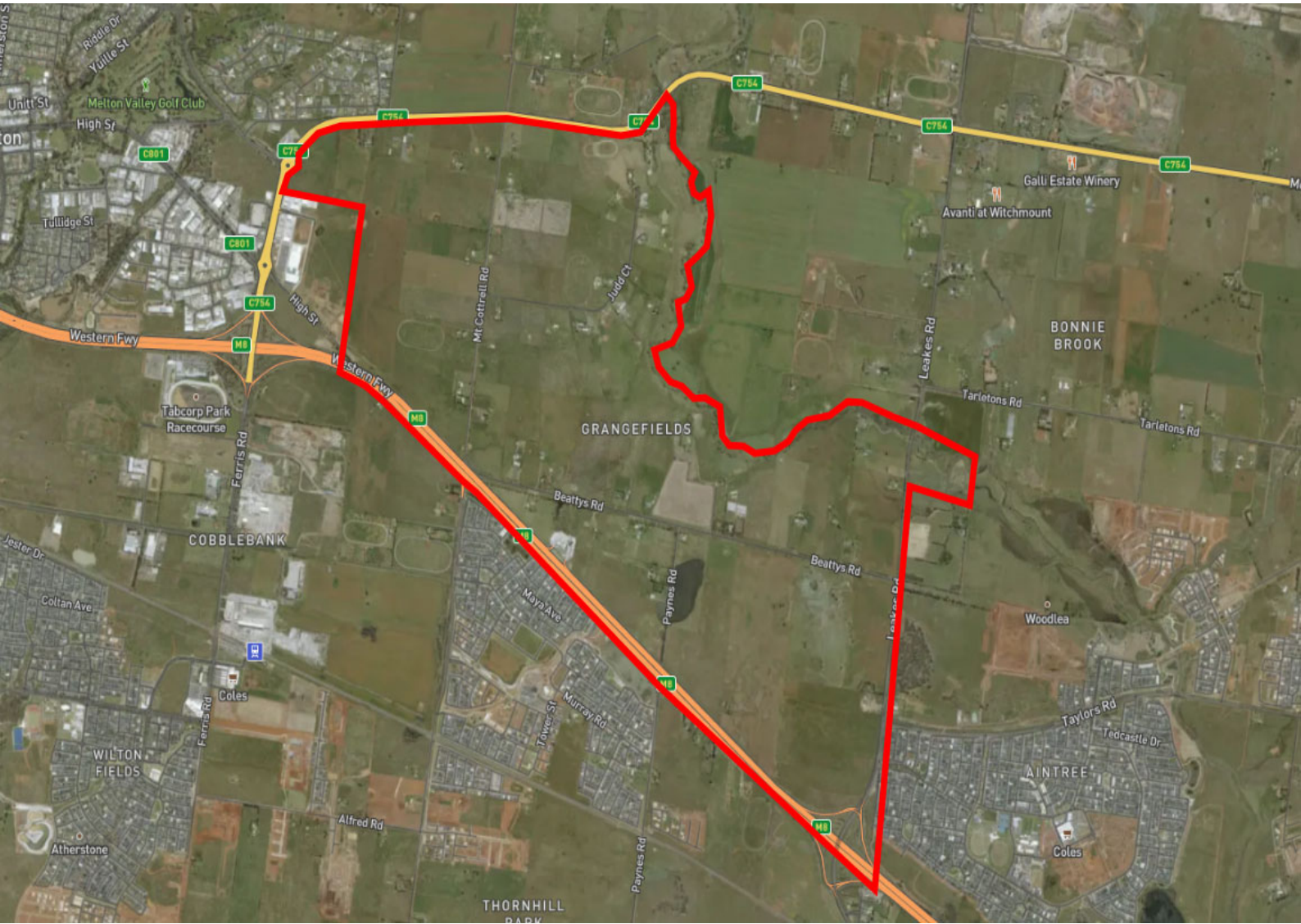
Melton East PSP Bridge Study

Final Feasibility Assessment Report

Victorian Planning Authority

05 March 2024

→ **The Power of Commitment**



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1. Introduction

The Victorian Planning Authority (VPA) are developing a Precinct Structure Plan (PSP) for Melton East, representing approximately 1,005ha of land east of the existing Melton township, 35km north-west of Melbourne's CBD. The PSP is roughly bounded by Kororoit Creek to the north-east, the Western Freeway to the south, Leakes Road to the east and the Melton Highway to the north-west – refer Figure 1 for a representation of the PSP boundary on aerial photography.

A key aspect of the PSP are two new bridge crossings over Kororoit Creek to develop the transport network and improve transport capacity within the area. One bridge is an east-west crossing for the future extension of Tarletons Road. The other bridge is a north-south crossing for the future Paynes Road extension.

Previous experience has demonstrated to the VPA that early consideration of bridge crossing locations and associated road alignments is beneficial to overall project delivery and can assist in understanding capital cost impacts. As a result, the VPA have engaged GHD to undertake a feasibility assessment for each bridge based on a set of defined parameters for consideration by the VPA, ahead of proceeding to formal concept design development and costing exercises.

This Final Feasibility Assessment report forms the final deliverable as part of GHD's current engagement with the VPA. A Preliminary Feasibility Assessment Report (dated 25th May 2023) was previously prepared which assessed three alignment options for each bridge. Following a review period for the report. the VPA provided direction to GHD to proceed with assessment of one alignment for each bridge. This report will therefore assess the preferred alignment for each bridge.

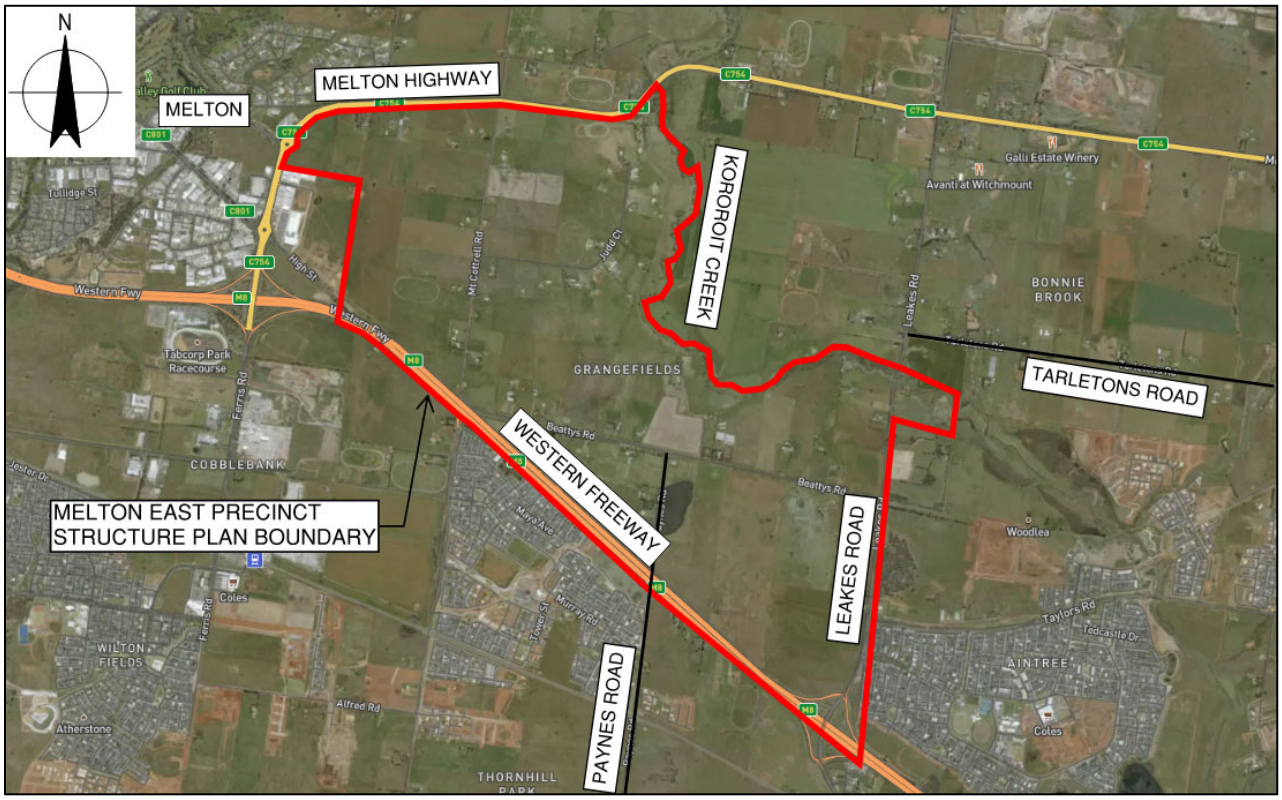


Figure 1 Aerial imagery indicating Melton East Precinct Structure Plan boundary (source: Metromap)

1.1 Purpose of this report

Two bridges are proposed over Kororoit Creek within the Melton East PSP to improve future transport capacity of the area. The previously prepared Preliminary Feasibility Assessment Report analysed three alignment options for each of Tarletons Road and Paynes Road, from which the VPA selected two preferred alignments. This report will provide a feasibility assessment of the preferred alignments based on the available data.

1.2 Preliminary Feasibility Assessment report

The Preliminary Feasibility Assessment (PFA) report, dated 25th May 2023, assessed a total of six options. This comprised of three alignments for each of Tarletons Road and Paynes Road. Refer Figure 2 for an excerpt from the overall layout plan which represents the options from the PFA report. The civil concept plans from the PFA report can be viewed in Appendix B.

The options in the PFA report were developed with consideration to the following:

- Draft PSP road alignments.
- Magnitude of deviation from PSP alignments.
- Avoidance of native flora.
- VPA suggested crossing locations.
- Minimisation of construction footprint.
- Minimisation of impact to cultural heritage significant locations.

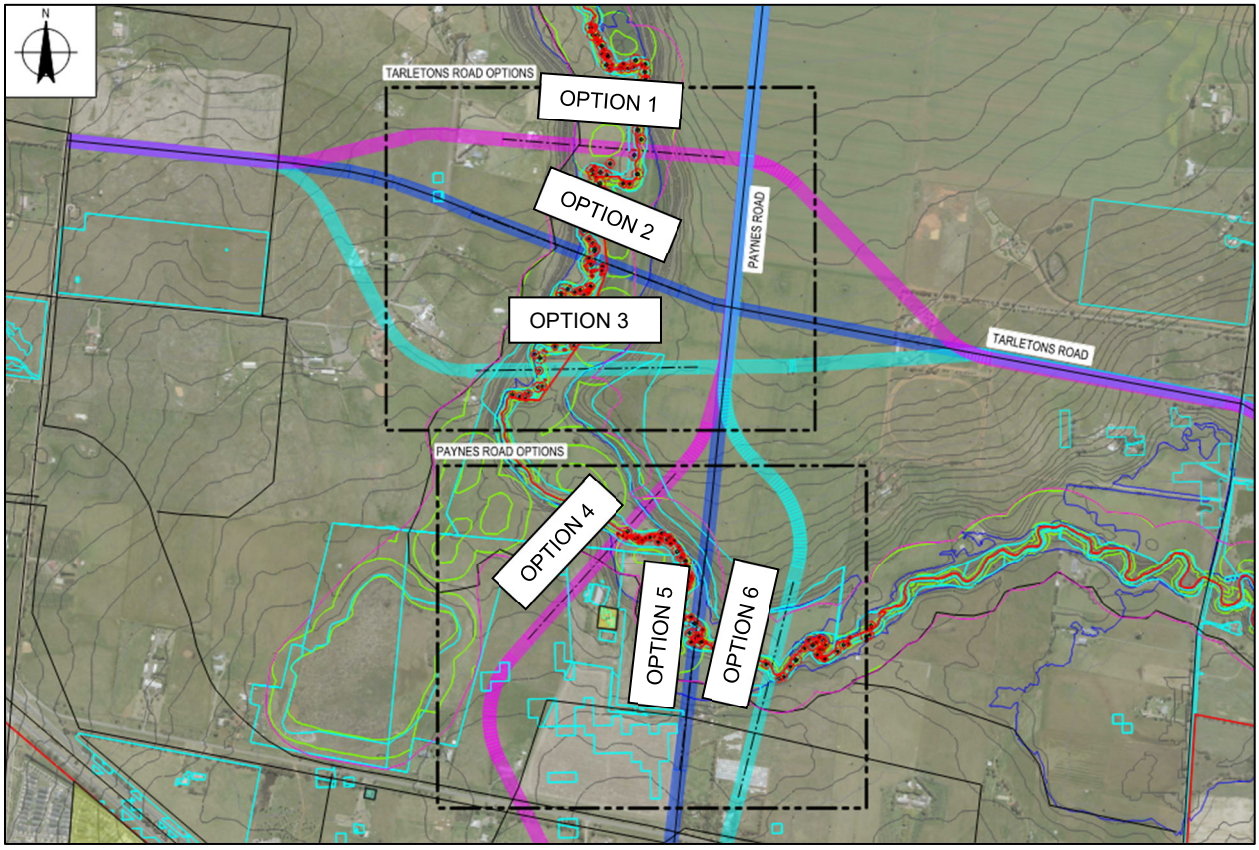


Figure 2 *Preliminary Feasibility Assessment report alignment options*

The options were assessed as per the following criteria:

- Cultural Heritage Impact.
- Environmental Impact.
- Transport Network.
- Value Management.

The assessment used a traffic light system to represent the suitability of each option against the given criteria. A summary of the traffic light assessment is provided in Table 1. The criteria are discussed in detail in section 5.

Table 1 *Summary of options assessment against provided criteria*

Alignment	Cultural Heritage Impact	Environmental Impact	Transport Network	Value Management
Tarletons Road options				
Option 1	Orange	Orange	Orange	Red

Alignment	Cultural Heritage Impact	Environmental Impact	Transport Network	Value Management
Option 2	Red	Red	Green	Orange
Option 3	Red	Green	Red	Green
Paynes Road options				
Option 4	Orange	Orange	Red	Green
Option 5	Red	Red	Green	Red
Option 6	Orange	Green	Orange	Orange

1.3 Assessment of Preliminary Feasibility Assessment options

An assessment of the alignment options from the Preliminary Feasibility Assessment was undertaken by the VPA and stakeholders. A summary of the feedback from this assessment is presented following.

1.3.1 Tarletons Road

1.3.1.1 Option 1

This Option will not be progressed due to significant impacts to the West Growth Corridor Plan (WGCP) transport network, a long bridge crossing of 256m which results in an unreasonable length of Biodiversity Conservation Strategy (BCS) area to be impacted.

1.3.1.2 Option 2

This alignment to be continued with modifications. This alignment impacts an 's-bend' within the creek corridor which has an unreasonable impact to the environmental values and BCS area. Desktop mapping for exposed rock features (See Appendix E) identifies that expoded rock features will be impacted resulting in an unreasonable potential to impact cultural heritage. Stakeholders determined it is preferred to re-align Option 2 further north (approximately 50m) to avoid exposed rocks and s-bend in Kororoit Creek. The distance across the creek is relatively consistent at this location. The escarpment width is reduced further south, however there are mapped exposed rock features. Option 2 is similar to the West Growth Corridor Plan alignment and therefore moving the alignment slightly north results in a reasonable change to the transport network.

1.3.1.3 Option 3

This Option will not be progressed due to the significant impact to the transport network (away from West Growth Corridor Plan alignment) and it is close to a cultural heritage landscape feature identified by WWWCHAC at the river bend. The bridge is relatively short bridge in comparison to others, however due to cultural heritage and transport network considerations it will not be progressed.

1.3.2 Paynes Road

1.3.2.1 Option 4

Option 4 will not be progressed. This is due to the close alignment to the Seasonal Herbaceous Wetland within the Biodiversity Conservation Strategy area as well as having a significant deviation from the WGCP alignment. The bridge is relatively short distance in comparison to other options (125m), however due to reasons outlined above will not be investigated.

1.3.2.2 Option 5

Option 5 in its current form has unreasonable impacts to the Kororoit Creek corridor at a length of 332m, as well as increased impacts to areas of Aboriginal cultural heritage sensitivity and the BCS area. This alignment is very long from escarpment to escarpment, impacts High and Moderate-A rated trees, it crosses an s-bend in the Kororoit Creek and impacts exposed rock features on the northern side, all of which should be avoided. Through detailed stakeholder engagement it is recommended to move this alignment further east to reduce impacts to all criteria identified above.

1.3.2.3 Option 6

Option 6 in its current form has unreasonable impacts to the Kororoit Creek corridor given it does not follow the shortest possible length within the conservation area with a length of 216m. There is also an unreasonable impact to the area of Aboriginal cultural heritage sensitivity and has significant deviation from the WGCP alignment. It is recommended that west of this alignment is progressed for further investigation.

1.4 Bridge alignments and assessment criteria

This report will assess one alignment for each of Tarletons Road and Paynes Road. Refer Figure 3 for an excerpt from the overall layout plan which shows the preferred alignments.

The final alignments were chosen based on VPA's preferred alignments. The final Tarletons Road alignment was based upon Option 2 with modifications. The final Paynes Road alignment was based upon Option 5 and Option 6 with modifications.

As per the previous PFA report, the alignments will be assessed by the following criteria:

- Cultural Heritage Impact.
- Environmental Impact.
- Transport Network.
- Value Management.

For the preferred alignments, conceptual engineering plans were developed on the basis of current engineering design standards, including high-level design of road and bridge geometry. Indicative road and bridge levels were developed on the basis of preferred bridge typology, flood modelling information and freeboard levels provided by MW. The final civil concept plans can be viewed in detail on in Appendix A.

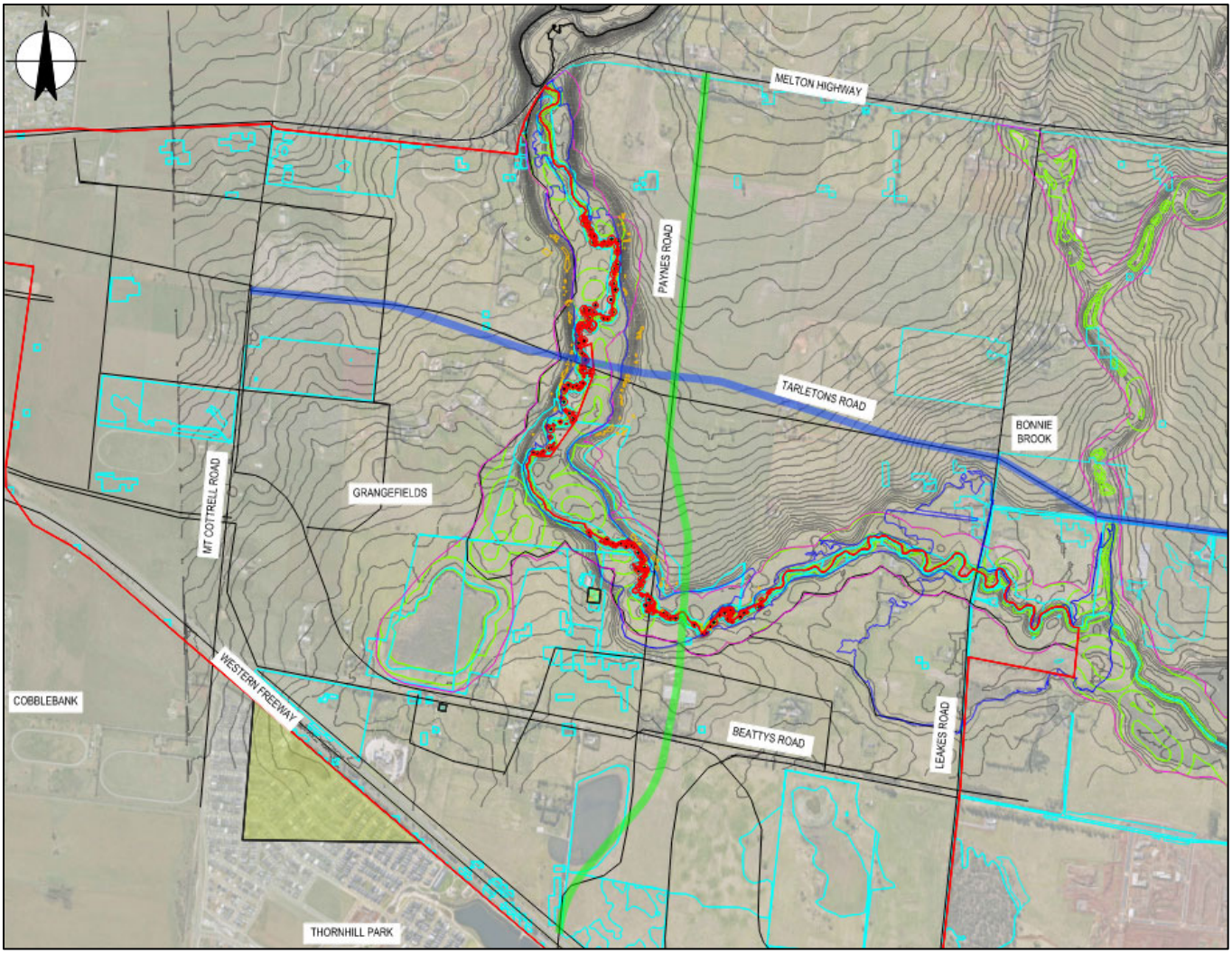


Figure 3 Overall layout plan

1.5 Scope and limitations

This report: has been prepared by GHD for Victorian Planning Authority and may only be used and relied on by Victorian Planning Authority for the purpose agreed between GHD and Victorian Planning Authority as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Victorian Planning Authority arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.6 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

1.6 Assumptions

– This report and associated engineering plans have been developed only using information available to GHD at the time the assessment was undertaken.

– It is assumed that provided information is the latest data available, that it is correct, and that the data is suitable for this assessment.

– Due to the large scale of the area being assessed, 10 m interval LIDAR data was used to develop existing and design surfaces and contours. It is assumed that this level of quality of data is sufficient for this stage of the design process.

2. Reference information

2.1 Previous reports and studies

A summary of the documents reviewed as part of this assessment is presented in Table 2.

Table 2 Previous reports and studies

Report / study	Completed by	Date	Comment
Arboriculture report	Tree Logic PL	May 2023	Tree Logic developed spatial data for Tree Protection Zones (TPZ) and Structural Root Zones (SRZ), which is presented in the civil concept plans. Provided by VPA.
Consultation with Wurundjeri representatives	VPA	Q1 2023	Verbal consultation. Assisted by presentation of drone footage to Wurundjeri representatives. Provided by VPA.
Aerial drone footage	VPA	February 2023	Provided by VPA.
Post-Contact Heritage Assessment (PHCA) report	Ecology & Heritage Partners	September 2022	Report on field survey and desktop investigations of post-colonisation culturally significant heritage areas. Provided by VPA.
Arboriculture mapping exercise	Treelogic	July 2022	Documented vegetation proximate to proposed alignments and categorised according to retention value. Provided by VPA.
Kororoit Creek hydrology modelling report	Spiire	October 2020	Assessed Kororoit Creek under 10% AEP, 1% AEP and 1% AEP with climate change factors - from Melton Hwy to Leakes Rd. Provided by VPA.
Growling Grass Frog Crossing Design Standards *under the MSA*	DEECA	2017	Referred to as Melton East PSP is within the MSA.
Biodiversity Conservation Strategy for Melbourne's Growth Corridors (BCS)	DEECA	June 2013	Referred to as Melton East PSP is within the BCS.
Melbourne Strategic Assessment (MSA)	DEECA	June 2013	Referred to as Melton East PSP is within the MSA.
'Melton East – VPA Workshop' review documents	VPA	9th August and 25th August 2023	Provided to GHD from the VPA, following the review period of the Preliminary Feasibility Assessment report.
Melton East bridge crossing – shortest distance analysis methodology	VPA	17th August 2023	Provided to GHD from the VPA, following the review period of the Preliminary Feasibility Assessment report. Documents VPA methodology in preparing GIS files to assess shortest bridge crossing distance.

Report / study	Completed by	Date	Comment
Melton East Bridge Crossing – exposed rock features methodology	VPA	25th August 2023	Provided to GHD from the VPA, following the review period of the Preliminary Feasibility Assessment report. Documents VPA methodology in preparing GIS files to represent exposed features.

2.2 Available digital data

GHD utilised a combination of GIS data repositories provided by the VPA as well as free online data portals provided by the Victorian Government. This data was imported into AutoCAD as a means of assessing spatial constraints for the alignments. A summary of the GIS data that was utilised is presented in Table 3.

Table 3 Digital data utilised

Type of data	Prepared by	Date	Comment
1-in-100 year flood extents Aladin, E., Kororoit Creek Flood Mapping	Melbourne Water	October 2015	Flood modelling based on ARR 1987 guidelines and is therefore outdated. New designs are to be completed based on flood models prepared using ARR 2019.
10 m interval LIDAR data	Victorian Government		Sourced from the Victorian Government on 27th March 2023.
Areas of Strategic Importance	DELWP		Provided to the VPA on 23rd June 2022.
BCS Conservation Areas	DELWP		Provided to the VPA on 23rd June 2022.
Native Vegetation	DELWP		Provided to the VPA on 23rd June 2022.
Tree Protection Zones (TPZ) Structural Root Zones (SRZ)	Tree Logic PL		Provided to the VPA on 5th May 2023.
Minimum distances across creek escarpments shapefile	VPA		Provided to GHD on 17th August 2023.
Exposed rock features shapefile	VPA		Provided to GHD on 17th August 2023.

2.3 Relevant projects

Discussions with the VPA and Melbourne Water has identified a project proposed to be completed on the existing Leakes Road bridge, located downstream of the subject area of this report. GHD has not been provided with further details about the project at this stage, however future studies should assess if this project has progressed and if any impacts are relevant to the bridge alignments and flood levels contained within this report.

3. Consultation with authorities

3.1 Initial consultation

Following is a summary of the initial consultation undertaken with various authorities during the course of the PFA report.

3.1.1 Melbourne Water

GHD met with the VPA and Melbourne Water (MW) on 29th March 2023 to provide context about the nature of this project and to seek preliminary advice on the potential impact of the bridges to existing flood behaviour in Kororoit Creek and surrounds. Following the meeting, GHD provided formal correspondence requesting further information

to MW on 30th March 2023, to which Melbourne Water provided a response on 20th April 2023. GHD's correspondence with MW is provided in Appendix F.

Key general feedback from MW was as follows:

- All analysis is to be completed to the ARR2019, noting the flooding information is currently based on ARR1987. Consideration of scheme life context, and timing of construction and what the guidelines will be in the future. Climate change analysis and levels will likely be required at the time be implementation.
- The bridge underside must be set at least 600mm above 1% AEP climate change (CC) flood level (considering development services scheme life 30yr -40yr).
- The 1%AEP flood levels including CC flood level must not be increased. If flood levels were increased due to bridge construction including raising of road, then flood mitigation works must be undertaken to ensure existing flood levels are maintained.
- All upstream lots must be built at least 300mm or 600 mm above road levels. If road levels were proposed to be raised.
- Rock size must be designed to sustain 1% AEP velocity.
- Risk factors of the bridge and how it applies to existing and future development is a critical element. To reduce the risk for the 1% AEP as well as events greater than 1% AEP. In particular the deck level will influence the connecting road design to service and development area. The surrounding areas must retain adequate flood immunity levels.
- Minimum number of piers must be built within 1%AEP floodplain. Preferred pier shapes are rounded, elliptical or sharp nose.
- Existing flood storage volume must be maintained to avoid an increase in downstream flood levels. If loss of flood storage inevitable then cut and fill must be undertaken at same location in order to maintain existing flood storage volume.
- Bridge handrail must be built open style.
- Growling Grass Frogs are located in the surrounding area.

It was not within GHD's scope or insufficient information was provided to address the following queries from MW:

- Consideration of scheme life context, timing of construction and future guidelines.
- Climate change analysis and impact on flood levels.
- Design of rock beaching to ensure protection against velocity of stormwater flow in 1% AEP storm event.
- Detailed assessment of existing flood storage volumes and impacts on these volumes.
- Assessment of upstream lots to ensure 300 mm or 600 mm freeboard above road levels is maintained.
- Bridge handrail design as open style.

It is noted that this assessment was undertaken using flood modelling information provided by MW and based on ARR1987 guidelines. MW's current requirements is for flood modelling to be undertaken based on ARR2019 guidelines and are preparing an updated flood model to these guidelines, as advised in their correspondence. Once revised flood modelling information is available, this information should be incorporated into the design process to ensure that bridge designs are compliant with MW requirements.

3.1.2 Department of Transport and Planning - Transport

The VPA undertook consultation with Department of Transport and Planning – Transport (DTP-T) and provided GHD with the following feedback on 5th May 2023, following the consultation:

- Given that these roads will eventually provide Arterial Road to Arterial Road connections, DTP-T would suggest that the Road and structure should be designed to a PBS Level 2 Design Standard, with a SM1600 and HLP400 load limit requirement.
- Design speed should be 80 km/hr and the distance between intersections should be a minimum 400m.

Designing road and structures to PBS Level 2 Design Standard and consideration of load limit requirements is not within GHD's scope and will be addressed during future design stages. Design speed advice was utilised during design of road and bridge geometry.

3.1.3 Melton City Council

GHD contacted Melton City Council (MCC) and received feedback on 10th May 2023. The email correspondence can be viewed in Appendix G. It is noted that council provided some requests which are not within GHD's scope of works to address. It is suggested that these items are considered during later design stages and that further consultation with MCC is undertaken.

Key general feedback from MCC was as follows:

- The two bridge options should be also provided to the MSA team to comment on their impact on the GGF habitat, in particular the breeding ponds. Council's preliminary assessment has identified potential shading issues which should be assessed by the MSA team.
- Council would like to understand the impact of the proposed bridge options and road alignments on drainage; the extent of drainage land (estimated areas of drainage) should be taken into consideration when considering future road alignments.
- Council requests that the GHD Report consider whether there are any post-contact heritage items within the Water Reserve, such as dry-stone walls, and if any items are identified introduce them in the assessment.
- Council encourages GHD to review the location of threatened species, in addition to the GGF.
- Council requests that GHD analyse the impediments to the road alignment and bridge locations within the Warrensbrook PSP area. The road alignment should be also shown within the Warrensbrook PSP area.
- Indigenous cultural heritage is a matter of significance and should be introduced on plans when assessing the options. Bridge alignments should avoid River Red Gums and places of high Aboriginal heritage significance.

It is noted that:

- No information was provided to GHD to enable assessment of post-contact heritage items such as culturally significant dry-stone walls.
- Consideration to road drainage design and impacts to the Warrensbrook PSP area were not in GHD's scope to address.

3.1.4 Department of Energy, Environment and Climate Action

The VPA undertook consultation with the Melbourne Strategic Assessment (MSA) team within the Department of Energy, Environment and Climate Action (DEECA). GHD received DEECA advice in emails from the VPA on 22nd May 2023 and on 4th September 2023, as follows:

- Generally speaking, DEECA would not support a road alignment which would impact a future GGF wetland location, however in this instance we recognise the exceptional circumstance.
- The assessment criteria should be corrected to emphasise GGF wetland location and Conservation Area footprint in the light of state government obligations under MSA, instead of individual tree impacts.

Tarletons Road (east-to-west alignment)

- Option 2 is preferred given the footprint over the conservation area is smallest and the future GGF wetland may be reconfigured or adjusted slightly to accommodate the road. If the road alignment could be reconfigured very slightly to the north so that is crosses the conservation area at the thinnest point would be an ideal outcome.
- Option 3 has an unreasonably large construction footprint over the conservation area and option 1 has a substantial impact to a future GGF wetland location and therefore are not supported.

Paynes Road (north-to-south alignment)

– Option 4 is not a preferred alignment due to potential impacts to a GGF wetland buffer, however noting its impact would be less than option 5.
– Option 5 for the alignment is not considered to be acceptable given the large construction footprint which would require within the conservation area at this point.
– Because of the bend in the creek a crossing at this point would substantially increase the amount of conservation area impacted, DEECA's preferred option would be option 6, given that it does not impact any future GGF wetlands, and the construction footprint impacts less area of the conservation area.

3.1.5 Registered Aboriginal Party – Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation

The VPA undertook consultation with the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation (WWWCHAC) on 16th March 2023 to discuss the future locations of the creek crossings.

Following the consultation, the VPA formally advised GHD on 3rd April 2023 (as well as informally during meetings prior to this date) of the following:

– Wurundjeri identified the need to avoid rocky outcrops and terraces within the flood plain and escarpment.
– Wurundjeri will be further consulted with in the decision making for the preferred bridge locations.

3.2 Feedback from VPA and stakeholder review – August 2023

Following submission of the PFA report, the VPA sought feedback from the following authorities:

– Melbourne Water.
– Department of Transport and Planning – Transport.
– Melton City Council.
– Department of Energy, Environment and Climate Change (Melbourne Strategic Assessment team).

The VPA collated feedback from the reviews to provide to GHD. A register including a compilation of these comments is included in Appendix H.

The VPA also conducted several internal workshops as part of the review period. The workshops analysed data prepared by data management teams internal to the VPA. Key notes from these workshops as well as an explanation of the methodology of data preparation are included in Appendix E.

A summary of feedback from authorities is included following.

Melton City Council

– Regarding Tarletons Road:
  - From environmental department: Options 2 and 3 are preferred. Option 2 is less preferred as it encroaches upon GGF wetland areas, however MSA advises that these areas may be adjusted. Option 1 is not supported as it bisects the breeding pond.
  - From engineering department: Option 2 is the preferred alignment, followed by Option 1 and then Option 3 (least preferred).
– Regarding Paynes Road:
  - From environmental department: Options 5 and 6 are preferred. Option 4 is not supported due to close proximity to GGF habitat and water management issues, pollution from roads and noise at time of GGF breeding. Also fragments developable land.
  - From engineering department: Option 5 is preferred, following by Option 4 and Option 6. Preferred alignment will depend on outcome of water retention area adjacent to Paynes Road, as this may influence alignment towards Western Highway overpass.

– General preference is for a bridge with less piers, to reduce visual impact and shadows.

DEECA – MSA Team

– *"The report specifies that that option 2 would have significant environmental impact, however the MSA team has provided advice in regards to the potential reconfiguration of the impacted future GGF wetland which would reduce its impact. Further info about impacted trees is needed. MSA considers this to be the preferred option given the footprint over the conservation area is smallest and the future GGF wetland may be reconfigured or adjusted to accommodate the road. If the road alignment could be shifted slightly to the north so that is crosses the conservation area at the smallest width, this would be an ideal outcome in terms of impacts to habitat for GGF".*

– *"Option 3 has an unreasonably large construction footprint over the conservation area and substantial impact to a future GGF wetland location and therefore is considered to have significant environmental impact".*

– *"Considering the impacts on future GGF wetland and the trees* [Option 4] *is considered to have significant environmental impact".*

– *"Option 5 has a large construction footprint within the conservation area. Because of the bend in the creek a crossing at this point would substantially increase the amount of conservation area impacted, resulting in a large environmental impact. If the alignment could be shifted approximately 60m to the east the construction footprint within the conservation area would be minimised, resulting in less impact to GGF habitat".*

3.3 Feedback from VPA and stakeholder review – December 2023

Following submission of the draft FFA report, the VPA provided GHD with feedback and recommended changes. The VPA's feedback from December 2023 is included in Appendix I.

4. Basis of design

The following sections details the basis of design used for preparation of the civil plans. It is noted that the project at a pre-design stage and that elements of the basis of design may not be applicable at subsequent stages of the project.

4.1 Design standards

The following design standards and reference documents (versions current as of March 2023) have been used in this study:

– Austroads Guide to Road Design (AGRD) and corresponding VicRoads supplements.
– VicRoads Standard Specification for Roadworks and Bridgeworks.
– AS5100 Bridge Design.
– VicRoads Bridge Technical Notes (BTN) series.

4.2 Adopted parameters

Design speeds were adopted as 80 km/hr as advised by DTP-T.

Horizontal geometry guidelines adopted are outlined in Table 4.

Table 4 Horizontal geometry design guidelines

Criteria	Value	Comment	Reference
Minimum horizontal curve radius	80 km/h = 240 m		AGRD Part 3, Section 7.4.1, Equation 5 *and* AGRD Part 3, Table 7.6
Minimum horizontal curve length	80 km/h = 180 m		AGRD, Part 3, Table 7.7

Vertical geometry guidelines adopted are outlined in Table 5.

Table 5 Vertical geometry design guidelines

Vertical geometry limits	Value	Comment	Reference
Minimum k value for a crest curve	80 km/h = 29.3	Desirable minimum value for a 2.0s reaction time (2.5s is not available for these speeds)	AGRD, Part 3, Table 8.7
Minimum k value for a sag curve	80 km/h = 17.0	Other Urban and Rural Roads with street lighting	AGRD, Part 3, Figure 8.9
Minimum lengths of vertical curves for new construction	80 km/h = 80 m		AGRD Part 3, Table 8.10
Minimum longitudinal grade	1%	Desirable minimum value for drainage purposes	AGRD, Part 3, Table 8.5
Maximum longitudinal grade	5 - 7%	Rolling Terrain	AGRD Part 3 Table 8.3

Note that a maximum longitudinal grade of 5.0% was adopted for road and bridge vertical alignments.

Indicative maximum desirable and absolute grades are provided following, based on AGRD Part 3, Table 4.11. Provided grades are subject to revision in further design stages.

– Fill batters – 1:4.
– Cut batters – 1:3.

4.3 Road cross section

GHD was advised that the ultimate design of the cross-section for both roads was to align with the concept in the Rockbank PSP for Paynes Road. Refer Figure 4 for the conceptual road cross-section.

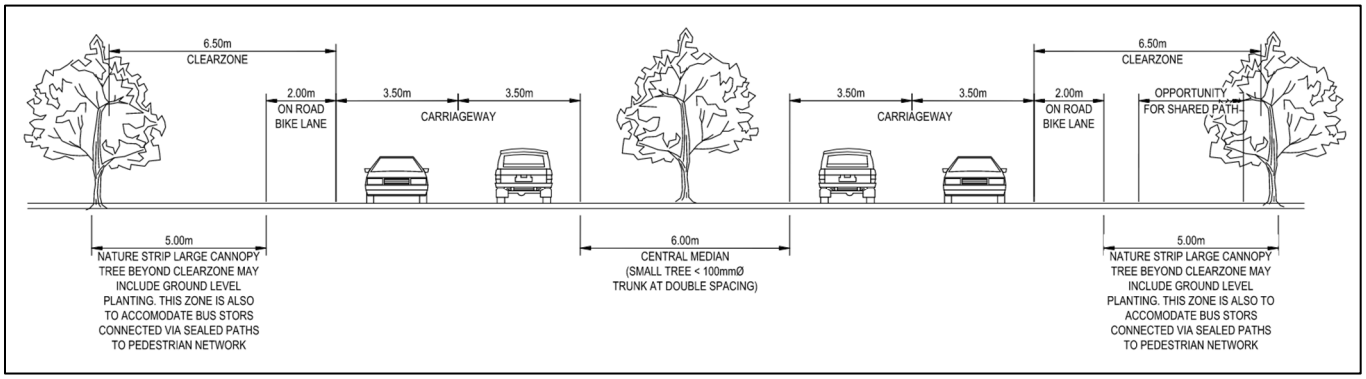


Figure 4 Ultimate cross section design applicable to Tarletons Road and Paynes Road

4.4 Bridge cross section

An indicative bridge cross section is proposed as represented in Figure 5. Key elements of the cross section include a 1.0 m central median for separation between carriageways, as well as provision of pedestrian and cycle paths on the bridge.

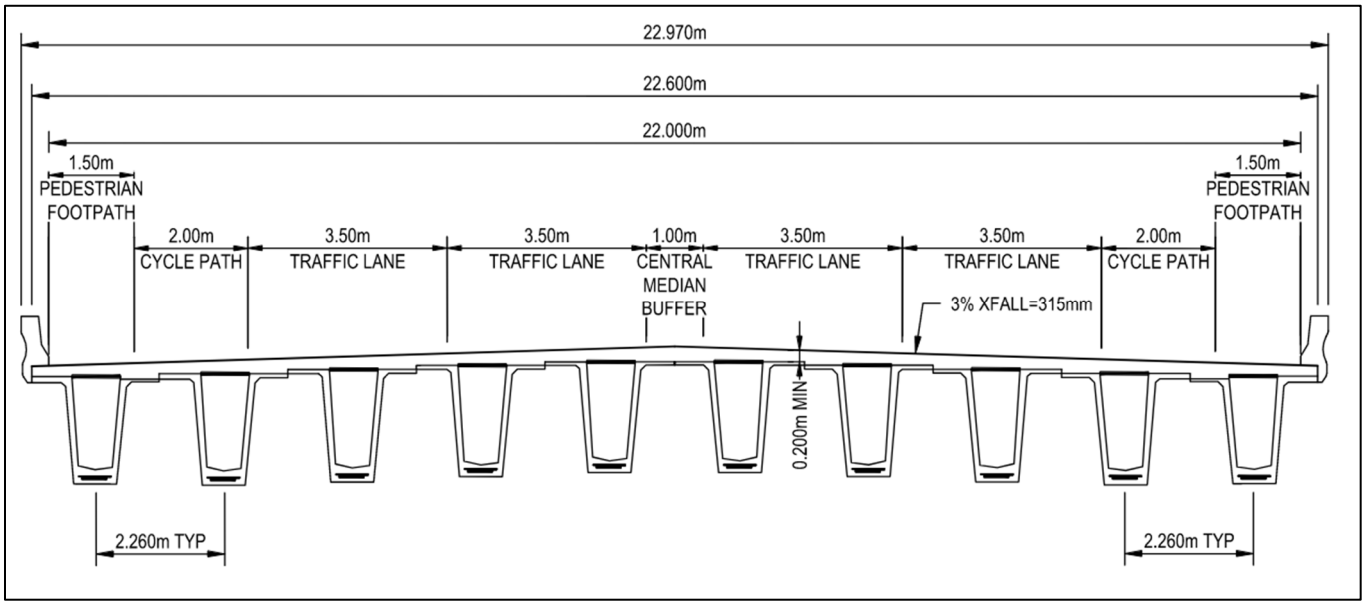


Figure 5 Indicative bridge cross-section

4.5 Bridge construction typologies

For the purposes of this assessment, GHD has adopted a typical concrete ‘Super T’ design. The vast majority of modern bridges are constructed with this method. The steel box girder method is a feasible alternative, however the benefit of an increased span (and therefore reduced number of piers and construction footprint) is heavily offset by the dramatically increased cost, as steel box girder bridges are typically twice the cost of concrete ‘Super T’ bridges. A conceptual representation of the two bridge typologies can be viewed in Appendix C.

A ‘Super T’ bridge consists of the following key elements:

– Typical spans of 36 m between piers.
– Concrete deck cast on 1800 mm deep ‘Super T’ concrete beams.

– Concrete piers founded on concrete pile caps.
– Pile caps founded on driven precast piles.
– Concrete abutments founded on bored piles with concrete pile caps.

A steel box girder design has the following unique key elements:

– Typical span of up to 50 m.
– Concrete deck cast on top of 3.0 m deep steel box girder beams.
– Increased cost when compared to concrete ‘Super T’.

5. Assessment criteria

The following section discusses the four alignment selection criteria and how they will be used to assess the bridge alignments. Previously, the assessment criteria were used to develop the traffic light assessment in the PFA report. Refer Table 1 for a summary of this assessment.

The four assessment criteria are as follows:

– Cultural Heritage Impact.
– Environmental Impact.
– Transport Network.
– Value Management.

5.1 Cultural Heritage Impact

Consultation with the WWWCHAC was undertaken by the VPA in early 2023. Due to the limited design information available to enable a site-specific assessment of the impacts of the proposed bridges, the advice provided was general in nature. VPA has advised GHD of outcomes of the consultation for the nominate bridge alignments, which will be discussed during the assessment. Based on the high-level discussions the key outcomes were to minimise impacts on potential key sites along Kororoit Creek which include rocky outcrops, river bends and terraces. It is noted that additional consultation with WWWCHAC is required to ensure satisfactory outcomes are achieved for all parties.

To assist in avoidance of culturally significant locations, the VPA developed a GIS dataset which mapped all exposed rock and unknown features within the study area for both bridges, using high-resolution imagery – refer Appendix E – VPA Review Workshop and Methodology – Exposed Rock Features. The dataset includes two types of mapped features as follows:

– ‘Exposed Rock’ – Clear from desktop review that the feature was exposed rock.
– ‘Other feature’ – Unknown feature in the landscape. Possibility to be grass, rock, farming machine or miscellany.

The VPA acknowledge the limitations in this GIS desktop assessment for reviewing the cultural heritage sensitivity of Kororoit Creek. This GIS dataset is intended to provide an additional layer of information, however it does not confirm any area of cultural heritage sensitivity. Refer Appendix E for additional information regarding this.

The entire Kororoit Creek water corridor with a 200 m buffer either side is identified as an area of Aboriginal cultural heritage sensitivity. It is acknowledged that all bridge alignment options will have an impact to this area of Aboriginal cultural heritage sensitivity. On-site field investigations and a walk on-country with Traditional Owners is required to validate the desktop analysis.

The VPA also commissioned a Post Contact Heritage Assessment (PCHA) report by Ecology and Heritage Partners (EHP) in September 2022. The report identified two culturally significant post-colonial heritage areas in proximity to the proposed road alignment for Paynes Road. Refer a map extract from the PHCA report in Figure 6.

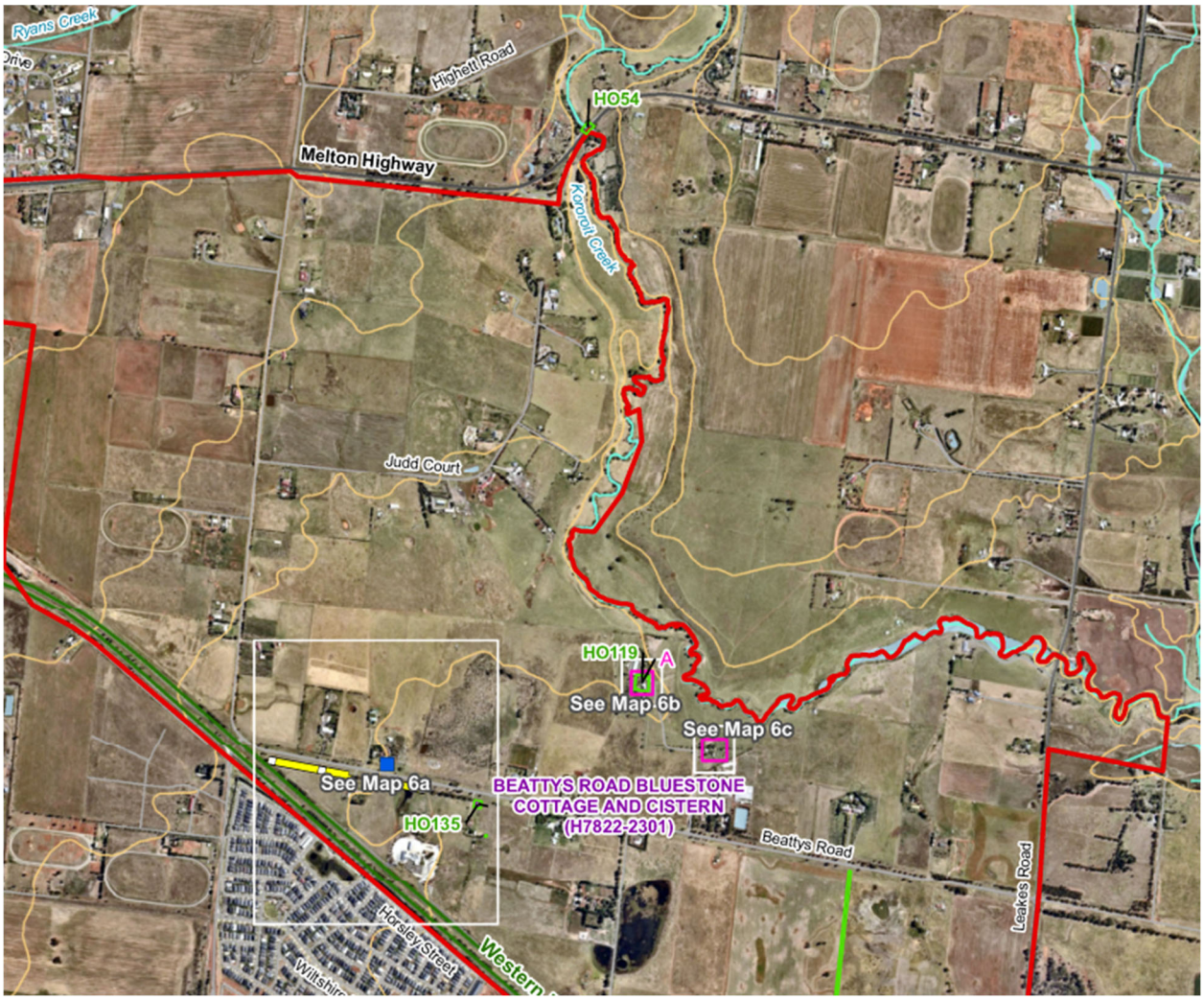


Figure 6 *Extract from "Map 6 – Survey Results" of PHCA report Sept. 2022*

5.2 Environmental Impact

A key aspect of this project is the targeted minimisation of impact to the existing environment. This is primarily considered in conservation of biodiversity values, minimisation of changes to the existing topography and impact on the existing flood behaviour.

Conservation of biodiversity values includes maintaining native flora and fauna. The main consideration of native flora is the preservation of existing trees, as these may also be of cultural significance. Conservation of native fauna is directed by policy prepared by DEECA (formerly DELWP). The Biodiversity Conservation Strategy (BCS) provide guidelines on how to reduce the impacts of urbanisation and development on key biodiversity values. Spatial data concerning wetland conservation areas set out in the BCS has been included in GHD's plans demonstrating road and bridge alignments.

Additionally, Condition 2 of the Part 10 Commonwealth approvals that regulate urban development in the growth corridors under the EPBC Act requires that a person must not undertake an action, such as a proposed use or development, that results in a 'net loss of habitat' for ecological communities or species listed under the EPBC Act in a conservation area unless agreed by the Commonwealth Minister.

Regarding waterway crossing design attributes, Table 1 from the Growling Grass Frog Crossing Design Standards (GGFCDS) provides guidance and can be viewed in Table 6. Figure 7 demonstrates some of these attributes as well.

Table 6 Culvert design attributes and standards (Table 1, Growling Grass Frog Crossing Design Standards, 2017)

Attribute	Design standard	Rationale
Configuration	Maximum distance between passages of 50 metres.	To ensure that Growling Grass Frogs moving through the landscape can easily encounter the passages under roads.
Substrate	Preferably natural surface. Concrete with a smooth base may be acceptable in some circumstances, for example permanently inundated box culverts.	To provide relatively natural conditions and minimise obstacles that may impede direct movement.
Dimensions – all culverts	Straight and as wide and short as possible. Entrance as close to the road edge as possible.	To minimise the distance that needs to be traversed, reduce the difference in climate between inside and outside the culvert and provide a sight line to the end.
Dimensions of waterway culverts	An opening that is at least the width of the 3 month ARI flow plus a minimum of 2 metres (horizontally) each side of the waterway Minimum airspace of 600 mm for any culvert across a waterway that will be inundated during baseflow conditions.	To enable passage along the stream bank in frequent flow conditions. To try to maintain climatic equilibrium between the inside and outside environments; allow water conveyance and allow frogs to breathe while in the culvert.
Dimensions of terrestrial culverts	Each arched culvert or set of multiple box culverts is to provide a horizontal opening of at least 10 metres. Permanently inundated culverts must contain standing water approximately 300 mm deep. A supply of suitable water (for example treated stormwater) must be identified as part of the design. Culverts for infrastructure that is level with terrestrial habitat must have bases dug in below natural surface if required.	To provide opportunity for Growling Grass Frog to find passages, and to try to maintain climatic equilibrium between the inside and outside environments. A maximum transition grade of 1 in 10 to the culvert invert must be incorporated in the design.
Light and moisture	Install microclimate vents that: 1. Have footprint of at least 1 metre x 1 metre and preferably much larger. 2. Are placed adjacent to the kerb and channel on either side of a two lane road. 3. Have an additional vent in the central median for larger roads so that there is no more than 10 metres between vents. 4. Consist of a "grated lid" with a 500 mm concrete surround that falls towards the grate.	To allow light and moisture to penetrate the culvert, to try to maintain climatic equilibrium between the inside and outside environments.

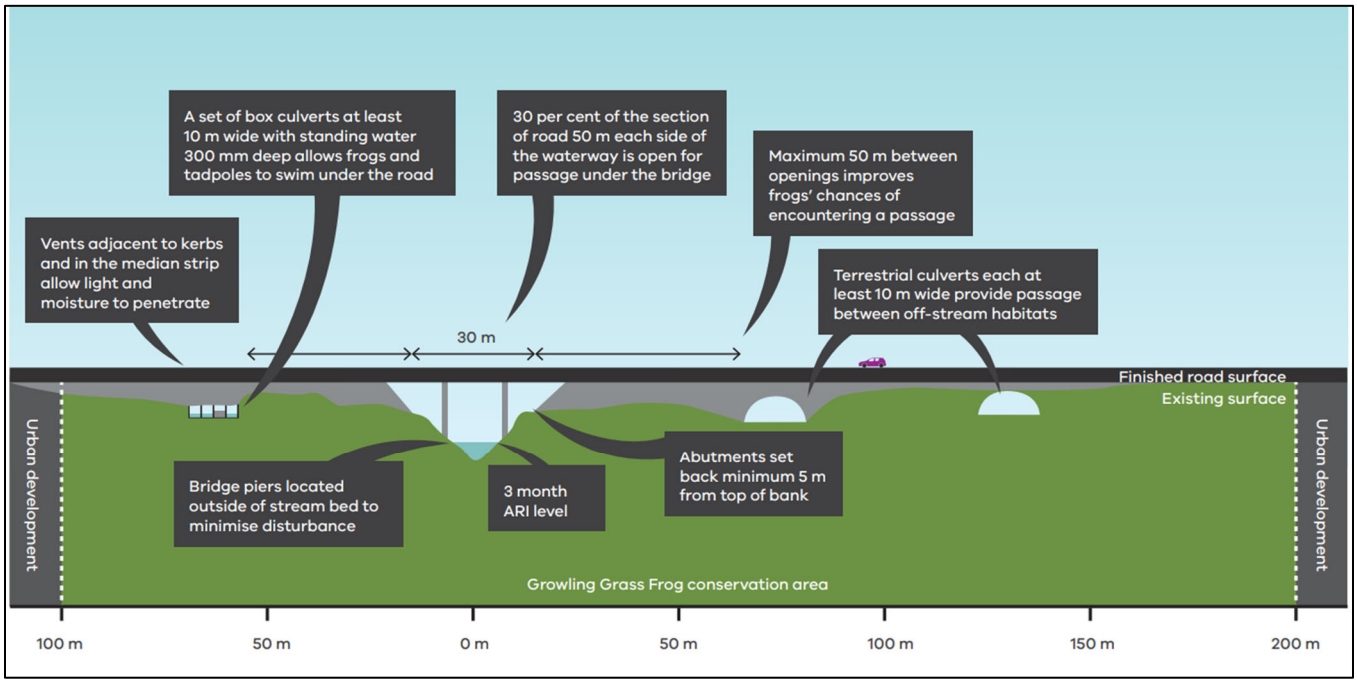


Figure 7 Bridge design considerations (Figure 3, Growling Grass Frog Crossing Design Standards, 2017)

Correspondence received from MW included some key general parameters for minimising impact on existing flood behaviour, including:

– Surrounding areas must retain adequate flood immunity levels.
– Bridge underside must be set at least 600 mm above 1% AEP climate change flood level.
– A minimum number of piers to be built within the 1% AEP floodplain, with preference towards rounded, elliptical or shar nose pier shapes.
– Existing flood storage volume must be maintained.
– Upstream lots must be at least 300 mm – 600 mm above proposed road levels.

Hence, the 'Environmental Impact' criteria will consider bridge alignments and typologies which align with the above objectives favourably, particularly the following:

– Minimise impact to flora and fauna.
– Reduce construction and structure footprint within waterways.
– Ensure connectivity of growling grass frog between habitats.
– Minimise earthworks and variation to existing topography.
– Minimise impact to existing flood behaviour.

5.3 Transport Network

Draft road alignments for the Melton East PSP have been developed on the basis of a "one-mile grid" ideal – in practice, this grid is approx. 1.6 km. Draft alignments have been developed by the VPA for Tarletons Road and Paynes Road on the basis of the one-mile grid. In the assessment, a lesser deviation from the ideal grid for the 'Transport Network' criteria, is considered the preferred outcome.

5.4 Value Management

The criterion of ‘Value Management’ is defined as producing the most cost-efficient bridge design and alignment, on the balance of considering all other criteria. Value management is dependent upon the following factors:

– Preferred bridge typology.
– Construction methods – e.g., balance of cut/fill, piers, open cut, culverts, etc.
– Avoidance of, or reduction in impact of, sodic and dispersive soils.
– Shortest bridge length.

A key element in value management is obtaining the shortest possible bridge length. The VPA developed a data repository which analysed the shortest crossing distance between the two creek escarpments at 10 m intervals. Refer Appendix E – VPA Review Workshop and Methodology – Shortest Distance Analysis Methodology for discussion of this topic. This was utilised in the selection of the preferred alignment to ensure that the bridge length was reduced as much as possible.

6. Final alignment assessment

The following section details an assessment of the selected alignments against the criteria given in section 5.

6.1 Concept plan development

Concept engineering plans were developed using datasets as listed in section 2 and can be viewed in detail in Appendix A. The overall layout plan can be viewed in Figure 8. A detail plan was prepared for each preferred alignment, represented on drawings CI-020 and CI-030. The detail plans include longitudinal sections with the following information:

– MW flood modelling data (based on ARR1987).

– Indicative road vertical geometry.

– Bridge deck level.

– Road surface level.

– Approx. number of piers required.

– Level difference in terms of cut and fill.

The bridge deck level was drawn as a minimum 600 mm above flood levels (based on advice from MW), then adjusted as appropriate to manage earthworks quantities. The road surface was drawn as 2.0 m above bridge deck level, based on the typical detail of a concrete ‘Super T’ pier. Required number of piers was determined based upon the required bridge length for the floodway crossing and the maximum span.

Bridge length and determination of number of piers required was undertaken on the basis that the construction footprint (excluding bridge piers) was to be clear of the existing floodway. The floodway was identified using the flood modelling information provided by MW. Road horizontal and vertical geometry was developed using the parameters as set out in Section 4: Basis of design. Longitudinal sections, level differences and final earthworks quantities were produced using 12d Model software.

It is noted that road and bridge horizontal and vertical alignment design shown are conceptual only, and are subject to refinement and optimisation during subsequent design phases.

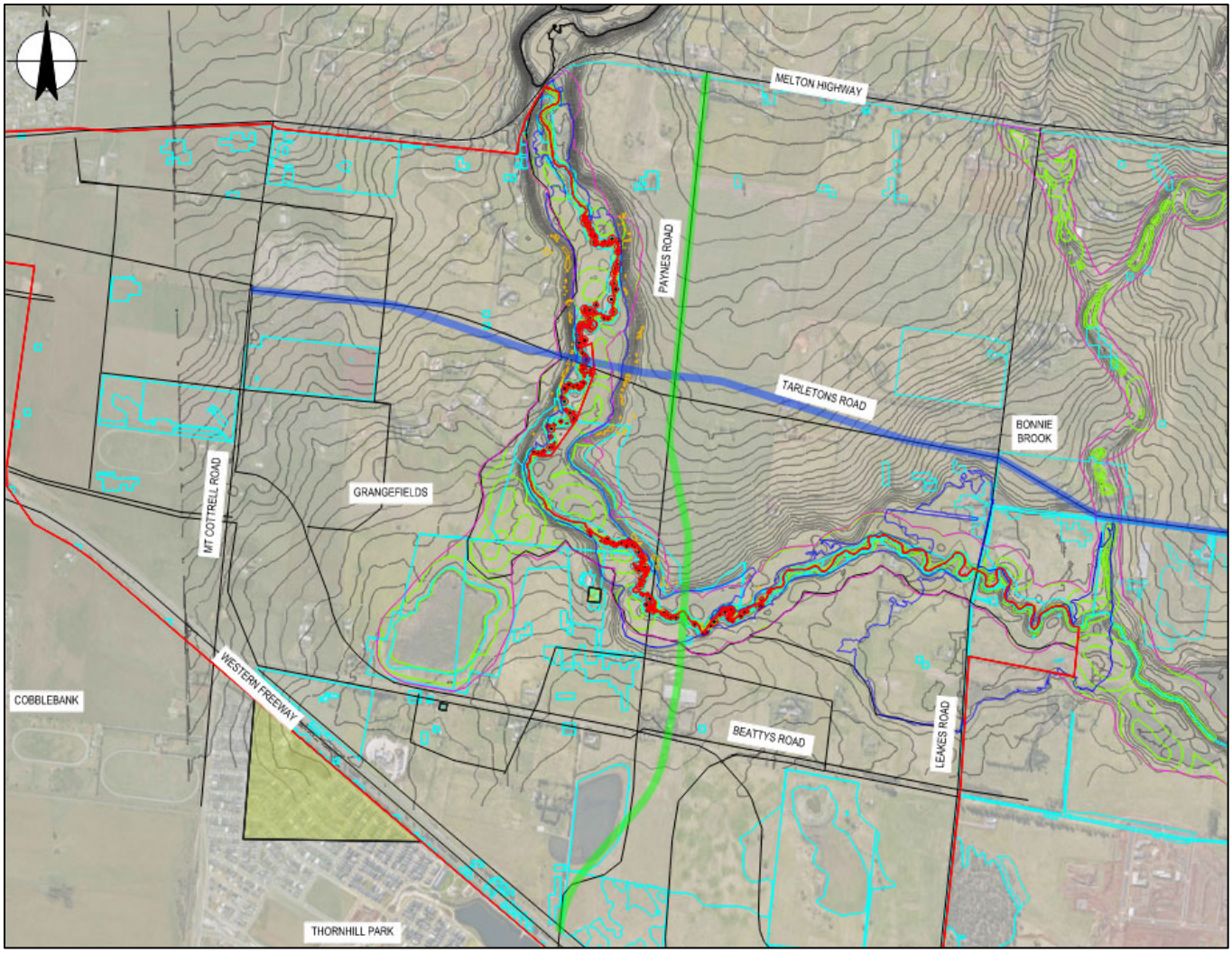


Figure 8 *Alignment layout plan*

6.2 Tarletons Road alignment

The preferred Tarletons Road alignment is based upon initial Option 2 with modifications. The proposed bridge in this location is approx. 199 m long and requires four piers. Refer Figure 9 for an extract of the detail plan view and Figure 10 for an extract of the longitudinal section of the preferred alignment. Concerning the longitudinal section, it is noted that the green hatch indicates a fill area, while the red hatch indicates a cut area.

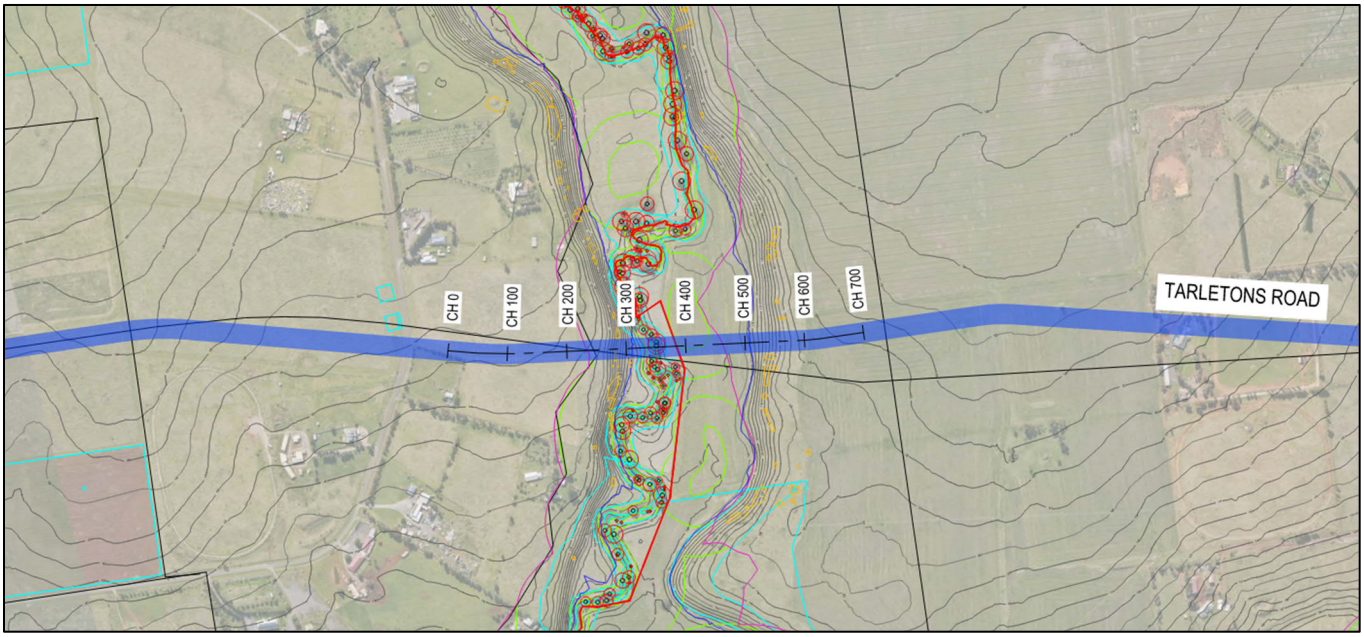


Figure 9 Tarletons Road preferred alignment

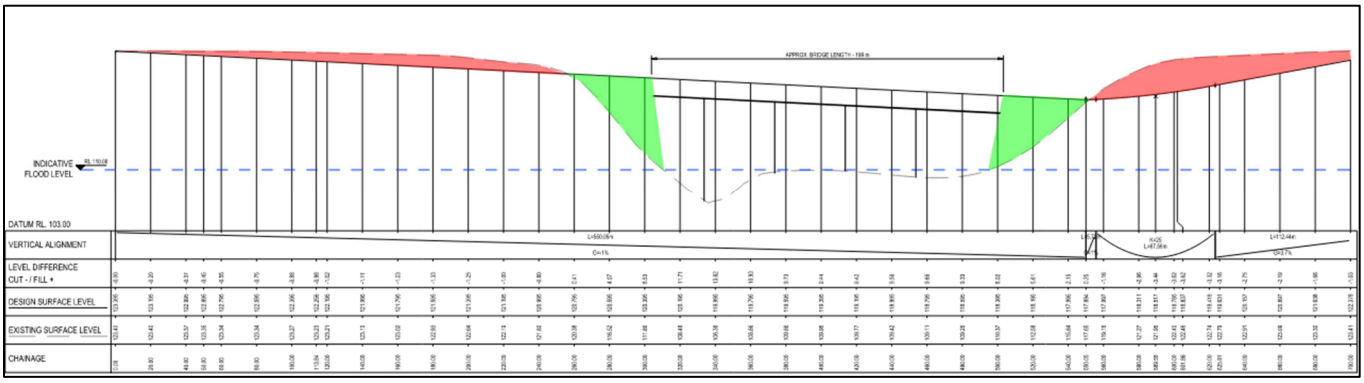


Figure 10 Tarletons Road preferred alignment longitudinal section (See Appendix A for high resolution)

6.2.1 Cultural Heritage Impact

Kororoit Creek and a 200m buffer either side is located within an area of Aboriginal Cultural Heritage Sensitivity and therefore all bridge alignments and infrastructure will result in an impact to Aboriginal cultural heritage.

The preferred alignment seeks to minimise the impact to Aboriginal cultural heritage through engagement with WWWCHAC as well as detailed desktop assessments as well as site visits.

Additional technical work and engagement with WWWCHAC is required to determine the cultural heritage sensitivity of each alignment.

The preferred alignments do not result in an impact to Post-Contact Heritage as per the Post Contact Heritage Assessment, prepared by Ecology Heritage & Partners.

6.2.2 Environmental Impact

The alignment impacts three TPZs of Moderate-B arboriculture rating nearby to Kororoit Creek. It also impacts wetland conservation areas as set out in the Biodiversity Conservation Strategy (BCS) prepared by the DEECA MSA team. However, advice from the MSA team is that there is flexibility to adjust the wetland to suit this alignment.

Due to advice received from the MSA team and low impact to existing trees, the alignment is assessed to have low environmental impact.

It is acknowledged that any infrastructure within the Biodiversity Conservation Strategy area will have some impact on environmental values, however, a 'low' environmental rating for this alignment has been assessed due to the following:

– This alignment does not affect an s-bend or complex undulating section of the creek.
– It avoids 'High' and 'Moderate-A' rated trees as per the Arboricultural Assessment and Report - River Red Gum Trees Kororoit Creek for Melton East PSP, dated 5 May 2023.
– It minimises the distance across the Biodiversity Conservation Strategy area.

Impacts to non-tree environment or habitat has not been factored into this rating due to it all being a BCS area within the Melbourne Strategic Assessment, the entire area is considered to have environmental values.

When assessed against Options 1,2 and3 identified in the Preliminary Feasibility Assessment (25 May 2023) against the criteria above, the proposed alignment within this report is considered to have a low environmental rating.

6.2.3 Transport Network

The alignment has minor deviation from the West Growth Corridor Plan alignment. The alignment is assessed to have low impact to the transport network.

6.2.4 Value Management

Indicative cost estimates prepared by GHD assessed the value of the total delivery cost for the bridge alignment to be $55,477,324.00. The estimates will be discussed in detail in section 7.

6.3 Paynes Road alignment

The preferred Paynes Road alignment is based upon initial Options 5 and 6 with modifications. The proposed bridge in this location is approx. 159 m long and requires five piers. Refer Figure 11 for an extract of the detail plan view and Figure 12 for an extract of the longitudinal section of the preferred alignment. Concerning the longitudinal section, it is noted that the green hatch indicates a fill area, while the red hatch indicates a cut area.

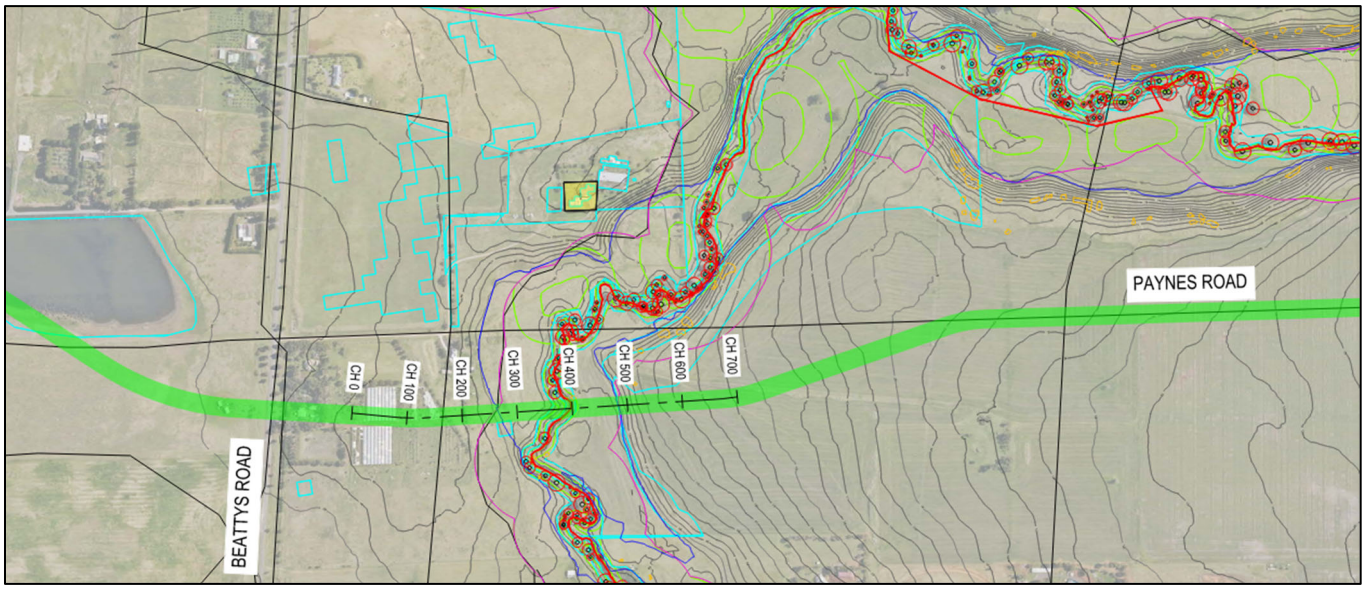


Figure 11 Paynes Road preferred alignment

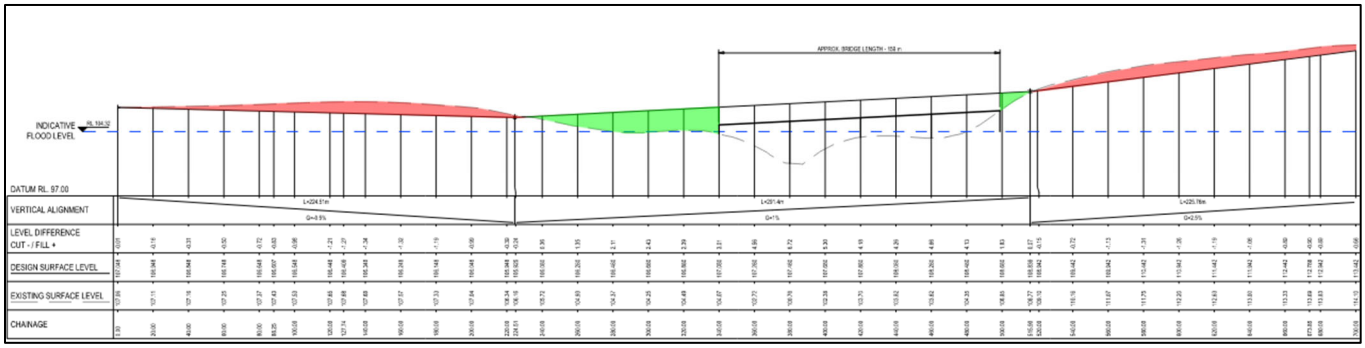


Figure 12 Paynes Road preferred alignment longitudinal section (See Appendix A for high resolution)

6.3.1 Cultural Heritage Impact

Kororoit Creek and a 200m buffer either side is located within an area of Aboriginal Cultural Heritage Sensitivity and therefore all bridge alignments and infrastructure will result in some impact to Aboriginal cultural heritage.

The preferred alignment seeks to minimise the impact to Aboriginal cultural heritage through engagement with WWWCHAC as well as detailed desktop assessments as well as site visits (Please review Appendix E).

Additional technical work and engagement with WWWCHAC is required to determine the alignment.

The preferred alignment does not result in an impact to Post-Contact Heritage as per the Post Contact Heritage Assessment, prepared by Ecology Heritage & Partners.

6.3.2 Environmental Impact

The alignment does not impact TPZs or GGF wetland conservation areas.

This alignment is assessed to have low environmental impact.

It is acknowledged that any infrastructure within the Biodiversity Conservation Strategy area will have some impact on environmental values, however, a 'low' environmental rating for this alignment has been assessed due to the following:

- This alignment does not affect an s-bend or complex undulating section of the creek.
- It avoids 'High' and 'Moderate-A' rated trees as per the Arboricultural Assessment and Report - River Red Gum Trees Kororoit Creek for Melton East PSP, dated 5 May 2023.
- It minimises the distance across the Biodiversity Conservation Strategy area.
- This section of the creek has been significantly impacted from the existing farming uses including the abandonment of machinery and metal close to the creek corridor.

When assessed against Options 4, 5 and 6 in the Preliminary Feasibility Assessment (25 May 2023), the proposed alignment is considered to have a low environmental rating.

6.3.3 Transport Network

The alignment has minor deviation from the West Growth Corridor Plan alignment. The alignment is assessed to have low impact to the transport network.

6.3.4 Value Management

Indicative cost estimates prepared by GHD assessed the value of the total delivery cost for the bridge alignment to be $43,684,645.00. The estimates will be discussed in detail in section 7.

6.4 Assessment summary

The preferred alignments for both Tarleton and Paynes Roads have been refined with regard to the assessment criteria following the VPA and other authorities feedback period. Conceptual engineering plans, including indicative horizontal and vertical road/bridge geometry, have been developed.

The assessment documents low risk of impact for Cultural Heritage, Environmental considerations and upon the Transport Network. Order of magnitude cost estimates have been provided for each alignment as well.

7. Cost estimation

GHD has prepared order of magnitude estimates for each bridge commensurate with this high-level stage of the design process. Estimates provided are based upon previous experience with similar projects and using a cost template provided by the VPA.

7.1 Assumptions

The following assumptions have been made when preparing the estimates.

– The cost estimates provided herein are order of magnitude estimates only. GHD recommend that updated cost estimates are sought as the project develops and designs are refined.
– The cost estimates assume a traditional lump sum competitively tendered procurement method.
– The cost estimates are based on carrying out the works during normal working hours.
– Cost template was supplied by the VPA.
– Preliminary vertical road and bridge alignments was completed using GIS alignments provide by VPA, GHD has undertaken preliminary design using 12D software.
– Extra over allowance rate for rock excavation allows for possibility of encountering rock during excavation.
– GHD has made no allowance for contaminated material.
– Habitat compensation fees have been excluded.
– Rates used in the cost estimates are based on recent project data and benchmarked rates for concept cost estimates for projects of a similar nature in the Melbourne region.
– All structural rates are high level allowances based on concept drawings. Adjustments to structural rates upon further structural design developments are anticipated.
– Cost estimates do not allow for additional road lengths required to divert from the draft PSP road alignments.

7.2 Cost summary

A summary of the order of magnitude estimate of development costs is captured in Table 7. The estimate sheets have been attached in Appendix D.

From GHD's experience, it is noted that steel box girder bridges are approximately twice the cost of typical concrete 'Super T' bridges. GHD recommends a cost estimator be consulted in subsequent design stages to confirm bridge cost estimates to a greater degree of confidence.

Table 7 Overall Development Cost

Alignment	Construction Costs (excl. GST)	Other Project Costs (excl. GST)	Total Delivery Cost (excl. GST)
Concrete 'Super T' bridge typology			
Tarletons Road	$37,933,213.00	$17,544,111.01	**$55,477,324.00**
Paynes Road	$29,869,843.00	$13,814,802.39	**$43,684,645.39**

8. Conclusion

This report documents the feasibility assessment of two bridge crossings over Kororoit Creek, which have been proposed to support the future transport capacity of the Melton East PSP and surrounds.

A total of six options, three for each of Tarletons Road and Paynes Road, were developed and assessed in the previously prepared Preliminary Feasibility Assessment report. The options were assessed against agreed criteria to assist the VPA in the selection of a preferred option.

Following submission of the Preliminary Feasibility Assessment report to the VPA on 5th June 2023, a review and feedback period was entered during which other key authorities were consulted. The VPA also developed datasets and analysis methodologies to assist in the selection of a preferred alignment.

On 17th August 2023, the VPA advised GHD to proceed with preparation of a Final Feasibility Assessment Report on the basis of two preferred alignments. This report assesses the preferred alignment for each of Tarletons Road and Paynes Road.

For the preferred alignments, conceptual engineering plans were developed on the basis of current engineering design standards, including high-level design of road and bridge geometry. Indicative road and bridge levels were developed on the basis of preferred bridge typology, flood modelling information and freeboard levels provided by MW.

The alignments were assessed against the following criteria: Cultural Heritage Impact; Environmental Impact; Transport Network; and Value Management. Each of the alignments were found to have a low risk of impact for the Cultural Heritage, Environment and Transport Network criteria. An order of magnitude cost estimate was also provided for the two alignments.

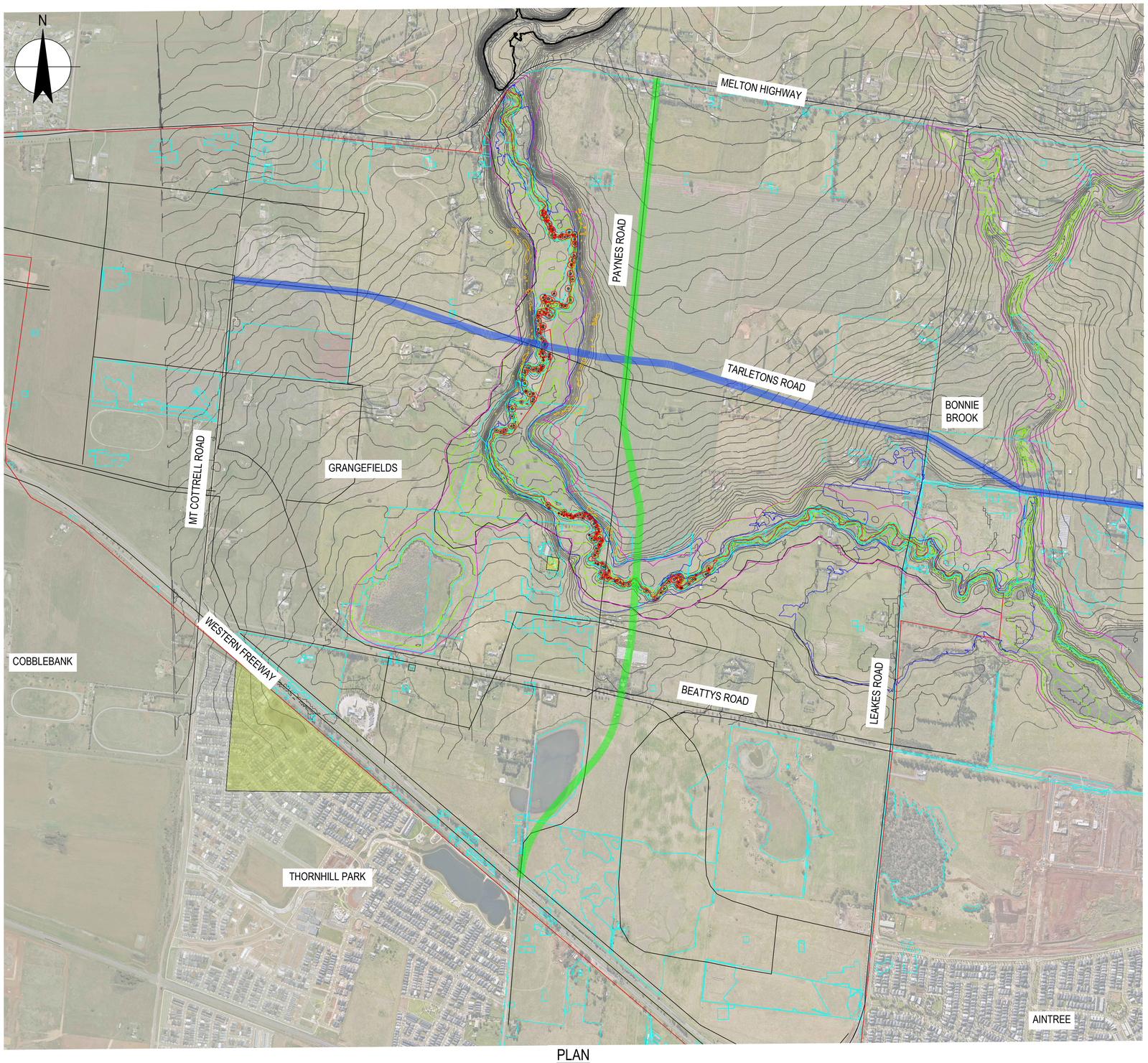
For next steps, it is recommended that:

– The VPA seek advice from registered cost estimators in subsequent design phases.
– The VPA undertake further consultation with Traditional Owners to understand impacts of the preferred alignments.

Appendices

Appendix A

Final civil concept plans



PLAN

SCALE 1: 10000

LEGEND

- MELTON EAST PRECINCT BOUNDARY
- PREFERRED ALIGNMENT - TARLETONS ROAD
- PREFERRED ALIGNMENT - PAYNES ROAD
- KORORoit CREEK FLOOD EXTENTS
- DEECA AREAS OF STRATEGIC IMPORTANCE
- NATIVE VEGETATION OVERLAY
- BCS CONSERVATION AREAS
- MELTON EAST PSP CADASTRAL BOUNDARIES
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- TREE PROTECTION ZONE (TPZ)
- STRUCTURAL ROOT ZONE (SRZ)
- EXPOSED ROCK FEATURES

Rev	Description	Checked	Approved	Date
B	FINAL FEASIBILITY ASSESSMENT REPORT	E.A.	M.W.	08.09.23
A	PRELIMINARY ISSUE	L.M.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC

Designer R. BON **Design Check** L. MORRISON

0 100 200 300 400 500m

SCALE 1:10,000 AT ORIGINAL SIZE

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title OVERALL LAYOUT PLAN
VPA PREFERRED ALIGNMENTS

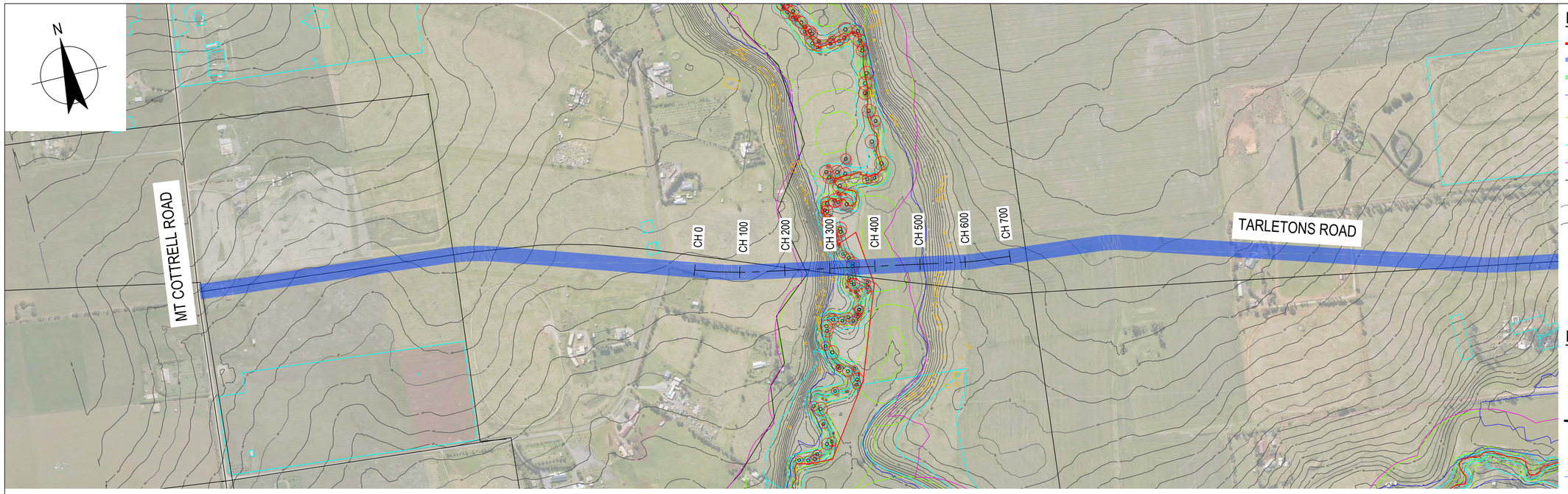
Size A1

Drawing No. 12605913-DRG-CI-C010

Rev B

Plot Date: 8 September 2023 - 11:43 AM Plotted by: Roberto Balberan

File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C010.dwg



LEGEND

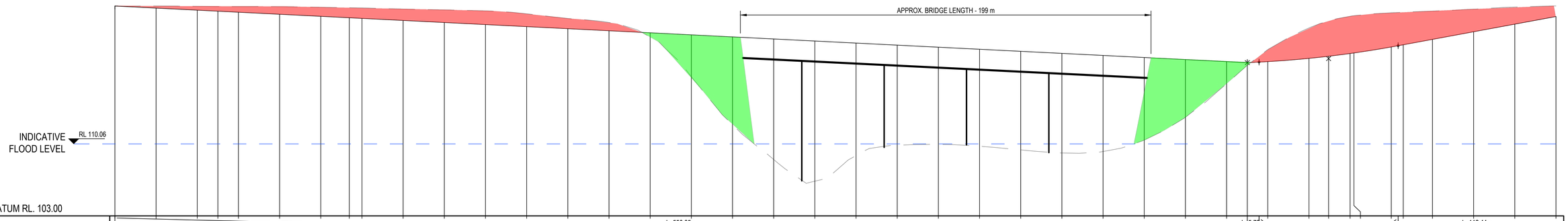
🟥	MELTON EAST PRECINCT BOUNDARY
🟦	PREFERRED ALIGNMENT - TARLETONS ROAD
🟩	PREFERRED ALIGNMENT - PAYNES ROAD
—	KORORROIT CREEK FLOOD EXTENTS
—	DEECA AREAS OF STRATEGIC IMPORTANCE
—	NATIVE VEGETATION OVERLAY
—	BCS CONSERVATION AREAS
—	MELTON EAST PSP CADASTRAL BOUNDARIES
—	MAJOR CONTOUR (EXISTING)
—	MINOR CONTOUR (EXISTING)
○	TREE PROTECTION ZONE (TPZ)
○	STRUCTURAL ROOT ZONE (SRZ)
☐	EXPOSED ROCK FEATURES

LEGEND - LONGITUDINAL SECTION

🟩	AREA IN FILL
🟥	AREA IN CUT
—	BRIDGE SOFFIT
|	BRIDGE PIERS
- -	Q100 FLOOD LEVEL

PLAN

SCALE 1:5000



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LEVEL DIFFERENCE CUT - / FILL +	-0.00	-0.20	-0.37	-0.45	-0.55	-0.75	-0.88	-0.98	-1.02	-1.11	-1.23	-1.33	-1.25	-1.00
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EXISTING SURFACE LEVEL	123.40	123.40	123.37	123.35	123.34	123.34	123.27	123.23	123.21	123.10	123.02	122.93	122.64	122.19

CHAINAGE	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00
LEVEL DIFFERENCE CUT - / FILL +	-0.80	0.41	4.07	8.53	11.71	13.62	10.93	9.73	9.44	9.42	9.58	9.68	9.33	8.02
DESIGN SURFACE LEVEL	120.995	120.795	120.595	120.395	120.195	119.995	119.795	119.595	119.395	119.195	118.995	118.795	118.595	118.395
EXISTING SURFACE LEVEL	121.80	120.38	116.52	111.86	108.48	106.38	108.86	109.86	109.95	109.77	109.42	109.11	109.26	110.37

CHAINAGE	520.00	540.00	550.05	560.00	580.00	589.55	600.00	601.86	620.00	625.81	640.00	660.00	680.00	700.00
LEVEL DIFFERENCE CUT - / FILL +	5.61	2.15	0.25	-1.16	-2.96	-3.44	-3.62	-3.62	-3.32	-3.16	-2.75	-2.19	-1.66	-1.03
DESIGN SURFACE LEVEL	118.195	117.995	117.894	117.997	118.311	118.517	118.785	118.837	119.418	119.631	120.157	120.897	121.638	122.378
EXISTING SURFACE LEVEL	112.58	115.84	117.65	119.16	121.27	121.95	122.40	122.46	122.74	122.79	122.91	123.09	123.30	123.41

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
B	FINAL FEASIBILITY ASSESSMENT REPORT	E.A.	M.W.	08.09.23
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC
Designer R. BON **Design Check** L. MORRISON

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SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200
AT ORIGINAL SIZE
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HORIZONTAL 1:1000
AT ORIGINAL SIZE
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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 1 - TARLETONS ROAD

Size A1

Drawing No. 12605913-DRG-CI-C020

Rev B

Plot Date: 8 September 2023 - 11:38 AM Plotted by: Roberto Balberan

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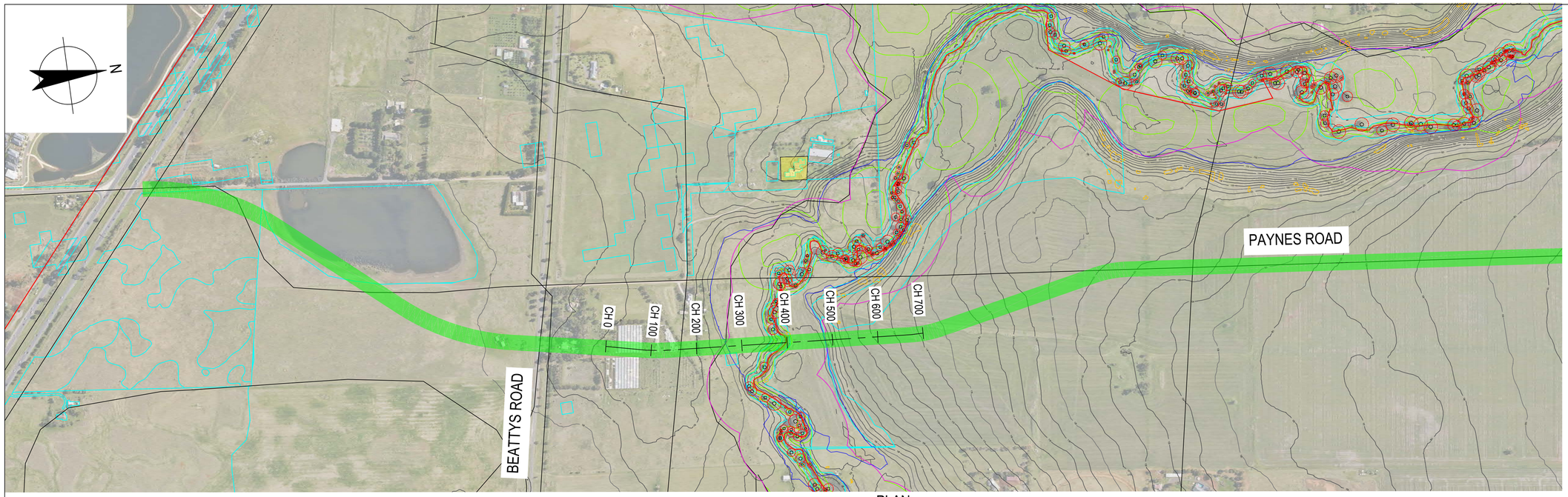


LEGEND

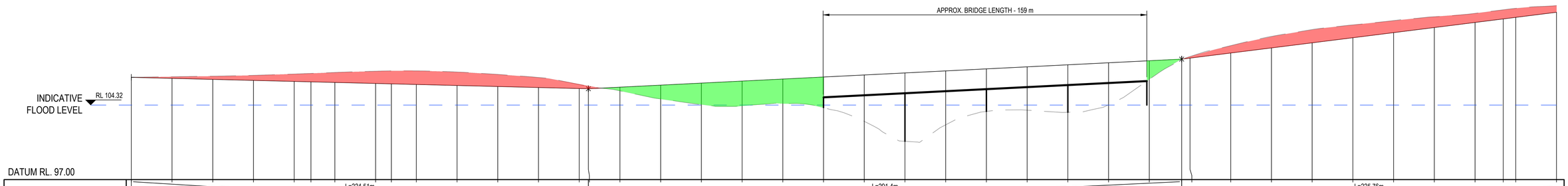
🟥	MELTON EAST PRECINCT BOUNDARY
🟦	PREFERRED ALIGNMENT - TARLETONS ROAD
🟩	PREFERRED ALIGNMENT - PAYNES ROAD
—	KOROROIT CREEK FLOOD EXTENTS
—	DEECA AREAS OF STRATEGIC IMPORTANCE
—	NATIVE VEGETATION OVERLAY
—	BCS CONSERVATION AREAS
—	MELTON EAST PSP CADASTRAL BOUNDARIES
—	MAJOR CONTOUR (EXISTING)
—	MINOR CONTOUR (EXISTING)
○	TREE PROTECTION ZONE (TPZ)
○	STRUCTURAL ROOT ZONE (SRZ)
☐	EXPOSED ROCK FEATURES

LEGEND - LONGITUDINAL SECTION

🟩	AREA IN FILL
🟥	AREA IN CUT
—	BRIDGE SOFFIT
|	BRIDGE PIERS
- - -	Q100 FLOOD LEVEL

PLAN

SCALE 1:5000



DATUM RL. 97.00

CHAINAGE	0.00	20.00	40.00	60.00	80.00	88.25	100.00	120.00	127.74	140.00	160.00	180.00	200.00	220.00	224.51
VERTICAL ALIGNMENT	L=224.51m G=-0.5%														
LEVEL DIFFERENCE CUT - / FILL +	-0.01	-0.16	-0.31	-0.50	-0.72	-0.83	-0.98	-1.21	-1.27	-1.34	-1.32	-1.19	-0.99	-0.39	-0.24
DESIGN SURFACE LEVEL	107.048	106.948	106.848	106.748	106.648	106.607	106.548	106.448	106.409	106.348	106.248	106.148	106.048	105.948	105.925
EXISTING SURFACE LEVEL	107.06	107.11	107.16	107.25	107.37	107.43	107.53	107.65	107.68	107.68	107.57	107.33	107.04	106.34	106.16

CHAINAGE	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00
VERTICAL ALIGNMENT	L=291.4m G=1%													
LEVEL DIFFERENCE CUT - / FILL +	0.36	1.35	2.11	2.43	2.39	3.01	4.56	6.72	5.30	4.18	4.26	4.66	4.13	1.83
DESIGN SURFACE LEVEL	106.080	106.280	106.480	106.680	106.880	107.080	107.280	107.480	107.680	107.880	108.080	108.280	108.480	108.680
EXISTING SURFACE LEVEL	105.72	104.93	104.37	104.25	104.49	104.07	102.72	100.76	102.38	103.70	103.82	103.62	104.35	106.85

CHAINAGE	515.90	520.00	540.00	560.00	580.00	600.00	620.00	640.00	660.00	673.85	680.00	700.00
VERTICAL ALIGNMENT		L=225.76m G=2.5%										
LEVEL DIFFERENCE CUT - / FILL +	0.07	-0.15	-0.72	-1.13	-1.31	-1.26	-1.19	-1.06	-0.89	-0.90	-0.89	-0.66
DESIGN SURFACE LEVEL	108.839	108.942	109.442	109.942	110.442	110.942	111.442	111.942	112.442	112.788	112.942	113.442
EXISTING SURFACE LEVEL	108.77	109.10	110.16	111.07	111.75	112.20	112.63	113.00	113.33	113.69	113.83	114.10

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
B	FINAL FEASIBILITY ASSESSMENT REPORT	E.A.	M.W.	08.09.23
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC
Designer R. BON **Design Check** L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

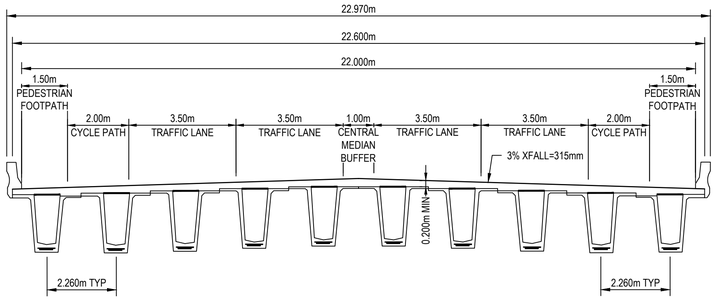
Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 2 - PAYNES ROAD

Size A1

Drawing No. 12605913-DRG-CI-C030

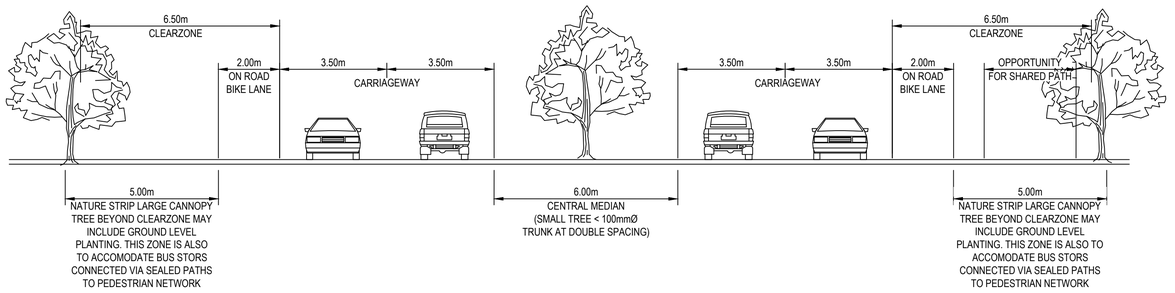
Rev B

Plot Date: 8 September 2023 - 11:39 AM Plotted by: Roberto Balberan
File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C030.dwg



DETAIL A - BRIDGE CROSS SECTION

N.T.S



DETAIL B - ROAD CROSS SECTION

N.T.S

Rev	Description	Checked	Approved	Date
A	FINAL FEASIBILITY ASSESSMENT REPORT	E.A.	M.W.	08.09.23

Author R. BALBERAN **Drafting Check** D. KOKOTOVIC

Designer R. BON **Design Check** M. WHALEN

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Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title TYPICAL SECTIONS

Size A1

Drawing No. 12605913-DRG-CI-C040

Rev A

Plot Date: 8 September 2023 - 11:40 AM Plotted by: Roberto Balberan

File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C040.dwg

Appendix B

Initial civil concept plans

N

TARLETONS ROAD OPTIONS

PAYNES ROAD

TARLETONS ROAD

PAYNES ROAD OPTIONS

LEGEND

- MELTON EAST PRECINCT BOUNDARY
- OPTION 1 - TARLETONS ROAD
- OPTION 2 - TARLETONS ROAD
- OPTION 3 - TARLETONS ROAD
- OPTION 4 - PAYNES ROAD
- OPTION 5 - PAYNES ROAD
- OPTION 6 - PAYNES ROAD
- KORORoit CREEK FLOOD EXTENTS
- DEECA AREAS OF STRATEGIC IMPORTANCE
- NATIVE VEGETATION OVERLAY
- BCS CONSERVATION AREAS
- MELTON EAST PSP CADASTRAL BOUNDARIES
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- TREE PROTECTION ZONE (TPZ)
- STRUCTURAL ROOT ZONE (SRZ)

PLAN

SCALE 1: 5000

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	L.M.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC

Designer R. BON **Design Check** L. MORRISON

0 50 100 150 200 250m

SCALE 1:5000 AT ORIGINAL SIZE

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title OVERALL LAYOUT PLAN
ALIGNMENT OPTIONS

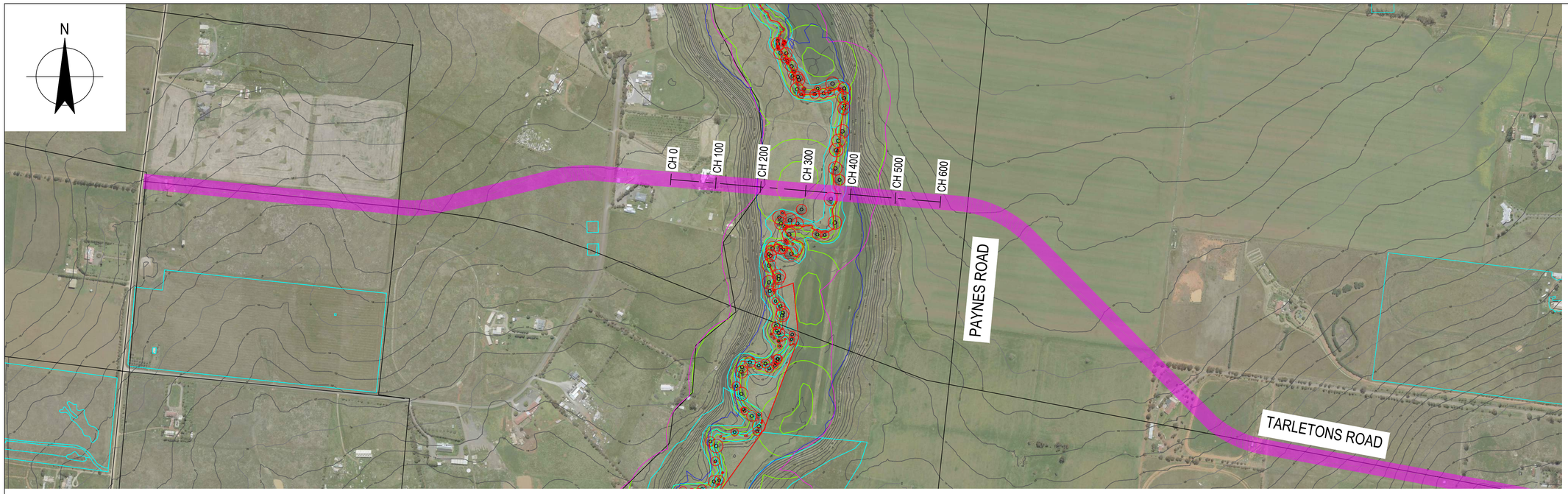
Drawing No. 12605913-DRG-CI-C001

Size A1

Rev A

Plot Date: 26 May 2023 - 12:26 PM Plotted by: Richard Bon

File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C001.dwg



LEGEND

🟥	MELTON EAST PRECINCT BOUNDARY
🟪	OPTION 1 - TARLETONS ROAD
🟦	OPTION 2 - TARLETONS ROAD
🟦	OPTION 3 - TARLETONS ROAD
🟨	OPTION 4 - PAYNES ROAD
🟩	OPTION 5 - PAYNES ROAD
🟥	OPTION 6 - PAYNES ROAD
—	KOROROIT CREEK FLOOD EXTENTS
—	DEECA AREAS OF STRATEGIC IMPORTANCE
—	NATIVE VEGETATION OVERLAY
—	BCS CONSERVATION AREAS
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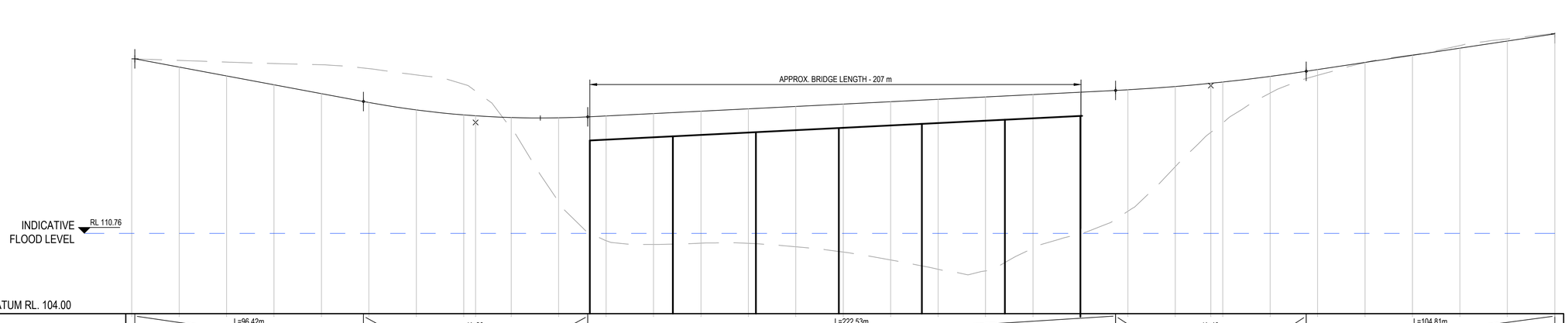
∼	MAJOR CONTOUR (EXISTING)
∼	MINOR CONTOUR (EXISTING)
○	TREE PROTECTION ZONE (TPZ)
○	STRUCTURAL ROOT ZONE (SRZ)

PLAN

SCALE 1:5000



DATUM RL. 104.00

VERTICAL ALIGNMENT	L=96.42m G=-3.73%					K=20 L=94.58m					
LEVEL DIFFERENCE CUT - / FILL +	-0.07	-0.57	-1.17	-1.79	-2.44	-2.85	-2.95	-2.59	-2.08	0.92	7.08
DESIGN SURFACE LEVEL	125.411	124.777	124.032	123.286	122.540	121.796	121.173	120.750	120.675	120.527	120.504
EXISTING SURFACE LEVEL	125.48	125.34	125.20	125.08	124.98	124.65	124.12	123.34	122.75	119.61	113.43
CHAINAGE	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	145.00	160.00	180.00

VERTICAL ALIGNMENT	L=222.53m G=1%										
LEVEL DIFFERENCE CUT - / FILL +	10.51	11.03	11.13	11.34	11.83	12.47	13.34	14.32	14.66	12.95	11.91
DESIGN SURFACE LEVEL	120.666	120.866	121.066	121.266	121.466	121.666	121.866	122.066	122.266	122.466	122.666
EXISTING SURFACE LEVEL	110.16	109.83	109.94	109.93	109.64	109.19	108.53	107.75	107.60	109.52	110.75
CHAINAGE	200.00	220.00	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00

VERTICAL ALIGNMENT	K=40 L=80.37m					L=104.81m G=3.01%				
LEVEL DIFFERENCE CUT - / FILL +	10.24	6.75	4.13	3.44	1.41	0.49	0.00	-0.04	-0.22	-0.17	-0.06
DESIGN SURFACE LEVEL	122.870	123.146	123.418	123.522	123.997	124.570	125.172	125.774	126.376	126.978	127.580
EXISTING SURFACE LEVEL	112.63	116.39	119.29	120.08	122.59	124.08	125.17	125.81	126.60	127.15	127.64
CHAINAGE	420.00	440.00	455.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC

Designer R. BON **Design Check** L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m

HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

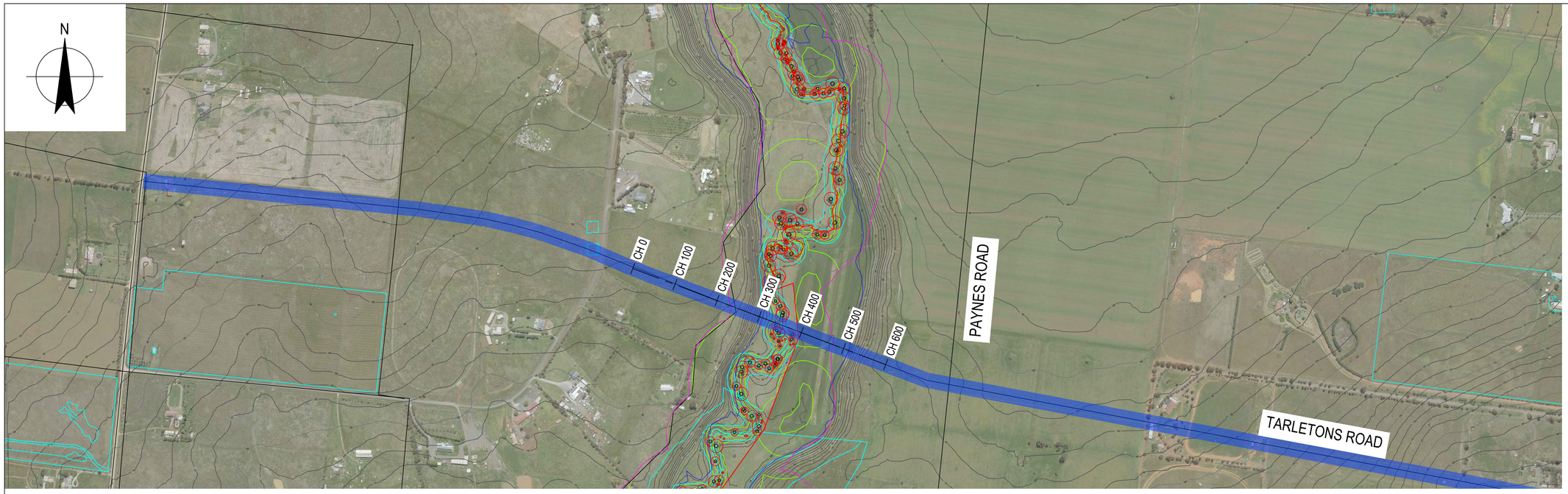
Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 1 - TARLETONS ROAD

Size A1

Drawing No. 12605913-DRG-CI-C002

Rev A

Plot Date: 26 May 2023 - 12:27 PM Plotted by: Richard Bon File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C002_C004.dwg



LEGEND

- 🟥 MELTON EAST PRECINCT BOUNDARY
- OPTION 1 - TARLETONS ROAD
- OPTION 2 - TARLETONS ROAD
- OPTION 3 - TARLETONS ROAD
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- 🟩 OPTION 5 - PAYNES ROAD
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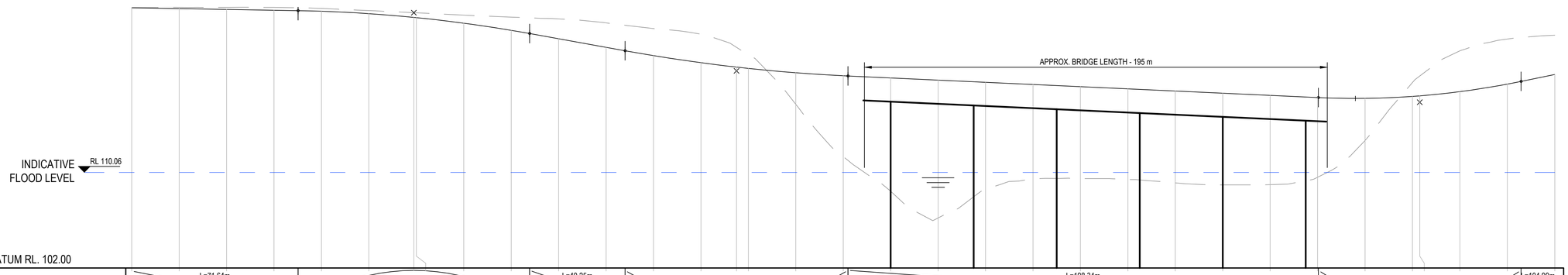
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- ○ TREE PROTECTION ZONE (TPZ)
- ○ STRUCTURAL ROOT ZONE (SRZ)

PLAN

SCALE 1:5000



DATUM RL. 102.00

VERTICAL ALIGNMENT	L=71.64m G=-0.35%				K=30 L=97.61m					
LEVEL DIFFERENCE CUT - / FILL +	-0.01	-0.10	-0.17	-0.23	-0.24	-0.26	-0.40	-0.41	-0.68	-1.11
DESIGN SURFACE LEVEL	123.931	123.862	123.792	123.722	123.636	123.433	123.119	123.098	122.629	122.026
EXISTING SURFACE LEVEL	123.94	123.96	123.96	123.96	123.87	123.69	123.52	123.51	123.31	123.14
CHAINAGE	0.00	20.00	40.00	60.00	80.00	100.00	118.95	120.00	140.00	160.00

VERTICAL ALIGNMENT	L=40.25m G=-3.6%		K=35 L=93.99m						L=198.34m G=-0.92%				
LEVEL DIFFERENCE CUT - / FILL +	-1.68	-2.06	-2.28	-2.40	-1.66	-1.17	2.66	6.82	9.55	11.62	9.02	7.95	7.74
DESIGN SURFACE LEVEL	121.316	120.595	119.895	119.300	118.929	118.819	118.453	118.201	118.017	117.833	117.650	117.466	117.282
EXISTING SURFACE LEVEL	122.99	122.66	122.18	121.70	120.59	119.99	115.79	111.38	108.47	106.22	108.63	109.51	109.55
CHAINAGE	180.00	200.00	220.00	240.00	255.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00

VERTICAL ALIGNMENT					K=17 L=85.46m						L=104.99m G=4.11%
LEVEL DIFFERENCE CUT - / FILL +	7.64	7.74	7.73	7.52	6.72	3.55	-1.17	-1.67	-3.44	-3.80	-3.31
DESIGN SURFACE LEVEL	117.099	116.915	116.732	116.548	116.365	116.295	116.460	116.506	116.861	117.497	118.309
EXISTING SURFACE LEVEL	109.46	109.17	109.00	109.02	109.65	112.75	117.63	118.17	120.30	121.30	121.62
CHAINAGE	420.00	440.00	460.00	480.00	500.00	520.00	540.00	543.06	560.00	580.00	600.00

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC
Designer R. BON **Design Check** L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200
AT ORIGINAL SIZE
0 2 4 6 8 10m

HORIZONTAL 1:1000
AT ORIGINAL SIZE
0 10 20 30 40 50m

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 2 - TARLETONS ROAD

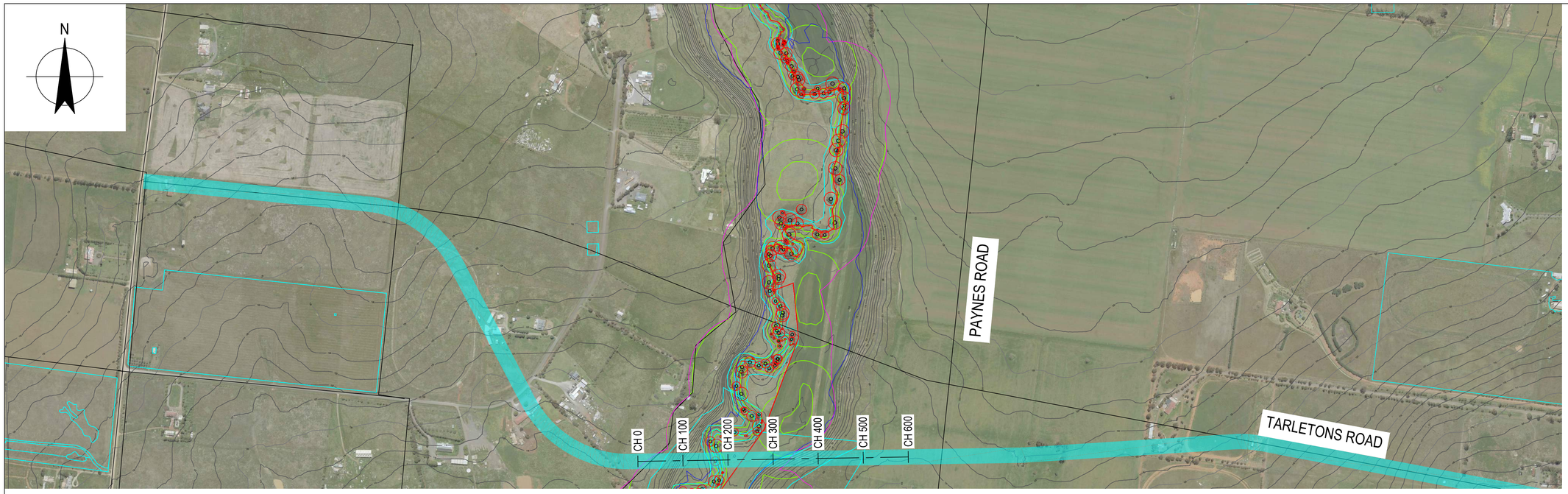
Size A1

Drawing No. 12605913-DRG-CI-C003

Rev A

Plot Date: 26 May 2023 - 12:27 PM Plotted by: Richard Bon

File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C002_C004.dwg



LEGEND

🟥	MELTON EAST PRECINCT BOUNDARY
🟪	OPTION 1 - TARLETONS ROAD
🟦	OPTION 2 - TARLETONS ROAD
🟦	OPTION 3 - TARLETONS ROAD
🟨	OPTION 4 - PAYNES ROAD
🟩	OPTION 5 - PAYNES ROAD
🟥	OPTION 6 - PAYNES ROAD
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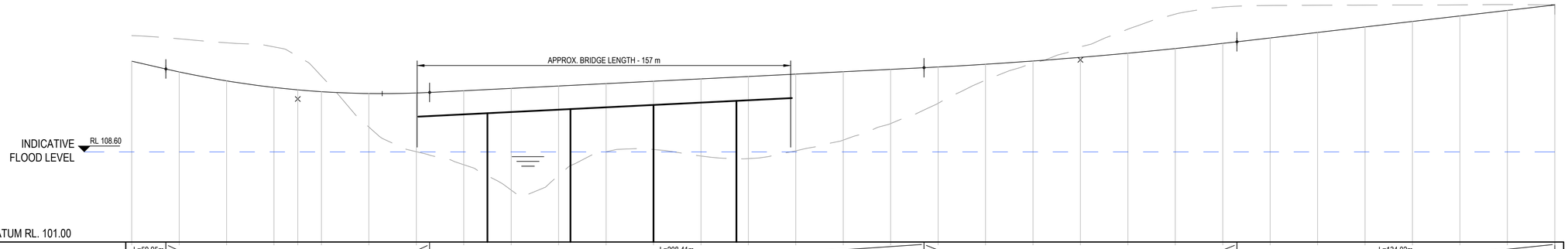
~	MINOR CONTOUR (EXISTING)
○	TREE PROTECTION ZONE (TPZ)
○	STRUCTURAL ROOT ZONE (SRZ)

PLAN

SCALE 1:5000



DATUM RL. 101.00

VERTICAL ALIGNMENT	L=59.95m G=-4.56%	K=20 L=111.23m							L=208.41m G=1%							
LEVEL DIFFERENCE CUT - / FILL +	-2.16	-2.79	-3.21	-3.42	-2.83	-1.31	2.83	4.96	6.25	8.59	7.55	5.75	5.76	6.51	6.93	6.48
DESIGN SURFACE LEVEL	116.265	115.360	114.604	114.048	113.845	113.692	113.536	113.580	113.772	113.972	114.172	114.372	114.572	114.772	114.972	115.172
EXISTING SURFACE LEVEL	118.42	118.15	117.82	117.47	116.67	115.00	110.70	108.62	107.52	105.38	106.62	108.62	108.81	108.26	108.04	108.70
CHAINAGE	0.00	20.00	40.00	60.00	70.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00

VERTICAL ALIGNMENT			K=100 L=131.95m							L=134.02m G=2.32%						
LEVEL DIFFERENCE CUT - / FILL +	5.77	4.57	3.07	1.35	0.17	-0.87	-2.02	-2.90	-3.07	-2.74	-2.29	-1.84	-1.38	-0.93	-0.49	-0.01
DESIGN SURFACE LEVEL	115.372	115.572	115.773	116.005	116.277	116.589	116.941	117.333	117.765	118.227	118.691	119.155	119.619	120.083	120.547	121.011
EXISTING SURFACE LEVEL	109.60	111.00	112.70	114.66	116.11	117.46	118.96	120.23	120.83	120.97	120.98	121.00	121.00	121.01	121.04	121.02
CHAINAGE	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC
Designer R. BON **Design Check** L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

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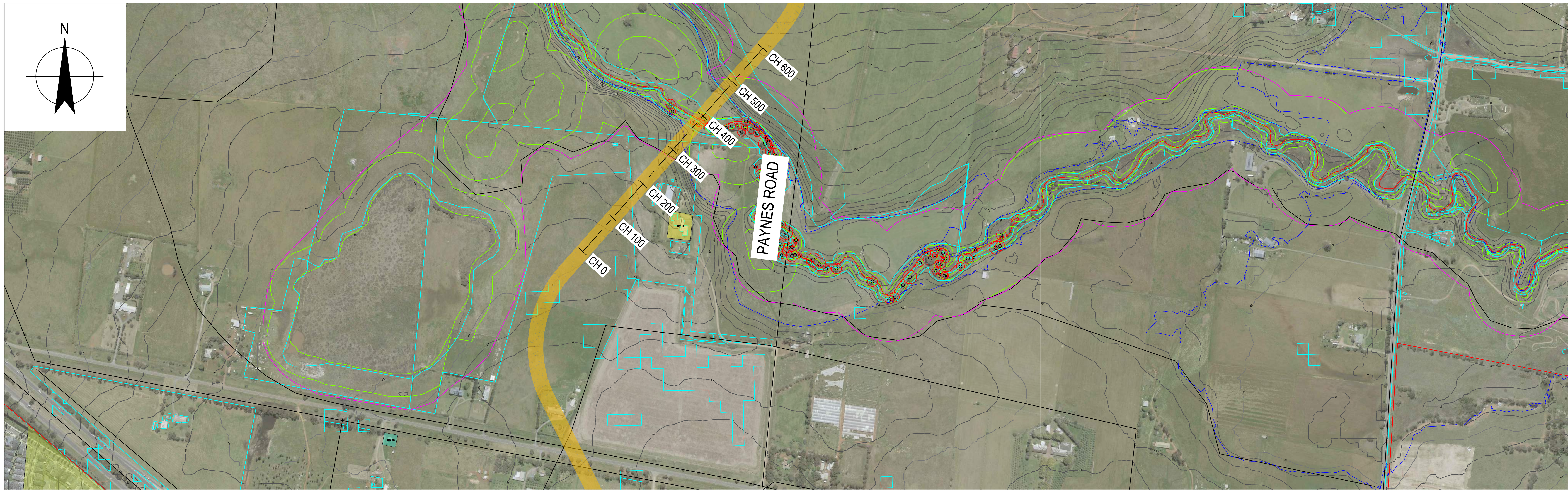
Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY
Project MELTON EAST PSP BRIDGE STUDY
Status PRELIMINARY

Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 3 - TARLETONS ROAD

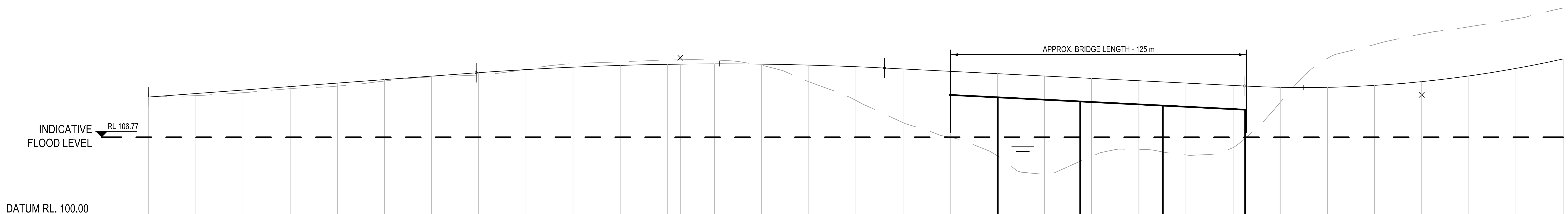
Size **A1**
Drawing No. 12605913-DRG-CI-C004
Rev A

Plot Date: 26 May 2023 - 12:27 PM Plotted by: Richard Bon File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C002_C004.dwg



PLAN

SCALE 1:5000



DATUM RL. 100.00

VERTICAL ALIGNMENT: L=138.9m, G=1.47% | K=70, L=173.15m | L=152.95m, G=-1% | K=25, L=150m

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LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.17	0.22	0.18	0.26	0.12	0.07	0.20	-0.03	-0.29	-0.31	-0.36	-0.37	-0.33	0.10	1.41
DESIGN SURFACE LEVEL	110.177	110.472	110.767	111.062	111.356	111.651	111.946	112.240	112.503	112.709	112.858	112.950	112.965	112.984	112.961	112.881
EXISTING SURFACE LEVEL	110.18	110.30	110.54	110.88	111.10	111.53	111.88	112.05	112.53	113.00	113.16	113.31	113.33	113.32	112.86	111.48

CHAINAGE	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00
LEVEL DIFFERENCE CUT - / FILL +	2.86	4.55	5.58	6.95	8.33	6.60	5.81	6.09	5.26	1.28	-2.45	-3.47	-4.03	-4.17	-4.19	-4.32
DESIGN SURFACE LEVEL	112.744	112.555	112.355	112.155	111.955	111.755	111.555	111.355	111.155	111.000	111.000	111.160	111.480	111.960	112.600	113.400
EXISTING SURFACE LEVEL	109.88	108.00	106.77	105.20	103.63	105.15	105.74	105.27	105.89	109.72	113.45	114.63	115.51	116.13	116.79	117.72

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA Drafting Check D. KOKOTOVIC
Designer R. BON Design Check L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200 AT ORIGINAL SIZE — 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE — 0 10 20 30 40 50m

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

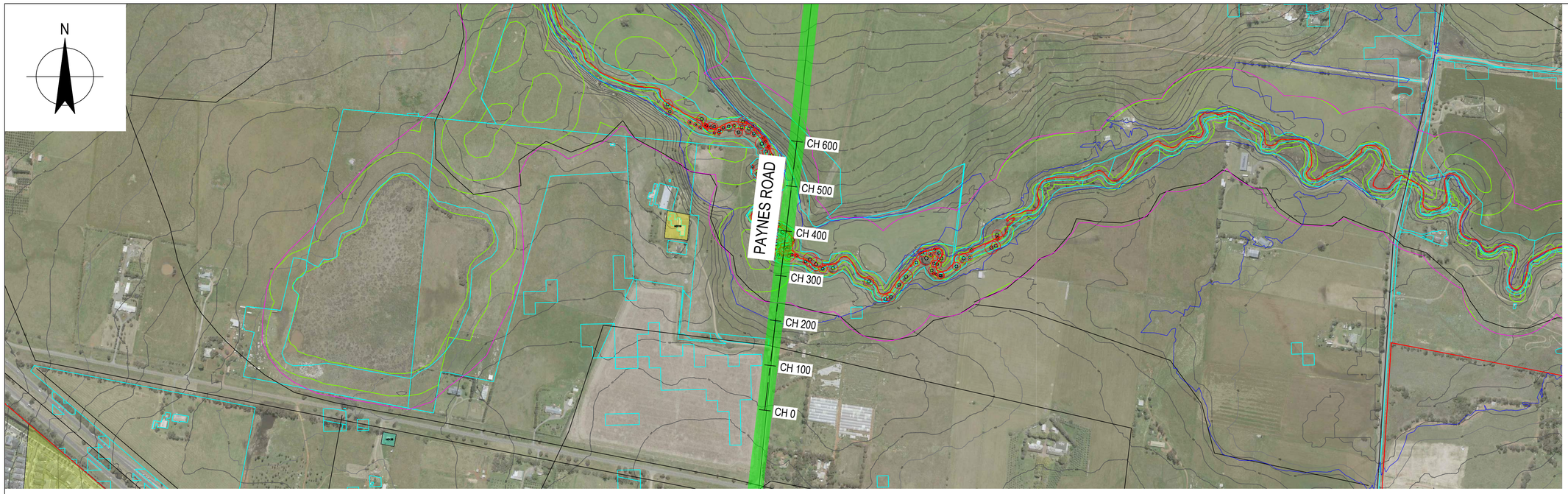
Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 4 - PAYNES ROAD

Size A1

Drawing No. 12605913-DRG-CI-C005

Rev A

Plot Date: 26 May 2023 - 12:34 PM Plotted by: Richard Bon File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C005_C007.dwg

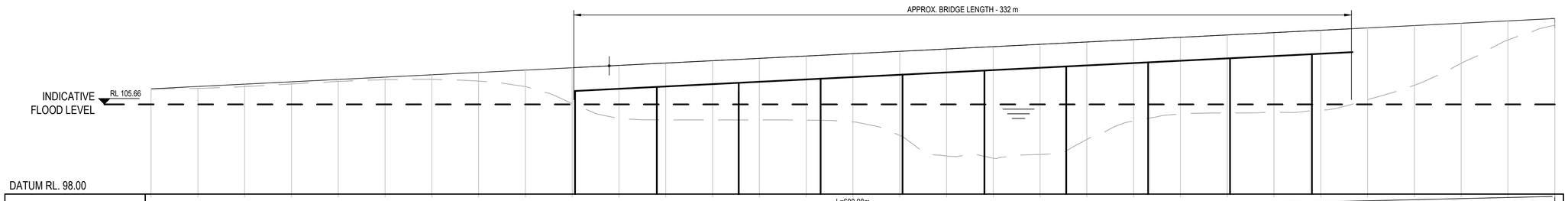


LEGEND

- MELTON EAST PRECINCT BOUNDARY
- OPTION 1 - TARLETONS ROAD
- OPTION 2 - TARLETONS ROAD
- OPTION 3 - TARLETONS ROAD
- OPTION 4 - PAYNES ROAD
- OPTION 5 - PAYNES ROAD
- OPTION 6 - PAYNES ROAD
- KORORROIT CREEK FLOOD EXTENTS
- DEECA AREAS OF STRATEGIC IMPORTANCE
- NATIVE VEGETATION OVERLAY
- BCS CONSERVATION AREAS
- MELTON EAST PSP CADASTRAL BOUNDARIES
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- TREE PROTECTION ZONE (TPZ)
- STRUCTURAL ROOT ZONE (SRZ)

PLAN

SCALE 1:5000



VERTICAL ALIGNMENT	L=600.98m G=1%																																
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DESIGN SURFACE LEVEL	106.994	107.194	107.394	107.594	107.794	107.994	108.194	108.394	108.594	108.794	108.994	109.194	109.394	109.594	109.794	109.994	110.194	110.394	110.594	110.794	110.994	111.194	111.394	111.594	111.794	111.994	112.194	112.394	112.594	112.794	112.994		
EXISTING SURFACE LEVEL	106.99	107.03	107.18	107.40	107.62	107.77	107.80	107.65	107.19	105.72	104.46	104.34	104.34	104.34	104.32	104.17	103.01	101.26	101.07	101.39	102.67	104.25	104.85	104.92	104.98	105.18	106.07	107.30	109.18	111.16	112.43		
CHAINAGE	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	580.00	600.00		

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA Drafting Check D. KOKOTOVIC

Designer R. BON Design Check L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200 AT ORIGINAL SIZE

HORIZONTAL 1:1000 AT ORIGINAL SIZE

0 2 4 6 8 10m
0 10 20 30 40 50m

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title ALIGNMENT LAYOUT PLAN OPTION 5 - PAYNES ROAD

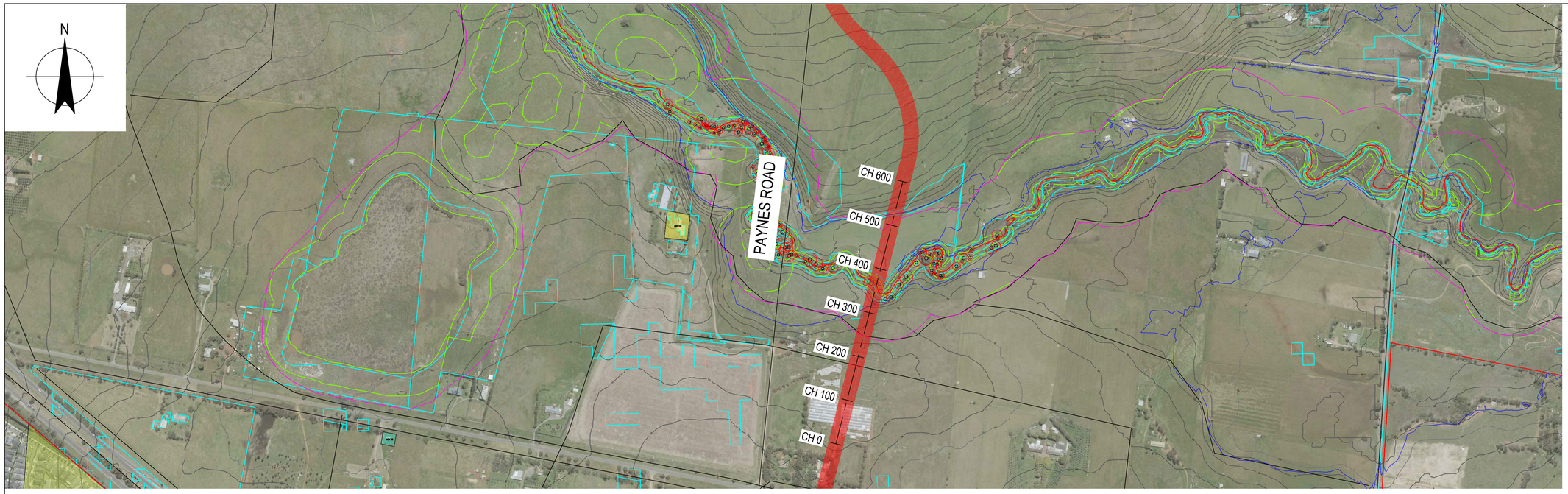
Size A1

Drawing No. 12605913-DRG-CI-C006

Rev A

Plot Date: 26 May 2023 - 12:34 PM Plotted by: Richard Bon

File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C005_C007.dwg

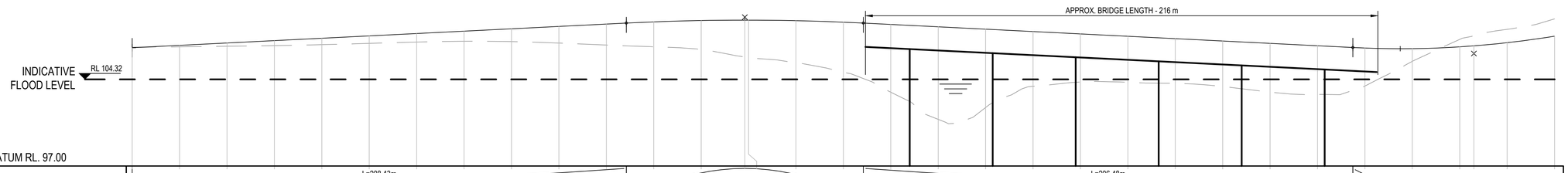


LEGEND

🟥	MELTON EAST PRECINCT BOUNDARY
🟪	OPTION 1 - TARLETONS ROAD
🟦	OPTION 2 - TARLETONS ROAD
🟦	OPTION 3 - TARLETONS ROAD
🟨	OPTION 4 - PAYNES ROAD
🟩	OPTION 5 - PAYNES ROAD
🟥	OPTION 6 - PAYNES ROAD
—	KOROROIT CREEK FLOOD EXTENTS
—	DEECA AREAS OF STRATEGIC IMPORTANCE
—	NATIVE VEGETATION OVERLAY
—	BCS CONSERVATION AREAS
—	MELTON EAST PSP CADASTRAL BOUNDARIES
~	MAJOR CONTOUR (EXISTING)
~	MINOR CONTOUR (EXISTING)
○	TREE PROTECTION ZONE (TPZ)
○	STRUCTURAL ROOT ZONE (SRZ)

PLAN

SCALE 1:5000



DATUM RL. 97.00

VERTICAL ALIGNMENT	L=208.43m G=1%											K=50 L=100m				
LEVEL DIFFERENCE CUT - / FILL +	-0.04	0.12	0.27	0.42	0.54	0.63	0.72	0.85	1.08	1.40	1.77	2.11	2.44	3.11	3.16	3.56
DESIGN SURFACE LEVEL	106.996	107.196	107.396	107.596	107.796	107.996	108.196	108.396	108.596	108.796	108.996	109.183	109.297	109.330	109.330	109.284
EXISTING SURFACE LEVEL	107.04	107.08	107.12	107.18	107.26	107.36	107.48	107.54	107.52	107.39	107.22	107.08	106.86	106.22	106.17	105.72
CHAINAGE	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	258.43	260.00	280.00

VERTICAL ALIGNMENT		L=206.48m G=-1%										K=20 L=102.09m					
LEVEL DIFFERENCE CUT - / FILL +	4.22	5.72	7.82	6.62	4.63	4.07	3.89	3.79	3.84	4.12	4.13	3.21	1.07	-0.63	-0.85	-1.13	-1.46
DESIGN SURFACE LEVEL	109.158	108.965	108.765	108.565	108.365	108.165	107.965	107.765	107.565	107.365	107.165	106.971	106.922	107.073	107.157	107.424	107.975
EXISTING SURFACE LEVEL	104.94	103.24	100.94	101.95	103.74	104.10	104.08	103.98	103.72	103.25	103.03	103.76	105.85	107.71	108.00	108.55	109.44
CHAINAGE	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	560.00	565.96	580.00	600.00

LONGITUDINAL SECTION

SCALE 1:1000 H 1:200 V

Rev	Description	Checked	Approved	Date
A	PRELIMINARY ISSUE	A.V.E.	L.M.	26.05.23

Author M. PAÑA **Drafting Check** D. KOKOTOVIC
Designer R. BON **Design Check** L. MORRISON

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

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Project No. 12605913

Client VICTORIAN PLANNING AUTHORITY

Project MELTON EAST PSP BRIDGE STUDY

Status PRELIMINARY

Drawing Title ALIGNMENT LAYOUT PLAN
OPTION 6 - PAYNES ROAD

Size **A1**

Drawing No. 12605913-DRG-CI-C007

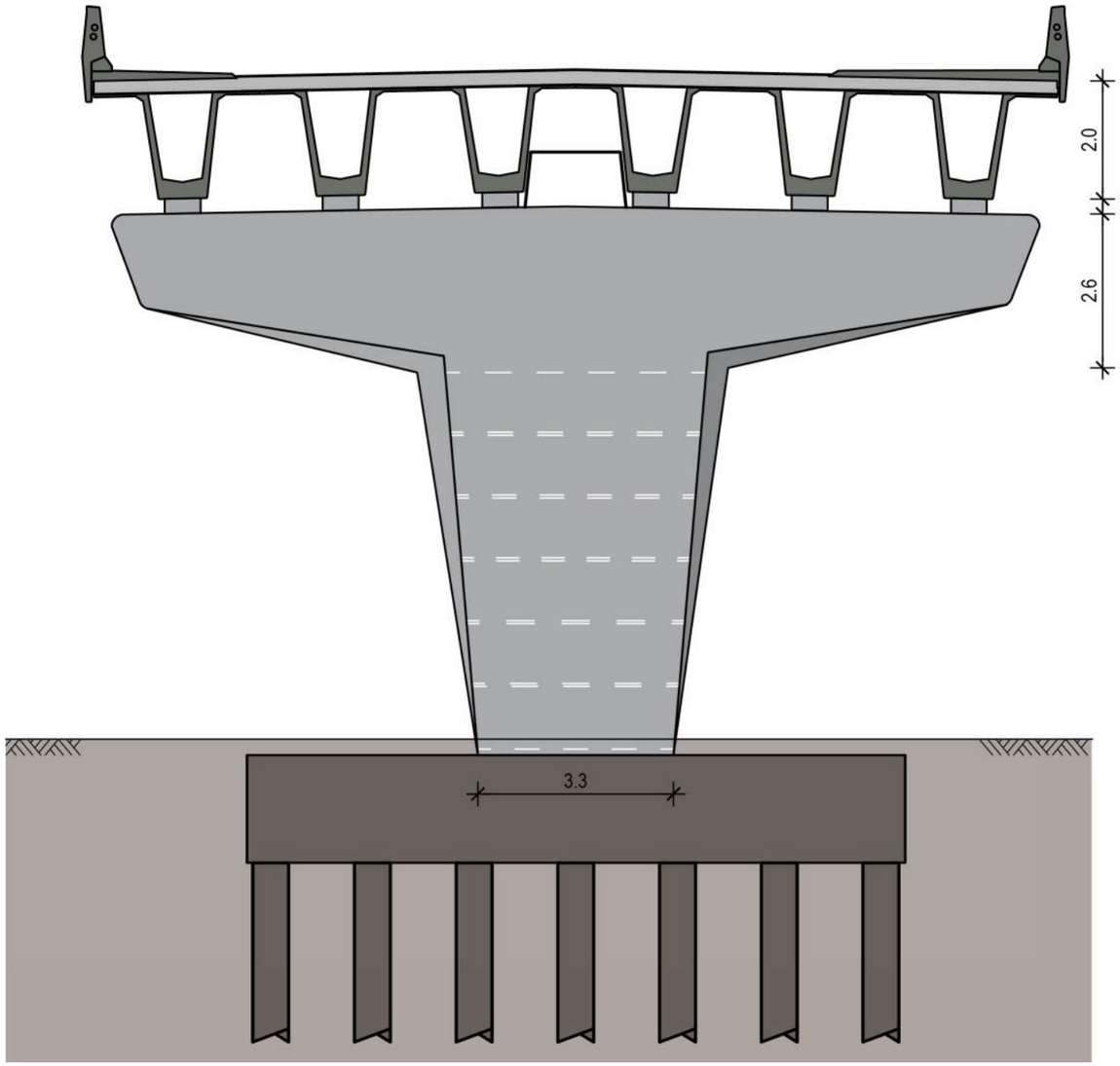
Rev A

Plot Date: 26 May 2023 - 12:34 PM Plotted by: Richard Bon File Name: C:\12d\SW\data\P-00-12D-001\31-12605913 - VPA Melton East PSP - Bridge Study_2462\CADD\Drawings\12605913-DRG-CI-C005_C007.dwg

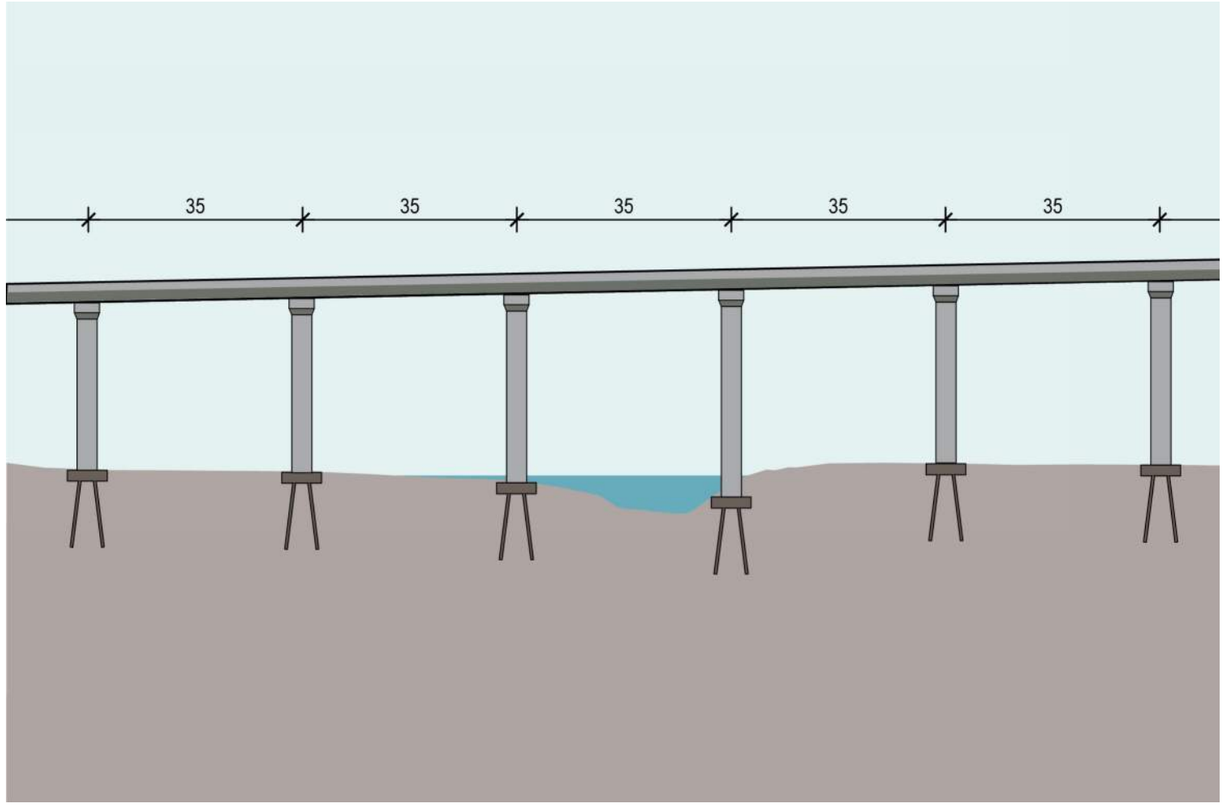
Appendix C

Bridge typologies

OPTION 01 - PRECAST SUPER ‘T‘ BEAMS



- SPAN : 35m maximum
- COST: $
- ADVANTAGE:
  - Structural cost is low
  - Pier is slim in design (refined from original)
  - Precast construction for piers is an option
- DISADVANTAGE:
  - Requires more structural piers due to span being “short“
  - Elevation from distance is very fine and delicate
  - Thinner bridge profile looks fragile due to span, height & distance of topography it is spanning



TYPICAL ELEVATION

TYPICAL CROSS - SECTION

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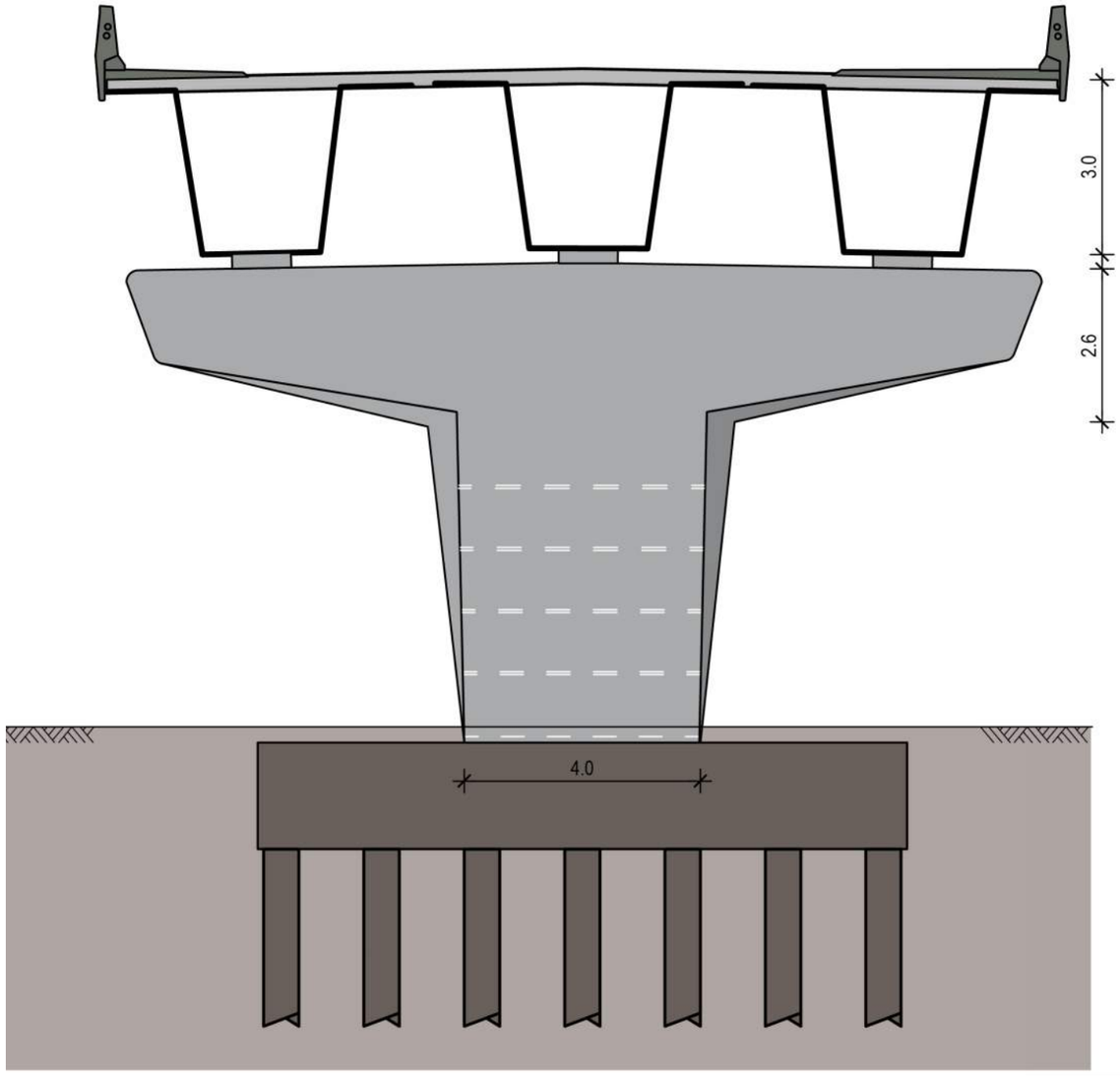
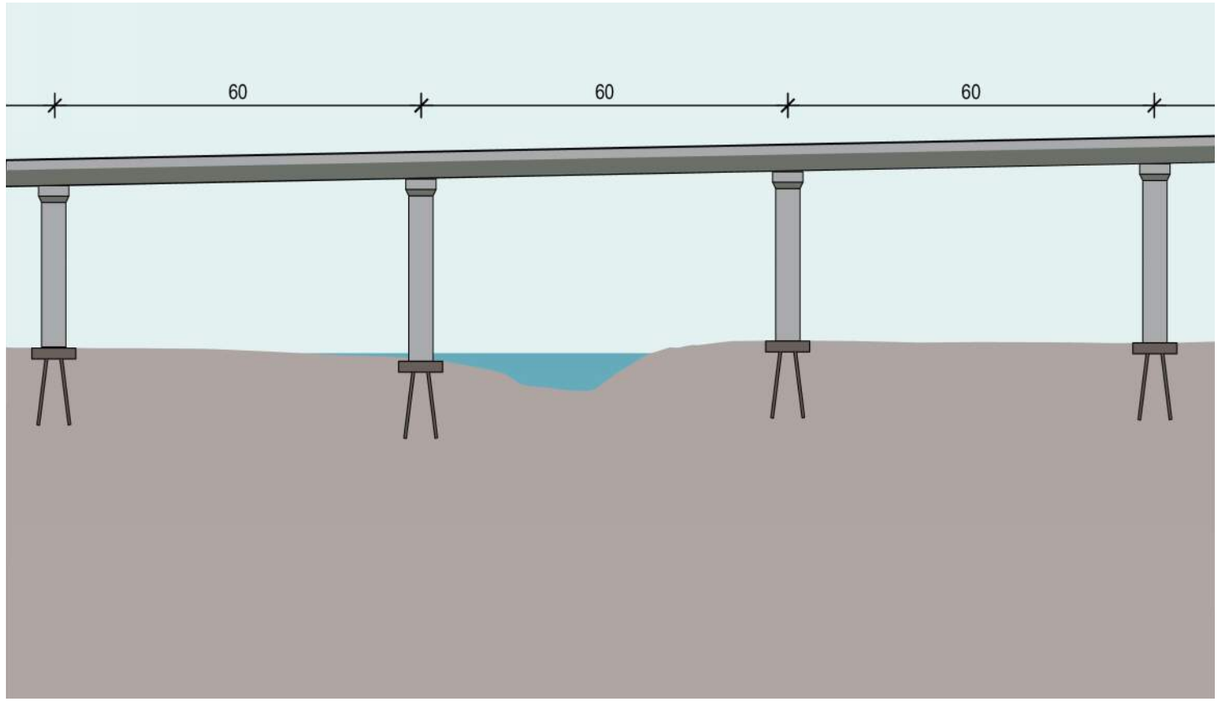
OPTION 02 - STEEL GIRDERS



TYPICAL ELEVATION

- SPAN : 60m maximum
- COST: $$
- ADVANTAGE:
  - Requires less structural piers due to span
  - Less impact on surrounding environment due to span distance
  - Pier silhouette is slim
  - Precast construction for piers is an option
  - Steel girders gives bridge an overal thicker appearance
  - Elevation from a distance has a stronger visual presence
  - Less sections allows for quicker assembly
  - Less piers to construct
- DISADVANTAGE:
  - Structural cost is higher



TYPICAL CROSS - SECTION

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Appendix D

Bridge cost estimates

Tarletons Road Option 1

Approx. length 195 m

Approx. width 23 m

Item	Description	Quantity	Unit	Rate	Amount	Comments
1	**SITEWORKS AND EARTHWORKS**					
1.1	Site preparation	2	Item	50,000	100,000	Establishment, sheds, site strip
1.2	Earthworks	32,666	m3	70	2,286,620	Inclusive of approaches as shown on long sections, allowance for some rock
1.3	Set-Out	1	Item	15,000	15,000	Survey
2	**STRUCTURE**					
2.1	Slab & foundations/piers/beams	4,485	m2	6,500	29,152,500	200mm thick deck slab on top of super 1800mm deep T-Beams
2.2	Abutments	2	Item	650,000	1,300,000	Abutment crosshead, anti sliding blocks, abutment walls and bearings, bored piers
2.3	Bridge Containment Barrier	390	LM	2,400	936,000	Medium level
2.4	*Other (Description)*		Item	-	-	
3	**ON-BRIDGE WORKS**					
3.1	Asphalt wearing course over slab	3,510	m2	160	561,600	
3.2	Kerb and channel	390	LM	105	40,950	
3.3	Footpath	585	m2	195	114,075	100mm thick concrete
3.4	Lighting on-bridge	6	Item	25,500	153,000	Per 12m pole with luminaires, poles every 35m
3.5	*Other (Description)*		Item	-	-	
4	**OFF BRIDGE WORKS**					
4.1	Approach slabs	154	m2	600	92,400	7m long width or bridge
4.2	Safety guard rail/barrier	390	LM	1,800	702,000	50m each side of road both ends of bridge
4.3	Drainage	2	Item	120,000	240,000	Abutment drainage and ponds for water quality
4.4	Scour protection	2	Item	30,000	60,000	Rock beaching to abutment
4.5	*Other (Description)*		Item	-	-	
5	**MISCELLANEOUS**					
5.1	Line-marking	195	LM	52	10,140	Rate
5.2	Regulatory Signage	1	Item	25,000	25,000	Rate
5.3	Maintenance of works – 1 year	1	Item	150,000	150,000	Assumed lump sum
6	**SERVICES**					
6.1	Services conduit on-bridge	195	LM	1,000	195,000	
	SUB-TOTAL WORKS				**36,134,285**	
7	**DELIVERY**					
7.1	Council Fees	3.25%			1,174,364	
7.2	VicRoads Fees	1.00%			361,343	
7.3	Traffic Management	5.00%			1,806,714	
7.4	Environmental Management	0.50%			180,671	
7.5	Survey & Design	5.00%			1,806,714	
7.6	Supervision & Project Management	9.00%			3,252,086	
7.7	Site Establishment	2.50%			903,357	
7.8	Contingency	20.00%			7,226,857	
	SUB-TOTAL DELIVERY				**16,712,107**	
8	TOTAL ESTIMATED COST				**52,846,392**	

Tarletons Road Option 2

Approx. length 157 m

Approx. width 23 m

Item	Description	Quantity	Unit	Rate	Amount	Comments
1	**SITEWORKS AND EARTHWORKS**					
1.1	Site preparation	2	Item	50,000	100,000	Establishment, sheds, site strip
1.2	Earthworks	52,635	m3	70	3,684,450	Inclusive of approaches as shown on long sections, allowance for some rock
1.3	Set-Out	1	Item	15,000	15,000	Survey
2	**STRUCTURE**					
2.1	Slab & foundations/piers/beams	3,611	m2	6,500	23,471,500	200mm thick deck slab on top of super 1800mm deep T-Beams
2.2	Abutments	2	Item	650,000	1,300,000	Abutment crosshead, anti sliding blocks, abutment walls and bearings, bored piers
2.3	Bridge Containment Barrier	314	LM	2,400	753,600	Medium level
2.4	*Other (Description)*		Item	-	-	
3	**ON-BRIDGE WORKS**					
3.1	Asphalt wearing course over slab	2,826	m2	160	452,160	
3.2	Kerb and channel	314	LM	105	32,970	
3.3	Footpath	471	m2	195	91,845	100mm thick concrete
3.4	Lighting on-bridge	5	Item	25,500	127,500	Per 12m pole with luminaires, poles every 35m
3.5	*Other (Description)*		Item	-	-	
4	**OFF BRIDGE WORKS**					
4.1	Approach slabs	154	m2	600	92,400	7m long width or bridge
4.2	Safety guard rail/barrier	314	LM	1,800	565,200	50m each side of road both ends of bridge
4.3	Drainage	2	Item	120,000	240,000	Abutment drainage and ponds for water quality
4.4	Scour protection	2	Item	30,000	60,000	Rock beaching to abutment
4.5	*Other (Description)*		Item	-	-	
5	**MISCELLANEOUS**					
5.1	Line-marking	157	LM	52	8,164	Rate
5.2	Regulatory Signage	1	Item	25,000	25,000	Rate
5.3	Maintenance of works – 1 year	1	Item	150,000	150,000	Assumed lump sum
6	**SERVICES**					
6.1	Services conduit on-bridge	157	LM	1,000	157,000	
	SUB-TOTAL WORKS				**31,326,789**	
7	**DELIVERY**					
7.1	Council Fees	3.25%			1,018,121	
7.2	VicRoads Fees	1.00%			313,268	
7.3	Traffic Management	5.00%			1,566,339	
7.4	Environmental Management	0.50%			156,634	
7.5	Survey & Design	5.00%			1,566,339	
7.6	Supervision & Project Management	9.00%			2,819,411	
7.7	Site Establishment	2.50%			783,170	
7.8	Contingency	20.00%			6,265,358	
	SUB-TOTAL DELIVERY				**14,488,640**	
8	TOTAL ESTIMATED COST				**45,815,429**	

Tarletons Road Option 3

Approx. length 207 m

Approx. width 23 m

Item	Description	Quantity	Unit	Rate	Amount	Comments
1	**SITEWORKS AND EARTHWORKS**					
1.1	Site preparation	2	Item	50,000	100,000	Establishment, sheds, site strip
1.2	Earthworks	52,730	m3	70	3,691,100	Inclusive of approaches as shown on long sections, allowance for some rock
1.3	Set-Out	1	Item	15,000	15,000	Survey
2	**STRUCTURE**					
2.1	Slab & foundations/piers/beams	4,761	m2	6,500	30,946,500	200mm thick deck slab on top of super 1800mm deep T-Beams
2.2	Abutments	2	Item	650,000	1,300,000	Abutment crosshead, anti sliding blocks, abutment walls and bearings, bored piers
2.3	Bridge Containment Barrier	414	LM	2,400	993,600	Medium level
2.4	*Other (Description)*		Item	-	-	
3	**ON-BRIDGE WORKS**					
3.1	Asphalt wearing course over slab	3,726	m2	160	596,160	
3.2	Kerb and channel	414	LM	105	43,470	
3.3	Footpath	621	m2	195	121,095	100mm thick concrete
3.4	Lighting on-bridge	6	Item	25,500	153,000	Per 12m pole with luminaires, poles every 35m
3.5	*Other (Description)*		Item	-	-	
4	**OFF BRIDGE WORKS**					
4.1	Approach slabs	154	m2	600	92,400	7m long width or bridge
4.2	Safety guard rail/barrier	414	LM	1,800	745,200	50m each side of road both ends of bridge
4.3	Drainage	2	Item	120,000	240,000	Abutment drainage and ponds for water quality
4.4	Scour protection	2	Item	30,000	60,000	Rock beaching to abutment
4.5	*Other (Description)*		Item	-	-	
5	**MISCELLANEOUS**					
5.1	Line-marking	207	LM	52	10,764	Rate
5.2	Regulatory Signage	1	Item	25,000	25,000	Rate
5.3	Maintenance of works – 1 year	1	Item	150,000	150,000	Assumed lump sum
6	**SERVICES**					
6.1	Services conduit on-bridge	207	LM	1,000	207,000	
	SUB-TOTAL WORKS				**39,490,289**	
7	**DELIVERY**					
7.1	Council Fees	3.25%			1,283,434	
7.2	VicRoads Fees	1.00%			394,903	
7.3	Traffic Management	5.00%			1,974,514	
7.4	Environmental Management	0.50%			197,451	
7.5	Survey & Design	5.00%			1,974,514	
7.6	Supervision & Project Management	9.00%			3,554,126	
7.7	Site Establishment	2.50%			987,257	
7.8	Contingency	20.00%			7,898,058	
	SUB-TOTAL DELIVERY				**18,264,259**	
8	TOTAL ESTIMATED COST				**57,754,548**	

Paynes Road Option 1

Approx. length **332 m**

Approx. width **23 m**

Item	Description	Quantity	Unit	Rate	Amount	Comments
1	**SITEWORKS AND EARTHWORKS**					
1.1	Site preparation	2	Item	50,000	100,000	Establishment, sheds, site strip
1.2	Earthworks	22,154	m3	70	1,550,780	Inclusive of approaches as shown on long sections, allowance for some rock
1.3	Set-Out	1	Item	15,000	15,000	Survey
2	**STRUCTURE**					
2.1	Slab & foundations/piers/beams	7,636	m2	6,500	49,634,000	200mm thick deck slab on top of super 1800mm deep T-Beams
2.2	Abutments	2	Item	650,000	1,300,000	Abutment crosshead, anti sliding blocks, abutment walls and bearings, bored piers
2.3	Bridge Containment Barrier	664	LM	2,400	1,593,600	Medium level
2.4	*Other (Description)*		Item	-	-	
3	**ON-BRIDGE WORKS**					
3.1	Asphalt wearing course over slab	5,976	m2	160	956,160	
3.2	Kerb and channel	664	LM	105	69,720	
3.3	Footpath	996	m2	195	194,220	100mm thick concrete
3.4	Lighting on-bridge	10	Item	25,500	255,000	Per 12m pole with luminaires, poles every 35m
3.5	*Other (Description)*		Item	-	-	
4	**OFF BRIDGE WORKS**					
4.1	Approach slabs	154	m2	600	92,400	7m long width or bridge
4.2	Safety guard rail/barrier	664	LM	1,800	1,195,200	50m each side of road both ends of bridge
4.3	Drainage	2	Item	120,000	240,000	Abutment drainage and ponds for water quality
4.4	Scour protection	2	Item	30,000	60,000	Rock beaching to abutment
4.5	*Other (Description)*		Item	-	-	
5	**MISCELLANEOUS**					
5.1	Line-marking	332	LM	52	17,264	Rate
5.2	Regulatory Signage	1	Item	25,000	25,000	Rate
5.3	Maintenance of works – 1 year	1	Item	150,000	150,000	Assumed lump sum
6	**SERVICES**					
6.1	Services conduit on-bridge	332	LM	1,000	332,000	
	SUB-TOTAL WORKS				**57,780,344**	
7	**DELIVERY**					
7.1	Council Fees	3.25%			1,877,861	
7.2	VicRoads Fees	1.00%			577,803	
7.3	Traffic Management	5.00%			2,889,017	
7.4	Environmental Management	0.50%			288,902	
7.5	Survey & Design	5.00%			2,889,017	
7.6	Supervision & Project Management	9.00%			5,200,231	
7.7	Site Establishment	2.50%			1,444,509	
7.8	Contingency	20.00%			11,556,069	
	SUB-TOTAL DELIVERY				**26,723,409**	
8	TOTAL ESTIMATED COST				**84,503,753**	

Paynes Road Option 2

Approx. length 216 m

Approx. width 23 m

Item	Description	Quantity	Unit	Rate	Amount	Comments
1	**SITEWORKS AND EARTHWORKS**					
1.1	Site preparation	2	Item	50,000	100,000	Establishment, sheds, site strip
1.2	Earthworks	21,058	m3	70	1,474,060	Inclusive of approaches as shown on long sections, allowance for some rock
1.3	Set-Out	1	Item	15,000	15,000	Survey
2	**STRUCTURE**					
2.1	Slab & foundations/piers/beams	4,968	m2	6,500	32,292,000	200mm thick deck slab on top of super 1800mm deep T-Beams
2.2	Abutments	2	Item	650,000	1,300,000	Abutment crosshead, anti sliding blocks, abutment walls and bearings, bored piers
2.3	Bridge Containment Barrier	432	LM	2,400	1,036,800	Medium level
2.4	*Other (Description)*		Item	-	-	
3	**ON-BRIDGE WORKS**					
3.1	Asphalt wearing course over slab	3,888	m2	160	622,080	
3.2	Kerb and channel	432	LM	105	45,360	
3.3	Footpath	648	m2	195	126,360	100mm thick concrete
3.4	Lighting on-bridge	7	Item	25,500	178,500	Per 12m pole with luminaires, poles every 35m
3.5	*Other (Description)*		Item	-	-	
4	**OFF BRIDGE WORKS**					
4.1	Approach slabs	154	m2	600	92,400	7m long width or bridge
4.2	Safety guard rail/barrier	432	LM	1,800	777,600	50m each side of road both ends of bridge
4.3	Drainage	2	Item	120,000	240,000	Abutment drainage and ponds for water quality
4.4	Scour protection	2	Item	30,000	60,000	Rock beaching to abutment
4.5	*Other (Description)*		Item	-	-	
5	**MISCELLANEOUS**					
5.1	Line-marking	216	LM	52	11,232	Rate
5.2	Regulatory Signage	1	Item	25,000	25,000	Rate
5.3	Maintenance of works – 1 year	1	Item	150,000	150,000	Assumed lump sum
6	**SERVICES**					
6.1	Services conduit on-bridge	216	LM	1,000	216,000	
	SUB-TOTAL WORKS				**38,762,392**	
7	**DELIVERY**					
7.1	Council Fees	3.25%			1,259,778	
7.2	VicRoads Fees	1.00%			387,624	
7.3	Traffic Management	5.00%			1,938,120	
7.4	Environmental Management	0.50%			193,812	
7.5	Survey & Design	5.00%			1,938,120	
7.6	Supervision & Project Management	9.00%			3,488,615	
7.7	Site Establishment	2.50%			969,060	
7.8	Contingency	20.00%			7,752,478	
	SUB-TOTAL DELIVERY				**17,927,606**	
8	TOTAL ESTIMATED COST				**56,689,998**	

Paynes Road Option 3

Approx. length 125 m

Approx. width 23 m

Item	Description	Quantity	Unit	Rate	Amount	Comments
1	**SITEWORKS AND EARTHWORKS**					
1.1	Site preparation	2	Item	50,000	100,000	Establishment, sheds, site strip
1.2	Earthworks	38,025	m3	70	2,661,750	Inclusive of approaches as shown on long sections, allowance for some rock
1.3	Set-Out	1	Item	15,000	15,000	Survey
2	**STRUCTURE**					
2.1	Slab & foundations/piers/beams	2,875	m2	6,500	18,687,500	200mm thick deck slab on top of super 1800mm deep T-Beams
2.2	Abutments	2	Item	650,000	1,300,000	Abutment crosshead, anti sliding blocks, abutment walls and bearings, bored piers
2.3	Bridge Containment Barrier	250	LM	2,400	600,000	Medium level
2.4	*Other (Description)*		Item	-	-	
3	**ON-BRIDGE WORKS**					
3.1	Asphalt wearing course over slab	2,250	m2	160	360,000	
3.2	Kerb and channel	250	LM	105	26,250	
3.3	Footpath	375	m2	195	73,125	100mm thick concrete
3.4	Lighting on-bridge	4	Item	25,500	102,000	Per 12m pole with luminaires, poles every 35m
3.5	*Other (Description)*		Item	-	-	
4	**OFF BRIDGE WORKS**					
4.1	Approach slabs	154	m2	600	92,400	7m long width or bridge
4.2	Safety guard rail/barrier	250	LM	1,800	450,000	50m each side of road both ends of bridge
4.3	Drainage	2	Item	120,000	240,000	Abutment drainage and ponds for water quality
4.4	Scour protection	2	Item	30,000	60,000	Rock beaching to abutment
4.5	*Other (Description)*		Item	-	-	
5	**MISCELLANEOUS**					
5.1	Line-marking	125	LM	52	6,500	Rate
5.2	Regulatory Signage	1	Item	25,000	25,000	Rate
5.3	Maintenance of works – 1 year	1	Item	150,000	150,000	Assumed lump sum
6	**SERVICES**					
6.1	Services conduit on-bridge	125	LM	1,000	125,000	
	SUB-TOTAL WORKS				**25,074,525**	
7	**DELIVERY**					
7.1	Council Fees	3.25%			814,922	
7.2	VicRoads Fees	1.00%			250,745	
7.3	Traffic Management	5.00%			1,253,726	
7.4	Environmental Management	0.50%			125,373	
7.5	Survey & Design	5.00%			1,253,726	
7.6	Supervision & Project Management	9.00%			2,256,707	
7.7	Site Establishment	2.50%			626,863	
7.8	Contingency	20.00%			5,014,905	
	SUB-TOTAL DELIVERY				**11,596,968**	
8	TOTAL ESTIMATED COST				**36,671,493**	

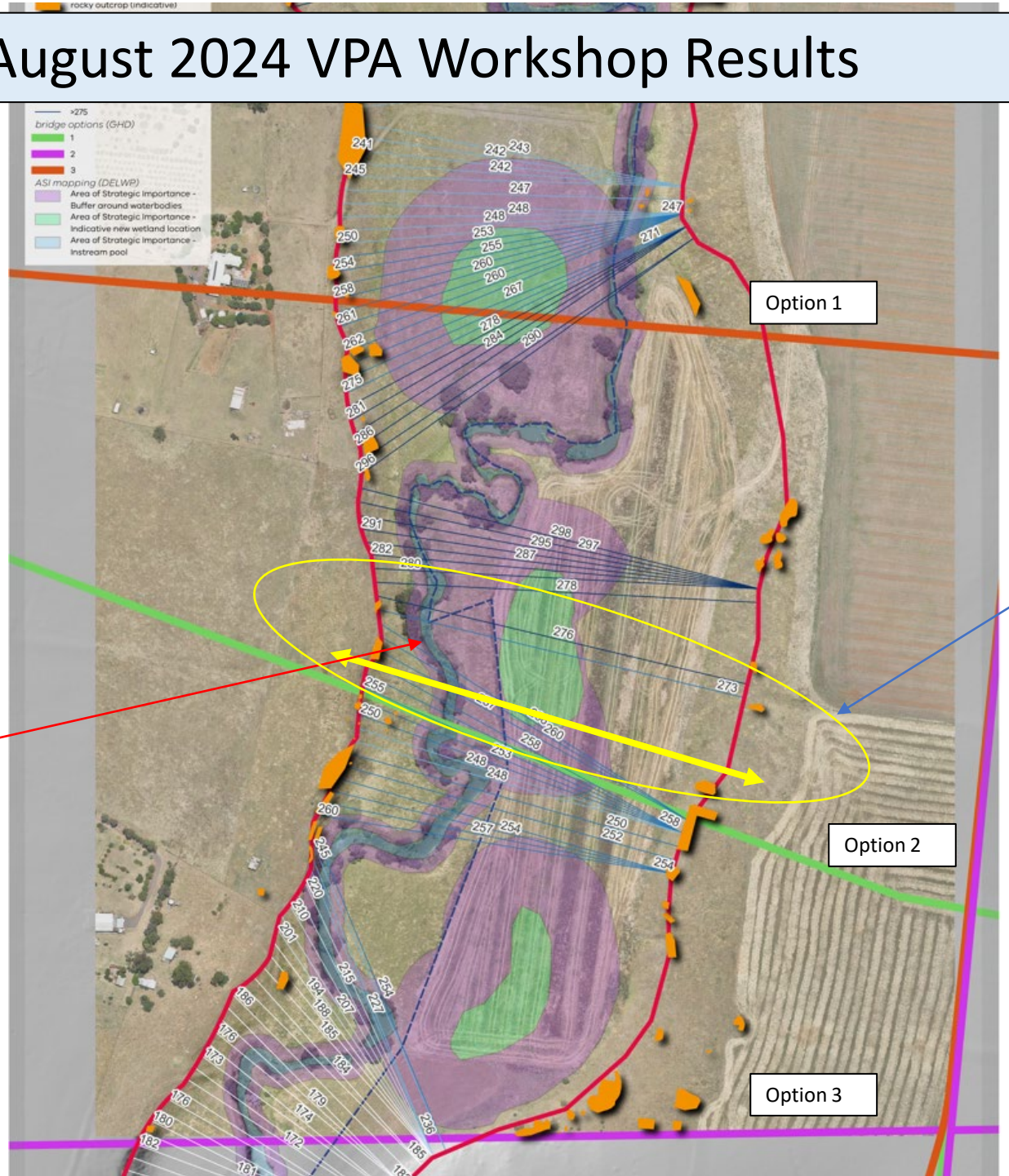
Appendix E

VPA Review Workshop and Methodology Documents

Tarletons Road - 25 August 2024 VPA Workshop Results

Option 1 Assessment - This Option will not be progressed due to significant impacts to the West Growth Corridor Plan (WGCP) transport network, a long bridge crossing of 256m which results in an unreasonable length of Biodiversity Conservation Strategy (BCS) area to be impacted.

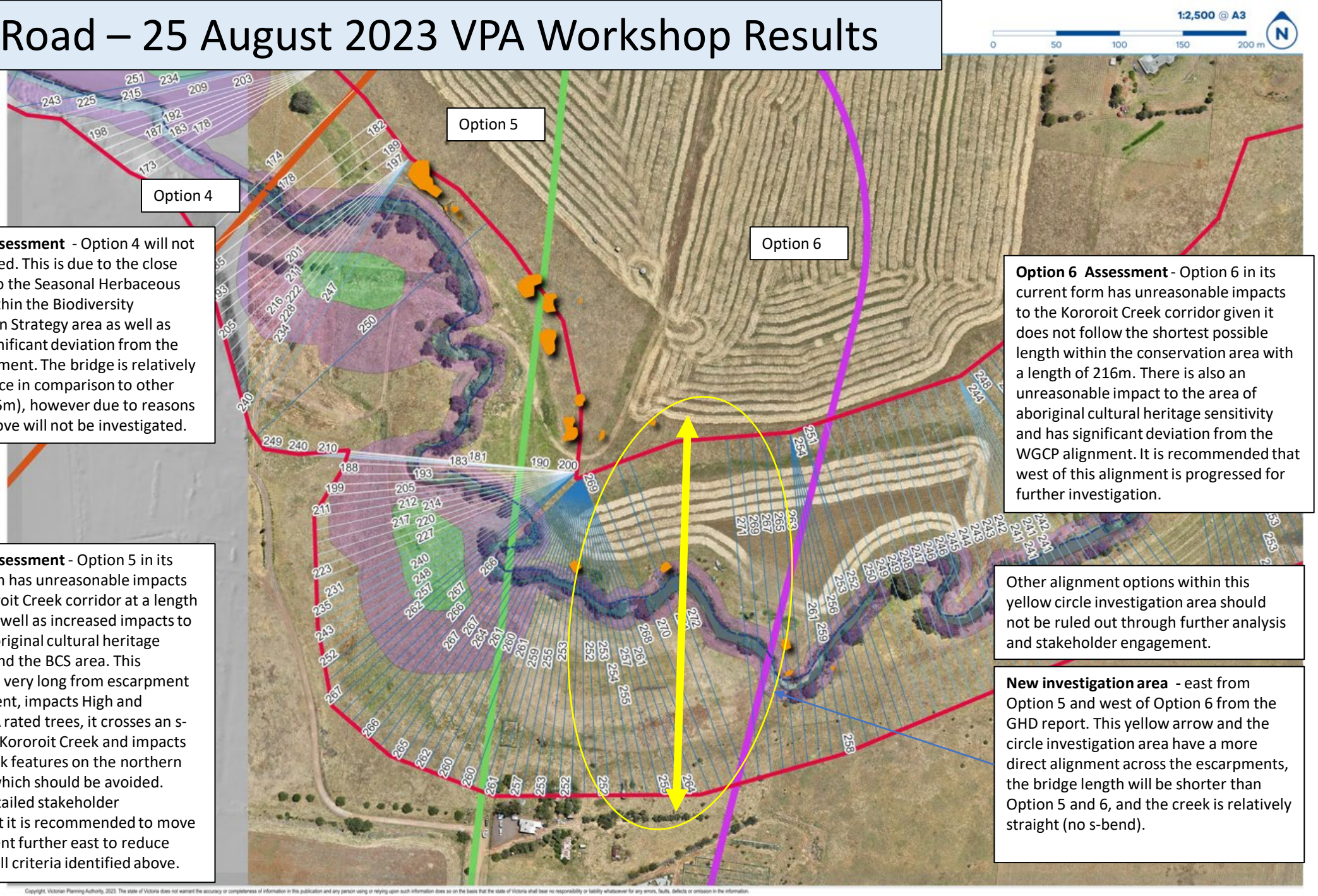
Option 2 Assessment - This alignment to be continued with modifications. This alignment impacts an 's-bend' within the creek corridor which has an unreasonable impact to the environmental values and BCS area. Desktop mapping for exposed rock features (See Appendix E) identifies that expoded rock features will be impacted resulting in an unreasonable potential to impact cultural heritage. Stakeholders determined it is preferred to re-align Option 2 further north (approximately 50m) to avoid exposed rocks and s-bend in Kororoit Creek. The distance across the creek is relatively consistent at this location. The escarpment width is reduced further south, however there are mapped exposed rock features. Option 2 is similar to the West Growth Corridor Plan alignment and therefore moving the alignment slightly north results in a reasonable change to the transport network.



Preferred investigation area following detailed review and stakeholder engagement. This area indicates close variances in bridge distances, limited exposed rocks from desktop mapping, minimal impacts to overall transport network, DEECA MSA have confirmed the future Growling Grass Frog Pond can be moved north, and the creek is relatively straight.
Yellow arrow indicates more preferred alignment following VPA internal workshop.
Also consistent with DEECA MSA feedback

Option 3 Assessment - This Option will not be progressed due to the significant impact to the transport network (away from West Growth Corridor Plan alignment) and it is close to a cultural heritage landscape feature identifed by WWWCHAC at the river bend. The bridge is relatively short bridge in comparison to others, however due to cultural heritage and transport network considerations it will not be progressed.

Paynes Road – 25 August 2023 VPA Workshop Results



Option 4 Assessment - Option 4 will not be progressed. This is due to the close alignment to the Seasonal Herbaceous Wetland within the Biodiversity Conservation Strategy area as well as having a significant deviation from the WGCP alignment. The bridge is relatively short distance in comparison to other options (125m), however due to reasons outlined above will not be investigated.

Option 5 Assessment - Option 5 in its current form has unreasonable impacts to the Kororoit Creek corridor at a length of 332m, as well as increased impacts to areas of aboriginal cultural heritage sensitivity and the BCS area. This alignment is very long from escarpment to escarpment, impacts High and Moderate-A rated trees, it crosses an s-bend in the Kororoit Creek and impacts exposed rock features on the northern side, all of which should be avoided. Through detailed stakeholder engagement it is recommended to move this alignment further east to reduce impacts to all criteria identified above.

Option 6 Assessment - Option 6 in its current form has unreasonable impacts to the Kororoit Creek corridor given it does not follow the shortest possible length within the conservation area with a length of 216m. There is also an unreasonable impact to the area of aboriginal cultural heritage sensitivity and has significant deviation from the WGCP alignment. It is recommended that west of this alignment is progressed for further investigation.

Other alignment options within this yellow circle investigation area should not be ruled out through further analysis and stakeholder engagement.

New investigation area - east from Option 5 and west of Option 6 from the GHD report. This yellow arrow and the circle investigation area have a more direct alignment across the escarpments, the bridge length will be shorter than Option 5 and 6, and the creek is relatively straight (no s-bend).

Overall Transport Network - VPA Review August 2024

Option 3 - Tarletons Road is too close where it intersects with Paynes Road.

Option 4 – this alignment is too close to the Seasonal Herbaceous Wetland (SHW).

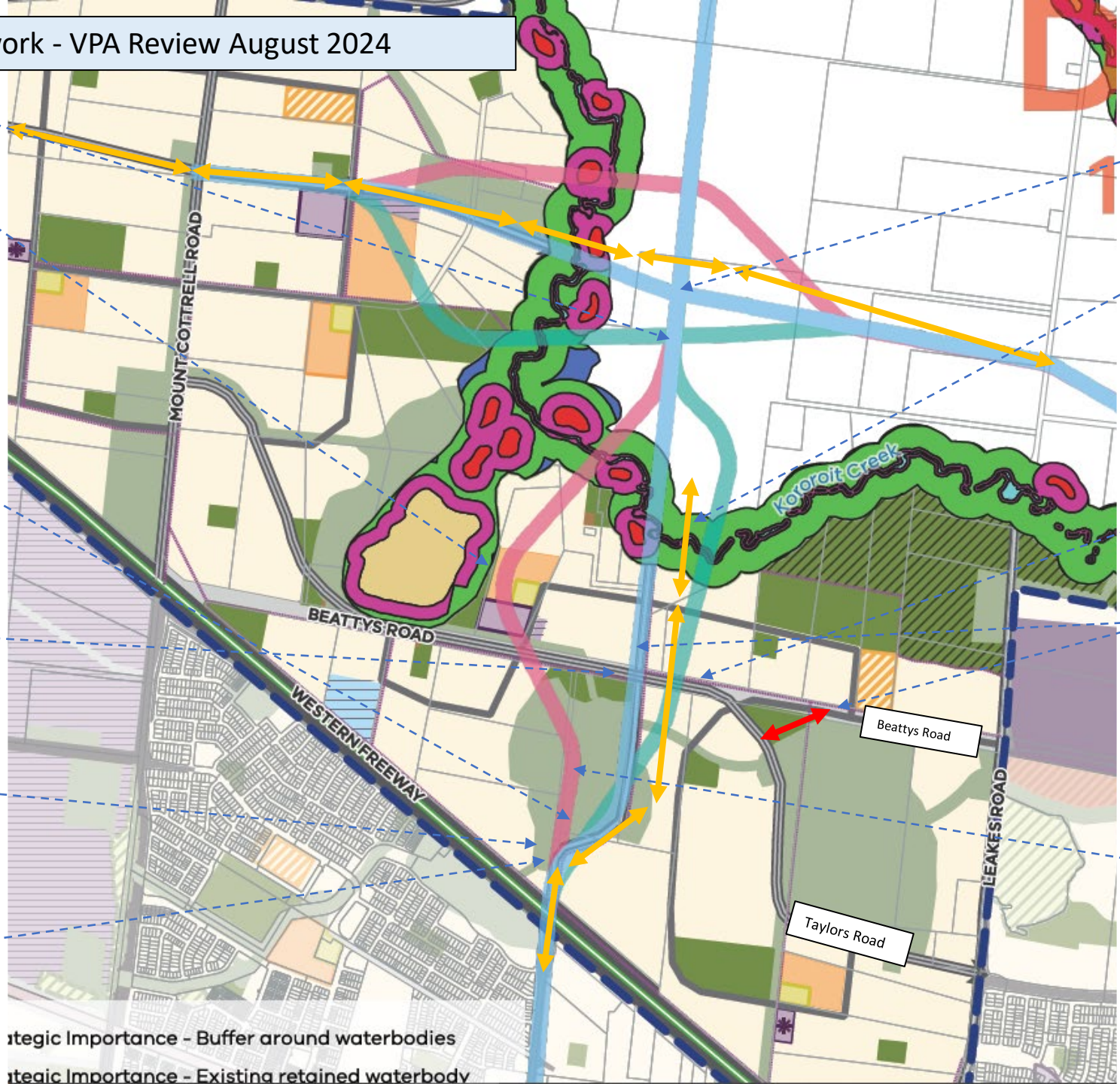
It is preferrable to reduce the land that needs to be purchased under the ICP by utilising existing road reserves where possible and practical.

Future alignment will need to avoid natural depressions in the topography within the Paynes Road wetland.

Paynes Road needs to intersect Taylors Road at a right angle, as well as ensure the alignment is straight on approach 100m either side of connection.

Fixed point no 1 overpass of Western Fwy = 150m-200m north of freeway.
Concept design done part of Rockbank PSP

Road designs need to be ARGD desirable for 60km/hr design 200 - 240m turning radii.



It is preferable that intersection occurs reasonable distance (circa 400m) from bridge crossings. By aligning Paynes further west, it allows greater distance separation from Tarletons Road bridge crossing.

Paynes Road – Preferred new investigation area is east from WGCP alignment (Option 5) and west of Option 6.

Broader network consideration - Need to consider the curve of Taylors Road as it approaches the intersection with Paynes Road.

Ensure Beattys Road and Paynes Road intersection is approx. 400m separation.

Please label Taylors Road and Beattys Road east of Taylors Road on GHD maps.

Melbourne Water investigating whether existing Paynes Road reserve can be utilised through future alignment or whether Paynes Road needs to be realigned to go around the wetland.

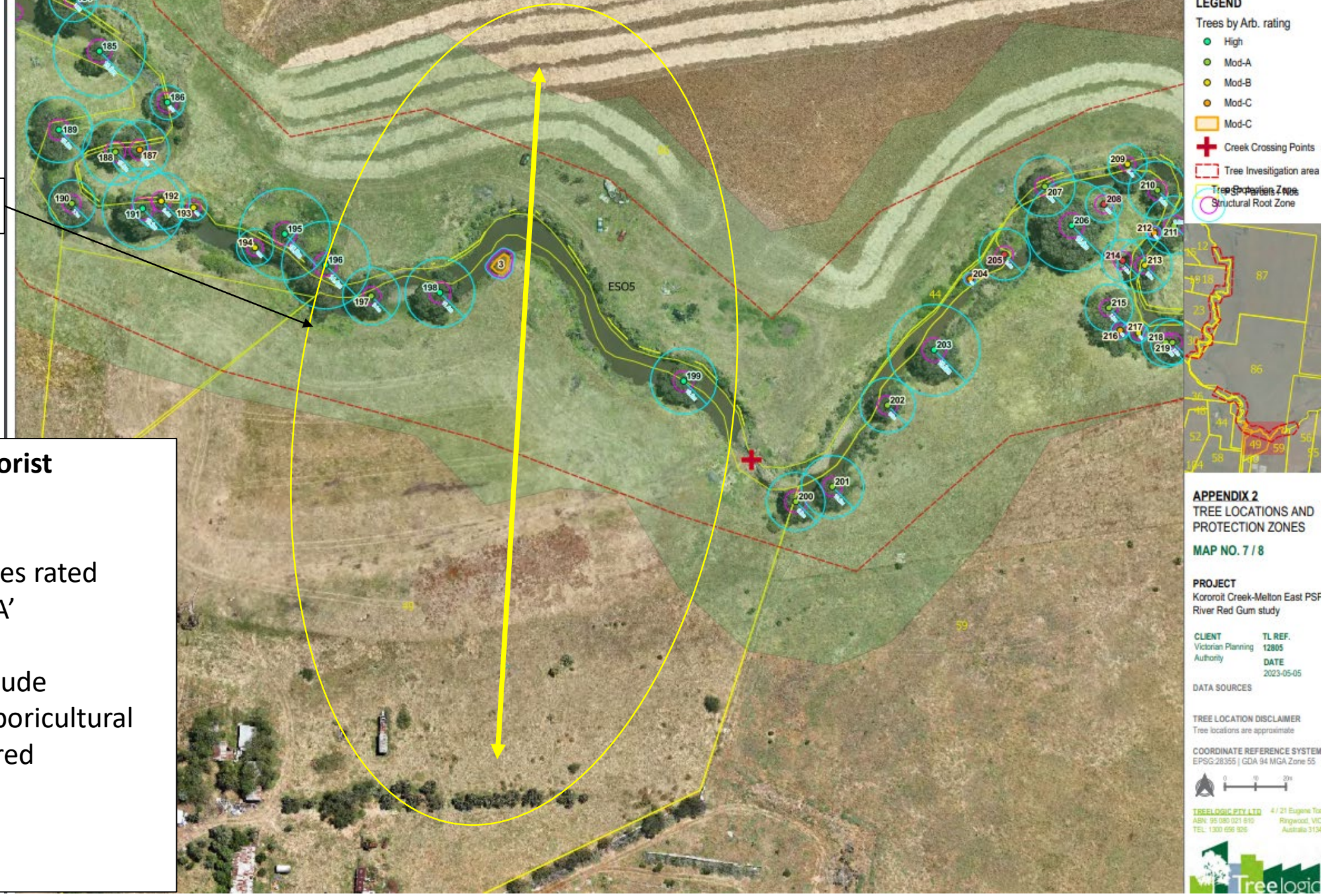
Tarletons Road Arborist Evaluation –

Need to avoid trees rated ‘High’ and ‘Mod-A’

GHD – please include assessment of arboricultural impact for preferred alignment.

Yellow circle is investigation area

Yellow circle is investigation area



Paynes Road Arborist Evaluation –

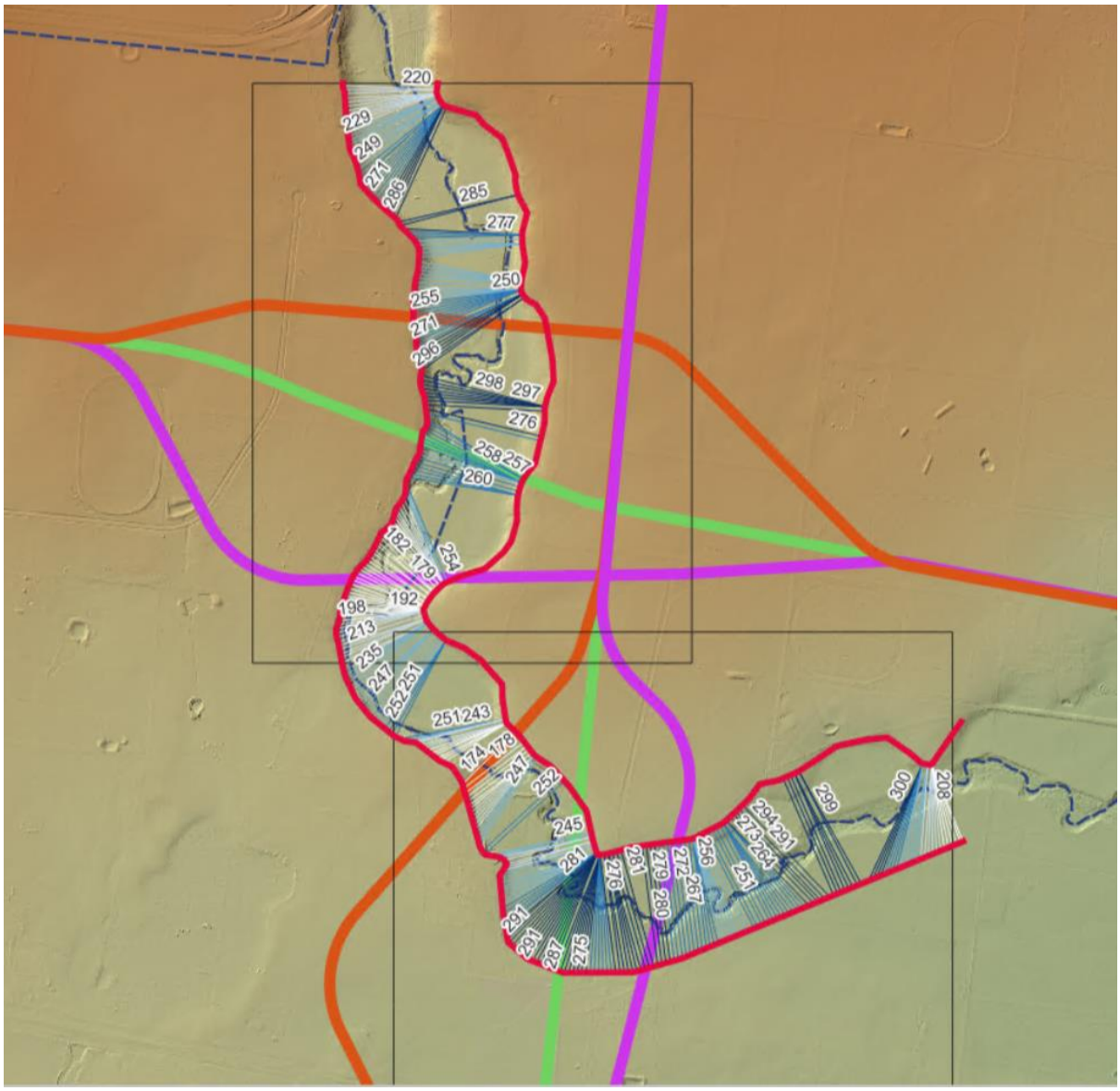
Need to avoid trees rated ‘High’ and ‘Mod-A’

GHD – please include assessment of arboricultural impact for preferred alignment.

GIS Analysis for Potential Bridge Crossing Points

Objective:

Utilising a desktop GIS platform, this analysis aims to identify potential bridge crossing point options along a specified pair of breaks of slope or escarpments. The metric of the analysis is the shortest distances in metres between two points.



Methodology:

- Data Input:
    - high-resolution 1m Digital Elevation Model (DEM) topographic data encompassing the area of interest.
    - Determination of breaks of slope or escarpments within the area of interest where there is a significant change of slope.
    - Establish origin points along one break of slope at regular 10m intervals. These points will serve as the starting point for the distance calculations.

- Distance Computation: For each origin point generated in the previous step, compute the shortest distance to the corresponding point (also at a 10m interval) on the opposite escarpment.
- Data Visualisation: Plot these calculated shortest distances onto a map, visualising the potential bridge crossing points. The shortest distances would be represented as lines or paths connecting the two breaks of slope.
- Analysis Output: The output will present a series of potential crossing points, with each point characterised by its shortest distance between the two breaks.

Considerations:

While crossing distance is one of the factors impacting the bridge alignment, it is important to note that this is only one of many considerations. The potential bridge crossing points derived from this analysis will need to be evaluated further, considering factors such as geological constraints, environmental impacts, sensitive interfaces, flood levels, cultural heritage, land ownership, infrastructure concerns, and potential construction challenges.

Disclaimer:

This is a preliminary desktop GIS assessment designed solely to facilitate option development discussions. It does not provide a comprehensive assessment of on-site conditions or other essential factors. Any party or consultant interested in these potential bridge crossing points is strongly advised to conduct their own due diligence, involving on-site surveys and in-depth studies, before making any final decisions.

GIS Analysis for Potential Bridge Crossings – Exposed Rock Features

Objective:

Utilising a desktop GIS platform, this analysis aims to identify exposed rocks or landscape features along the escarpments or within the flood plain. The objective is to identify exposed surface level features that may need to be avoided.

Figure 1 - Polygon mapping of exposed rock features

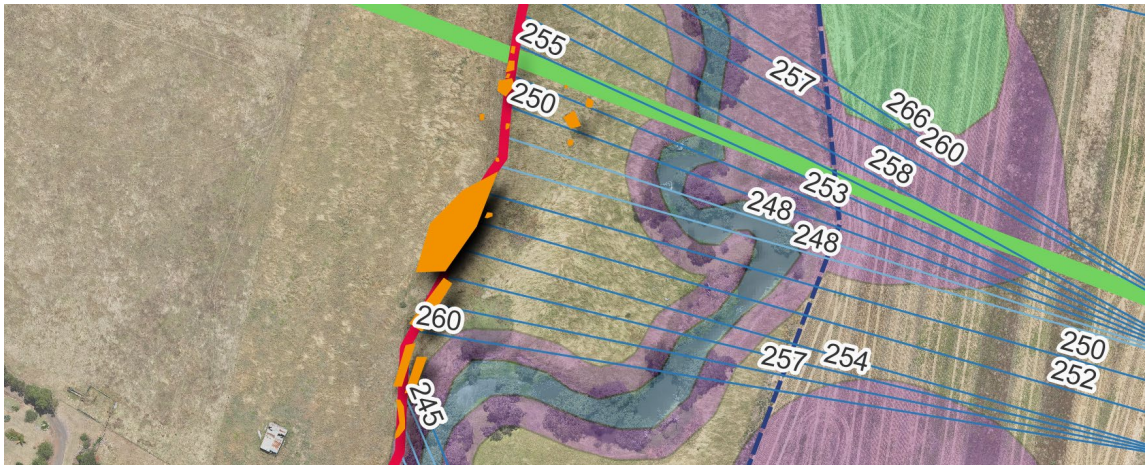


Figure 2 - Orange polygons identify exposed rock features

Methodology:

- Data Input:
    - TIFF ortho-mosaics of the creek corridor investigation areas with resolutions at 10cm per pixel prepared by drone footage in January 2023.
    - High-resolution 1m Digital Elevation Model (DEM) topographic data encompassing the area of interest to identify the creek floodplain and escarpment.
- Data Visualisation: Polygons are drawn over exposed rock features or landscape features within the creek investigation area using the high-resolution imagery. This data is represented as orange shapes across the creek investigation area as illustrated on Figure 2.
- Analysis Output: The output will present a series of polygons over the imagery where an exposed rock or landscape feature was identified.

Considerations:

While desktop mapping for exposed rock features provides a high-level overview of landscape features, it does not satisfy cultural heritage requirements for determining preferred locations and is intended to indicate areas to avoid where possible. On-site investigations and ground truthing will be required to determine if the preferred bridge alignments are acceptable from cultural heritage considerations. The potential bridge crossing points derived from this analysis will need to be evaluated further, considering factors such as geological constraints, environmental impacts, sensitive interfaces, flood levels, cultural heritage, land ownership, infrastructure concerns, and potential construction challenges.

Disclaimer:

This is a preliminary desktop GIS assessment designed solely to facilitate option development discussions. It does not provide a comprehensive assessment of on-site conditions or other essential factors. Any party or consultant interested in these potential bridge crossing points is strongly advised to conduct their own due diligence, involving on-site surveys and in-depth studies, before making any final decisions.

Appendix F

Correspondence from Melbourne Water

Richard Bon

From: Ian Pham <Ian.Pham@melbournewater.com.au>
Sent: Thursday, 20 April 2023 8:25 AM
To: Richard Bon
Cc: Greta Porras; Rion Casey (VPA); Monique So (VPA); Luke Morrison
Subject: RE: 12695813 - VPA Melton East PSP bridge study - Request For Information from Melbourne Water
Attachments: Kororoit Creek Report .zip; RORB.zip; KORKOROIT CK FLOOD MAPPING REPORT JUL2002.PDF; Growling-Grass-Frog-Crossing-Design-Standards_March2017.pdf

OFFICIAL Sensitive

Hi Richard,

Thanks for sending the request through. We agree further detailed discussions will be required during subsequent stages of the project. Reponses to your queries and preliminary advice below.

Feel free to call to discuss anytime.

Regards

Can MW provide digital information in relation to flood levels and extents within the project area?

The flood extents provided to VPA is the current available extents from Melbourne Water.

Can MW provide further flood information within the project area which provides Q flows during peak storm events?

We have attached the available RORB, HEC-RAS and reports that provides context on the flows and storm events. Noting that the modelling was completed under ARR1987, all current designs are to be of ARR2019. Therefore appropriate consideration of this when using any outputs from the model. Melbourne Water has resourced the update of the modelling in our program but it will not be available/completed at this early stage.

Can MW provide advice on its preferred bridge typology noting the potential for the bridge lengths may need to exceed 250m to span across the current floodplain. GHD would like to understand if MW would in principle support filling of the approaches to the proposed bridges within the floodplain to reduce the bridge extents? GHD notes that this installation would have an increased environmental impact and would require installation of culverts within the floodplain to maintain current flooding conditions within the project area. Noting any conditions would need to be met to MW's satisfaction in future stages of the design development.

Understanding the project is at the preliminary review and costing stage, Melbourne Water will generally consider options that maintain of existing storage capacities within the area. Any proposed cut and fill must be undertaken at same location in order to maintain existing flood storage volume.

Furthermore deck levels may inform road and lots levels in the surrounding area, the impact flood immunity of the current and future surrounding areas are to be considered. High level environmental advice have also been provided. General advice below.

General Advice

- All analysis is to be completed to the ARR2019, noting the flooding information is currently based on ARR1987. Consideration of scheme life context, and timing of construction and what the guidelines will be in the future. Climate change analysis and levels will likely be required at the time be implementation.

- Risk factors of the bridge and how it applies to existing and future development is a critical element. To reduce the risk for the 1% AEP as well as events greater than 1% AEP. In particular the deck level will influence the connecting road design to service and development area. The surrounding areas must retain adequate flood immunity levels.

- The bridge underside must be set at least 600mm above 1%AEP climate change (CC) flood level. (considering development services scheme life 30yr -40yr).

- Minimum number of piers must be built within 1%AEP floodplain. Preferred pier shapes are rounded, Elliptical or Sharp nose.

- The 1%AEP flood levels including CC flood level must not be increased. If flood levels were increased due to bridge construction including raising of road, then flood mitigation works must be undertaken to ensure existing flood levels are maintained.

- Existing flood storage volume must be maintained to avoid an increase in downstream flood levels. If loss of flood storage inevitable then cut and fill must be undertaken at same location in order to maintain existing flood storage volume.

- All upstream lots must be built at least 300mm or 600 mm above road levels. If road levels were proposed to be raised.

- Bridge handrail must be built open style.

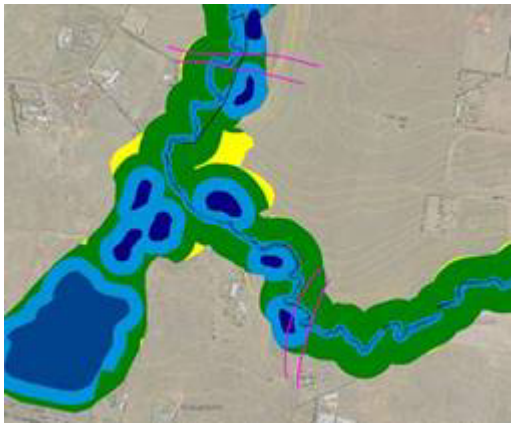
- Rock size must be designed to sustain 1%AEP velocity.

- Growling Grass Frogs are located in the surrounding area more details see attached guidelines. Preliminary advice from our environmental planner below.

  *Just highlighting **GGF assets** – avoid crossings here if possible as any changes to BCS need federal approval. Also these crossings need to meet GGF crossing requirements (assuming they will be span bridges will allow for natural surface below and not be an issue in this case anyway). Info below.*

  *Also any opportunity to **avoid impacting any of the river red gums** (alive and dead) within the waterway corridor.*

  GGF CA assets:



GGF bridge and culvert crossing:

Bridge design standards

Where a bridge has been determined to be required it must incorporate the following design elements:

- 30 per cent of the section of road 50 metres each side of the waterway (a 100 metre section in total) must be open for passage if the whole opening is provided by a bridge;
- A minimum set back from top of bank of 5 metres for the bridge abutments. If the top of bank is undefined the opening should at least be the width of the 3 month average recurrence interval (ARI) flow (based upon ultimate developed conditions upstream) plus a minimum of 2 metres horizontal distance each side of the waterway;
- Hydraulic capacity to meet flood conveyance as required by the relevant water management authority (generally Melbourne Water); and
- A substrate that reflects the natural riparian environment.

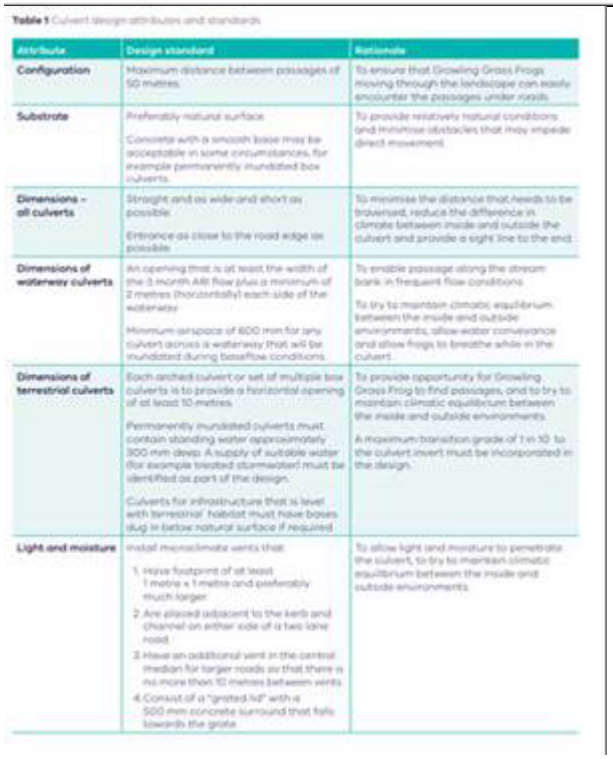


Table 1 Culvert design attributes and standards

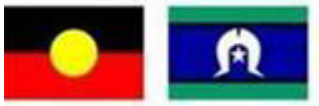
Attribute	Design standard	Rationale
Configuration	Maximum distance between passages of 50 metres.	To ensure that Growling Grass Frogs moving through the landscape can easily encounter the passages under roads.
Substrate	Preferably natural surface. Concrete with a smooth base may be acceptable in some circumstances, for example permanently inundated box culverts.	To provide relatively natural conditions and minimise obstacles that may impede direct movement.
Dimensions – all culverts	Straight and as wide and short as possible. Entrance as close to the road edge as possible.	To minimise the distance that needs to be traversed, reduce the difference in climate between inside and outside the culvert and provide a sight line to the end.
Dimensions of waterway culverts	An opening that is at least the width of the 3 month ARI flow plus a minimum of 2 metres (horizontally) each side of the waterway. Minimum airspace of 600 mm for any culvert across a waterway that will be inundated during baseflow conditions.	To enable passage along the stream bank in frequent flow conditions. To try to maintain climatic equilibrium between the inside and outside environments, allow water conveyance and allow frogs to breathe while in the culvert.
Dimensions of terrestrial culverts	Each arched culvert or set of multiple box culverts is to provide a horizontal opening of at least 10 metres. Permanently inundated culverts must contain standing water approximately 300 mm deep. A supply of suitable water (for example treated stormwater) must be identified as part of the design. Culverts for infrastructure that is level with terrestrial habitat must have bowls dug in below natural surface if required.	To provide opportunity for Growling Grass Frog to find passages, and to try to maintain climatic equilibrium between the inside and outside environments. A maximum transition grade of 1 in 10 to the culvert invert must be incorporated in the design.
Light and moisture	Install monoclimate vents that: 1. Have footprint of at least 1 metre x 1 metre and preferably much larger. 2. Are placed adjacent to the kerb and channel on either side of a two lane road. 3. Have an additional vent in the central median for larger roads so that there is no more than 10 metres between vents. 4. Consist of a "grated hill" with a 500 mm concrete surround that falls towards the grate.	To allow light and moisture to penetrate the culvert, to try to maintain climatic equilibrium between the inside and outside environments.

Note all the information is provided is via the license agreement between the VPA and MW. The information provided is not to be used outside the context of the scope outlined by the VPA.

Ian Pham | Principal Engineer, Catchment Planning and Engineering, Urban Planning and Development, Service Futures | **Melbourne Water** T: (03) 9473 5545 | 990 La Trobe Street, Docklands, VIC 3008 | PO Box 4342 Melbourne VIC 3001 | melbournewater.com.au

In order to assist the Statutory Developer Services team with adjusting to blended working, all meetings will be conducted online via Teams or Zoom. We thank you for your cooperation, this will enable our Services to be provided in a more timely way.

Statutory Developer Services provides the essential regulatory water planning decisions for Metropolitan Melbourne's urban and greenfield development sector. If you are the applicant and have an escalation regarding a technical aspect of your project, you can contact (Logan Walter) on 131 722 to discuss.



We acknowledge the Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and I pay my respects to their Elders past and present and to the ongoing living culture of Aboriginal and Torres Strait Islander Peoples.

Enhancing Life and Liveability.

From: Richard Bon <Richard.Bon@ghd.com>
Sent: Wednesday, 29 March 2023 3:20 PM
To: Ian Pham <Ian.Pham@melbournewater.com.au>
Cc: Greta Porras <Greta.Porras@melbournewater.com.au>; Zachary Powell (VPA) <Zachary.Powell@vpa.vic.gov.au>; Rion Casey (VPA) <Rion.Casey@vpa.vic.gov.au>; Monique So (VPA) <Monique.So@vpa.vic.gov.au>; Luke Morrison <Luke.Morrison@ghd.com>
Subject: 12695813 - VPA Melton East PSP bridge study - Request For Information from Melbourne Water

Hello Ian,

Thank you for our meeting this morning, regarding the bridge study over Kororoit Creek and associated with the Melton East PSP.

As discussed, attached is formal correspondence from GHD outlining a request for further information. As GHD is performing a high-level assessment, the request is for preliminary advice from Melbourne Water – it is anticipated that further detailed advice will be sought in subsequent stages.

Please call if you wish to discuss. Luke Morrison's contact details are also provided within the letter.

Regards,

Richard Bon
B.Eng (Civil) (Hons)
Civil Engineer

GHD
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D 02 6043 8735 **E** Richard.Bon@ghd.com

180 Lonsdale Street, Level 9
Melbourne, Victoria 3000
Australia
www.ghd.com

Our ref: 12605913

29 March 2023

Ian Pham
Melbourne Water
990 La Trobe Street
Docklands VIC 3008

RE: Melton East PSP - Request for flood information and preliminary bridge preferences

Dear Ian,

Thank you for attending the inception meeting held on 29th March 2023 between Melbourne Water (MW), the Victorian Planning Authority (VPA) and GHD, regarding the construction of bridges at two locations across Kororoit Creek near Melton East. The bridges are being investigated as part of Melton East PSP being developed by the VPA and are proposed along a future alignments of Tarletons and Paynesville Roads.

As a precursor to the VPA undertaking design and costing to inform the ICP, GHD has been engaged to provide a high-level options analysis for the two bridge locations, considering the following key factors:

– Environmental
– Value management
– Transport
– Cultural heritage

From the inception meeting, it is understood that:

– The requested advice is preliminary only and subsequent stages of the Melton East PSP process will seek additional formal advice from MW.
– VPA is not seeking a detailed environmental impact assessment from MW. This has been addressed through the Melbourne Strategic Assessment.
– MW outlined that the existing flood levels upstream of the Leakes Road bridge across Kororoit Creek need to be retained.

To aid with GHD's analysis of the proposed bridge typologies and existing hydrologic behaviour GHD is seeking to obtain further information from MW as detailed below:

– Can MW provide digital information in relation to flood levels and extents within the project area?
– Can MW provide further flood information within the project area which provides Q flows during peak storm events?
– Can MW provide advice on its preferred bridge typology noting the potential for the bridge lengths may need to exceed 250m to span across the current floodplain. GHD would like to understand if MW would in principle support filling of the approaches to the proposed bridges within the floodplain to reduce the bridge extents? GHD notes that this installation would have an increased environmental impact and would require installation of culverts within the floodplain to maintain current flooding conditions within the project area. Noting any conditions would need to be met to MW's satisfaction in future stages of the design development.

A longitudinal section of the existing topography for the two bridge locations (Tarletons Road and Paynesville Road) is attached. The longitudinal sections have an 5x vertical exaggeration and are preliminary only and have been provided to promote discussions about approaches to bridge construction.

GHD looks forward to receiving a response to these queries. Please let me know if you wish to discuss these items further or require any clarification on the items raised.

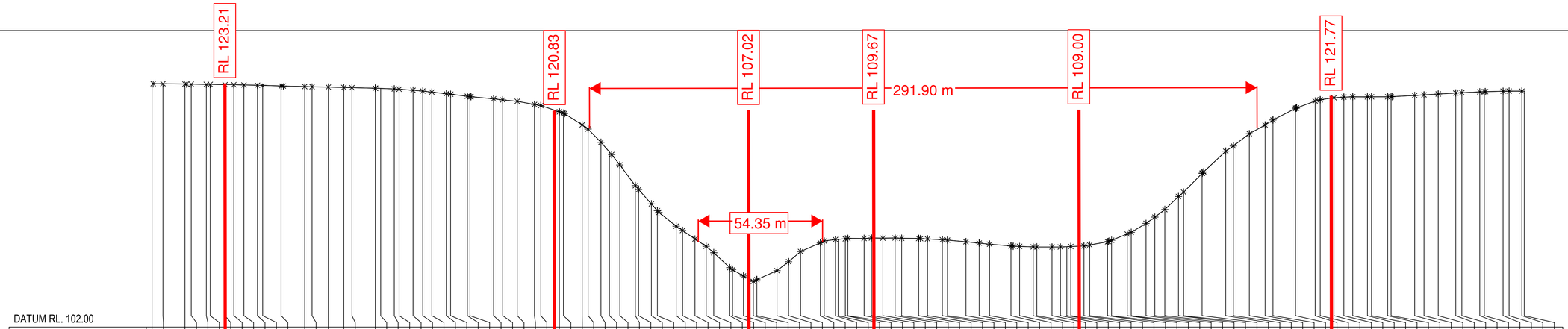
Regards

Luke Morrison
Senior Project Manager

+61 3 86878784
luke.morrison@ghd.com

Copy to: Zachary.Powell@vpa.vic.gov.au

Attachments



LONGITUDINAL SECTION - CTRL ROAD TARLETONS

HORZ 1:1000 VERT 1:200

LONGITUDINAL SECTION - CTRL ROAD PAYNESVILLE

HORZ 1:1000 VERT 1:200

Rev	Description	Checked	Approved	Date

Author
Drafting Check
Designer
Design Check

GHD
Suite 5, 105 Hume Street Wodonga VIC 3690 Australia
T 61 2 6043 8700 F 61 2 6043 8711
E abxmail@ghd.com.au W www.ghd.com.au
www.ghd.com

Project No.

Client

Project

Status

Status Code

Drawing Title

Size
A1

Drawing No.
12605913-DRG-SK001_SK002

Rev

Plot Date: 28 March 2023 - 1:32 PM Plotted by: Richard Bon File Name: \\ghdnet\ghd\AU\Melbourne\Projects\31\12605913\CADD\12D\12605913 VPA BRIDGE STUDY SURV\12605913-DRG-SK001_SK002.dwg

Appendix G

Correspondence from Melton City Council

Richard Bon

From: Anastasia Badina <AnastasiaB@melton.vic.gov.au>
Sent: Wednesday, 10 May 2023 11:25 AM
To: Rion Casey (VPA); Richard Bon
Cc: Olivia Gauci (VPA); Luke Morrison; Matthew Milbourne; Jayson Tran
Subject: RE: 12605913 - VPA Melton East PSP bridge study - Melton City Council feedback

Hi Rion and Richard,

Apologies for the delay in providing our response. We have reviewed the preliminary bridge alignment options and typologies and would like to provide the following commentary to assist the VPA in providing directions for GHD's bridge options assessment:

Environmental

- The two bridge options should be also provided to the MSA team to comment on their impact on the GGF habitat, in particular the breeding ponds. Council's preliminary assessment has identified potential shading issues which should be assessed by the MSA team
- Council encourages GHD to review the location of threatened species, in addition to the GGF

Traffic impact

- GHD Report should show the location of both interim and ultimate bridge options
- Council requests that GHD analyse the impediments to the road alignment and bridge locations within the Warrensbrook PSP area. The road alignment should be also shown within the Warrensbrook PSP area

Drainage

- Council would like to understand the impact of the proposed bridge options and road alignments on drainage; the extent of drainage land (estimated areas of drainage) should be taken into consideration when considering future road alignments

Cultural heritage

- Indigenous cultural heritage is a matter of significance and should be introduced on plans when assessing the options. Bridge alignments should avoid River Red Gums and places of high aboriginal heritage significance
- Council requests that the GHD Report consider whether there are any post-contact heritage items within the Water Reserve, such as dry stone walls, and if any items are identified introduce them in the assessment

Council would like to see the following information in the GHD Report:

- 3D modelling and shadow diagrams to show the potential impact of the bridges to GGF breeding ponds for MSA consideration
- Duplicated bridges
- Estimated areas of drainage
- Difference between road height and ground height
- Consideration for any MW plans including existing and future one; it would be good to see them side by side
- Visual impact assessment on all alignments
- Location of River Red Gums along the creek
- Location of highly significant Aboriginal cultural heritage
- Location of post-contact heritage, such as dry stone walls
- Threatened species location (other than GGF)

Please feel free to reach out if you need to clarify any of the comments above.

Kind regards,
Anastasia

Anastasia Badina
Senior Strategic Planner | **Melton City Council**

P: (03) 9747 5775
E: AnastasiaB@melton.vic.gov.au | **W:** melton.vic.gov.au
PO Box 21, Melton Vic 3337

Melton City Council acknowledges the Traditional Owners of this land,
the people of the Kulin Nations, and pays respect to their Elders, past, present and emerging.

From: Anastasia Badina
Sent: Wednesday, 19 April 2023 3:10 PM
To: Richard Bon <Richard.Bon@ghd.com>
Cc: Rion Casey (VPA) <Rion.Casey@vpa.vic.gov.au>; Jake Koumoundouros (VPA) <Jake.Koumoundouros@vpa.vic.gov.au>; Olivia Gauci (VPA) <Olivia.Gauci@vpa.vic.gov.au>; Luke Morrison <Luke.Morrison@ghd.com>; Matthew Milbourne <matthewm@melton.vic.gov.au>
Subject: RE: 12605913 - VPA Melton East PSP bridge study - Melton City Council feedback

Hi Richard,

Thank you for getting in touch and for an opportunity to provide feedback at the early stage of the bridge study.

Due to the Council staff availability we may not be able to provide you with our feedback by the 3rd of May. We will have an internal discussion on the subject within the next couple of weeks and I will get back to you with Council's comments by Friday 5th of May.

Kind regards,
Anastasia

Anastasia Badina
Senior Strategic Planner | **Melton City Council**

P: (03) 9747 5775
E: AnastasiaB@melton.vic.gov.au | **W:** melton.vic.gov.au
PO Box 21, Melton Vic 3337

Melton City Council acknowledges the Traditional Owners of this land,
the people of the Kulin Nations, and pays respect to their Elders, past, present and emerging.

From: Richard Bon <Richard.Bon@ghd.com>
Sent: Tuesday, 18 April 2023 2:24 PM
To: Anastasia Badina <AnastasiaB@melton.vic.gov.au>
Cc: Rion Casey (VPA) <Rion.Casey@vpa.vic.gov.au>; Jake Koumoundouros (VPA) <Jake.Koumoundouros@vpa.vic.gov.au>; Olivia Gauci (VPA) <Olivia.Gauci@vpa.vic.gov.au>; Luke Morrison <Luke.Morrison@ghd.com>
Subject: 12605913 - VPA Melton East PSP bridge study - Melton City Council feedback

Hello Anastasia,

GHD has been provided your contact by the Strategic Planning department of the VPA.

GHD has been engaged by the VPA to prepare a report on the feasibility of three bridge alignment options for both Tarletons Road and Paynes Road to support the development of the Melton East PSP. The purpose of this email is to engage with council early within the design process to gain an understanding of any design constraints or preferences they wish to see incorporated into the project which may impact the feasibility of each bridge.

GHD will be assessing the options against the following key criteria:

- Environmental
- Cost
- Traffic impact
- Cultural heritage

Please find attached the following.

- Bridge alignment and longitudinal section plans.
- Typical bridge typologies.

Please note that GHD is yet to receive advice from Melbourne Water on Koroit Creek flood levels, which will determine required road vertical alignments, bridge heights and other factors such as cut/fill volumes.

If council would like to provide any input on the alignments, bridge typologies or further design considerations to inform GHD's report, due to the constrained program for delivery with the VPA, please provide this information by Wednesday 3rd May 2023.

Please feel free to contact me on the below number.

Thank you and regards,

Richard Bon
B.Eng (Civil) (Hons)
Civil Engineer

GHD
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105 Hume Street, Wodonga, Victoria, 3690, Australia
D 02 6043 8735 **E** Richard.Bon@ghd.com

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Appendix H

Melton East Feedback Table

August 2023

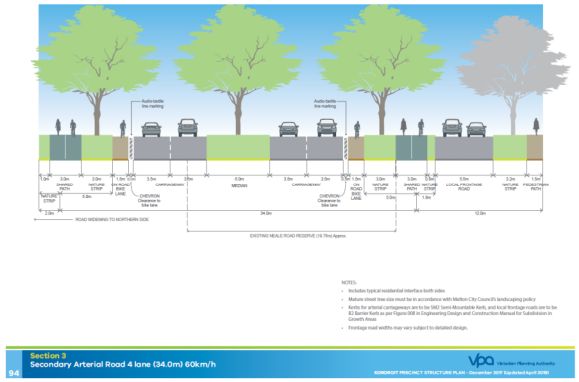
Melton East PSP : Bridge Feasibiltiy Report feedback table								
No.	Section	Page	Text	Comments	Feedback	VPA comments	Changes made	Consultant Commentary
PART 1 REPORT								
			VPA Feedback July 2023					
	1.1	1	"...options assessment of there (3) possible crossing..."	VPA	Change from "there" to "three"		Yes	
	1.1	1	Koroit Creek	VPA	Update to Kororoit Creek		Yes	
	1.4	3	10m interval Lidar	VPA	Seems a bit rough for this work. Not sure that such a Lidar data interval will add much value. Please review.	Justification added	No	
	3	5	Consultation with authorities	VPA	We would like to see a new section (3.5) for "Registered Aboriginal Party - Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation" - Wurundjeri were engaged by the VPA on 16 March 2023 to discuss the future locations of the creek crossings. - Wurundjeri identified the need to avoid rocky outcrops and terraces within the flood plain and escarpment. - Wurundjeri will be further consulted with in the decision making for the preferred bridge locations.		Yes	
	3.2	6	Department of Transport	VPA	Machinery of Government changes following the election last year mean that Department of Transport no longer exists. It is now known as Department of Transport and Planning - Transport (DTP-T)		Yes	
		7		VPA	There is significant confusion between the Option numbers presented to DEECA MSA and the updated Option numbers as per the GHD report. This was a mix up in the past numbering of road Options on the VPA plan provided to DEECA MSA on 11/05/2023. Please update DEECA MSA Feedback on Page 7 to reflect the below: **Tarletons Road -** Option 1 is updated to Option 2 Option 2 is updated to Option 1 Option 3 refers to Option 3. **Paynes Road -** Option 1 is updated to Option 5 Option 2 is updated to Option 6. DEECA does not reference Option 3 for Paynes Road.		Yes	
	4	8	"The following sections details the basis..."	VPA	Change from "details" to "detail"		Yes	
		9	Figure 3	VPA	Need to update with a cross section without the median strip with vegetation. GHD - Can this be prepared in accordance with DTP-Transport requirements below?		Yes	
	5.1	11	Image - Figure 4	VPA	Low-resolution image, improve clarity		Yes	
	5.2	12	Image - Table 5	VPA	Low-resolution screen clip, improve clarity		Yes	
	5.2	13	Image - Figure 5	VPA	Low-resolution image, improve clarity		Yes	
			Figure 6	VPA	Please include more of the precinct, particularly for how Paynes Road overall transport network is impacted.		No	
	6.3.1.2	16	Image - Figure 7	VPA	Low-resolution image, improve clarity		Yes	
	6.3.2.1	16	"GHD notes that this alignment impacts approx. eight (8) TPZs and is situated near a bend in the creek."	VPA	Discusses tree protection Zones (TPZ) under Cultural Heritage - this is not done in any of the other option discussions. TPZs are discussed in section 6.3.2.2.		Yes	
	6.3.2.2	17	Image - Figure 8	VPA	Low-resolution image, improve clarity		Yes	
	6.3.3.2	17	"The ree was assigned..."	VPA	Change from "ree" to "tree"			
	6.3.3.2	18	Image - Figure 9	VPA	Low-resolution image, improve clarity		Yes	
	6.3.4.2	19	Image - Figure 10	VPA	Low-resolution image, improve clarity		Yes	
	6.3.5.2	20	Image - Figure 11	VPA	Low-resolution image, improve clarity		Yes	
	6.3.6.2	21	Image - Figure 12	VPA	Low-resolution image, improve clarity		Yes	
	Appendix A - Drawing # 12605913-DRG-SK001_SK002		"LONGTITUDINAL SECTION - CTRL ROAD PAYNESVILLE"	VPA	Change from "Paynesville" to "Paynes"			
		General comment		VPA	What are the costs for steel box girder designs?	Explanation added	No	
			Preferred alignments	VPA	The VPA have undertaken an internal workshop to refine the bridge alignments further. Please review attached PDF document that lists more preferred alignments and investigation areas for GHD to review.		Yes	
			Alignment feedback	VPA	**Tarletons Road** Option 1 - not to continue. Significant impacts to transport network, long bridge crossing, significant impact to conservation area. Option 2 - Continue with changes - Currently crosses s-bend of creek which is unaccpetable biodiversity impact where it can be avoided. Evidence of some exposed rock on western side of escarpment. Preferred alignment to move further north approximately 50m to avoid exposed rocks and s-bend in creek. Reasonable bridge distance and reasonable impact to transport network. Option 3 - Not to continue - Significant impact to transport network, close to a terrace cultural heritage feature identifed by Wurundjeri. Relatively short bridge in comparison, however due to reasons above. **Paynes Road** Option 4 - Do not continue. Alignment too close to seasonal herbaceous wetland and impact to transport network too significant. Option 5 - Continued with changes. Move alignment further east to have a shorter crossing of the creek corridor and conservation area. Further investigation is required to determine if the Paynes Road reserve can be utilised to its full extent, or whether Water Reserve Road should be utilised. Option 6 - This option is combined with Option 5 - where the new alignment is to be in the middle of both these Options. Ensure there is a 90degree intersection with Taylors Road. Ensure there is minimised impact to conservation area where possible. Ensure the s-bend of the creek is not impacted.		Yes	

		General comment	Methodology	VPA	The VPA have prepared additional information to input into the consideration of the bridge designs. We have prepared a data layer that shows the minimum distances from one edge of the escarpment to the other. The lines are taken at 10 metre intervals and have been programmed to draw a link to the other side of the escarpment via the shortest distance. Please review attached "Melton East bridge crossing - shortest distance analysis methodology" Please add a new section in the Methodology that accounts for this new data layer.		Partially	
		General comment	Methodology	VPA	The VPA have also prepared a new data layer that maps all exposed rocks within the precinct - see attached to email. This is not to be referenced as cultural heritage mapping, however it will be used to help inform where exposed rocks and potential for rocky outcrops are located. Please add a new section in the Methodology that outlines that all rocks or unknown features within the landscape have been mapped using high resolution imagery across the entire investigation areas for both bridge alignments. On-site field investigations and a walk on country with Traditional Owner's is required to ground truth the desktop analysis. This layer includes two types of polygons: 'no comment' = clear from desktop review there are exposed rocks, and, 'comment' = unknown feature in the landscape, possible to be grass, rock, farming machine or miscellaneous'. Disclaimer to methodology will be provided by VPA shortly.		Yes	
VPA Feedback (December 2023)								
	2	1.2	Minimisation of impact to culturally significant locations	VPA	Please update to: Minimisation of impact to cultural heritage significant locations	GHD to action	Yes	
		2	Table 1	VPA	Please remove 'green' for Cultural heritage and replace with 'Orange'. There will be a level of impact to cultural heritage.	GHD to action	Yes	
	1.2	2,3	Please add a new section "1.3 Assessment of PFA Alignment Options" and include this text for an assessment of the past options.	VPA	The following assessment of alignment options within the Preliminary Feasibiltiy Assessment have been undertaken by the VPA and stakeholders: **Tarletons Road** Option 1 - This Option will not be progressed due to significant impacts to the West Growth Corridor Plan (WGCP) transport network, a long bridge crossing of 256m which results in an unreasonable length of Biodiversity Conservation Strategy (BCS) area to be impacted. Option 2 - This alignment to be continued with modifications. This alignment impacts an 's-bend' within the creek corridor which has an unreasonable impact to the environmental values and BCS area. Desktop mapping for exposed rock features (See Appendix E) identifies that expoded rock features will be impacted resulting in an unreasonable potential to impact cultural heritage. Stakeholders determined it is preferred to re-align Option 2 further north (approximately 50m) to avoid exposed rocks and s-bend in Kororoit Creek. The distance across the creek is relatively consistent at this location. The escarpment width is reduced further south, however there are mapped exposed rock features. Option 2 is similar to the West Growth Corridor Plan alignment and therefore moving the alignment slightly north results in a reasonable change to the transport network. Option 3 - This Option will not be progressed due to the significant impact to the transport network (away from West Growth Corridor Plan alignment) and it is close to a cultural heritage landscape feature identifed by WWWCHAC at the river bend. The bridge is relatively short bridge in comparison to others, however due to cultural heritage and transport network considerations it will not be progressed. **Paynes Road** Option 4 - Option 4 will not be progressed. This is due to the close alignment to the Seasonal Herbaceous Wetland within the Biodiversity Conservation Strategy area as well as having a significant deviation from the WGCP alignment. The bridge is relatively short distance in comparison to other options (125m), however due to reasons outlined above will not be investigated. Option 5 - Option 5 in its current form has unreasonable impacts to the Kororoit Creek corridor at a length of 332m, as well as increased impacts to areas of aboriginal cultural heritage sensitivity and the BCS area. This alignment is very long from escarpment to escarpment, impacts High and Moderate-A rated trees, it crosses an s-bend in the Kororoit Creek and impacts exposed rock features on the northern side, all of which should be avoided. Through detailed stakeholder engagement it is recommended to move this alignment further east to reduce impacts to all criteria identified above. Option 6 - Option 6 in its current form has unreasonable impacts to the Kororoit Creek corridor given it does not follow the shortest possible length within the conservation area with a length of 216m. There is also an unreasonable impact to the area of aboriginal cultural heritage sensitivity and has significant deviation from the WGCP alignment. It is recommended that west of this alignment is progressed for further investigation.	GHD to action	Yes	
		6	Table 2 Previous reports and studies	VPA	Please update DELWP to DEECA. Please add 'June 2013' for the MSA date. Please add a comment to each of the reports/studies, such as 'provided by VPA' or 'Melton East PSP is within the BCS/MSA"	GHD to action	Yes	
		8	DTP-T-T	VPA	Update to DTP-T	GHD to action	Yes	
		15	and removal of trees	VPA	Please remove "removal of trees" and add "terraces"	GHD to action	Yes	
	5.1	15	the VPA developed a GIS dataset which mapped all exposed rock and unknown features within the study area for both bridges, using high-resolution imagery.	VPA	At the end of the sentence add: ….using high-resolution imagery (See Appendix E - VPA Review Workshop and Metholdology - Exposed Rock Features).	GHD to action	Yes	
	5.1	15	On-site field investigations and a walk on-country with Traditional Owners is required to validate the desktop analysis.	VPA	Please add text before this sentence: The VPA acknowledge the limitations in this GIS desktop assessment for reviewing the cultural heritage sensitivity of Kororoit Creek. This GIS dataset is intended to provide an additional layer of information, however it does not confirm any area of cultrual heritage sensitivity. Please review Appendix E for additional information. The entire Kororoit Creek water corridor with a 200m buffer either side is identified as an area of Aborginal cultural heritage sensitivity. Therefore it is acknowledged that all bridge alignment options will have an impact to this area of Aboriginal cultural heritage sensitivity.	GHD to action	Yes	

		15	'No comment' – Clear from desktop review that the feature was exposed rock. – 'Comment' – Unknown feature in the landscape. Possibility to be grass, rock, farming machine or miscellany.	VPA	Can you please remove 'No comment' and 'Comment', and replace with 'Exposed Rock' and 'Other feature' Please also reference Appendix E.	GHD to action	Yes	
		15	EHP	VPA	Ecology & Heritage Partners (EHP)	GHD to action	Yes	
		16	Table 6	VPA	Can this be a high resolution image?	GHD to action	Yes	
		17	approx. 1.3km	VPA	Update to 1.6km	GHD to action	Yes	
		17	on the basis of the grid.	VPA	Update to: on the basis of the one-mile grid.	GHD to action	Yes	
		18	between the two creek escapments at 10m intervals.		Add at the end of sentence: .....at 10m intervals (See Appendix E - VPA Review Workshop and Metholdology - Shortest Distance Analysis Methodology).	GHD to action	Yes	
	6.2.1	21	Cultural Heritage Impact	VPA	Due to cultural heritage sensitivity, please update all text in this section to the below: Kororoit Creek and a 200m buffer either side is located within an area of Aboriginal Cultural Heritage Sensitivity and therefore all bridge alignments and infrastructure will result in an impact to Aboriginal cultural heritage. The preferred alignment seeks to minimise the impact to Aboriginal cultural heritage through engagement with WWWCHAC as well as detailed desktop assessments as well as site visits. Additional technical work and engagement with WWWCHAC is required to determine the cultural heritage sensitivity of each alignment. The preferred alignments do not result in an impact to Post-Contact Heritage as per the Post Contact Hertiage Assesment, prepared by Ecology Heritage & Partners.	GHD to action	Yes	
	6.2.2	21	Tarletons Road Environmental Impact	VPA	Please add in additional text at bottom of section: It is acknowledged that any infrastructure within the Biodiversity Conservation Strategy area will have some impact on environmental values, however, a 'low' environmental rating for this alignment has been assessed due to the following: - This alignment does not affect an s-bend or complex undulating section of the creek. - It avoids 'High' and 'Moderate-A' rated trees as per the Arboricultural Assessment and Report - River Red Gum Trees Kororoit Creek for Melton East PSP, dated 5 May 2023. - It minimises the distance across the Biodiversity Conservation Strategy area. Impacts to non-tree environment or habitat has not been factored into this rating due to it all being a BCS area within the Melbourne Strategic Asssessment, the entire area is considered to have environmental values. When assessed against Options 1,2 and3 identified in the Preliminary Feasibility Assessment (25 May 2023) against the criteria above, the proposed	GHD to action	Yes	
	6.2.3	22	Tarletons Road - Transport Network	VPA	Please update wording to: The alignment has minor deviation from the West Growth Corridor Plan alignment.	GHD to action	Yes	
	6.3.1	22	Cultural Heritage Impact	VPA	Due to cultural heritage sensitivity, please update all text in this section to the below: Kororoit Creek and a 200m buffer either side is located within an area of Aboriginal Cultural Heritage Sensitivity and therefore all bridge alignments and infrastructure will result in some impact to Aboriginal cultural heritage. The preferred alignment seeks to minimise the impact to Aboriginal cultural heritage through engagement with WWWCHAC as well as detailed desktop assessments as well as site visits (Please review Appendix E). Additional technical work and engagement with WWWCHAC is required to determine the alignment. The preferred alignment does not result in an impact to Post-Contact Heritage as per the Post Contact Hertiage Assesment, prepared by Ecology Heritage & Partners.	GHD to action	Yes	
	6.3.2	23	Paynes Road - Environmental Impact	VPA	Please add in additional text at bottom of section: It is acknowledged that any infrastructure within the Biodiversity Conservation Strategy area will have some impact on environmental values, however, a 'low' environmental rating for this alignment has been assessed due to the following: - This alignment does not affect an s-bend or complex undulating section of the creek. - It avoids 'High' and 'Moderate-A' rated trees as per the Arboricultural Assessment and Report - River Red Gum Trees Kororoit Creek for Melton East PSP, dated 5 May 2023. - It minimises the distance across the Biodiversity Conservation Strategy area. - This section of the creek has been significantly impacted from the existing farming uses including the abandonment of machinery and metal close to the creek corridor. When assessed against Options 4, 5 and 6 in the Preliminary Feasibility Assessment (25 May 2023), the proposed alignment is considered to have a low environmental rating.	GHD to action	Yes	
	6.3.3	23	Transport Network The alignment has minor deviation from the draft PSP alignment developed by the VPA.	VPA	Please update wording to: The alignment has minor deviation from the West Growth Corridor Plan alignment.	GHD to action	Yes	
	6.1-6.4	19-23	Final alignment assessment	VPA	Please add in any additional analysis or consideration GHD has undertaken into the proposed alignments to strengthen the assessment criteria or findings.	GHD to action	Yes	
		PDF page 50	Appendix E	VPA	The Exposed Rock Features methology is included twice and the Shortest Distance Methodology is missing. Please replace second Rock Features Methology and adding the Shortest Distance Analysis Methodology.	GHD to action	Yes	
		PDF page 51	Appendix E	VPA	Appendix E needs to be updated with the arboricultural tree mapping provided by VPA in this feedback review.	GHD to action	Yes	

Melton East PSP : Bridge Feasibiltiy Report feedback table No.	Section	Page	Text	Commer	Feedback	VPA comments	Changes n	Consultant Commentary
PART 1 REPORT								
			Melton City Council Feedback (4 July 2023)					
1.1	Purpose of this report	1	assessment of there (3) possible crossing alignments	Melton CC	minor error	GHD to action	No	
1.2	Options development	2	Refer Figure 2	Melton CC	minor error	GHD to action	No	
3.4	Department of Energy, Environment and Climate Action	7	Tarletons Road and Paynes Rd - options discussion	Melton CC	Would it be possible to include the plan provided by the MSA team in their feedback? The MSA team has a different legend for road options from the one used in this study. MSA's Option 1 for Tarletons Rd is Option 2 in the study and MSA's Option 2 for Paynes Rd is Option 6 in the study.	**VPA Comment (02/08) -** Option numbers in MSA teams feedback has been updated to reflect option numbers consistent in GHD report to avoid further confusion.	Yes	
4.3	Road cross section	9	Figure 3 Ultimate cross section design applicable to Tarletons Road and Paynes Road	Melton CC	Change image resolution, it is currently hard to see what is shown	GHD to action	Yes	
4.4	Bridge cross section	9	Conceptual cross-section	Melton CC	The bridge cross section of 23m allows for footpaths, bike paths and 2 traffic lanes in each direction and is similar to the Ferris Road level crossing bridge in the Toolern PSP. However, the 1m median between directions of traffic is minimal and doesn't allow for much separation or room for centre median planting. Just to clarify - does standard practice allow for plantings on bridges?	**VPA Comment (09/08) -** Planting / median strip will be removed from bridge cross section. GHD to action.	Yes	
5.1	Cultural Heritage Impact	11	Figure 4 Extract from "Map 6 – Survey Results" of PHCA report Sept. 2022	Melton CC	Change image resolution, it is hard to see what is shown and change description to clearly indicate what is shown	GHD to action	Yes	
5.2	Environmental Impact	12	Table 5, Figure 5	Melton CC	Same as above - the table and image are not readable	GHD to action	Yes	
5.3	Transport Network	13	Draft alignments have been developed by the VPA for Tarletons Road and Paynes Road on the basis of the grid, and this report considers the draft alignments as Option 2 (Tarletons Road) and Option 5 (Paynes Road).	Melton CC	Consider revising the wording for clarity: 'In this report, the draft road alignments are referred to as Option 2 (Tarletons Road) and Option 5 (Paynes Road)'	GHD to action	No	
6.1	Options	14	Figure 6	Melton CC	Change image resolution, it is hard to see what is shown, circle the options (number inside a circle shape), the image will look less busy	GHD to action	Yes	
6.3.1.2	Option 1 - Environmental Impact	16	Figure 7	Melton CC	Same as above - image is not readable	GHD to action	Yes	
6.3.2.2	Option 2 - Environmental Impact	16	Option 2 impacts wetland conservation areas as set out in the Biodiversity Conservation Strategy (BCS) prepared by DEECA – refer Figure 8. This option is assessed to have significant environmental impact.	Melton CC	Would it be reasonable to consider the MSA team input regarding a possibility of reconfiguring the future wetland?	**VPA Comment (09/08)** MSA team have nominated support for reconfiguring future GGF ponds if necessary to improve bridge alignments. No GHD action.	Yes	
6.3.2.2	Option 2 - Environmental Impact	17	Figure 8	Melton CC	Same as above - image is not readable	GHD to action	Yes	
6.3.4.1	Option 4 - Cultural Heritage Impact	18	Option 4 is proximate to sites identified in the PCHA, however does not impact them.	Melton CC	Issues with Option 4 (Paynes Rd), the north-south pink option – visual impacts, too close to the breeding pond and heritage asset, this is our least preferred option for multiple reasons from the heritage and environmental perspectives	**VPA Comment (09/08)** VPA agrees. GHD to note council position.	Yes	
8	Conclusion	23	For Tarletons Road, Option 1 is the most favourable on the balance of all criteria. However, it is also the least cost-effective options, being categorised as 'Red' for Value Management. Option 3 is the most cost-effective option; however it is categorised as 'Red' for both the Cultural Heritage and Transport Network criteria.	Melton CC	**Tarletons Road/Kororoit Creek** **Environmental perspective:** Options 2 and 3 are preferred alignments Option 2 is less preferred as it cuts through the breeding pond buffer area however we note MSA advice that GGF wetland may be reconfigured or adjusted slightly to accommodate the road Option 1 is not supported from biodiversity perspective as it cuts through the centre of the breeding pond **Engineering perspective:** Option 2 is preferred alignment is , followed by Option 1 and Option 3 (least preferred)	**VPA Comment (09/08)** VPA agrees with broad intent of feedback, however with further detailed comments as provided. GHD to note council position.	Yes	

8	Conclusion	23	For Paynes Road, Option 6 is the most favourable on the balance of all criteria, categorised as 'Green' for both Cultural Heritage Impact and Environmental Impact. It is noted that it is the median option in terms of cost-effectiveness. Option 4 is the most cost-effective option; however it is categorised as 'Red' for Transport Network.	Melton CC	**Paynes Road/Kororoit Creek** **Environmental perspective:** Options 5 and 6 are preferred alignments Option 4 is not supported due to its close proximity to the GGF habitat and water management issues, pollution from roads, noise at the time of GGF breeding; it also fragments the developable land **Engineering perspective:** Option 5 is the preferred alignment, followed by Options 4 and 6. The preferred alignment will also depend on what happens with the water retention area immediately adjacent to Paynes Road which may influence the alignment towards the Western Highway overpass	**VPA Comment (09/08)** VPA agrees with broad intent of feedback, however with further detailed comments as provided. GHD to note council position.	Yes	
N/A	N/A	N/A	Bridge designs	Melton CC	Council don't have the expertise to provide commentary on the bridge configuration from an engineering perspective and will refer to your judgement on the matter The general preference is for a bridge with less piers, as multiple piers look imposing and cast more shadow which which may inhibit frog movement	GHD to note council postion.	Yes	
N/A	N/A	N/A	N/A	Melton CC	We believe the following can assist decision making in choosing the preferred bridge locations: 1. Council would like to understand the impact of the proposed bridge options and road alignments on drainage; the extent of drainage land (estimated areas of drainage) should be taken into consideration when considering future road alignments 2. 3D modelling and shadow diagrams would be helpful to show the potential impact of the bridges to GGF breeding ponds for MSA consideration 3. GHD report should analyse the impediments to the road alignment and bridge locations within the Warrensbrook PSP area. The road alignment should be also shown within the Warrensbrook PSP area	VPA Comment (09/08) 1. VPA / MW / MCC can work through drainage impacts of bridge alignments following future DSS refinements. 2. VPA have prepared 3D modelling of creek corridori which will assist in future refinements of bridge impact to GGF breeding ponds. 3. VPA agrees, GHD to update.	Yes	
Melton City Council Feedback (October 2023)								
		General Comment	Bridge Crossing Locations	Melton CC	- Council is generally supportive of the proposed locations for Tarletons Rd and Paynes Rd bridge crossings subject to further discussion with stakeholders (DEECA, MSA, Traditional Owners, DTP and Melbourne Water).	VPA Comment (17/10) - Ok proceed with two options. Further consultation will be conducted. GHD please note council's comment within the final assessment.	Yes	
		General Comment	Bridge Crossing Locations	Melton CC	- We need to be absolutely certain that Aboriginal cultural heritage will not impede the development of these bridges, therefore areas of low cultural heritage sensitivity should be identified for both crossings. Unfortunately we couldn't get close to the proposed Tarletons Rd bridge location during the site tour with the Wurundjeri last week due to weather conditions; a follow up visit will hopefully help to gain more clarity on the matter.	VPA Comment (17/10) - A Cultural Heritage Permit is being prepared to assist in cultural heritage considerations for the bridge locations which will seek to excavate land for cultural heritage purposes. A second site visit specifically for Tarletons Road bridge is being investigated. Further investigation required. No action required from GHD.	Yes	
		General Comment	Bridge Crossing Locations	Melton CC	- Both bridges are critical to ensure adequate connectivity with the future Warrensbrook PSP area.	VPA Comment (17/10) - Noted. No GHD action required.	Yes	
		General Comment	Ecological Impact	Melton CC	- .Council is concerned regarding the perceived low environmental impact for the proposed bridge location considering its impact on the GGF Habitat, significant trees within the TPZ and other impacts on 'non-tree' vegetation and habitats.	VPA Comment (17/10) - GHD please update wording in the report. See VPA feedback for environmental impact. No further GHD action.	Yes	
		General Comment	Ecological Impact	Melton CC	- .The assessment of potential ecological impact is simplistic focusing primarily on engineering metrics rather than properly assessing the environmental concerns.	VPA Comment (17/10) - The VPA considers the ecological impact review undertaken within the GHD report satisfactory for this stage of the bridge analysis. The GHD report is a Feasibility Assessment to identify practical locations for the two bridges based on site features and constraints. No GHD action required.	Yes	

		General Comment	Ecological Impact	Melton CC	- .To assess the bridges' impact on GGF breeding ponds, we emphasize the importance of providing 3D models and shadow diagrams for MSA consideration.	VPA Comment (17/10) - 3D Modelling and shadow diagrams will form future basis for design work. Future designs of bridges will need to comply with MSA requirements. No GHD action required.	Yes	
		General Comment	Road Cross-Section (34m Secondary Arterial)	Melton CC	- .The report used the design for Paynes Rd in the Rockbank PSP for both roads. Council's preference for the arterial road cross-sections are the cross-sections in the Mt Atkinson, Kororoit and Plumpton PSPs. An example of a Secondary Arterial Road cross-section from Kororoit PSP is provided below. 	VPA Comments (17/10) - Further ICP design and costing will be based on benchmark designs and will be based on interim design (2 lane bridge/one path/ 15m cross section). Future road categorisation is still unknown. No GHD action.	Yes	
		General Comment	Bridge cross-section (23m with 1m wide median between directions of traffic)	Melton CC	- We recommend considering a 2m median to allow enough space for light poles in the central median.	VPA Comment (17/10) - Lighting details undertaken at detailed design and costing. No GHD action.	Yes	
		General Comment	Bridge Design	Melton CC	- Bridge design is proposed for the interim bridge only.	VPA Comment (17/10) - Bridge has been designed for ultimate. No GHD action.	Yes	
			Bridge Design	Melton CC	- .Council would like to see the design for both the interim and the ultimate bridges included. The plan should clearly identify the interim bridge (which will be costed in the ICP) and the ultimate bridge. The ultimate bridge is required to ensure that there are no ecological / cultural heritage / hydrological / geotechnical problems associated with the bridge widening.	VPA Comments (17/10) - Ultimate design has been provided - Refer to VPA Transport Engineers. No GHD action.	Yes	
			Bridge Design	Melton CC	- .Preference is towards piers rather than fill and steel base. The introduction of significant fill into the creek corridor introduces shadow, hydrological, and ecological problems into the creek corridor. A pier construction will not impede Growling Grass Frog movement in the corridor, will lessen shadowing of the creek corridor, and will allow better water flow in the corridor when the creek is in flood.	VPA Comment (17/10) - A pier standard has been provided in the concept designs. Proposed filling needs to be confirmed by further consultation/investigation by the VPA.	Yes	

Melton East PSP : Bridge Feasibiltiy Report feedback table								
No.	Sectio	Page	Text	Comment	Feedback	VPA comments	Changes	Consultant Commenta
PART 1 REPORT								
			DEECA MSA Feedback (4 July 2023)					
3.4		6 &7	Department of Energy , Environment and Climate	DEECA MSA	Noting that the references to option numbers within DEECA response do not correlate with option numbers of this report as the were not specified in the map originally provided to DEECA. Option 1= DEECA option 2 Tarleton's rd. Option 2= DEECA option 1 Tarleton's rd. Option 3= DEECA option 2 Tarleton's rd. Option 4 = DEECA option 3 Payne's rd. Option 5= DEECA option 1 Payne's rd Option 6= DEECA option 2 Payne's rd.	**VPA Comment (09/08)** VPA agrees with confusion. GHD Please make updates to MSA's feedback based on VPA feedback on Line item 10 above.	Yes	
5.2		11	Environmental impact	DEECA MSA	This section should be updated to state that "Condition 2 of the Part 10 Commonwealth approvals that regulate urbar development in the growth corridors under the EPBC Act requires that a person must not undertake an action, such as a proposed use or development, that results in a 'net loss of habitat' for ecological communities or species listed under the EPBC Act in a conservation area unless agreed by the Commonwealth Minister". The conservation area includes areas of habitat for Growling Grass Frog.	GHD to action	Yes	
6.3.3.3	6.3.2.2	16	Environmental impact	DEECA MSA	The report specifies that option 2 would have significant environmental impact, however the MSA team has provided advice i regards to the potential reconfiguration of the impacted future GGF wetland which would reduce its impact. Further info about impacted trees is needed. MSA considers this to be the preferred option given the footprint over the conservation area is smallest and the future GGF wetland may be reconfigured or adjusted to accommodate the road. If the road alignment could be shifted slightly to the north so that is crosses the conservation area at the smallest width, this would be an ideal outcome in terms of impacts to habitat for GGF.	**VPA Comment (09/08)** VPA agrees and is supported through VPA feedback. GHD to note MSA's position.	Yes	
6.3.3	6.3.3.2	th	Environmental impact	DEECA MSA	Option 3 has an unreasonably large construction footprint over the conservation area and substantial impact to a future GGF wetland location and therefore is considered to have significant environmental impact .	**VPA Comment (09/08)** VPA agrees and is supported through VPA feedback. GHD to note MSA's position.	Yes	
6.3.4.2	6.3.4.2	18	Environmental impact	DEECA MSA	Considering the impacts a future GGF wetland and the trees this option is considered to have significant environmental impact	**VPA Comment (09/08)** VPA agrees and is supported through VPA feedback. GHD to note MSA's position.	Yes	
6.3.5	6.3.5.2	19	Environmental impact	DEECA MSA	Option 5 has a large construction footprint within the conservation area. Because of the bend in the creek a crossing at this poin would substantially increase the amount of conservation area impacted, resulting in a large environmental impact. If the alignment could be shifted approximately 60m to the east the construction footprint within the conservation area would be minimised, resulting in less impact to GGF habitat.	**VPA Comment (09/08)** VPA agrees and is supported through VPA feedback. GHD to note MSA's position.	Yes	
			DEECA Feedback (October 2023)					
4.5	4.5	13	Bridge construction typologies	DEECA MSA	The report specifies two types of bridge construction. DEECA MSA will be supportive of a bridge type that meets the GGF crossing standards as set out in the GGF masterplan.	VPA Comment (17/10) - Noted. This will be achieved through ICP design and costings. GHD no action required.	Yes	
5.2	5.2	16	Environmental impact	DEECA MSA	Environmental impact criteria should include the following criteria: Ensuring no 'net loss of habitat' for ecological communities o species listed under the EPBC Act'	VPA Comment (17/10) - GHD - please action.	Yes	
5.2	5.2	16	Environmental Impact	DEECA MSA	Report should be updated to read that the Growling Grass Frog crossing standards as set out in the GGF masterplan must be met to the satisfaction of DEECA. Any works within the conservation area will require a works within conservation area approval from DEECA before any works commence. Table 6 in the report references culvert design attributes and standards however as the proposal is for a bridge the following bridge design standards must be met: -30 per cent of the section of road 50 metres each side of the waterway (a 100-metre section in total) must be open for passage if the whole opening is provided by a bridge; -A minimum set back from top of bank of 5 metres for the bridge abutments. If the top of bank is undefined the opening should at least be the width of the 3-month average recurrence interval (ARI) flow (based upon ultimate developed conditions upstream) plus a minimum of 2 metres horizontal distance each side of the waterway; -Hydraulic capacity to meet flood conveyance as required by the relevant water management authority (generally Melbourne Water); and -A substrate that reflects the natural riparian environment.	VPA Comment (17/10) - GHD please update text.	Yes	
5.2	5.2	17	Environmental impact	DEECA MSA	The following sentence 'Allow ongoing relocation of growling grass frogs between habitats' updated to read: ensure connectivit of growling grass frog between habitat'.	VPA Comment (17/10) - GHD - please action.	No	

6.2	6.2	21	Tarlteson	DEECA MSA	The design of the bridge needs to comply with the Crossing standards as set out in the Growling Grass Frog Masterplan. Bridge piers are required to avoid any instream pools within the creek line as in stream is habitat for GGF. MSA team is unable to make an assessment of the design against the GGF crossing standards with the information presented, the design will need to be approved by DEECA before any works commence through a works in conservation area application. Some of the text in figures 10 & 12 are not able to be read - we can provide more specific feedback on whether concept design meets the crossing design standards if VPA sends through a clearer version of these figures.	VPA Comment (17/10) - The bridge will be designed and costed at a more detailed later stage to ensure compliance with the GGF crossing standards. The purpose of this assessment was to identify practical crossing locations using site features and constraints. **GHD Please Action -** Update Figure 10 and 12 descreptions to say: (Review Appendix A)	No	
6.3	6.3	22	Payne's Road	DEECA MSA	The design of the bridge needs to comply with the Crossing standards as set out in the Growling Grass Frog Masterplan. Bridge piers are required to avoid any instream pools within the creek line as in stream is habitat for GGF. MSA team is unable to make an assessment of the design against the GGF crossing standards with the information presented, the design will need to be approved by DEECA before any works commence through a works in conservation area application.	VPA Comment (17/10) - Detailed design work will occur at a later stage to confirm GGF crossing standards. GHD no action required.	Yes	
6.3	6.3.2	23	Environmental impact	DEECA MSA	New location does not impact any existing or future GGF wetlands, as well as connectivity between existing or future wetlands. The crossing is also located on an appropriate section of conservation area in terms of minimising the construction footprint within the conservation area.	VPA Comment (17/10) - This comment is under discussion with DEECA. GHD no action required.	Yes	
			General Comment: Alignment	DEECA MSA	The DEECA feedback that stated the new location does not impact any existing or future GGF wetlands, as well as connectivity between existing or future wetlands. The crossing is also located on an appropriate section of conservation area in terms of minimising the construction footprint within the conservation area'' relates to the new alignment proposed for the Paynes Road alignment. We have looked at the new proposed Talsteron road location and are aware that it impacts a section of a future GGF, this is consistent with advice previously provided to the VPA which recommended moving the bridge slightly to the north of optio 2 .	VPA Comment (20/10) - Confirmed. No GHD action.	Yes	
			General Comment: Alignment	DEECA MSA	We have reviewed the appendix and it appears that the Tarleton road alignment will not meet the GGF crossing standards, in particular the requirement that 30 per cent of the section of road 50 metres each side of the waterway (a 100 metre section in total) must be open for passage if the whole opening is provided by a bridge. The level of fill within the conservation area should l minimised as it will cause connectivity issues for GGF traversing through the conservation area. The Payne's Road alignment look close to meeting the openness requirement but I cannot confirm it without a diagram which has the conservation area boundary shown to confirm.	VPA Comment (20/10) - Noted. Further detailed design will happen at later stage to ensure GGF crossing standards are achieved. No GHD action.	Yes	

Melton East PSP : Bridge Feasibiltiy Report feedback table No.	Section	Page	Text	Comments from	Feedback	VPA comments	Changes ma	Consultant Commentary
PART 1 REPORT								
			DTP-Transport Feedback August 2023					
1	1.2	2	The options were developed with consideration to the following: – VPA suggested crossing locations. – Minimisation of construction footprint. – Avoidance of native flora, especially trees. – Minimisation of impact to potentially significant locations for Indigenous culture. – Required bridge length for crossing. – Magnitude of deviation from draft PSP road alignments.	DTP	Not sure why we are indicating 'especially trees' Would have thought the native flora component would have been driven by the requirement to avoid habitat of known EBPC or State signficant flora, irrespective if it was a tree or grass or flower. Those areas with a lesser native flora value should be considered as areas to potential mitigate. Should also include Flora and Fauna, as we will need to consider potential habitat for specicies and avoidance of these areas.	**VPA Comment (31 July 2023**) - Agreed Remove "especially trees" GHD update to "Minimal impact to flora and fauna" At this stage the VPA will not be undertaking additional technical biodiversity studies of the creek corridor.	No	
			Generallly figures and tables are hard to read	DTP	Generallly figures and tables are hard to read	GHD to action	Yes	
2	2	4	Table 1	DTP	Were any desktop assessments of of Aboriginal Cultural sites undertaken.	**VPA Response (31 July 2023)** - Yes, VPA have prepared a Draft Aboriginal Cultural Heritage Impact Assessment which identifies the entire creek line as high potential for cultural heritage sensitivity. Additional cultural heritage work is required to determine the cultural heritage sensitivity of the preferred locations. No GHD Action	Yes	
1	4.1	8	The following design standards and reference documents (versions current as of March 2023) have been used in this investigation: – Austroads Guide to Road Design (AGRD) and corresponding VicRoads supplements – VicRoads Standard Specification for Roadworks and Bridgeworks.	DTP	Please include VicRoads BTN's and AS5100	GHD to action	Yes	
2	4.4	9	Sect 4.4 Bridge cross section - 23m	DTP	Proposed 23m - Cross section should be amended to allow for shoulders on road in accordance with AustRoads guidelines. - Does cross section allow for separation of bicycle lanes from traffic? - What is the proposed barrier arrangement between traffic / bike / pedestrian lanes and can barriers between vehicles and bikes / pedestrians be incorporated as preferred in AS5100	GHD to action	No	
3	4.5	10	– Pile caps founded on driven precast piles. – Concrete abutments founded on bored piles with concrete pile caps.	DTP	Typically cheaper to use same pile type and size at piers and abutments rather than a mix of bored and driven piles	GHD to action	No	
4	5.2 / 6.1	13 / 14	Page 10 - Bridge underside must be set at least 600 mm above 1% AEP climate change flood level. - Page 11 - The bridge deck level was drawn as a minimum 300 mm above flood levels (based on advice from MW), then adjusted as appropriate to manage earthworks quantities.	DTP	Typically 600mm above 100 year flood level is used. Recommend adjust Section 6.1 to reflect deck soffit 600mm above flood levels. Refer also Sect 3.1 page 5 that states Melb Water requires 600mm freeboard.	GHD to action	Yes	
5	5.4	13	Value Management	DTP	Costs of a a change deviation of road to accommodate new alignment should also be considered in the value component. This should also consider the land use impacts these alignment. Cost to realign other connecting road into the network should also be included.	**VPA Response (31 July 2023)** VPA Agrees and broad impacts to transport network should be included in any overall design costs. Due to preferred options as part of this feedback review with less deviation from WGCP alignment, VPA suggest no detailed costs of alignment impacts is necessary. No GHD action.	Yes	
6	6.3.2.1	16	Feedback from initial consultation with the WWWCHAC did not include comment on the proposed location of alignment of Option 2. Risk of cultural heritage impact has therefore been assessed with consideration to general feedback received.	DTP	Can we be clear on what the general assessment was and how the alignment seems to jump to this conclusion without clear justification. How are we weighting this against Option 1 when the WWWCHAC have not made comment.	**VPA Response (31 July 2023)** - - Additional work and engagement with Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation (WWWCHAC) is required. GHD please note additional collaboration with WWWCHAC is required.	No	

6	6.3.3.1	17	Option 3 has high risk of significant impact on culturally significant Indigenous sites due to the proximity to terrace type geological features before the bend in the creek.	DTP	Need consistency in wording Did WWWCHAC comment on this alignment as well	**VPA Response (31 July 2023)** - - WWWCHAC have only provided high level feedback based on drone footage in March 2023. Additional engagement with Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation (WWWCHAC) is required.	No	
5	App D	54 / 55	Bridge cross section	DTP	The typical elevation appears to be much narrower than the 23m cross section in Section 4.4. Has this been considered in the estimates and can this elevation be updated to reflect proposed cross section	GHD to action	No	
6	App E	57 - 62	Estimates	DTP	Estimates may be low compared to some of the prices that we have seen recently.	GHD to action	No	
	DTP-Transport Feedback (November 2023)							
	General			DTP	Narrowing down the assessment to look at a single alignment for each bridge based on such limited due diligence information is a risk.	Noted. No GHD action.	Yes	
	1.1			DTP	Should be clear to what the limitations are with the avaiable data are. Reader needs to understand the context to which decisions have been made to the preferred alignment	& 1.5 as well as Appendix E. Additional information to clarify alignments has been added as part of updated feedack. No GHD action required.	Yes	
	1.2	6		DTP	A more detailed MCA should be used to determine preferred alignments - the assessment shown is not clear/definiteive in comparing options (this may come out in a more detailed MCA to rule out options).	VPA isn't building the bridge. We are just trying to find an alignment that suits. The MCA could be far more detailed but at this stage of planning, the MCA used is considered sufficient. No GHD action.	Yes	
	1.2	6		DTP	Report would benefit from an appendix that further defined the assessment process and explained the assessment table.	Agree - depends what we agreed when scoping the sudy and the expectations resulting from the GHD fee proposal. Additional information added within this feedback review. No further GHD action.	Yes	
	3.1.1	12		DTP	Why is the climate change analysis not included? This is a future proofing aspect for future flood levels. - This is a requirement in the environmental considerations - 'bridge underside must be set at least 600mm above 1% AEP climate change flood level'.	VPA Response December 2023 - Flood modelling is not required for the current GHD assessment which is only a high-level assessment and aims to identify a suitable location for each of the bridge crossings. Flood levels will need to be considered as part of the future devleopment of concept designs (as part of the VPA ICP design and costing work) and the subsequent devleopment of functional designs for each bridge post the PSP process. No action from GHD required.	Yes	Flood modelling is not required for the current GHD assessment which is only a high-level assessment and aims to identify a suitable location for each of the bridge crossings. Flood levels will need to be considered as part of the future devleopment of concept designs (as part of the VPA ICP design and costing work) and the subsequent devleopment of functional designs for each bridge post the PSP process.
	3.1.1	13		DTP	*It is noted that this assessment was undertaken using flood modelling information provided by MW and based on ARR1987 guidelines. MW's current requirements is for flood modelling to be undertaken based on ARR2019 guidelines and are preparing an updated flood model to these guidelines, as advised in their correspondence. Once revised flood modelling information is available, this information should be incorporated into the design process to ensure that bridge designs are compliant with MW requirements.* Will this updated modelling have an impact on the assessment of each alignment or would it impact the design of each aligment in the same manner. This needs to be clarified as to the impact on each alignment.	VPA Response December 2023 - As above. No action required from GHD.	Yes	
	3.1.3	8		DTP	How is drainage impacts being assessed as these could have significxant impacts on the future land take requirements and potential cost implications which will neeed to be considered and assessed against each option	VPA Response December 2023 - As above. No action required from GHD.	Yes	
	5.1	19		DTP	Desktop level assessment for heritage in an unmapped area could be a high risk given the amount of sensitivity in the nearby areas that have been mapped.	VPA Response December 2023 - The alignment options have reviewed all known cultural heritage sites within both investigation areas. Additional cultural heritage investigations will be required to provide futher input into alignments. No action required from GHD.	Yes	
	5.3	21		DTP	Is the road alignment or impacts in Warrensbrook considered?	Yes, a road alignment within Warrensbrook has been considered as part of PSP planning. No action from GHD.	Yes	
	5.3	21		DTP	Has the interface with the Western Freeway overpass been considered?	Yes, a road alignment within Warrensbrook has been considered as part of PSP planning. No action required from GHD.	Yes	

	5.4	22		DTP	Value management should consider broader context of the bridge impacts such as surrounding road alignments and any subsequent cost impacts.	Potentially, but not considered in the definition provided by GHD in the report. There is limited impacts on the surrounding road alignments due to the bridge alignment. The significant wetlands offer far greater impediments to road alignment options. No action required from GHD.	Yes	
	5.4			DTP	Value Management - what is not clear is the assumption on what the abuntments are on is it proposed to be a spill batter or retaintaing wall. This will have an impact on costs as well. Higher construction cost for retaining wall but reduced costs for land take and drainage.	VPA Response December 2023 - To be idenitifed and quantified as part of the ICP design and costing work which the VPA will be undertaking. No GHD action required.	Yes	
	7.1	28		DTP	Cost estimates do not allow for additional road lengths required to divert from the draft PSP road alignments' - given both preferred options divert from the PSP alignments, why is this not considered? This could be particularly important given the potential structural changes for the Paynes Road Western Freeway overpass.	Paynes Road overpass of Freway is fixed - no proposal to alter this. The roads will be costs to PSP and deviations are considered relatively minor. No action required from GHD.	Yes	
	7	28		DTP	What is the risk in the cost estimates (figures, and risks considered)? If this has not been considered, what is the basis for the 20% contingency that should aim to cover risk? The lack of background due diligence investigations mean that the risk is high.	VPA Response - The GHD cost estimates aare indicatrive and for information only. The VPA will be devleoping cost estimates as part of the ICP design and costing work. No action from GHD.	Yes	
	Previous comments from August review	See above		DTP	- Comment 62 - Still not clear how/whether bikes lanes can be separated form traffic in the cross section provided. The same goes for any buffer between the footpath and cycle path (there will at least need to be kerbing at some point). o This may need to be amended as discussed should shared user paths be required on the structure to make the separation from traffic work.	To be determined as part of the VPA ICP design and costing work. No action from GHD required.	Yes	
	Previous comments from August review	See above		DTP	Comment 63 - Comment on consistency of pile types due to costs has not been addressed. It is typically cheaper to use same pile type and size at piers and abutments rather than a mix of bored and driven piles.	To be determined as part of the VPA ICP design and costing work. No action from GHD required.	Yes	
	Previous comments from August review	See above		DTP	Comment 65 - Not sure this necessarily answers the question directly about cost of land use impacts or costs to realign other connecting roads. Suggest we need this to be discussed in the text (and in more detail than the VPA/GHD's answer to this comment).	**VPA Response (31 July 2023)** VPA Agrees and broad impacts to transport network should be included in any overall design costs. Due to preferred options as part of this feedback review with less deviation from WGCP alignment, VPA suggest no detailed costs of alignment impacts is necessary. No GHD action.	Yes	
	Previous comments from August review	See above		DTP	Comment 66 - need to review this response. Suspect further detail is needed on what the general assessment was and the justification for the alignment rather than stating that further consultation is needed. Comment above captures the potential risk on making the assumptions based on desktop assessment in such a sensitive area indicated by surrounding mapped areas.	VPA Response (12 Dec 2023) - This is addressed in this feedback review. No further GHD action required.	Yes	
	Previous comments from August review	See above		DTP	Comment 68 - Difference in bridge cross section is still not addressed.	VPA Response (12 Dec 2023) - Bridge has been designed to 23m cross section as requested by VPA. No GHD action.	Yes	
	Previous comments from August	See above		DTP	Comment 69 - Estimates for the bridges have been updated but the ranges are still magnitudinally similar ($45,815,426 -> $55,477,324 and $56,689,988/$36,671,493 -> $43,684,645) - we may need to double check this with David from the bridge team.	VPA Response (12 Dec 2023) - DTP to action. - No action from GHD.	Yes	

Melton East PSP : Bridge Feasibiltiy Report feedback table No.	Section	Page	Text	Comments	Feedback	VPA comments	Changes made	Consultant Commentary
PART 1 REPORT								
		Melbourne Water Feedback July 2023						
GHD report for VPA Date 25th May 2023	3.1	5		MW	Hydraulic modelling (TUFLOW) is required to be undertaken considering the various current and climate change AEP storm events from 20%AEP storm event up to and including 1%AEP storm events, to demonstrate flood levels are not increased upstream and downstream of proposed bridge location. If flood levels were increased due to bridge design including raising of road, then flood mitigation works must be undertaken to ensure existing and climate change flood levels are maintained. Note the Melbourne Water do not support an afflux on the adjoining private properties.	GHD to action	Addressed to satisfy VPA requirements.	
	3.1	5		MW	Existing 1%AEP flood storage including 1%AEP climate flood storage flood volume must be maintained to avoid an increase in downstream flood levels. If loss of flood storage invitable then cut and fill must be undertaken at same location in order to maintaining existing 1%AEP flood storage including the 1%AEP climate change flood storage	GHD to action	Addressed to satisfy VPA requirements.	
	6.1	14		MW	Can GHD clarify this sentence " The bridge deck level was drawn as minimum 300mm above flood levels (Based on advice from MW). Our advice is outlined on this report on page no 5. section 3.1, regarding freeboard between flood level and bridge underside/soffit level.	GHD to action	Addressed to satisfy VPA requirements.	
	6.4	21 and Apendix C Civil Concept plans showing bridge cross section		MW	Based on current study, undertaken by GHD, all options are suitable option for Tarletons Road alignment from hydraulic perpective. However, details hydraulic assessment will be required as per our advice as outlined on page 5 of this report and revised comments as highlighted above.	GHD to action	Addressed to satisfy VPA requirements.	
	6.4	21 and Apendix C Civil Concept plans showing bridge cross section		MW	Based on current study, undertaken by GHD, option 4 and 5 are suitable options for paynes Road from hydraulic perpective. However, details hydraulic assessment will be required as per our advice as outlined on page 5 of this report and revised comments as highlighted above.	GHD to action	Addressed to satisfy VPA requirements.	
		Overall report- GGF habitat		MW	Very concerning that GHD's Preliminary Feasibility Assessment does not seem to accurately reflect DEECA's Melbourne Strategic Assessment Program's advice on the relative impacts of the options. DEECA highlighted both the overall footprint of the road on the GGF Conservation Area plus the likely impact on future GGF wetland locations (some of which they are prepared to adjust if necessary but others don't have any wiggle room). Melbourne Water's Growling Grass Frog Masterplan Program comments focus on conservation area and waterway requirements in the context of MWC being the appointed future land manager for the Growling Grass Frog Conservation Area. From this perspective, the key waterway management issues relating to the bridge location and high-level design include: • The total footprint of GGF Conservation Area occupied by the road (resulting in removal of GGF terrestrial habitats and barriers to GGF dispersal along the Conservation Area) and bridge (shading of waterway habitats) should be minimised so that the integrity of the waterway and connectivity between GGF populations is maintained as far as possible • Ease of passage under the bridge, if necessary for waterway/habitat maintenance access I can see that the estimated costs of the options vary significantly but would like to see the options with lower environmental and cultural heritage impacts identified accurately and the costings checked and given further consideration. At the next step when bridge designs are being considered, additional matters will need to be addressed and the GGF Masterplan Program team can assist when the time comes. For example: • Provision of maintenance access points both upstream and downstream of the bridges. Access points must be minimum 3.5m wide with include a safe approach and entry for machinery to access and maintain (including desilting) the waterway and off-stream GGF wetlands. • Shared trails and pedestrian paths to avoid GGF Masterplan Areas of Strategic Importance (including potential future wetland locations) • Instream drainage works that may be required to ensure that Kororoit Creek can carry any increased volume/duration of flows from the upstream developed catchment • Landscaping/revegetation • Fencing and gates.	**VPA comment (08/08)** The preferred alignments as part of this feedback round will resolve key items in this MW comment regarding alignment options. GHD to action unresolved MW feedback.	Addressed to satisfy VPA requirements.	
		Traffic Light System and environmental sections		MW	Ideally for the traffic light system assessment needs to be more detail in relation to "environmental impact" (and CH impact). This might be expanded to "X number of red gums/trees impacted (including impact to tree protection zones)", "X ha of conservation area impacted/lost", and "Yes/No/ X area impact to future GGF Wetland". Another one from my perspective is noise pollution and other impact (faster road, animals getting squashed) for the Paynes Rd option road beside the K3 wetland is something not preferred (road Option 4).	GHD to consider.	Addressed to satisfy VPA requirements.	
		Melbourne Water Feedback (October 2023)						
		Overall- Hydraulic		MW	Hydraulic modelling (Tuflow) is important for understanding the flood levels regarding 20% AEP to 1% AEP storm events i	VPA Comment (17/10) - To be considered as part of the future detailed design - GHD no action required	Yes	
		Overall- Hydraulic		MW	Hydraulic modelling (Tuflow) is also important for understanding the flood storage regarding 20% AEP to 1% AEP storm ev	VPA Comment (17/10) - To be considered as part of the future detailed design - GHD no action required	Yes	

		Overall- Hydraulic		MW	The studies regarding the Severe Scenario should be discussed in later stages	VPA Comment (17/10) - To be considered as part of the future detailed design - GHD no action required	Yes	
		6.1	19	MW	Adopting 600 mm would be enough at this situation for flood immunity. But flood immunity has to also be reviewed with the updated modelling once completed.	VPA Comment (17/10) - To be considered as part of the future detailed design - GHD no action required	Yes	
	(Figure 7, Growling Grass Frog Crossing Design Standards, 2017)	17		MW	Please consider Growling Grass Frog Crossing Design Standards for later bridge designs.	VPA Comment (17/10) - To be considered as part of the future detailed design - GHD no action required	Yes	
	6.2 & 6.3	20 to 22		MW	Regarding the sections represented for the modified options : 1- A more detailed comparison between the modified options and the old options would be appreciated (in the Environmental and cultural Heritage aspects). Also more detailed information are required to discuss their risk based on information provided on 6.2.1 ("the alignment impacts three TPZs (Tree Protection Zone) of Moderate-B arboriculture rating. Additionally, the alignment impacts three minor exposed rock features"), 6.2.2 ("It also impacts wetland conservation areas as set out in the Biodiversity Conservation Strategy (BCS) prepared by the DEECA MSA team. However, advice from the MSA team is that there is flexibility to adjust the wetland to suit this alignment."), and 6.3.1 ("the alignment impacts one minor exposed rock features, as per the data from the VPA's mapping exercise. ").	VPA Comment (17/10) - 1. MW please review Appendix E for more detailed comments regarding the differences between the alignments. The preferred options will be further investigated to confirm the environmetnal and tree aspects. GHD no action required.	Yes	
	6.2 & 6.3	20 to 22		MW	2- It is also recommended to consider another factor for option comparison to involve hydraulic impacts.	To be considered as part of the future detailed design - GHD no action required	Yes	
	6.2 & 6.3	20 to 22		MW	3- Please control if the 1% AEP level in the preferred option of Paynes Rd requires any change (compared with the previous option 5 and 6). It has to be noted that the preferred option had a shift compared with those previous options. (104.32 m)	To be considered as part of the future detailed design - GHD no action required	Yes	
	6.2 & 6.3	20 to 22		MW	4- It is recommended to represent the elevation for the underside of the bridge on the sections too. This is mainly important to compare the underside of the deck with 1% AEP elevation (currently ARR1987) to maintain 600 mm between these two.	Will be addressed through ICP design and costs.	Yes	
	6.2 & 6.3	20 to 22		MW	5- If the modified options for Tarletones Rd and Paynes Rd embankments are considered above the 1% AEP it is good, but it has to be mentioned that the flood levels regarding 1% AEP storm event considered here are based on the ARR1987 modelling, and still the relevant flood levels of existing and Climate Change (CC) hydraulic modelling in ARR2019 are required.	To be considered as part of the future detailed design - GHD no action required	Yes	

Appendix I

Melton East Feedback Table

December 2023

Melton East PSP : Bridge Feasibiltiy Report feedback table								
No.	Section	Page	Text	Comments	Feedback	VPA comments	Changes made	Consultant Commentary
PART 1 REPORT								
			VPA Feedback July 2023					
	1.1	1	"...options assessment of there (3) possible crossing..."	VPA	Change from "there" to "three"		Yes	
	1.1	1	Koroit Creek	VPA	Update to Kororoit Creek		Yes	
	1.4	3	10m interval Lidar	VPA	Seems a bit rough for this work. Not sure that such a Lidar data interval will add much value. Please review.	Justification added	No	
	3	5	Consultation with authorities	VPA	We would like to see a new section (3.5) for "Registered Aboriginal Party - Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation" - Wurundjeri were engaged by the VPA on 16 March 2023 to discuss the future locations of the creek crossings. - Wurundjeri identified the need to avoid rocky outcrops and terraces within the flood plain and escarpment. - Wurundjeri will be further consulted with in the decision making for the preferred bridge locations.		Yes	
	3.2	6	Department of Transport	VPA	Machinery of Government changes following the election last year mean that Department of Transport no longer exists. It is now known as Department of Transport and Planning - Transport (DTP-T)		Yes	
		7		VPA	There is significant confusion between the Option numbers presented to DEECA MSA and the updated Option numbers as per the GHD report. This was a mix up in the past numbering of road Options on the VPA plan provided to DEECA MSA on 11/05/2023. Please update DEECA MSA Feedback on Page 7 to reflect the below: **Tarletons Road -** Option 1 is updated to Option 2 Option 2 is updated to Option 1 Option 3 refers to Option 3. **Paynes Road -** Option 1 is updated to Option 5 Option 2 is updated to Option 6. DEECA does not reference Option 3 for Paynes Road.		Yes	
	4	8	"The following sections details the basis..."	VPA	Change from "details" to "detail"		Yes	
		9	Figure 3	VPA	Need to update with a cross section without the median strip with vegetation. GHD - Can this be prepared in accordance with DTP-Transport requirements below?		Yes	
	5.1	11	Image - Figure 4	VPA	Low-resolution image, improve clarity		Yes	
	5.2	12	Image - Table 5	VPA	Low-resolution screen clip, improve clarity		Yes	
	5.2	13	Image - Figure 5	VPA	Low-resolution image, improve clarity		Yes	
			Figure 6	VPA	Please include more of the precinct, particularly for how Paynes Road overall transport network is impacted.		No	
	6.3.1.2	16	Image - Figure 7	VPA	Low-resolution image, improve clarity		Yes	
	6.3.2.1	16	"GHD notes that this alignment impacts approx. eight (8) TPZs and is situated near a bend in the creek."	VPA	Discusses tree protection Zones (TPZ) under Cultural Heritage - this is not done in any of the other option discussions. TPZs are discussed in section 6.3.2.2.		Yes	
	6.3.2.2	17	Image - Figure 8	VPA	Low-resolution image, improve clarity		Yes	
	6.3.3.2	17	"The ree was assigned..."	VPA	Change from "ree" to "tree"			
	6.3.3.2	18	Image - Figure 9	VPA	Low-resolution image, improve clarity		Yes	
	6.3.4.2	19	Image - Figure 10	VPA	Low-resolution image, improve clarity		Yes	
	6.3.5.2	20	Image - Figure 11	VPA	Low-resolution image, improve clarity		Yes	
	6.3.6.2	21	Image - Figure 12	VPA	Low-resolution image, improve clarity		Yes	
	Appendix A - Drawing # 12605913-DRG-SK001_SK002		"LONGTITUDINAL SECTION - CTRL ROAD PAYNESVILLE"	VPA	Change from "Paynesville" to "Paynes"			
		General comment		VPA	What are the costs for steel box girder designs?	Explanation added	No	
			Preferred alignments	VPA	The VPA have undertaken an internal workshop to refine the bridge alignments further. Please review attached PDF document that lists more preferred alignments and investigation areas for GHD to review.		Yes	

Melton East PSP : Bridge Feasibiltiy Report feedback table								
No.	Section	Page	Text	Comments	Feedback	VPA comments	Changes made	Consultant Commentary
PART 1 REPORT								
			Alignment feedback	VPA	**Tarletons Road** Option 1 - not to continue. Significant impacts to transport network, long bridge crossing, significant impact to conservation area. Option 2 - Continue with changes - Currently crosses s-bend of creek which is unaccpetable biodiversity impact where it can be avoided. Evidence of some exposed rock on western side of escarpment. Preferred alignment to move further north approximately 50m to avoid exposed rocks and s-bend in creek. Reasonable bridge distance and reasonable impact to transport network. Option 3 - Not to continue - Significant impact to transport network, close to a terrace cultural heritage feature identifed by Wurundjeri. Relatively short bridge in comparison, however due to reasons above. **Paynes Road** Option 4 - Do not continue. Alignment too close to seasonal herbaceous wetland and impact to transport network too significant. Option 5 - Continued with changes. Move alignment further east to have a shorter crossing of the creek corridor and conservation area. Further investigation is required to determine if the Paynes Road reserve can be utilised to its full extent, or whether Water Reserve Road should be utilised. Option 6 - This option is combined with Option 5 - where the new alignment is to be in the middle of both these Options. Ensure there is a 90degree intersection with Taylors Road. Ensure there is minimised impact to conservation area where possible. Ensure the s-bend of the creek is not impacted.		Yes	
		General comment	Methodology	VPA	The VPA have prepared additional information to input into the consideration of the bridge designs. We have prepared a data layer that shows the minimum distances from one edge of the escarpment to the other. The lines are taken at 10 metre intervals and have been programmed to draw a link to the other side of the escarpment via the shortest distance. Please review attached "Melton East bridge crossing - shortest distance analysis methodology" Please add a new section in the Methodology that accounts for this new data layer.		Partially	
		General comment	Methodology	VPA	The VPA have also prepared a new data layer that maps all exposed rocks within the precinct - see attached to email. This is not to be referenced as cultural heritage mapping, however it will be used to help inform where exposed rocks and potential for rocky outcrops are located. Please add a new section in the Methodology that outlines that all rocks or unknown features within the landscape have been mapped using high resolution imagery across the entire investigation areas for both bridge alignments. On-site field investigations and a walk on country with Traditional Owner's is required to ground truth the desktop analysis. This layer includes two types of polygons: 'no comment' = clear from desktop review there are exposed rocks, and, 'comment' = unknown feature in the landscape, possible to be grass, rock, farming machine or miscellaneous'. Disclaimer to methodology will be provided by VPA shortly.		Yes	
VPA Feedback (December 2023)								
	2	1.2	Minimisation of impact to culturally significant locations	VPA	Please update to: Minimisation of impact to cultural heritage significant locations	GHD to action		
		2	Table 1	VPA	Please remove 'green' for Cultural heritage and replace with 'Orange'. There will be a level of impact to cultural heritage.	GHD to action		
	1.2	2,3	Please add a new section "1.3 Assessment of PFA Alignment Options" and include this text for an assessment of the past options.	VPA	The following assessment of alignment options within the Preliminary Feasibiltiy Assessment have been undertaken by the VPA and stakeholders: **Tarletons Road** Option 1 - This Option will not be progressed due to significant impacts to the West Growth Corridor Plan (WGCP) transport network, a long bridge crossing of 256m which results in an unreasonable length of Biodiversity Conservation Strategy (BCS) area to be impacted. Option 2 - This alignment to be continued with modifications. This alignment impacts an 's-bend' within the creek corridor which has an unreasonable impact to the environmental values and BCS area. Desktop mapping for exposed rock features (See Appendix E) identifies that expoded rock features will be impacted resulting in an unreasonable potential to impact cultural heritage. Stakeholders determined it is preferred to re-align Option 2 further north (approximately 50m) to avoid exposed rocks and s-bend in Kororoit Creek. The distance across the creek is relatively consistent at this location. The escarpment width is reduced further south, however there are mapped exposed rock features. Option 2 is similar to the West Growth Corridor Plan alignment and therefore moving the alignment slightly north results in a reasonable change to the transport network. Option 3 - This Option will not be progressed due to the significant impact to the transport network (away from West Growth Corridor Plan alignment) and it is close to a cultural heritage landscape feature identifed by WWWCHAC at the river bend. The bridge is relatively short bridge in comparison to others, however due to cultural heritage and transport network considerations it will not be progressed. **Paynes Road** Option 4 - Option 4 will not be progressed. This is due to the close alignment to the Seasonal Herbaceous Wetland within the Biodiversity Conservation Strategy area as well as having a significant deviation from the WGCP alignment. The bridge is relatively short distance in comparison to other options (125m), however due to reasons outlined above will not be investigated. Option 5 - Option 5 in its current form has unreasonable impacts to the Kororoit Creek corridor at a length of 332m, as well as increased impacts to areas of aboriginal cultural heritage sensitivity and the BCS area. This alignment is very long from escarpment to escarpment, impacts High and Moderate-A rated trees, it crosses an s-bend in the Kororoit Creek and impacts exposed rock features on the northern side, all of which should be avoided. Through detailed stakeholder engagement it is recommended to move this alignment further east to reduce impacts to all criteria identified above. Option 6 - Option 6 in its current form has unreasonable impacts to the Kororoit Creek corridor given it does not follow the shortest possible length within the conservation area with a length of 216m. There is also an unreasonable impact to the area of aboriginal cultural heritage sensitivity and has significant deviation from the WGCP alignment. It is recommended that west of this alignment is progressed for further investigation.	GHD to action		

Melton East PSP : Bridge Feasibiltiy Report feedback table								
No.	**Section**	**Page**	**Text**	**Comments**	**Feedback**	**VPA comments**	**Changes made**	**Consultant Commentary**
PART 1 REPORT								
		6	Table 2 Previous reports and studies	VPA	Please update DELWP to DEECA. Please add 'June 2013' for the MSA date. Please add a comment to each of the reports/studies, such as 'provided by VPA' or 'Melton East PSP is within the BCS/MSA"	GHD to action		
		8	DTP-T-T	VPA	Update to DTP-T	GHD to action		
		15	and removal of trees	VPA	Please remove "removal of trees" and add "terraces"	GHD to action		
	5.1	15	the VPA developed a GIS dataset which mapped all exposed rock and unknown features within the study area for both bridges, using high-resolution imagery.	VPA	At the end of the sentence add: ….using high-resolution imagery (See Appendix E - VPA Review Workshop and Metholdology - Exposed Rock Features).	GHD to action		
	5.1	15	On-site field investigations and a walk on-country with Traditional Owners is required to validate the desktop analysis.	VPA	Please add text before this sentence: The VPA acknowledge the limitations in this GIS desktop assessment for reviewing the cultural heritage sensitivity of Kororoit Creek. This GIS dataset is intended to provide an additional layer of information, however it does not confirm any area of cultrual heritage sensitivity. Please review Appendix E for additional information. The entire Kororoit Creek water corridor with a 200m buffer either side is identified as an area of Aborginal cultural heritage sensitivity. Therefore it is acknowledged that all bridge alignment options will have an impact to this area of Aboriginal cultural heritage sensitivity.	GHD to action		
		15	‘No comment’ – Clear from desktop review that the feature was exposed rock. – ‘Comment’ – Unknown feature in the landscape. Possibility to be grass, rock, farming machine or miscellany.	VPA	Can you please remove 'No comment' and 'Comment', and replace with 'Exposed Rock' and 'Other feature' Please also reference Appendix E.	GHD to action		
		15	EHP	VPA	Ecology & Heritage Partners (EHP)	GHD to action		
		16	Table 6	VPA	Can this be a high resolution image?	GHD to action		
		17	approx. 1.3km	VPA	Update to 1.6km	GHD to action		
		17	on the basis of the grid.	VPA	Update to: on the basis of the one-mile grid.	GHD to action		
		18	between the two creek escaprments at 10m intervals.		Add at the end of sentence: .....at 10m intervals (See Appendix E - VPA Review Workshop and Metholdology - Shortest Distance Analysis Methodology).	GHD to action		
	6.2.1	21	Cultural Heritage Impact	VPA	Due to cultural heritage sensitivity, please update all text in this section to the below: Kororoit Creek and a 200m buffer either side is located within an area of Aboriginal Cultural Heritage Sensitivity and therefore all bridge alignments and infrastructure will result in an impact to Aboriginal cultural heritage. The preferred alignment seeks to minimise the impact to Aboriginal cultural heritage through engagement with WWWCHAC as well as detailed desktop assessments as well as site visits. Additional technical work and engagement with WWWCHAC is required to determine the cultural heritage sensitivity of each alignment. The preferred alignments do not result in an impact to Post-Contact Heritage as per the Post Contact Hertiage Assesment, prepared by Ecology Heritage & Partners. Please add in additional text at bottom of section.	GHD to action		
	6.2.2	21	Tarletons Road Environmental Impact	VPA	It is acknowledged that any infrastructure within the Biodiversity Conservation Strategy area will have some impact on environmental values, however, a 'low' environmental rating for this alignment has been assessed due to the following: - This alignment does not affect an s-bend or complex undulating section of the creek. - It avoids 'High' and 'Moderate-A' rated trees as per the Arboricultural Assessment and Report - River Red Gum Trees Kororoit Creek for Melton East PSP, dated 5 May 2023. - It minimises the distance across the Biodiversity Conservation Strategy area. Impacts to non-tree environment or habitat has not been factored into this rating due to it all being a BCS area within the Melbourne Strategic Asssessment, the entire area is considered to have environmental values. When assessed against Options 1,2 and3 identified in the Preliminary Feasibility Assessment (25 May 2023) against the criteria above, the proposed	GHD to action		
	6.2.3	22	Tarletons Road - Transport Network	VPA	Please update wording to: The alignment has minor deviation from the West Growth Corridor Plan alignment.	GHD to action		

Melton East PSP : Bridge Feasibiltiy Report feedback table								
No.	Section	Page	Text	Comments	Feedback	VPA comments	Changes made	Consultant Commentary
PART 1 REPORT								
	6.3.1	22	Cultural Heritage Impact	VPA	Due to cultural heritage sensitivity, please update all text in this section to the below: Kororoit Creek and a 200m buffer either side is located within an area of Aboriginal Cultural Heritage Sensitivity and therefore all bridge alignments and infrastructure will result in some impact to Aboriginal cultural heritage. The preferred alignment seeks to minimise the impact to Aboriginal cultural heritage through engagement with WWWCHAC as well as detailed desktop assessments as well as site visits (Please review Appendix E). Additional technical work and engagement with WWWCHAC is required to determine the alignment. The preferred alignment does not result in an impact to Post-Contact Heritage as per the Post Contact Hertiage Assesment, prepared by Ecology Heritage & Partners.	GHD to action		
	6.3.2	23	Paynes Road - Environmental Impact	VPA	Please add in additional text at bottom of section: It is acknowledged that any infrastructure within the Biodiversity Conservation Strategy area will have some impact on environmental values, however, a 'low' environmental rating for this alignment has been assessed due to the following: - This alignment does not affect an s-bend or complex undulating section of the creek. - It avoids 'High' and 'Moderate-A' rated trees as per the Arboricultural Assessment and Report - River Red Gum Trees Kororoit Creek for Melton East PSP, dated 5 May 2023. - It minimises the distance across the Biodiversity Conservation Strategy area. - This section of the creek has been significantly impacted from the existing farming uses including the abandonment of machinery and metal close to the creek corridor. When assessed against Options 4, 5 and 6 in the Preliminary Feasibility Assessment (25 May 2023), the proposed alignment is considered to have a low environmental rating.	GHD to action		
	6.3.3	23	Transport Network The alignment has minor deviation from the draft PSP alignment developed by the VPA.	VPA	Please update wording to: The alignment has minor deviation from the West Growth Corridor Plan alignment.	GHD to action		
	6.1-6.4	19-23	Final alignment assessment	VPA	Please add in any additional analysis or consideration GHD has undertaken into the proposed alignments to strengthen the assessment criteria or findings.	GHD to action		
		PDF page 50	Appendix E	VPA	The Exposed Rock Features methology is included twice and the Shortest Distance Methodology is missing. Please replace second Rock Features Methology and adding the Shortest Distance Analysis Methodology.	GHD to action		
		PDF page 51	Appendix E	VPA	Appendix E needs to be updated with the arboricultural tree mapping provided by VPA in this feedback review.	GHD to action		

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