffic modelling using the EMME land-use / transport model of Canberra for the years 2016, 2021 and 2031. It is understood that the model was developed on the planning projection of 9,600 dwellings and over 20,000 residents in Molonglo 2.

The traffic noise impact assessment was also included as part of the study and the summary of the findings indicated that noise mitigation by identifying noise driven planning constraints such as setbacks, conceptual acoustic treatment options and house treatment to achieve an appropriate internal noise level can be designed within the identified residential development i.e no noise mitigation is to be provided in the road corridor.

5.2 Planning and Design Framework – Molonglo Valley Stage 2

The planning and design framework was prepared by SGS to guide the developments of Molonglo Stage 2 and to provide an indicative layout of:

- Future land uses, such as housing, shops, schools and community facilities.
- Infrastructure, such as electricity services, water and sewerage reticulation.
- Roads and open space networks.

Similar to Section 5.1 above that it is that the PDF projected the ultimate yield of approximately 7150 dwellings and occupied by approximately 18,000 people in Molonglo 2.

The draft Planning and Design Framework (PDF) report for the Molonglo Valley stage 2 has been completed, and it has been approved in April 2012.

The key findings of the Draft PDF relevant to JGD extension are as follows:

- The preferred JGD alignment does not correspond with the Territory Plan.
- The narrower cross section - from 72.6m in Wright and Coombs to 45m in order to reduce earthworks and minimise the 'barrier' effect of roads.
- Reduction of the travel speed to 60km/h through the Group Centre.
- Design Criteria:
 - adopt a 5% maximum grade for amenity of cyclist and pedestrians
 - adopt a maximum 4% grade at intersections
 - adopt a posted speed of 60km/h at the group centre and 70km/h elsewhere

- Arterial road cross section configuration.
- Allowance for a 12m median to include allowance for conversion to an Inter-town Public Transport (IPT) in the future.
- Allowance for on road cycle lanes or as an alternative wide shared paths each side.

The above findings have generally been used as design basis in the design of JGDE Stage 2A.

5.3 Detailed Survey of Molonglo Stage 2 Area

Brown Consulting engaged Leach-Steger Pty Ltd to undertake topographical survey for Coppins Crossing Road of the original scope of works (February 2011). The detailed ground survey was completed and is incorporated into this project.

LANDdata Survey Pty Ltd was commissioned by Land Development Agency (LDA) to undertake detailed survey for the entire Molonglo Stage 2 development. The detailed ground survey model is also incorporated in this project.

5.4 Heritage Studies

In August 2010, ESDD engaged BIOSIS Research to undertake a cultural heritage survey and sub-surface test pitting program of the proposed Molonglo Stage 2. The investigations followed on from the initial desktop heritage review of the Molonglo Valley in 2006.

The key findings and recommendations for further investigations or monitoring outlined in the report are related to areas outside of JGD road reserve alignment proposed in the PDF.

A copy of the report is included in the appendices.

5.5 Matters of National Environmental Significance (NES Plan)

In September 2008 the ACT Government signed an agreement with the Commonwealth to undertake an assessment of the Molonglo Valley Structure Plan under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This agreement was amended in March 2010 to provide for the assessment of impacts under the *Molonglo Valley Plan for the Protection of Matters of National Environmental Significance* (the NES Plan) and ESDD engaged Eco Logical Australia Pty Ltd (ELA) to prepare this strategic assessment report of the Molonglo Valley plan.

The strategic assessment of the area was undertaken to streamline the referral process, provide greater certainty in environmental protection and conservation practices, and facilitate sustainable outcomes in new urban development areas.

In the Molonglo Valley matters of NES include threatened species, migratory species and important ecological communities and have been identified as follows;

- *White Box – yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland* (Box Gum Woodland) - listed under the EPBC Act as critically endangered
- *Natural temperate Grassland of the Sothern Tablelands of NSW and the ACT* (Natural temperate Grassland) - listed under the EPBC Act as endangered
- *Aprasia parapulchella* (*Pink-tailed Worm Lizard*) - listed as vulnerable
- *Polytelis swainsonii* (*Superb Parrot*)
- *Lathamus discolor* (*Swift parrot*)

The presence of these endangered and vulnerable communities, require that the impacts of development in Molonglo and North Weston were required to be assessed under national environment law.

On 7 October 2011, the Federal Environment Minister endorsed the Plan. This is the third strategic assessment in Australia to reach the endorsement stage. The endorsement of this Plan allows the federal environment minister to consider giving approval to actions or class of actions that are taken in accordance with the endorsed Plan.

On 20 December 2011, the Federal Environment Minister approved actions associated with urban development in East Molonglo as described in the endorsed Plan.

A copy of the NES Plan is included in the appendices.

5.6 Vegetation Assessment

In October 2010 Eco Logical Australia Pty Ltd (ELA) reported findings of an ecological assessment and mapping of unsurveyed vegetation within the East Molonglo Stage 2 development area and adjoining lands, and the Molonglo River Corridor between the Stage 1 boundary and the Kama Nature Reserve. This study was undertaken fill gaps in the existing mapping information reviewed in earlier studies.

This study was completed as part of the Strategic Assessment process for Molonglo and the results are summarised in the NES plan. It is understood that the findings have been published in a draft form and should be used in the context of the NES plan only.

A copy of the report is included in the appendices.

5.7 Geotechnical Investigations

In June 2009, Douglas Partners undertook a geotechnical investigation in the vicinity of the proposed North-South Arterial Road and Group Centre defined in the Territory Plan. These findings are used as a guide in determining the subgrade conditions of JGD extension in this PSP design phase. A copy of the report is included in the appendices.

Additional geotechnical investigation on the proposed alignment of JGD and water quality control pond was undertaken in May 2012 and a copy of the report is included in the appendices.

5.8 Contamination Assessment

Phase 1 Environmental Site Assessment for Molonglo Stage 2 was undertaken by AECOM for Stage 2 Molonglo (West) area in 2010.

The potential sources of contamination are identified and summarised in Figure 2 in the report. The two potential sources of contamination located in close proximity or within JGDE Stage 2A road corridor are:

- A dam located at the southern end of JGDE Stage 2A
- A farmhouse, septic tank and stockyards located in the vicinity of East West Arterial intersection.

The report also recommended the following:

- The area impacted by rural activities within the study area should be considered potentially contaminated and subjected to further assessment and audits should redevelopment of the area is proposed.
- A detailed Phase 2 Environmental Site Assessment to be undertaken, targeting the areas identified to have potential sources of contamination.
- A wider grid based sampling program to assess the potential for contamination within the cleared agricultural lands.
- Groundwater monitoring well at the following locations to assess potential contaminant impact to underlying groundwater aquifers:

→ Potential sheep dip located 150m west of the old homestead site of Section A

→ Identified sheep dip located within south west boundary of Section B

→ Two illegal tip areas in Section A

→ Septic Tank and shed areas associated with the main homestead in Section A.

It is understood that a Phase 2 Environmental Site Assessment is currently in progress, audited by an accredited contaminated site auditor and managed by the Land Development Agency (LDA). This investigation may result in a remedial action plan for the two potential sources of contamination located in close proximity or within JGDE Stage 2A road corridor.

6 CONCURRENT PROJECTS

6.1 Molonglo Valley Stage 2 Group Centre and Environs PDF Urban Design Component

Hames Sharley / Bonthorne Pty Ltd have been engaged to undertake the planning and design of the Group Centre Precinct, located at the northern end of JGD extension project. It is understood that the project is currently at the early stage of planning and an alternative layout, different to the layout proposed in the Draft PDF of Molonglo Stage 2, is currently under development.

The alternative layout includes the following main alterations to the proposed layout in the Draft PDF of Molonglo Stage 2 report:

- Deletion of eastern leg of Pond Road.
- Incorporation of general traffic accessing Commercial Street.
- The Group Centre Precinct will begin from JGD / Commercial Street intersection.

A feasibility study of the proposed alteration was undertaken and discussed in the next section.

6.2 John Gorton Drive Extension to Molonglo 2 - Revised Group Centre Road Network Feasibility Assessment

In March 2012, BC undertook a feasibility study of the alterations proposed as part of the group centre precinct planning and design project. The objective of this feasibility study is to investigate the impact of changes to the road network around the proposed Group Centre on the operation and viability of JGDE Stage 2A.

All aspects of the engineering design were considered for the revised layout of roads around the proposed Molonglo 2 Group Centre.

The study found that the design of JGD have not been adversely affected by the proposed changes and the road layout is considered to be a viable option that will allow satisfactory operation of JGDE Stage 2A and associated intersections. A copy of the report is included in the appendices.

6.3 Molonglo Group Centre and Environment Planning and Design Framework Arterial Roads

SMEC has been engaged to undertake the Molonglo Arterial Road Feasibility Study on behalf of the ACT Shared Services Procurement (SSP). It is understood that the project is currently at the initial stage (Stage 1) of the program.

The objectives of this study are to:

- Review previous road alignment studies and validate/determine the key arterial road alignments, intersections/interchange arrangements with the existing road network and the river crossing locations and details.
- Substantiate the timing for the North-South and the East-West Arterial roads and associated bridges over the Molonglo River based on the development staging assumptions and the transport model.
- Review the impact on the external road network imposed by the Molonglo development and evaluate Coppins Crossing Road capacity to serve as an interim north-south link.
- Provide projections on the transport mode shifts to public transport, cycling and walking based on the recent planning studies review the existing Molonglo traffic model.
- Provide road alignments that support future land use intentions and that minimise environmental impacts.

6.4 Uriarra Road Intersections and Link Road from John Gorton Drive Link Road Forward Design

Brown Consulting has been engaged by the ACT Shared Services Procurement to provide the design and construction phase services of:

- Three intersections on Uriarra Road to provide access to Molonglo 2 development area.
- The realignment / modification to the existing alignment of Uriarra Road (where necessary) to provide adequate sight distances for the intersections and to improve road safety where required.
- Design of a new link road between John Gorton Drive (JGD) Stage 1D and a new intersection at the entrance to Stromlo Forest Park.
- Intersection of the link road with Uriarra Road at the Stromlo Forest Park entrance.
- Off-road cycle path along Uriarra Road within the Stromlo Forest Park boundary.

The project is currently at the Preliminary Sketch Plan (PSP) design stage.

6.5 Molonglo Infrastructure Stage 1D Construction

The southern end of JGD Extension to Molonglo 2 design abuts with the northern end of Molonglo Infrastructure Stage 1D project.

Stage 1D earthworks formation extends to CH 13,940 to enable future construction of JGD to be clear of the existing Coppins Crossing Road. An interim connection for two way traffic has been provided at the northern end of the project.

The tender of the works have been awarded with possession of site of the area in the vicinity of Stage 1D/2A overlap being delayed.

This project will match the JGD Stage 1D at approximately Chainage 13,628.

6.6 Molonglo Infrastructure Stage 1D/2A Overlap

The adopted JGDE Stage 2A alignment discussed in Section 9.1, resulted in the documentation of Molonglo Infrastructure Stage 1D to be amended to suit the adopted alignment of JGDE Stage 2A in the vicinity of Stage 1D/ 2A overlap. The works include in amendment of the approved Molonglo Infrastructure Stage 1D Development Application and tender documentation (originally submitted by GHD) from Chainage 13,620 to approximately Chainage 13,985 of alignment MC05.

In April 2012, BC was engaged by SSP to prepared Stage 1D/2A Overlap tender drawings and DA amendment documentation. The Client Agency later requested that the DA submission for Stage 1D/2A overlap be combined with the DA submission for Molonglo Trunk Sewer and Stormwater diversion project.

6.7 Molonglo Trunk Sewer and Stormwater Diversion

Brown Consulting is currently undertaking the design of 1.7km of the Molonglo Trunk Sewer to service the development in Molonglo Stage 2 and a section of 450mm diameter stormwater main to divert the one year flow from Catchment C as defined in Indesco Coombs Pond PSP report to the Holden's Creek Pond (Pond B).

The DA documentation for the project, including Stage 1D/2A overlap, has just recently been lodged.

7 PLANNING APPROVAL

7.1 Development Application

Impact track assessment applies to proposals under Section 123 of the Planning and Development Act 2007 (the Act) that involves a process or activity likely to have significant adverse environmental impact on an endangered species or ecological community. The Molonglo Urban Land Development is a proposal that meets this criterion and will therefore require an Environmental Impact Statement (EIS).

Section 211 of the Act allows an applicant to seek exemption from the requirement to complete an EIS. The Minister responsible for the Act has discretion under Section 211 to grant exemption based on the information presented in previous studies. If an exemption is granted then the EIS process is regarded as complete and allows an application to lodge a development assessment (DA) for evaluation under the impact track process.

As noted in Section 4.5, the NES plan has been approved. Thus, the Commonwealth Government's endorsement Criteria outlined in the Strategic Assessment Agreement, as amended between the ACT and the Commonwealth under s146(1) of the EPBC Act, has been met.

Economic Development Directorate (EDD) as a client agency has prepared and submitted an Environmental Impact Statement (EIS) scoping / s211 exemption application for a part of the Molonglo Stage 2 development which identifies the potential impacts of the proposed development and provides information to support the request for Ministerial exemption under s211 of the Act. An exemption has been granted on 14 May 2012. A copy of the exemption letter is included in the appendices.

8 UTILITY SERVICES

8.1 Existing Services

A Dial-Before-You-Dig (DBYD) search was undertaken at the commencement of the project.

The existing services are shown on plans C10104-101+ to C10104-105+.

Existing services in the vicinity of the project generally follow the alignment of Coppins Crossing Road.

8.1.1 Telstra

Telstra assets are present in the vicinity of the project.

The Telstra assets generally follows the alignment of Coppins Crossing Road with a number of pit structures including access chambers and jointing pits located within the road reserve.

A Local service is located generally in the eastern verge with a line that extends to the residence at Kallenia Rivers.

Two Fibre Optic (OF) lines are also present in the vicinity of the works. The lines are identified on the plans as Belconnen to Weston Creek High Integrity Data and Belconnen to Weston Creek Low Integrity Data.

The Low Integrity OF line appears to follow the alignment of the local service and contain within the road reserve.

The High Integrity OF line follows a north south alignment and appears to be located outside the Coppins Crossing Road reserve with varying offsets along the alignment.

During detailed design stage, an attempt to locate the existing Telstra assets was undertaken and one of the optic fibres shown on DBYD was unable to be located. It appears the undetected optic fibre is located between two detected Telstra assets.

8.1.2 Electricity

High voltage overhead (11kv) assets are present in the vicinity of the project area, and cross Coppins Crossing Road and fall within the project site approximately at CH 14,740 to provide domestic supply to the residence at Kallenia Rivers.

8.2 Services Relocation and Protection

The proposed relocation of services is shown on drawings C10104-101+ to C10104-105+.

8.2.1 Telstra

Telstra services encroach within the work area at three locations along the proposed JGD extension alignment:

- In the vicinity of the interface between Molonglo Infrastructure Stage 1D and JGD extension.
- In the vicinity of eastern leg of East-West Arterial Road.
- At the northern end of the project.

It is understood that the relocation of Telstra local copper and low integrity Fibre Optic located at the interface between Molonglo Infrastructure Stage 1D and JGD extension, will be relocated clear of the proposed works as part of Molonglo Infrastructure Stage 1D contract and prior to the commencement of the JGDE Stage 2A contract.

As highlighted in Section 8.1.1 that one of the optic fibres is undetected and it appears the undetected optic fibre is located between two detected Telstra assets. The information found on site was forwarded to Telstra Team who is responsible for the design of possible protection and/or relocation required for the project. The design has yet to be finalised.

8.2.2 Electricity

The 11kv high voltage overhead cable crossing JGDE Stage 2A will become redundant once the project has commenced to the construction. Thus, initial advice from ActewAGL indicated that it can be disconnected and removed. An indicative cost for the disconnection and removal by ActewAGL is in the order of \$12,000 excluding GST.

8.3 Proposed Services from Adjacent Contracts

In addition the existing services, there are services being either currently designed or will soon to be constructed in close proximity or in the vicinity of the project. These services are discussed in the subsection below.

8.3.1 Molonglo Infrastructure Stage 1D Project

The proposed services documented in the Molonglo Infrastructure Stage 1D project include:

- A shared trench ST4 of 160mm PE gas and 6x125mm electrical conduits in the vicinity of the western verge.
- A 150mm diameter water line on the western verge.
- A 300mm diameter water main on the eastern verge.
- A telecommunication shared trench ST2 on the eastern verge which consists of:
 - 4xP100 Telstra conduits
 - 2xP100 Icon conduits

- 1xP100 NBNC Co conduit
- 1xP100 AAPT conduit
- 1xP100 ICON conduit

8.3.2 *Molonglo Trunk Sewer and Stormwater Diversion Project*

As discussed briefly in Section 6.7, a trunk sewer is proposed to service the development in Molonglo Stage 2. The trunk sewer is to run from south east of JGD and across JGD just before future Pond Road intersection. The construction of this trunk sewer up to a structure south western corner of Pond Road intersection will be undertaken as part of Molonglo Infrastructure Stage 1D project. The construction of the trunk sewer across Pond Road and along southern verge of Pond Road will be undertaken as part of JGDE Stage 2A.

8.4 Proposed Services

The proposed services are shown on drawings C10104-101+ to C10104-105+.

A continuation of services proposed in the verges of Molonglo Infrastructure Stage 1D to be adopted in the project area. This proposal had been discussed with services authorities and the records of discussions are included in the appendices.

8.4.1 *Water Supply*

The design and construction of two water mains along JGD extension is included as part of this project. Further discussion with ActewAGL was undertaken and the summary of the discussion are as follow:

- A continuation of a 150mm diameter water main from Stage 1D, along the western verge of JGD for the full length of the project, with a flushing bend and hydrant at the northern end of the project, due to fire fighting requirements
- A continuation of a 300mm diameter water main from Stage 1D, along the eastern verge of JGD and connects to a 375mm diameter on southern verge of East-West Arterial Road.
- A 375mm diameter water main, runs west along the southern verge of East-West Arterial Road.
- A 150mm diameter water main crossing at each of the intersections.
- A 150mm diameter line runs west, along the stub of Pond Road.
- A preliminary size of 225mm diameter water main along legs of Commercial Street and eastern leg of East-West Arterial Road due to fire fighting requirements.
- No PRV is required along JGDE road corridor.

A copy of discussions with ActewAGL is included in the appendices.

8.4.2 Sewer

Proposed sewer includes the following:

- A 225 diameter sewer main along the southern verge of Pond Road. This is an extension of an existing 300 diameter sewer main in John Gorton Drive.
- A 225 diameter sewer main along the western verge of John Gorton Drive from Pond Road through to the crest between Pond Road and Road 1 (approximately 390m in length). This sewer includes four block ties and is also an extension of the existing 300 diameter sewer main in John Gorton Drive.
- A 150 diameter sewer main crossing John Gorton Drive north of the East West Arterial. This main will connect in to the future to Molonglo Central Main downstream.
- A second 150 diameter sewer main crossing and continuing along the western verge of John Gorton Drive north of the East West Arterial. This main will also connect in to the future Molonglo Central Main downstream.

8.4.3 Shared trenches

Consultation with Telecommunications authorities indicated the following provisions are required for their assets, in lined with Molonglo Infrastructure Stage 1D project:

- 4 x P100 Telstra conduits
- 2 x P100 ICON conduits
- 1 x P100 TransACT conduit
- 1 x P100 NBNCo conduit
- 2 x P100 AAPT conduit

All Telecommunications authorities indicated no concern of locating their assets under paths or paving.

During the preparation of DA documentation, InTACT requested for a conduit to be included as part of the project. InTACT has later withdrawn the request as ICON have agreed to allow InTACT to access one of the 2xP100 ICON conduits.

Telstra, NBNCo and AAPT have advised that all costs related to the supply and installation of the conduits are to be borne by the development and the installation of the pits can be undertaken in a later date depending upon timing of demand from adjacent developments.

ICON indicated that all costs related to the supply and installation of conduits are to be borne by the development and the supply and installation of the pits be borne by ICON.

Transact noted that they will be supplying and laying the conduits and pits at no cost to the project. The excavation and backfilling of the shared trench, however, have to be undertaken by the Contractor.

Arrangements at the three side roads for future connections to Telecommunications shared trench will be undertaken at a later date and documented during final design.

The provisions of conduits along the legs of Pond Road, Commercial Street and East-West Arterial Road are as follow:

- 2 x P100 Telstra conduits
- 1 x P100 TransACT conduit
- 1 x P100 NBNCo conduit
- 2 x P100 AAPT conduit

8.4.4 Gas

A continuation of a pressure gas main from Stage 1D, has been made within a shared trench (ST4) in the western verge of JGD. The diameter of this gas main is to be:

- 225mm conduits (acting as a sleeve) at road crossings.
- 160mm PE along the western verge of JGD.
- 110mm PE along the legs of Pond Road and Commercial Street.
- 160mm PE along East-West Arterial Road.

Jemena advised that the excavation and backfilling of the trench (including sand backfill around the gas main), road crossings' conduit, marker tapes, and marking the kerbs shall be undertaken by the Contractor as part of the construction. Jemena will supply, lay and commission the gas main at no cost to the project.

A continuation of reservation of future steel gas main from Stage 1D, has been made along the eastern verge of JGD. Further discussion with Jemena after the submission of PSP documentation was undertaken and the outcomes of discussion are as follow:

- The preferred alignment of gas steel main reservation has moved from 1.0m to 2.9m from the boundary line in the vicinity of JGD extension project.
- The preferred alignment will therefore provide a wider working width corridor to building line for future installation of the main.
- Gas main reservation in the median was discussed. Noted that depending upon the timing of construction of ultimate arrangement and the installation of gas main, the median may viable construction width for the installation of gas main. This option, however, may entail certain sections of gas main to be located under pavement at intersections.

It should be noted that any services that cross this corridor will need to consider the required minimum clearance.

8.4.5 *Electricity*

A continuation of electrical conduits (6 x 125mm diameter) from Stage 1D has been made within a shared trench (ST4) in the western verge of JGD.

Three 125mm diameter conduits are to be installed at road crossings in the vicinity of the intersections and extended to the end of each legs of the intersection.

ActewAGL indicated that no pathways run parallel or directly over the assets are permitted. ActewAGL noted that paving over the conduits is acceptable in Town Centres only and this may change in the near future.

9 ROAD DESIGN

9.1 Development of the Alignment

9.1.1 Option Studies

Two horizontal alignment options of the JGD extension were explored and their outcomes are discussed below. Changes to the horizontal and vertical alignment were derived through continual consultation with the client via a number of workshops convened to discuss the relative merit of each option during their development.

9.1.1.1 Option A

Option A alignment, was adopted from that documented in the Draft PDF with the following minor adjustments to the geometry as follows:

- Horizontal alignment;
 - Compound curve introduced within the Stage 1D works to enable the horizontal alignment to align to the location of the Group Centre roads as documented in the PDF, in particular the proposed location of the commercial street intersection.
 - Larger radius curve introduced near the Commercial Street intersection.
- Vertical Alignment
 - The grade of 4% through the Group Centre as documented in the Draft PDF.
 - Following the VMW the 4% grade through the Group Centre was reduced to 2.5%. The reduction in the vertical grade was also considered a better outcome for two reasons:
 - This grade is less than the preferred approach grade for intersections of 3% as noted in the Austroads Design Guide – Part 4 – Intersections and Crossings.
 - Reduction the differential levels at the corners of the group centre development blocks.

9.1.1.2 Option B

Option B alignment, varies from that documented in the Draft PDF with a change in the horizontal alignment north of the Commercial Street Intersection that affected the following outcomes:

- Horizontal alignment
 - The straight alignment through the Group Centre was skewed east to allow the curve at the approach to the Molonglo River to shift approximately 100m east of the PDF location. This shift of the alignment enhances access and development outcomes for the northern most parcel of land directly west of the river.
- Vertical alignment
 - The vertical grading through the group centre was further reduced to 2%, however grades were increased to 3.5% further north. This grading however on closer investigation resulted in a substantial shortfall of fill materials in the order of 127,000 m³ for the

embankment construction from Chainage 13,600. Note that the preliminary assessment of the earthworks does not include boxing, stripping of topsoil, and embankment construction as part of Stage 1D. The preliminary earthworks quantity was estimated based on the volume between the existing ground and this option design levels.

9.1.1.3 Option C

The vertical alignment explored as Option C maintained the same horizontal alignment as Option B. The variation affected a change to the vertical grading where the grade line was lowered and a 3% grade line was adopted north of EWA through the Group Centre.

Preliminary estimation of earthworks quantities for this option indicated that a substantial reduction in shortfall of fill material adopting similar assumption in Option B. Further discussion on the earthworks estimation is included in Section 15.

The alignment and grading from Option C was subsequently adopted as the preferred option for the PSP Design and carried through to final design.

A more detailed earthworks estimation of this option is further discussed in Section 15.1

9.1.1.4 Overlap of JGD extension with Stage 1D

Two design issues required resolution in the overlap section of JGD extension and Molonglo Infrastructure Stage 1D due to the following reasons:

- Stage 1D alignment documented in the tender documentation followed an alignment in line with the Territory Plan.
- Stage 1D's extent of works encroaches approximately 350m into Molonglo Stage 2. Thus, this creates a section of overlap into JGDE Stage 2A works.
- JGDE Stage 2A PSP alignment differs from Stage 1D alignment in the overlapping section due to the findings of the Draft PDF in Section 5.2.
- Stage 1D final design documentation has advanced to tender documentation during preparation of the Draft Planning and Design Framework report.

The first design issue relates to the proposed compound curve in the vicinity of the overlap section. As discussed in 9.1.1.1 above, a compound curve was introduced to enable the horizontal alignment of JGD extension to align with the location of the group centre roads as documented in the PDF, in particular the proposed location of the commercial street intersection. The compound curve consists of the 805m radius (measured at the centreline of the median) followed by a 530m radius.

The ACT Design Standards for Urban Infrastructure, Design Standard (DS) 03 - Road Design defers to the Austroads Guide to Road Design (GRD) for geometric standards for compound curves. Austroads GRD

Part 3 - Geometric Design suggests that where compound curves of radii <1000m are undesirable unless radii values are above that required for the minimum operation speed.

Discussions with Roads ACT during JGDE Stage 2A PSP documentation concluded acceptance of the proposed alignment compound curves proposed in the project. It was noted that the proposed radii of the compound curves are not ideal in a green field project. The design radii, however, are well above the minimum suitable for an 80km/h design speed and the compound curves have been accepted in this instance. A warning sign is proposed to enhance the message to road users of the curve change and to address the condition requested by Roads ACT. Relevant correspondence between Brown Consulting and Roads ACT is included in the Appendices.

The second design issue relates to the change in alignment in Stage 1D, in the vicinity of the overlap section, to suit the preferred Group Centre location documented in the PDF. This issue has been addressed with the documentation of Stage 1D/ 2A overlap.

9.1.2 *Matching with Coppins Crossing Road*

The adopted shift in the JGD extension horizontal alignment arising from Option B has resulted in the northern interim connection to Coppins Crossing Road being shifted further north than anticipated in the Project Brief.

The preferred Option C would enable for JGD extension to be terminated in an embankment stub for future connection at CH 15160. The similarity in levels between the existing road and the JGD extension will allow the interim connection to Coppins Crossing Road to be constructed under traffic.

9.2 Traffic

The results of the traffic modelling included in Molonglo Stage 2 Background Investigation Report by AECOM in 2010 has formed the basis of intersection and lane arrangements of JGDE Stage 2A during the PSP design stage. Adopting the scenario of no connection of EWA with Tuggeranong Parkway creates higher (conservative) traffic volumes on JGD in 2021. Therefore, these volumes have been used to generate the following:

- Short, medium and long term options of JGD typical sections.
- Intersection layout of JGD with Pond Road.
- Intersection layout of JGD with East-West Arterial Road.

A more recent results of traffic modelling produced as part of the Molonglo Arterial Road Feasibility Study project (discussed in Section 6.3) have been used in the FSP and Detailed Design documentations. Note that the traffic volumes adopted is lower than the volumes adopted in the PSP design stage.

9.3 Design Criteria

Road design criteria have been adopted from the latest AUSTRROADS publications (Guide to Road Design) and are generally consistent with other constructed sections of JGD. Where appropriate, RTA criteria have been adopted.

Key design parameters listed in the table below have been discussed and accepted with Roads ACT.

Table 9-1 Design Parameters

Criterion	Value
Road classification	Arterial Road
Design Speed: Stage 1D to North of Pond Road North of Pond Road to northern limit of works Connection to Coppins Crossing Road	80km/h 70km/h 70km/h
Road classification	Arterial Road
Posted speed: Stage 1D to North of Pond Road North of Pond Road to northern limit of works Coppins Crossing Road	70km/h 60km/h To match current posted speed for the section.
Paths: JGD	1.5m concrete path on western verge of JGD 2.0 asphalt path on eastern verge of JGD. No Path proposed on the eastern verge of the group centre as this verge will be fully paved in the future (from Commercial Street to the northern end of the project).
Pond Road	1.5m concrete path on the northern verge of Pond Road.
Commercial Street	No path proposed along Commercial Street as these verges may be fully paved in the future.
East-West Arterial Road	2.0m concrete path on the northern verge of East-West Arterial Road.
Design vehicle JGD Main Alignment and East-West Arterial Road Pond Road Commercial Street	AUSTRROADS B-Double AUSTRROADS 19m Semi – Access Roads 14.5m Long Rigid Bus

The relevant design criteria adopted in the project are as follows:

Table 9-2 Design Criteria based on Road Design Guide

Criterion	Value	Relevant Design Guide
Normal crossfall	3%	Austrroads Part 3, Section 4.2.2
Maximum superelevation	3%	Austrroads Part 3, Section 7.7.2
Minimum crossfall transition length 80 km/h 60km/h	63m 48m	Austrroads Part 3, Section 7.7.8
Minimum radius of main alignment	270m	
Minimum radius adverse crossfall 80km/h 70km/h	500m 300m	Austrroads Part 3, Section 7.8
Minimum stopping sight distance 80km/h 70km/h	114m 92m	Austrroads Part 3, Section 5.3.1
Minimum desirable longitudinal grade	0.5% in kerbed areas for drainage	-
Maximum desirable longitudinal grade	8% (Bus Routes)	-
Minimum K value for main alignment 80km/h 60km/h	K=29.3 (Crest) K=11.8 (Crest)	Austrroads Part 3, Section 8.6.3
Minimum Length of vertical Curve (appearance) 80km/h 70km/h	60 - 80m 50 - 60m	Austrroads Part 3, Section 8.6.3
Vehicular lane width	3.5m	Austrroads Part 3, Section 4.2.5
Cycle lane Width 80km/h 70km/h* 60km/hr	2.0m 1.75m 1.5m	ACT Design Standards for Urban Infrastructure (DUS), Section 13.6.4
Auxiliary lanes (minimum) length – for deceleration turning lane 80km/h 70km/h	70m (+ storage) 55m (+ storage)	Austrroads Part 4A, Section 5.3.2
Clear zone (slope 6:1 to flat; ADT > 6000) 70 - 80km/h	6.5m	Austrroads Part 6, Section 4.2.2

* The criteria for 70km/h design speed is obtained by interpolation between 60km/h and 80km/h design speed.

9.4 Horizontal alignment

9.4.1 General

The horizontal alignments for the intersecting roads have been determined from the Territory Plan together with preliminary layouts for the Molonglo 2 development and Group Centre planning.

The adopted horizontal design centreline for JGD extension sits centrally within the proposed road reserve and median.

Note that Molonglo Infrastructure Stage 1D adopted two control lines for each carriageway.

The following have been taken into account when determining the horizontal alignment for the new carriageway:

- A suitable design speed and geometric requirements.
- Clear zone widths and sight distance.
- Avoidance of tangent points at intersections where possible.

9.5 Vertical Alignment

9.5.1 General

The vertical alignment of JGD extension has been determined based on the following constraints:

- Achieve levels for constructability of interim connection to Coppins Crossing road at the northern end of the project
- To achieve an optimum level difference for adjoining development.
- Achieve the desirable vertical grade where possible at intersection approaches.
- Achieve a balanced earthworks volume.
- Achieve the required vertical grade to accommodate the future IPT route.

The grading of the new carriageway takes into account the following:

- A suitable design speed and geometric requirements.
- Levels of the existing ground with a view to minimising earthworks.
- Adequate grade for drainage purposes.
- Achieving required sight distance.
- Sympathy with natural topography
- Avoidance of tangent points intersections.
- Matching with Stage 1D vertical grade.

Possible impacts of the proposed vertical alignment to the Intertown Public Transport (IPT) are discussed in Section 9.11.

9.5.2 Matching with Coppins Crossing Road

The design of the interim connection to Coppins Crossing Road has been developed to the following design criteria:

- Design speed 70km/h
- Match the existing geometry along Coppins Crossing Road at the interim connection
- Constructability to achieve final levels through the JGD extension formation under traffic if required
- Maximum Superelevation of 3%

An interim connection at the end of Stage 1D will be likely to be complete and under traffic at the commencement of the JGD extension contract. This will remain in operation until a two way carriageway can be opened on the new southbound lanes. At this time the Stage 1D interim connection will be closed to enable construction over this section of Coppins Crossing Road.

9.6 Typical Cross Section

9.6.1 JGD

9.6.1.1 General

The key characteristic of the cross section of JGD extension from Pond Road to the northern end of the project is a uniform roadway width of 30.0m (measured between outer kerb lines). Thus, the outer kerb will be constructed on its ultimate alignment and widening for future upgrades will occur in the median requiring reconfiguration of linemarking to define additional the lanes.

The cross section of JGD extension south of Pond Road will vary to match the proposed Stage 1D works.

Refer to drawings C10104-P011 to C10104P013 for Typical Cross Sections.

9.6.1.2 Short term (2013) and medium term (2021)

The key characteristics of JGD cross section are:

- 3.5m wide traffic lanes.
- Dedicated bus lane southbound on the section of JGD from Commercial Street to Pond Road
- 2.0m wide on road cycle lanes.
- 4.5m wide on-street parking/ cycle lane on southbound JGD, north of Commercial Street.
- 4.5m wide on-street parking/ cycle lane on northbound JGD, north of East-West Arterial Street.
- 1.5m width concrete path on the western verge.
- 2.0m wide asphalt path on the eastern verge, except the verge adjacent to future group centre as the verge will be paved as part of the development of the group centre.

- A minimum verge width of 7.5m to accommodate the shared trench, trunk services and landscaping.
- Batters are generally 4H:1V in fill areas and 2H:1V in cut areas on the western side. Note that the steeper cut batters is subjected to geotechnical investigation for the project.
- A 45m wide road reserve corridor, which does not include the width required for verge rounding.

The proposed trees are located within the clear zone requirements noted in **Error! Reference source not found.** in these locations:

- In the median along JGD, north of Pond Road.
- In the verge, south of Commercial Street.

An assessment of hazards and risks of these trees are discussed in Section 9.7.

9.6.1.3 Long term (2031)

Ultimately JGD will be widened to accommodate the demand of a dedicated Inter-town Public Transport (IPT), depending upon requirements on each section of JGD.

As noted in Section 9.5.1 that widening on JGD ultimately can be categories into two sections:

- Southern end of the project to Commercial Street.
 - A dedicated IPT corridor of 4.0m wide will be required ultimately.
 - Both widening into the median and on the verge are required to match Stage 1D works.
- Commercial Street to the northern end of the project.
 - A dedicated IPT corridor of 4.0m wide will be required ultimately.
 - Widening either in median or kerb side depending upon the adopted option.
 - The minimum width of median will be 3.4m ultimately.

Two options have been explored on the possible arrangement of IPT and retrofitting “Copenhagen’ style of cycle lane and are shown in Drawing C10104 F012 and F013.

9.6.1.3.1 Option 1 – locating IPT corridor in the median

Preliminary assessments of possible impacts are:

- Reduced traffic lanes to 3.3m wide.
- IPT corridor is 4m wide.
- The width of one-way cycle lane is 1.8m.
- Pavement widening in the median is required.
- Installation of separation strip (1m wide) on the existing pavement.

- No assessment of clear zone requirement of median trees as it would depend on whether the IPT corridor be used as bus lanes or light rail and the trees may possibly need to be removed to accommodate the installation of platforms and catenary.
- Barriers, drainage and other assets located in the median would need to be relocated and possibly be removed.
- Platform would need to be staggered and would most probably be located mid-block, due to limited median width in the vicinity of the intersection.
- No works in the verge – i.e no impacts to the services in the verge.
- Limited impact on the stormwater in the verge – breaks in the separation strip can be incorporated to maintain the free drainage of the road.
- Alteration to the traffic signal phasing.
- Incorporation of a switch to move IPT provisions in Stage 1D from the verge side to median side in Stage 2A.

9.6.1.3.2 Option 2 – locating IPT corridor in the verge side

Preliminary assessments of possible impacts are:

- Reduce traffic lanes to 3.3m wide.
- IPT corridor is 4m wide.
- The width of one-way cycle lane is 1.8m.
- Pavement widening in the median is required.
- Barriers, drainage and other assets located in the median would need to be relocated and possibly be removed.
- Horizontal separation of 0.6m is provided between the tree in the verge and the cycle lane. This is based on the assumption of the tree trunk could grow to a 0.8m wide in diameter. Note that the absolute minimum separation between the cyclist operating spaces and potential hazards beside paths is 0.5m and desirable separation is 1m based on Cycling Aspects of Austroads Guides, 2011.
- The separation strip/ platform of 3m wide is proposed. Note that the width of bus stop requirements (DS13-03-1) has been adopted. The allowable grade at the platform would also need to be assessed if light rail is proposed in the IPT corridor.
- The median trees are located within the clear zone of the outer traffic lane. Thus, safety barrier is required in the median if the trees are retained.
- Alteration to the traffic signal phasing.
- Works on the verge:
 - Reducing the verge width to 5.5m.
 - The proposed water main will be located under a cycle path. ActewAGL's acceptance is required for locating the main under a path.
 - Subjected to ActewAGL's acceptance – adjustment to the fittings such as air valves, scour outlets, hydrants, and stop valves are required to suit the proposed design level.

- Relocating street light poles.
- Street light conduit will be located under cycle lane. TAMS' acceptance is required for locating the street light conduits under a path.
- Adjustments to stormwater network.

9.6.2 Pond Road

The key characteristics of Pond Road cross section are:

- 3.5m wide traffic lanes, with local widening at the bus stop.
- 1.5m wide on road cycle lanes.
- 1.5m wide concrete path on the northern verge.
- Batters are generally 4H:1V.
- A 30m wide road reserve corridor.

9.6.3 Commercial Street

The key characteristics of Commercial Street cross section are:

- 3.5m wide traffic lanes.
- 1.5m wide on road cycle lanes.
- No off-road path on the verges as these verges will be paved as part of the adjacent developments.
- Batters are generally 4H:1V.
- A 30m wide road reserve corridor.

9.6.4 East-West Arterial Road

The key characteristics of East-West Arterial Road cross section are:

- 3.5m wide traffic lanes.
- 2.0m wide on road cycle lanes.
- 2.0m wide path to the northern verge.
- Batters are generally 4H:1V in fill and 2H:1V in cut.
- A 39m wide road reserve corridor.

9.7 Safety Barriers

There are no warrants of safety barriers in the project, except in the vicinity of large trees.

As discussed in Section 13 that there are large trees proposed in the verge and median of JGDE Stage 2A. Some of these trees are located within the clear zone widths specified in Austroads Part 6, Roadside Design, Safety and Barriers, 2009.

As shown in Table 9-3 that the severity indexes noted in Austroad Part 6 indicated tree trunk diameter larger than 150mm would have a significantly higher severity index compared to a basic safety barrier. Whilst the severity index for tree trunk diameter of 150mm is marginally higher than a safety barrier, it is assumed that a safety barrier would be required for a tree trunk diameter larger than 150mm.

Table 9-3: Severity Index, Austroads Part 6, 2009

Object type and characteristics	Severity Index - based on design speed			
	50	60	70	80
Basic SI Cable on strong posts (adjust for estimated penetration)	2.0	2.2	2.4	2.6
Trees - Diameter = 100mm	1.0	1.1	1.1	1.2
Trees - Diameter = 150mm	2.5	2.6	2.6	2.7
Trees - Diameter = 200mm	3.2	3.5	3.7	4
Trees - Diameter = 300mm	3.3	3.7	4.1	4.6
Trees - Diameter >300mm	3.4	3.8	4.2	4.7

A number of discussions with Roads ACT concluded that an assessment of safety barriers would be undertaken in the future once landscaping has had a chance to mature.

9.8 On-road cycle lane

The following provision of on-road cycle lanes are provided and they are consistent with Stage 1D project:

- A 2.0m wide lane on JGD and East-West Arterial Road
- A 1.5m wide lane through the 60km/h (posted speed) Group Centre precinct, Pond Road and Commercial Street.

Based on the weighting and rating noted Section 13.6.6 of the ACT Design Standard for Urban Infrastructure, for traffic figures projected to 2016 the use of coloured pavement treatment is not warranted at the proposed intersections.

As discussed in Section 9.6.1.3 that 'Copenhagen' style of cycle lane can be retrofitted in the ultimate arrangement.

9.9 Off-road paths

The adopted widths of the off-road paths on JGD are in lined with Stage 1D works. These parameters have been discussed and agreed with Roads ACT and they are as follows:

- No trunk path is required along JGDE Stage 2A based on the draft off-road cycle network master plan.
- 2.0m wide asphalt path provided in the eastern verge on JGD

- 1.5m wide concrete path provided in the western verge on JGD
- No path on the eastern verge on JGD adjacent to future group centre, north of Commercial Street as the verge in this area will be paved as part of the development of the group centre.

A 1.5m wide path is proposed on the northern verges of Pond Road whilst a 2.0m wide path provided on the northern verge of the East-West Arterial Road.

9.10 Noise

As noted in Section 9.2 that the estimated traffic volumes adopted in this FSP is lower than previous volumes adopted for the Molonglo Stage 2 Background Investigation Report by AECOM in 2010. Thus, it is deduced that similar approach proposed in the Molonglo Stage 2 Background Investigation Report can be adopted i.e no noise mitigation would be required in JGDE Stage 2A road corridor.

9.11 Public Transport

Dedicated bus lanes are provided along JGDE between Pond Road and Commercial Street to facilitate access to the Group Centre via Commercial Street

Proposed bus stop locations have been discussed and agreed with Territory and Municipal Services (TAMS) at the FSP presentation at the following locations:

- On JGD departure sides in the vicinity of East West Arterial Road intersection.
- On JGD northbound departure side after Pond Road intersection.
- On JGD southbound before Pond Road intersection. Buses turning right into Pond Road to utilize the bus stop on Pond Road i.e no stopping at the bus stop prior to Pond Road intersection.
- On Pond Road westbound after the intersection.

Bus priority measures are provided at the following intersections on JGDE:

- Pond Road intersection.
- Commercial Street.

A dedicated and separated kerbside bus lane at Commercial Street has been proposed to allow flexibility for buses to turn right or continue straight through the intersection. This proposal has been discussed and accepted by Roads ACT. A record of discussion is included in the appendices.

A dedicated future IPT provision is incorporated in the ultimate arrangement for the length of the JGDE Stage 2A corridor and discussed in Section 9.6.1.3.

The possible implications of incorporating provisions for bus stations along JGDE Stage 2A were discussed in the FSP presentation to TAMS such as:

- Steep tie-in to existing Coppins Crossing Road at the northern end.

- Significant increase of earthworks (possibly double the quantity) with 2% vertical grade.
- Probably increase excavating into rock and thus construction costs.

The discussion concluded that no provision for bus stations can be made along JGDE Stage 2A. If bus station is required, it can be accommodated in the vicinity of Group Centre Precinct as suggested in the PDF document and ACT Strategic Public Transport Plan.

9.12 Intersections

Three signalised intersections have been identified to be constructed with this stage of JGD. These intersections will provide critical links to the adjoining development of Molonglo 2. The eastern and western legs of each intersection will be constructed as stubs to be extended at a later date as a separate contract. The location and configuration of each intersection is as follows;

- A Tee intersection including high angle entry left turn lanes at approaches at Pond Road Intersection.
- A Tee intersection providing a left turn to a dedicated bus lane southbound and signalised entry for northbound public transport at Commercial Street intersection. This intersection does not provide access to general traffic into Commercial Street.
- A Tee intersection at Road 1 intersection, providing connection onto Commercial Street for general traffic.
- A major 4-way intersection, including high angle entry left turn lanes at all approaches at East-West Arterial intersection.

Bus priority will be provided at Pond Road and Commercial Street intersections signals with advanced green activation via detectors within dedicated lanes at the intersection approaches.

10 PAVEMENT DESIGN

10.1 Design Traffic and Loadings

Based on the recent results of traffic modelling discussed in Section 9.2, the design traffic along JGDE Stage 2 has been reassessed and tabulated below.

The following assumptions have been adopted in the calculation of design ESA:

- The adopted design life pavement is 25 years.
- The construction of JGD extension will be completed in 2013.
- The traffic volumes within the first three years after the opening of JGD to traffic volumes would be relatively low and would likely be construction traffic for the development of adjacent areas.
- The adopted percentage for Heavy Commercial Vehicles (HCV) is dropped to 8% between the year 2016 to 2021, further reduced to 6% from the year 2021 to 2031 and remained constant at 4% after the year 2031.
- The Annual Average Daily Traffic (AADT) after the year 2031 is increased marginally at the rate of 1% to the end of the design pavement life.

Table 10-1: Design ESA

Location	Estimated ESA	Adopted Design ESA
John Gorton Drive (JGD) through carriageway	8.5x10 ⁶ ESA.	1x10 ⁷ ESA.
JGD intersections with Pond Road and East West Arterial	-	4x10 ⁷ ESA.

Refer to appendices for detailed calculations.

10.2 Subgrade Condition

The geotechnical investigation was undertaken by Douglas Partners in July 2012 suggested design subgrade California Bearing Ratio (CBR) values of 3% on silty clays, 7% on recompacted extremely low to low strength dacite rock and 10% or more for insitu rocks.

The road will predominantly be constructed on a fill embankment or deep cut, therefore a minimum CBR value of 7% has been adopted for the subgrade.

10.3 Pavement Options

Three pavement options were considered in the FSP with SMA wearing course on each of these pavement options:

- Option 1 – Deep Lift Asphalt
- Option 2 – Asphalt over bound Pavement

- Option 3 – Full Depth Unbound Granular

Assessment of risk on these pavement options suggested that Pavement Option 2 (AC with bound subbase) would have higher risks compared to Pavement Option 1 and 3 and would generally be more expensive compare to Option 1 or Option 3. Thus, Pavement Option 2 is excluded in the WOLC.

Pavement profile for Option 1 and 3 are tabulated below.

Table 10-2: Pavement Profile

Pavement Type	Carriageway (subgrade CBR 7%)	Intersections & approaches (subgrade CBR 7%)
Option 1 – Deep Lift Asphalt	45mm SMA	45mm SMA
	150m Asphalt Concrete	200mm Asphalt Concrete
Option 3 – Full Depth Unbound Granular	45mm SMA	45mm SMA
	7mm primer seal	7mm primer seal
	14mm seal	14mm seal
	200mm DGB basecourse	200mm DGB basecourse
	160mm DGS subbase	200mm DGS subbase

The assumptions adopted in the above pavement profiles are:

- Generally cut material onsite would have CBR values of more than 7%. Therefore, in an embankment situation and in the event where subgrade CBR is found to be less than 7%, the cut material would be utilised to construct the embankment and therefore would provide subgrade CBR of more than 7%.
- In cut areas where hard rock subgrade is found, a 100mm granular base material (DGS20) placed at the underside of Deep Lift Asphalt (Option 1) is required. This granular platform, however, is not included in the assessment of WOLC as it would be subjected to geotechnical inspection of subgrade prior to commencement of pavement construction.

10.4 Whole of Life Costing (WOLC) Analysis

Whole of Life Costing (WOLC) analysis for different pavement types was undertaken and the report is included in the appendices.

The report concluded that Full Depth Asphalt pavement with SMA wearing course is to be adopted in the design. This is consistent with the type of pavement adopted in Molonglo Infrastructure Stage 1D works.

This pavement type is also considered appropriate by Roads ACT.

11 STORMWATER DRAINAGE

11.1 Water Quality Pond

A Water Quality Control Pond (WQCP) is proposed closer at the southern end of the project as part of the project. This WQCP will play an important role in managing the quality of stormwater that discharges to the Molonglo River.

Various options have been considered for the proposed WQCP. Two stormwater management strategies have been developed in the PSP stage and discussed separately in proposed Water Quality Control Pond at John Gorton Drive, Molonglo report included in the appendices.

Responding to the PSP comments and further discussions with the Client Agencies, Strategy 3 was introduced and discussed in the appendices.

11.2 Design Criteria

The drainage design of JGD extension has been carried out in accordance with the following publications:

- Design Standards for Urban Infrastructure, TAMS (Edition 1 Rev 1).
- Urban Road Design: A Guide to the Geometric Design of Major Urban Roads (Austroads, 2002).
- RTA drainage structure standard drawings

The key design criteria used in the design are:

- 100 years ARI for cross drainage under JGDE Stage 2A.
- 10 year ARI for longitudinal road surface drainage (including intersections).

11.3 Hydrological and Hydraulic Assessment

In general, the drainage for the project has been designed to the following principles:

- Any runoff treatments required for the upstream urban developments are assumed to have been included as part of the developments' considerations and assessments within the developments, in the exception of the treatments provided by the proposed WQCP as part of this project.
- Water sensitive urban design (WSUD) principles have been adopted for the project where possible.
- Cut off drain will be located as appropriate at the top of cuts and table drain at the toe of fills to guide water to the crossing points.
- For cross drainage culverts, energy dissipators are proposed at the outlet, where the discharge velocity is estimated to be above 4.5 m/s.

The catchment flows are estimated using the rational method outlined in the Australian Rainfall and Runoff 1987 and the Design Standards for Urban Infrastructure, TAMS, Edition 1 Revision 1.

The following criteria has been adopted for cross drainage culvert design:

- Flow calculations are based upon 90% fraction impervious.
- Where practical, the locations of cross drainage culverts are aligned closely with the future intersecting roads based on the adjacent development layouts available at the time of assessment.

Table 11-1 Summary of Cross Drainage Culverts

Upstream Structure Number	Catchment Area (Ha)	Catchment Location	Q100 (m3/s)	Culvert Size
B1	4.0	North of Pond Road and west of existing Coppins Crossing Road. Structure in southeast corner	1.12	1050
E11	0.7	North of Pond Road and West of John Gorton Drive. Structure in southeast corner	0.35	375
E4	0.6	West of John Gorton Drive. Structure in southeast corner	0.29	375
G4	1.3	West of John Gorton Drive. Structure at low point on eastern edge	0.37	675
H4	1.3	West of John Gorton Drive. Structure midway along eastern edge	0.43	675
M4	0.6	East of John Gorton Drive covering 'Block 1'. Structure in northwest corner	0.28	525
M20	2.1	East of John Gorton Drive covering 'Blocks 2 and 3'. Structure midway along western edge	0.61	750

11.4 Pavement Surface Drainage

Road drainage is required to ensure that water does not pond on the pavement surface resulting in a safety hazard. Pit spacing and pipe sizes had been developed during final design, in particular at superelevation transitions, to ensure that flow widths in lanes are acceptable.

11.5 Subsoil Drainage

Generally subsoil drainage has been provided on each side of the carriageway and under kerbs.

All subsoil drains are drained to a stormwater sump or an outlet headwall on the batter. The configuration of subsoils is documented in the DR drawings.

12 STREETLIGHTING

New street lighting is required along the carriageway. The design is in accordance with TAMS Design Standards for Urban Infrastructure Part 12 Public Lighting. It should be noted that the project site is within 5km radius of Mount Stromlo Observatory, therefore high pressure sodium lamps is proposed in the project.

Discussions with ESDD Land Planning Section indicated that a change from the arterial style of lighting of JGD to smart poles in the vicinity of the proposed group centre, north of Commercial Street, is preferred to reinforce the transition from a higher speed environment. The spacing of street light poles in this vicinity is to suit the spacing of the proposed trees along the verge.

TAMS indicated no concern with adopting smart poles in the vicinity of the group centre and noted that the proposed poles shall comply with frangibility requirements.

The following parameters have been used in the design of the lighting:

- Generally V3 along JGD extension and at intersections.
- P3 on the roadway and associated pathways adjacent to future group centre.

Lighting and lamp types on JGD extension will generally be as follows:

- South of Commercial Street
 - 12 meter high Direct Buried Impact Absorbing (DBIA) frangible type of column with 4.5 meter outreach with new street light luminaires equivalent to Sylvania Roadster to TAMS standards (250w HPS Integral with 0 degree uplift) with PE base, bridging plug and a circuit breaker located at the base of the columns..
- North of Commercial Street
 - 12 meter high BPM Fyntrim decorative column or approved equivalent with 4 meter outreach with new street light luminaires equivalent to Sylvania Elipt 65 to TAMS standards (250w HPS Integral with 0 degree uplift) with environ control gear.
 - 12 meter high BPM Fyntrim decorative column or approved equivalent with 4 meter outreach on road side with new street light luminaires equivalent to Sylvania Elipt 65 to TAMS standards (250w HPS Integral with 0 degree uplift) with environ control gear and 1.5m outreach on pedestrian side with new street light luminaires equivalent to Sylvania Elipt 45 to TAMS standards (70w HPS Integral with 0 degree uplift).
 - 6.5 meter high BPM Fyntrim decorative column or approved equivalent with 1.5m outreach on pedestrian side with new street light luminaires equivalent to Sylvania Elipt 45 to TAMS standards (70w HPS Integral with 0 degree uplift) with environ control gear.
- New Sylvania AS400 HPS Asymmetric pedestrian crossing luminaires to be mounted on 12 meter high street light column.
- Columns will be set back 1.7 meter behind kerbs and street light cable (in 50mm conduit) will be a further 300mm offset behind the columns.

A new streetlight controller is proposed in the vicinity of East West Arterial intersection.

The proposed streetlights are supplied either from existing streetlight columns, the proposed traffic controllers or the proposed streetlight controller.

Streetlight drawings and the lux diagrams are shown on Drawing WPB 3605 Sheet 1 to 6.

13 LANDSCAPING

13.1 Existing Trees

Although Brown Consulting has taken adequate measure to conserve the existing trees along the corridor, the development involves removal of an exceptional quality of tree 13098 within the project limits. Whilst making the best effort to minimize the impact on the environment, it is our persuasion that the current layout and the design represent the best fit solution in terms of a sensible road design.

During FSP presentation, TAMS indicated that spilling of earthworks within the drip line of Tree 13039 is acceptable in an attempt to retain the tree.

Tree Management Plans have been included in the DA Drawings.

A more detailed discussion on these existing trees is included in the Landscape Design Report in the appendices.

13.2 Proposed Landscaping

The tree alignment in the median is generally aligned with the road control line, with the exception of the median south of Pond Road. The tree alignment south of Pond Road is located 3m offset from the median southbound kerb.

The landscape for JGDE Stage 2A has been designed into three distinctive zones:

- Zone 1 – South of Pond Road. Landscaping in this area is a continuation of the design in Molonglo Infrastructure Stage 1D.
- Zone 2 – Between Pond Road to Commercial Street. Landscaping in this area is providing a transition zone between Zone 1 and Zone 3.
- Zone 3 – North of Commercial Street. Landscaping in this area is to create a visual differentiation of the Group Centre.

There were discussions between ESDD Planning Section and TAMS regarding the type of trees and an acceptable setback from these trees to the building in the vicinity of the proposed Group Centre. The discussions post Development Application submission concluded that:

- Building setback is to be 1.6 m.
- Spacing between trees is to be 12 m rather than 9 m.
- Platanus Orientalis are to be specified in the verges.

ESDD Planning Section requested for the parking blisters to be landscaped. Thus, Lomandra planting is proposed in the blisters.

A more detailed discussion in the landscaping design is included in the Landscaping Design Report in the appendices.

The estimated trunk diameters of the proposed trees are tabulated below.

Table 13-1: Estimated trunk sizes for proposed trees

Species	Location in design	Estimated trunk at Planting	Estimated trunk at 5 years	Estimated trunk at 10 years	Estimated trunk at maturity
Eucalyptus microcarpa	Median	30mm	100-150mm	250-300mm	500-800mm
Eucalyptus mannifera	Median	30mm	100-150mm	250-300mm	500-800mm
Platanus orientalis 'Chilensis'	Verge	50mm	100-150mm	250mm	500-700mm
Malus halliana 'Parkmanii'	Verge	50mm	100mm	200mm	250mm
Pyrus calleryana 'Bradford'	Verge	50mm	100mm	200mm	250mm
Zelkova serrata	Verge	40mm	100mm	200mm	250mm
Quercus palustris 'yarralumla clone'	Median	40mm	100-150mm	250mm	500-700mm

The proposed landscaping plans are shown on drawing L500 series.

14 CONSTRUCTION ISSUES

14.1 Northern Switch

Two options explored on the possible arrangement of the northern switch were:

14.1.1 Option 1 – attempting to match as close as possible to existing Coppins Crossing levels.

Summary of preliminary findings are:

- Northbound carriageway would be constructed as per JGDE ultimate design levels.
- Minimal impacts on Coppins Crossing Road.
- Regarding of southbound carriageway for approximately 120m as part of the next stage of design north of Stage 2A is required.
- Temporary access track in a form of pavement widening on southbound carriageway is required. Majority of the access track can be accommodated within the design embankment.

Possible impacts onto Stage 2A works are:

- Construction of temporary type pavement from approximately Ch 15,000.
- Similar to Stage 1D overlap, these permanent works can be reduced:
 - Services (water mains, shared trench ST4 and ST2, street lighting and landscaping) can be terminated at approximately Ch 15,000
 - Embankment north of the switch can be constructed up to the subgrade level.
- Limited impacts onto existing Telstra assets located along the eastern side of Coppins Crossing Road, just after Ch 15,060.

14.1.2 Option 2 – constructing final design levels to Chainage 15,160

Summary of preliminary findings are:

- Both northbound and southbound carriageway would be constructed as per JGDE ultimate design levels.
- Match with Coppins Crossing Road closer to s211 boundary.
- Cutting approximately 1.9m deep of Coppins Crossing Road.
- Temporary access track in a form of pavement widening on southbound carriageway similar to Option 1 is required. Majority of the access track can be accommodated within the design embankment.
- Additional temporary access track connecting the end of northbound carriageway to Coppins Crossing road, while cutting into Coppins Crossing Road. This access track will be located beyond the current s211 exemption boundary, however, it will be within the s211 exemption of the next

stage of Molonglo 2 and it is anticipated that the exemption for the next stage would be acquired prior to the construction of Stage 2A commences.

Possible impacts onto Stage 2A works are:

- Construction of final design level on JGD to Chainage 15,190.
- The existing Telstra assets located along the eastern side of Coppins Crossing Road are likely to be impacted and would require relocation.

14.1.3 Discussions

Both options require switching of traffic from Coppins Crossing Road to the new John Gorton Drive carriageway Stage 2A on both ends of the works, to enable works over existing Coppins Crossing Road to be undertaken. It will solely depending upon John Gorton Drive Stage 1D works be opened to traffic.

The two options have been presented to the Client agency and Option 2 has been noted to be the preferred arrangement of the northern switch and to be included in the project documentation.

14.2 Staging and Constructability

A number of discussions with the Client agency indicated that it would be likely for the construction of the northern end of Stage 1D works to occur concurrently with the construction of JGDE Stage 2A.

Thus, two packages of works are explored in this project to provide flexibility in the staging and coordination of the works with Stage 1D works. It is intended that only one package will be awarded in the project.

14.2.1 Package A

This package involves the construction of Stage 2A from approximately Chainage 13,700 to the northern end of Stage 2A works at Ch 15,160.

The civil works' separable portions for this package would probably be divided into 3 portions:

- Separable Portion (SP) 1 – works from the end of Stage 1D limit of earthworks to the northern end of the project (Ch 15,160), excluding Separable Portion 2 outline below.
- SP 2 – works in the vicinity of the existing property as per the advice from the Client Agency.
- SP 3 – works in the vicinity of the Stage 1D/2A overlap, excluding earthworks.
- SP 4 to 6 are related to landscaping works for each of the separable portions above.

14.2.2 Package B

This package involves the construction of Stage 2A from the end of Stage 1D earthworks (Ch 13,970) to the end of the northern end of Stage 2A works at Ch 15,160.

The civil works' separable portions for this package would be similar to Package A, with an exception of the works in the vicinity of Stage 1D/2A overlap:

- SP 7 – works from the end of Stage 1D limit of earthworks to the northern end of the project (Ch 15,160), excluding Separable Portion 2 outline below.
- SP 8 – works in the vicinity of the existing property as per the advice from the Client Agency.
- SP 9 to 10 are related to landscaping works for each of the separable portions above.

14.2.3 Discussions

Critical items that may impact on the progress of Stage 2A construction in any of these packages are:

- Works over existing Coppins Crossing Road will solely dependent upon John Gorton Drive Stage 1D carriageway be opened to traffic as it is highlighted in Section 14.1.3.
- Delay in the completion of SP 2 for Package A and SP 8 for Package B would prevent traffic from being diverted onto John Gorton Drive Stage 2A carriageway.
- Any of the outstanding items listed in Section 17.

14.3 Temporary Traffic Management

As this is, for the most part, a greenfield site, temporary traffic management will be required at both ends of the project when the tie-ins at each end are constructed.

Temporary traffic management will consist of warning signs, barrier protection and lowered speed environment as required. Temporary switching of all traffic will require the speed limit to be dropped to 40km/h. Temporary signals may be required in constrained area.

Temporary access tracks are required to be constructed at the northern end.

Temporary Traffic Management Concept Plans are included in the DR drawings set.

14.4 Pollution Control

During construction normal procedures would be in place to minimise erosion and control transfer of sediment to downstream water bodies. These actions would include the following:

- Use of silt fences and hay bales.
- Temporary fence of grass buffer zones that must be left undisturbed.
- Locate stockpiles in areas that minimise land take and erosion.
- Revegetate disturbed areas as soon as possible.
- Following completion of construction, drainage outlets will be stabilised.

Based on the Environment Protection Guidelines for Construction and Land Development in the ACT produced by Environmental Protection Authority (EPA) in March 2011, sediment ponds are not required for road projects.

The Client Agency have requested for temporary sediment control ponds be provided at drainage outlets, conveying runoff from the disturbed area, to ensure extra measures are in place in attempt to treat the runoff as the project is located in close proximity to the Molonglo River. These ponds have been included in C10104-601+ to C10104-603+ for Pollution Control Concept Plans.

15 EARTHWORKS

15.1 JGDE

Earthworks batters are generally 2H:1V in cut on the western side of JGDE, 4H:1V in cut elsewhere and 4H:1V in fill.

The summary of findings of the geotechnical investigation undertaken in May 2012 is as follows:

- Topsoil stripping depth of around 300mm
- Likelihood of wet silty and sandy soil depth (slopewash soil) of around 300mm to 600mm is present below the underside of topsoil. This layer of material is considered unsuitable and an allowance to remove this soil is recommended.
- As noted in the pavement design section that the suggested design subgrade California Bearing Ratio (CBR) values of 3% on silty clays, 7% on recompacted extremely low to low strength dacite rock and 10% or more for insitu rocks.

The suitability of reusing the slopewash soil was discussed with Douglas Partners and the summaries of discussions are:

- Silt/sandy material properties can be so poor and it could be seen from the excavator sinking during the investigation.
- This material can only be used in non-structural application following drying.
- Consideration could be given to adding a cement binder to stabilise the material. However, testing to determine the required percentage of cement binder required and controlling the placement of this cement binder for consistency during construction could be quite costly as it may require the need of using pug mill.
- Stripping of sandy silty material could be minimised by using geotextile encased rock bridging layers. However there would be some risk of settlement of the embankment.

After further discussion with Douglas Partners to estimate the earthworks sensibly, the allowances included in the earthworks estimation are:

- Topsoil depth of 300mm deep.
- Slopewash average depth of 200mm
- Pavement boxing of 250mm deep.

It is assumed that the slopewash soil could not be reused in the embankment construction.

Thus, the revised earthwork estimation (without borrow pit) are as follow:

- Cut to fill volume – 112,750 m³.
- An allowance of imported fill (Provisional Quantity) – 10,000m³

- An allowance of disposal of unsuitable material (Provisional Quantity) – 25,000m³

The revised earthwork estimation above indicated that no surplus material from Stage 2A works. Therefore the option of borrow pit explored during DA is no longer viable based on the discussions above.

15.2 Pond

15.2.1 Pond Batter Slopes

Earthworks batters above the median operating levels of the wetland and pond are generally 4H:1V. Maximum batter slopes of 2H:1V have been provided for the embankment between the pond and wetlands. It is proposed to densely plant batters which are steeper than 4H:1V. Around the perimeter of each water body is a 3m wide berm, therefore no batters extend directly into the ponds. Above the 3m wide berms there are several access points with batters at 6H:1V.

Batters below the operating levels of the wetland and pond will incorporate a 1.4m wide edge with a batter of 4H:1V to a maximum depth of 300mm. Below this level a minimum 2m bench with a maximum batter of 8H:1V will be provided. Beyond the bench is a 6H:1V batter which extends to the base of each water body. TAMS has indicated that the 6H:1V batter slope is acceptable.

Please note the 4H:1V edge treatment is to define the pond edge and minimise the potential to create mosquito breeding areas.

The proposed edge treatment and batter slopes satisfy the ACT WSUD General Code Section 3.2.2 which specifies 1 in 6 to 1 in 10 batter slopes above and below the water level. With the design changes recommended by TAMS & EDD post the PSP review there are no sudden drops or changes of grade below the water level.

15.2.2 Pond Earthworks Estimates and Assumptions

The earthworks estimates are:

- Removal of Topsoil (0.15m thick): 1,900m³;
- Cut to Fill Volume: 4,100m³;
- Rock Excavation: 900m³;
- Excess – Available Fill: 7,500m³;
- Allowance for disposal of unsuitable material (PQ): 3,000m³;
- Allowance for import of 300mm thick clay liner (PQ): 1,900m³.

The assumptions for the pond earthworks are as follows:

- Topsoil Depth of 0.15m;

It is proposed that excess material from the pond works could be stockpiled for later use as general fill or regrading works adjacent to the group centre.

16 OPINION OF COST

16.1 John Gorton Drive Extension

The assessment of construction costs for the John Gorton Drive Extension is as follows:

Table 16-1 Opinion of Cost

Item	Description	Package A (Approx. Ch 13,700 to northern end) Amount	Overlap (Approx. Ch 13,700 to Ch 13,970) Amount	Package B (Approx. Ch 13,970 to northern end) Amount
0	Preliminaries	\$1,046,100.00	\$306,100.00	\$1,126,100.00
1	Provision for Traffic	\$175,000.00	\$40,000.00	\$165,000.00
2	Earthworks	\$5,086,600.00	\$178,400.00	\$4,918,200.00
3	Underground Services	\$3,707,840.00	\$806,560.00	\$2,908,100.00
4	Flexible Pavement	\$5,560,100.00	\$1,180,500.00	\$4,379,700.00
6	Concrete Kerbs, Footpaths and Minor Works	\$852,200.00	\$198,700.00	\$852,200.00
7	Road Furniture	\$159,800.00	\$1,400.00	\$653,600.00
8	Incidental Works	\$516,900.00	\$67,700.00	\$158,400.00
9	Landscaping	\$1,350,300.00	\$368,800.00	\$452,200.00
10	Road Signs	\$16,500.00	\$4,300.00	\$727,600.00
11	Pavement Marking	\$84,400.00	\$28,300.00	\$12,300.00
13	Traffic Signals	\$631,300.00	\$176,600.00	\$58,700.00
14	Streetlighting	\$1,182,100.00	\$161,200.00	\$1,043,400.00
Subtotal		\$20,369,140.00	\$3,515,560.00	\$17,058,000.00
10% Contingency		\$2,037,000.00	\$352,000.00	\$1,706,000.00
GST		\$2,241,000.00	\$387,000.00	\$1,877,000.00
TOTAL Including GST (Say)		\$24,650,000.00	\$4,260,000.00	\$20,645,000.00
WQCP (refer to Section 16.2)		\$1,328,000.00	\$1,328,000.00	-
Total		\$25,978,000.00	\$5,588,000.00	\$20,645,000.00

Notes:

1. The cost assessment above is exclusive of professional fees (ie contract administration, project management etc).
2. In earthworks included in the cost estimates, the following assumptions have been adopted:
 - An allowance of 25,000 m³ has been made for unsuitable material.
 - Material below 1m deep would consist of rock type material and therefore be reused in the construction of fill embankment.
 - An allowance of 10,000 m³ has been made of imported fill.

3. The removal of existing Coppins Crossing Road will be limited to the area within the footprint of JGDE Stage 2A construction. It is assumed that the decommissioned existing pavement located outside JGDE Stage 2A would be removed as part of adjacent developments.

16.2 Water Quality Control Pond

The assessment of construction costs for the WQCP (Pond and Wetland) is outlined in **Table 7.1**.

Table 16.2:Opinion of Cost

Item	Description	Amount
0	Preliminaries	\$148,000.00
1	Provision for Traffic	\$5,000.00
2	Earthworks	\$563,300.00
3	Underground Services - Stormwater	\$145,400.00
3	Underground Services – Subsoil Drainage	\$1,100.00
6	Concrete Kerbs, Footpaths and Minor Works	\$13,800.00
8	Incidental Works	\$135,600.00
9	Landscape (by others)	
10	Signs	\$1,200.00
11	Major Concrete Works	\$84,000.00
Subtotal		\$1,097,400.00
10% Contingency		\$109,740.00
GST		\$120,714.00
TOTAL Including GST (Say)		\$1,328,000.00

Note: The assessment above is exclusive of professional fees (i.e. contract administration, project management etc).

17 OUTSTANDING ISSUES

Issues which have arisen during this Document Readiness design which require resolution prior to awarding the tender are:

- The design of possible protection and/or relocation of existing Telstra assets by Telstra Team.
- Consent from the land custodian to decommission the existing electrical supply to the existing property.
- Phase 2 ESA ensuring that all matters relevant to contamination have been addressed and including the demolition of the existing structures in the vicinity of proposed East West Arterial intersection.
- Development Application approval.
- Roads ACT's Design Acceptance.

BROWN CONSULTING (ACT) PTY LTD
July2012

APPENDICES

Appendix A Value Management Workshop (VMW)

Appendix B Preliminary Sketch Plan (PSP) Comments

**Appendix C John Gorton Drive Extension to Molonglo 2 – Revised
Group Centre Road Network Feasibility Assessment**

Appendix D Design Traffic

Appendix E Geotechnical Reports

Appendix F Water Quality Pond Report

Appendix G NES Plan

Appendix H Discussions with Services Authorities

Appendix I

Appendix J Discussions with Government Departments

Appendix K

Appendix L Heritage Studies

Appendix M Vegetation Assessment

Appendix N Landscape Design Report

Appendix O Tree Assessment

Appendix P NES Plan

Appendix Q Phase 1 ESA