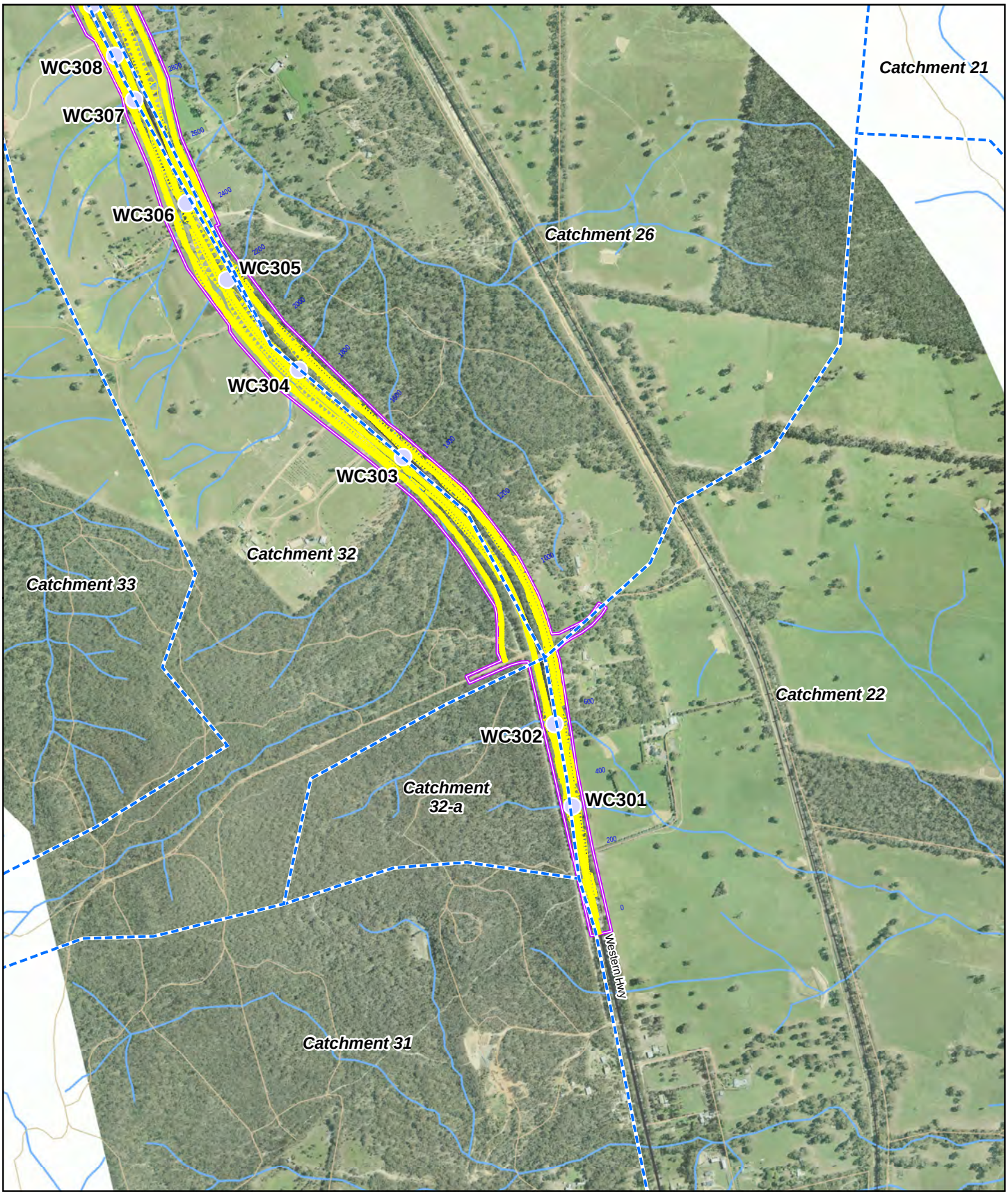
Appendix A

Waterway Crossing and Alignment Mapbook



LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

- Minor
- Moderate
- Major
- Maximum Construction Footprint
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Major water area
- River
- Stream
- Channel / drain
- Connector

Paper Size A4

0 125 250 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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Western Highway Project

Ararat to Stawell
Waterway Crossings **Sheet 1**

Job Number 31-27558
Revision C
Date 14 Nov 2012

Appendix A

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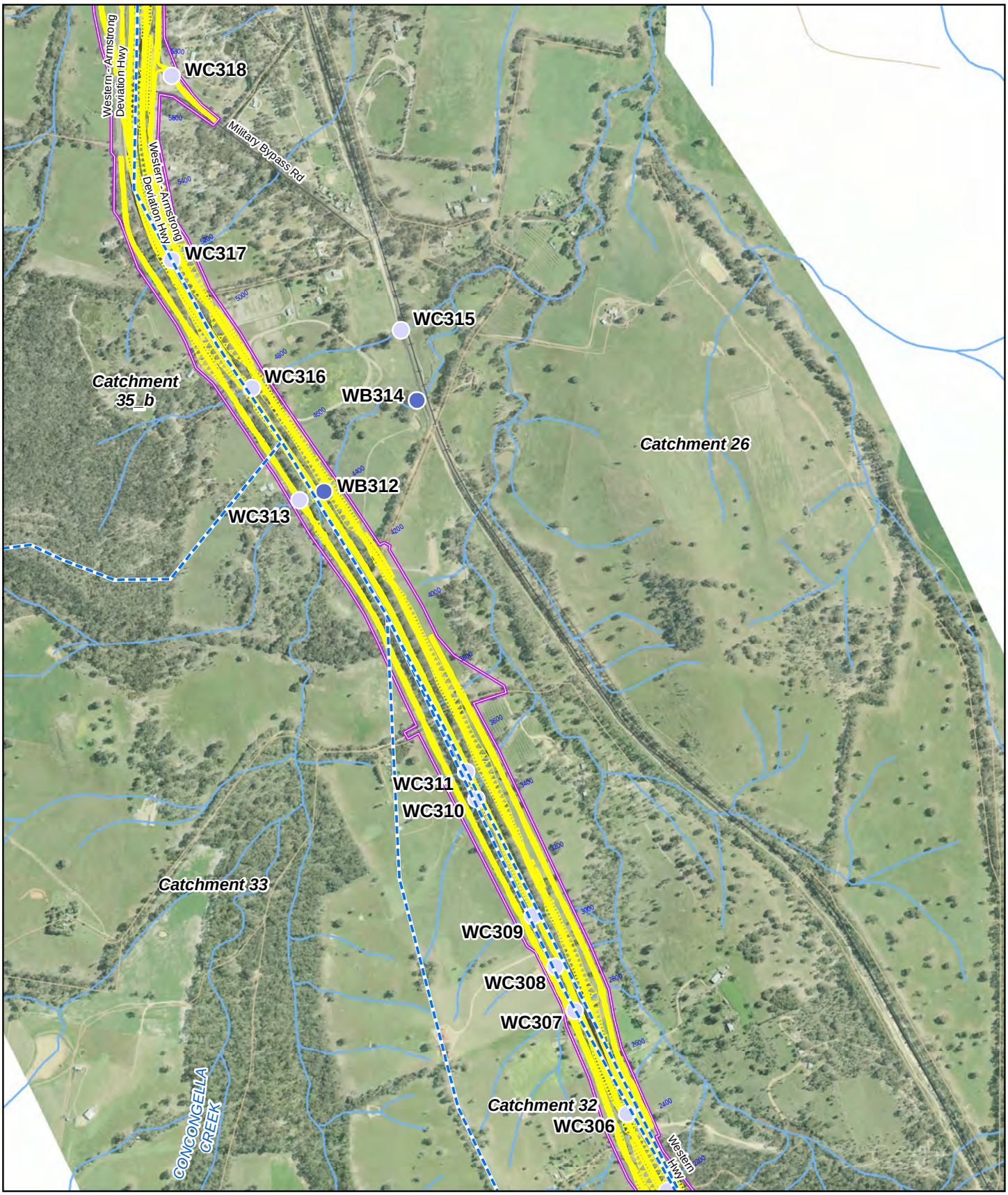

LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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Ararat to Stawell
Waterway Crossings **Sheet 2**

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Revision C
Date 14 Nov 2012

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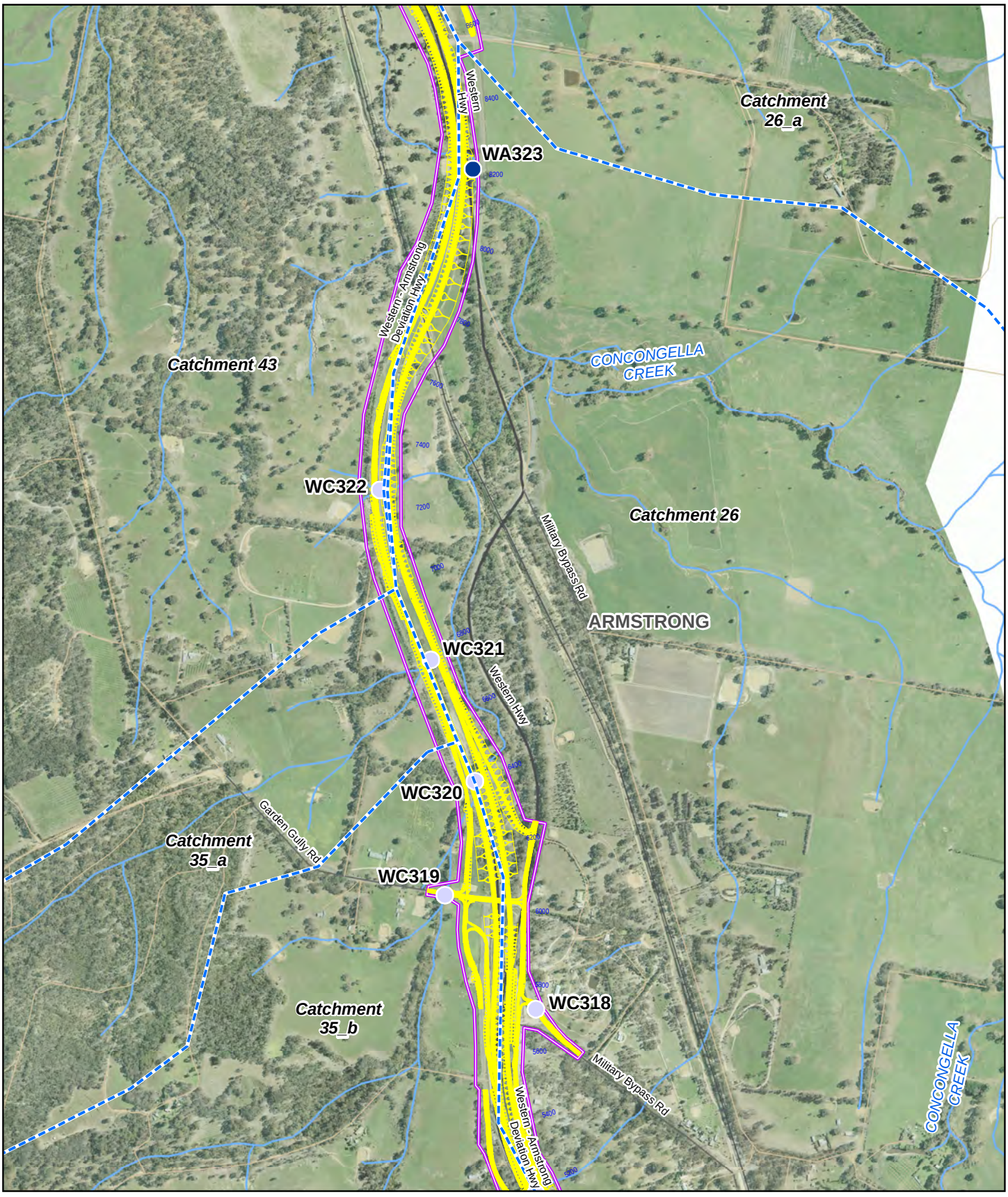

LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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Ararat to Stawell
Waterway Crossings **Sheet 3**

Job Number 31-27558
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Date 14 Nov 2012

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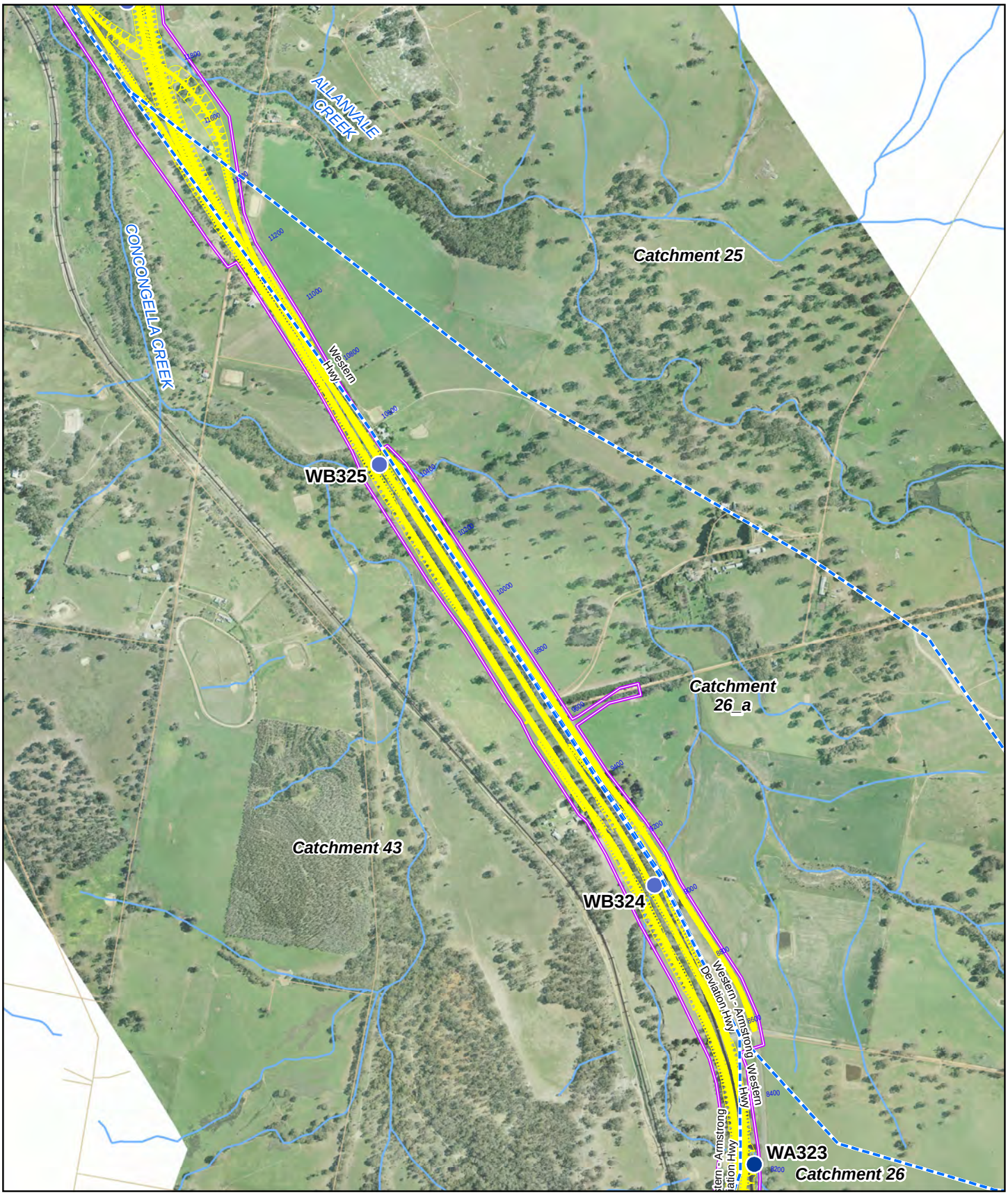

LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

- Minor
- Moderate
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- Maximum Construction Footprint
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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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Western Highway Project

Ararat to Stawell
Waterway Crossings **Sheet 4**

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Date 14 Nov 2012

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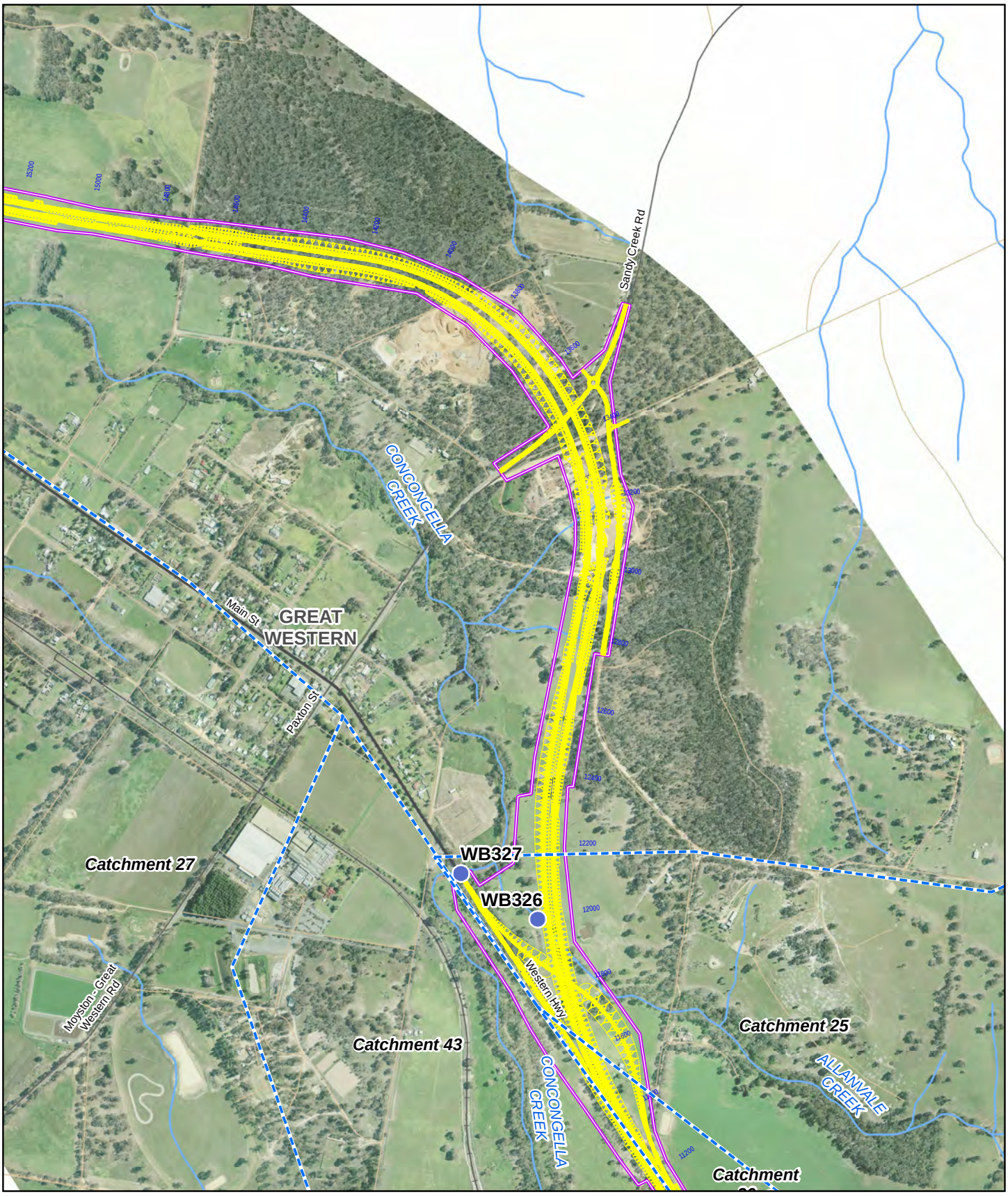

LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

- Minor
- Moderate
- Major
- Maximum Construction Footprint
- Highway
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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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Ararat to Stawell
Waterway Crossings **Sheet 5**

Job Number 31-27558
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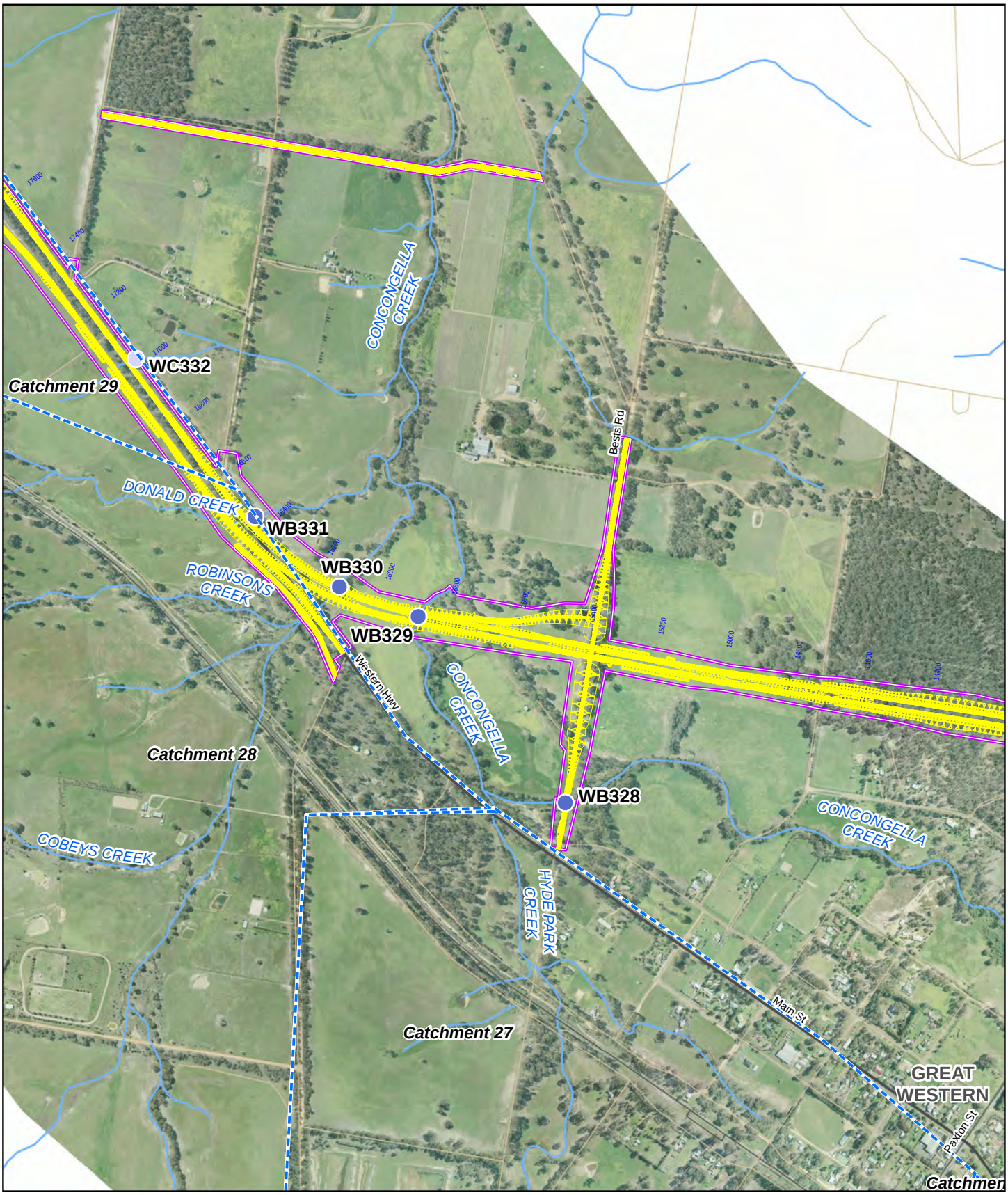

LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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Ararat to Stawell
Waterway Crossings **Sheet 6**

Job Number 31-27558
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Date 14 Nov 2012

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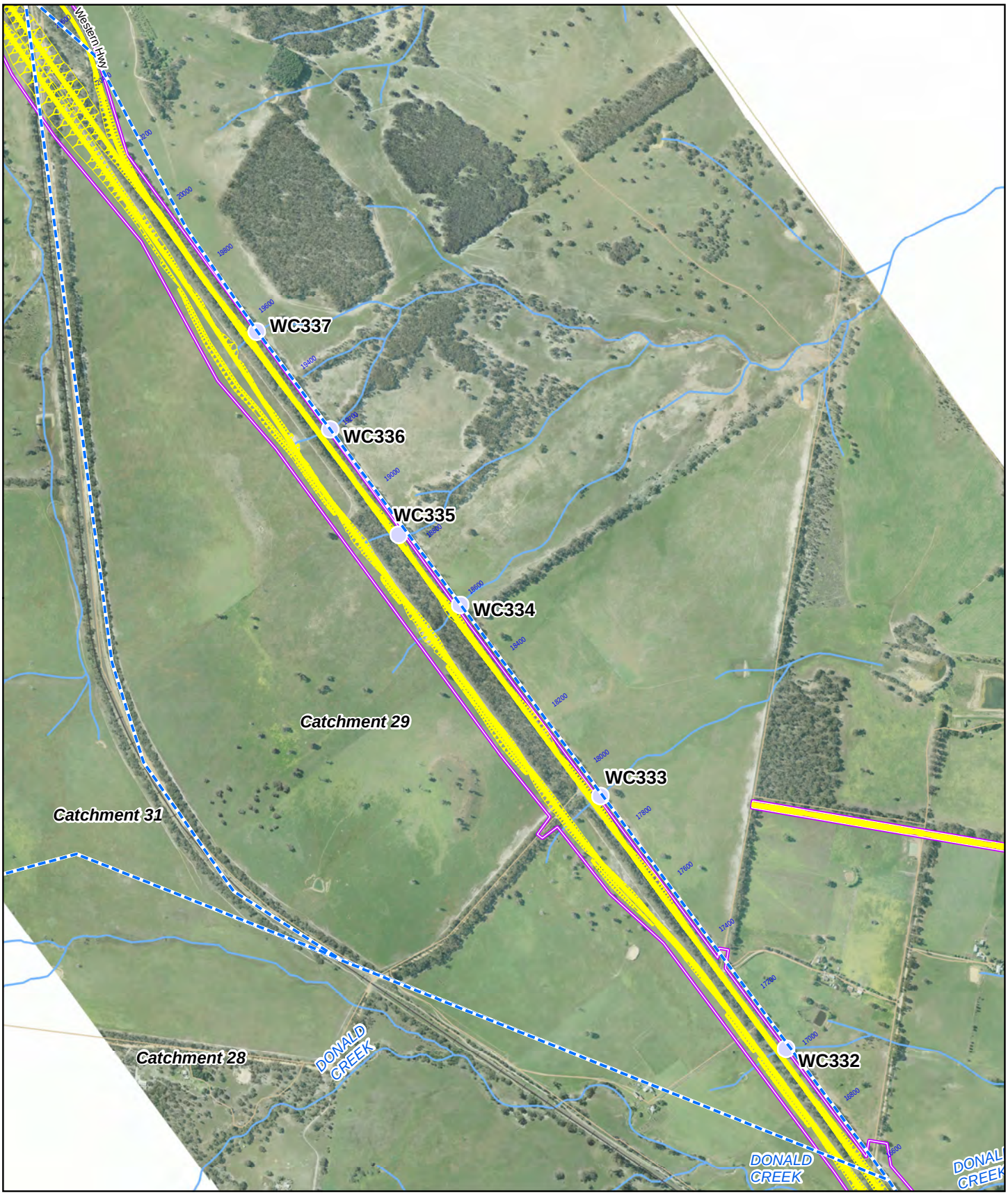

LEGEND

- Bonacci Model Catchments
- Design Carriageway & Interchanges

Waterway Crossings

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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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VicRoads
Western Highway Project

Ararat to Stawell
Waterway Crossings **Sheet 7**

Job Number 31-27558
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Date 14 Nov 2012

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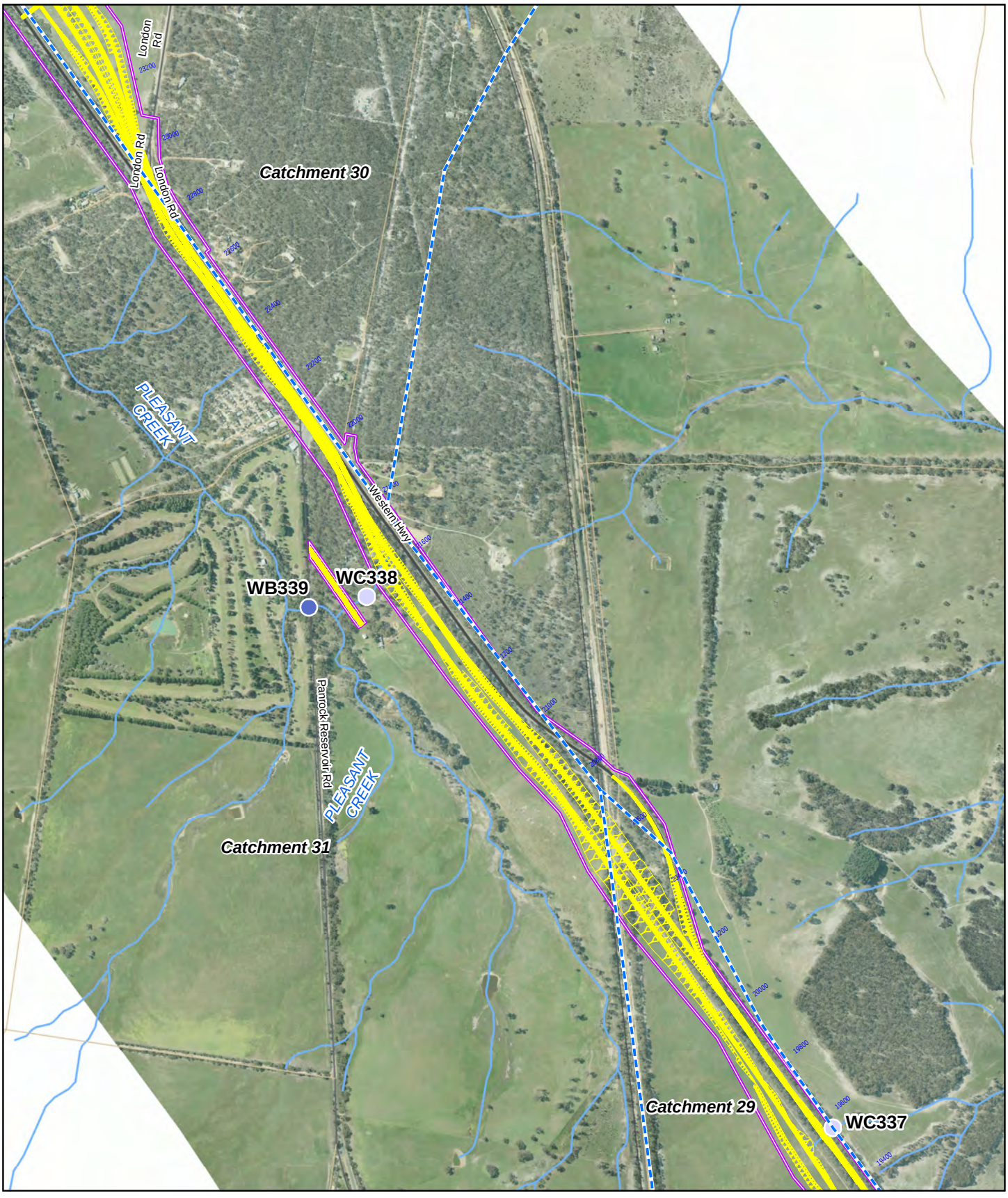

LEGEND

- Bonacci Model Catchments
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Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Western Highway Project

Ararat to Stawell
Waterway Crossings **Sheet 8**

Job Number 31-27558
Revision C
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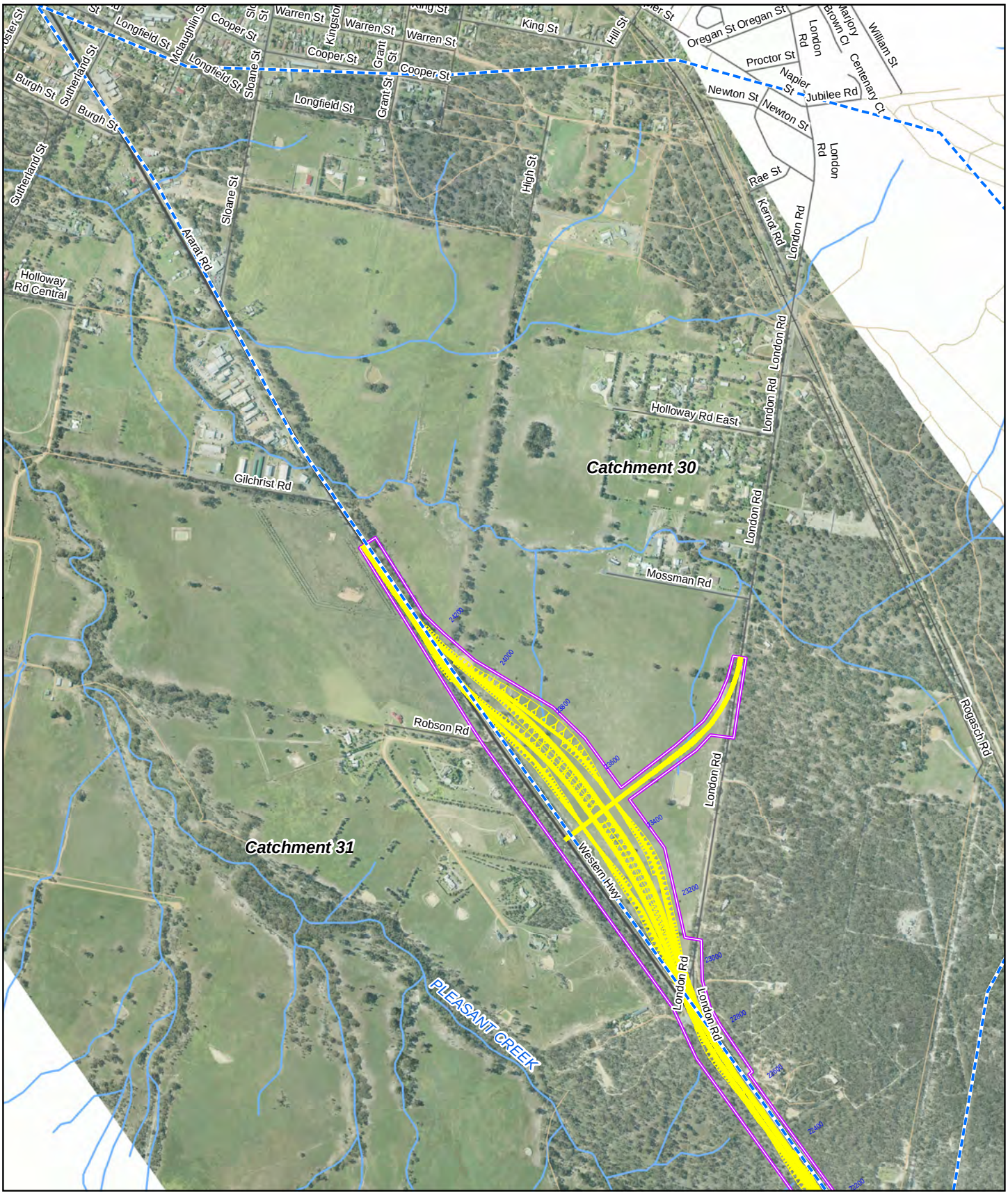

LEGEND

- Bonacci Model Catchments
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Waterway Crossings

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Metres

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Horizontal Datum: GDA 1994
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Western Highway Project

Ararat to Stawell
Waterway Crossings **Sheet 9**

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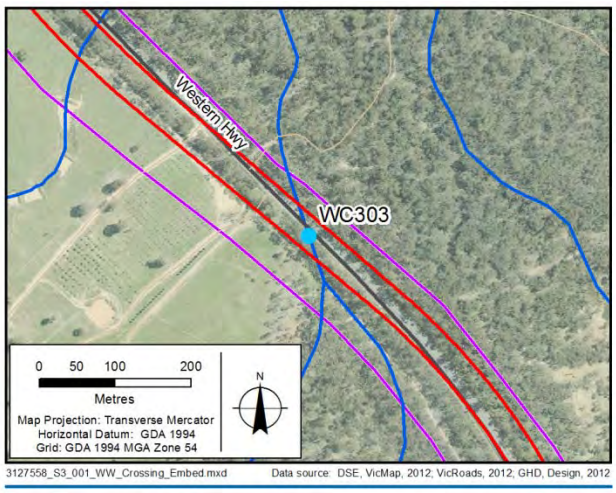
Data source: DSE, VicMap, 2012; VicRoads, 2012; Flooding data: Bonacci, 2012; TGM, 2012. Created by:splaird

Appendix B

Waterway Crossing Field Inspection Proformas

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC303		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	32-a		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Forest reserve		Aquatic ecology	Pastoral grasses
Catchment Area (ha)	106		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 669305 **N** 5876500	**Geomorphic Classification**	Confined
Channel planform			
- Channel geometry	Shallow incised channel. Downstream from road culvert channel 0.3 m high, 2 m wide. Further downstream channel narrows to 0.5 deep 1 m wide. A few grade controls in the form of tree roots/debris; small drops of 10 cm.		
- Channel gradient	2.5%		
- Channel sinuosity	Straight; 1.04		
Banks	Short steep banks- vertical. Undercutting and slump in some sections.		
Instream Features	1.05 m culvert under road. Sand deposits mid-channel. Large mounds of vegetation/debris. Some rocks in channel bed at culvert outlet.		
Floodplain Description	No floodplain. Narrow valley. Potential for lateral adjustment approx. 10 m to either side.		



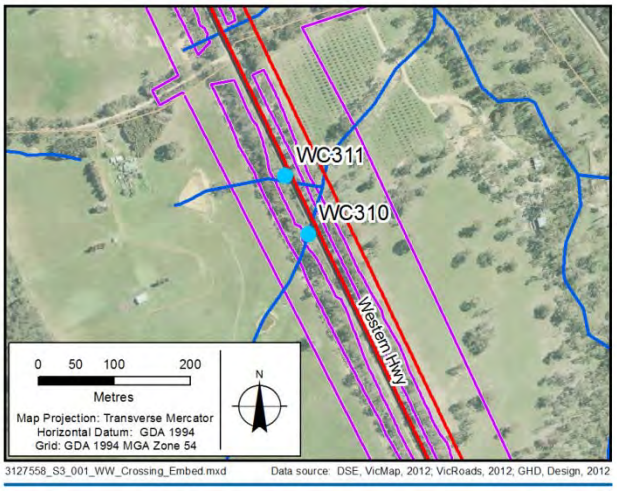
GIS aerial image of site

Downstream face of road culvert

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC311 (and WC310)		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	32-a		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6-37		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Road reserve. Olive plantation downstream, cleared grazing upstream		Aquatic ecology	Pastoral grasses
Catchment Area (ha)	11		Disturbance rating	High
Flow Characteristics				

Site Inspection			
GPS Location	**E** 668250 **N** 5878120	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	No channel		
- Channel gradient	4 %		
- Channel sinuosity	n/a		
Banks	n/a		
Instream Features	2 x 0.375 m culverts		
Floodplain Description			

Looking downstream, north west of the Existing Highway, from the confluence of crossing WC310 and WC311.

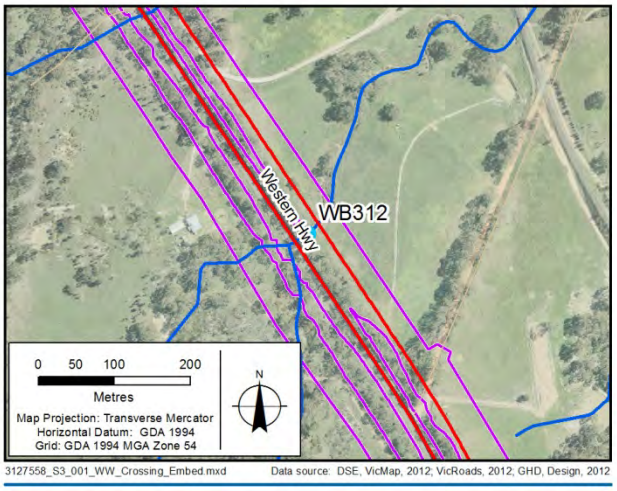


GIS aerial image of site WC311

Waterway Crossing			**Regional River Health Strategy**	
Crossing Number	WB312		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	33		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6-36		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Agricultural- cleared for grazing, and well treed Crown Land		Aquatic ecology	Pastoral grasses, reeds,
Catchment Area (ha)	580		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 667805 **N** 5879015	**Geomorphic Classification**	Partially confined
Channel planform			
- Channel geometry	Downstream of Existing Highway bridge channel bend 10 m wide, 2.5 m deep. Eroding exposed banks, then channel narrows downstream through more vegetated section. Upstream of Highway bridge a tributary enters from the north west. This tributary is shallower with a low flow channel 1 m wide 0.2 m deep. Concongella Creek upstream of bridge up to 3 m deep and 6 m wide.		
- Channel gradient	0.8 %		
- Channel sinuosity	Low sinuosity; 1.07		
Banks	Highly eroding banks. Some past vertical. Slumping and incision occurring. Some large remnant trees in bank. Fallen tree across channel lying across top of bank.		
Instream Features	Road bridge. Standing water under bridge. Sandy deposits on channel bed. Boulders (up to 1 m diameter) in place on upstream side of bridge as bank stabilisation. Some woody debris and vegetation debris- masses of acacia shrubs.		
Comments	Will need to protect right bank downstream of road bridge where large boulders have been put in place		

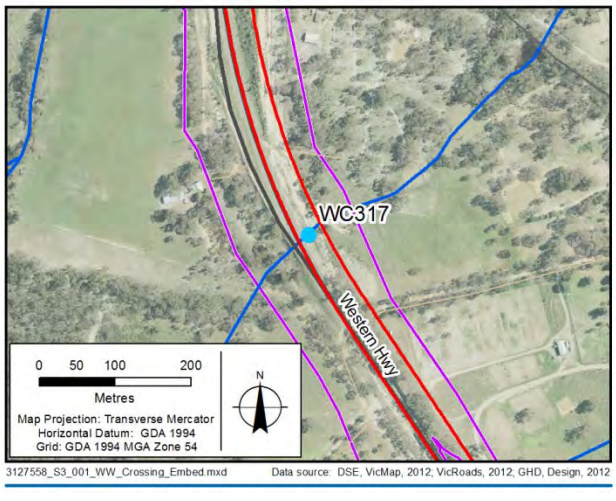
Looking upstream (facing south), upstream from the Existing Highway



GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC317		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	35		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6-33-1		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description			Aquatic ecology	Reeds, grasses.
Catchment Area (ha)	14		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 667370 **N** 5879675	**Geomorphic Classification**	Confined
Channel planform			
- Channel geometry	Unchannelled except for where VicRoads have put in rock work and bund to direct flows downstream of road culvert to the south east.		
- Channel gradient	3.03%		
- Channel sinuosity	No channel through alignment		
Banks	n/a		
Instream Features	1.05 m culvert under road. Rocks downstream of culvert at first small dam.		
Floodplain Description	No floodplain		
Comments	Flow directed south east into small dam, then flows on to large dam. Rock work and soil/sandy bund to direct flows to small dam has been washed away and now water bypasses first dam and flows directly into second larger dam.		



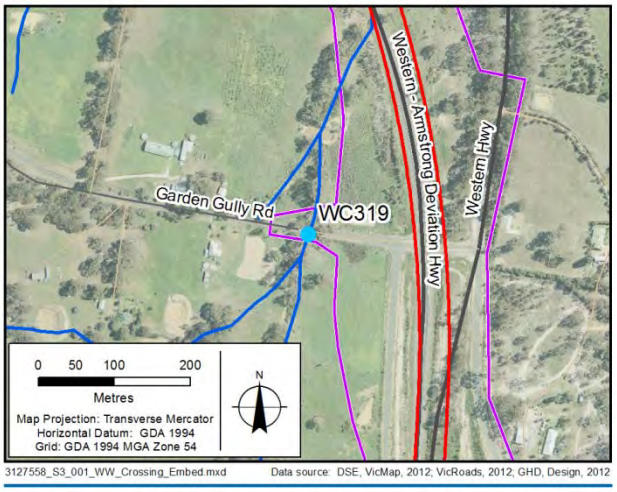
GIS aerial image of site

Downstream face of road culvert. N.B. scoured face of bund in middleground.

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC319		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	35		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6-3		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Cleared sheep grazing with river reserve.		Aquatic ecology	Pastoral grasses.
Catchment Area (ha)	240		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 667110 **N** 5880525	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Channel wider at bridge, approx. 10 m across and up to 3 m deep. Some lateral erosion at/behind wing wall- both sides of bridge. Further from road bridge channel 2.5 m deep, 4 m wide. Low flow channel within channel 1 m wide, 0.4 m deep.		
- Channel gradient	1.6 %		
- Channel sinuosity	Straight; 1.02		
Banks	Steep slopes. Some undercutting and slump. Banks vertical on downstream side of road bridge.		
Instream Features	Box culvert 2.4 m x 4.8 m. Bank attached sand bar. Terrace from low flow channel.		
Floodplain Description	Small dam levee on left bank, downstream of bridge.		

Looking downstream from Garden Gully Road bridge

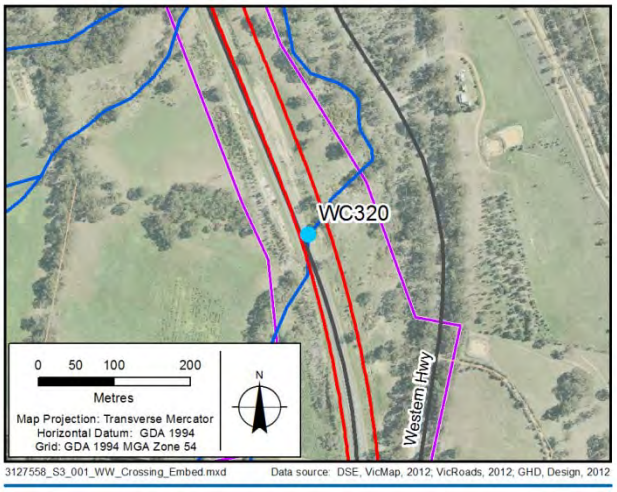


GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC320		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	35		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6-33		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Sheep grazing and road reserve. Rail line further north.		Aquatic ecology	Reeds, rushes.
Catchment Area (ha)	270		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 667195 **N** 5880850	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Channel up to 3 m deep and 12 m across. Low flow channel within channel 0.5 m deep up to 3 m wide. Large sand deposit in base of channel.		
- Channel gradient	1.8%		
- Channel sinuosity	Low sinuosity; 1.1		
Banks	Right bank steep, past vertical in some sections. Left bank more gentle slope with some terrace sections. Slump and undercutting evident. Incision evident throughout reach.		
Instream Features	2 x 1.05 m culverts under Highway. Culverts significantly blocked by tree stump that has washed down creek. Rusty combine harvester dumped in creek, 10 m up from road crossing. Concreted rock protection side of channel, erosion occurring around this protection. Woody debris in channel. Large sandy deposits in channel.		
Floodplain Description	Potential for lateral adjustment of channel within floodplain.		

Looking downstream on downstream side or Existing Highway

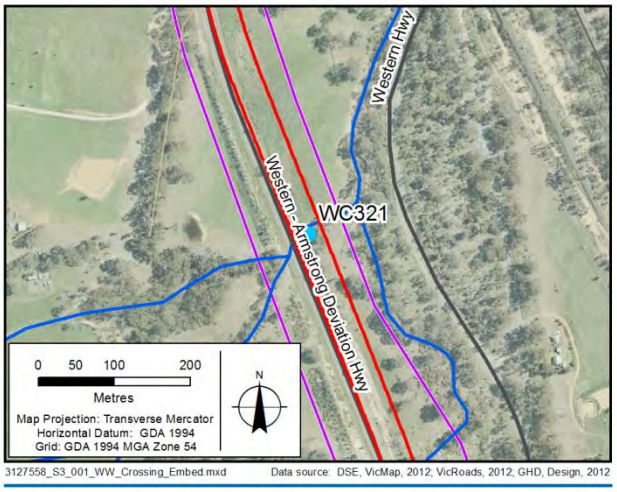


GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC321		Basin	Wimmera River, WMCA
Waterway Name	Tributary to Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	35		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6-33-2		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Bushland/road reserve		Aquatic ecology	Reeds, grasses
Catchment Area (ha)	150		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 667070 **N** 5881195	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Active erosion, therefore very dynamic geometry. Height up to 4 m width 3 – 8 m. Many smaller tributaries with attempted stabilisation rock work join the channel. Incised small channel within greater channel shows drop of approx. 20 cm from last recent event.		
- Channel gradient	1.8 %		
- Channel sinuosity	Low sinuosity; 1.1		
Banks	Very steep banks. Mostly near vertical banks. Slump, some undercutting, incision. Some deposition of sands. Exposed banks and veg being ripped out and covered in further debris coming downstream.		
Instream Features	2 x 1050 culverts under Existing Highway. Small standing water pool. Lots of rock work along reach at smaller trib. confluences. Sandy bed with 45º banks downstream of culvert- extends 10 m. Rock work and PVC pipe at 10 m mark. This was probably a weir though now washed out.		
Floodplain Description	On hill slope coming down to main creek so probably doesn't have a floodplain.		

Looking downstream, 50 m from road culverts

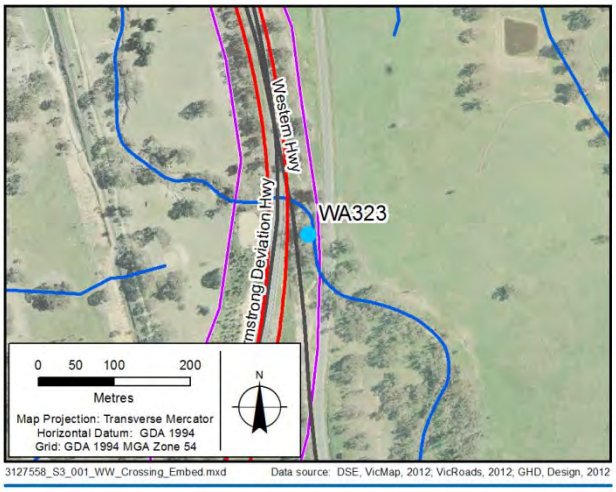


GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WA323		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	26 +(35+33+32a)		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Agricultural sheep grazing upstream and lightly treed road reserve/river frontage		Aquatic ecology	Reeds
Catchment Area (ha)	2800		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 667190 **N** 5882595	**Geomorphic Classification**	Partially confined
Channel planform			
- Channel geometry	Sinuous channel, height 2-3 m, width 6-10 m. Active incision widening channel through bends. Widening of channel up to 25 m at box culverts under Existing Highway.		
- Channel gradient	0.3 %		
- Channel sinuosity	Low sinuosity; 1.14		
Banks	Undercutting, incision and slump occurring. Lots of deposited sand - bank attached sand bars and across entire channel bed. Bank angle from 40º to vertical. Some exposed roots.		
Instream Features	Bridge over Old Highway. Existing Highway 3 x 2.4 m x 2.4 m box culverts. Permanent pools. Some woody debris. Sandy channel constrictions.		
Floodplain Description	Large floodplain upstream, beyond where road is proposed to go, up to 200 m from either bank. Currently the Railway and Existing and Old Highways pose restriction on floodplain on both left and right banks. Potential for lateral adjustment upstream of Old Highway bridge and downstream of Existing Highway (as can be seen in the last photo)		
Comments	Head cut from road drain from Old Highway. Drains into Concongella Creek just upstream of Existing Highway culverts. Needs formal channel and protection from scour.		

Looking downstream, facing north, directly under proposed alignment of road

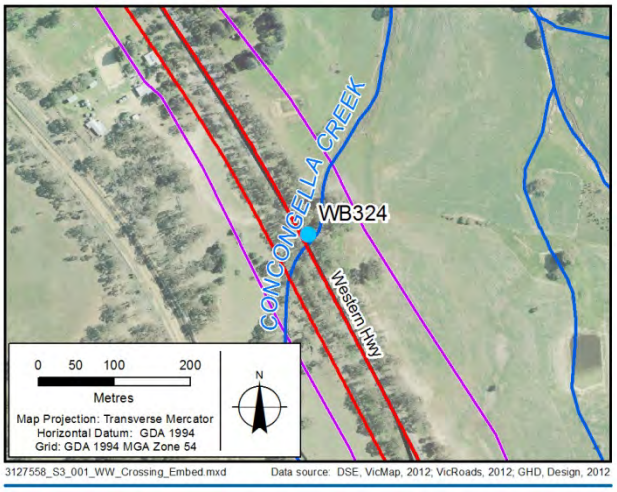


GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB324		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	26 +(35+33+32a)		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Cleared for sheep grazing, and road reserve		Aquatic ecology	Reeds, sedges
Catchment Area (ha)	2950		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 666905 **N** 5883390	**Geomorphic Classification**	Partially confined
Channel planform			
- Channel geometry	Large sand deposits on upstream creek bed significantly reducing channel depth, depth 0.5 – 1 m, width 5 m. Under road bridge depth increases to 2 m, width 10 m; continues like this 10 m downstream. Pool downstream of bridge 15 m long, 3 m wide.		
- Channel gradient	0.4 %		
- Channel sinuosity	Straight; 1.04		
Banks	Exposed banks with slump, accretion of soil/sand and huge deposits. Some large red gums along bank margin.		
Instream Features	Sand banks/mounds. Some debris from recent event in channel. Standing water in pools. Rock protection on road bridge.		
Floodplain Description	Partially confined, creek close to valley margin on left bank, especially upstream of road bridge. Downstream of bridge floodplain more broad.		
Comments	Service road- adjust alignment to cross more perpendicular to creek and reduce crossing length.		

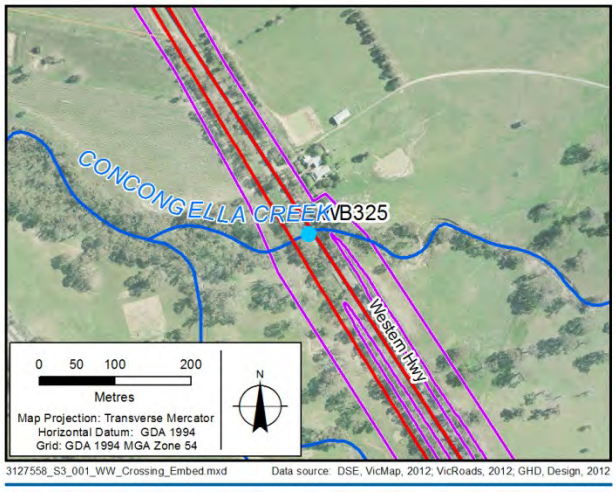
Looking downstream, immediately downstream of bridge



GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB325		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	26a+26 +(35+33+32a)		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Road reserve. Cleared grazing		Aquatic ecology	Reeds, sedges.
Catchment Area (ha)	3650		Disturbance rating	High
Flow Characteristics	Permanent			

Site Inspection			
GPS Location	**E** 666120 **N** 5884590	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	2 m deep, up to 5 m wide upstream of bridge. Channel opens out, approx. 15 m wide at road bridge		
- Channel gradient	0.2 %		
- Channel sinuosity	Moderately sinuous; 1.12		
Banks	Slump and undercutting. Large fallen tree across bank upstream of bridge.		
Instream Features	Bank attached sand bar. Small mid-stream sands bar downstream of bridge. Broad pool under Existing Highway.		
Floodplain Description	Broad floodplain. Downstream culvert small rise on right bank restricting floodplain. Vineyard downstream on right bank. Possibly with levees and internal drainage.		



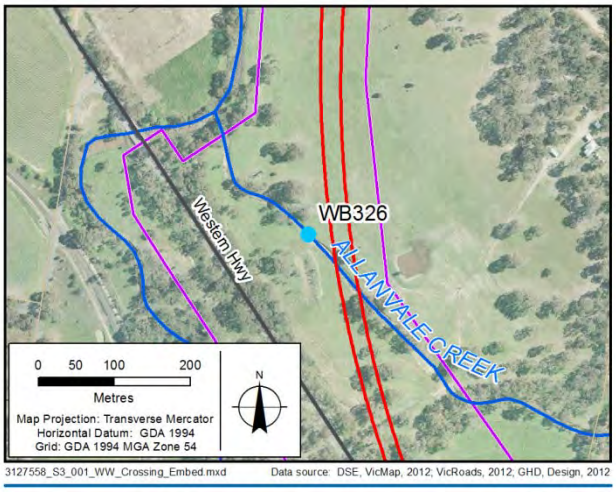
GIS aerial image of site

Looking downstream from bridge

Waterway Crossing			**Regional River Health Strategy**	
Crossing Number	WB326		Basin	Wimmera River, WMCA
Waterway Name	Allenvale Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	65: Upper Tributary of Allenvale Creek.
Catchment Reference (Bonacci)	25		ISC rating (score)	Moderate (19) *ISC reach # 50*
Designated Waterway Reference	15/1-66-6-28		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Cleared. Horses grazing.		Aquatic ecology	Reeds, grasses, sedges.
Catchment Area (ha)	2650		Disturbance rating	High
Flow Characteristics	Ephemeral (possible flow-leeching through sand at time of site visit)			

Site Inspection			
GPS Location	**E** 665400 **N** 5885910	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Up to 6 m wide, 2 – 1.5 m deep. Large sand deposit mid channel. Open water along most of reach- seep through dry sand bank section? Short banks. Some sandy islands mid-channel.		
- Channel gradient	0.01%		
- Channel sinuosity	Straight; 1.04		
Banks	Sand deposits, bank-attached and mid-channel. Some undercutting.		
Instream Features	Open pools with narrower vegetated channels. Some woody debris recently washed in. Farm dam through middle of proposed alignment.		
Floodplain Description	Wide floodplain, approx. 100 m either bank. Parallel high flow channels on either bank. Existing Highway presents barrier to floodplain on left bank.		
Comments	Further downstream from crossing (coords E 665522 N 5885750) footprint from proposed alignment will severely impact on floodplain storage.		

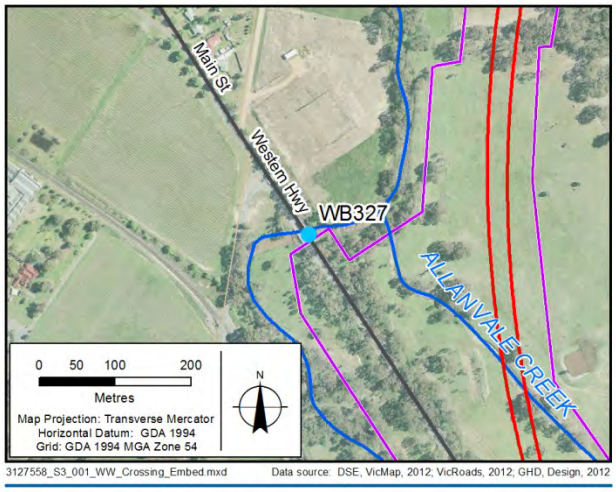
From right bank looking back upstream, mid-reach.



GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB327		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	25+43+26a+26+(35+33+32a)		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	River reserve, lightly vegetated		Aquatic ecology	Reeds, rushes.
Catchment Area (ha)	4500		Disturbance rating	High
Flow Characteristics	Permanent (flow observed)			

Site Inspection			
GPS Location	**E** 665180 **N** 5886040	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Channel width 20 m. Standing pool approx. 0.6 – 0.8 m.		
- Channel gradient	0.3 %		
- Channel sinuosity	Sinuous; 1.35		
Banks	Well vegetated		
Instream Features	Stone riprap. Very large permanent pool.		
Floodplain Description	Large floodplain		
Comment	Not much height between soffit of bridge and water level- esp. given site visit during dry summer conditions.		

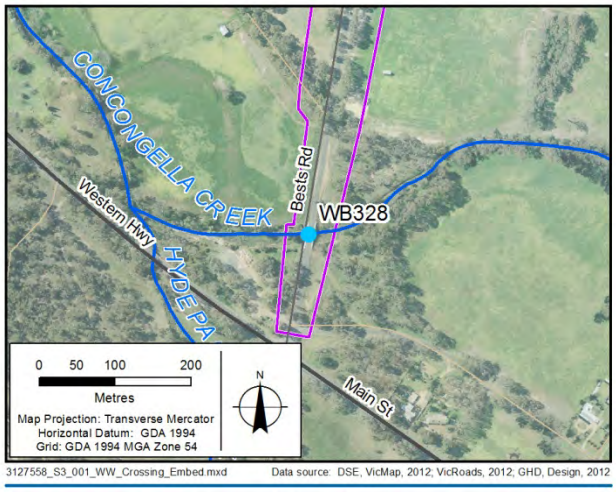


GIS aerial image of site

Looking downstream from bridge

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB328		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	66: Tributary of Concongella Creek
Catchment Reference (Bonacci)	25+43+26a+26+(35+33+32a)		ISC rating (score)	Moderate (25) *ISC reach # 51*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	River reserve, lightly vegetated		Aquatic ecology	Reeds, rushes.
Catchment Area			Disturbance rating	High
Flow Characteristics	Permanent (flow observed)			

Site Inspection			
GPS Location	**E** 663675 **N** 5887545	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Wide channel, up to 20 m wide at Bests Bridge. Channel straight under bridge, begins to bend approx. 100 m downstream and 250 m upstream. Permanent pool of unknown depth under bridge. Island downstream of bridge.		
- Channel gradient	0.2 %		
- Channel sinuosity	Low sinuosity; 1.06		
Banks	Gentle slopes, lightly vegetated with exposed sections. Some undercutting. Deposition of sands.		
Instream Features	Large pool under bridge. Vegetated island downstream of bridge. Bank attached bar.		
Floodplain Description	Constrained floodplain by Existing Highway on left bank.		

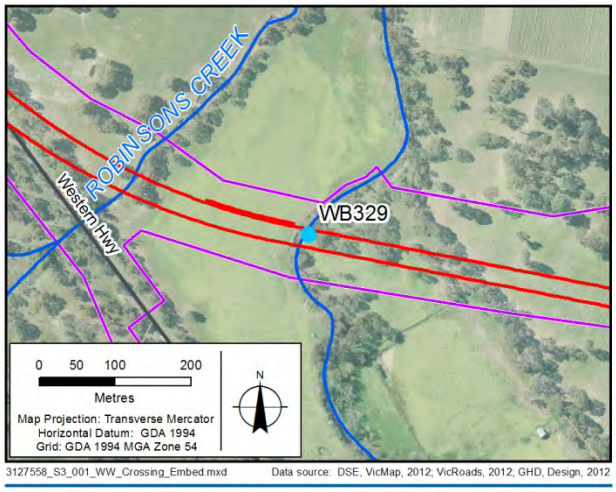


GIS aerial image of site

Looking downstream from bridge

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB329		Basin	Wimmera River, WMCA
Waterway Name	Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	31: Concongella Creek
Catchment Reference (Bonacci)	27+25+43+26a+26+(35+33+32a)		ISC rating (score)	Moderate (24) *ISC reach # 49*
Designated Waterway Reference	15/1-66-6		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Cleared for sheep grazing		Aquatic ecology	Reeds, aquatic grass, algae
Catchment Area (ha)	9050		Disturbance rating	High
Flow Characteristics	Permanent (flow observed)			

Site Inspection			
GPS Location	**E** 663255 **N** 5888075	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Varying geometry; terrace on right bank. 3 m to top of bank, terrace 0.6 m. Terrace extends laterally 2 m. Low flow channel 0.4 m deep. A few pools- 4 m diameter. Channel width 2 m. Palaeochannel through bend at downstream end of reach, 0.8 m deep, 3 m wide.		
- Channel gradient	0.2 %		
- Channel sinuosity	Low sinuosity; 1.21		
Banks	Left bank 45-60º to top of bank. Right bank 2 m terrace, then another approx. 3 m with moderate bank angle. Undercutting and slump. Some exposed roots.		
Instream Features	Large woody debris in places- whole tree down. Bank attached sand bars.		
Floodplain Description	Large floodplain. Confined along left bank by rise very close to top of bank, approx. 30 m. On right bank flood plain more than 150 m.		



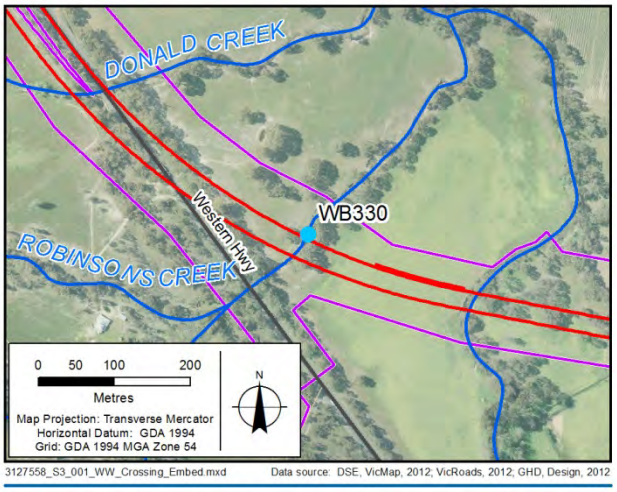
GIS aerial image of site

Looking upstream, mid-reach

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB330		Basin	Wimmera River, WMCA
Waterway Name	Robinsons Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	31: Concongella Creek
Catchment Reference (Bonacci)	28		ISC rating (score)	Moderate (24) *ISC reach # 49*
Designated Waterway Reference	15/1-66-6-26		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Cleared for sheep grazing		Aquatic ecology	Reeds
Catchment Area (ha)	880		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 663030 **N** 5888160	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Up to 1 m deep channel. Pool 10 m wide immediately downstream of road culverts. Further downstream channel is between 4 m and 1.5 wide. Some narrower sections in channel with a few open shallow pools.		
- Channel gradient	0.7 %		
- Channel sinuosity	Low sinuosity; 1.08.		
Banks	Sandy deposits. Some undercutting and slump along channel. Significant scour of banks at downstream side of Existing Highway culverts.		
Instream Features	3 x 1.2 m square box culverts. Drop from invert level of apron level to channel bed approx. 0.7 m (300 mm concrete lip + 400 mm to water surface of pool). Some exposed bed rock in channel downstream. Seep pools, approx. 100 m downstream from property fence, held by this bed rock. Still water, approx. 0.5 m deep.		
Floodplain Description	Right bank- 40 m. Left bank- extends to next creek (Donald Creek, see *WB331*), approx. 270 m. Likely part of greater floodplain of Concongella Creek (next creek to the east)		
Comments	Water has been over the road in a recent flood event. Lots of debris on road railings. Therefore must upgrade of culvert size and fill invert level.		

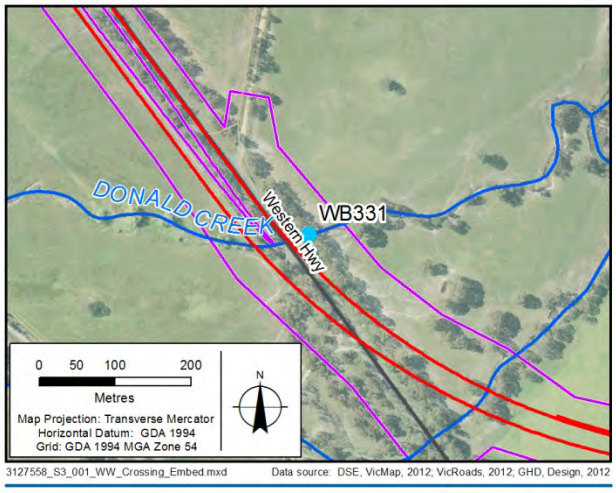
Looking downstream at downstream end of reach



GIS aerial image of site

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB331		Basin	Wimmera River, WMCA
Waterway Name	Donald Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	31: Concongella Creek
Catchment Reference (Bonacci)	28		ISC rating (score)	Moderate (24) *ISC reach # 49*
Designated Waterway Reference	15/1-66-6-25		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Crown land		Aquatic ecology	Reeds, sedges, pastoral grasses
Catchment Area (ha)	750		Disturbance rating	High
Flow Characteristics	Permanent (flow observed)			

Site Inspection			
GPS Location	**E** 662790 **N** 5888360	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	Channel up to 5 m wide, 1.5 m deep with low flow channel 30 cm deep 1 m wide.		
- Channel gradient	1.1 %		
- Channel sinuosity	Straight; 1.05. (Low sinuosity through reach upstream or alignment; 1.11)		
Banks	Exposed banks with slump. Deposition of sands. Some large exposed tree roots. Active lateral head cuts.		
Instream Features	3 x 1.2 m culverts and a 2.4 m wide x 1.5 m high box culvert. Roadside drain directed into channel via drain with rockwork. Some medium trees in stream immediately downstream of road culverts. Large gum with significant undercutting, creating deep pool. Another pool 8 m radius, in grazing paddock.		
Floodplain Description	Broad floodplain, probably within greater floodplain of nearby Concongella Creek.		

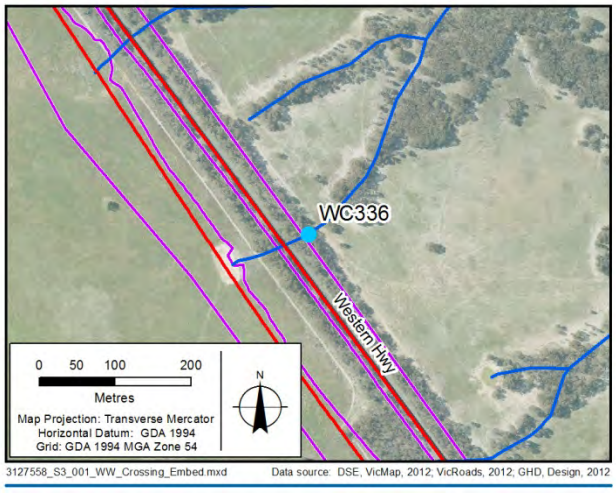


GIS aerial image of site

Looking upstream, north of Existing Highway

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC336		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	31: Concongella Creek
Catchment Reference (Bonacci)	29		ISC rating (score)	Moderate (24) *ISC reach # 49*
Designated Waterway Reference	n/a		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Agricultural- cleared for grazing. Some fenced sections lightly treed.		Aquatic ecology	Nil.
Catchment Area (ha)	14		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 661150 **N** 5890575	**Geomorphic Classification**	Confined
Channel planform			
- Channel geometry	Unchannelled hillslope.		
- Channel gradient	3.6 %		
- Channel sinuosity	n/a		
Banks	n/a		
Instream Features	n/a		
Floodplain Description	No floodplain- confined; at top of hill.		
Comments	No culverts under Existing Highway sighted.		

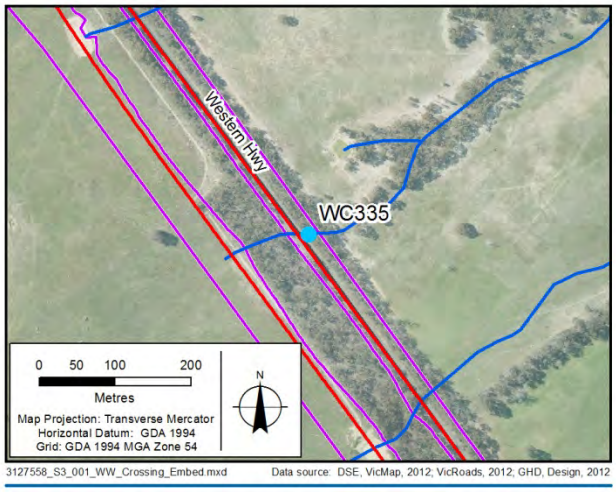


GIS aerial image of site

Looking downstream

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WC335		Basin	Wimmera River, WMCA
Waterway Name	Tributary of Concongella Creek		Management Unit	4. Concongella Creek
Catchment System	Concongella		Reach	31: Concongella Creek
Catchment Reference (Bonacci)	29		ISC rating (score)	Moderate (24) *ISC reach # 49*
Designated Waterway Reference	15/1-66-6-22		Critical threats to sub-catchment	
General			**Ecological Values**	
Land Use Description	Agricultural- cleared for grazing. Some fenced sections lightly treed.		Aquatic ecology	Nil.
Catchment Area (ha)	18		Disturbance rating	High
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 661345 **N** 5890275	**Geomorphic Classification**	Confined
Channel planform			
- Channel geometry	Unchannelled hillslope.		
- Channel gradient	2.5 %		
- Channel sinuosity	n/a		
Banks	n/a		
Instream Features	375 mm culvert under Existing Highway		
Floodplain Description	No floodplain- confined; at top of hill.		

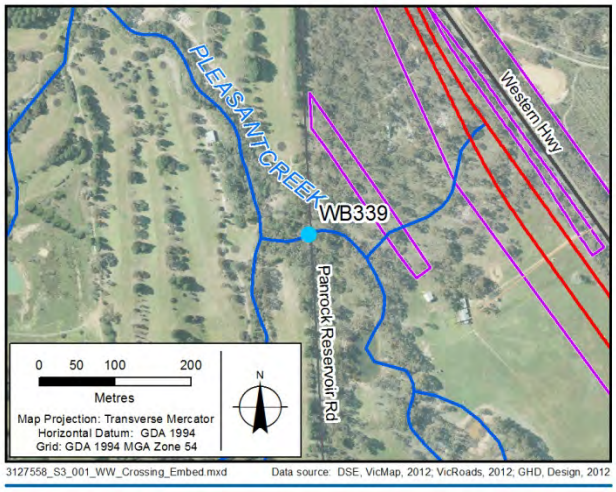


GIS aerial image of site

Looking downstream

Waterway Crossing			Regional River Health Strategy	
Crossing Number	WB339		Basin	Wimmera River, WMCA
Waterway Name	Pleasant Creek		Management Unit	5. Upper Mt William Creek
Catchment System	Pleasant Creek		Reach	n/a
Catchment Reference (Bonacci)	31		ISC rating (score)	n/a
Designated Waterway Reference	15/1-50-22		Critical threats to sub-catchment	n/a
General			**Ecological Values**	
Land Use Description	Bushland. Golf course downstream		Aquatic ecology	Reeds
Catchment Area (ha)	590		Disturbance rating	Medium
Flow Characteristics	Ephemeral			

Site Inspection			
GPS Location	**E** 659445 **N** 5892340	**Geomorphic Classification**	Unconfined
Channel planform			
- Channel geometry	0.5 m deep, 3 m wide channel. Large, flat opening on upstream side of road culverts.		
- Channel gradient	0.4 %		
- Channel sinuosity	Low sinuosity; 1.29		
Banks	Well vegetated. Steep but short banks.		
Instream Features	3 x 1.5 m road culverts. Standing water in pool downstream of the road culverts.		
Floodplain Description	Broad floodplain well treed. 70 m to the left bank. 20 m to the right bank, confined by small rise.		

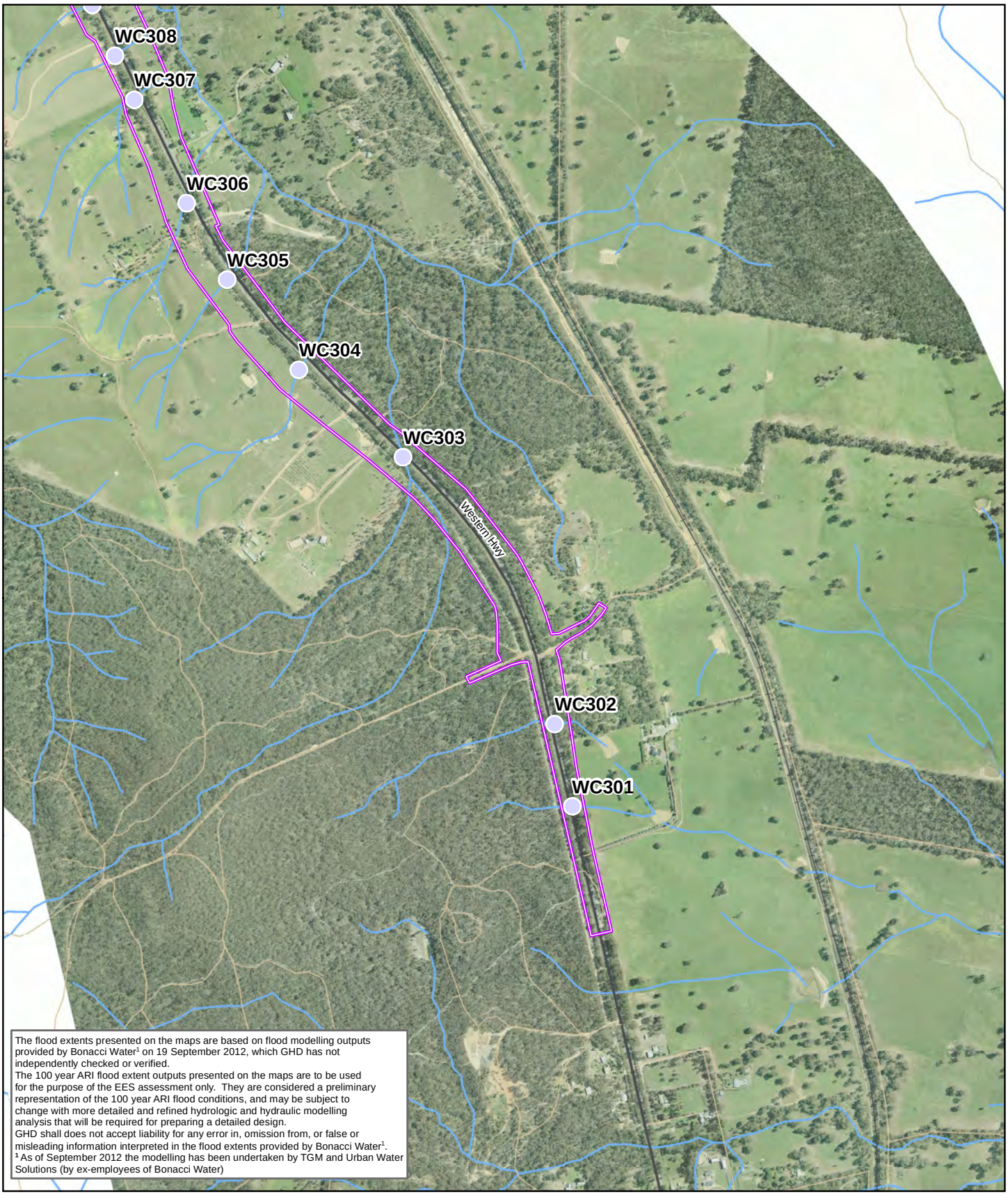


GIS aerial image of site

Looking downstream from the road crossing

Appendix C

Waterway Crossing & Alignment including Flood Extent - Mapbook



The flood extents presented on the maps are based on flood modelling outputs provided by Bonacci Water[1] on 19 September 2012, which GHD has not independently checked or verified.
The 100 year ARI flood extent outputs presented on the maps are to be used for the purpose of the EES assessment only. They are considered a preliminary representation of the 100 year ARI flood conditions, and may be subject to change with more detailed and refined hydrologic and hydraulic modelling analysis that will be required for preparing a detailed design.
GHD shall does not accept liability for any error in, omission from, or false or misleading information interpreted in the flood extents provided by Bonacci Water[1].
[1] As of September 2012 the modelling has been undertaken by TGM and Urban Water Solutions (by ex-employees of Bonacci Water)

LEGEND

100yr Modelled Flood Depth (m)
- 0 - 0.6
- 0.61 - 1.2
- 1.3 - 1.8
- 1.9 - 2.4
- 2.5 - 3

Waterway Crossings
- Minor
- Moderate
- Major

Maximum Construction Footprint
Highway
Sealed road (arterial & local)
Unsealed road
Major water area
River
Stream
Channel / drain
Connector

Paper Size A4
0 125 250 500
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

CLIENTS | PEOPLE | PERFORMANCE

VicRoads
Western Highway Project
Ararat to Stawell
Waterway Crossings &
Modelled Flood Extents **Sheet 1**

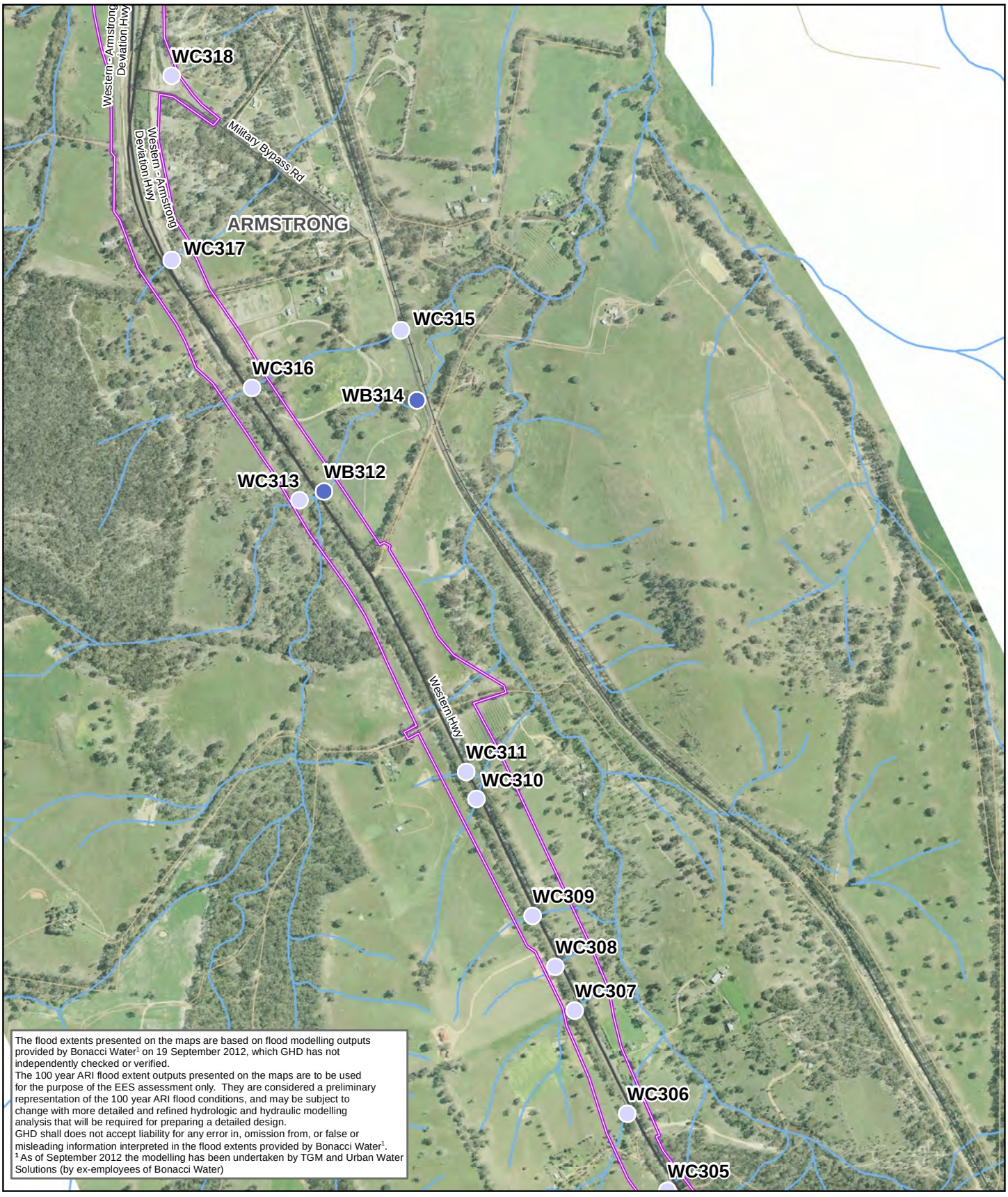
Job Number 31-27558
Revision D
Date 21 Nov 2012

Appendix C

180 Lonsdale Street Melbourne VIC 3000 Australia **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com **W** www.ghd.com

G:\31\27558\GIS\Maps\Deliverables\Stage 3\RISK AND IMPACT ASSESSMENT\06_SURFACE_WATER\3127558_S3_004_Flood_Extents_A4P_MB_AppC.mxd

Data source: DSE, VicMap, 2012; VicRoads, 2012; Flooding data: Bonacci, 2012; TGM, 2012. Created by:splaird



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LEGEND

100yr Modelled Flood Depth (m)
- 0 - 0.6
- 0.61 - 1.2
- 1.3 - 1.8
- 1.9 - 2.4
- 2.5 - 3

Waterway Crossings
- Minor
- Moderate
- Major

- Maximum Construction Footprint
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Major water area
- River
- Stream
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- Connector

Paper Size A4
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Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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VicRoads
Western Highway Project
Ararat to Stawell
Waterway Crossings & Modelled Flood Extents **Sheet 2**

Job Number 31-27558
Revision D
Date 21 Nov 2012

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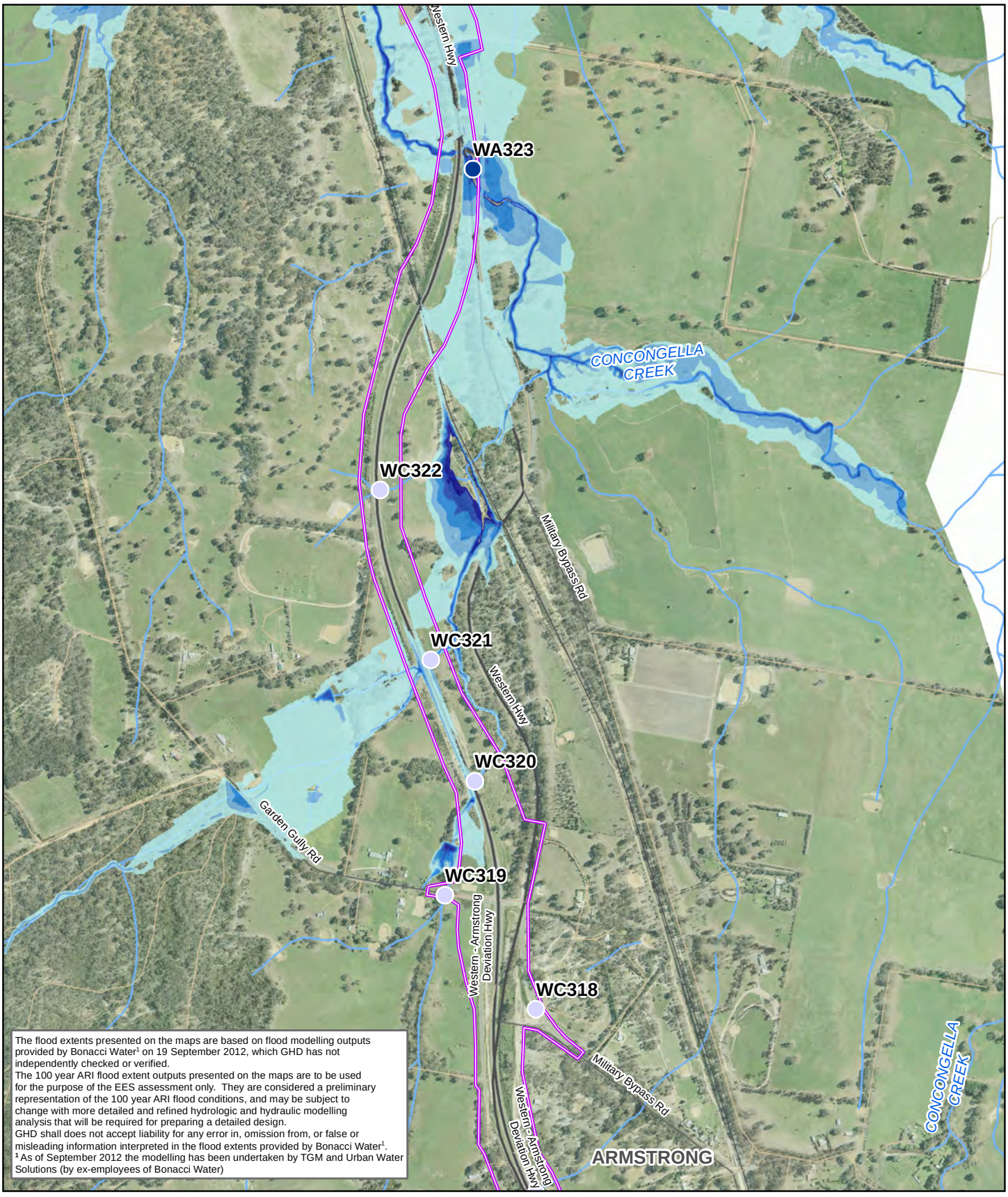

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VicRoads
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Ararat to Stawell
Waterway Crossings & Modelled Flood Extents **Sheet 3**

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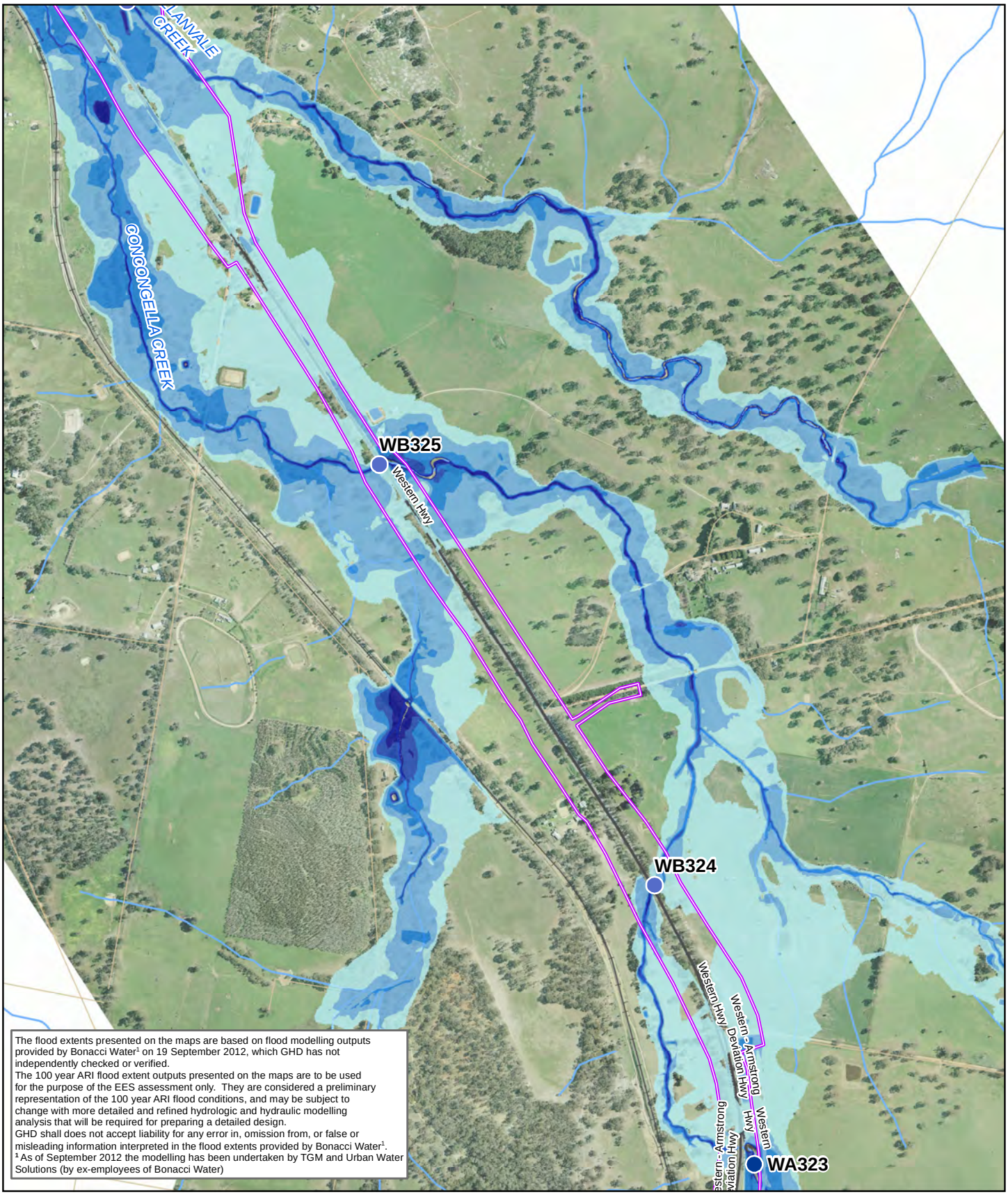

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Ararat to Stawell
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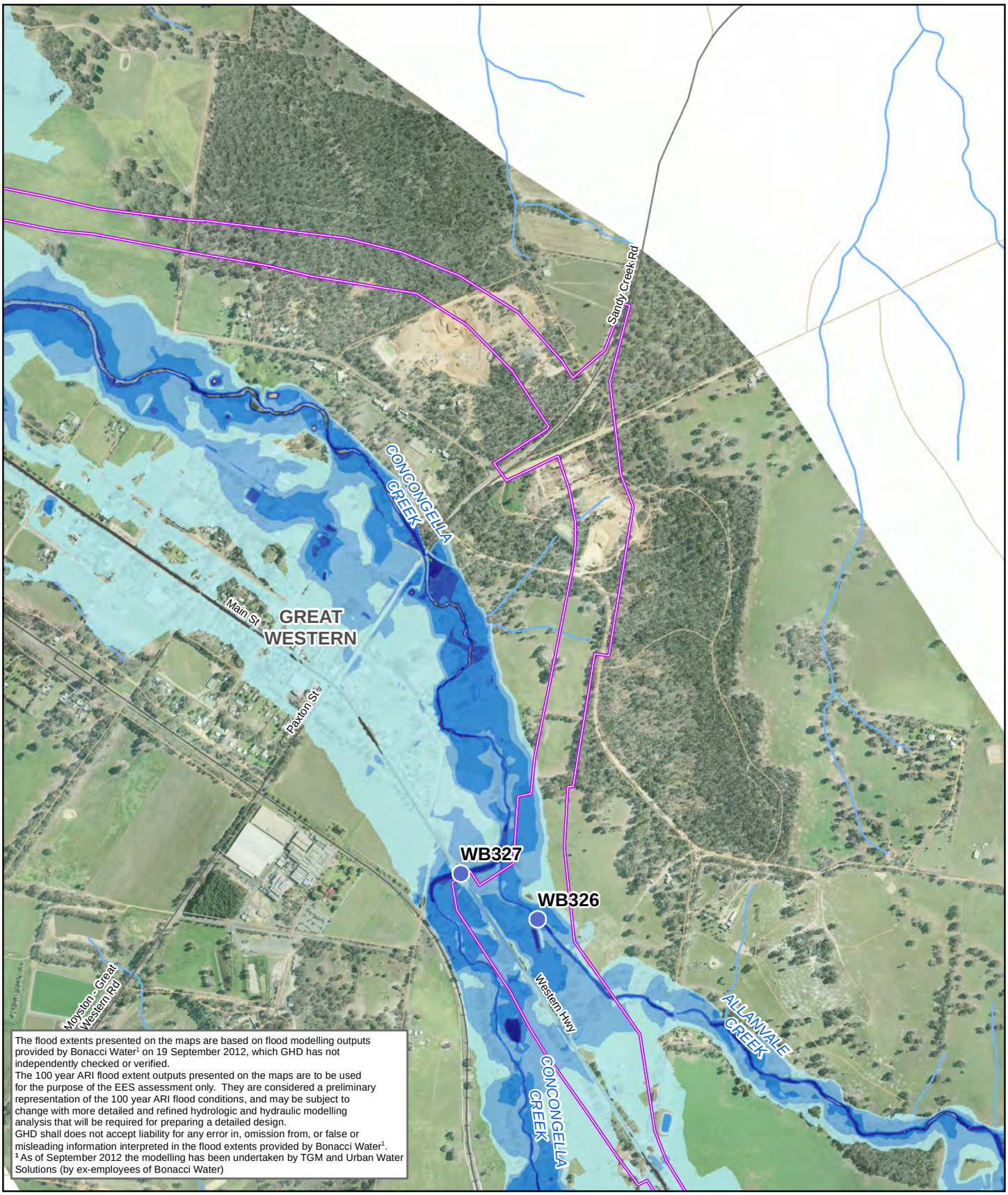

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Western Highway Project
Ararat to Stawell
Waterway Crossings &
Modelled Flood Extents **Sheet 5**

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Date 21 Nov 2012

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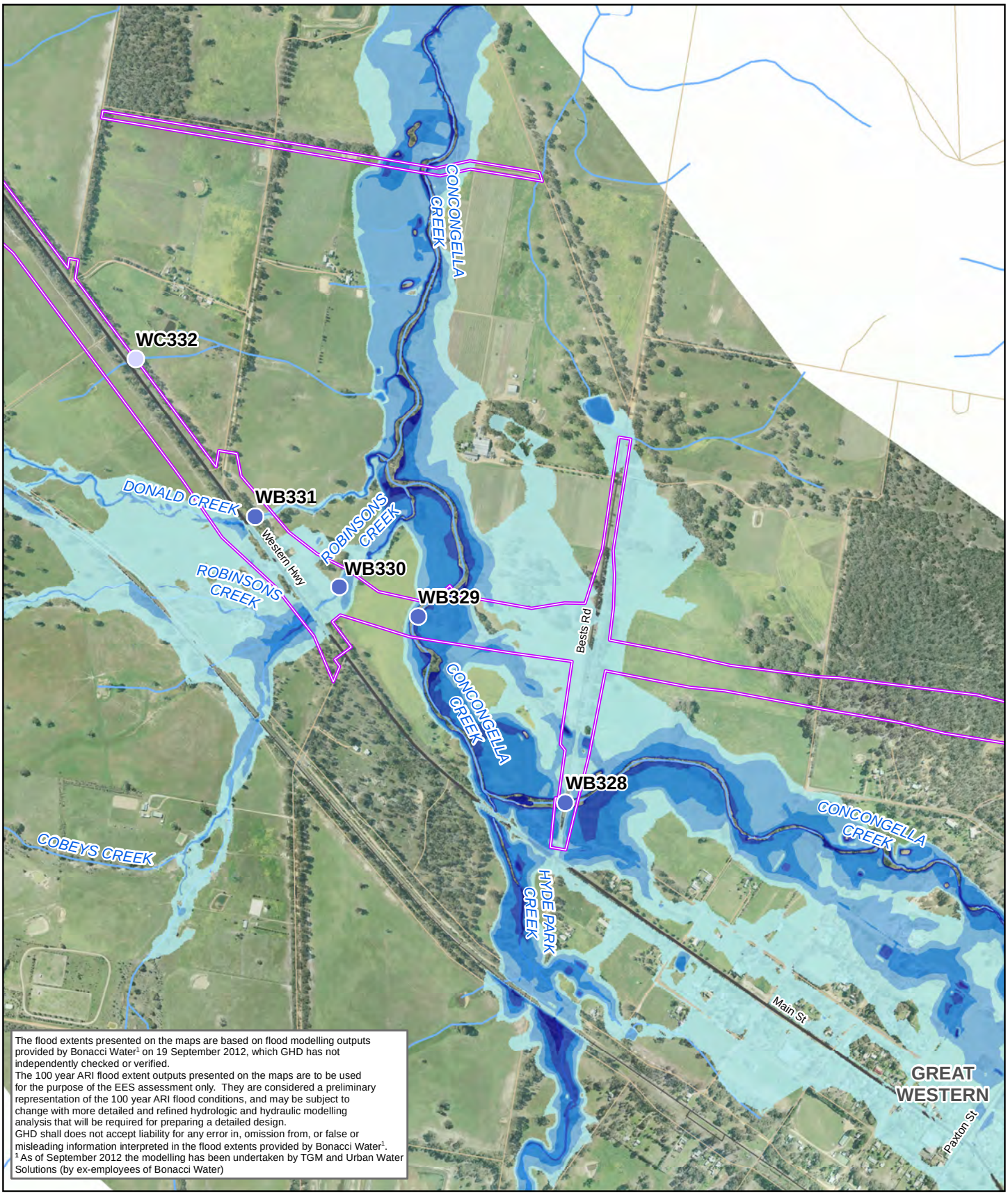

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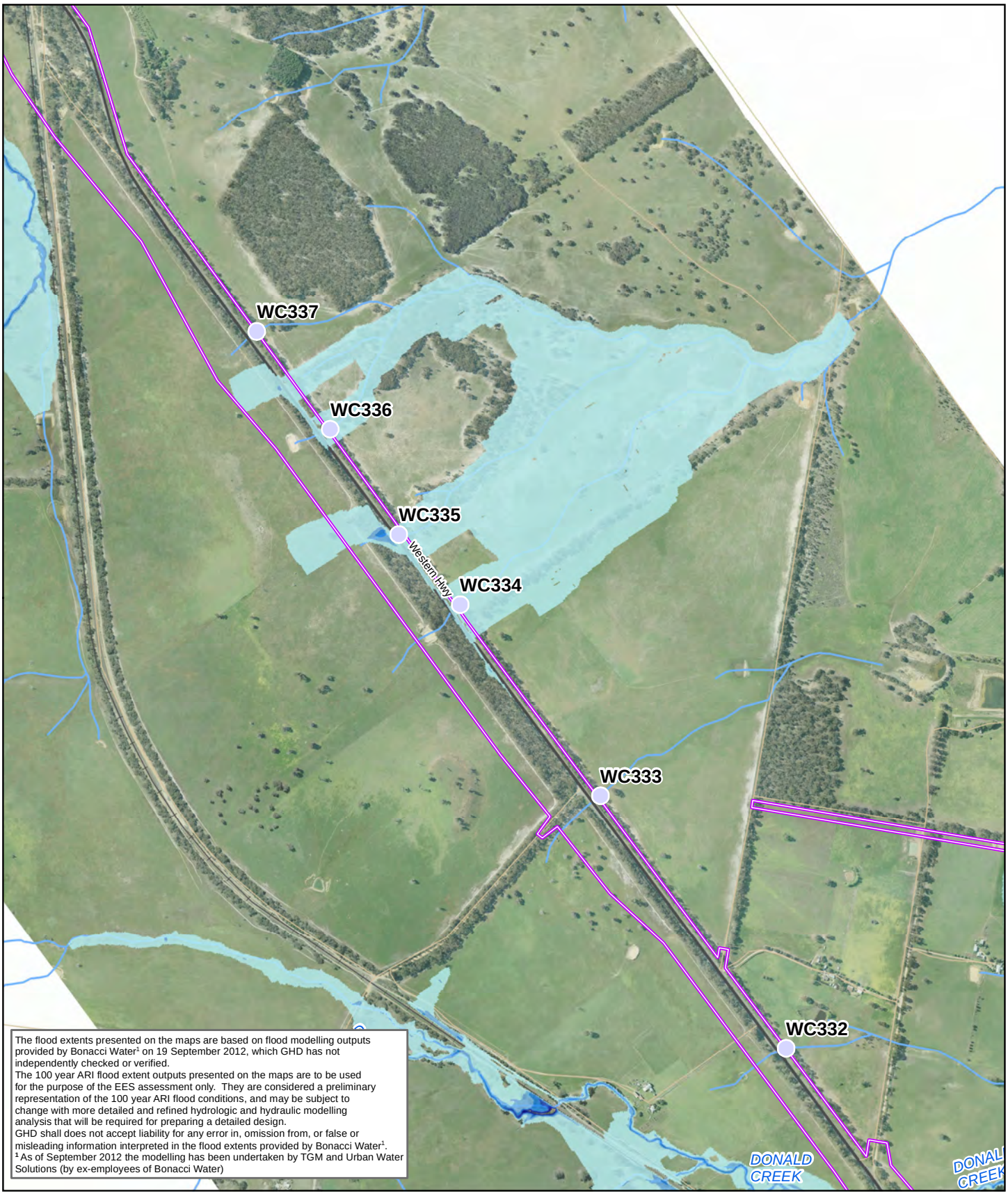

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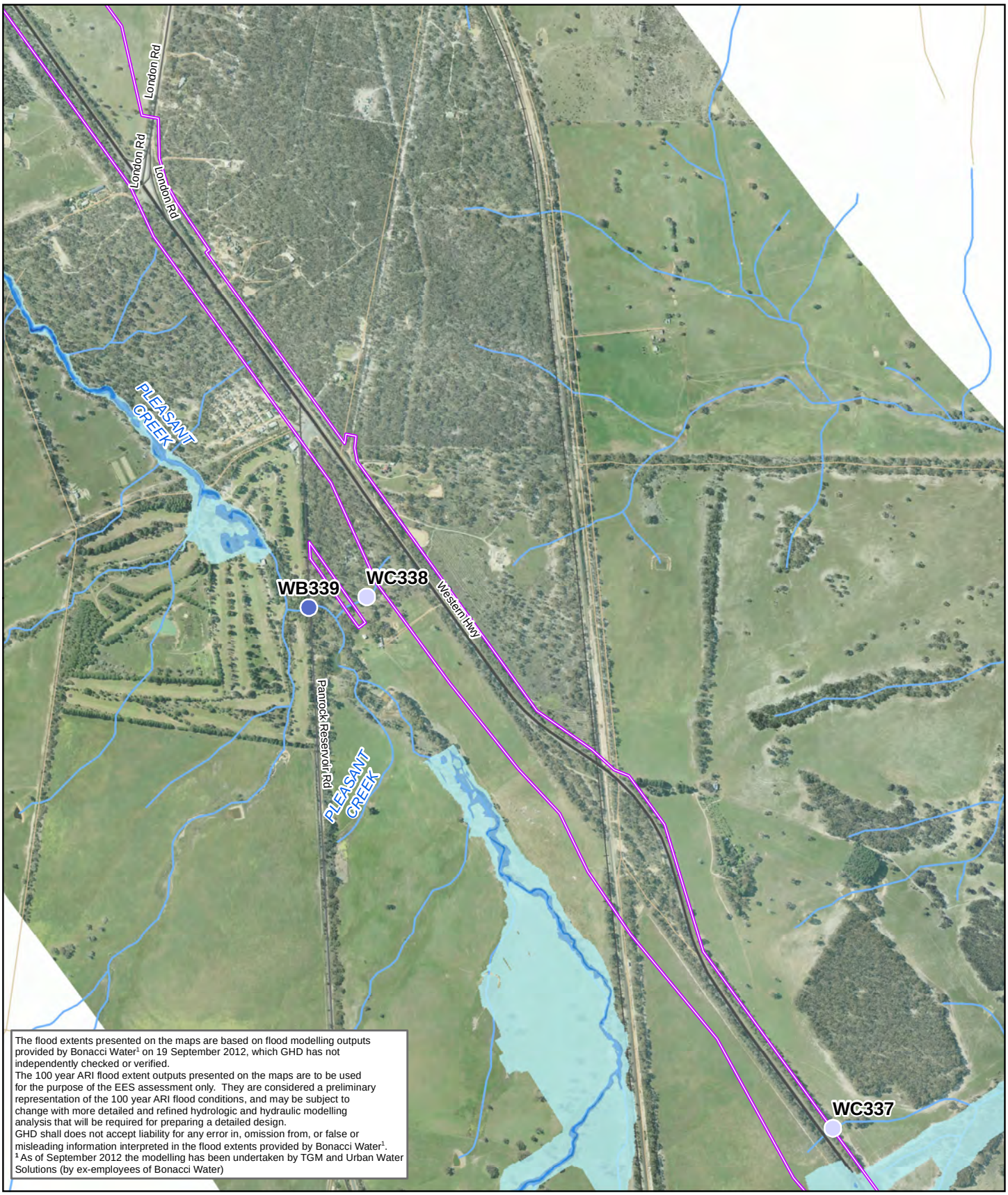

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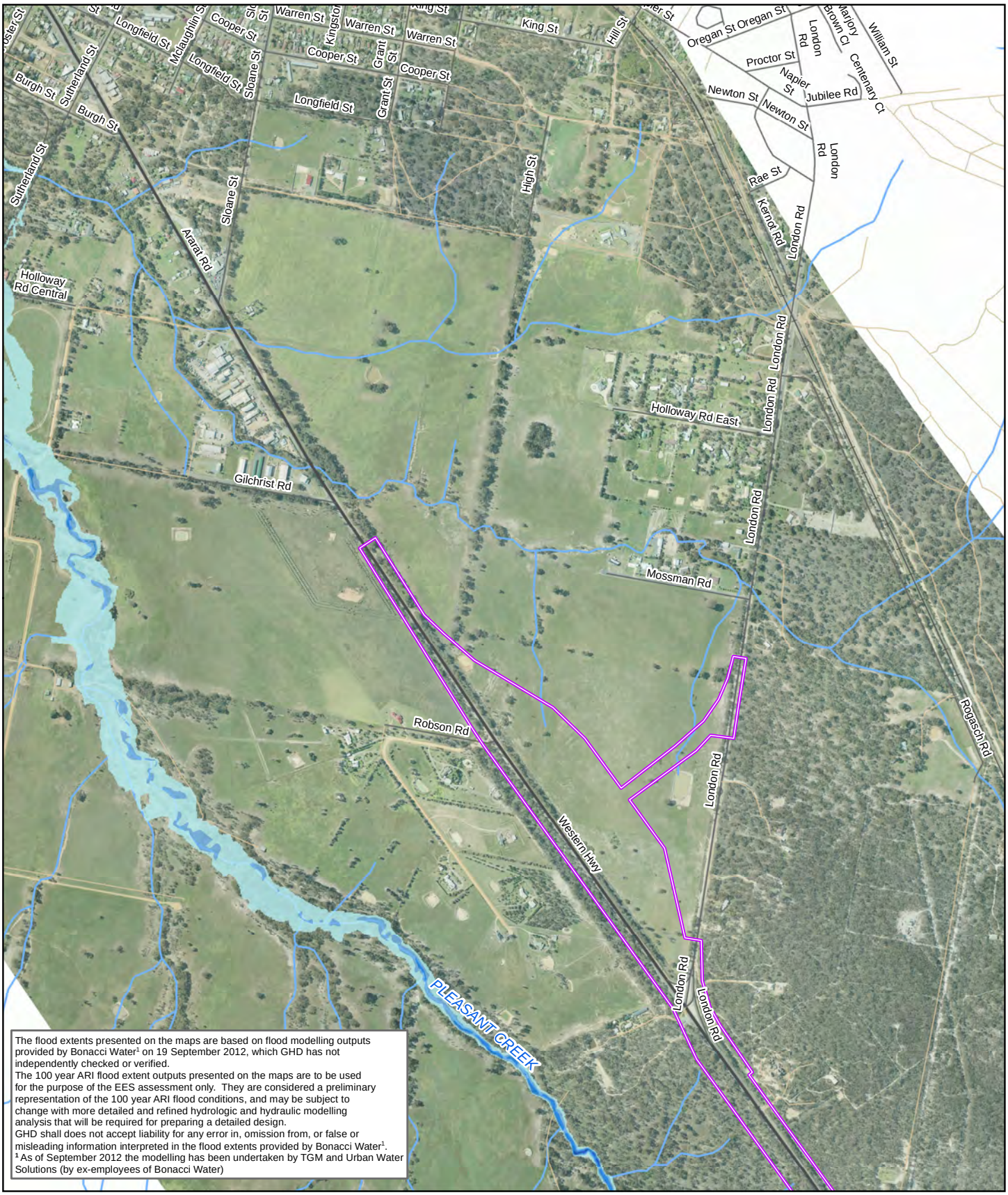

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Western Highway Project
Ararat to Stawell
Waterway Crossings & Modelled Flood Extents **Sheet 9**

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Revision	D
Date	21 Nov 2012

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Data source: DSE, VicMap, 2012; VicRoads, 2012; Flooding data: Bonacci, 2012; TGM, 2012. Created by:splaird

Appendix D

Water Sensitive Road Design

Water Sensitive Road Design (WSRD)

Runoff from roads have been shown to have detrimental impacts on receiving waters and the aquatic life they sustain, and can contribute to large pollutant loads compared to runoff from other land uses. These contaminants include:

- Particulate matter;
- Nutrients (nitrogen and phosphorus);
- Heavy metals;
- Petroleum based products;
- Organic compounds; and/ or
- Rubber products.

The treatment of road runoff is an important element of catchment management, owing to the expected high pollutant concentrations of metals and hydrocarbons generated from road surfaces.

There are many stormwater management elements for reducing the pollutants conveyed in road stormwater runoff. It should be noted that no single stormwater management measures can effectively remove the full range of pollutant types and particle sizes. Using a combination of these elements (referred to as a 'treatment train') helps to effectively manage stormwater to meet best practise treatment objectives and minimise environmental impacts.

There are a range of typical WSRD elements that could be adopted to target various pollutant types and particle sizes. Typically for a project of this nature, considering the space available and limited treatment options, a general treatment process using buffer strips and vegetated swales along both sides of the highway (where possible) within the road reserve, would be used. Provided it can be demonstrated, during detailed design, that the best practice treatment standards are being achieved by this regime, no additional treatments are expected to be required to treat stormwater runoff from the Project.

- **Buffer Strips**

  Buffer strips are basically strips of vegetation, generally located close to pollutant sources i.e. along the edge of the highway, and are usually incorporated as an initial method of pollutant treatment in a treatment train, where appropriate. Buffer strips are used to treat coarse and medium suspended solids from runoff, as well as some nutrients, and work most effectively for distributed runoff.

- **Vegetated or Grassed Swales**

  Swales are areas of open channel used to convey stormwater in lieu of pipes. They are used for the retention of coarse to fine sediments and reduction of pollutant loading (nitrogen and phosphorus), and provide a desirable buffer between receiving waters and impervious areas of a catchment. The effectiveness of the swale in pollutant treatment depends on factors such as hydraulic loading and the size, type and density of vegetation.

  Swales use overland flows and mild slopes to slowly convey water downstream. The interaction with vegetation promotes an even distribution of water and slowing of flows, thus encouraging coarse sediments to be retained.

  Swales can use a variety of vegetation types, or can simply be grassed. Vegetation is required to cover the whole width of the swale, be capable of withstanding design flows and be of sufficient density to provide good filtration. For best treatment performance, vegetation height should be above treatment flow water levels. If runoff enters directly into a swale, perpendicular to the main flow direction, the edge of the swale acts as a buffer and provides pre-treatment for the water entering the swale.

Appendix E

Waterway Crossings

UWCS/TGM Catchment	Culvert	GHD Crossing ID	Chainage	Waterway	Highway Alignment	Existing Crossing Type	Waterway Type
32-a	-	WC301	350	Tributary of Hopkins River	Existing, Proposed	Culvert	Minor
32-a	19	WC302	550	Tributary of Hopkins River	Existing, Proposed	Culvert	Minor
32	-	WC303	1450	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC304	1900	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC305	2150	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC306	2450	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC307	2800	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC308	2900	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC309	3050	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	-	WC310	3450	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
32	32	WC311	3500	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
33	-	WB312	4400	Concongella Creek	Existing, Proposed	Bridge	Significant
33	-	WC313	4400	Tributary of Concongella Creek	Proposed	n/a	Minor
35b	-	WC316	4750	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
35b	-	WC317	5200	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor

UWCS/TGM Catchment	Culvert	GHD Crossing ID	Chainage	Waterway	Highway Alignment	Existing Crossing Type	Waterway Type
35b	-	WC318	5750	Tributary of Concongella Creek	Proposed	n/a	Minor
35b	-	WC319	6100	Tributary of Concongella Creek	Proposed	Side road major culvert	Minor
35b	20	WC320	6450	Tributary of Concongella Creek	Existing, Proposed	Twin culverts	Minor
35a	21	WC321	6750	Tributary of Concongella Creek	Existing, Proposed	Twin culverts	Minor
43	-	WC322	7250	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
26	22	WA323	8200	Concongella Creek	Existing, Proposed	Major culverts	Significant
43	23	WB324	9100	Concongella Creek	Existing, Proposed	Bridge	Significant
26a	24	WB325	10550	Concongella Creek	Existing, Proposed	Major culverts	Significant
25	New	WB326	12050	Allanvale Creek	Proposed	n/a	Significant
43	25	WB327	12150	Concongella Creek	Existing, Proposed	Bridge	Significant
na		WB328	15400	Concongella Creek	Existing	n/a	Significant
27	26		n/a	Hyde Park Creek	Existing	Bridge	No New Crossing
na	New	WB329	15950	Concongella Creek	Proposed	n/a	Significant
28	27	WB330	16200	Robinsons Creek	Existing, Proposed	Major culverts	Significant

UWCS/TGM Catchment	Culvert	GHD Crossing ID	Chainage	Waterway	Highway Alignment	Existing Crossing Type	Waterway Type
28a	28	WB331	16500	Donald Creek	Existing, Proposed	Major culverts	Significant
29	-	WC332	17050	Tributary of Concongella Creek		Culvert	Minor
29	-	WC333	17950	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
29	29	WC334	18600	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
29	-	WC335	18850	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
29	-	WC336	19250	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
29	-	WC337	19600	Tributary of Concongella Creek	Existing, Proposed	Culvert	Minor
31	-	WC338	21600	Tributary of Pleasant Creek	Existing, Proposed	Culvert	Minor

Appendix F

Flood Mitigation Modelling

To:	**VicRoads Western Highway Duplication Project Team**
From:	Mark Colegate & Peter Coombes
Copy to:	Peter Preece
Date:	18th September 2012
Program:	Western Highway Duplication
Project:	**Flood Modelling – Section 3 (Iteration 2A and 2B)**
Topic:	Existing Flood Extent vs. Design Flood Extent
Reference:	11041-01

Purpose

This memo provides the 100 yr ARI design flood overlay for both the Existing and Design **iteration 2A** and **2B**. The Design flood overlay uses culverts identified in the design *iteration 2*. Assessment of a "no worsening" impact is achieved by comparing the design overlay to the existing overlay as shown in Figure 1 and 2 below.

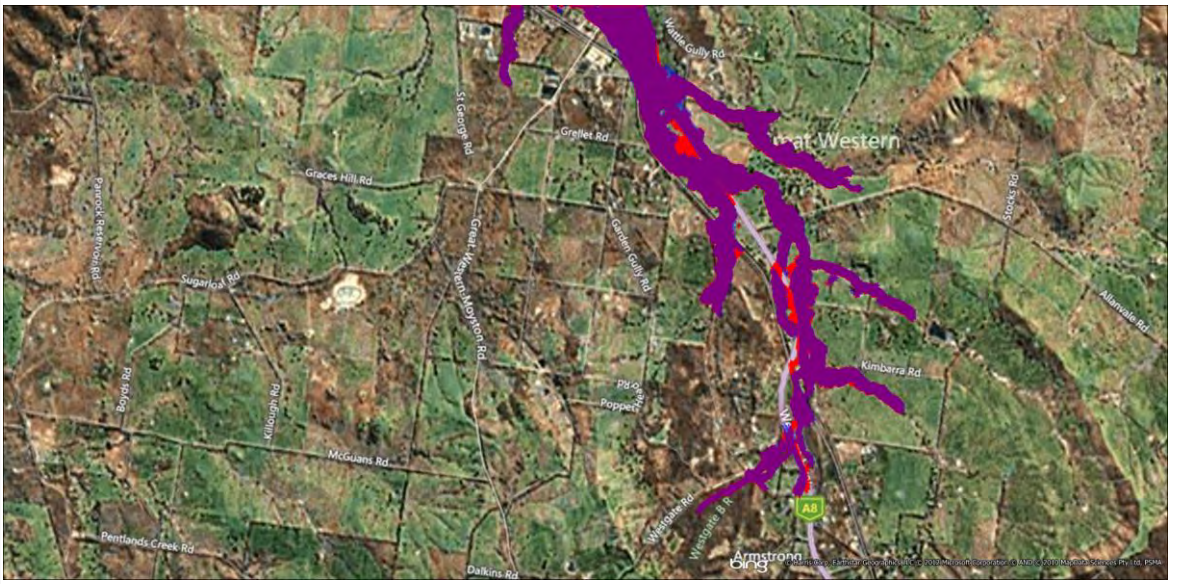

Figure 1: Comparison between iteration 2A design (blue) and existing (red) flooding

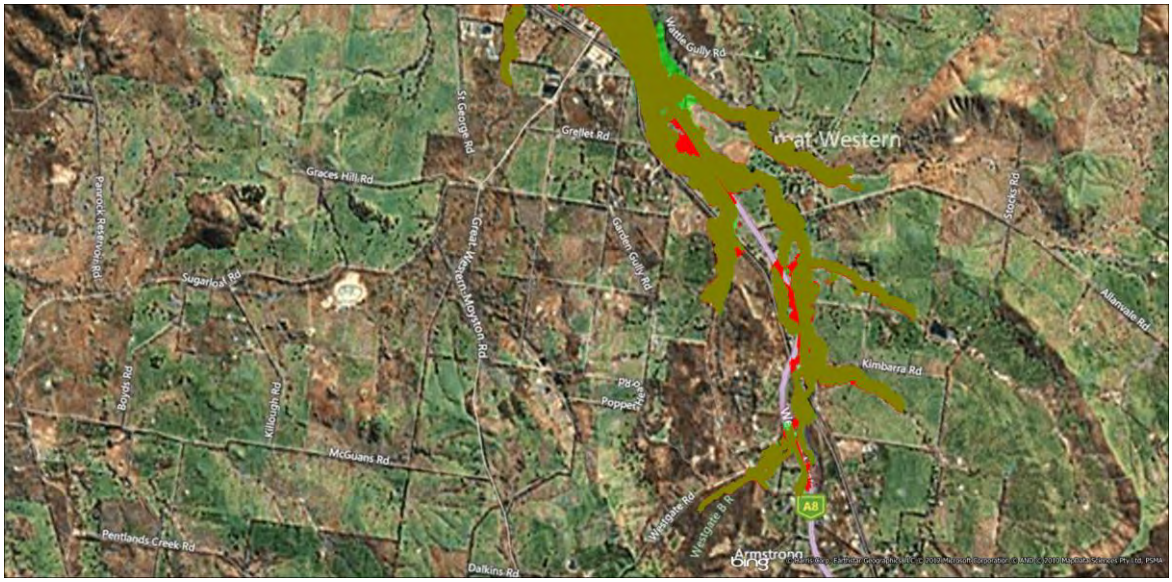

Figure 2: Comparison between iteration 2B design (green) and existing(red) flooding- Concongella Creek

Both iterations show a 'no-worsening' in flooding for the most part with improvement in a number of areas. The bypass still holds back some of the flood water in 2A and does so significantly in 2B, which is by design. The effects of this detention can be seen in Great Western in Figure 3 and 4.

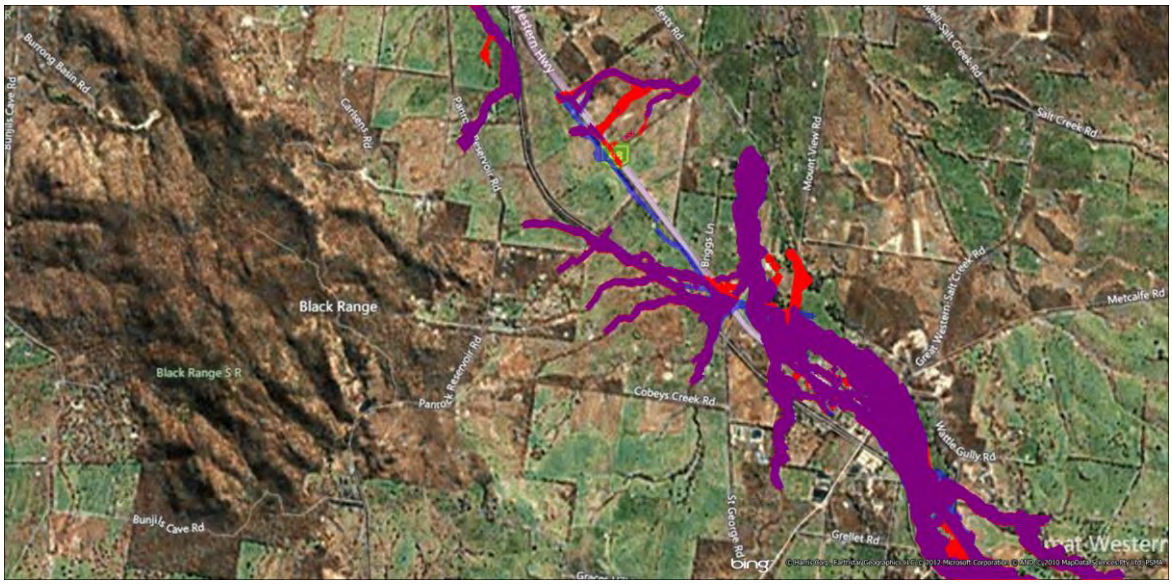

Figure 3: Comparison between iteration 2A design (blue) and existing (red) flooding

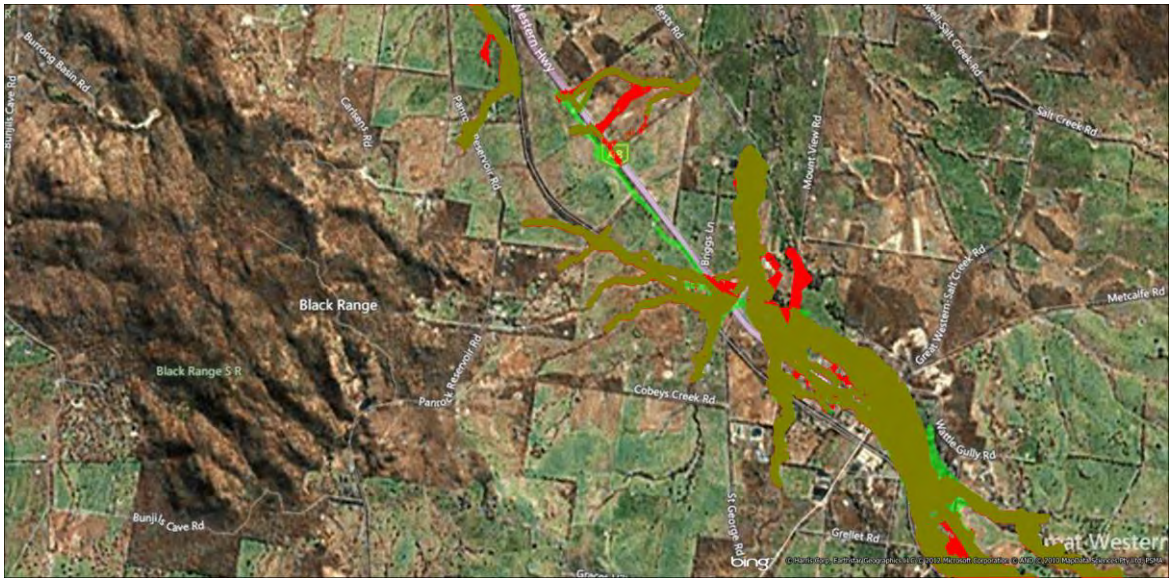

Figure 4: Comparison between iteration 2B design (green) and existing (red) flooding

Both iterations have slightly reduced the flooding in Great Western – the flood extents are seen here, but the effect would translate to flood depths as well.

In both iteration instances there is flood water running parallel to the highway from north to south above Concongella Creek, this is due to inadequate culvert capacity allowing the water to cross the road and should be addressed prior to design.

Summary of Modelled Crossings

Crossing GHD Ref	Waterway	Existing Crossing (as per TGM model)	Crossing Openings-Iteration 2A	Crossing Openings-Iteration 2B
WB312	Concongella Creek + Tributary of Concongella Creek	Unknown (not included in email)	Ignore	Ignore
WC320	Tributary to Concongella Creek	TGM to include in model assumed 2 No 1050dia pipes	Upgraded Highway - 4 No 1200dia pipes perpendicular to proposed road, matching into existing channel downstream of crossing Minor reshaping of creek at upstream end along proposed road, from existing channel to proposed crossing	As per 2A
WC321	Tributary to Concongella Creek	1 No 1200dia pipe	Upgraded Highway -6 x (1200 x 1200) culverts under proposed road, matching into existing channel upstream and downstream of crossing	As per 2A
WA323	Concongella Creek	3 No 2400H x 2700W RCBC	Upgraded Highway -5 No 2400x2400 RCBC perpendicular to proposed road, matching into existing channel upstream and downstream of crossing	As per 2A, plus local eathworks if required to further encourage more flows into culvert
WB324	Concongella Creek	Opening 17m x 3.3m	Upgraded Highway - Duplicate/extend bridge under proposed freeway, reshaping creek to match angle of existing bridge (not quite perpendicular to proposed roadway). Realign channel upstream of crossing to match into existing creek. New Service Road - Extend bridge across service road maintaining equivalent waterway area to highway crossing whilst maintaining existing channel invert, soffit at 251.3 (above existing 100y water level)	
WB325	Concongella Creek	2 No 3200H x 6200W RCBC	Upgraded Highway - 3 No 3200H x 6200W RCBC perpendicular to proposed freeway, matching into existing channel downstream of crossing New Service Road - Extend 3 No 3200H x 6200W RCBC perpendicular road, therefore minor realignment of creek at upstream end along proposed service road, from existing channel to freeway crossing.	Flood attenuation storage opportunity - Restrict waterway opening to less than existing (ie 1 No 3200H x 6200W RCBC) to encourage upstream flood storage and downstream diversion
WB326	Allenvale Creek/ Concongella Creek confluence	Allenvale Ck (N/A - no existing crossing) Concongella Creek - Bridge (no details provided- not changed)	New Road Deviation (New Bridge Crossing) - Leave a gap across the freeway at Allenvale Ck, approx. 100m either side of the creek centreline New Entry road- provide culvert connections 3 x(2400 x 2400) through ramp currently represented as an embankment Exit road - provide additional culvert connections(600 x 2400) through upgraded existinmg highway (exit road) at 3 locations (10mm spacing from existing bridge) New Service Road - assume at existing surface levels (no obstruction)	Flood attenuation storage opportunity - Restrict waterway opening to new highway crossing for Allenvale Creek flow (i.e restrict opening from current 200m gap to to encourage upstream flood storage
WB328	Concongella Creek	TGM to include in model email did not specify dimensions	Bests Road overpass - Maintain existing bridge crossing and assume no change to road geometry	As per Iteration 1, with road deck represneted
WB329	Concongella Creek	N/A - no existing crossing	New Road Deviation (New Bridge Crossing) - Provide new bridge (50m wide waterway area to bridge at WB328) keeping existing channel invert, soffit at 231 m	As per 2A
WB330	Robinsons Creek	3 No 1200H x 1200W RCBC	New Road Deviation (new crossing) and northern Service Road - 5 No 1200H x 1200W RCBC under proposed freeway and service road (downstream side of freeway), matching into existing channel upstream and downstream of crossing. Entry Road (Existing highway alignment) and southern Service Road -5 No 1200H x	As per Iteration 1
WB331	Donald Creek	1 No 1500H x 2700W RCBC 3 No 1200dia pipe	3 No 1500H x 2700W RCBC under combined alignment, matching into existing channel upstream and downstream of crossing.	As per Iteration 1
Off Bests Rd	Concongella Creek d/s	N/A - no existing crossing		Was not included in Iteration 1. (Attached image ServiceRd_off_BestsRd.jpg shows location, to north of crossings WB329 and WB330)
WC333	Minor tributary to Concongella Creek	1 No 900dia pipe		Ignore crossing as per Iteration 1

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Document Status

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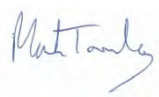
Final	Matt van der Peet	Ashley Roberts		Mark Tansley		16/11/12