Esk Main Road
St Pauls River Bridge and
Fingal Rivulet Culvert Replacement

SUBMISSION
to the
PARLIAMENTARY STANDING COMMITTEE
on
PUBLIC WORKS

June 2015

Department of State Growth

Tasmania
Explore the possibilities

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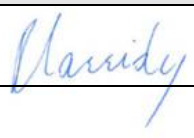
	Name	**Signature**	**Date**
Authorised by:	Richard Cassidy		19 June 2015

1. Introduction

1.1 Project

This project involves the replacement of the St Pauls River Bridge at Avoca and a culvert at Fingal (Esk Main Road culvert). The bridge is located at the south western side of Avoca in the municipality of the Northern Midlands Council. The culvert is located on the eastern side of Fingal in the municipality of the Break O'Day Council. The structures are on Esk Main Road which is gazetted a high mass load (HML) and high productivity (HPV) route. Esk Main Road is classed as a Category 3 regional access road in the *Tasmanian State Road Hierarchy*.

The upgrade works predominantly involve:

- Replacing the structures;
- Providing temporary roadworks; and
- Providing new road alignment works.

The location of the bridge replacements are shown in Figure 1 and Figure 2.

This report summarises the objectives, investigations undertaken, a project description and the issues associated with the proposed project.

1.2 Background

The Esk Main Road Bridge Upgrade Project forms a part of a Tasmanian State Government initiative to retain this HPV and HML approved roads as a strategic freight route. This will be achieved by ensuring that it can continue to carry these loads into the future without load downgrades being imposed due to bridge strength related issues. This project relates to the replacement of two under strength bridges on Esk Main Road namely the St Pauls River Bridge and the Esk Main Road culvert.

The Department of State Growth Bridge Strengthening Strategy 2012 is the primary overarching strategy document for the bridge strengthening and replacement proposed in this report. The basis for this strategy is to progressively strengthen deficient bridges on the key freight roads within Tasmania to retain the existing HPV and HML approved roads as strategic freight routes.

The overall strategy is to replace ten bridges on Esk Main Road that are deficient for strength and width. Three bridges were replaced in 2013/14 under the Heavy Vehicle Safety and Productivity Program (Round 3) which was co-funded by the Australian Government. The strengthening and replacement of the remaining seven bridges have been divided into two Stages. Only Stage 1 will be undertaken as part of this Project. Stage 2 is a future project.

St Pauls River Bridge was designed for MS18 loading and the Esk Main Road culvert was designed for Crusher Train (pre 1940's design standard) loading. Strengthening of these bridges is not economically viable therefore replacements have been proposed.

These bridges were selected for inclusion within Stage 1 because they represent the bridges that are most deficient for strength, based on the comparative line load assessment presented in the Bridge Strengthening Strategy 2012.

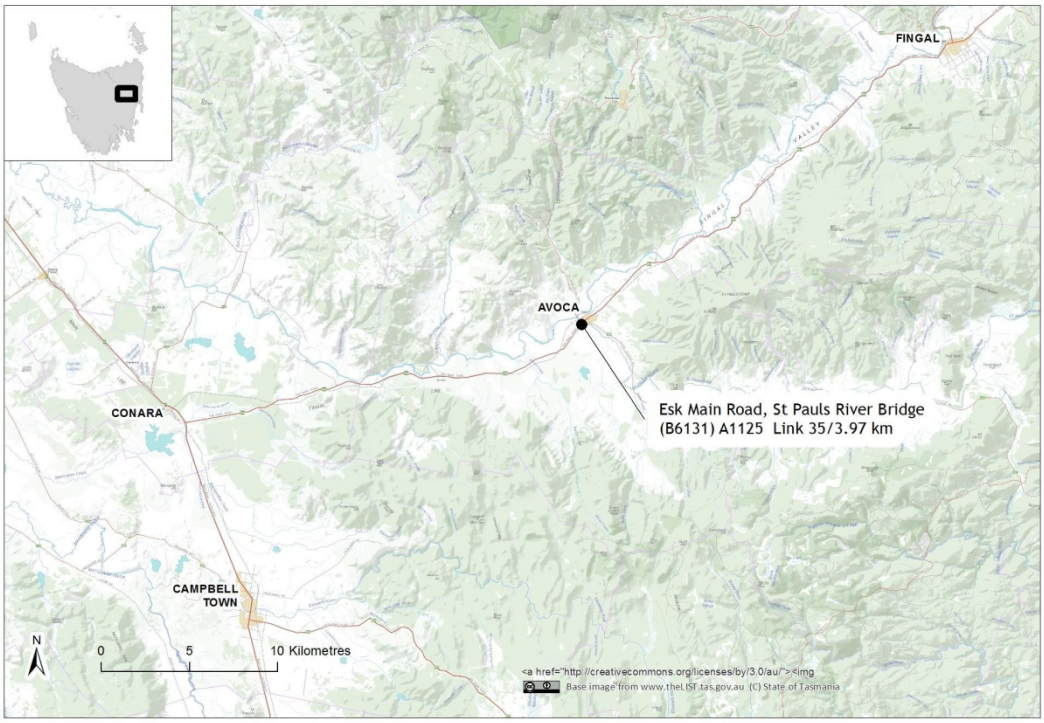


Figure 1: Location of St Pauls River Bridge

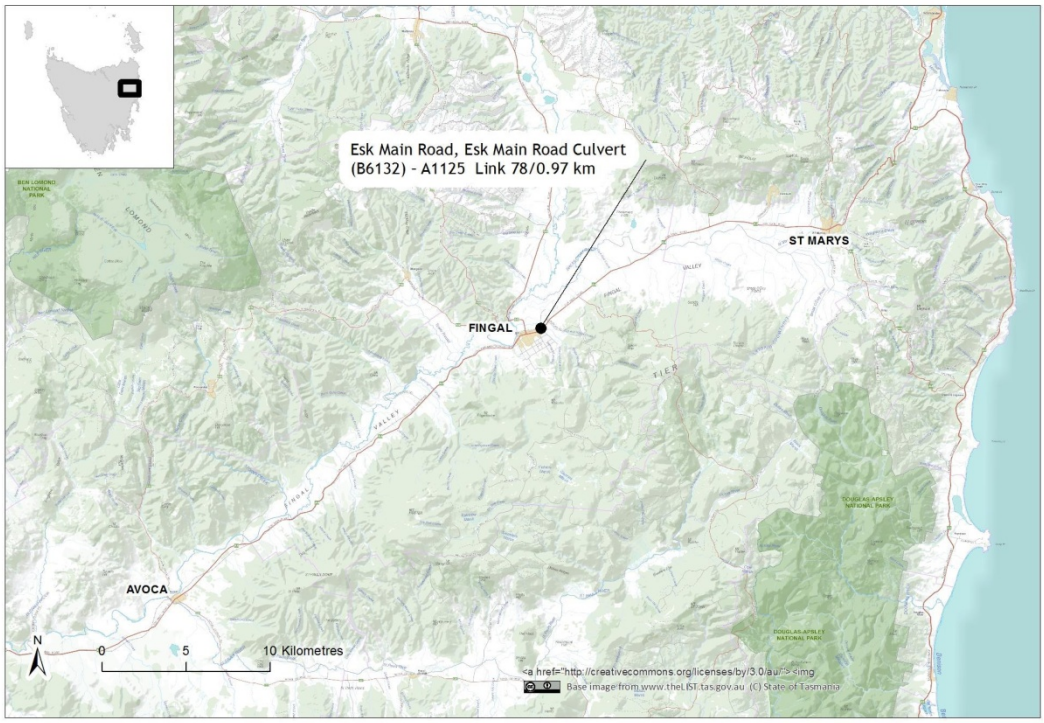


Figure 2: Location of Esk Main Road Culvert

1.3 Site Constraints

The concept development phase included the collation of ground, environmental and heritage information. The detailed design phase includes geotechnical and pavement investigations and consultation with adjacent landowners.

The concept design has identified Aboriginal, Historic Heritage and threatened flora site constraints at the St Pauls River Bridge. There are two junctions and two accesses in close proximity to the bridge to be retained.

At the Esk Main Road culvert site there is one threatened flora species in the general vicinity, two accesses and a junction.

The detailed design phase is now underway. Construction will not proceed until the project is approved. Further consultation with adjacent landowners, public utility owners, the Northern Midlands Council and Break O'Day Council is also underway.

1.4 Tender and Construction

It is proposed that a contractor be engaged for the works at both sites through the normal Request for Tender process. The expected tender opening date is 11 July 2015 with a tender briefing at Avoca on 17 July 2015. The tender close date is 12 August 2015.

Construction is expected to commence in late September 2015 with completion in May 2016.

The project is partially funded by the Australian Government. The funding agreement has three milestones, these are:

1. 31 July 2015 – Commencement of construction following planning approvals being obtained and successful acquisition of property
   (Note: the Department of State Growth is in discussion with the Australian Government regarding this deliverable)
2. 31 January 2016 – At completion of substructure
3. 31 July 2016 – Post Completion Report

1.5 Objectives

The overall objectives of the project are to:

- Provide bridges to meet the requirements for SM1600 loading in accordance with AS5100.2;
- Provide an 8.0m road cross section consisting of two 3.0 metre lanes and 1.0 metre sealed shoulders in accordance with Appendix B of the Department of State Growth's report "Review of Gazetted High Productivity Route Network".
- Provision of safe, low cost, low maintenance structures.

2. The Existing Conditions

2.1 The Road

Esk Main Road is a two-way two-lane road with an average sealed pavement width of 6.0 meters with a varying shoulder width ranging from no shoulder up to 1.0m wide. There are two unsealed property accesses and two junctions near the St Pauls Bridge and two unsealed accesses and one junction near the Esk Main Road culvert.

2.2 Traffic Flow

The most recent traffic counts indicate that the traffic flow on the Esk Main Road at Avoca is around 1225 vehicles per day including approximately 13.7% commercial vehicles.

The traffic flow at Fingal is around 1270 vehicles per day including approximately 12.8% commercial vehicles.

2.3 Road Crashes

The crash records indicate that there were no fatal crashes in the past five years at either site.

There have been two crashes within 250 meters of the St Pauls River Bridge. Both were property damage crashes. One was a three way crash in the vicinity of the southern side of the St Pauls River Bridge. The other crash occurred near the Blenhem Street junction at the northern extent of the project.

There has only been one crash near the Esk Main Road culvert. This crash was recorded as serious and occurred approximately 60 meters north of Pedder Street.

2.4 The Road Side Environment

The abutting land use is rural, although both sites are within the town limits of Avoca and Fingal.

The roadside is generally free of hazards.

2.5 Existing Services

There is a street light on the northern end of the existing St Pauls River Bridge. This light will be relocated to the new bridge and a new light provided at the southern end of the bridge.

Two other combined street light power poles at the St Pauls River Bridge site will require relocation. One provides lighting to the Storeys Creek Road junction. The other provides lighting on St Pauls Place. New lighting will be provided for the St Pauls Place junction.

Existing water mains at the St Pauls River Bridge will require relocation. An existing main currently traversing the existing bridge will be relocated into one of three service conduits proposed on the new bridge.

A combine street light power pole at the Pedder Street junction near the Esk Main Road culvert will require relocation.

An existing water main on the eastern side of the Esk Main Road culvert will require relocation as a proposed temporary side track to allow the new structure to be constructed will impact upon this water main.

3. Project Justification

This project is part of the broader Esk Main Road Bridge Upgrade Project, which forms part of a Tasmanian State Government initiative to retain HPV and HML approved roads, such as Esk Main Road, as strategic freight routes. The Department of State Growth's Bridge Strengthening Strategy 2012 is the primary overarching strategy document for this, and other, bridge strengthening and replacement projects. The basis for this strategy is to progressively strengthen deficient bridges on the key freight roads within Tasmania to retain the existing HPV and HML approved roads as strategic freight routes.

In addition to this strategic rationale, the more general justification for this project is derived from improved transport and freight efficiencies, safety improvements and a reduction in the current maintenance costs. These main issues are discussed below.

3.1 Transport Efficiencies

Esk Main Road is currently an HML and HPV Road Network, it is currently at risk of being downgraded to the General Access Road Network, or potentially lower, as the existing capacity of the bridge is not sufficient to continue to carry these vehicles. In addition, the bridge geometry is not compliant with current requirements and therefore presents a safety risk.

This will improve ease of transportation of cranes and over mass vehicles throughout the State as the bridge stock is improved, particularly in support of major industry. This is particularly important at St Pauls River Bridge as this structure is currently preventing over mass vehicles reaching a significant area of the East Coast of Tasmania as well as existing agricultural, forestry and mining regions in the Fingal valley.

3.2 Safety Benefits

The proposed project incorporates the following safety improvements:

- Reduced risk of road closure due to catastrophic failure or major maintenance requirements on bridges;
- Reduction in the incidence of road crashes (as there will be fewer vehicle movements required to perform the freight task);
- Reduction in the risk (both likelihood and consequence) of road crashes at these locations due to increased bridge width; and
- Replacement of road safety barriers to provide 8 meter clearance from face of barrier to face of barrier.

3.3 Maintenance Cost Savings

The proposed project will reduce the recurrent bridge maintenance costs through a reduction in the rate of bridge deterioration and therefore maintenance costs into the future.

4. Project Description

The proposed works can be categorised into:

- Bridge replacement, including demolition of existing bridge;
- Road realignment;
- Cross section improvement; and
- Safety barrier improvement.

Plans of the proposed works used for public display are provided in Appendix A. General arrangement drawings are provided in Appendix B.

4.1 Bridge Replacement

The replacement St Pauls River Bridge is proposed to be 90m long; this is an increase in length from the existing bridge which is 72m. The main reason for increasing the length is to limit the need for very high abutments to be constructed. The current structure has abutments that are approximately 10m high; by lengthening the proposed bridge the abutment and associated curtain wall can be limited to approximately 3m high.

The span configuration is well suited to the use of 1500 deep 'Super-T' beams with a cast in situ concrete deck. These beams are comfortably within the capability of the Tasmanian bridge construction industry to construct, transport and erect. The use of three spans is advantageous as it matches the existing bridge (i.e. no significant change to hydraulic effects) and means that the piers can each be constructed out of normal river levels.

It is proposed that the existing St Pauls River Bridge be demolished once the new bridge is completed. The demolition will include the removal of the bridge deck (including safety barriers), bridge piers and reinstatement of the redundant road approaches. The abutments will not be demolished and will have a fence installed at the top for safety purposes.

A geotechnical investigation has found competent rock at approximately 0.5m below ground level in the vicinity of the piers and about 3 to 4m below ground level at the abutments. It is therefore proposed that high level spread footings shall be used at the piers. The abutments shall have relatively short piles and an expansion joint at each end. The deck slab will be continuous over the piers; the beams will be discontinuous over the piers.

The Esk Main Road culvert is a large box culvert structure with a water way opening of approximately 5 meters wide by 1.6 meters high. The structure will be replaced with twin box culverts each with internal dimensions of 2.7 meters wide by 1.65 meters high. The new structure will be wider to facilitate a road width of 8.0m.

4.2 Road Realignment

The new bridge over the St Pauls River will be constructed to the south east of the existing bridge. The Esk Main Road will be realigned to suit the new bridge position. The new bridge will be slightly curved to suit the new road geometry.

The Esk Main Road culvert will be constructed in the same location as the existing structure. To facilitate this, a temporary sidetrack will be constructed on the southern side of the existing structure.

4.3 Cross Section Improvement

The existing St Pauls River Bridge has a trafficable width of 7.315 metres. The new bridge will accommodate a road cross section consisting of two 3.0 meter lanes and 1.0 meter shoulders.

The Esk Main Road culvert will be lengthened to accommodate a road cross section consisting of two 3.0 metre lanes, 1.0 meter shoulders and 1.0 meter verges.

4.4 Safety Barrier Improvement

The safety barriers will be replaced at both sites to bring them up to contemporary standards.

Widening of the Esk Main Road culvert will allow a safer distance between the face of the barriers.

5. Existing Environment

5.1 Flora

A flora and fauna survey has been conducted for the road reserve and adjacent land. For the St Pauls River Bridge study area, the survey identified two species listed under the *Threatened Species Protection Act 1995* (Tas):

- *Austrostipa scabra* (rough speargrass);
- *Persicaria decipiens* (slender waterpepper);

The survey also identified one species of threatened flora listed under both the *Threatened Species Protection Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* (Cwth):

- *Lepidium hyssopifolium* (soft peppercress)

To facilitate construction and temporary works some of the threatened species need to be removed. A Permit to Take has been approved for *A. scabra* (3 locations), and *P.decipiens* (2 locations) by the Policy and Conservation Assessment Branch of DPIPWE.

The study also identified nine introduced plants at the St Pauls River bridge listed as 'declared' weeds under the *Weeds Management Act 1999* (Tas):

- *Lycium ferocissimum* (African boxthorn);
- *Rubus fructicosus* (blackberry);
- Genista monspessulana (canary broom);
- *Cytisus scoparius* (english broom);
- *Ulex europaeus* (gorse);
- Foeniculum vulgare (fennel);
- Marrubium vulgare (horehound);
- Salix Xfragilis (crack willow); and
- *Salix Xrubens, S.alba* (willow).

For the Esk Main Road culvert study area, the survey identified one species of threatened flora listed under both the *Threatened Species Protection Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* (Cwth):

- *Lepidium hyssopifolium* (soft peppercress)

The study also identified five introduced plants at the Esk Main Road culvert listed as 'declared' weeds under the *Weeds Management Act 1999* (Tas):

- *Rubus fructicosus* (blackberry);
- Genista monspessulana (canary broom);
- *Cytisus scoparius* (english broom);
- *Ulex europaeus* (gorse); and
- Salix Xfragilis (crack willow).

5.2 Fauna

The flora and fauna survey also identified potential habitat for a number of threatened species. However the majority of the habitat values present are restricted to foraging values only.

No permits are required relative to fauna. Impacts on foraging habitat will be managed via standard construction controls that seek to minimise the footprint of disturbance. Disturbed areas to be rehabilitated in accordance with project specific rehabilitation plan

5.3 Aboriginal Cultural Heritage

An Aboriginal cultural heritage assessment has been undertaken for the St Pauls River Bridge study area. There were two Aboriginal heritage sites with potential Archaeological deposits in the vicinity of the St Paul River Bridge project area. An isolated artefact was relocated to a more secure location to avoid construction impacts as per the recommendations in the Consultant Archaeologist's report. An artefact scatter has been identified as an exclusion zone during construction and therefore provides such a secure location for the artefact.

An Aboriginal cultural heritage assessment was not required at the Esk Main Road Culvert site by Aboriginal Heritage Tasmania as there are no Aboriginal heritage sites recorded within or close to the works area. Due to the area being highly disturbed it is believed that the area has a low probability of Aboriginal heritage being present.

5.4 Historic Heritage

A Historic heritage survey has been undertaken for the St Pauls River Bridge study area.

The bridge replacement at St Pauls River Bridge is to the east of the existing bridge to minimise the risk of indirect damage to a majority of the identified heritage values which are on the western side of the Esk Main Road.

The realignment will impact upon one heritage listed property on the eastern side of the Esk Main Road. The property is the former Avoca Primary School at 16 Blenheim Street. The impact involves minor acquisition from the north-west corner of the heritage listed title. The acquisition area is approximately 135 m^2 of 4044 m^2 property.

No heritage values on the former Avoca Primary School will be impacted by the proposed works. A certificate of exemption for the works has been issued by the Tasmanian Heritage Council.
An historic heritage field survey was not undertaken for the Esk Main Road culvert**.** Historic heritage field surveys are not undertaken unless there are compelling reasons, such as presence of heritage listed sites and known historic values. Consistent with previous culvert replacements on the Esk Main Road and absence of historic heritage values, a survey was not required. It is noted that Heritage Tasmania supports this approach.

5.5 Visual Impact

There will be no impact on visual amenity at either the St Pauls River Bridge or the Esk Main Road culvert, as both only involve replacement of existing infrastructure and both are essentially within the urban extent of Avoca and Fingal respectively.

6. Environmental and Heritage Safeguards

6.1 Proposed Management Regime

In order to limit the impact on the environmental and heritage values identified, the following processes and actions are being incorporated into the project:

- The area of land being acquired for completion of the works has been kept to the minimum practicable level required by good road design;
- Avoidance or minimisation of impacts to threatened flora and potential threatened fauna habitat;
- Locations with environmental values requiring protection will have fencing erected around them for the duration of the construction;
- All weed areas are clearly identified and requirements for the treatment of the various declared weeds will be included in the tender documents, so they can be appropriately managed during construction;
- Bridge replacement located to avoid heritage features;
- Protection of the surrounding heritage values through pre-inspection of heritage structures and the specification of non-structurally damaging construction processes;
- The Contractor will be made aware of the locations of the Aboriginal heritage sites and areas of potential archaeological sensitivity. No soil disturbance will be permitted in these areas; and
- In the event that any Aboriginal cultural heritage material or historic heritage items are encountered during the construction phase the normal protocols will be followed. These require that all activities cease in the area immediately, pending consultation with the relevant Aboriginal community group(s) and the Manager, of Aboriginal Heritage Tasmania for Aboriginal cultural heritage and Heritage Tasmania for historic heritage.

7. Social Implications

Potential social and economic impacts as a result of the proposed works will be positive, as the aim is to retain Esk Main Road as a strategic freight route. In addition the extra width and improved safety barriers at each location will increase safety.

There will be some short-term social impacts arising from inconvenience associated with the road construction activities. These will be mitigated by good communication and traffic control during construction.

7.1 Property Impacts

There are six landowners who own land abutting the proposed works - three at the St Pauls River Bridge site and three at the Esk Main Road culvert site.

There have been on-going discussions with all property owners to determine what works are necessary and to enable acquisition of the required land. Every effort will be made to ensure that individual concerns have been addressed.

The works at the Fingal Rivulet have necessitated the need to relocate a TasNetworks transmission pole and street light. The relocation of the pole will adjust the alignment of the overhead transmission lines to cross the corner of 91 Talbot Street (CT164965-1). The owners of the property have been consulted and agreed to allow an easement over their land to contain the transmission lines.

The St Thomas's Church in Avoca is not directly adjacent to the construction works, however it has been identified as having heritage significance. A dilapidation survey has been undertaken to determine its current condition and recommendations from the survey have been incorporated into the design.

7.2 Public Consultation

As part of the project a public consultation plan has been developed and is currently being implemented.

Department of State Growth has consulted with Northern Midlands Council and Break O'Day Council to gain their input and to understand any local issues that Council may be aware of which should be included within the scope of the project.

The initial feedback from the Councils is that they support the proposed works in both cases.

During detailed design, meetings have been conducted with abutting property owners to:

- Explain the reasons for and objectives of the project; and
- Provide an opportunity to raise issues directly with the project team.

This phase will also include liaison with the landowners and service providers to precisely define the:

- Extent of the required acquisition;
- Works at accesses;
- Replacement of fencing; and
- Changes to public utilities.

Once the land required for the works has been surveyed and the acquisition process commenced, the Office of the Valuer General and Department of State Growth Land Assets Group will liaise with the landowners to agree on compensation to be paid.

The Department of State Growth met onsite with community representatives to discuss the project these included a member of the township committee a local councillor and members of the Boucher Park Committee. The impact on the Boucher Park was discussed and understood and options for fencing discussed. The fencing suggestions were then taken to the larger community including families with young children who had some safety concerns. As a result of these concerns the design now includes a safety fence around an extended children's play area.

Invitations to a public display in the Avoca Post Office were provided to all addresses in Avoca, Roassarden and Royal George. Invitations were also placed in the Community House in Fingal. The invitation and public display images were also e-mailed to both the Northern Midlands and Break O'Day Council's for distribution to their lists.

The project information was included on a website http://www.transport.tas.gov.au/road/projects/esk_main_road

Both the web address and a project phone number were included on all the written information.

The Public Display was held in the Avoca Post Office from Monday 11th May until Friday 22nd May. Comments forms and a comments box were provided. 4 completed comments forms were received.

Issues in comments forms included:

- All 4 respondents wanted a safe pedestrian access across the bridge, reasons given being to get to the cemeteries, for tourism purposes to see the view and for those who reside on the Conara side.
- 2 respondents wanted a sewerage pipe put across the river on the bridge.
- 2 respondents were concerned about cycling safety across the bridge because of "wind drag" from passing trucks. (The new design includes higher railings for the safety of cyclists).
- 1 respondent asked if the old bridge could be left for use as a cycle and pedestrian way and as a backup for the new bridge
- 2 respondents wanted to see a speed reduction over the bridge

The feasibility of a footpath has been investigated and found that the very low demand does not warrant the significant cost of providing the infrastructure. The feasibility of providing connections to facilitate the future attachment of a footpath to the bridge is currently being investigated.

The Department, through consultation with the key Avoca stakeholders, has agreed to provide additional fencing around the play equipment at Boucher Park to enhance the safety of this area.

The final phase of public consultation is during construction. During this period Department of State Growth will keep the travelling public informed of possible impacts through signage on the site and notices in the press. There will be close liaison between the contract administration team and adjacent landowners to ensure that the landowners are advised on works staging and potential impacts.

In summary, Department of State Growth will continue to consult with:

- Northern Midlands Council;
- Break O'Day Council;
- Transportation bodies;
- Bus operators;
- Emergency services;
- Public utility providers; and
- Local residents.

8. Approvals

8.1 Planning Approval

The project area for the St Pauls River Bridge is within the municipality of the Northern Midlands Council. Use and development within this municipality is governed by the *Northern Midlands Interim Planning Scheme 2013*. A development application has been submitted to Council for approval.

The Esk Main Road culvert project area is located in the Break O'Day municipality and subject to the *Break O'Day Interim Planning Scheme* 2013. The proposed works have been confirmed by Break O'Day Council as being exempt from planning approval and as such a development application is not required for the Esk Main Road culvert works.

8.2 Environmental Approvals

A Permit to Take has been approved for *A. scabra* (3 locations), and *P.decipiens* (2 locations) at St Pauls Rover Bridge by the Policy and Conservation Assessment Branch of DPIPWE.

It is not anticipated that any approvals will be required in relation to listed flora and fauna species at Esk Main Road culvert.

8.3 State Policies

8.3.1 Buy Local Policy

The Department of State Growth has requested exemption from the Treasurers' Instruction TI 1225 that requires procurements to be disaggregated. Aggregation is recommended due to a limited number of Tasmanian companies having the required pre-qualification however a pre-procurement local impact assessment concluded that the aggregation would have minimal negative impact.

8.3.2 State Coastal Policy

The Tasmanian *State Coastal Policy 1996* is applicable to all land within a distance of one kilometre from the high-water mark. Thus the State Coastal Policy does not apply to this project.

8.3.3 State Policy on the Protection of Agricultural Land

The *State Policy on the Protection of Agricultural Land 2000,* provides for protection of the State's prime agricultural land from conversion to non-agricultural use and development. The policy defines Prime Agricultural Land as meaning:

Agricultural land classified or capable of being classified as Class 1, 2 or 3 land using the Class Definitions and methodology from the Land Capability Handbook, KE Noble 1992, Department of Primary Industry, Tasmania.

There is no prime agricultural land within the project area.

The State Policy on the Protection of Agricultural Land does not apply to this project.

8.3.4 State Policy on Water Quality Management

In accordance with Section 35.1 of *The State Policy on Water Quality Management 1997*, all road construction works must employ measures consistent with best practice environmental management to prevent erosion and the pollution of streams and waterways by runoff from sites of road construction.

Appropriate silt control and sedimentation measures will be put in place to protect the surrounding waterways and prevent potential soil erosion on site.

9. Construction Program and Costs

9.1 Program

Project construction is programmed for the summers of 2015/16. This allows works to be constructed with a lower risk of inclement weather, which would increase costs and delay construction causing extended disruption to the traveling public. The key dates are shown in Table 1.

Table 1.
Program

Project Phase	Start Date	End Date
Design development	April '15	June '15
Tendering and tender assessment	July '15	Aug '15
Construction	Sept '15	May '16

9.2 Costs

The cost estimates have been prepared using the Evans and Peck document, Best Practice Cost Estimation Standard for Publicly funded Road and Rail Construction. The document outlines the preparation of probabilistic estimates based on the risks and confidence levels.

For this project P50 and P90 confidence level estimates have been prepared.

"P50 represents the project cost with sufficient risk provisions to provide a 50% level of confidence in the outcome i.e. that there is a 50% likelihood that the project costs will not be exceeded.

P90 represents the project cost with sufficient risk provisions to provide a 90% level of confidence in the outcome i.e. that there is a 90% likelihood that the project costs will not be exceeded."[1]

The major project components and estimated costs are shown in Table 2. The full estimate is in Appendix C.

Table 2.
Cost Estimate (P50)

Cost Item	Amount ($)
Department of State Growth Delivery Costs	$1,126,000
Environmental Works	$158,000
Temporary Works / Traffic Management	$407,000
Public Utilities Adjustments	$76,000
Earthworks	$250,000
Drainage	$81,000
Pavements	$260,000
Traffic Signage, signals, signal and controls	$155,000
Landscaping	$47,000
Supplementary Items	$498,000
Bridge Costs	$2,813,000
Department of State Growth Supplied Material or Services	$68,000
Contingency – inherent risks	$334,000
Contingency – contingent risks	$192,000
Escalation	$285,000
TOTAL	**$6,750,000**

[1] As quoted by Evans and Peck, Best Practice Cost Estimation Standard for Publicly Funded Road and Rail Construction.

10. Conclusions and Recommendations

The design for the proposed project on the St Pauls River Bridge and the Esk Main Road culvert has been carried out with regard to an acceptable balance of priorities, risks and cost.

Where feasible, the desires of abutting landowners, Northern Midlands Council, Break O'Day Council and public utility owners have been incorporated.

The concept design meets the objective of the project to provide bridges that meet the strength requirements for SM1600 loading and an 8m road cross section.

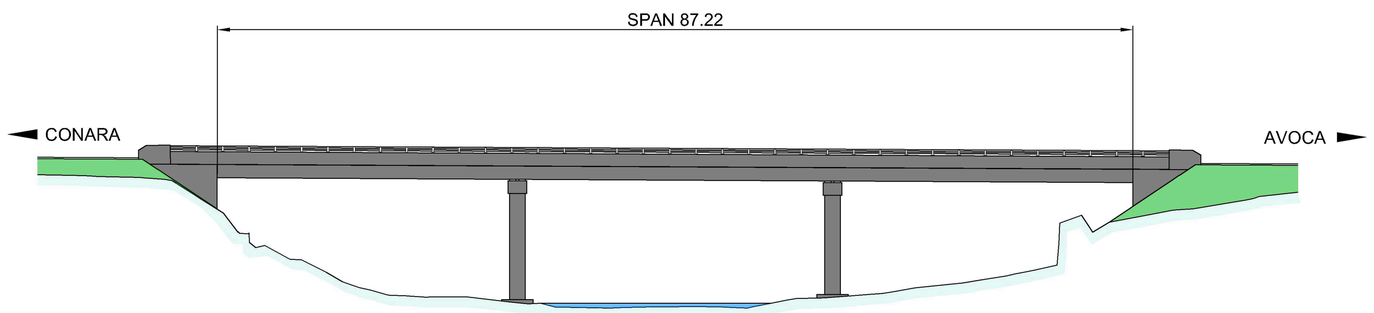
Once complete, the works will provide improved safety and reduced pavement maintenance costs through strengthening and improvements to pavement drainage.

It is recommended that the project be approved.

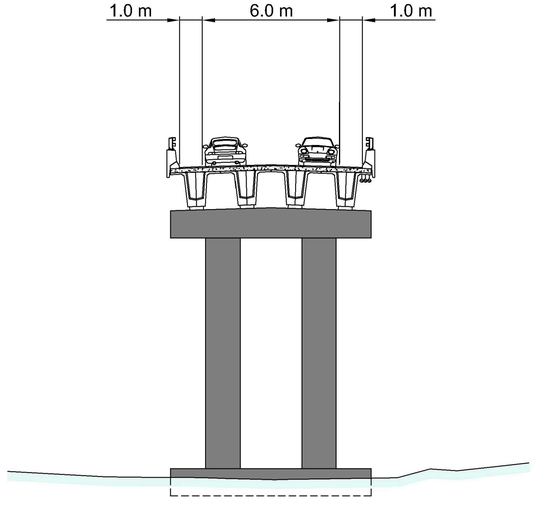
Appendix A

Public Display Plans

St Pauls River Bridge design



St Pauls River Bridge elevation



St Pauls River Bridge typical section

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Roads for our Future

St Pauls River Bridge replacement Avoca

St Pauls River Bridge location plan

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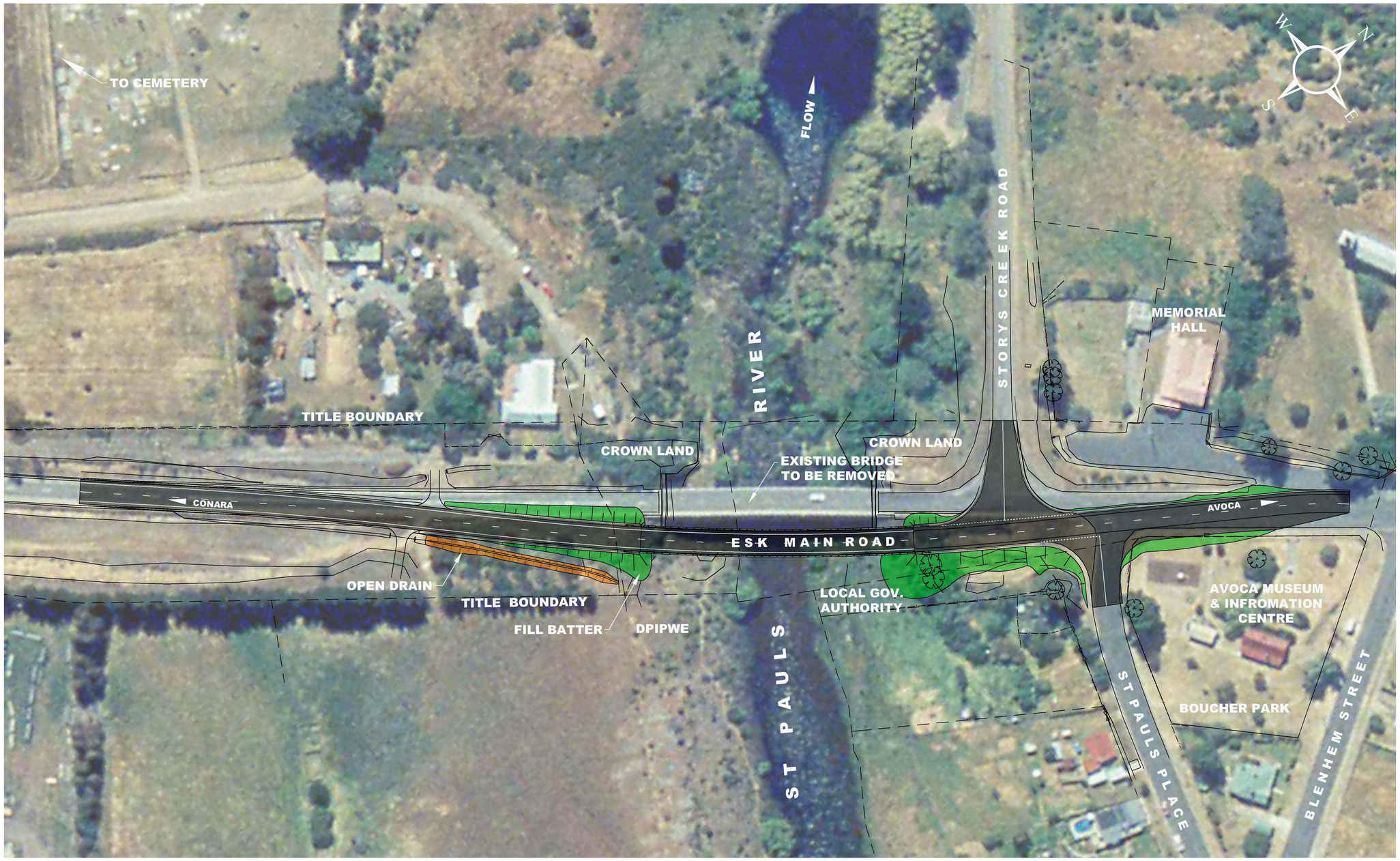
Roads for our Future

St Pauls River Bridge replacement design plan



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Roads for our Future

Fingal Rivulet culvert design plan

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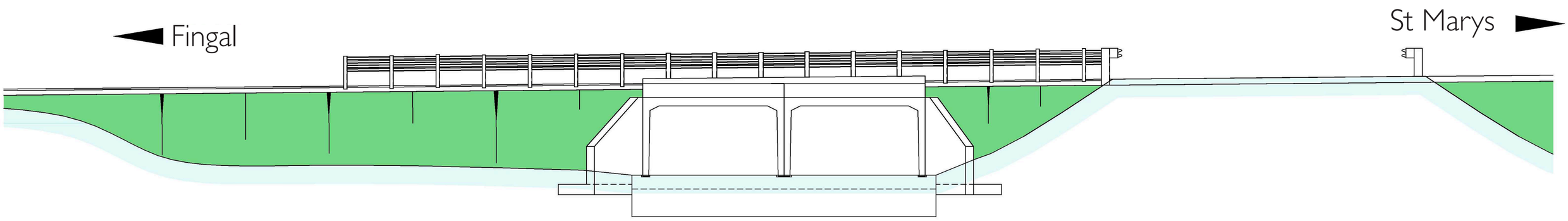
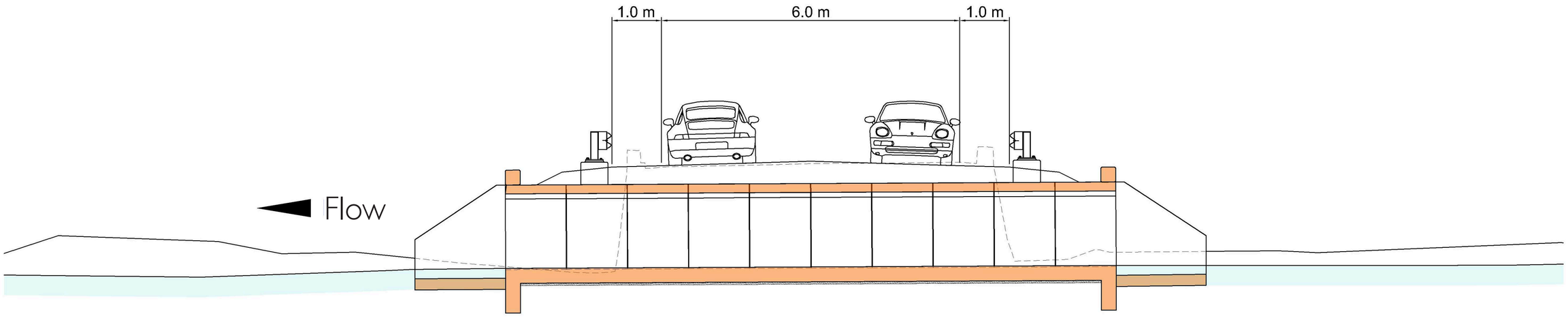
Roads for our Future

Fingal Rivulet design



Fingal Rivulet culvert elevation



Fingal Rivulet culvert section

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Appendix B

General Arrangement Drawings

M.J. MONEY
CT 143736-1

EXISTING PROPERTY BOUNDARY

INSTALL W-BEAM SAFETY BARRIER WITH POINT OF NEED AT CH.3879 (MC20) AND THRIE-BEAM TRANSITION TO BRIDGE. TERMINAL TO BE REDIRECTIVE

REMOVE EXISTING W-BEAM SAFETY BARRIER

INSTALL 3.6m WIDE ACCESS. REFER DESIGN LINE MC40

REDUNDANT ROAD 50mm TOPSOIL AND GRASS

REDUNDANT ROAD 50mm TOPSOIL AND GRASS

MATCH TO EXISTING FORMATION AT CH.3750 (MC20)

EXTENT OF CONTRACT

MC20

ESK MAIN ROAD

3800

MC40

MC30

3900

GV

GV

JOINS - SHEET 1102

LE03
207.571

MATCH EXISTING DRAIN TO TABLE DRAIN

CONARA

INSTALL 3.6m WIDE ACCESS. REFER DESIGN LINE MC30

FINGAL

INSTALL ROCK LINED OPEN DRAIN. REFER DESIGN LINES ID00 AND IE01

INSTALL PRESERVATION FENCE

FP1

INSTALL W-BEAM SAFETY BARRIER WITH POINT OF NEED AT CH.3875 (MC20) AND THRIE-BEAM TRANSITION TO BRIDGE. TERMINAL TO BE REDIRECTIVE

EXISTING PROPERTY BOUNDARY

R. FREEMAN & J.M. PHILLIPS
CT 142816-1

F.R. O'CONNOR
CT 243096-1

No.	Amendment Description	Initials	Date
A	PRELIMINARY DESIGN	N.D.	21/05/15

A3 original — This sheet may be prepared using colour and may be incomplete if copied

SCALES
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SCALE IN METRES - 1:500

Co-ordinate System: MGA ZONE 55 Height Datum: A.H.D.

pitt&sherry

Tasmanian Government

DESIGNED L.ALLEN
REVIEWED N.DYWER

Department of State Growth

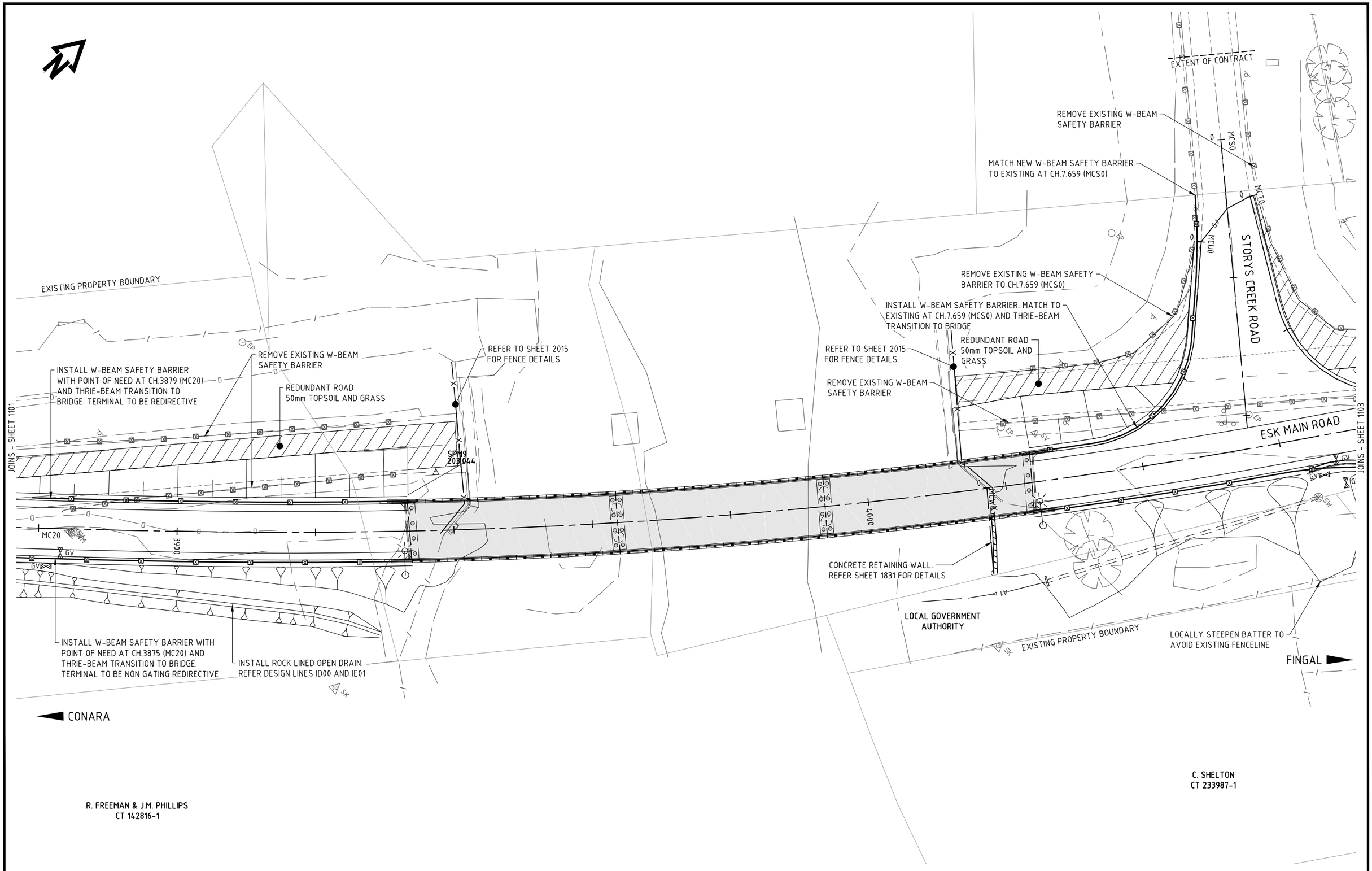
ESK MAIN ROAD (A1125)
BRIDGE REPLACEMENTS
ST PAULS RIVER BRIDGE (B6131)

GENERAL ARRANGEMENT - DRG 1 OF 3

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
2284	HB15144-C1101	04-Jun-15, 9:51 AM	1101

REGISTRATION NUMBER
A1125.003

REVISION A



No.	Amendment Description	Initials	Date
A	PRELIMINARY DESIGN	N.D.	21/05/15

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SCALES
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SCALE IN METRES - 1:500

Co-ordinate System: MGA ZONE 55 **Height Datum:** A.H.D.

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DESIGNED L.ALLEN
REVIEWED N.DYWER

Department of State Growth

ESK MAIN ROAD (A1125)
BRIDGE REPLACEMENTS
ST PAULS RIVER BRIDGE (B6131)

GENERAL ARRANGEMENT - DRG 2 OF 3

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
2284	HB15144-C1102	04-Jun-15, 9:51 AM	1102

REGISTRATION NUMBER
A1125.003

REVISION A

STORYS CREEK ROAD

EXTENT OF CONTRACT

NORTHERN MIDLANDS COUNCIL
CT 130744-1

NORTHERN MIDLANDS COUNCIL
CT 212209-1

THE TRUSTEES OF THE
DIOCESE OF TASMANIA
CT 204075-1

INSTALL PRESERVATION FENCE

EXISTING PROPERTY BOUNDARY

INSTALL W-BEAM SAFETY BARRIER. MATCH TO EXISTING AT CH.7.659 (MCS0) AND TRIE-BEAM TRANSITION TO BRIDGE

PROVIDE SMOOTH TRANSITION TO EXISTING PAVEMENT SURFACE

REMOVE EXISTING W-BEAM SAFETY BARRIER

REDUNDANT ROAD
50mm TOPSOIL AND GRASS

REDUNDANT ROAD
50mm TOPSOIL AND GRASS

LF01
204.998

ESK MAIN ROAD

FINGAL

EXTENT OF CONTRACT

JOINS - SHEET 1102

CONARA

LF02
202.376

F001

F002

F003

EXISTING PROPERTY BOUNDARY

EXISTING ENTRANCE AND FENCE TO PARK - **NOT** TO BE IMPACTED BY WORKS IN ANY WAY

INSTALL B1 KERB. REFER DESIGN LINE MCR0

NEW PROPERTY BOUNDARY

PLAYGROUND

3.0m

REMOVE EXISTING KERB BETWEEN CH.0 (MCR0) AND CH.69.529 (MCR0)

EXISTING INTERPRETIVE SIGNS AND RUBBISH BIN TO BE RELOCATED TO NEW FENCE LINE

INSTALL 1.5m WIDE KERB RAMP. REFER IPWEA DRG TSD-R18

INSTALL 1.5m WIDE FOOTPATH FROM KERB RAMP. MATCH TO EXISTING

INSTALL TREATED PINE FENCE. REFER IPWEA DRG TSD-R27. INSTALL 1m BACK FROM NEW KERB BETWEEN POINTS F001 AND F002 AND ALONG EXISTING BOUNDARY BETWEEN POINTS F002 AND F003

MATCH TO EXISTING KERB AT CH.0 (MCR0)

INSTALL 1.2m POOL FENCE PLAYGROUND. FENCE TO BE EXTENDED 3m SOUTH OF EXISTING PLAYGROUND. 1.2m WIDE GATE WITH CHILD PROOF POOL LATCH TO BE INSTALLED UNDER DIRECTION OF SUPERINTENDANT

REMOVE EXISTING TREATED PINE FENCE BETWEEN POINTS F001 AND F003

NORTHERN MIDLANDS COUNCIL
CT 161044-1

EXISTING PROPERTY BOUNDARY

INSTALL W-BEAM SAFETY BARRIER WITH POINT OF NEED AT CH.3 (MCQ0) AND THRIE-BEAM TRANSITION TO BRIDGE. TERMINAL TO BE REDIRECTIVE

LOCALLY STEEPEN BATTER TO AVOID EXISTING FENCELINE

REMOVE EXISTING KERB FROM CH.0 (MCQ0)

INSTALL B1 KERB. REFER DESIGN LINE MCQ0

MATCH TO EXISTING KERB AT CH.0 (MCQ0)

ST PAULS PLACE

EXISTING PROPERTY BOUNDARY

EXTENT OF CONTRACT

C. SHELTON
CT 233987-1

No.	Amendment Description	Initials	Date
A	PRELIMINARY DESIGN	N.D.	21/05/15

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SCALE IN METRES - 1:500

Co-ordinate System: MGA ZONE 55 **Height Datum:** A.H.D.

pitt&sherry

Tasmanian Government

DESIGNED L.ALLEN
REVIEWED N.DYWER

Department of State Growth

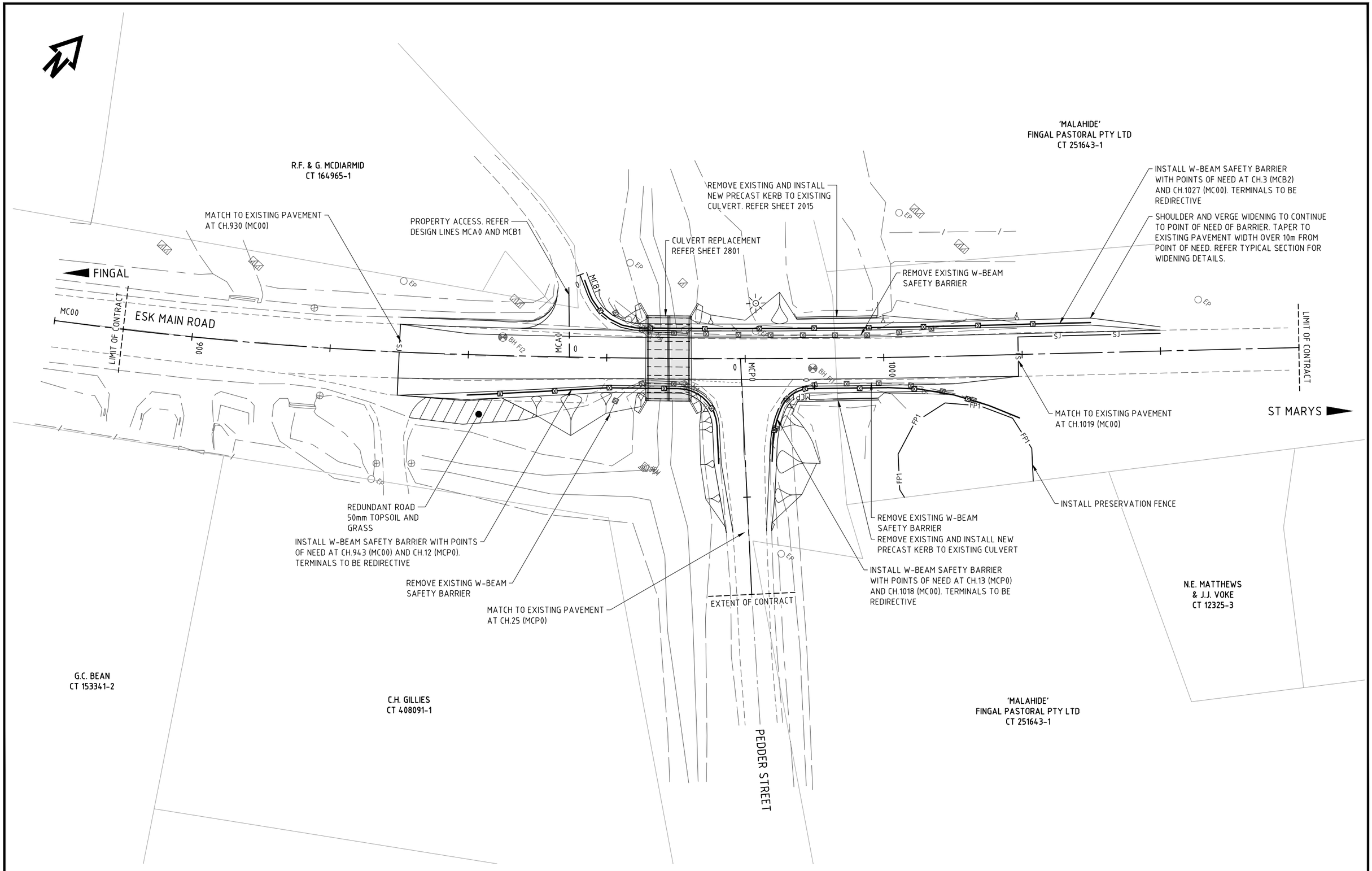
ESK MAIN ROAD (A1125)
BRIDGE REPLACEMENTS
ST PAULS RIVER BRIDGE (B6131)

GENERAL ARRANGEMENT - DRG 3 OF 3

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
2284	HB15144-C1103	04-Jun-15, 9:51 AM	1103

REGISTRATION NUMBER
A1125.003

REVISION A



No.	Amendment Description	Initials	Date
A	PRELIMINARY DESIGN	N.D.	21/05/15

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SCALES
1:500
5 0 5 10 15 20
SCALE IN METRES - 1:500

Co-ordinate System: MGA ZONE 55 Height Datum: A.H.D.

pitt&sherry
Tasmanian Government

DESIGNED L.ALLEN
REVIEWED N.DWYER

Department of State Growth

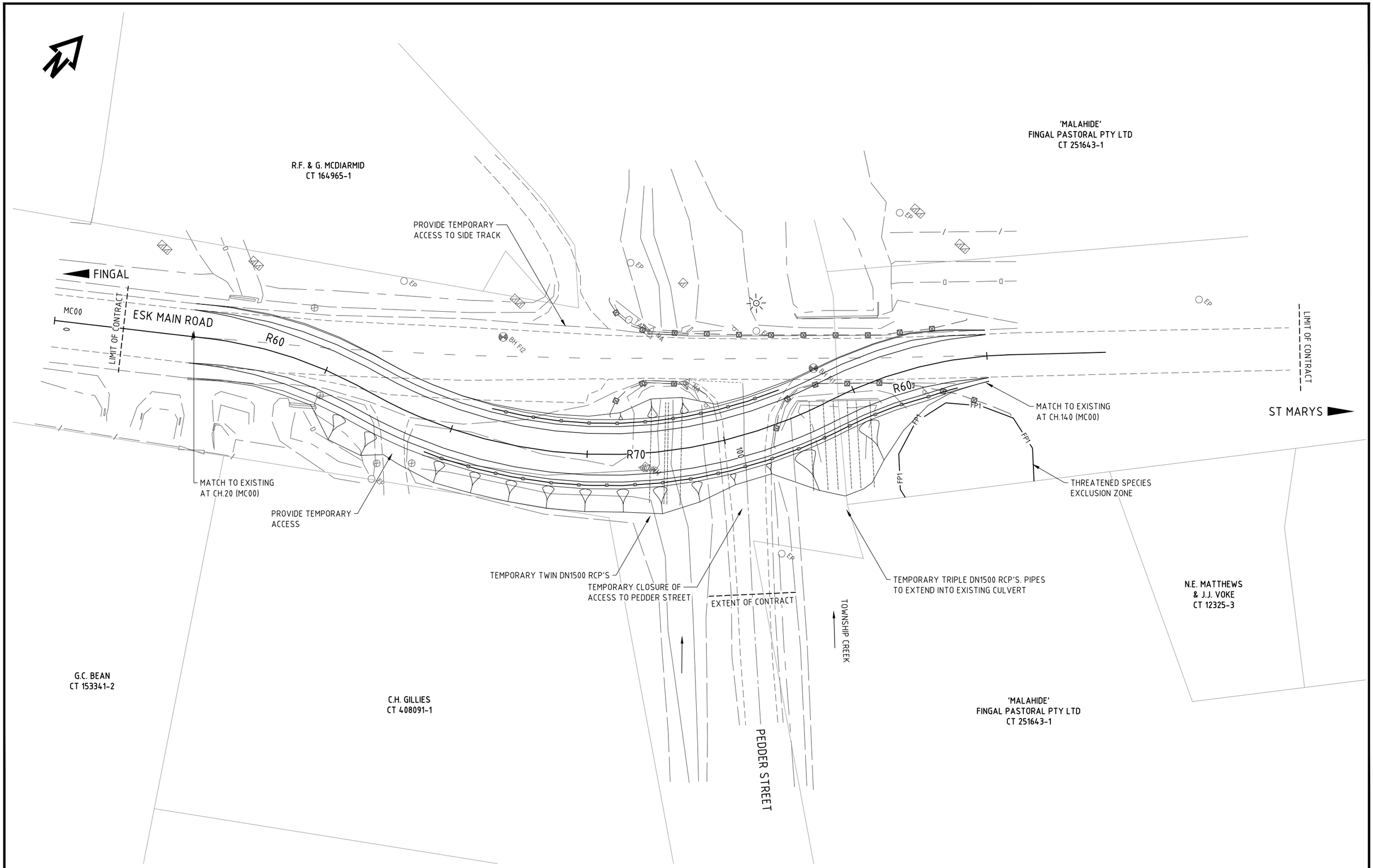
ESK MAIN ROAD (A1125)
CULVERT REPLACEMENTS
FINGAL RIVULET CULVERT (3169)

GENERAL ARRANGEMENT - DRG 1 OF 1

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
2284	HB15144-C2101	04-Jun-15, 9:54 AM	2101

REGISTRATION NUMBER
A1125.003

REVISION A



No.	Amendment Description	Initials	Date
A	PRELIMINARY DESIGN	N.D.	21/05/15

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SCALES
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SCALE IN METRES - 1:500

Co-ordinate System: MGA ZONE 55 | Height Datum: A.H.D.

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DESIGNED L.ALLEN
REVIEWED N.DWYER

Department of State Growth

ESK MAIN ROAD (A1125)
CULVERT REPLACEMENTS
FINGAL RIVULET CULVERT (3169)

GENERAL ARRANGEMENT - TEMPORARY WORKS

CONTRACT No.	DRAWING	PRINTED DATE	SHEET No.
2284	HB15144-C2102	04-Jun-15, 9:54 AM	2102

REGISTRATION NUMBER
A1125.003

REVISION A

Appendix C

Estimates

Esk Main Road; St Pauls River Bridge and Fingal Rivulet Culvert Replacement
Draft RFT Estimate
Project No. 2220-3-11
Estimate Date Jun-2015

		unit	qty	Rate	Amount	Comment			Inherent Risk Identifier
1	**Scoping Phase**								
a	Department of State Growth Project Management	Item		$ 6,000	$ 6,000				a
b	Scoping Phase	Item		$ 30,000	$ 30,000				a
	Subtotal: Scoping Phase				**$ 36,000**				
2	**Development Phase**								
a	Preliminary design	Item		$ 80,000	$ 80,000	Includes Geotechnical Investigation and Site Survey			b
b	Detailed Design	Item		$ 280,000	$ 280,000				b
c	Environmental and Heritage Assessments	Item		$ 50,000	$ 50,000	Includes Planning Aprovals			b
d	Preparation of Tender Documenation	Item		$ 20,000	$ 20,000				b
e	Community Liasion	Item		$ 20,000	$ 20,000				b
f	Department of State Growth Project Managment	Item		$ 20,000	$ 20,000				b
	Subtotal: Development Phase				**$ 470,000**				
3	**Property Acquisition**								
a	Acquisition	Item		$ 60,000	$ 60,000				c
	Subtotal: Property Acquisition				**$ 60,000**				
	Total Pre-Construction Costs				**$ 566,000**				
4	**Delivery Phase**								
a	Department of State Growth Project Management and Contract Administration	Item		$ 538,500	$ 539,000	Supplied by Department of State Growth			d
d	Client supplied Insurances, Fees, Levies	%	0.0045	$ 4,745,000	$ 21,000	Contract insurance (0.4497%)			d
	Subtotal: Delivery Phase Client Costs				**$ 560,000**				
5	**Total Client's Costs**				**$ 1,126,000**				
	Construction								
	Contractor's Direct Costs								
a	Environmental Works	Item		$ 158,436	$ 158,000				e
b	Temporary Works / Traffic Management	Item		$ 406,500	$ 407,000				f
c	Public Utilities Adjustments	Item		$ 76,095	$ 76,000				g
d	Earthworks	Item		$ 250,254	$ 250,000				h
e	Drainage	Item		$ 81,024	$ 81,000				i
f	Pavements	Item		$ 259,893	$ 260,000				j
g	Road marking, signage, furniture	Item		$ 155,336	$ 155,000				k
h	Landscaping	Item		$ 46,592	$ 47,000				l
i	Supplementary Items	Item		$ 498,275	$ 498,000				m
j	Bridge Costs	Item		$ 2,812,955	$ 2,813,000				n
6	**Total Contractor's Direct Costs**				**$ 4,745,000**				
	Contractor's In-direct Costs								
a	Preliminaries					Included in Contractor's direct costs			
b	Contractor's Offsite Overhead and Margin					Included in Contractor's direct costs			
7	*Total: Contractor's In-direct Costs*				**$ -**				
8	**Client Supplied Materials or Services**								
a	TasNetworks	Item		$ 37,831	$ 38,000				g
b	Optus	Item			$ -				g
c	TasWater	Item		$ 30,000	$ 30,000				g
	Total: Client Supplied Material or Services				**$ 68,000**				
	Total Construction Cost (TCC)				**$ 4,813,000**				
9	**Construction + CA Cost**				**$ 5,284,000**				
	Total Construction + CA Cost				**$ 5,352,000**				
	Base Estimate				**$ 5,939,000**				
10							**P50**	**P90**	
	Contingency - inherent risks						$334,000	$797,000	
	Contingency - contingent risks						$192,000	$235,000	
	Total Contingency						$526,000	$1,032,000	
	Total Contingency as percentage of Base Estimate						9%	17%	
12	**Project Estimate**						**$6,465,000**	**$6,971,000**	
13	**Cash flow:** Start Construction October 2015, Finish Construction June 2016								
	Escalation (applied to Project Estimate)						**$285,000**	**$309,000**	
14	% escalation (compared to base estimate + contingency)						4.4%	4.4%	
	Total Outturn Cost						**$6,750,000**	**$7,280,000**	

Esk Main Road; St Pauls River Bridge and Fingal Rivulet Culvert Replacement
Draft RFT Estimate
Project No. 2220-3-11
Estimate Date Jun-2015

Estimate Date Aug-2014 Expenditure Year ending 30 June

Cash flow / Escalation Amount	Project Estimate Amounts	**2015**	**2016**	totals
Owners Cost				
Scoping amount - distribution		100%	0%	
Scoping - cash flow	$ 36,000	$ 36,000	$ -	$ 36,000
Development amount - distribution		80%	20%	
Development - cash flow	$ 470,000	$ 376,000	$ 94,000	$ 470,000
Acquisition amount - distribution		100%	0%	
Acquisition - cash flow	$ 60,000	$ 60,000	$ -	$ 60,000
Construction PM & CA - distribution		0%	100%	
Construction PM & CA - cash flow	$ 560,000	$ -	$ 560,000	$ 560,000
Construction Cost				
Total Construction Cost - distribution		0%	100%	
Total Construction Cost - cash flow	$ 4,813,000		$ 4,813,000	$ 4,813,000
subtotal		$ 472,000	$ 5,467,000	$ 5,939,000
Contingency- P50				
inherent - distribution		0%	100%	
inherent - cash flow	$ 334,000		$ 334,000	$ 334,000
contingent - distribution		0%	100%	
contingent - cash flow	$ 192,000		$ 192,000	$ 192,000
subtotal			$ 526,000	$ 526,000
total (owner + construction + contingency)		$ 472,000	$ 5,993,000	$ 6,465,000
P50 Escalation	4.75%		$ 284,668	$ 284,668
Contingency- P90				
inherent - distribution		0%	100%	
inherent - cash flow	$ 797,000		$ 797,000	$ 797,000
contingent - distribution		0%	100%	
contingent - cash flow	$ 235,000		$ 235,000	$ 235,000
subtotal			$ 1,032,000	
total (owner + construction + contingency)		$ 472,000	$ 6,499,000	$ 6,971,000
P90 Escalation	4.75%		$ 308,703	$ 308,703

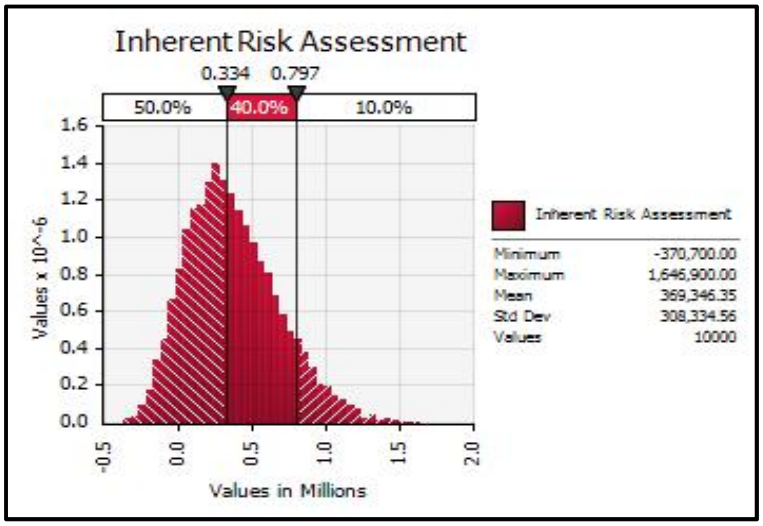
Esk Main Road; St Pauls River Bridge and Fingal Rivulet Culvert Replacement
Draft RFT Estimate
Project No. 2220-3-11
Estimate Date Jun-2015

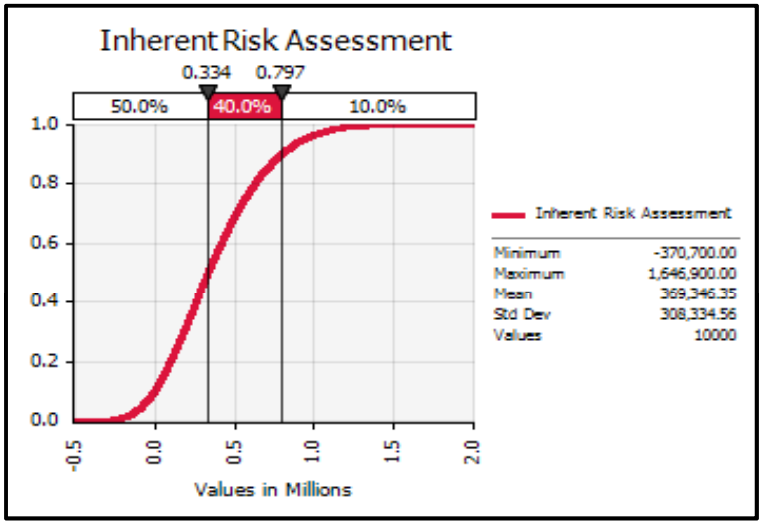
	Risk	Quantity						Rate							Adjusted Amount	Comment
	Description	Unit	Base	Lower Bound	Most Likely	Upper Bound	Adjusted Value	Adjusted Quantity	Base	Lower Bound	Most Likely	Upper Bound	Adjusted Value	Adjusted Rate		
	Pre-Construction															
a	Scoping Phase	Item	1	1	1	1	1.00	1.00	$ 36,000	1	1	1	1.00	$ 36,000	36,000	
b	Development Phase	Item	1	1	1	1	1.00	1.00	$ 470,000	1	1	1	1.00	$ 470,000	470,000	
c	Property Acquisition	Item	1	1	1	1	1.00	1.00	$ 60,000	0.9	1	1.05	0.98	$ 58,726	58,700	
d	Delivery Phase (Project Management and CA)	Item	1	0.85	1	1.25	1.04	1.04	$ 560,000	0.9	1	1.05	0.98	$ 548,107	571,400	
	Construction															
e	Environmental Works	Item	1	0.9	1	1.2	1.04	1.04	$ 158,000	0.95	1	1.25	1.1	$ 171,446	178,700	
f	Temporary Works / Traffic Management	Item	1	0.98	1	1.05	1.01	1.01	$ 407,000	0.95	1	1.2	1.1	$ 432,965	438,500	
g	Public Utilities Adjustments	Item	1	0.95	1	1.1	1.02	1.02	$ 144,000	0.95	1	1.2	1.1	$ 153,187	156,400	
h	Earthworks	Item	1	0.95	1	1.1	1.02	1.02	$ 250,000	0.95	1	1.1	1.0	$ 255,310	260,700	
i	Drainage	Item	1	0.95	1	1.1	1.02	1.02	$ 81,000	0.95	1	1.2	1.1	$ 86,168	88,000	
j	Pavements	Item	1	0.98	1	1.05	1.01	1.01	$ 260,000	0.95	1	1.1	1.0	$ 265,522	268,900	
k	Road marking, signage, furniture	Item	1	0.98	1	1.05	1.01	1.01	$ 155,000	0.95	1	1.1	1.0	$ 158,292	160,300	
l	Landscaping	Item	1	0.95	1	1.1	1.02	1.02	$ 47,000	0.95	1	1.1	1.0	$ 47,998	49,000	
m	Supplementary Items	Item	1	0.95	1	1.1	1.02	1.02	$ 498,000	0.95	1	1.2	1.1	$ 529,771	541,000	
n	Bridge Costs	Item	1	0.98	1	1.05	1.01	1.01	$ 2,813,000	0.95	1	1.2	1.1	$ 2,992,461	3,030,600	
														P50 Inherent Risk	$333,600	
														P90 Inherent Risk	$796,700	

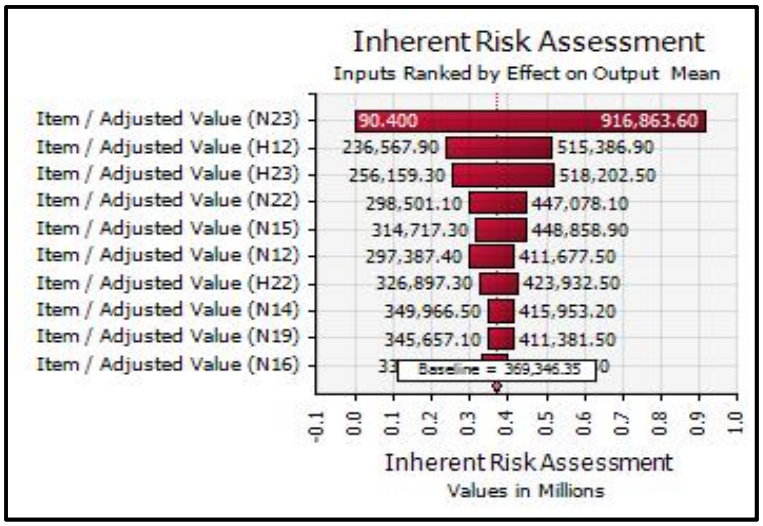
@RISK Output Report for Inherent Risk Assessment

Performed By: jlee

Date: Friday, 19 June 2015 11:18:32 AM







Simulation Summary Information

Workbook Name	HB15144H001 P50 P90 Rev 0
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	54
Number of Outputs	3
Sampling Type	Latin Hypercube
Simulation Start Time	19/06/2015 12:17
Simulation Duration	00:00:05
Random # Generator	Mersenne Twister
Random Seed	663616174

Summary Statistics for Inherent Risk Assessment

Statistics		Percentile	
Minimum	- 370,700	5%	- 78,000
Maximum	1,646,900	10%	- 2,500
Mean	369,346	15%	52,700
Std Dev	308,335	20%	99,100
Variance	95070198621	25%	140,300
Skewness	0.513642679	30%	183,300
Kurtosis	3.01291927	35%	221,400
Median	333,600	40%	258,900
Mode	215,900	45%	294,000
Left X	- 78,000	50%	333,600
Left P	5%	55%	376,100
Right X	927,200	60%	417,500
Right P	95%	65%	462,000
Diff X	1,005,200	70%	512,400
Diff P	90%	75%	566,400
#Errors	0	80%	626,100
Filter Min	Off	85%	701,700
Filter Max	Off	90%	796,700
#Filtered	0	95%	927,200

Change in Output Statistic for Inherent Risk Assessm

Rank	Name	Lower	Upper
1	Item / Adjusted Valu	90	916,864
2	Item / Adjusted Valu	236,568	515,387
3	Item / Adjusted Valu	256,159	518,203
4	Item / Adjusted Valu	298,501	447,078
5	Item / Adjusted Valu	314,717	448,859
6	Item / Adjusted Valu	297,387	411,678
7	Item / Adjusted Valu	326,897	423,933
8	Item / Adjusted Valu	349,967	415,953
9	Item / Adjusted Valu	345,657	411,382
10	Item / Adjusted Valu	333,693	397,925

Esk Main Road; St Pauls River Bridge and Fingal Rivulet Culvert Replacement
Draft RFT Estimate
Project No. 2220-3-11
Estimate Date Jun-2015

Risk	Consequence	No. occurrences	Likelihood	Distribution		Principal Value	Values						Risk Formulae			
Risk description	$		%		Principal affected		%min	Lower Bound	%ML	Most Likely	%Max	Upper Bound	Likelihood	Consequence	Frequency	Combined Consequence Distribution
Detailed Design and Delivery Risks																
Planning and Environment																
Discovery of protected flora and/or fauna	$105,680	1	2%	PertAlt	Construction + Contract Admin	$5,284,000	0.5%	$26,420	2%	$105,680	5%	$264,200	0.02	$118,890	0	$2,378
Discovery of aboriginal heritage items	$105,680	1	2%	PertAlt	Construction + Contract Admin	$5,284,000	0.5%	$26,420	2%	$105,680	5%	$264,200	0.02	$118,890	0	$2,378
Discovery of built heritage items	$105,680	1	1%	PertAlt	Construction + Contract Admin	$5,284,000	0.5%	$26,420	2%	$105,680	5%	$264,200	0.01	$118,890	0	$1,189
Design / Scope changes / design variations																
Error or omission in design identified and requires additional / changed work	$240,650	1	5%	PertAlt	Total Construction Cost	$4,813,000	1.0%	$48,130	5%	$240,650	20%	$962,600	0.05	$328,888	0	$16,444
Additional utility works required	$53,000	1	10%	PertAlt	Utility Costs	$106,000	20.0%	$21,200	50%	$53,000	100%	$106,000	0.10	$56,533	0	$5,653
Site Related Issues																
Heavier rainfall than envisaged delays delivery of project (prolongation of project)	$52,840	1	50%	PertAlt	Construction + Contract Admin	$5,284,000	0.2%	$10,568	1%	$52,840	3%	$158,520	0.50	$63,408	1	$31,704
Flood damages temporay works, falsework	$96,600	1	10%	PertAlt	Bridge + Temporary Works	$3,220,000	1.0%	$32,200	3%	$96,600	6%	$193,200	0.10	$101,967	0	$10,197
World wide price increase on steel, fuel, bitumen.	$105,680	1	20%	PertAlt	Construction + Contract Admin	$5,284,000	-2.0%	-$105,680	2%	$105,680	10%	$528,400	0.20	$140,907	0	$28,181
Unforeseen ground condition. Latent condition.	$264,200	1	10%	PertAlt	Construction + Contract Admin	$5,284,000	2.5%	$132,100	5%	$264,200	10%	$528,400	0.10	$286,217	0	$28,622
Safety / OHS																
A safety incident disrupts the program	$158,520	1	2%	PertAlt	Construction + Contract Admin	$5,284,000	1.0%	$52,840	3%	$158,520	5%	$264,200	0.02	$158,520	0	$3,170
Contractual / Commercial																
Public utility owners cause delays during construction	$158,520	1	20%	PertAlt	Construction + Contract Admin	$5,284,000	1.0%	$52,840	3%	$158,520	5%	$264,200	0.20	$158,520	0	$31,704
Market risk	$528,400	1	5%	PertAlt	Construction + Contract Admin	$5,284,000	5.0%	$264,200	10%	$528,400	15%	$792,600	0.05	$528,400	0	$26,420
Delivery																
Labour shortages during construction	$240,650	1	2%	PertAlt	Total Construction Cost	$4,813,000	1.0%	$48,130	5%	$240,650	10%	$481,300	0.02	$248,672	0	$4,973

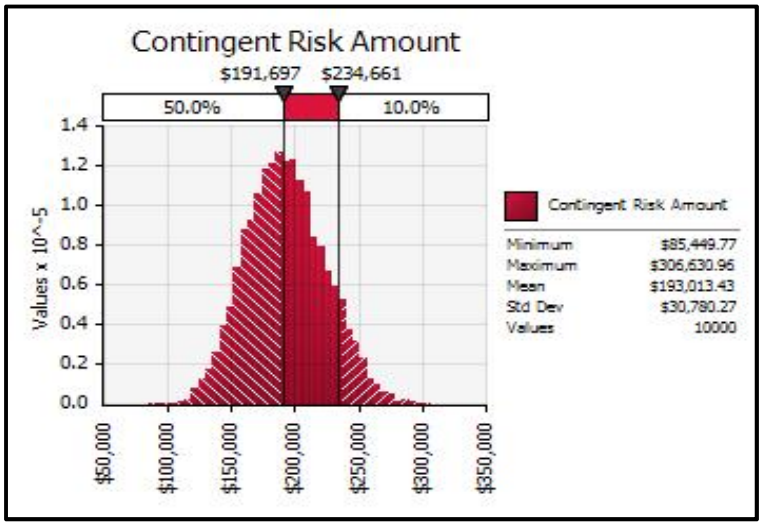
Total Contingent Risk		$193,014

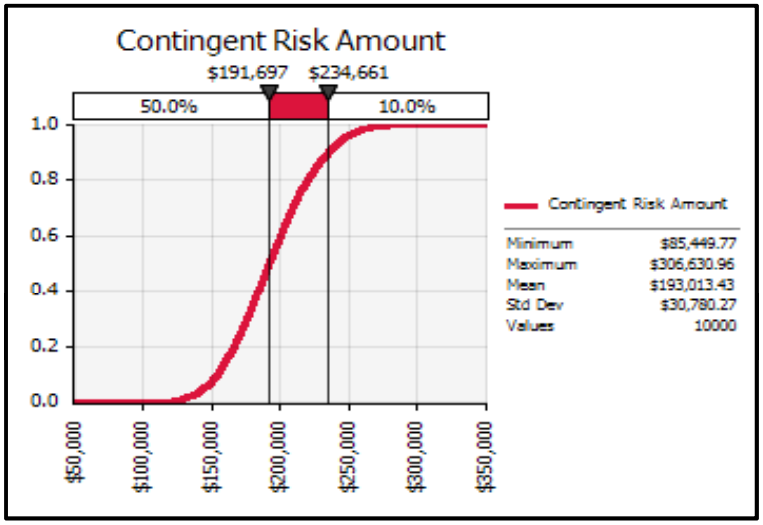
P50 Contingent Risk	$	191,697
P90 Contingent Risk	$	234,661

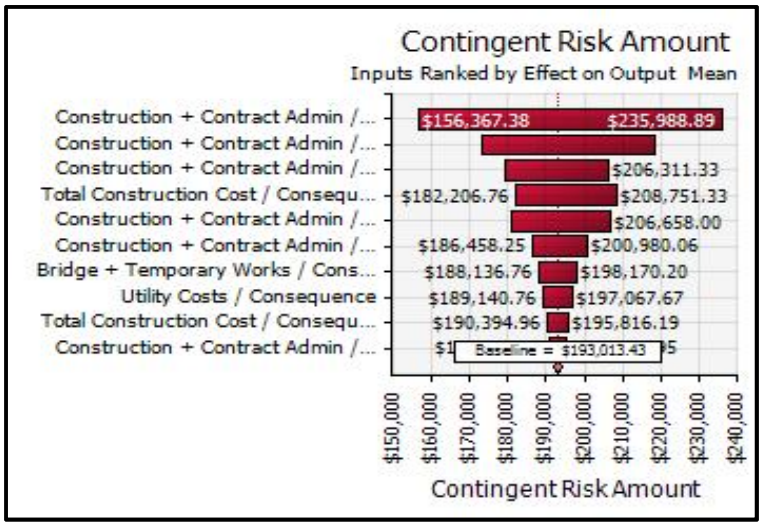
@RISK Output Report for Contingent Risk Amount

Performed By: jlee

Date: Friday, 19 June 2015 11:19:15 AM







Simulation Summary Information

Workbook Name	HB15144H001 P50 P90 Rev 0
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	54
Number of Outputs	3
Sampling Type	Latin Hypercube
Simulation Start Time	19/06/2015 12:17
Simulation Duration	00:00:05
Random # Generator	Mersenne Twister
Random Seed	663616174

Summary Statistics for Contingent Risk Amount

Statistics		Percentile	
Minimum	$85,450	5%	$144,231
Maximum	$306,631	10%	$154,135
Mean	$193,013	15%	$160,318
Std Dev	$30,780	20%	$166,112
Variance	947424729.8	25%	$171,014
Skewness	0.179896482	30%	$175,699
Kurtosis	2.739649126	35%	$179,657
Median	$191,697	40%	$183,741
Mode	$180,847	45%	$187,687
Left X	$144,231	50%	$191,697
Left P	5%	55%	$195,937
Right X	$245,772	60%	$199,991
Right P	95%	65%	$204,363
Diff X	$101,541	70%	$208,693
Diff P	90%	75%	$213,540
#Errors	0	80%	$219,655
Filter Min	Off	85%	$226,415
Filter Max	Off	90%	$234,661
#Filtered	0	95%	$245,772

Change in Output Statistic for Contingent Risk Amou

Rank	Name	Lower	Upper
1	Construction + Cont	$156,367	$235,989
2	Construction + Cont	$172,923	$218,277
3	Construction + Cont	$179,149	$206,311
4	Total Construction C	$182,207	$208,751
5	Construction + Cont	$181,068	$206,658
6	Construction + Cont	$186,458	$200,980
7	Bridge + Temporary	$188,137	$198,170
8	Utility Costs / Conse	$189,141	$197,068
9	Total Construction C	$190,395	$195,816
10	Construction + Cont	$190,707	$195,415