

APPENDIX

Q2

INLAND
RAIL 

Hydrology and Flooding Technical Report—Volume II

Part 1 of 3

INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

Inland Rail Border to Gowrie EIS

Appendix Q2 - Hydrology and
Flooding Technical Report -
Volume II

**Australian Rail Track
Corporation**

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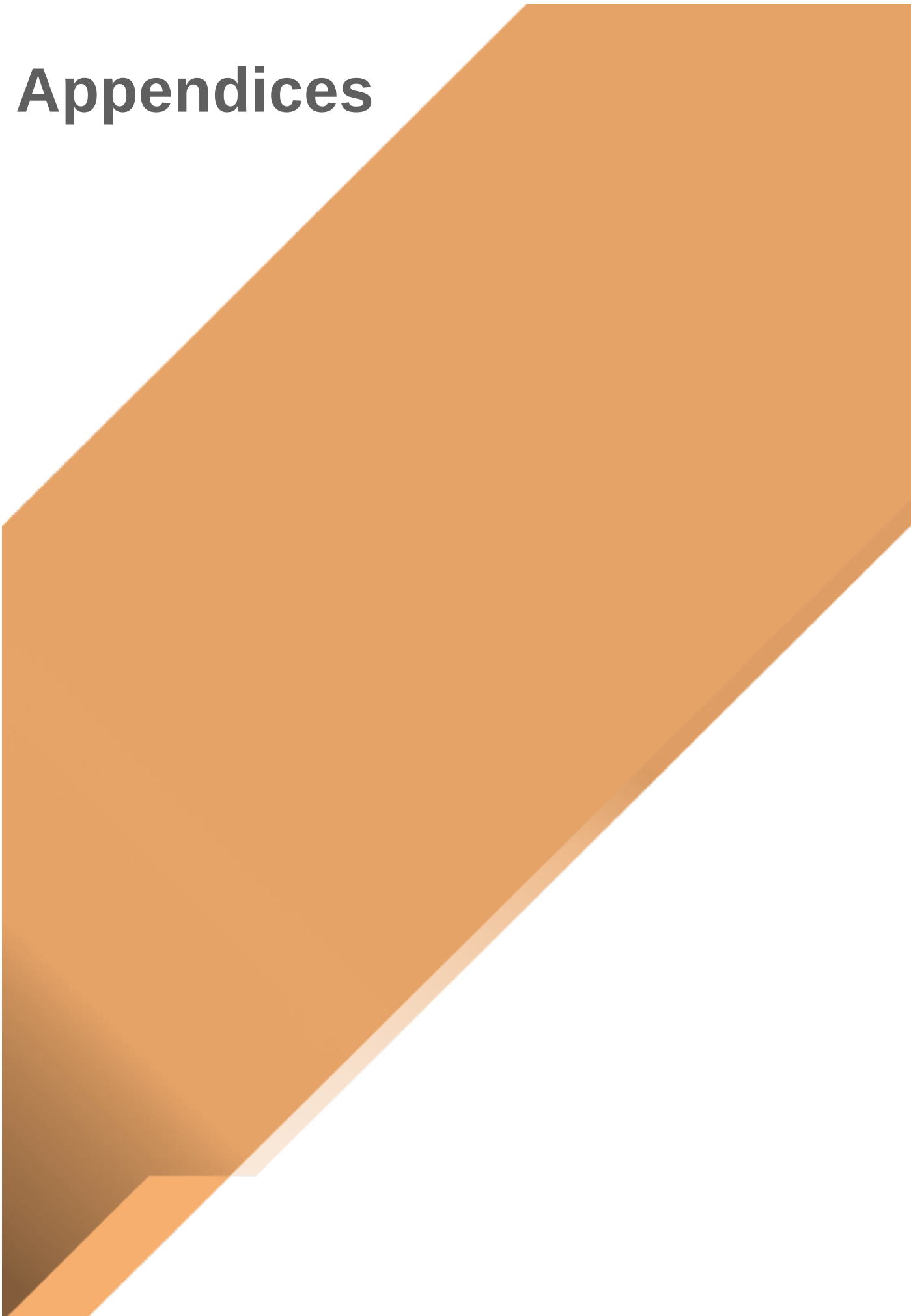
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APPENDIX

Q2

Hydrology and Flooding Technical Report—Volume II

Appendix A Gowrie Creek Flood Maps

INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

Appendix A

Gowrie Creek Flood Maps

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Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Watercourses
- Major roads
- Minor roads
- Road design
- Project footprint



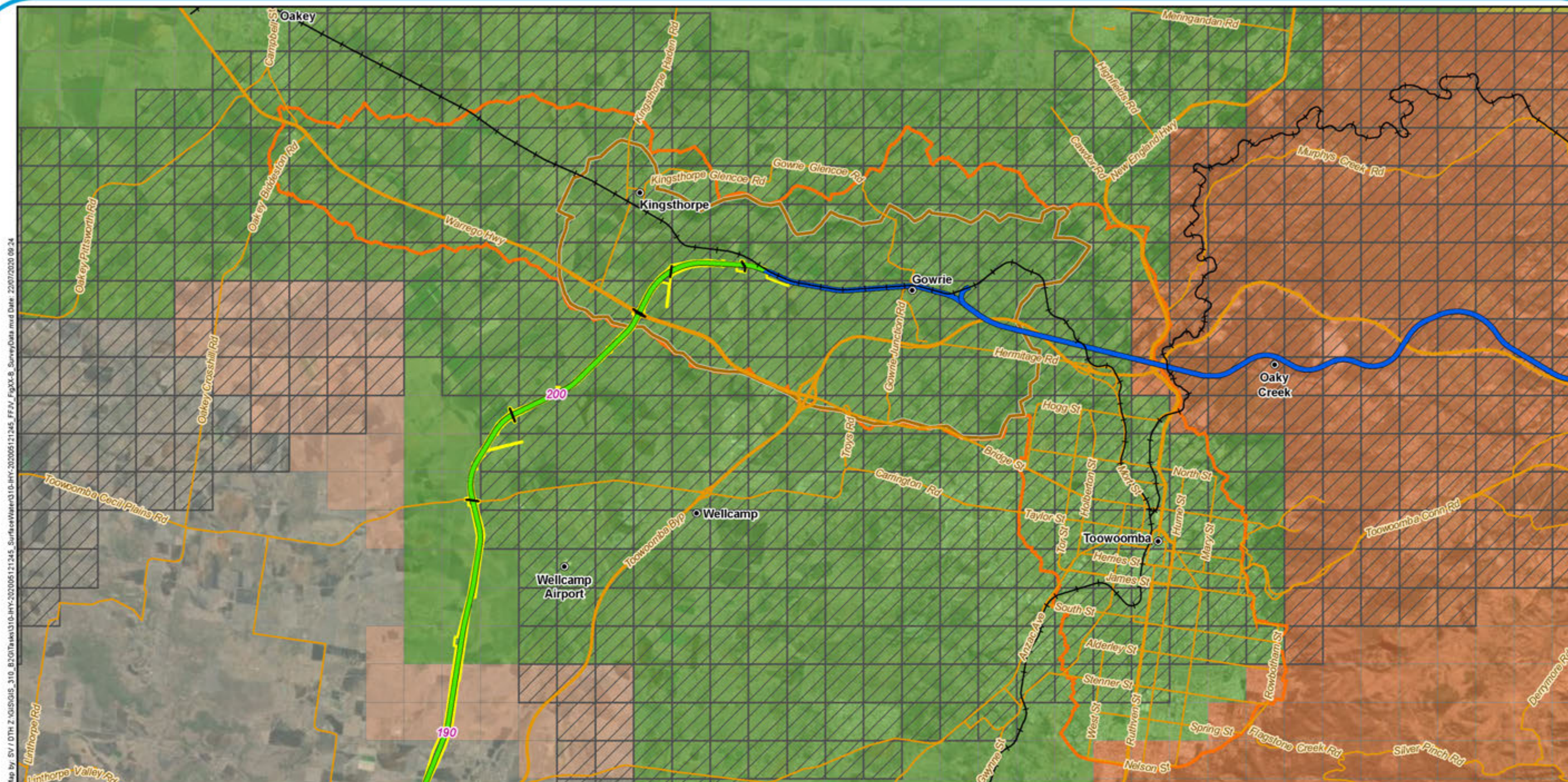
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 0 0.3 0.6 0.9 1.2 1.5km



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Border to Gowrie
Figure A1-A:
Locality plan - Gowrie Creek



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Hydrologic model extent

LiDAR datasets (1m grid)

- Inland Towns Stage 6 2014
- Lockyer Valley 2010
- Toowoomba Lockyer Project
- Toowoomba 2010
- 2015 ARTC LiDAR 1m



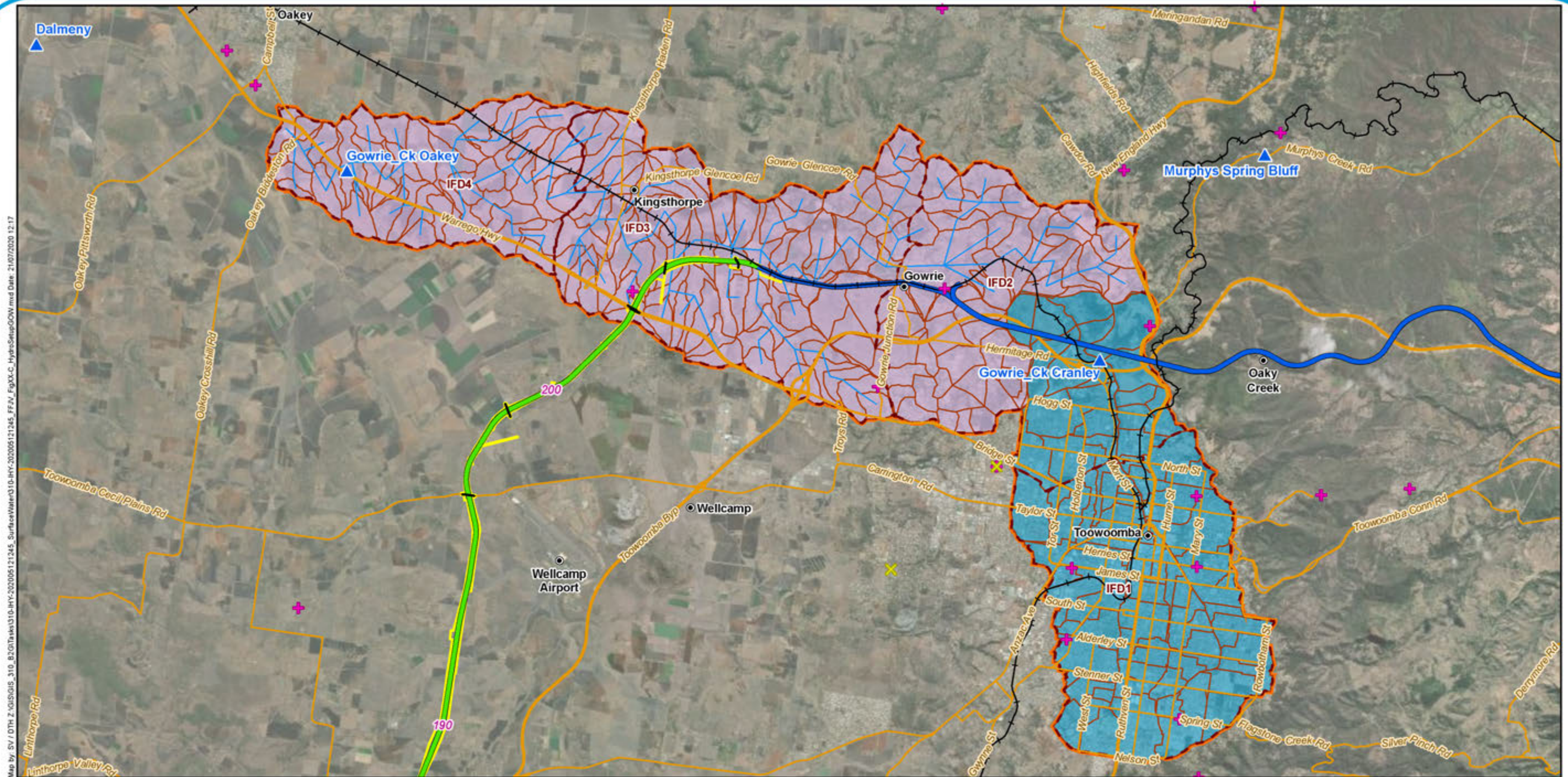
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Border to Gowrie
Figure A1-B:
Survey data - Gowrie Creek



Legend

- | | | | | |
|-----------------------------|-------------------|-------------------------|--------------------------|-------------------------|
| 5 Chainage (km) | Major roads | Catchment links | Gowrie loss model | Pluviograph stations |
| Localities | Minor roads | Sub-catchments | Area 1 | Daily rainfall stations |
| Existing rail (operational) | Road design | Hydrologic model extent | Area 2 | Stream gauge locations |
| Border to Gowrie alignment | Project footprint | IFD areas | | |
| Gowrie to Helidon alignment | | | | |



A3 scale: 1:110,000
 0 1 2 3 4 5km



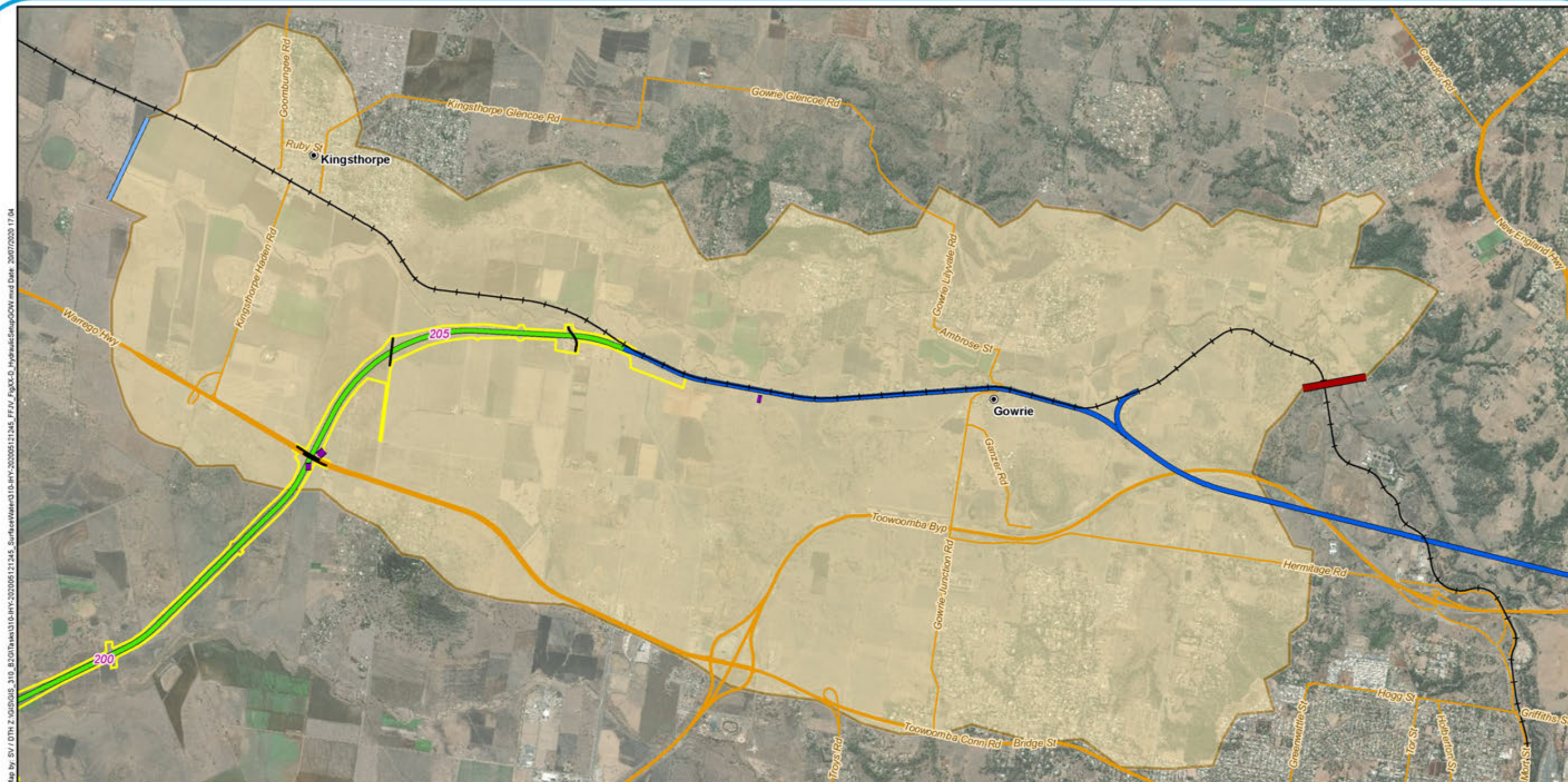
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Border to Gowrie

Figure A1-C:

Hydrologic model setup - Gowrie Creek



Legend

- | | | |
|-----------------------------|-------------------|------------------------|
| 5 Chainage (km) | Major roads | Hydraulic model extent |
| Localities | Minor roads | Outflow boundaries |
| Existing rail (operational) | Road design | Internal boundaries |
| Border to Gowrie alignment | Project footprint | Upstream boundaries |
| Gowrie to Helidon alignment | | |



A3 scale: 1:44,000
 0 0.4 0.8 1.2 1.6 2km



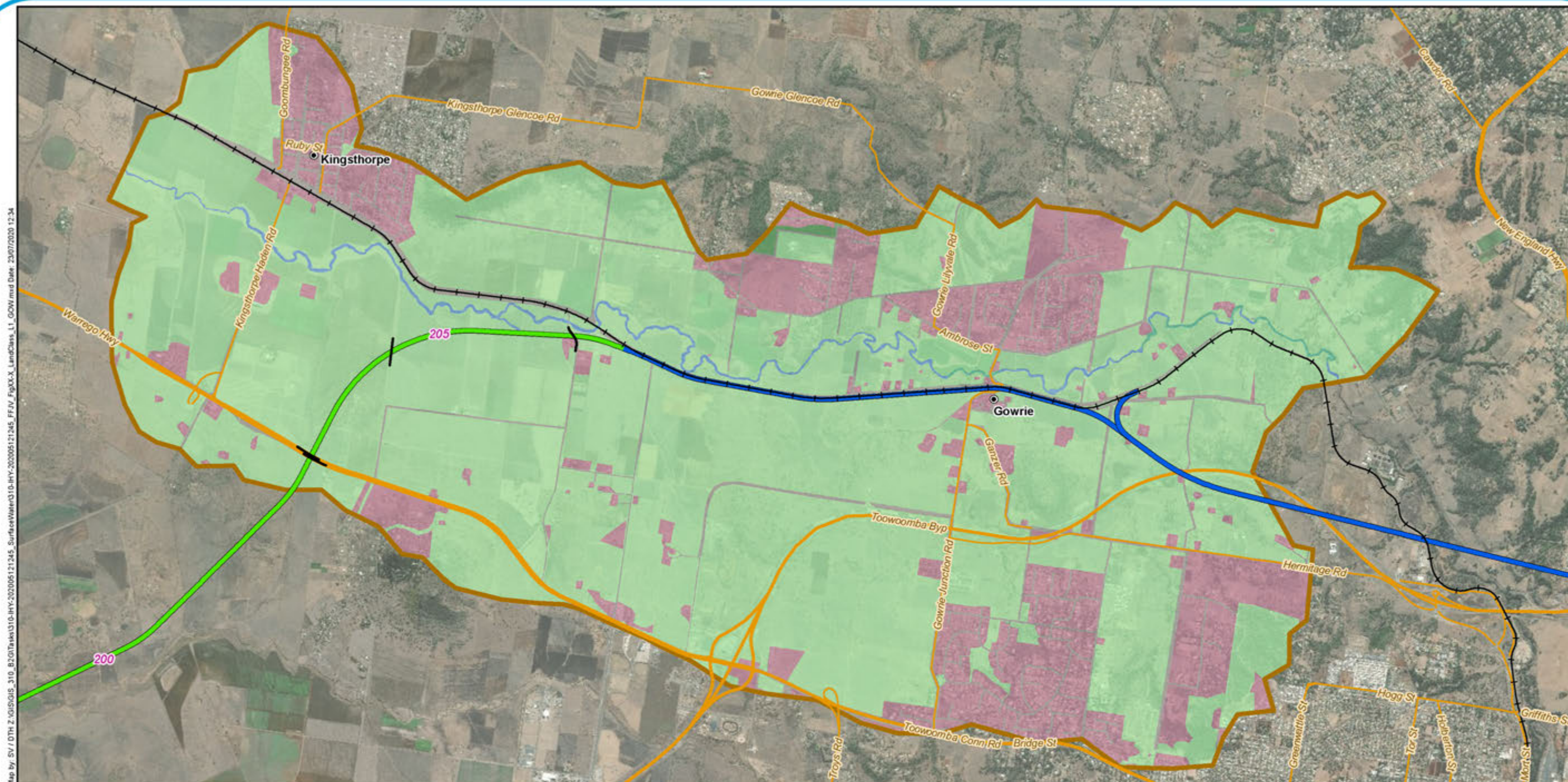
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Border to Gowrie

Figure A1-D:

Hydraulic model setup - Gowrie Creek



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Hydraulic model extent

Landuse classification

- Dense vegetation (n=0.100)
- Developed area (n=0.083)
- Vegetated waterways (n=0.050)
- Floodplain (n=0.050)
- Waterways (n=0.033)
- Roads (n= 0.025)



A3 scale: 1:44,000
 0 0.45 0.9 1.35 1.8 2.25km



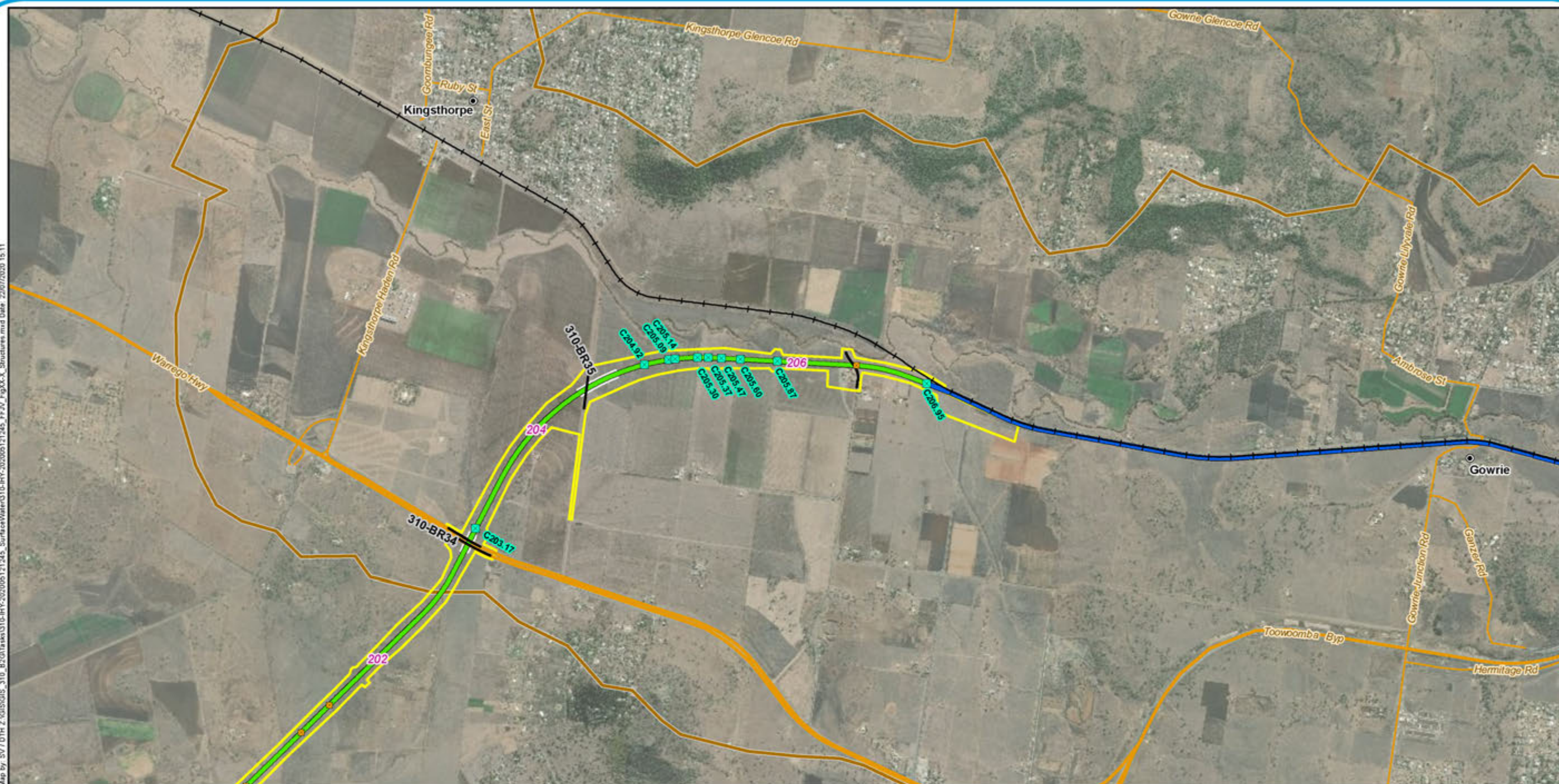
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Border to Gowrie

Figure A1-E:

Landuse classifications - Gowrie Creek



	Chainage (km)		Major roads
	Localities		Minor roads
	Floodplain culvert		Road design
	Local drainage culvert		Project footprint
	Bridges		Hydraulic model extent
	Existing rail (operational)		
	Border to Gowrie alignment		
	Gowrie to Helidon alignment		



A3 scale: 1:30,000



0 0.3 0.6 0.9 1.2 1.5 km

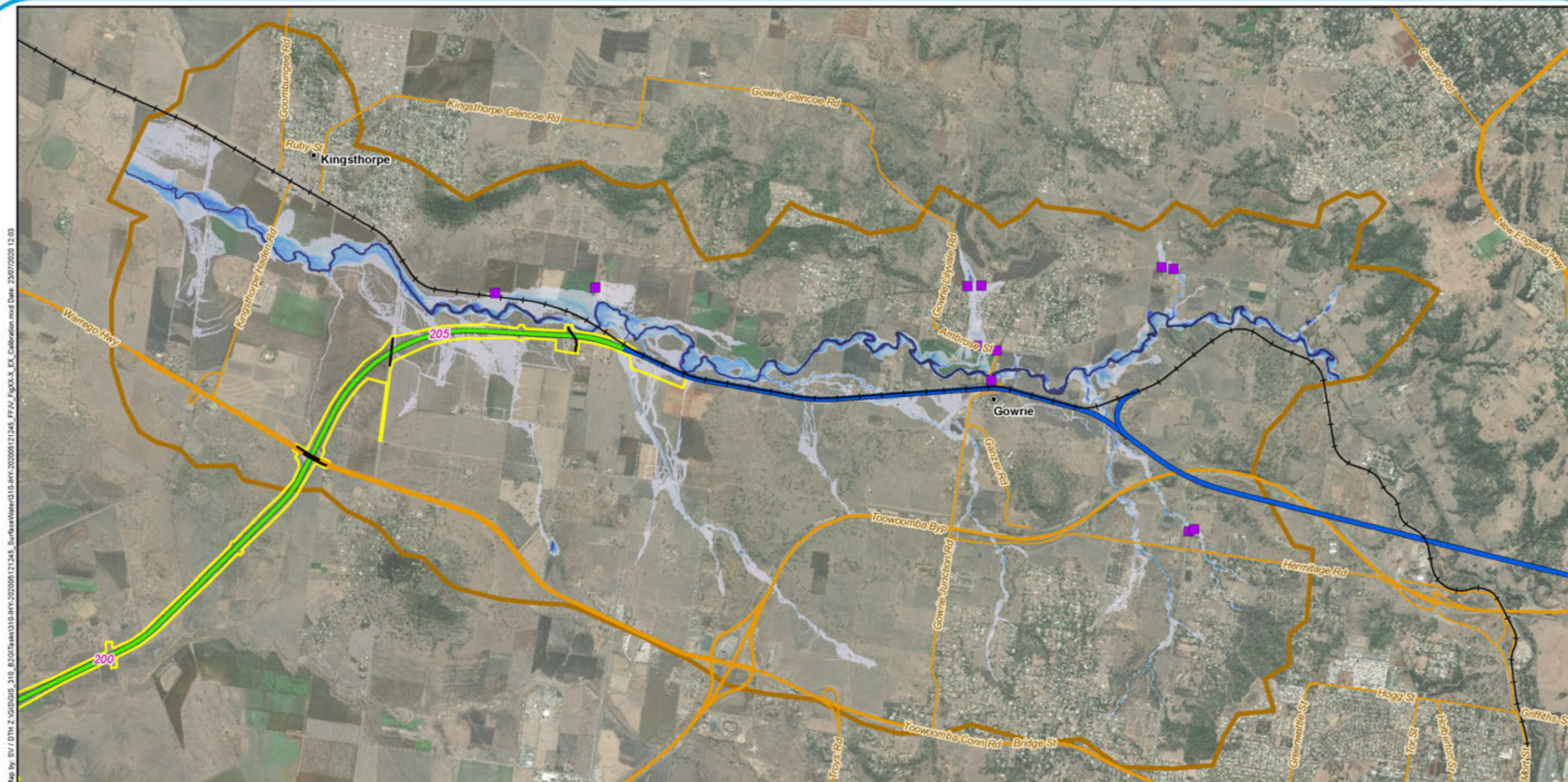


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Figure A1-F:

Proposed design structures - Gowrie Creek



Legend

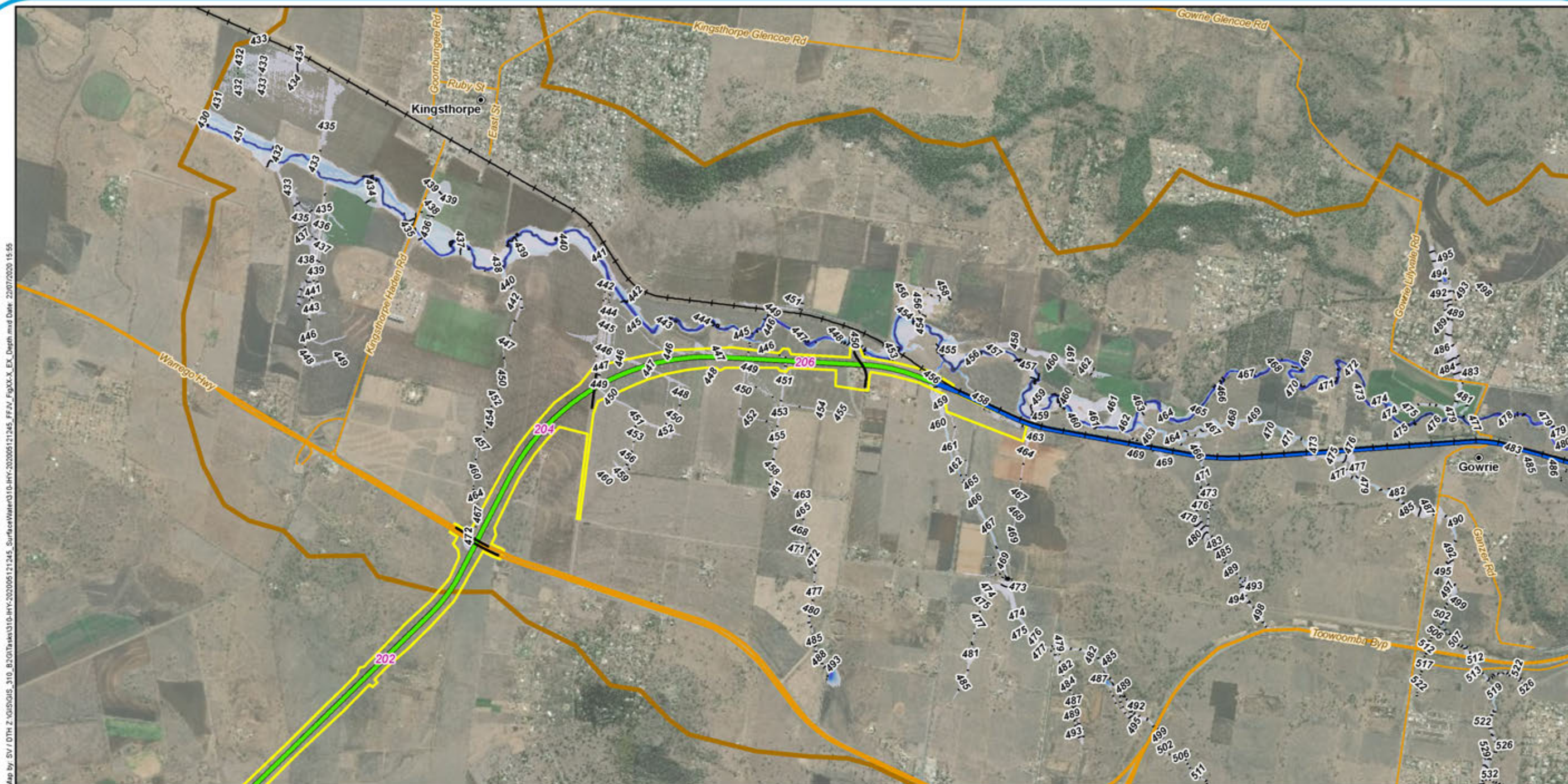
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Observed floodmarks**
 - ▲ > 0.3m
 - -0.3m to 0.3m
 - ▼ < -0.3m

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:44,000
 0 0.45 0.9 1.35 1.8 2.25km



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



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Border to Gowrie

Figure A3-A:

20% AEP peak water levels - Existing Case - Gowrie Creek

Map by SV / DTH Z:\GIS\GIS_310_B20Task\310-HY-202006121245_SurfaceWater\310-HY-202006121245_FF_N_FigA3-B_EX_Depth.mxd Date: 22/07/2020 15:55



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| ■ 0 - 0.5 | ■ 3.0 - 3.5 |
| ■ 0.5 - 1.0 | ■ 3.5 - 4.0 |
| ■ 1.0 - 1.5 | ■ 4.0 - 4.5 |
| ■ 1.5 - 2.0 | ■ 4.5 - 5.0 |
| ■ 2.0 - 2.5 | ■ > 5.0 |
| ■ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



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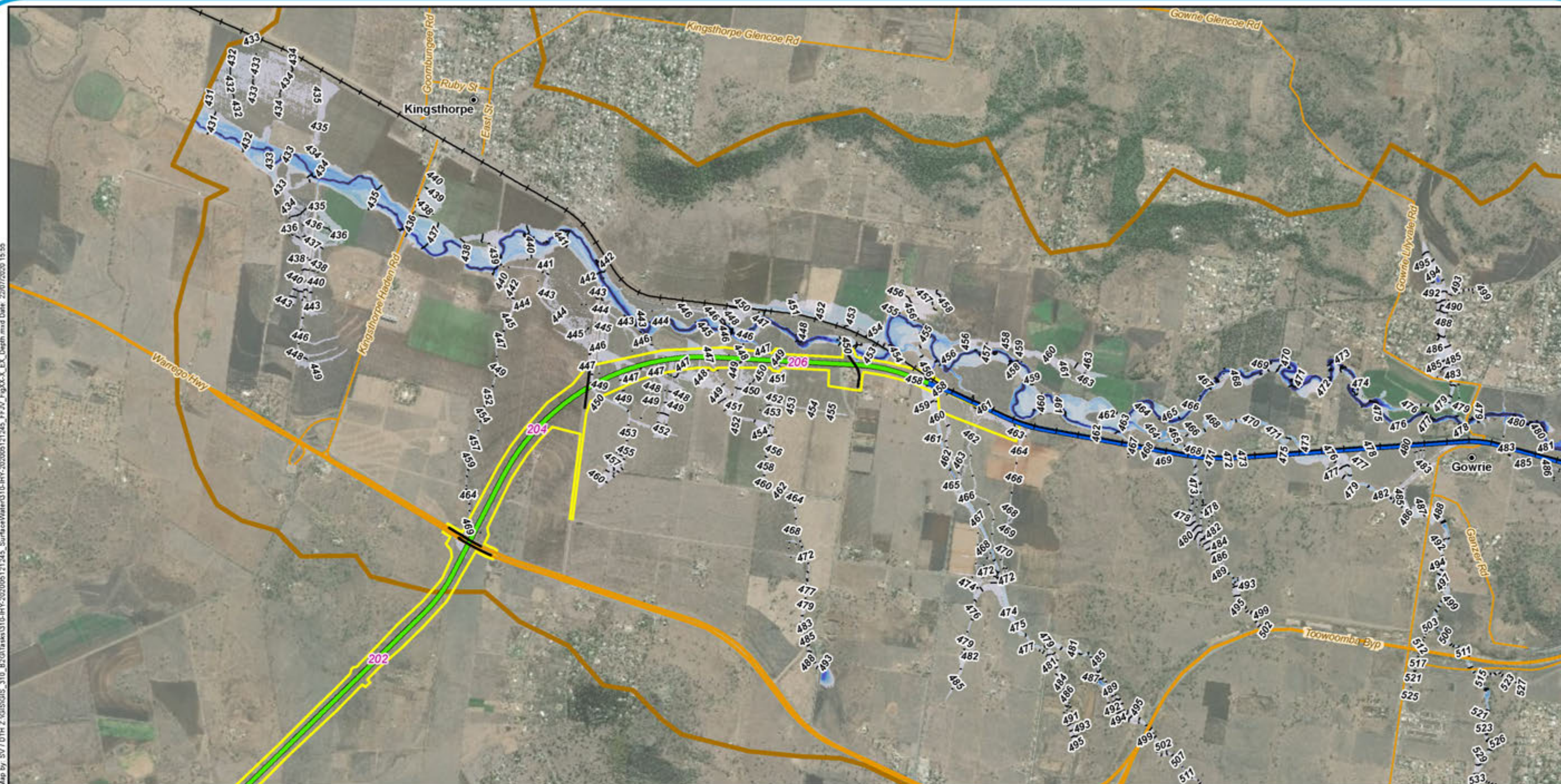
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure A3-B:

10% AEP peak water levels - Existing Case - Gowrie Creek

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202006121245_SurfaceWater310-HY-202006121245_FF3N_FigA3-C_EX_Depth.mxd Date: 22/07/2020 15:55



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



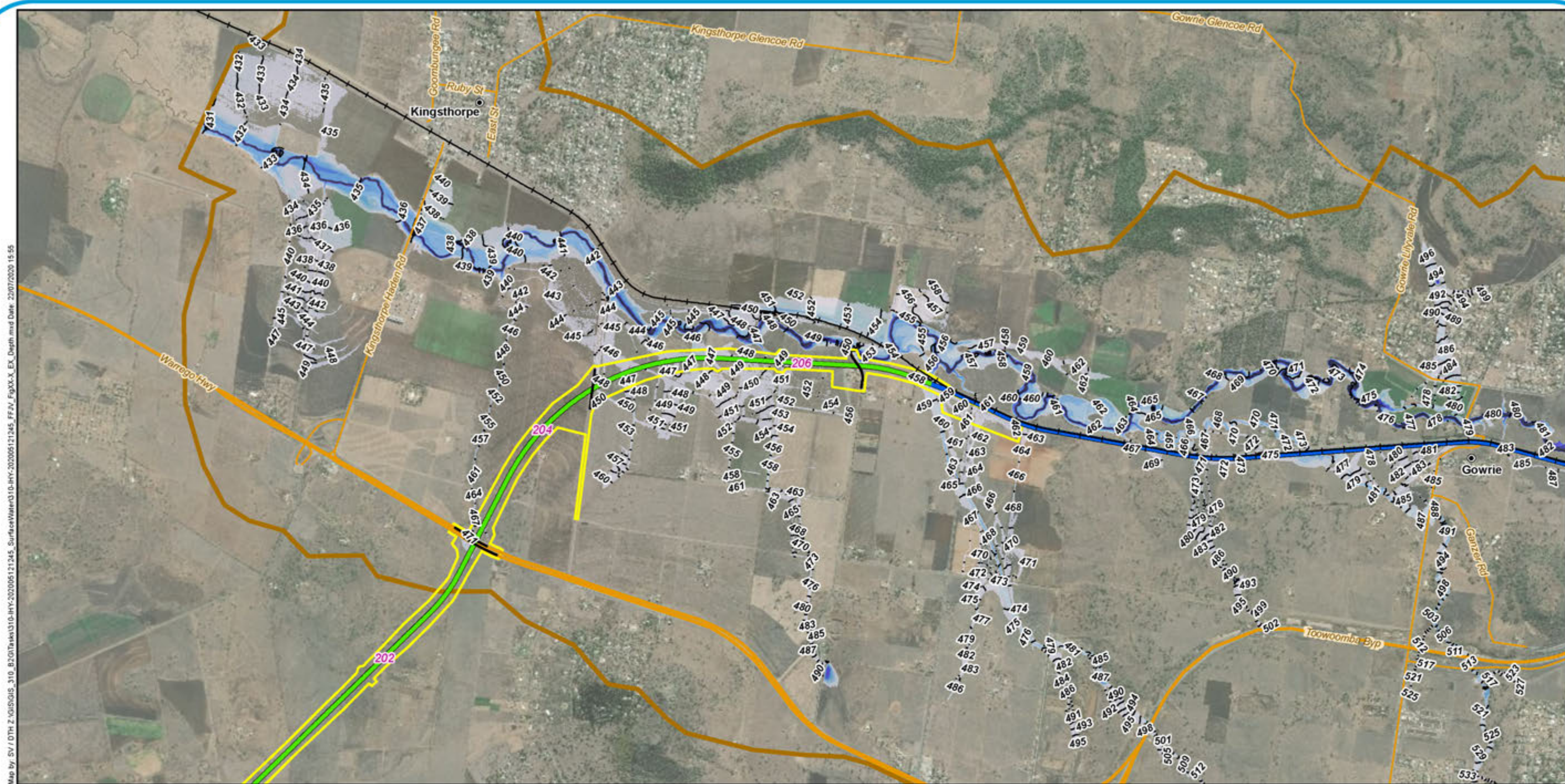
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Border to Gowrie

Figure A3-C:

5% AEP peak water levels - Existing Case - Gowrie Creek



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

 0 - 0.5	 3.0 - 3.5
 0.5 - 1.0	 3.5 - 4.0
 1.0 - 1.5	 4.0 - 4.5
 1.5 - 2.0	 4.5 - 5.0
 2.0 - 2.5	 > 5.0
 2.5 - 3.0	— 1m contour (mAHD)



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



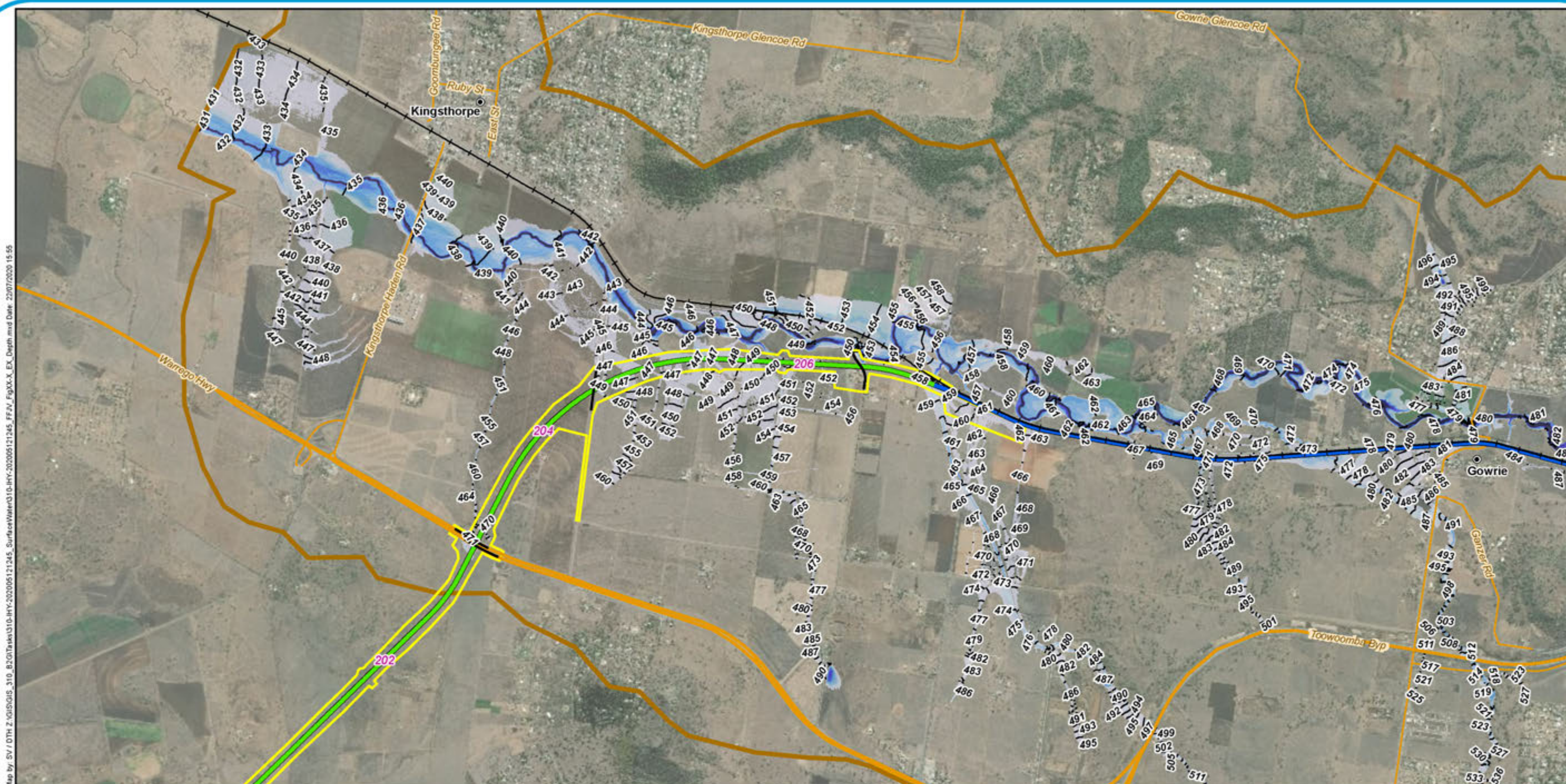
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Border to Gowrie

Figure A3-D:

2% AEP peak water levels - Existing Case - Gowrie Creek



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



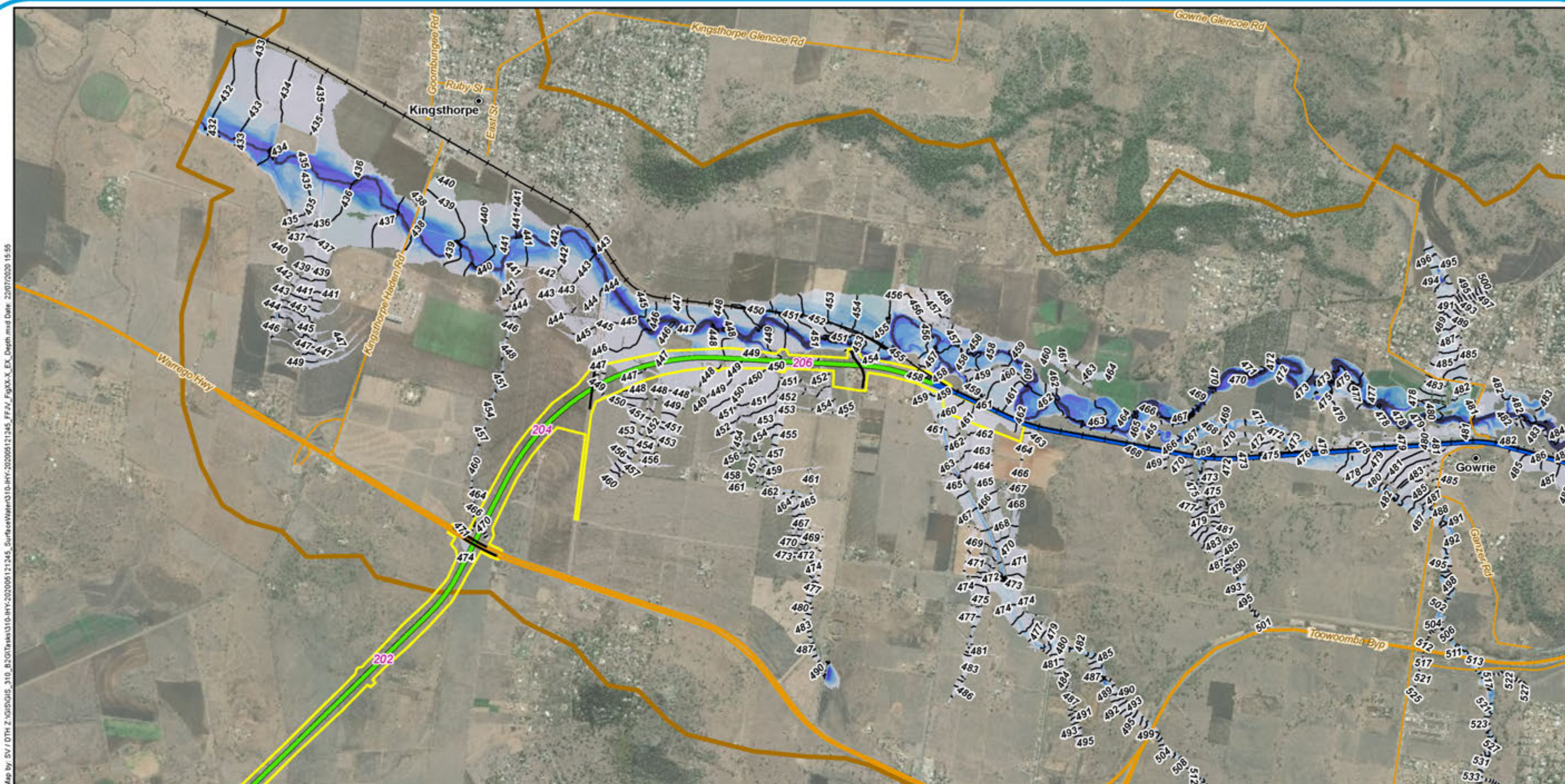
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Border to Gowrie

Figure A3-E:

1% AEP peak water levels - Existing Case - Gowrie Creek



Legend

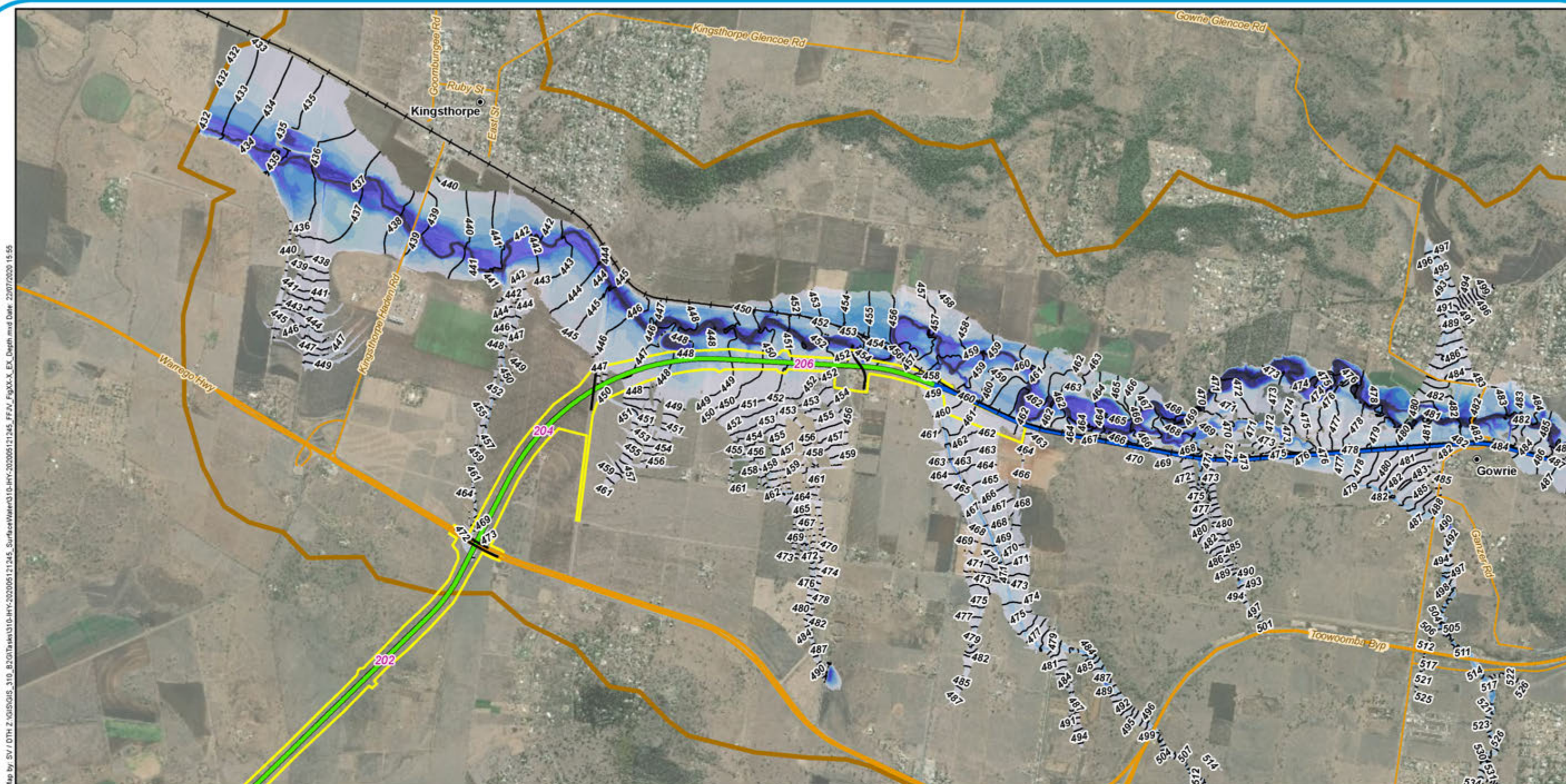
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km

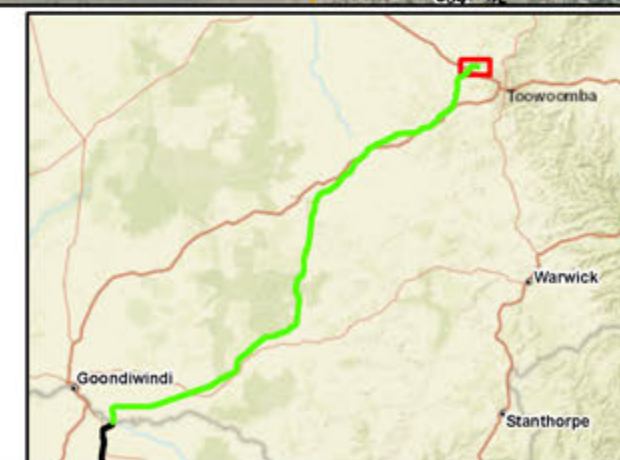


Legend

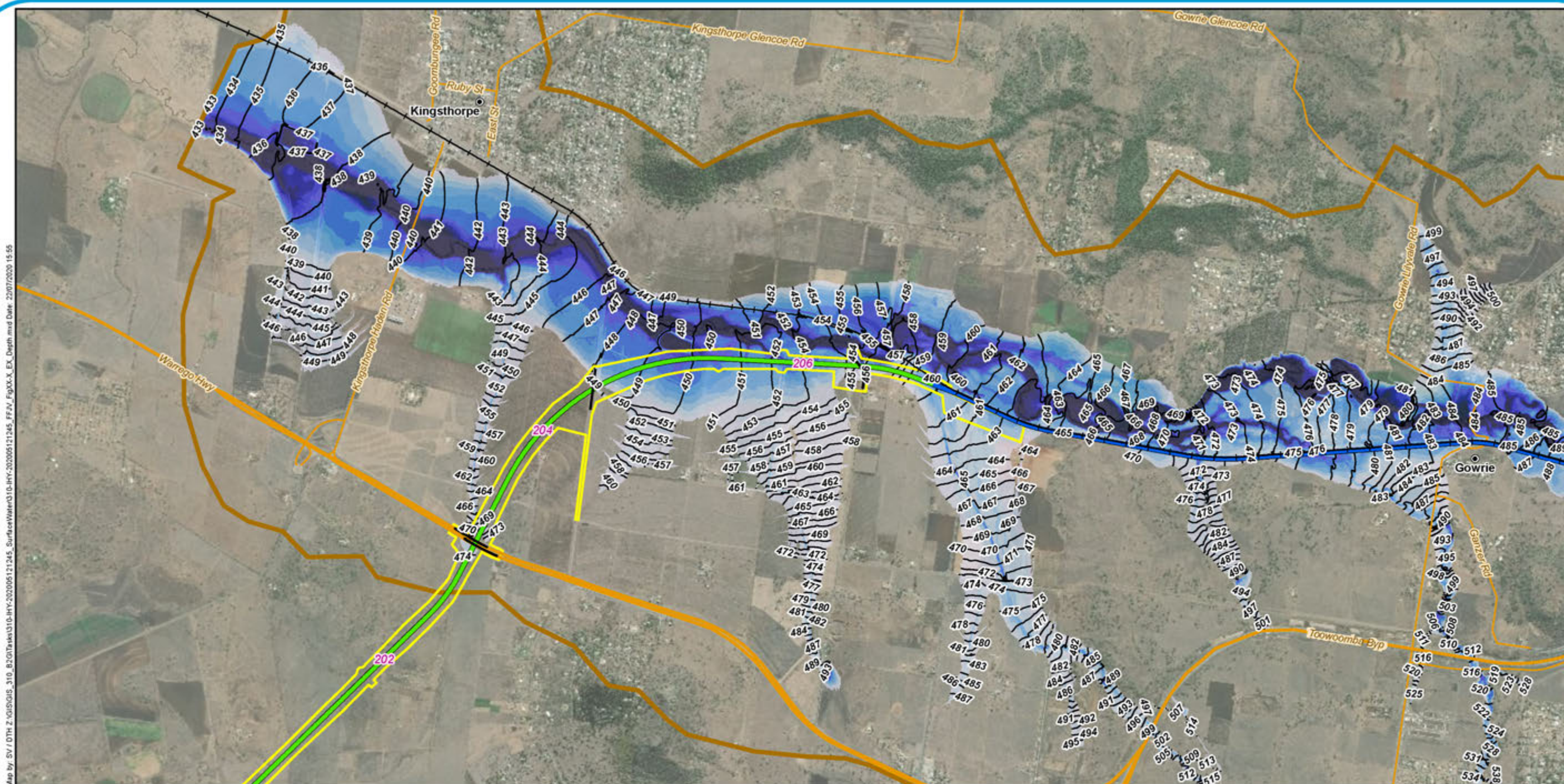
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| □ 0 - 0.5 | □ 3.0 - 3.5 |
| □ 0.5 - 1.0 | □ 3.5 - 4.0 |
| □ 1.0 - 1.5 | □ 4.0 - 4.5 |
| □ 1.5 - 2.0 | □ 4.5 - 5.0 |
| □ 2.0 - 2.5 | □ > 5.0 |
| □ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



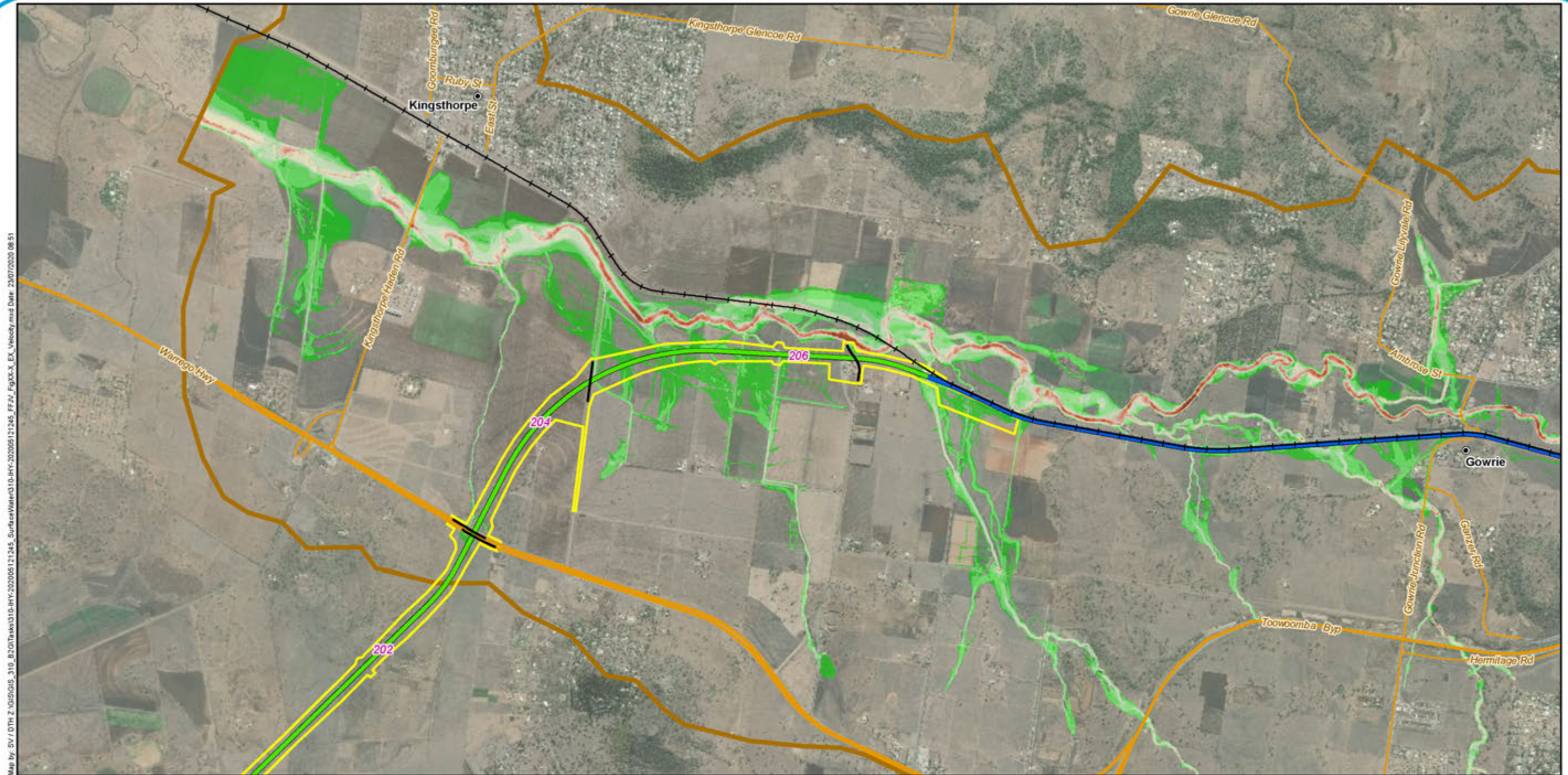
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Border to Gowrie

Figure A3-H:

PMF peak water levels - Existing Case - Gowrie Creek



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Peak velocity (m/s)

0.0	3.0
0.5	3.5
1.0	4.0
1.5	4.5
2.0	5.0
2.5	



A3 scale: 1:30,000
0 0.3 0.6 0.9 1.2 1.5km



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Border to Gowrie

Figure A4-A:

1% AEP peak velocity - Existing Case - Gowrie Creek



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

— < -0.5	— 0.01 to 0.05
— -0.50 to -0.20	— 0.05 to 0.10
— -0.20 to -0.10	— 0.10 to 0.20
— -0.10 to -0.05	— 0.20 to 0.50
— -0.05 to -0.01	— > 0.5
— -0.01 to 0.01	



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

■ < -0.5	■ 0.01 to 0.05
■ -0.50 to -0.20	■ 0.05 to 0.10
■ -0.20 to -0.10	■ 0.10 to 0.20
■ -0.10 to -0.05	■ 0.20 to 0.50
■ -0.05 to -0.01	■ > 0.5
■ -0.01 to 0.01	



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



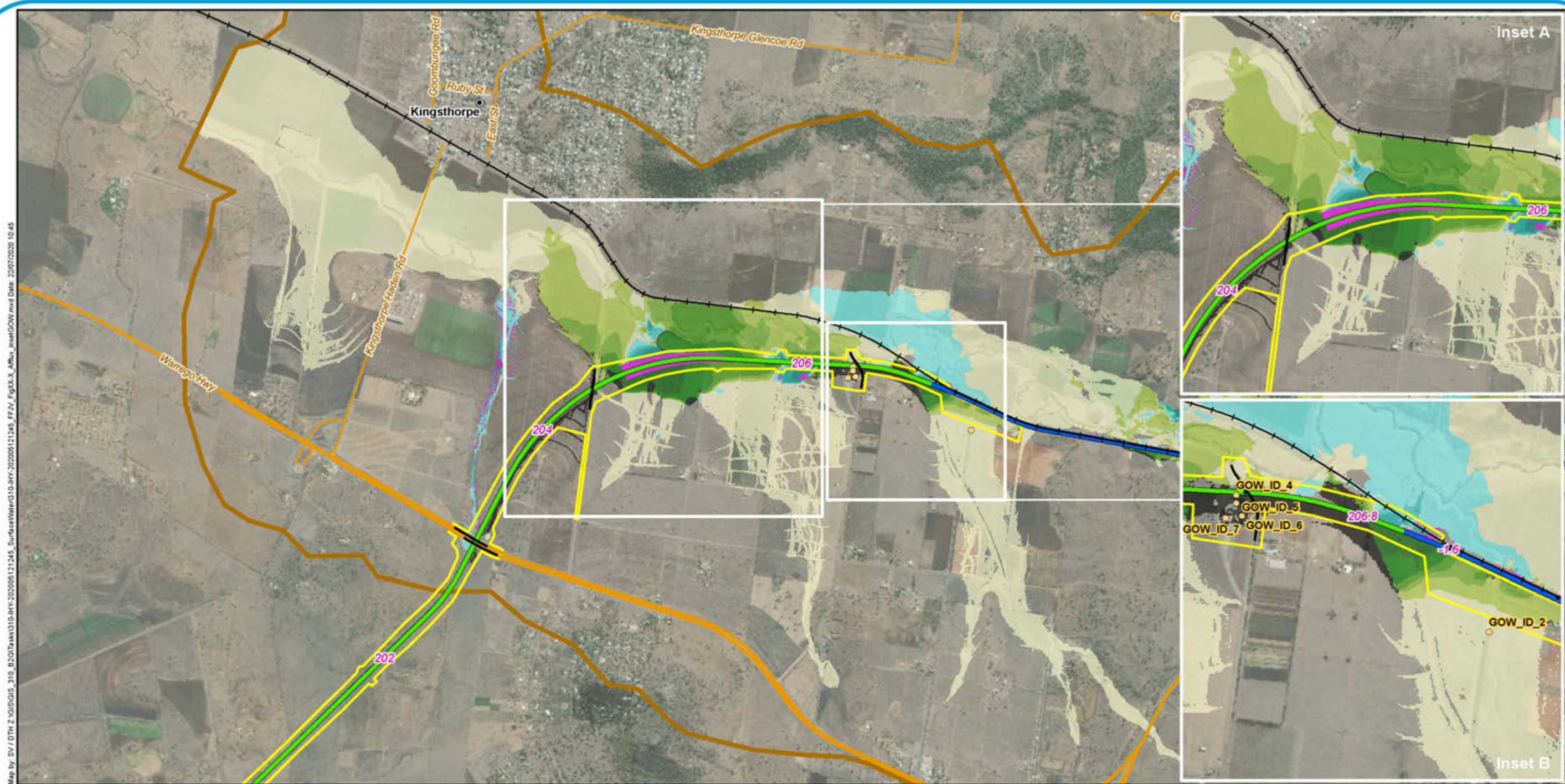
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Border to Gowrie

Figure A5-F:

1 in 2,000 AEP - design afflux - Gowrie Creek



Legend

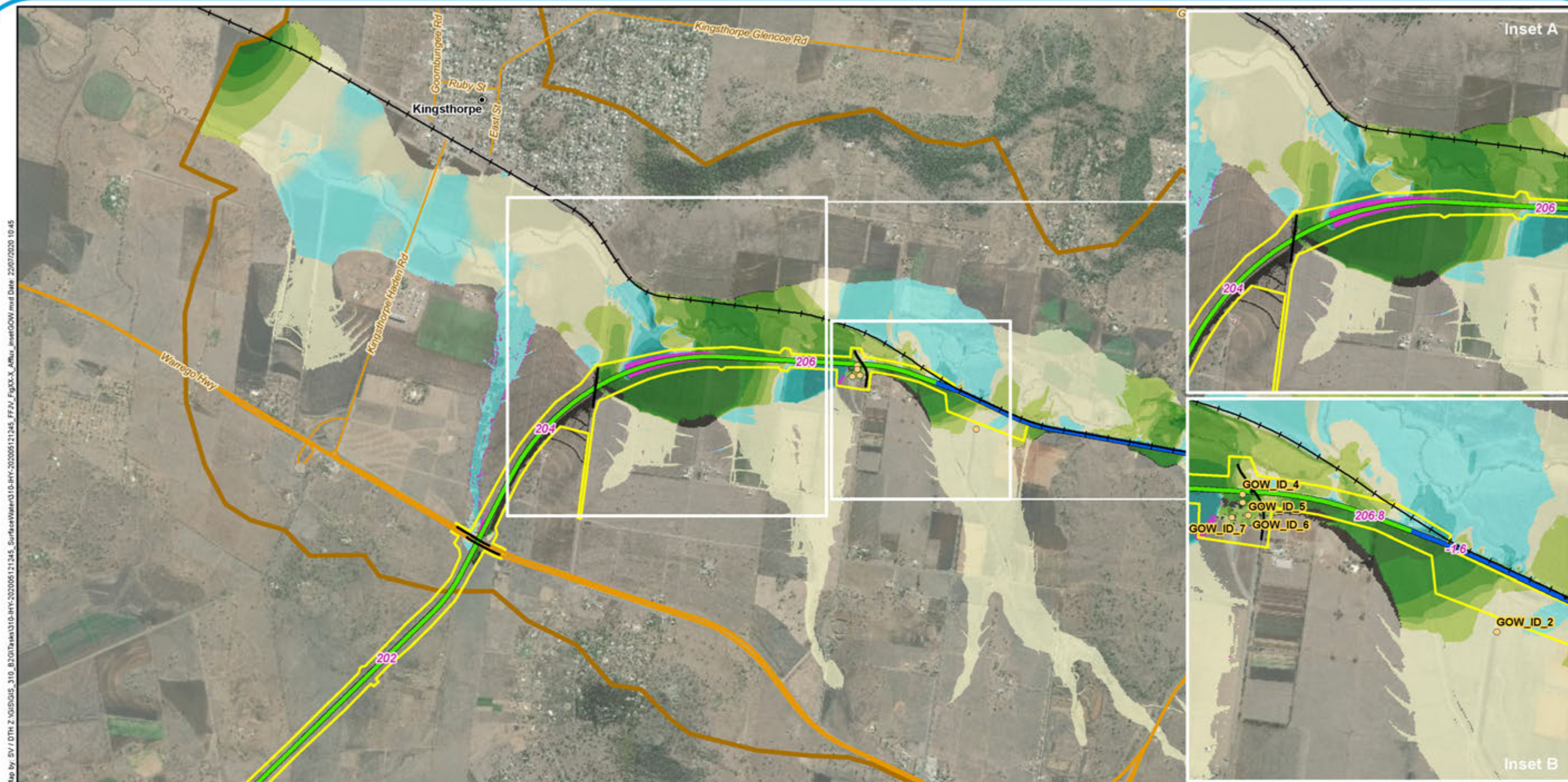
- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|----------------|--------------|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

< -0.5	0.01 to 0.05
-0.50 to -0.20	0.05 to 0.10
-0.20 to -0.10	0.10 to 0.20
-0.10 to -0.05	0.20 to 0.50
-0.05 to -0.01	> 0.5
-0.01 to 0.01	



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

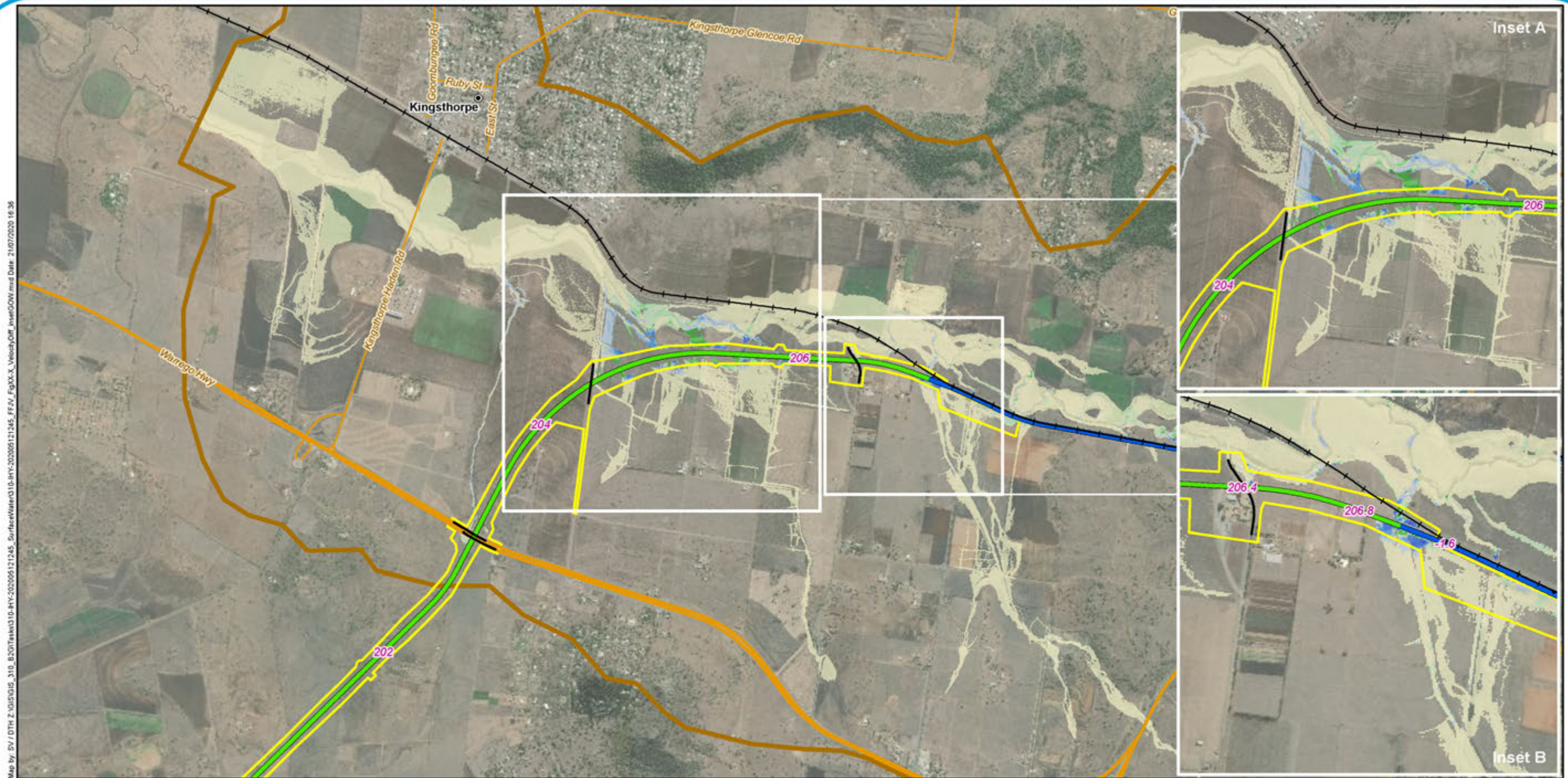
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in Time of Inundation (percentage)

- | | |
|---|---|
| — < -50% | — 10% to 20 % |
| — -50% to -40% | — 20% to 30 % |
| — -40% to -30% | — 30% to 40 % |
| — -30% to -20% | — 40% to 50 % |
| — -20% to -10% | — > 50% |
| — -10% to 10 % | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Change in peak velocity (m/s)

- | | |
|----------------|--------------|
| < -0.50 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.50 |
| -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

— < -0.5	— 0.01 to 0.05
— -0.50 to -0.20	— 0.05 to 0.10
— -0.20 to -0.10	— 0.10 to 0.20
— -0.10 to -0.05	— 0.20 to 0.50
— -0.05 to -0.01	— > 0.5
— -0.01 to 0.01	



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:30,000
 0 0.3 0.6 0.9 1.2 1.5km

APPENDIX

Q2

Hydrology and Flooding Technical Report—Volume II

Appendix B Westbrook Creek Flood Maps

INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

Appendix B

Westbrook Creek Flood Maps

Figure B1-A	Locality plan
Figure B1-B	Survey data
Figure B1-C	Hydrologic model setup
Figure B1-D	Hydraulic model setup
Figure B1-E	Landuse classifications
Figure B1-F	Proposed design structures
Figure B2-A	20% AEP peak water levels – Existing Case
Figure B2-B	10% AEP peak water levels – Existing Case
Figure B2-C	5% AEP peak water levels – Existing Case
Figure B2-D	2% AEP peak water levels – Existing Case
Figure B2-E	1% AEP peak water levels – Existing Case
Figure B2-F	1 in 2,000 AEP peak water levels – Existing Case
Figure B2-G	1 in 10,000 AEP peak water levels – Existing Case
Figure B2-H	PMF peak water levels – Existing Case
Figure B3-A	1% AEP peak velocity – Existing Case
Figure B4-A	20% AEP – design afflux
Figure B4-B	10% AEP – design afflux
Figure B4-C	5% AEP – design afflux
Figure B4-D	2% AEP – design afflux
Figure B4-E	1% AEP – design afflux
Figure B4-F	1 in 2,000 AEP – design afflux
Figure B4-G	1 in 10,000 AEP – design afflux
Figure B4-H	PMF – design afflux
Figure B4-I	1% AEP – change in time of inundation
Figure B4-J	1% AEP – change in velocity
Figure B5-A	1% AEP sensitivity – 0% blockage
Figure B5-B	1% AEP sensitivity – 50% blockage
Figure B5-C	1% AEP sensitivity – climate change RCP8.5 – peak water levels



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Watercourses
- Major roads
- Minor roads
- Road design
- Project footprint



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5km



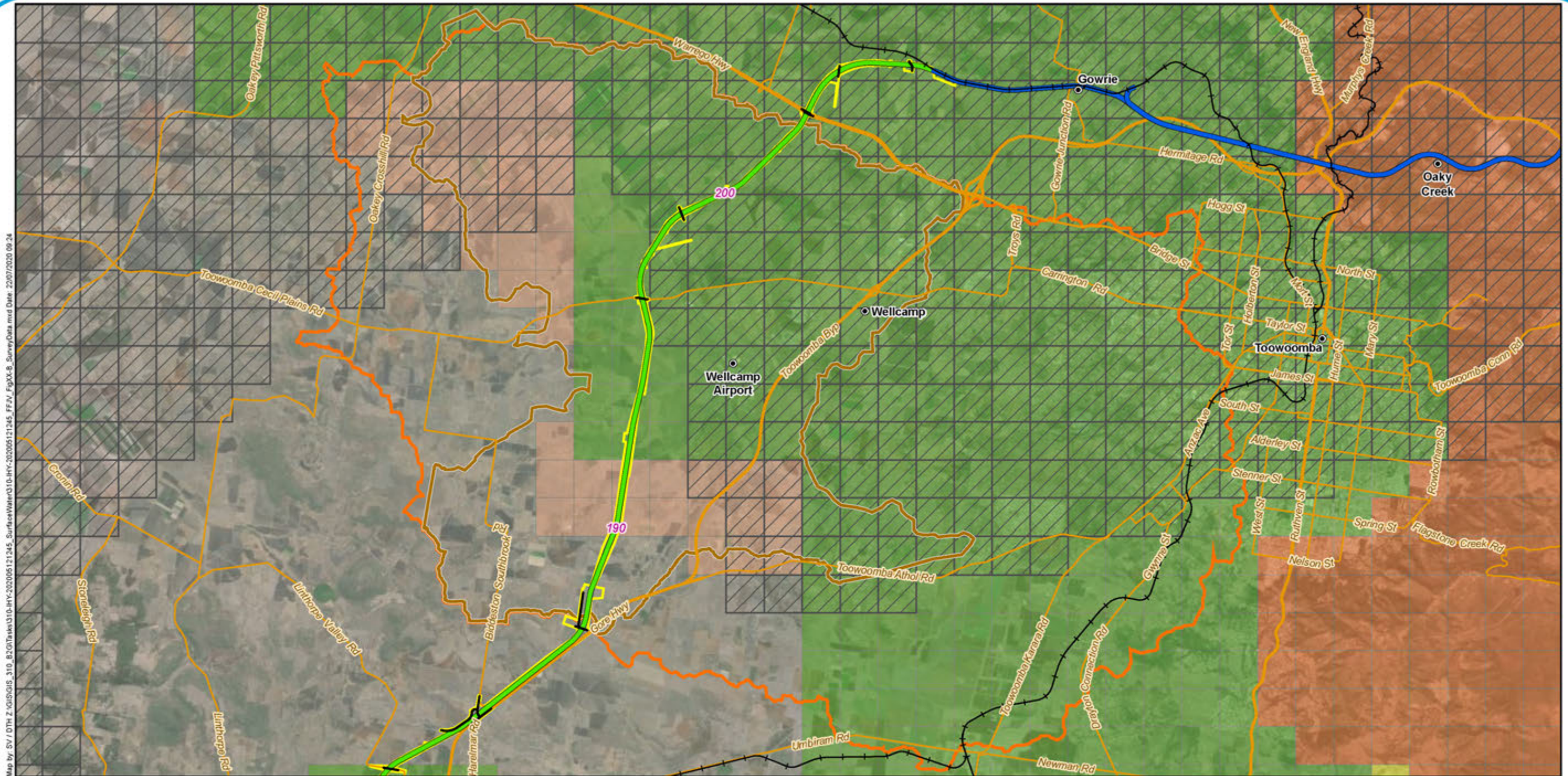
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Border to Gowrie

Figure B1-A:

Locality plan - Westbrook & Dry Creeks



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Hydrologic model extent

LiDAR datasets (1m grid)

- Inland Towns Stage 6 2014
- Lockyer Valley 2010
- Toowoomba Lockyer Project
- Toowoomba 2010
- 2015 ARTC LiDAR 1m



A3 scale: 1:110,000
 0 1 2 3 4 5 km



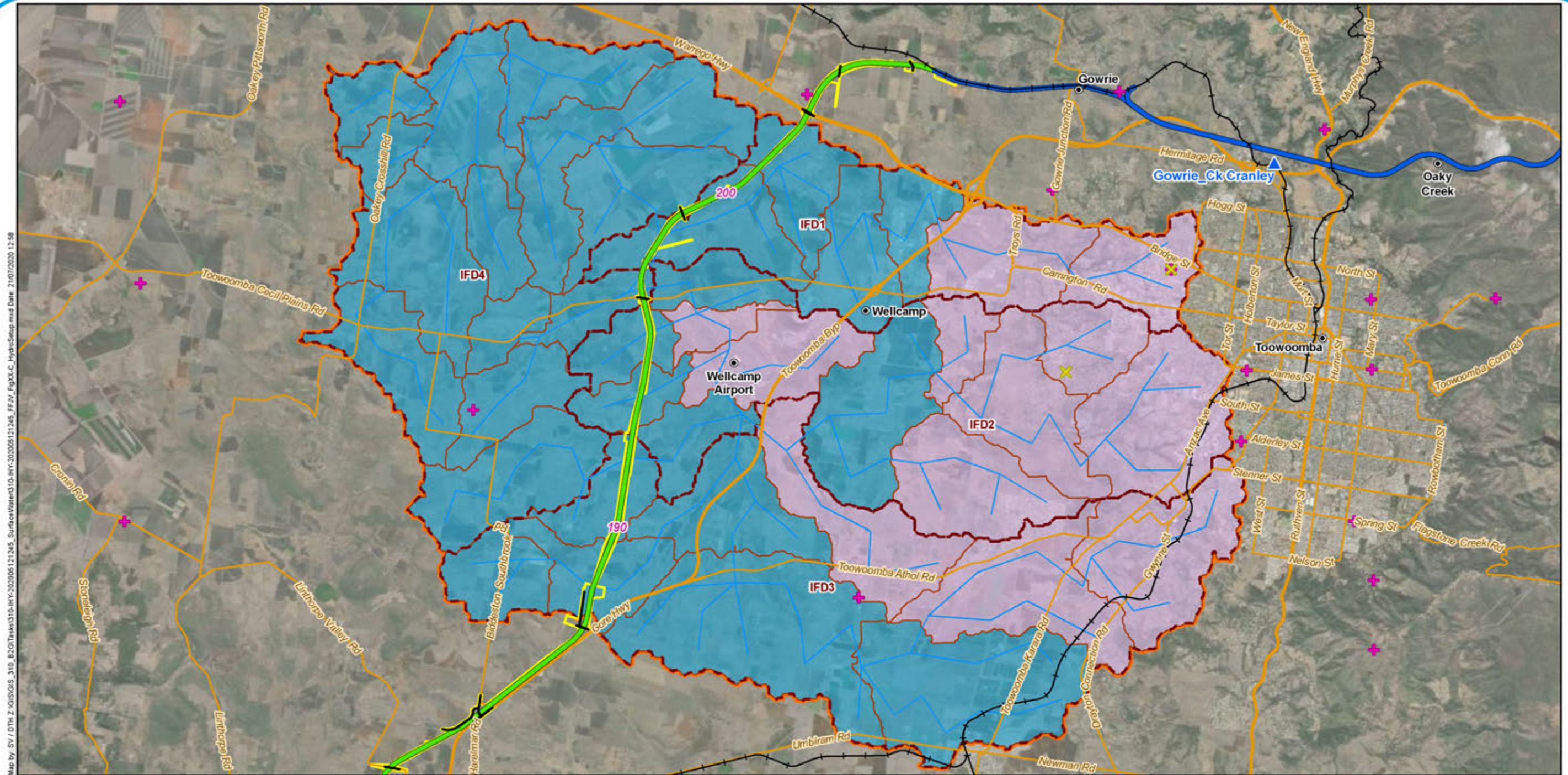
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Border to Gowrie

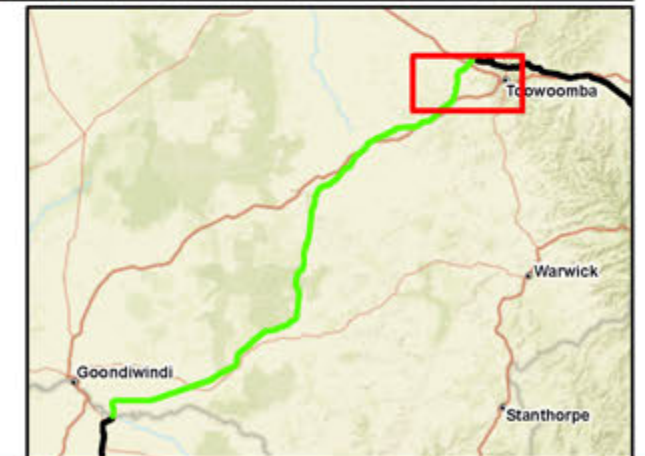
Figure B1-B:

Survey data - Westbrook & Dry Creeks

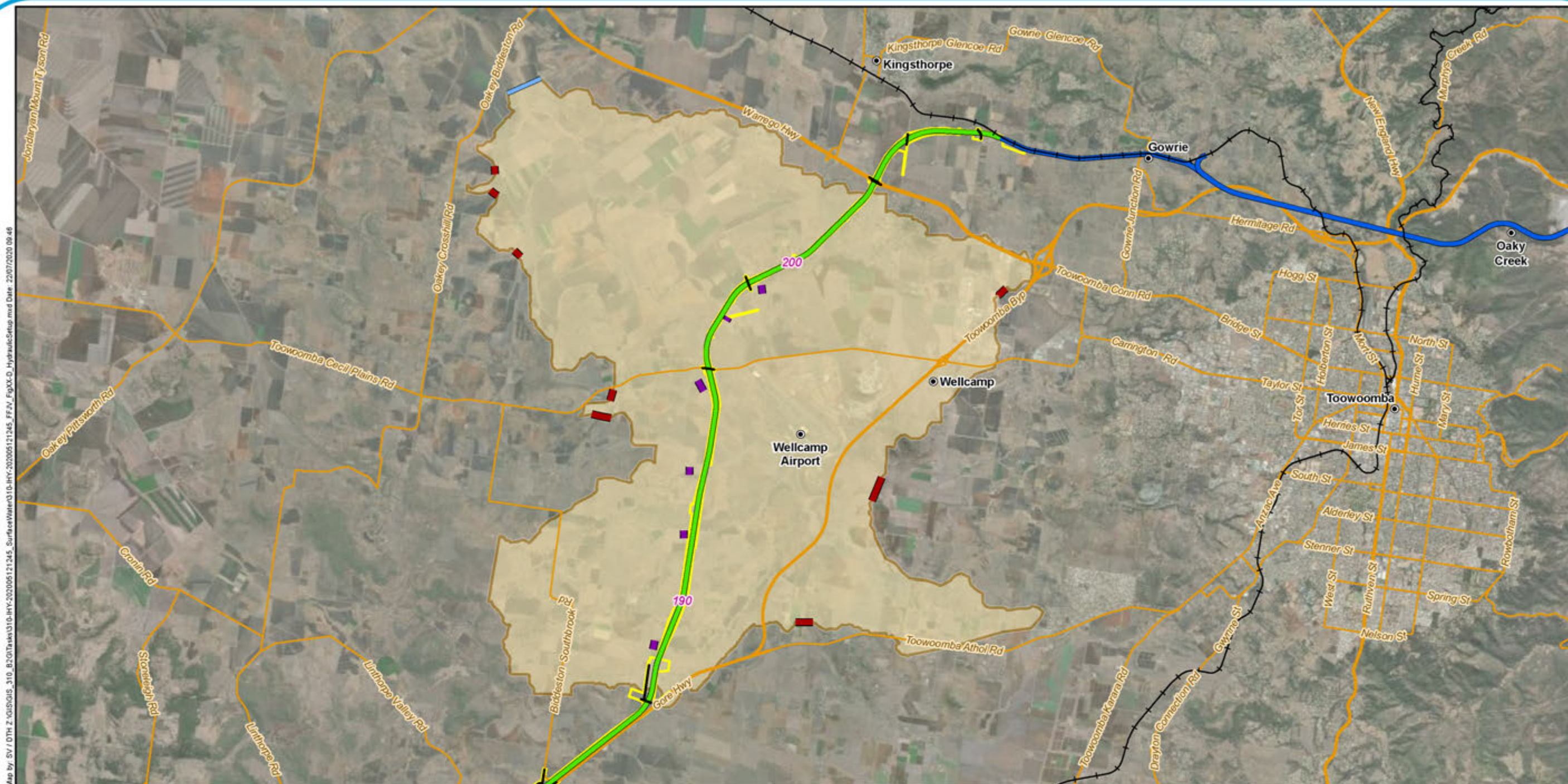


Legend

- | | | | | |
|-----------------------------|-------------------|-------------------------|-----------------------------|---------------------------|
| 5 Chainage (km) | Major roads | Catchment links | Westbrook Loss Model | X Pluviograph stations |
| Localities | Minor roads | Sub-catchments | Pervious | + Daily rainfall stations |
| Existing rail (operational) | Road design | Hydrologic model extent | Pervious Urbanised | ▲ Stream gauge locations |
| Border to Gowrie alignment | Project footprint | IFD areas | | |
| Gowrie to Helidon alignment | | | | |

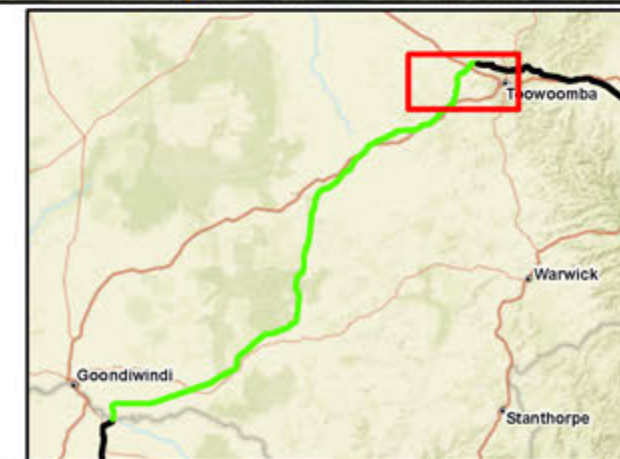


A3 scale: 1:110,000
 0 1 2 3 4 5km



Legend

- | | | |
|-----------------------------|-------------------|------------------------|
| 5 Chainage (km) | Major roads | Hydraulic model extent |
| Localities | Minor roads | Outflow boundaries |
| Existing rail (operational) | Road design | Internal boundaries |
| Border to Gowrie alignment | Project footprint | Upstream boundaries |
| Gowrie to Helidon alignment | | |



A3 scale: 1:110,000
 0 1 2 3 4 5km



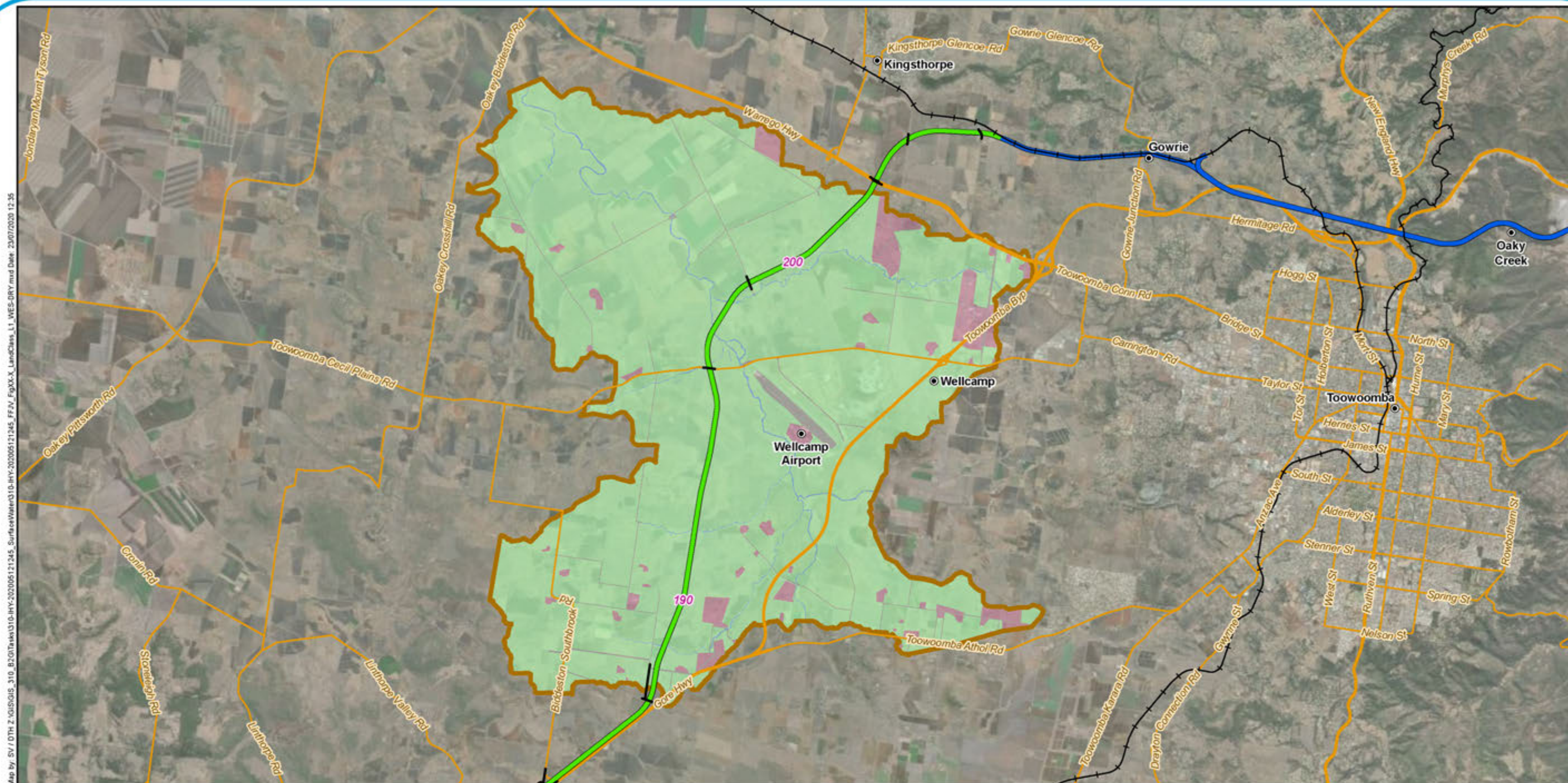
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Border to Gowrie

Figure B1-D:

Hydraulic model setup - Westbrook & Dry Creeks



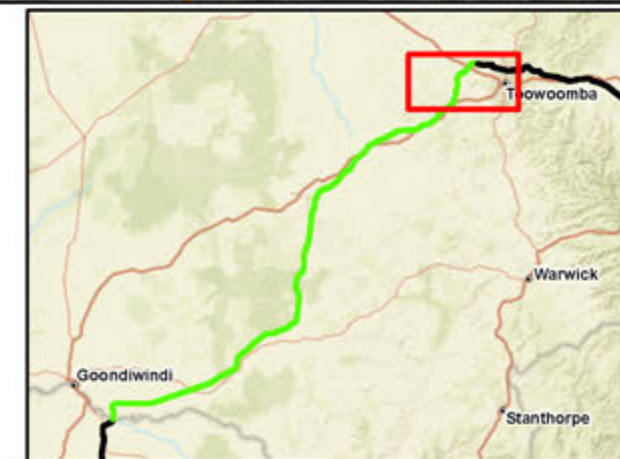
Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design

Hydraulic model extent

Landuse classification

- Developed area (n=0.083)
- Floodplain (n=0.050)
- Waterways (n=0.033)
- Roads (n= 0.025)



A3 scale: 1:110,000
 0 1 2 3 4 5km



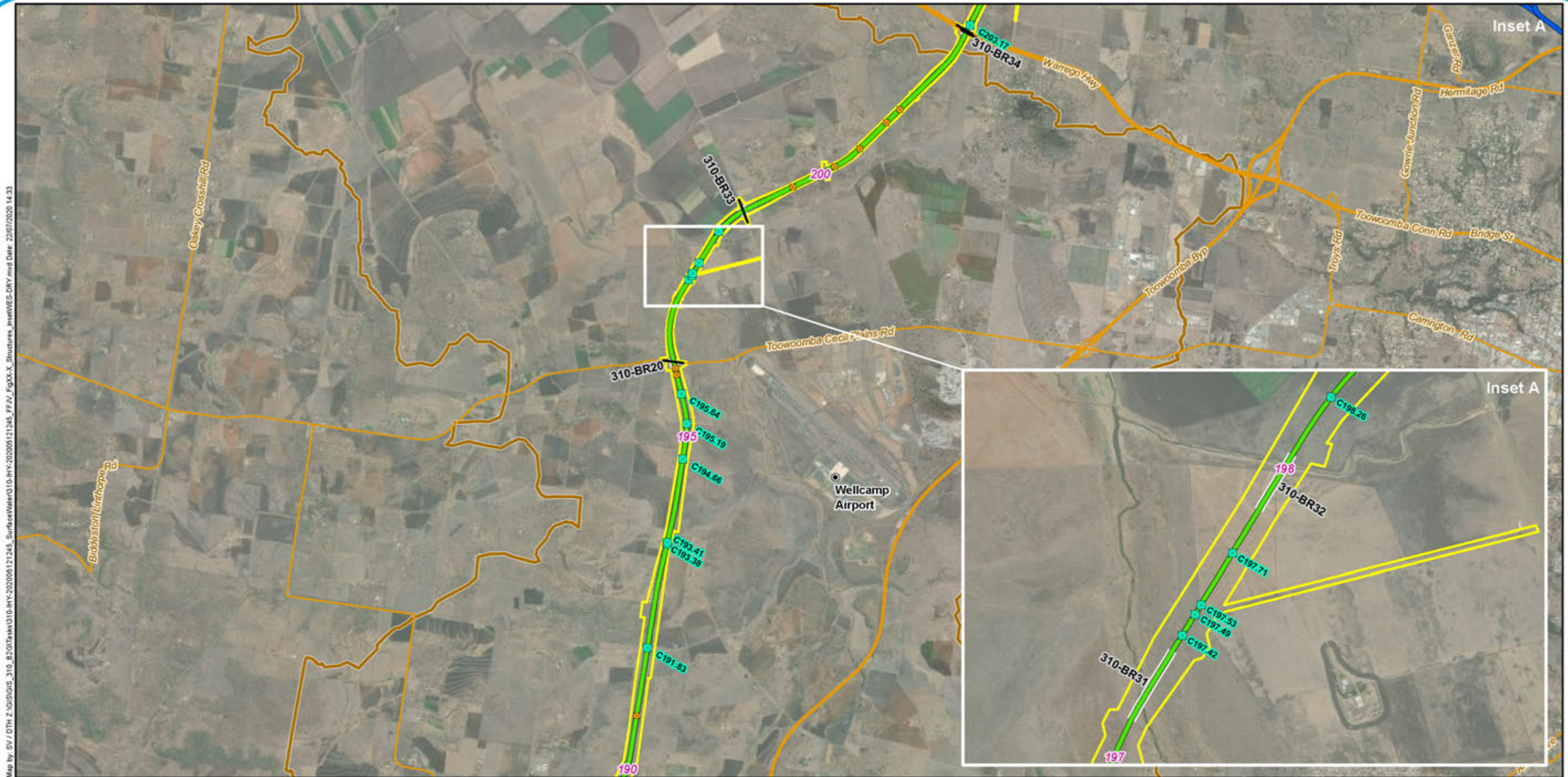
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Border to Gowrie

Figure B1-E:

Landuse classifications - Westbrook & Dry Creeks

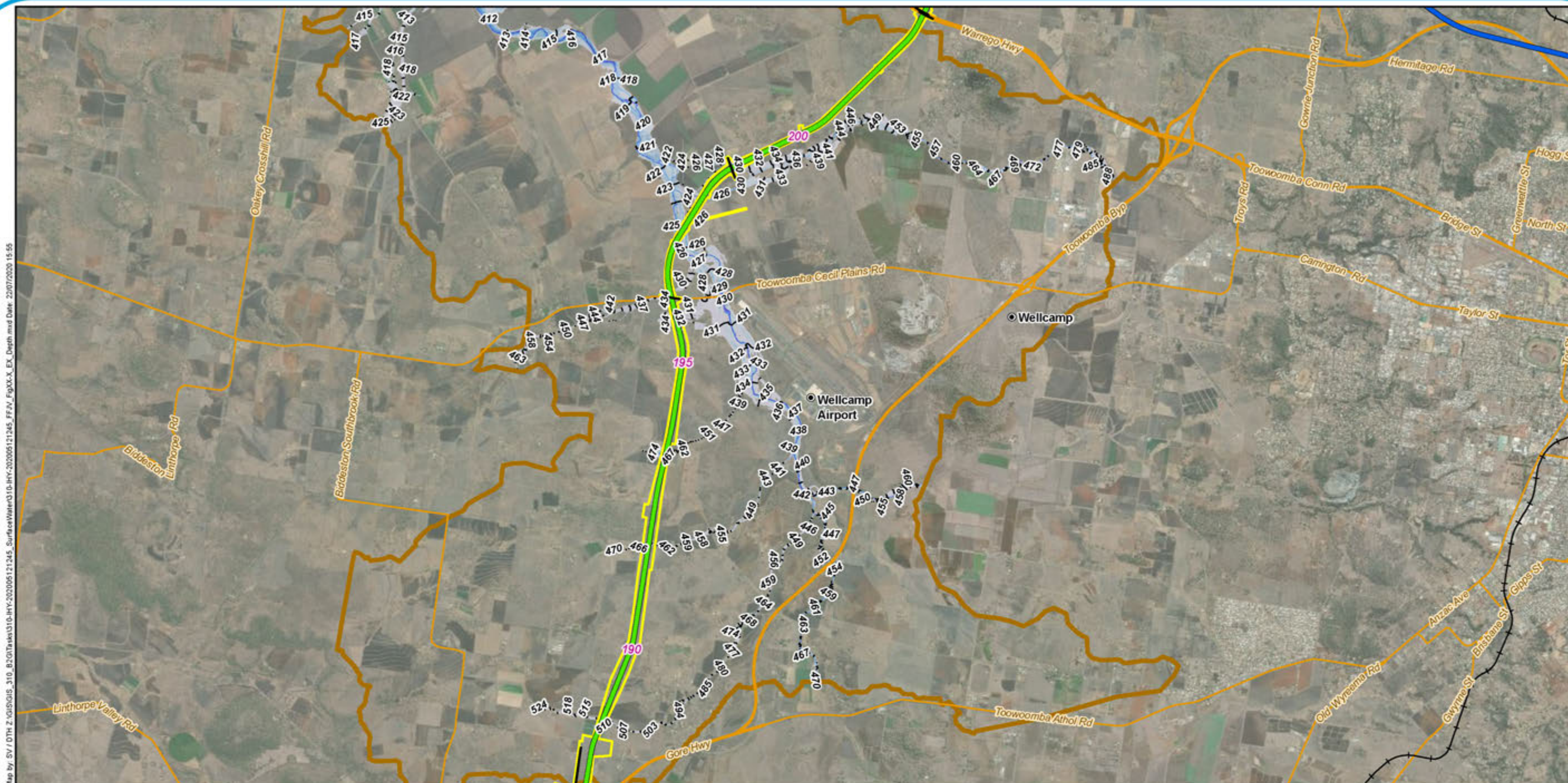


Legend

- 5 Chainage (km)
- Localities
- Floodplain culvert
- Local drainage culvert
- Bridges
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent



A3 scale: 1:62,000
 0 0.65 1.3 1.95 2.6 3.25 km



Legend

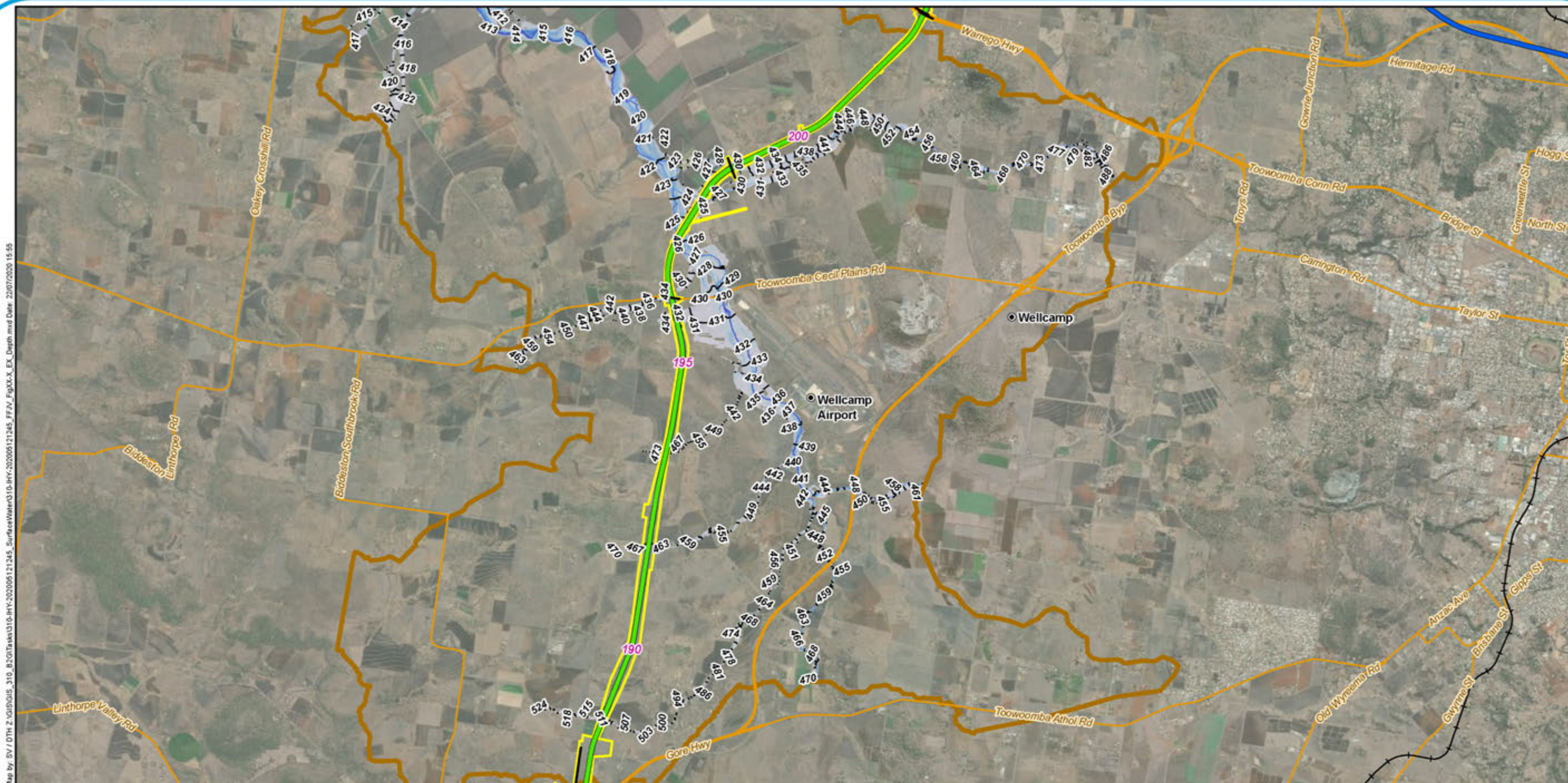
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| ■ 0 - 0.5 | ■ 3.0 - 3.5 |
| ■ 0.5 - 1.0 | ■ 3.5 - 4.0 |
| ■ 1.0 - 1.5 | ■ 4.0 - 4.5 |
| ■ 1.5 - 2.0 | ■ 4.5 - 5.0 |
| ■ 2.0 - 2.5 | ■ > 5.0 |
| ■ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km

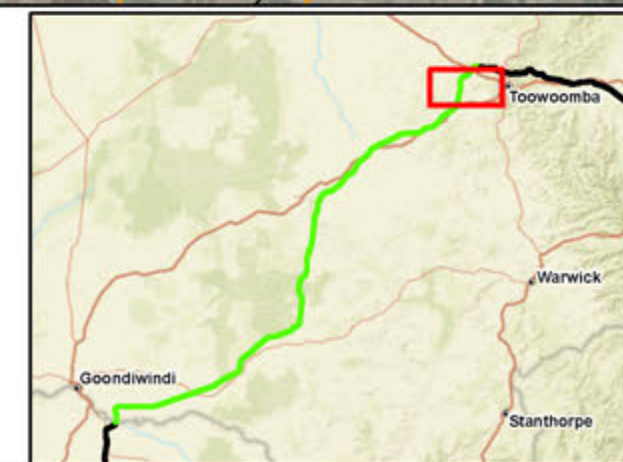


Legend

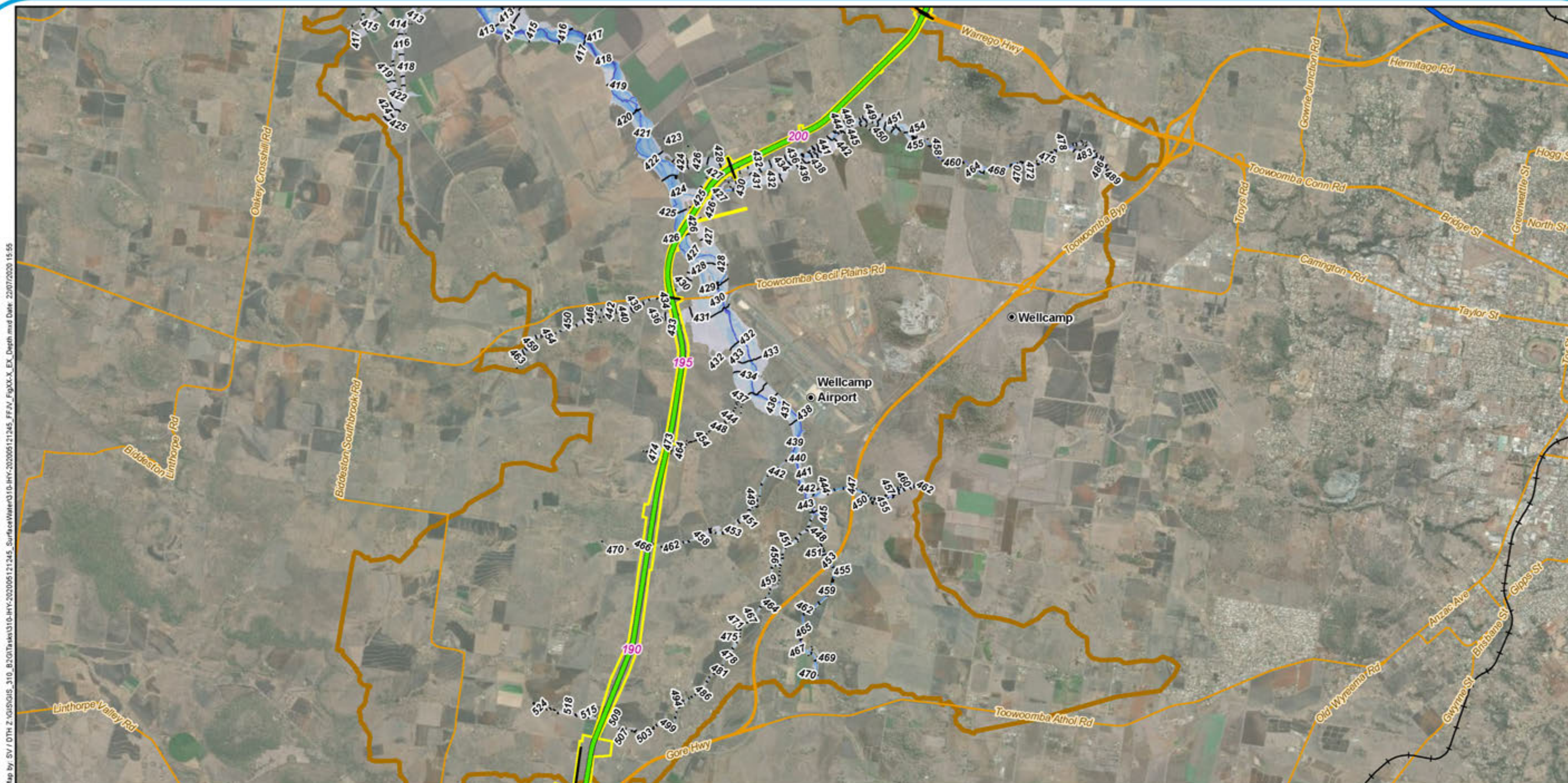
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|---------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km



Legend

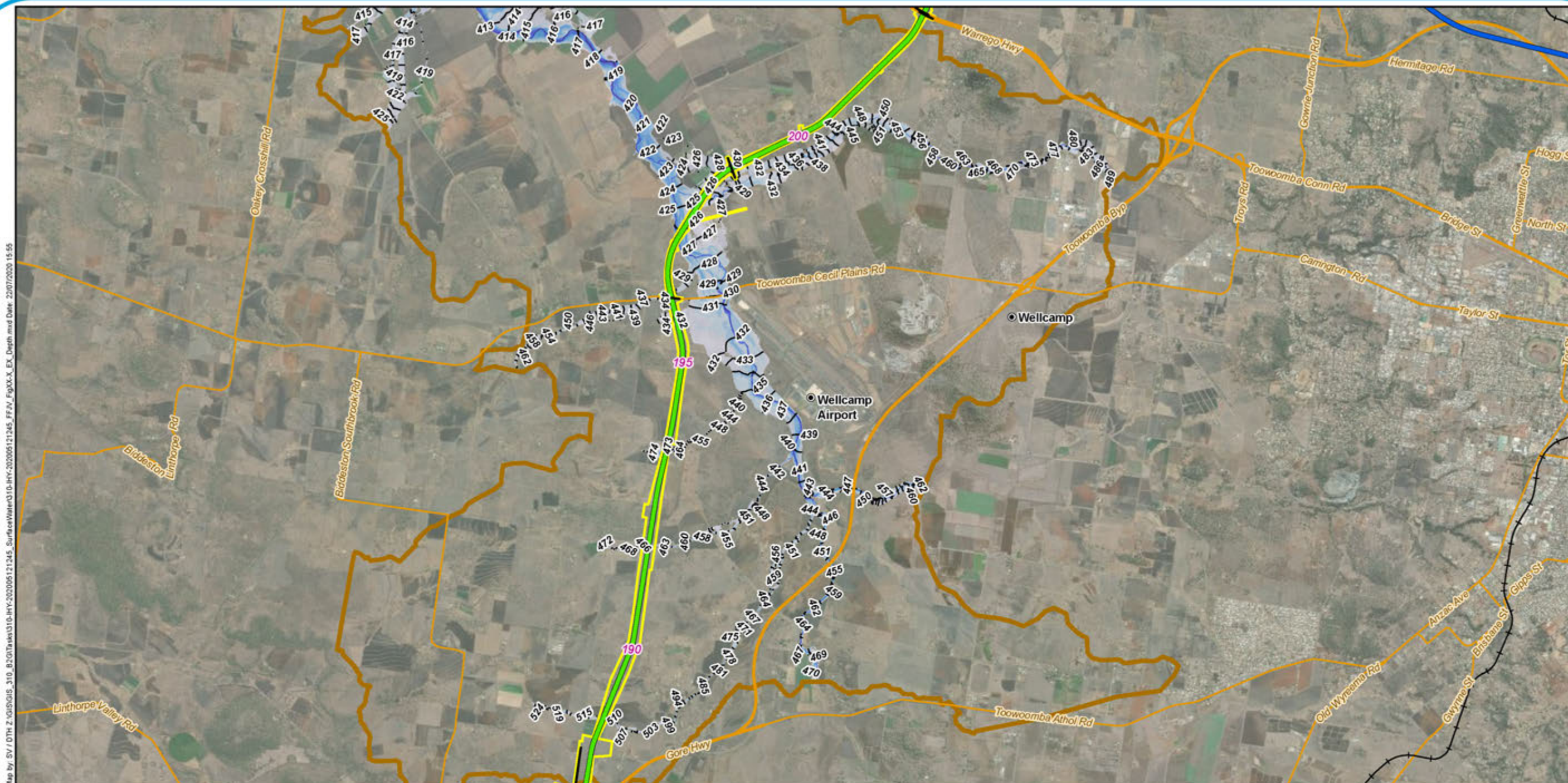
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

 0 - 0.5	 3.0 - 3.5
 0.5 - 1.0	 3.5 - 4.0
 1.0 - 1.5	 4.0 - 4.5
 1.5 - 2.0	 4.5 - 5.0
 2.0 - 2.5	 > 5.0
 2.5 - 3.0	— 1m contour (mAHD)



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km

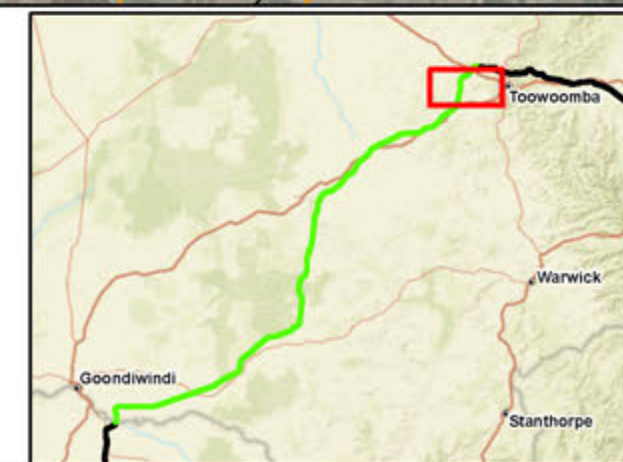


Legend

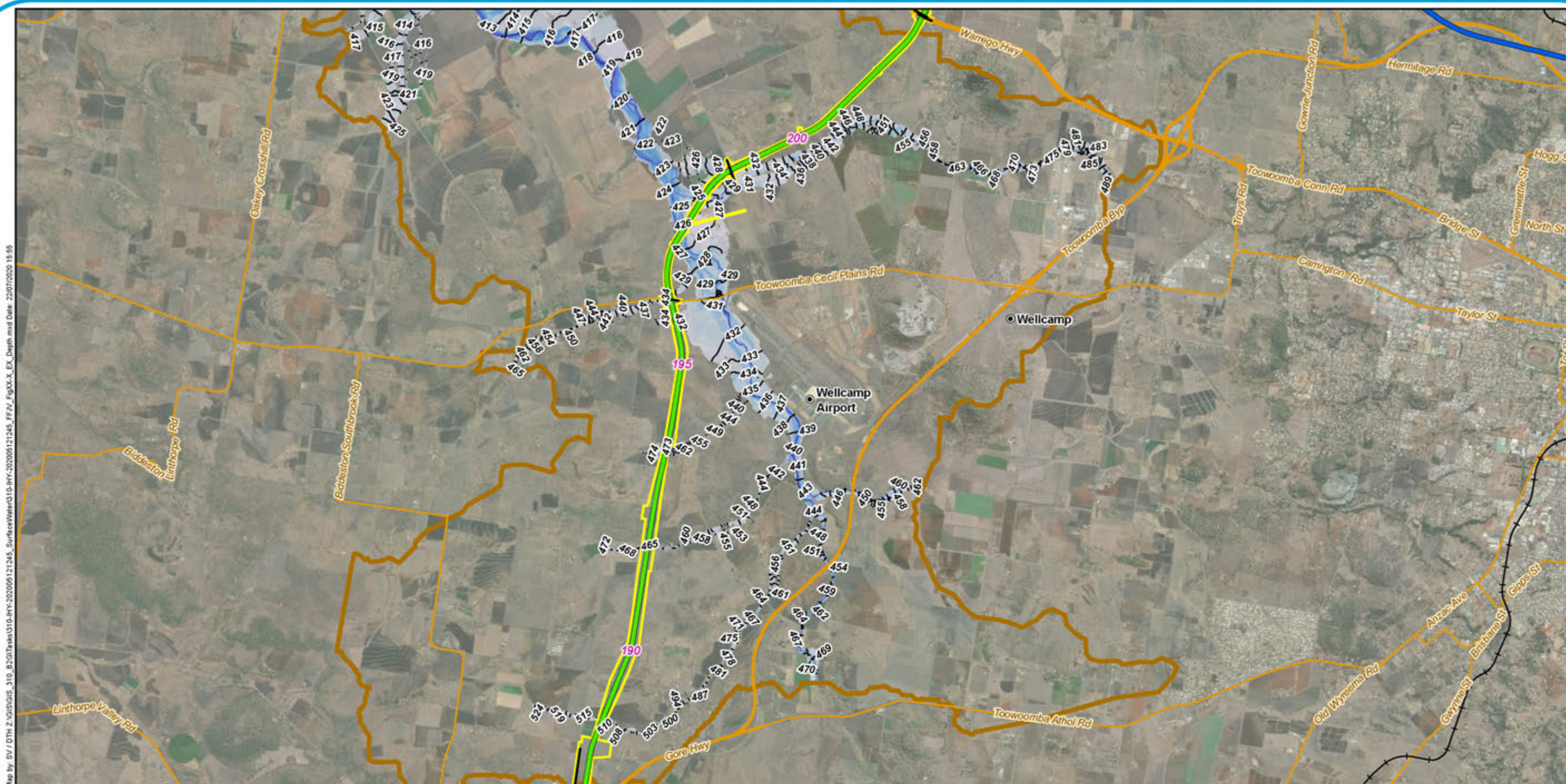
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|---------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km



Legend

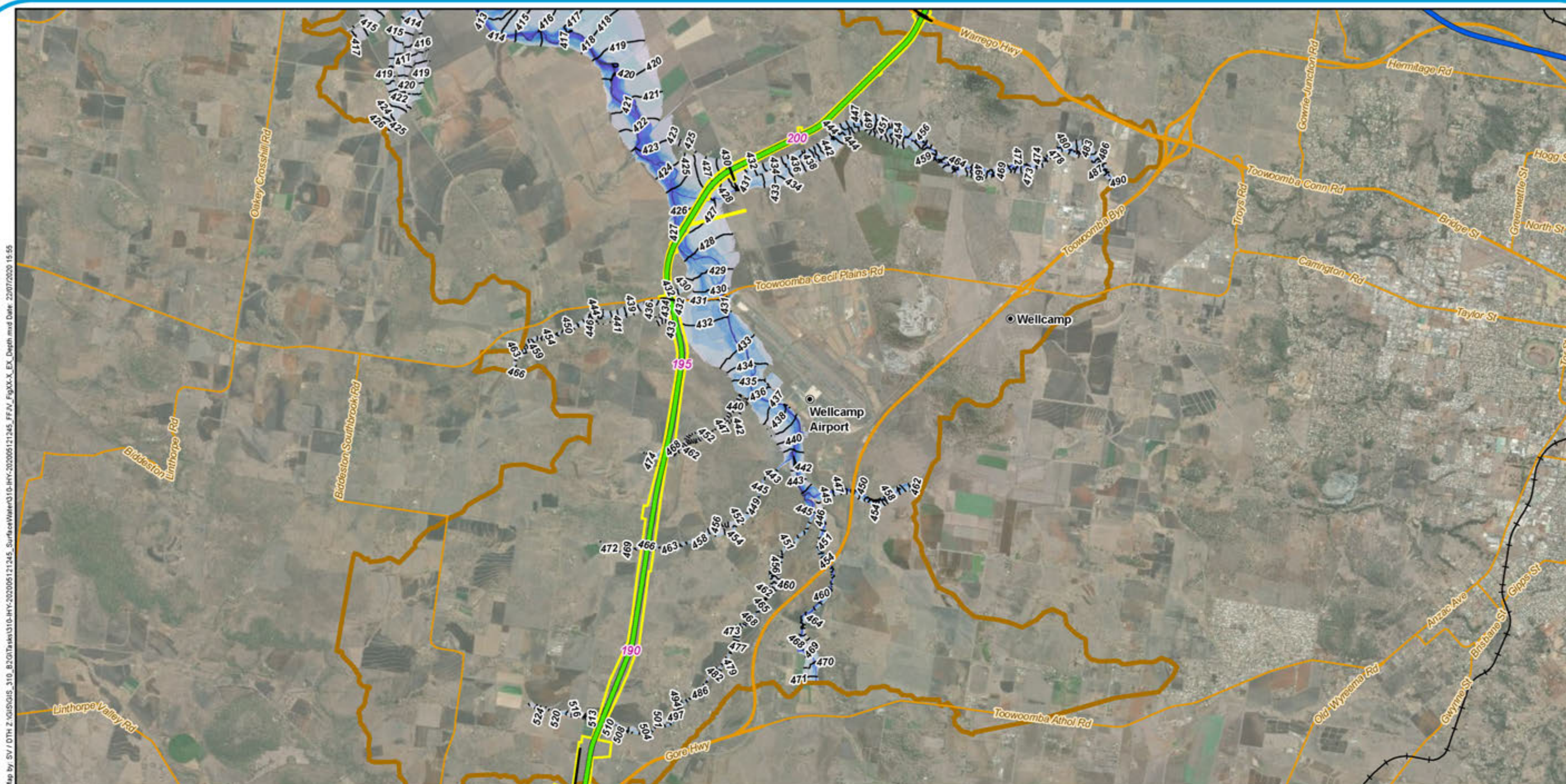
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km



Legend

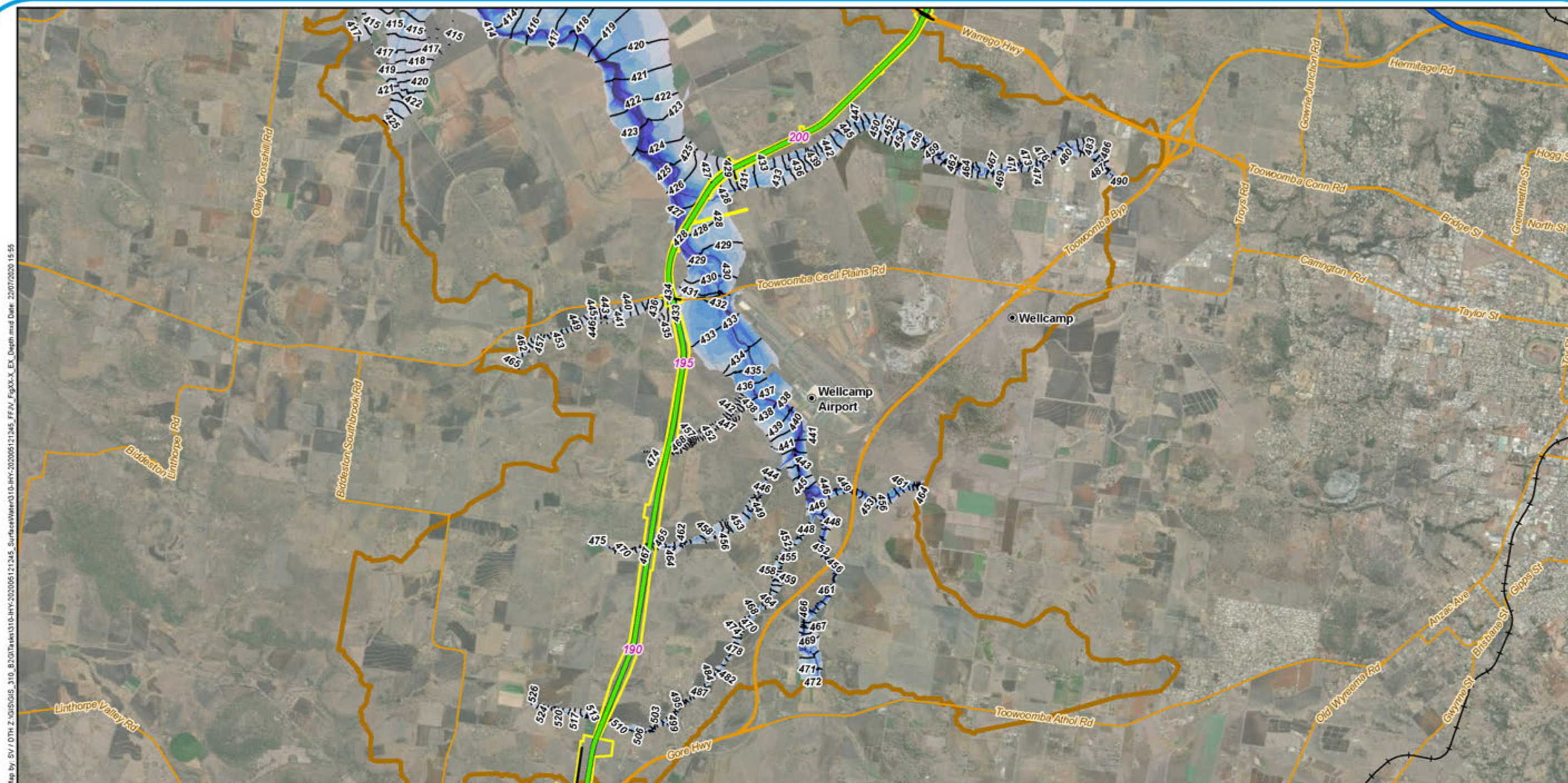
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km



Legend

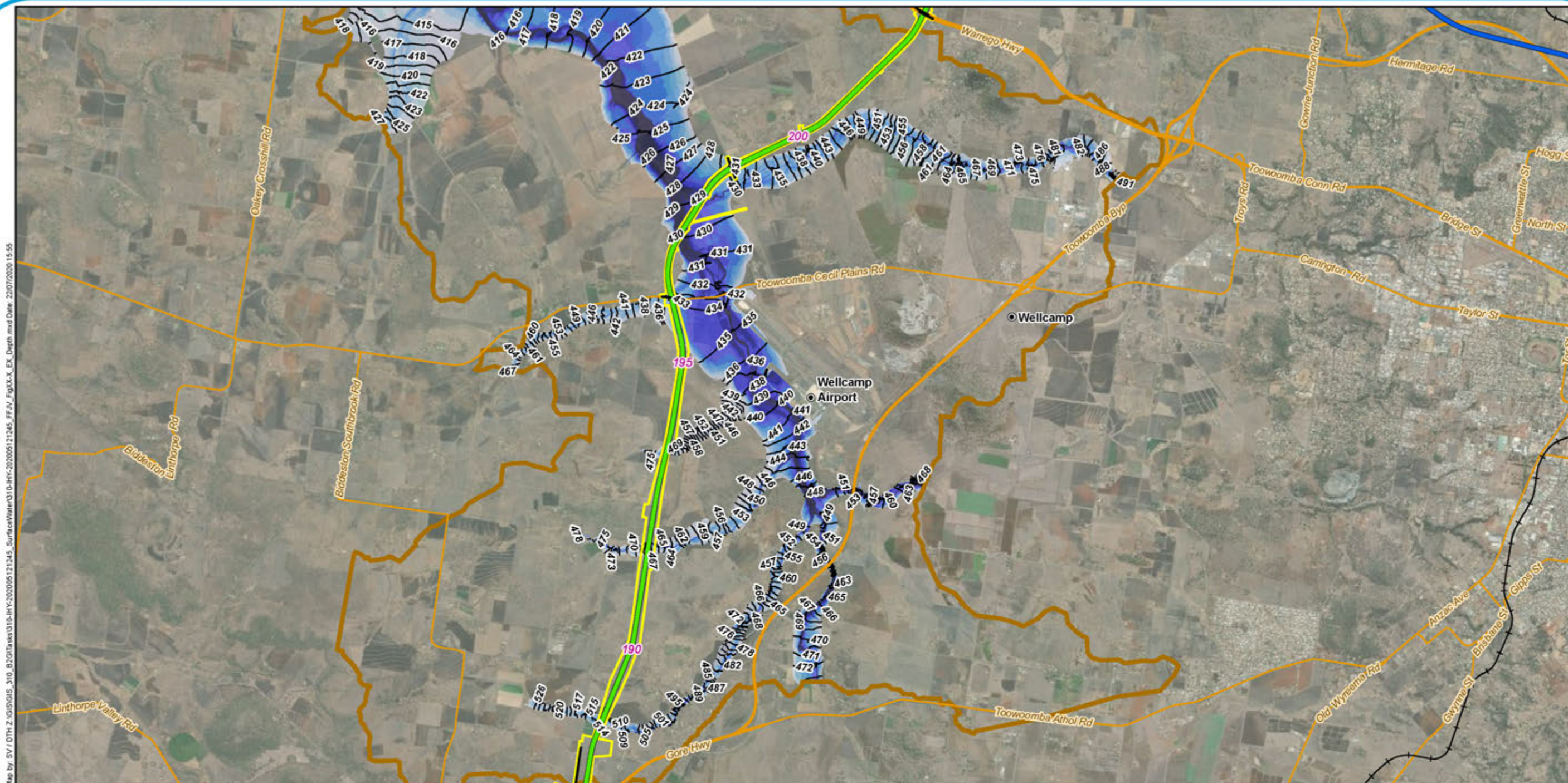
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km

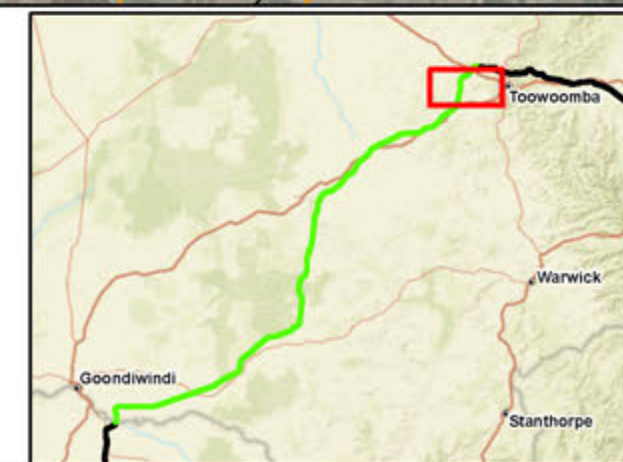


Legend

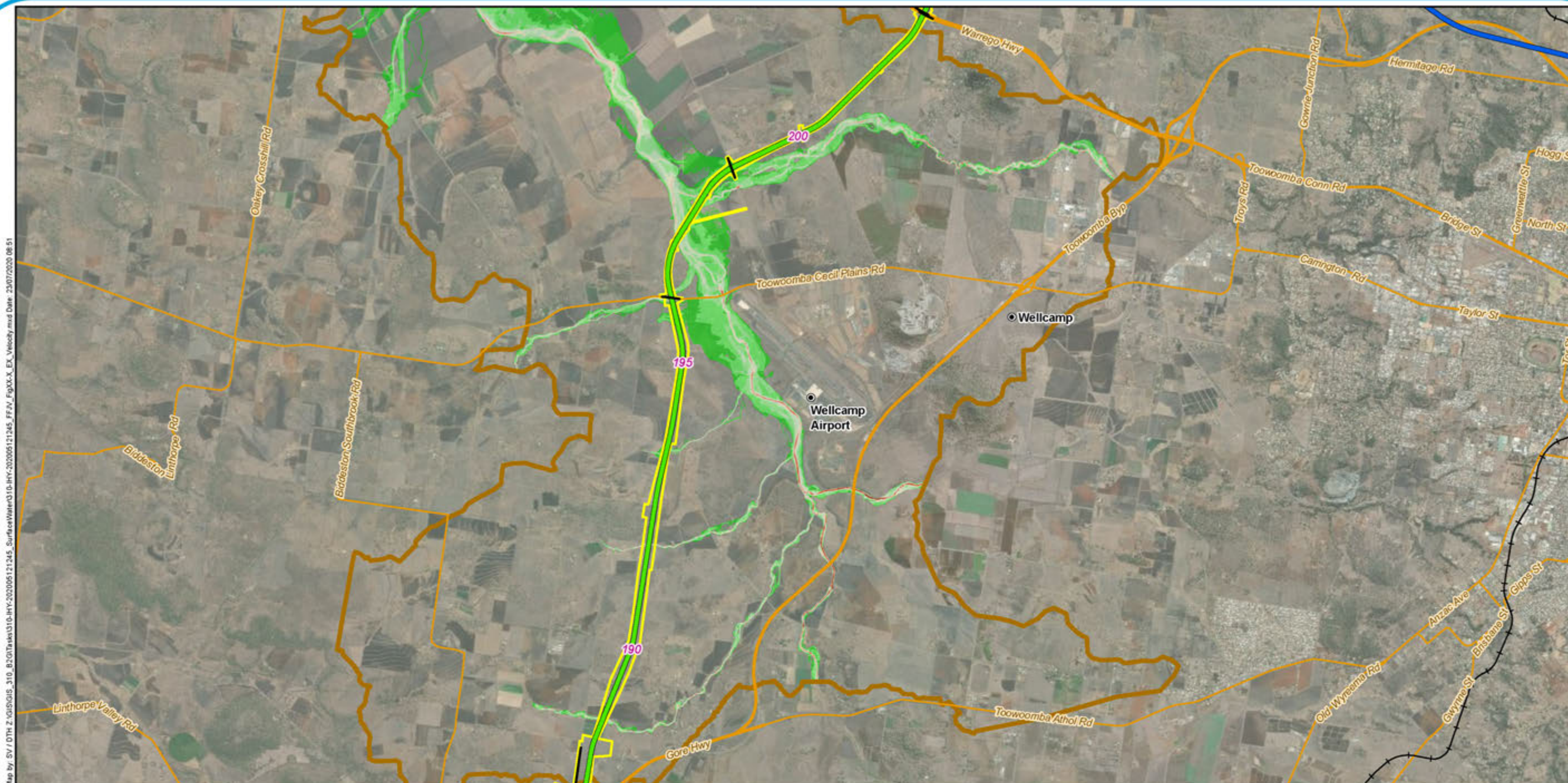
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5km

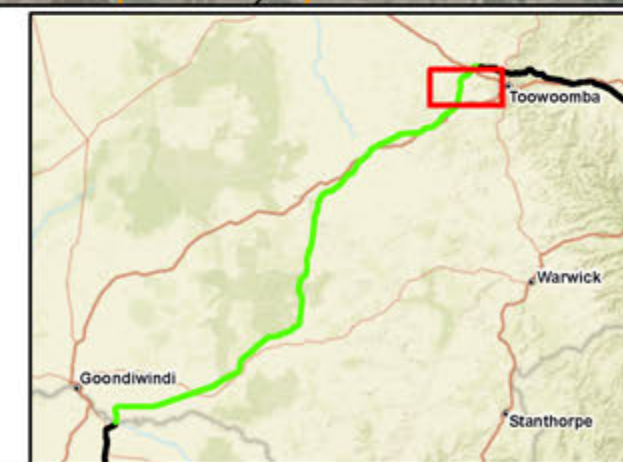


Legend

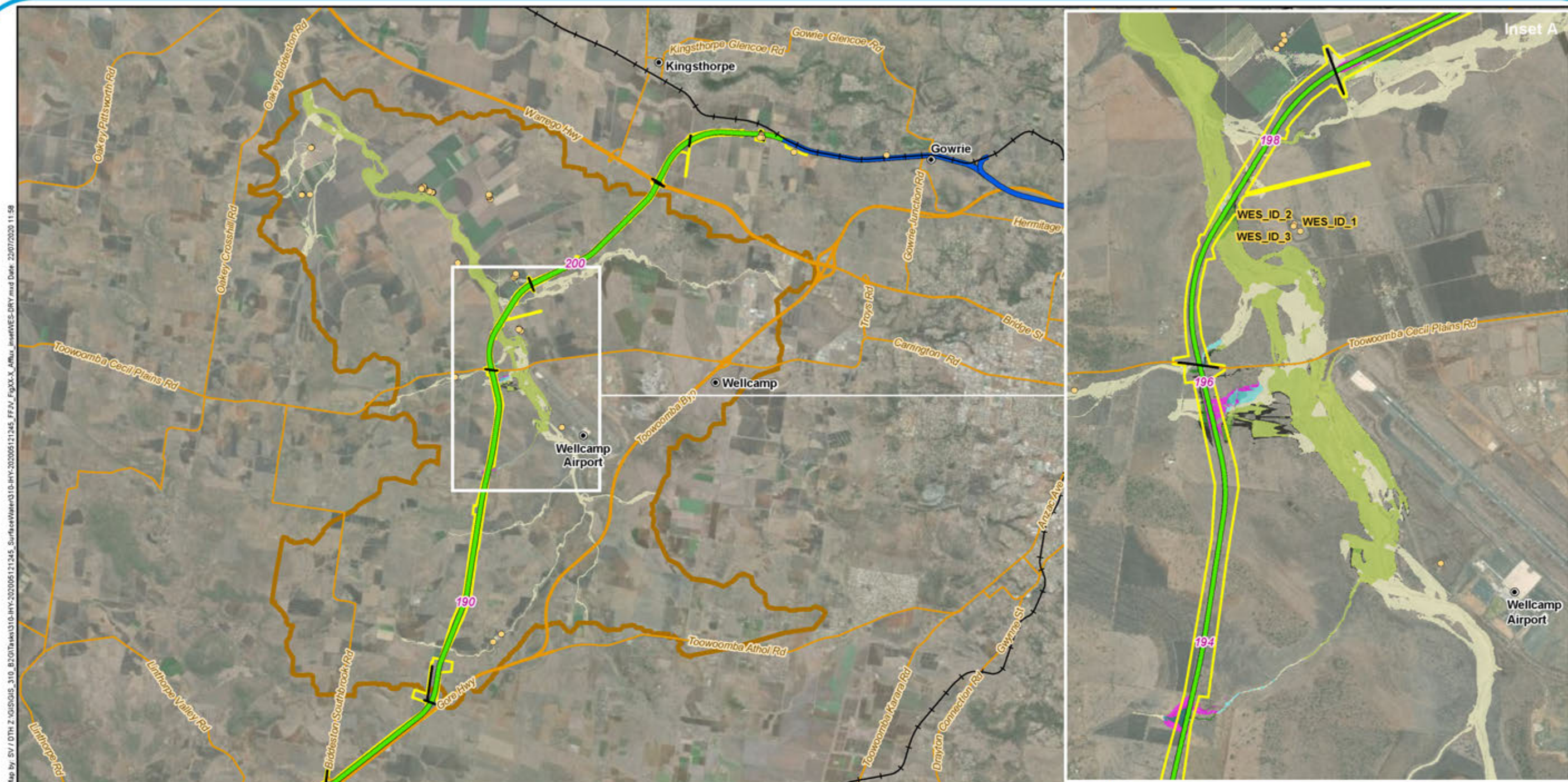
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Peak velocity (m/s)

0.0	3.0
0.5	3.5
1.0	4.0
1.5	4.5
2.0	5.0
2.5	



A3 scale: 1:72,500
 0 0.7 1.4 2.1 2.8 3.5 km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



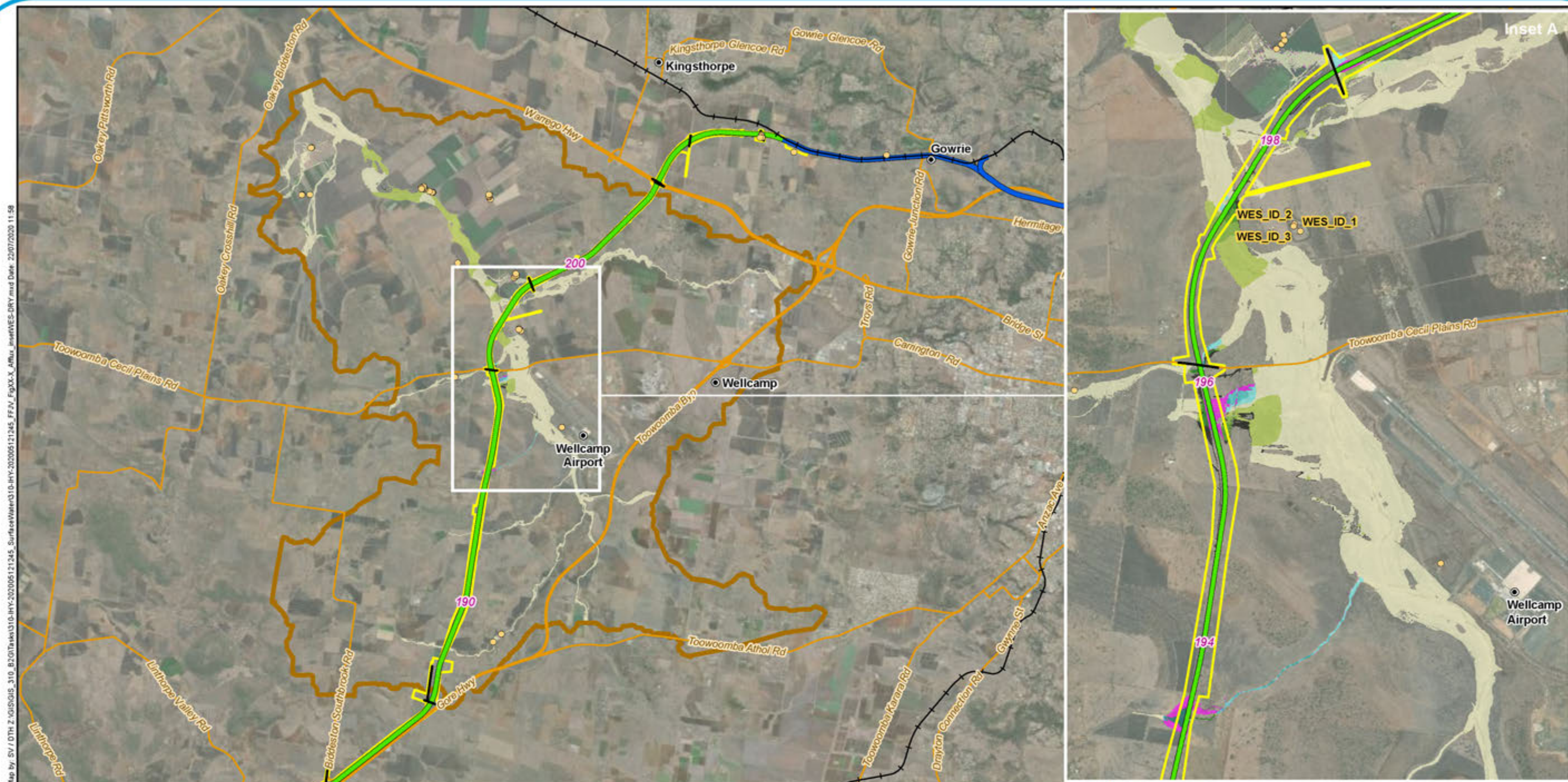
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Border to Gowrie

Figure B4-A:

20% AEP - design afflux - Westbrook & Dry Creeks



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

< -0.5	0.01 to 0.05
-0.50 to -0.20	0.05 to 0.10
-0.20 to -0.10	0.10 to 0.20
-0.10 to -0.05	0.20 to 0.50
-0.05 to -0.01	> 0.5
-0.01 to 0.01	



A3 scale: 1:110,000
 0 1 2 3 4 5 km



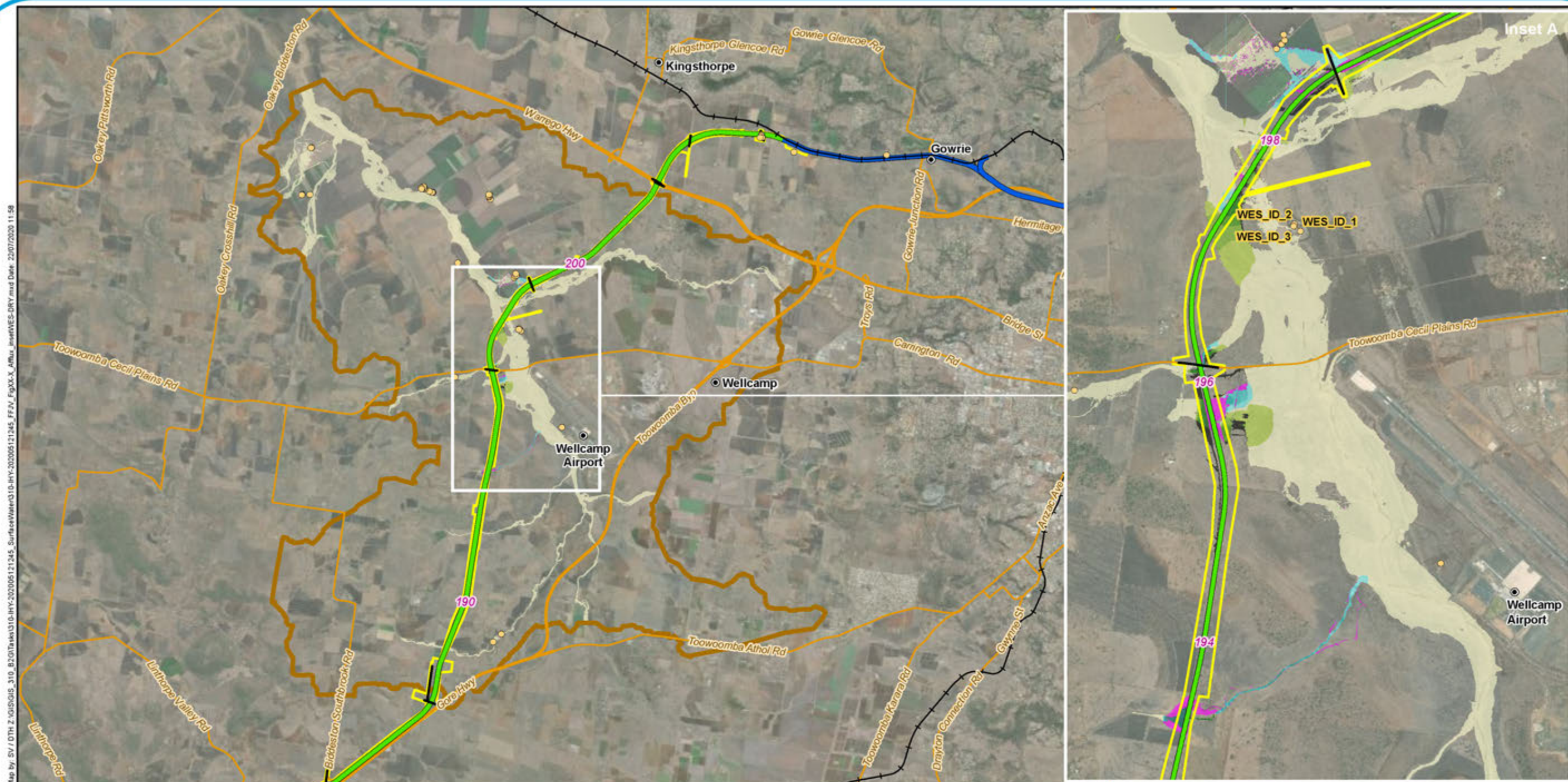
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Border to Gowrie

Figure B4-B:

10% AEP - design afflux - Westbrook & Dry Creeks



Legend

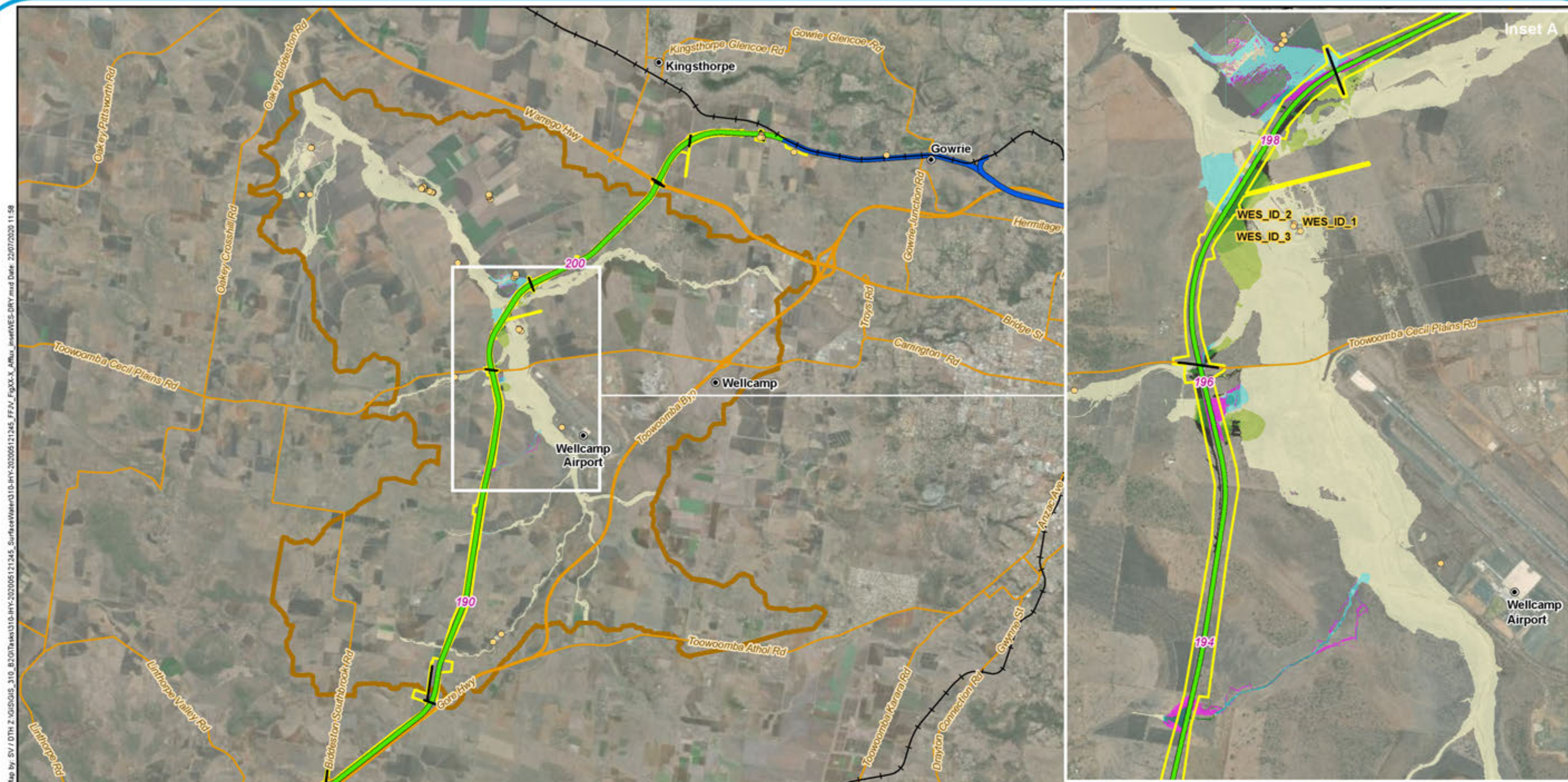
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



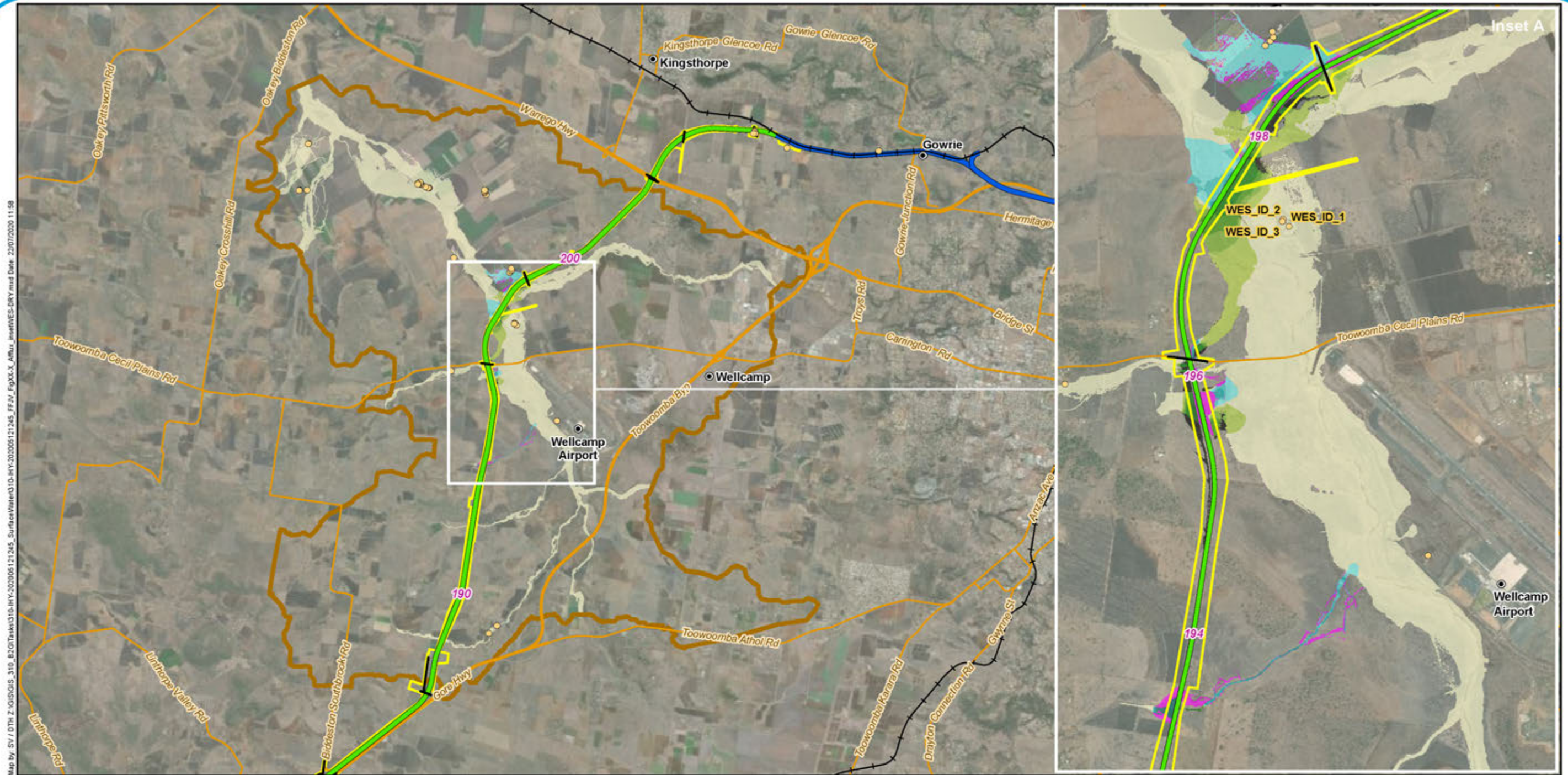
Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

	< -0.5		0.01 to 0.05
	-0.50 to -0.20		0.05 to 0.10
	-0.20 to -0.10		0.10 to 0.20
	-0.10 to -0.05		0.20 to 0.50
	-0.05 to -0.01		> 0.5
	-0.01 to 0.01		





Legend

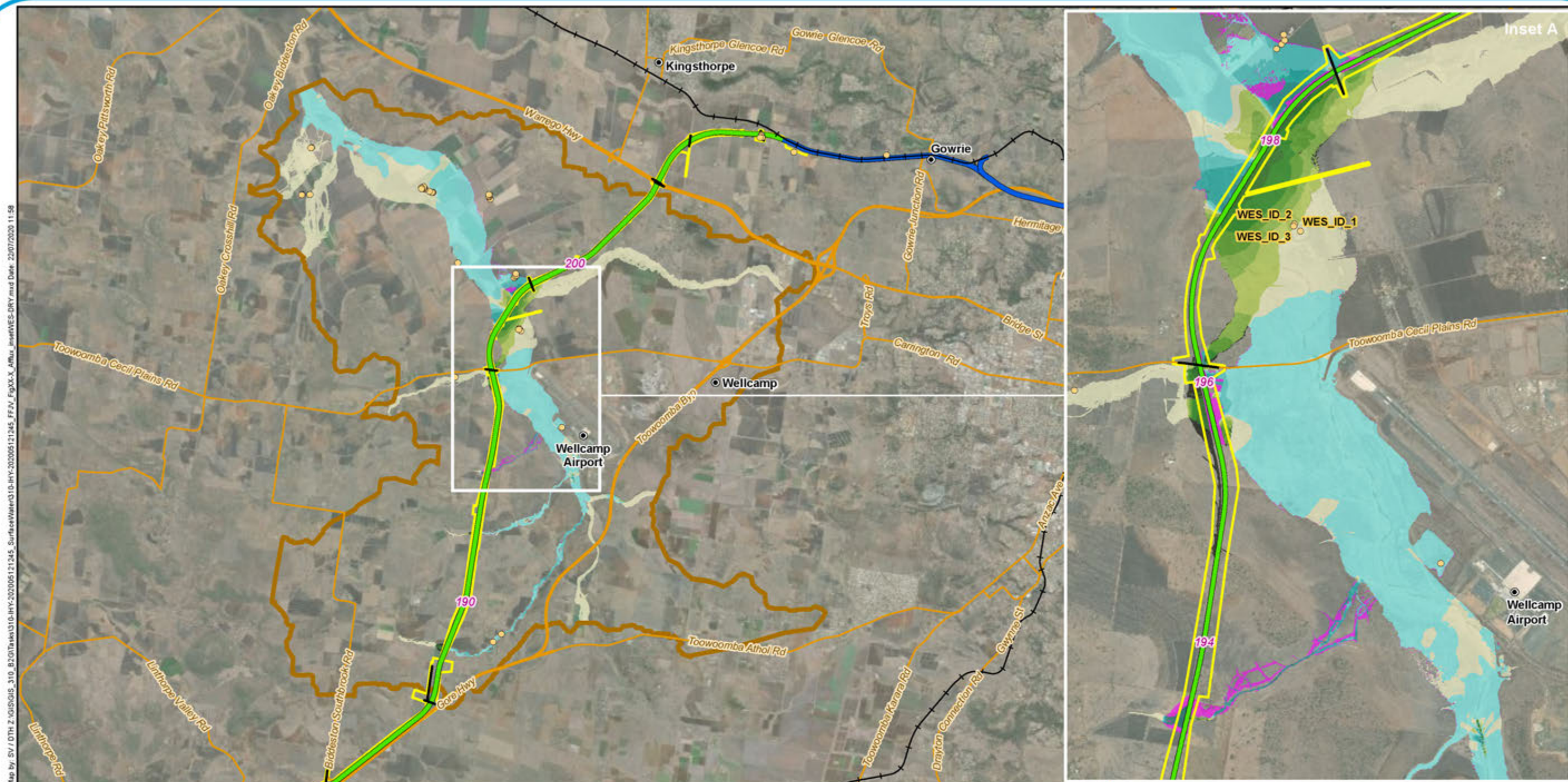
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | | | |
|--|----------------|--|--------------|
| | < -0.5 | | 0.01 to 0.05 |
| | -0.50 to -0.20 | | 0.05 to 0.10 |
| | -0.20 to -0.10 | | 0.10 to 0.20 |
| | -0.10 to -0.05 | | 0.20 to 0.50 |
| | -0.05 to -0.01 | | > 0.5 |
| | -0.01 to 0.01 | | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

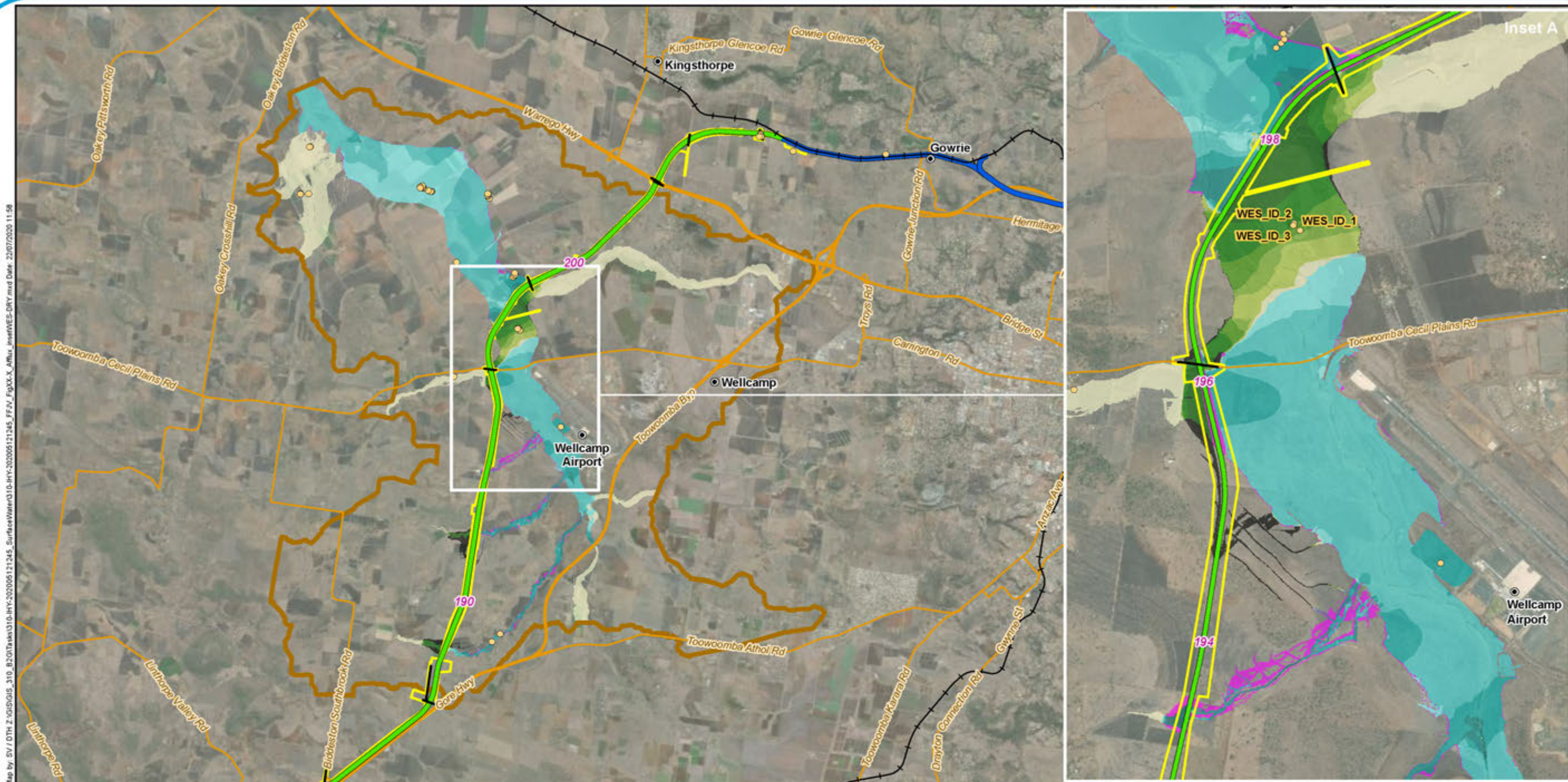
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

	< -0.5		0.01 to 0.05
	-0.50 to -0.20		0.05 to 0.10
	-0.20 to -0.10		0.10 to 0.20
	-0.10 to -0.05		0.20 to 0.50
	-0.05 to -0.01		> 0.5
	-0.01 to 0.01		



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

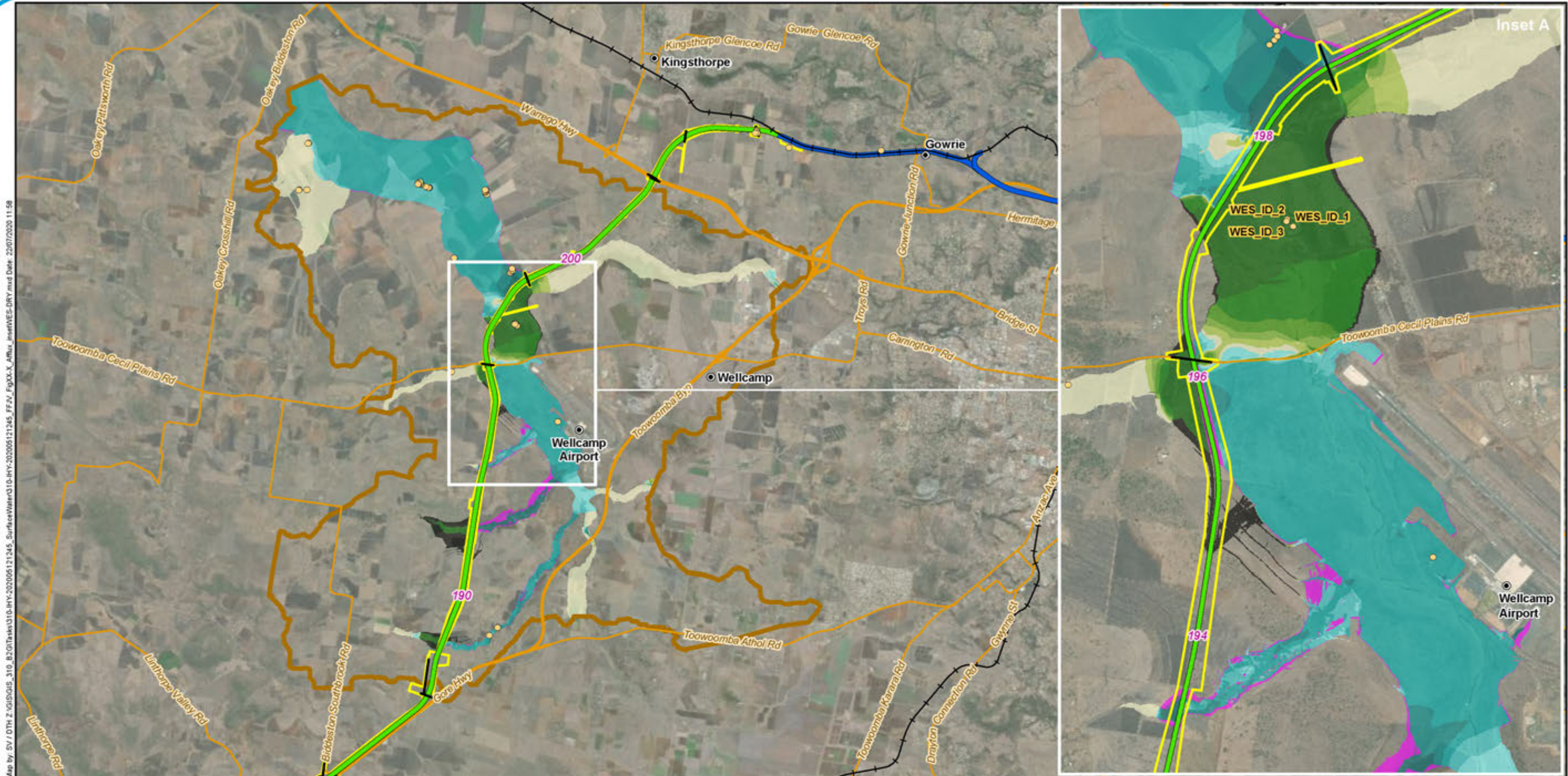
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|---|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

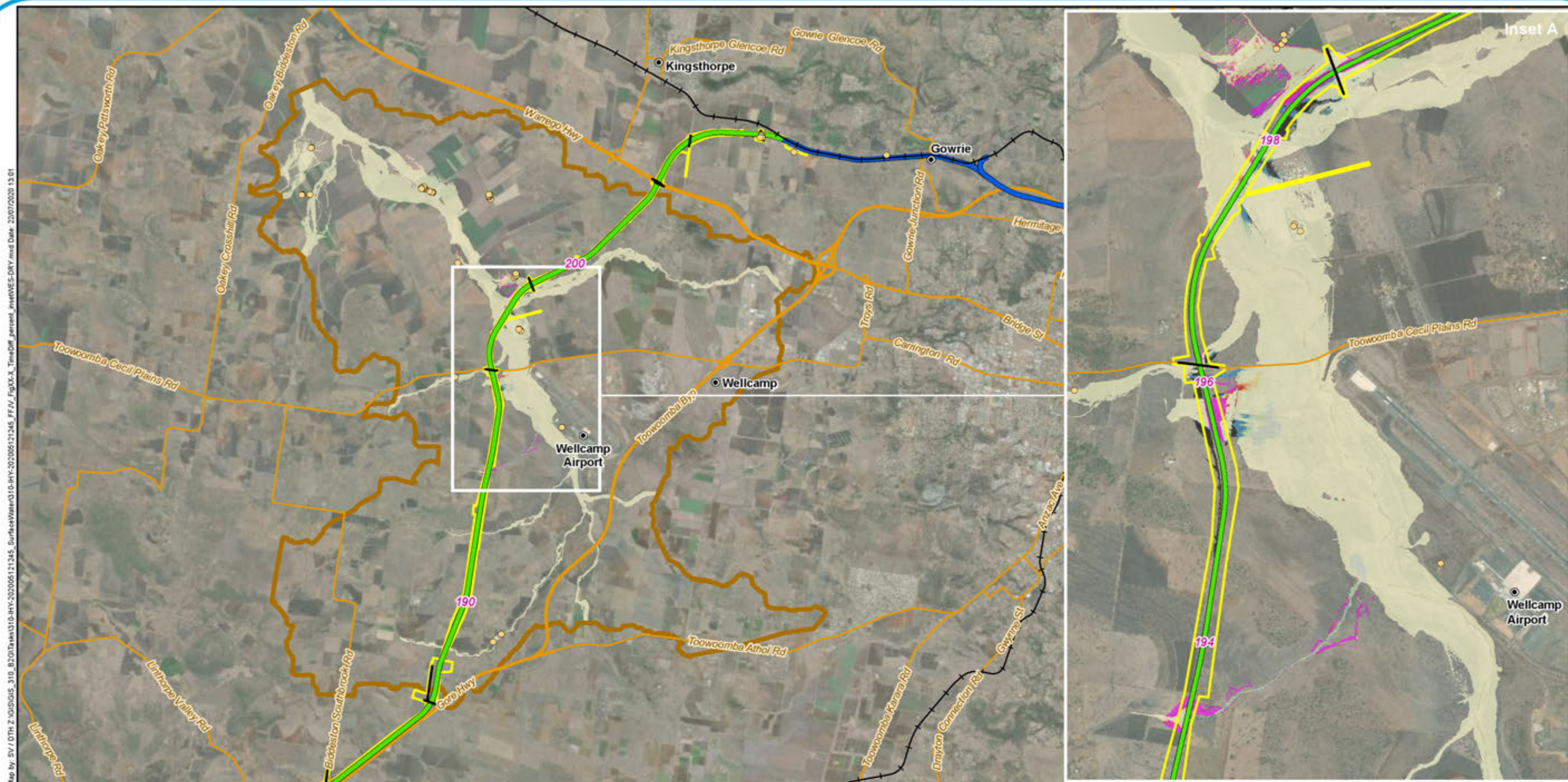
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

	< -0.5		0.01 to 0.05
	-0.50 to -0.20		0.05 to 0.10
	-0.20 to -0.10		0.10 to 0.20
	-0.10 to -0.05		0.20 to 0.50
	-0.05 to -0.01		> 0.5
	-0.01 to 0.01		



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

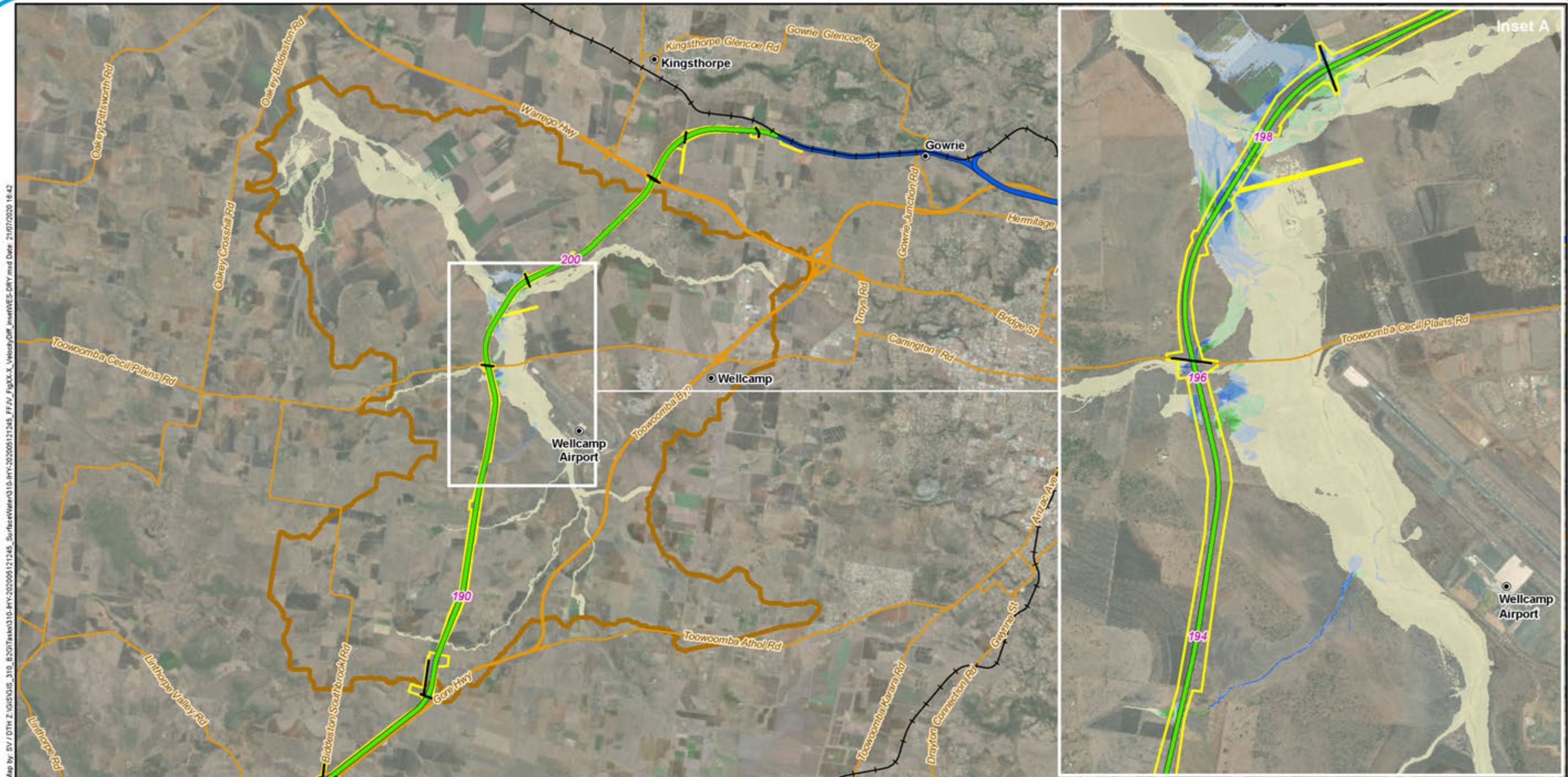
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in Time of Inundation (percentage)

- | | |
|---|--|
| < -50% | 10% to 20% |
| -50% to -40% | 20% to 30% |
| -40% to -30% | 30% to 40% |
| -30% to -20% | 40% to 50% |
| -20% to -10% | > 50% |
| -10% to 10% | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

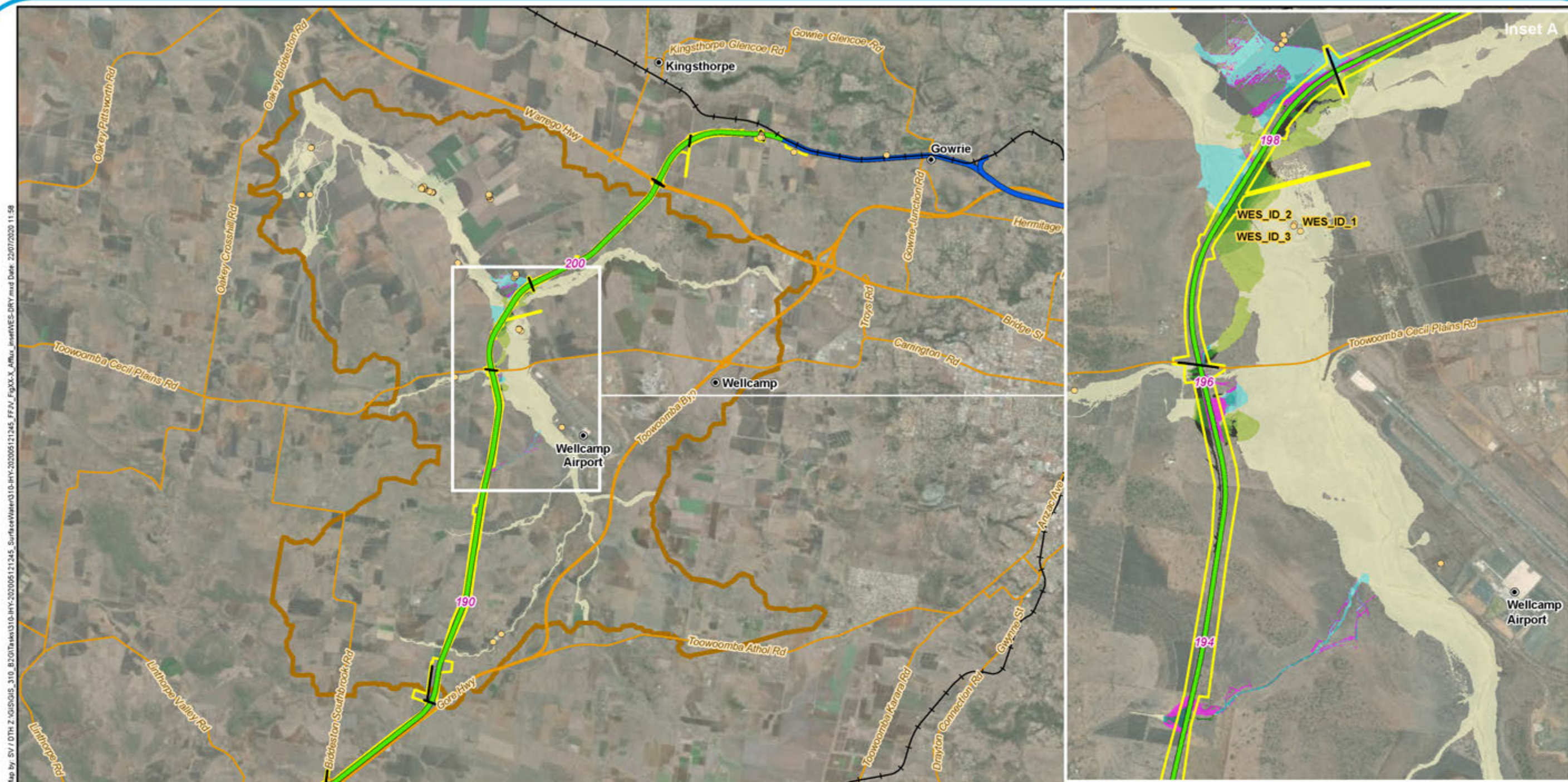
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Change in peak velocity (m/s)

- | | |
|----------------|--------------|
| < -0.50 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.50 |
| -0.01 to 0.01 | |



A3 scale: 1:110,000
 0 1 2 3 4 5km



Legend

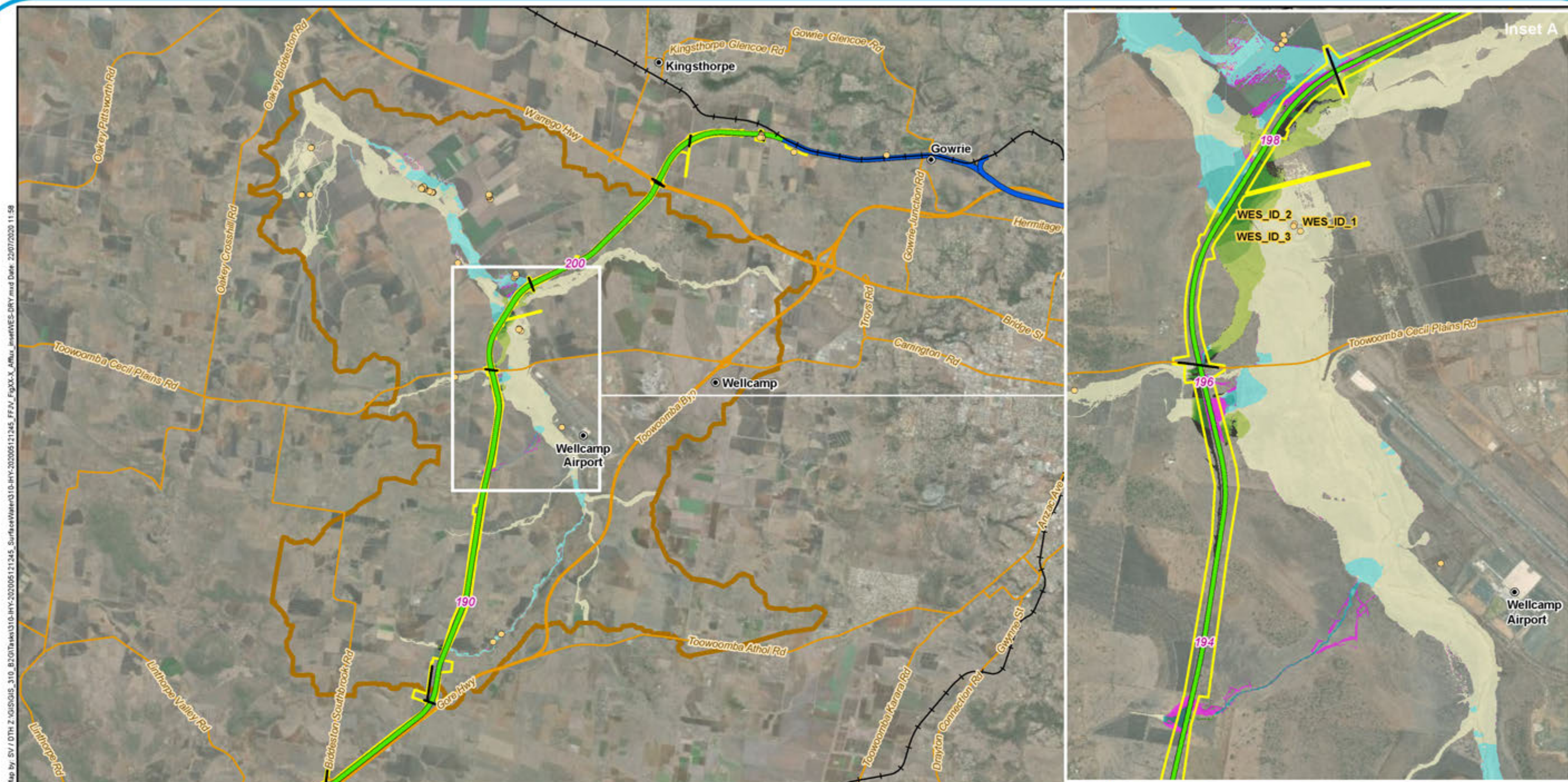
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|---|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

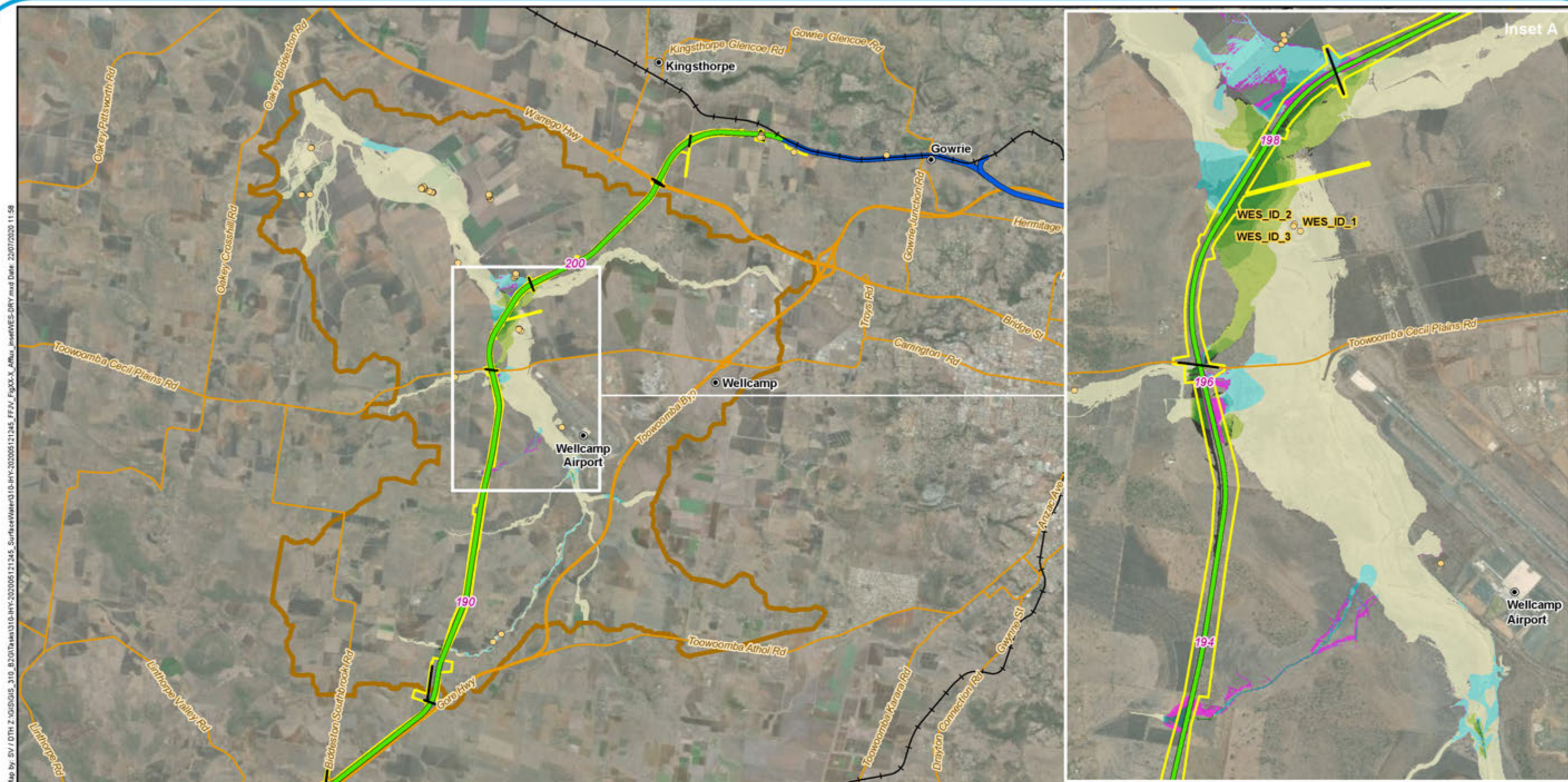
- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- + Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:110,000
 0 1 2 3 4 5 km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

	< -0.5		0.01 to 0.05
	-0.50 to -0.20		0.05 to 0.10
	-0.20 to -0.10		0.10 to 0.20
	-0.10 to -0.05		0.20 to 0.50
	-0.05 to -0.01		> 0.5
	-0.01 to 0.01		



A3 scale: 1:110,000
 0 1 2 3 4 5 km



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Border to Gowrie

Figure B5-C:

1% AEP sensitivity - climate change RCP8.5 - peak water levels - Westbrook & Dry Creeks

APPENDIX

Q2

Hydrology and Flooding Technical Report—Volume II

Appendix C Condamine River Flood Maps

INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

Appendix C

Condamine River Flood Maps

Figure C1-A	Locality plan
Figure C1-B	Survey data
Figure C1-C	Hydrologic model setup
Figure C1-D	Hydraulic model setup
Figure C1-E	Landuse classifications
Figure C1-F1	Proposed design structures
Figure C1-F2	Proposed design structures
Figure C1-F3	Proposed design structures
Figure C1-F4	Proposed design structures
Figure C1-F5	Proposed design structures
Figure C1-F6	Proposed design structures
Figure C2-A	2010 calibration event – inundation extent
Figure C2-B	1991 calibration event – inundation extent
Figure C2-C	2013 validation event – inundation extent
Figure C3-A	20% AEP peak water levels – Existing Case
Figure C3-B	10% AEP peak water levels – Existing Case
Figure C3-C	5% AEP peak water levels – Existing Case
Figure C3-D	2% AEP peak water levels – Existing Case
Figure C3-E	1% AEP peak water levels – Existing Case
Figure C3-F	1 in 2,000 AEP peak water levels – Existing Case
Figure C3-G	1 in 10,000 AEP peak water levels – Existing Case
Figure C3-H	PMF peak water levels – Existing Case
Figure C4-A	1% AEP peak velocity – Existing Case
Figure C5-A	20% AEP – design afflux
Figure C5-B	10% AEP – design afflux
Figure C5-C	5% AEP – design afflux
Figure C5-D	2% AEP – design afflux
Figure C5-E	1% AEP – design afflux
Figure C5-F	1 in 2,000 AEP – design afflux
Figure C5-G	1 in 10,000 AEP – design afflux
Figure C5-H	PMF – design afflux
Figure C5-I	1% AEP – change in time of inundation
Figure C5-J	1% AEP – change in velocity
Figure C6-A	1% AEP sensitivity – 0% blockage
Figure C6-B	1% AEP sensitivity – 50% blockage
Figure C6-C	1% AEP sensitivity – climate change RCP8.5 – peak water levels
Figure C6-D	1% AEP sensitivity – roughness variations – likelihood of inundation



Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Watercourses
- Major roads
- Minor roads
- Road design
- Project footprint



A3 scale: 1:100,000
 0 1 2 3 4 5km

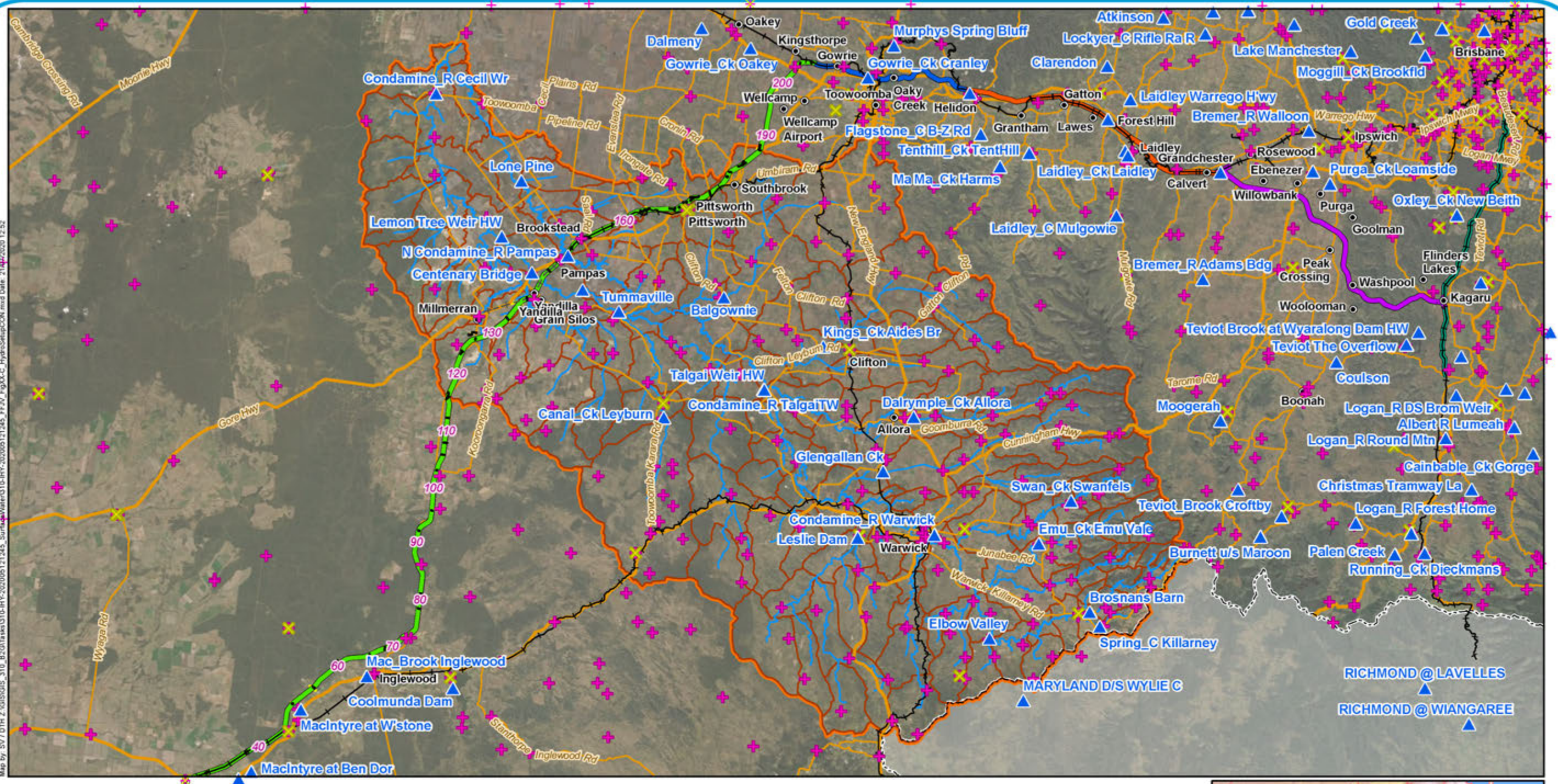


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Border to Gowrie
Figure C1-A:
Locality plan - Condamine River





Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Gowrie to Helidon alignment
- Helidon to Calvert alignment
- Calvert to Kagaru alignment
- Kagaru to Acacia Ridge/Bromelton alignment

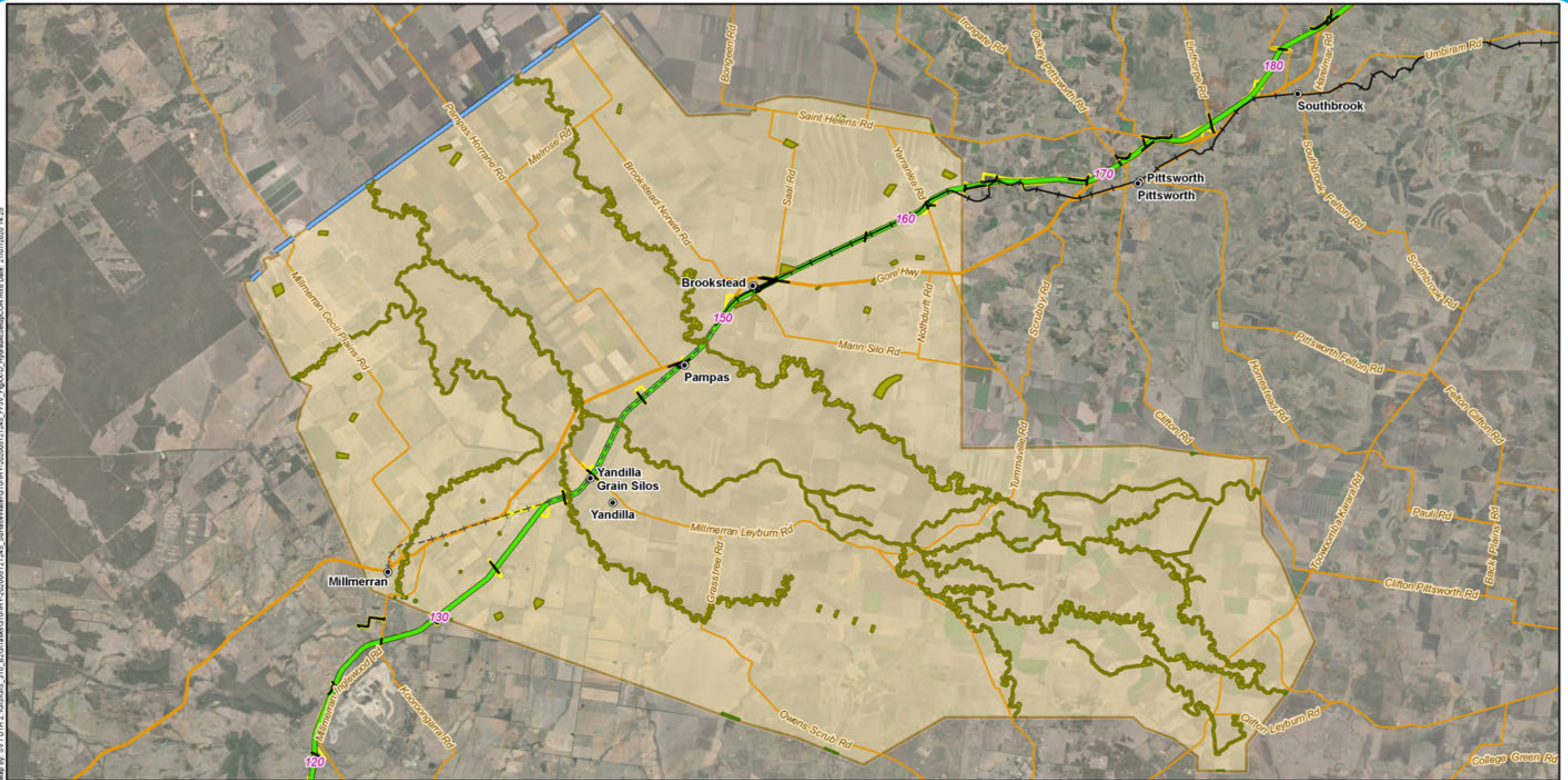
- Major roads
- Minor roads
- Road design
- NSW/QLD border
- Project footprint
- Catchment links
- Sub-catchments
- Hydrologic model extent

- Pluviograph stations
- Daily rainfall stations
- Stream gauge locations



A3 scale: 1:700,000
0 7 14 21 28 35km

Map by: SV / DTH 2:10:50:310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigC1-D_HydraulicSetupCON.mxd Date: 21/07/2020 14:25



Legend

- | | | |
|---------------------------------|-------------------|----------------------------|
| 5 Chainage (km) | Major roads | Hydraulic model extent |
| Localities | Minor roads | Outflow boundary |
| Existing rail (operational) | Road design | Inflow boundaries |
| Existing rail (non-operational) | Project footprint | Internal inflow boundaries |
| Border to Gowrie alignment | | |



A3 scale: 1:200,000
0 2 4 6 8 10km



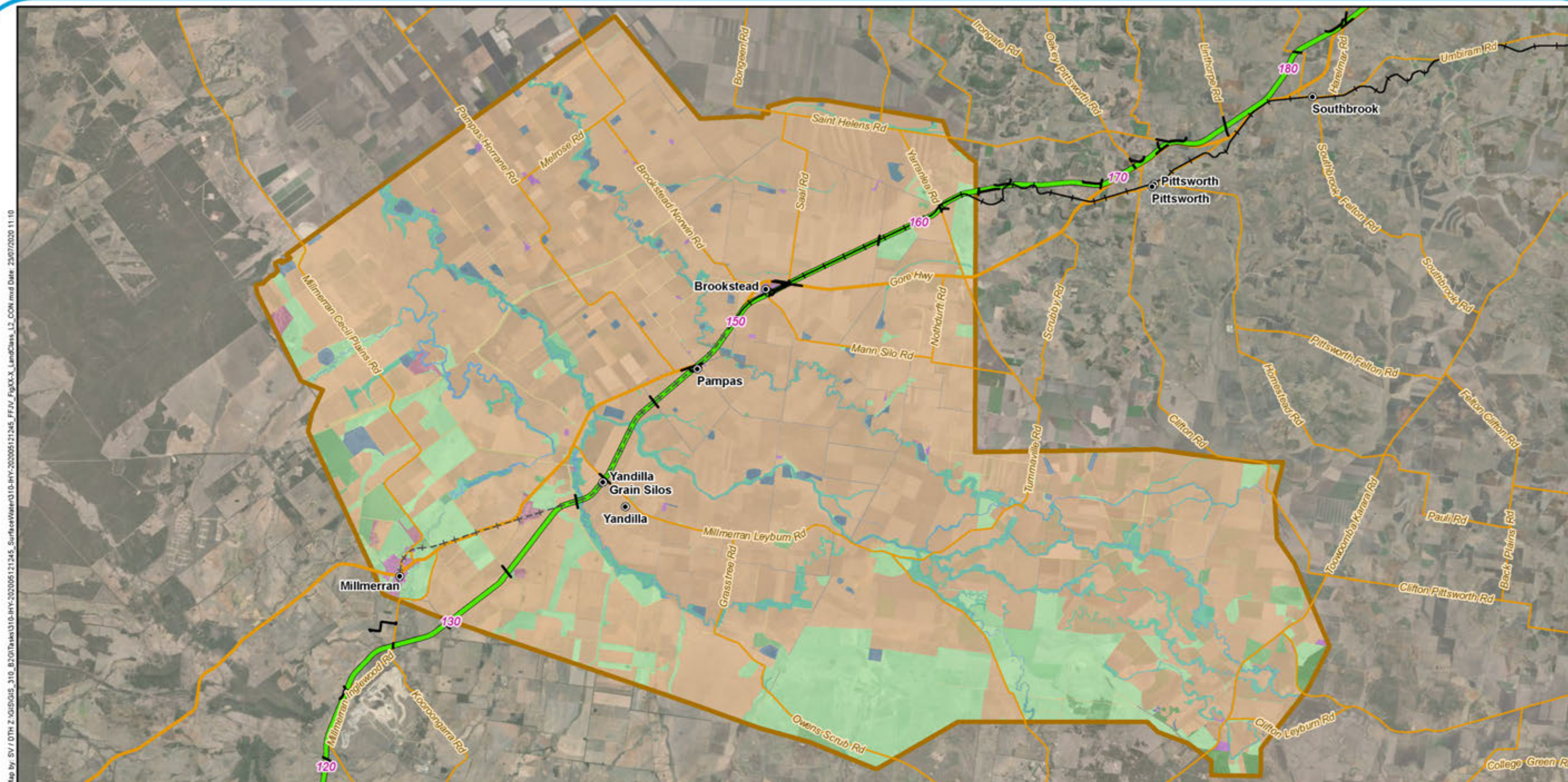
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Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C1-D:

Hydraulic model setup - Condamine River

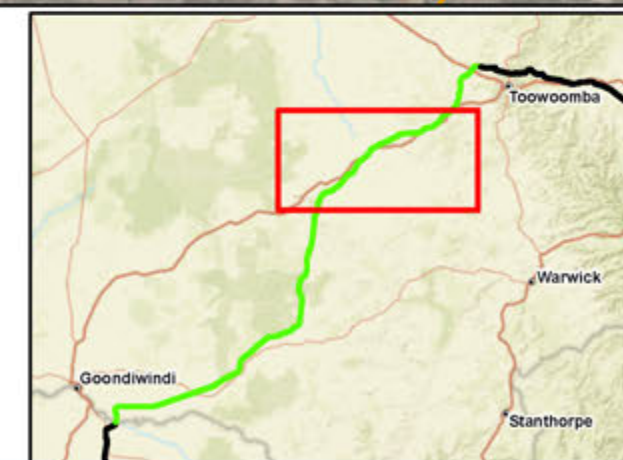


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Hydraulic model extent

Landuse classification

- | | |
|----------------------------------|---------------------------------|
| River (n=0.035) | Open space - mod veg (n=0.055) |
| Sealed road corridor (n=0.015) | Openspace - heavy veg (n=0.065) |
| Unsealed road corridor (n=0.025) | Open water (n=0.025) |
| Rural residential (n=0.090) | Rail (n=0.025) |
| Urban residential (n=0.100) | Riparian (n=0.040) |
| Commercial (n=0.060) | Crop (n=0.109) |
| Open space - min veg (n=0.045) | |



A3 scale: 1:200,000
 0 2 4 6 8 10 km



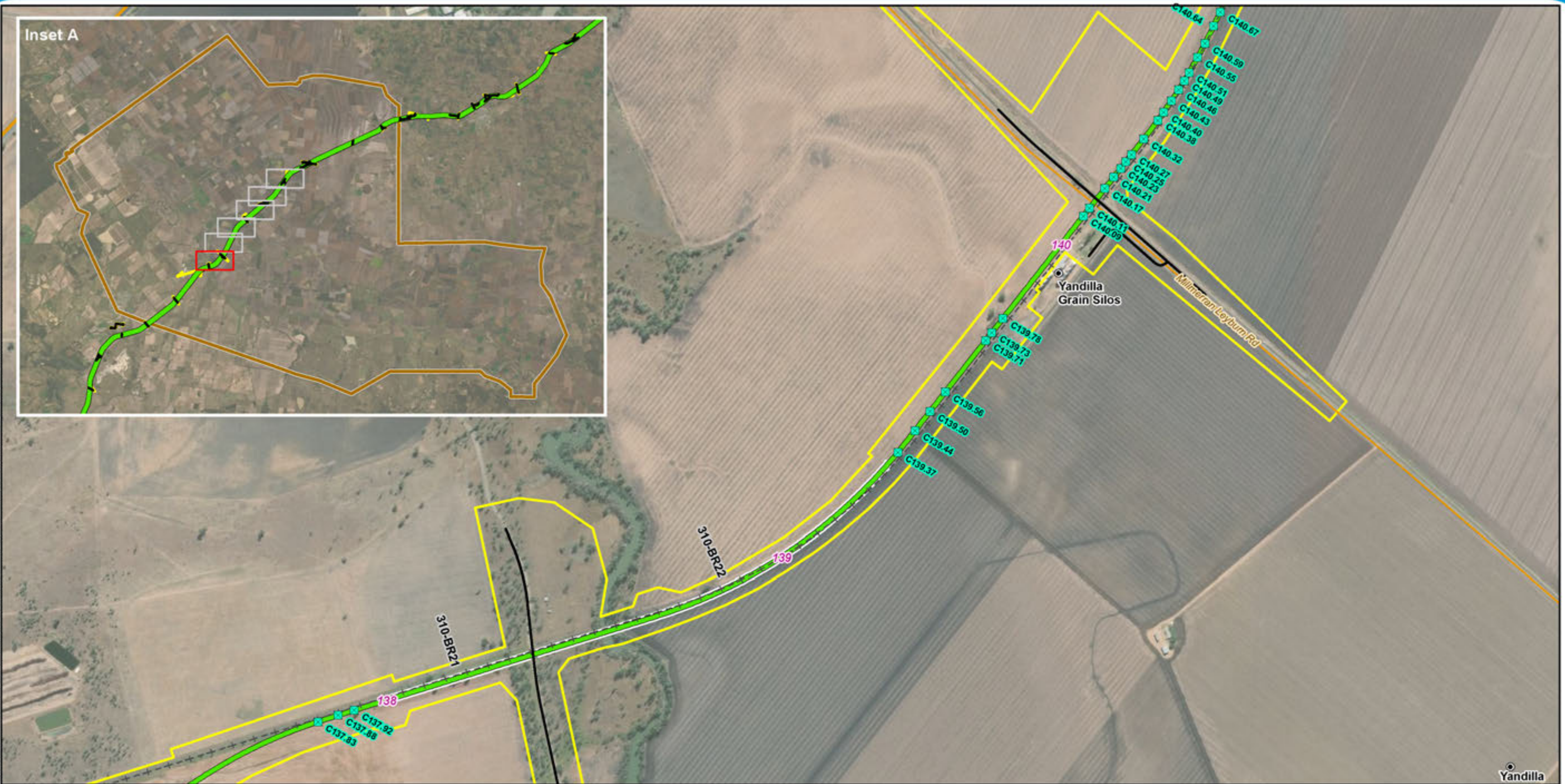
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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C1-E:

Landuse classifications - Condamine River



Legend

- | | |
|---------------------------------|------------------------|
| 5 Chainage (km) | Major roads |
| Floodplain culvert | Minor roads |
| Local drainage culvert | Road design |
| Bridges | Project footprint |
| Existing rail (non-operational) | Hydraulic model extent |
| Border to Gowrie alignment | |



A3 scale: 1:10,000
 0 0.1 0.2 0.3 0.4 0.5km



Legend

- | | |
|---------------------------------|------------------------|
| 5 Chainage (km) | Major roads |
| Floodplain culvert | Minor roads |
| Local drainage culvert | Project footprint |
| Bridges | Hydraulic model extent |
| Existing rail (non-operational) | |
| Border to Gowrie alignment | |



A3 scale: 1:10,000
 0 0.1 0.2 0.3 0.4 0.5km



Legend

- | | |
|---------------------------------|------------------------|
| 5 Chainage (km) | Major roads |
| Floodplain culvert | Road design |
| Local drainage culvert | Project footprint |
| Bridges | Hydraulic model extent |
| Existing rail (non-operational) | |
| Border to Gowrie alignment | |



A3 scale: 1:10,000
 0 0.1 0.2 0.3 0.4 0.5km



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Border to Gowrie

Figure C1-F-3:

Proposed design structures - Condamine River



Legend

- | | |
|---------------------------------|------------------------|
| 5 Chainage (km) | Major roads |
| Floodplain culvert | Minor roads |
| Local drainage culvert | Road design |
| Bridges | Project footprint |
| Existing rail (non-operational) | Hydraulic model extent |
| Border to Gowrie alignment | |



A3 scale: 1:10,000
0 0.1 0.2 0.3 0.4 0.5km



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Border to Gowrie
Figure C1-F-4:
Proposed design structures - Condamine River





Legend

- | | |
|---------------------------------|------------------------|
| 5 Chainage (km) | Major roads |
| Floodplain culvert | Minor roads |
| Local drainage culvert | Road design |
| Bridges | Project footprint |
| Existing rail (operational) | Hydraulic model extent |
| Existing rail (non-operational) | |
| Border to Gowrie alignment | |



A3 scale: 1:10,000
0 0.1 0.2 0.3 0.4 0.5km



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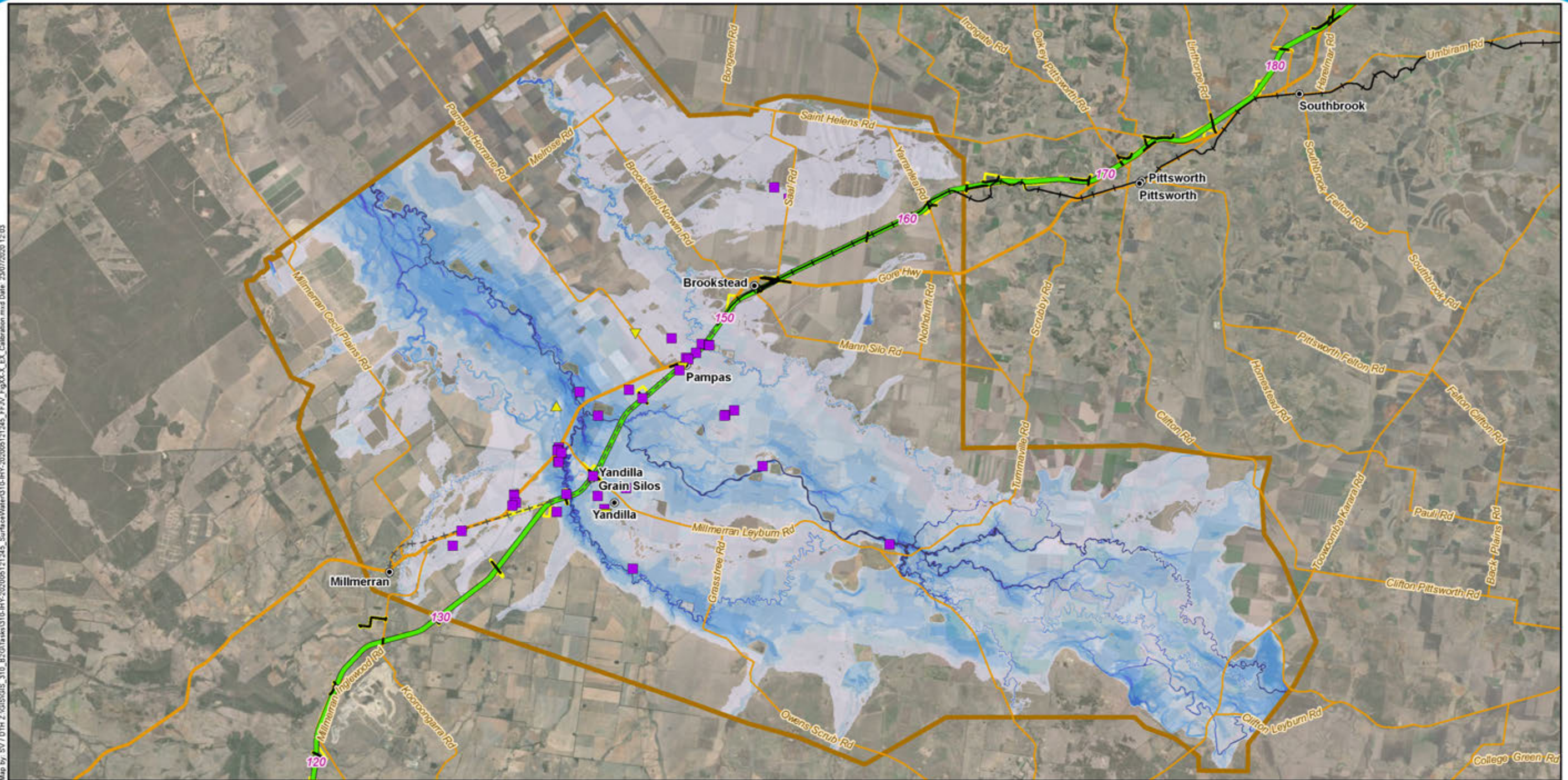
Issue date: 22/07/2020 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C1-F-6:

Proposed design structures - Condamine River

Map by SV / DTM 2:10USGS, 310_B20TTask310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigC2-A_EX_Calibration.mxd Date: 23/07/2020 12:03

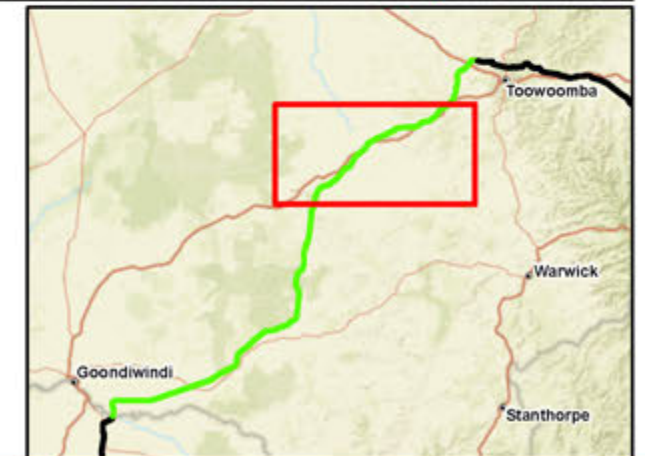


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Observed floodmarks**
 - ▲ > 0.3m
 - -0.3m to 0.3m
 - ▼ < -0.3m

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km



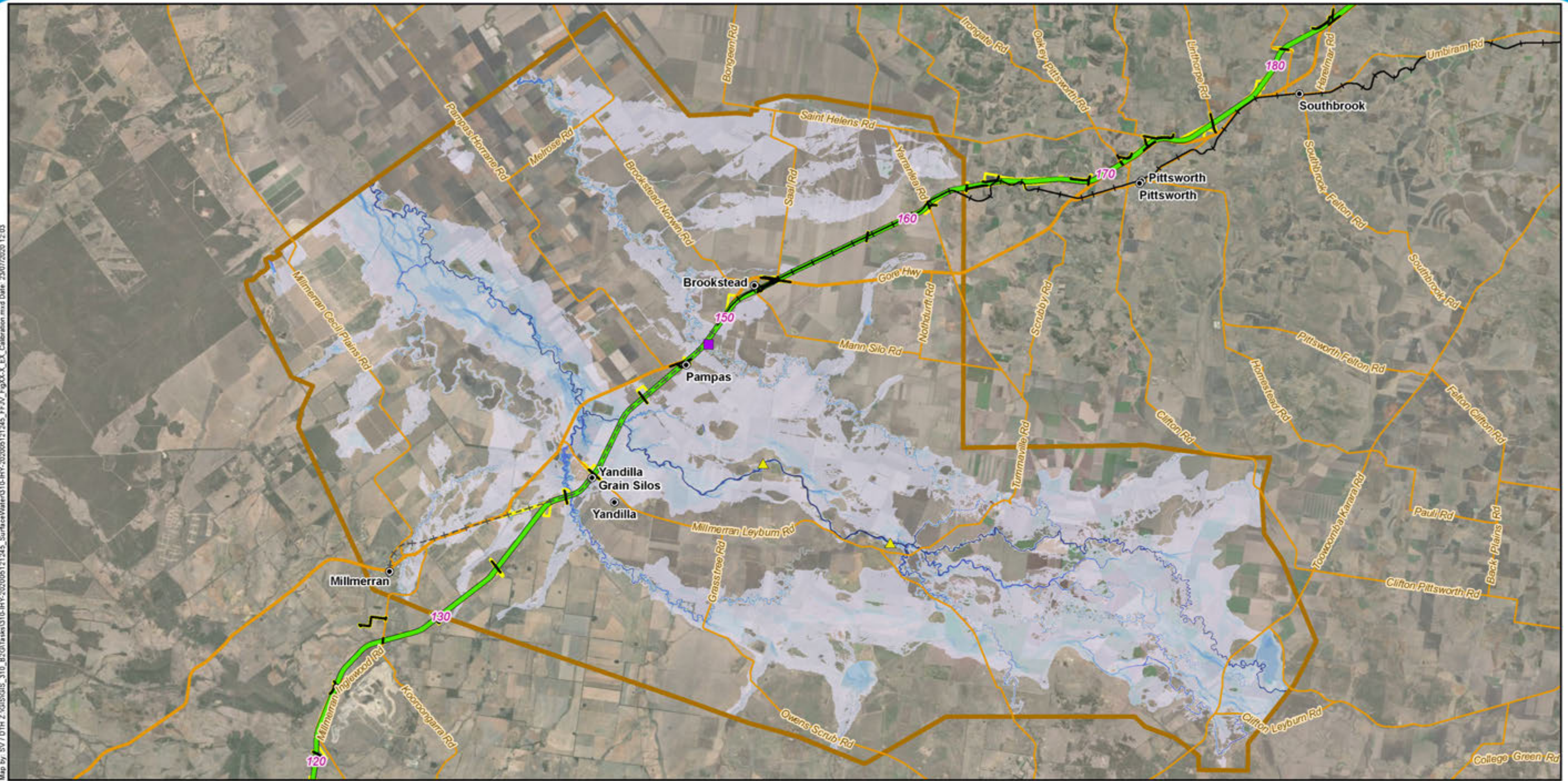
Issue date: 23/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C2-A:

2010 calibration event - inundation extent - Condamine River

Map by SV / DTM 2:10USGS, 310_B20TTask310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3N_FigC2-B_EX_Calibration.mxd Date: 23/07/2020 12:03

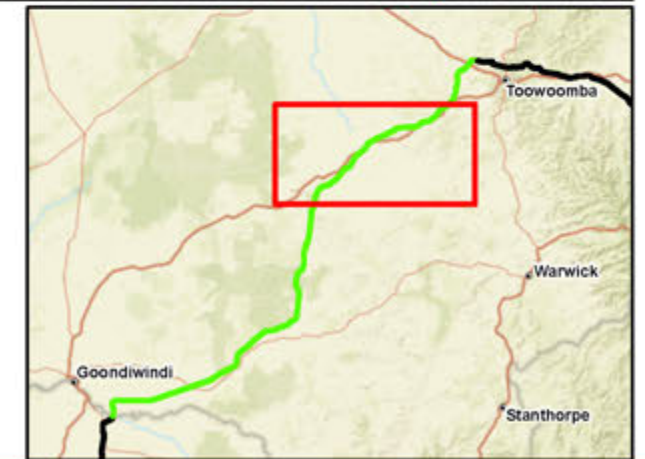


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Observed floodmarks**
 - ▲ > 0.3m
 - -0.3m to 0.3m
 - ▼ < -0.3m

Depth (m)

- | | |
|-----------|---------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km



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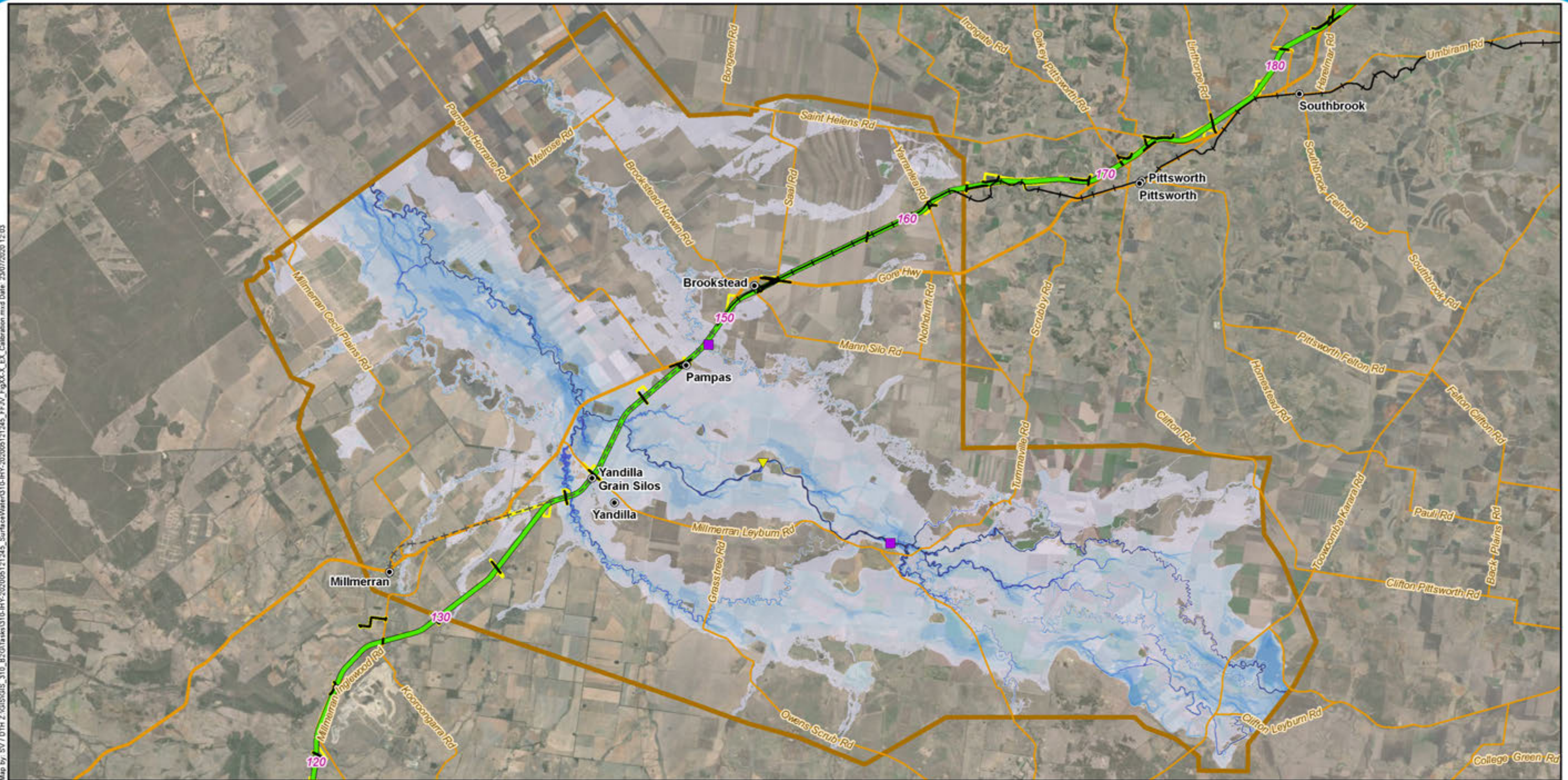
Issue date: 23/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C2-B:

1991 calibration event - inundation extent - Condamine River

Map by SV / DTM 2:10USGS, 310_B20TTask310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigC2-C_EX_Calibration.mxd Date: 23/07/2020 12:03

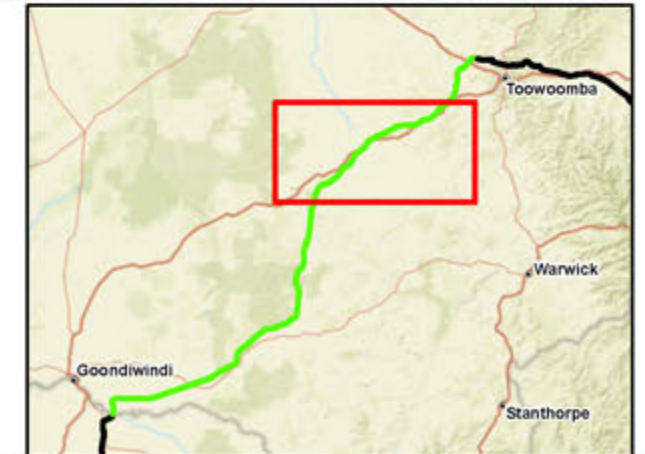


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Observed floodmarks**
 - ▲ > 0.3m
 - -0.3m to 0.3m
 - ▼ < -0.3m

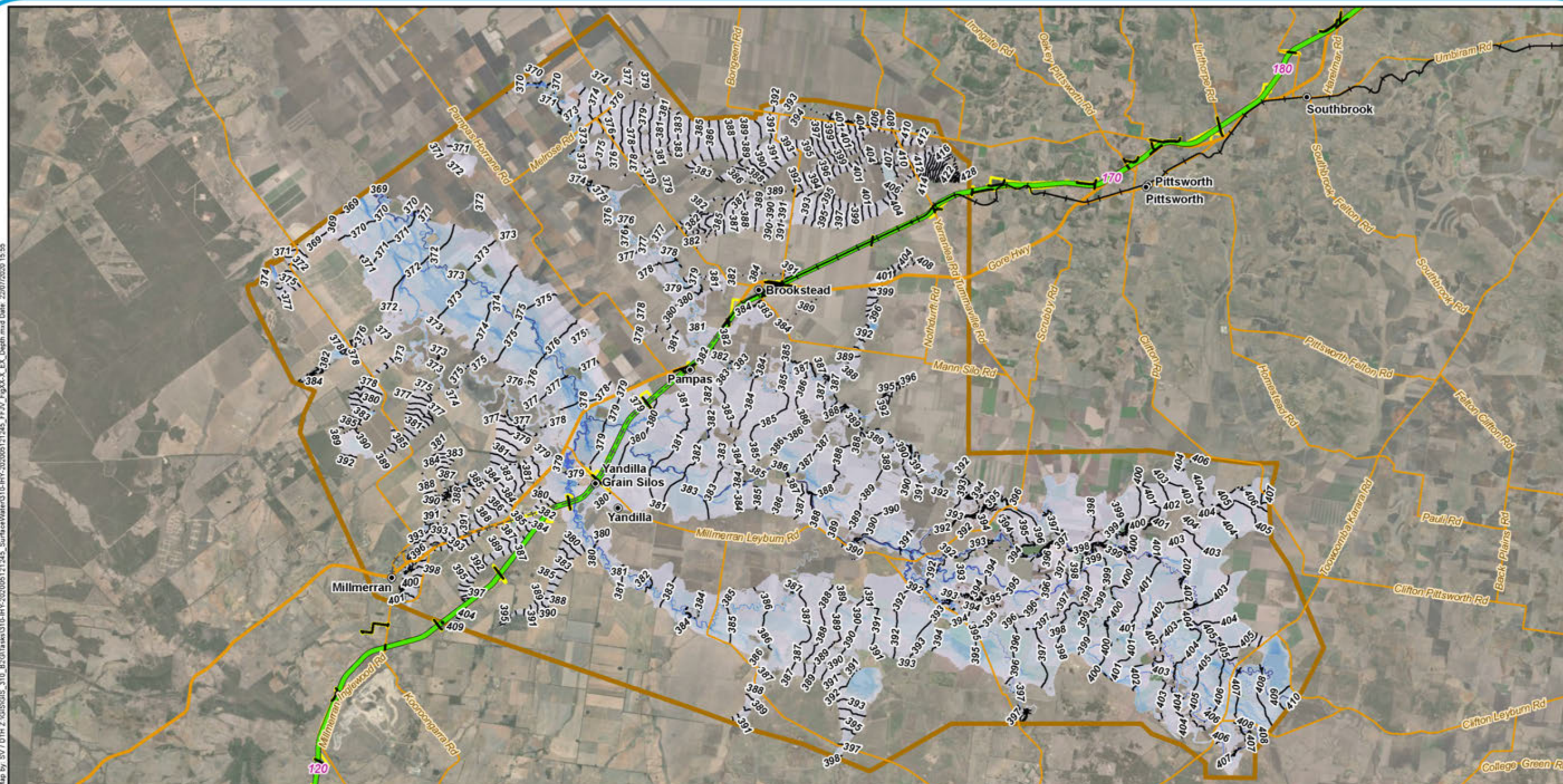
Depth (m)

- | | |
|-----------|---------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

Map by SV / DTM 2:10USGS, 310, 8201Task1310-1HY-202005121245_SurfaceWater310-1HY-202005121245_FF3N_FigC3-A_EX_Depth.mxd Date: 22/07/2020 15:55

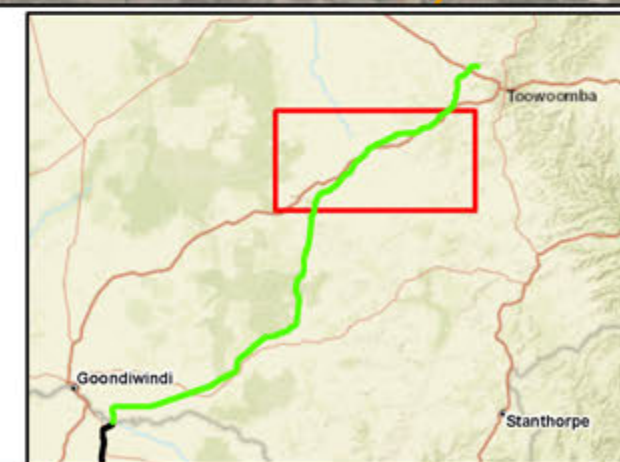


Legend

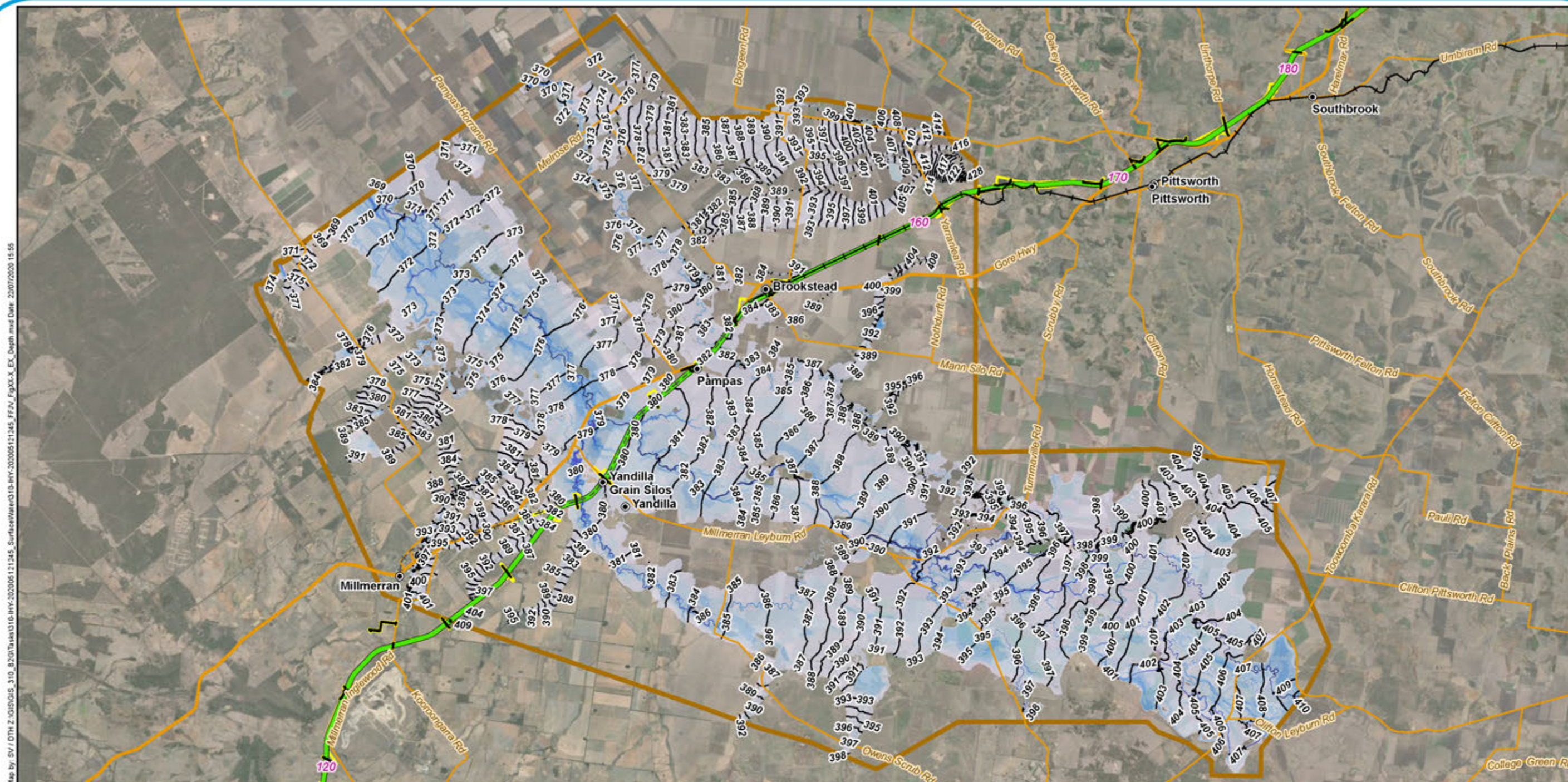
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| ■ 0 - 0.5 | ■ 3.0 - 3.5 |
| ■ 0.5 - 1.0 | ■ 3.5 - 4.0 |
| ■ 1.0 - 1.5 | ■ 4.0 - 4.5 |
| ■ 1.5 - 2.0 | ■ 4.5 - 5.0 |
| ■ 2.0 - 2.5 | ■ > 5.0 |
| ■ 2.5 - 3.0 | — 1m contour (mAHd) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

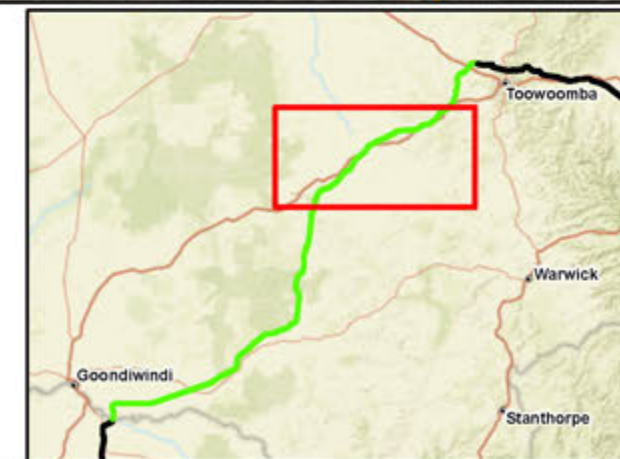


Legend

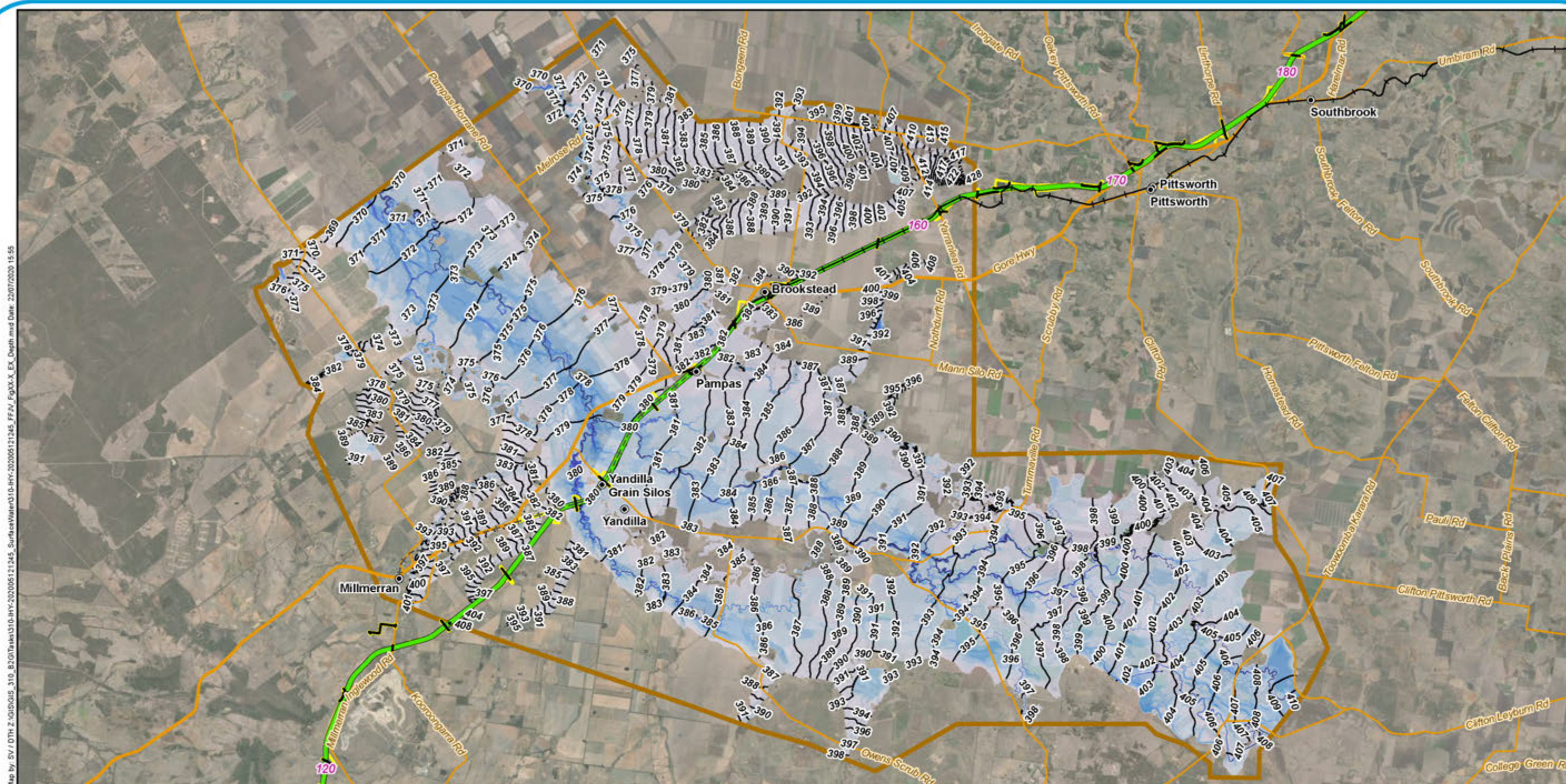
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

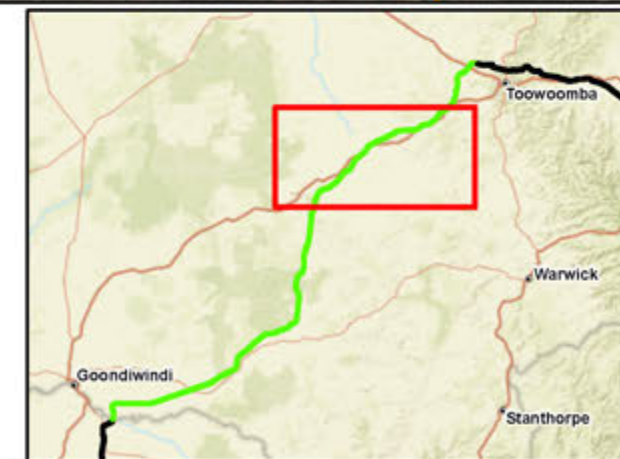


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

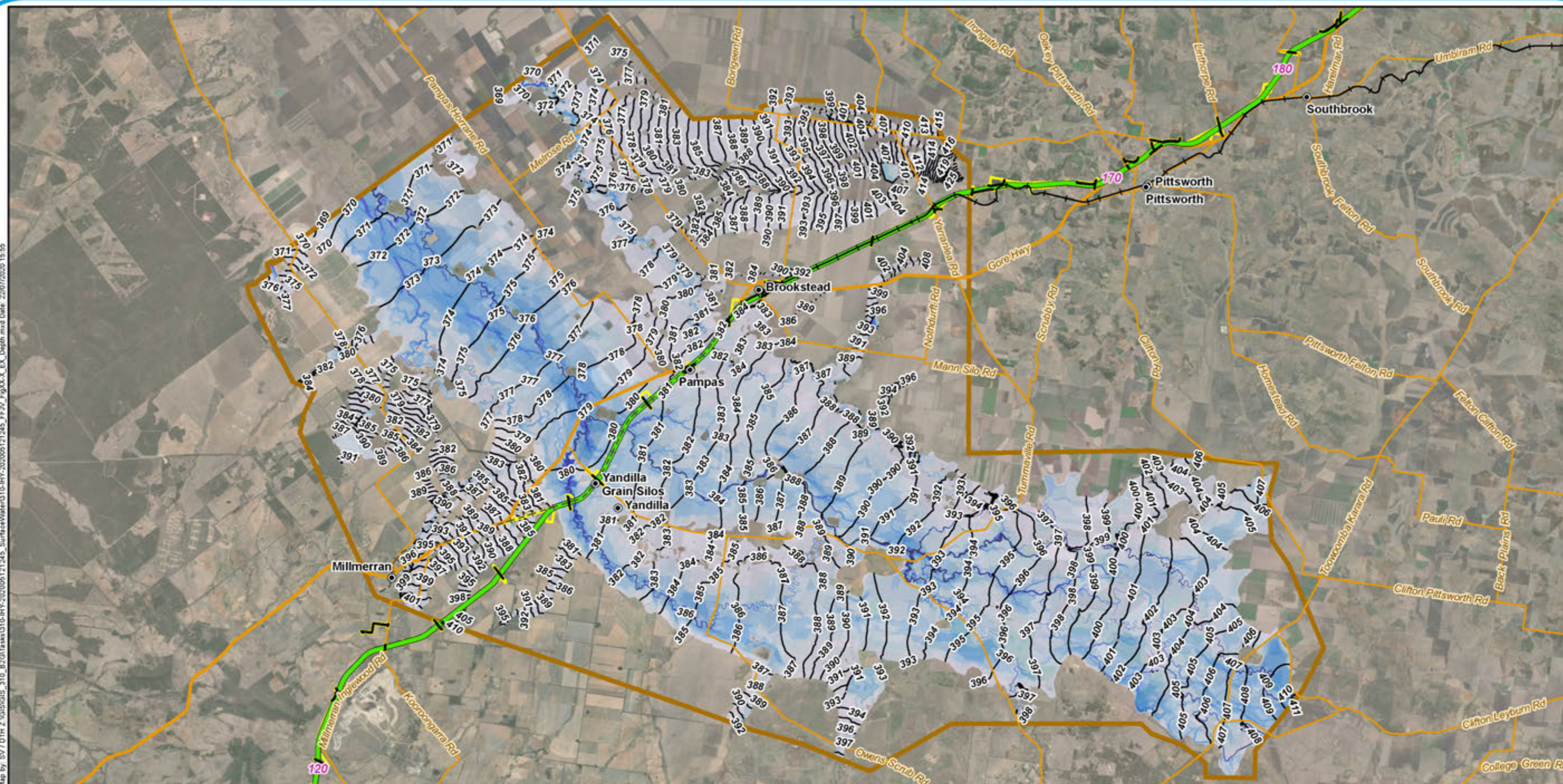
Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

Map by SV / DTM 2:10USGS, 310, B20TTask310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigC3-D_EX_Depth.mxd Date: 22/07/2020 15:55

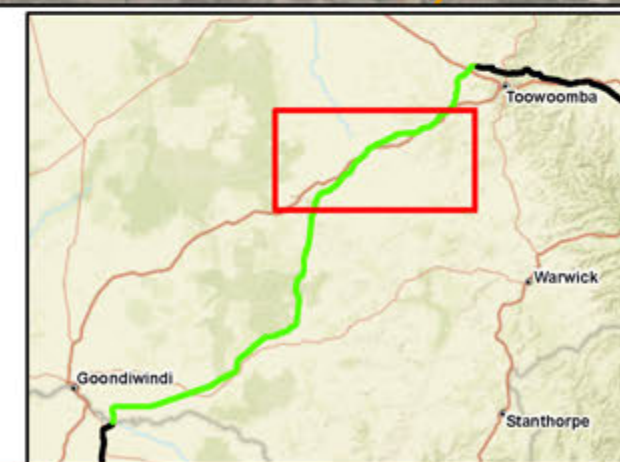


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km



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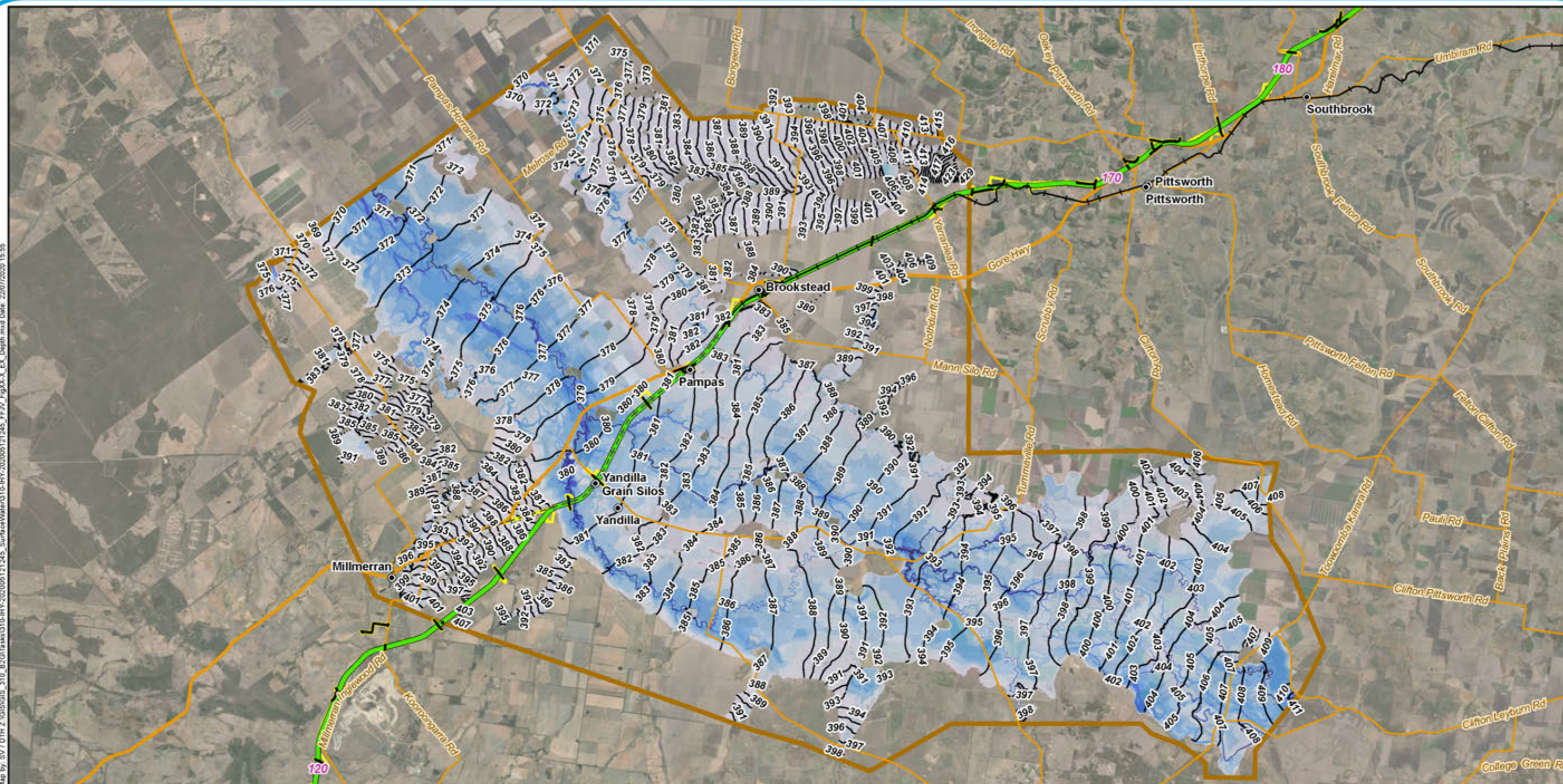
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C3-D:

2% AEP peak water levels - Existing Case - Condamine River

Map by SV / DTM 2:10USGS, 310, B20TTask310-1HY-202005121245_SurfaceWater310-1HY-202005121245_FF3V_FigC3-E_EX_Depth.mxd Date: 22/07/2020 15:55

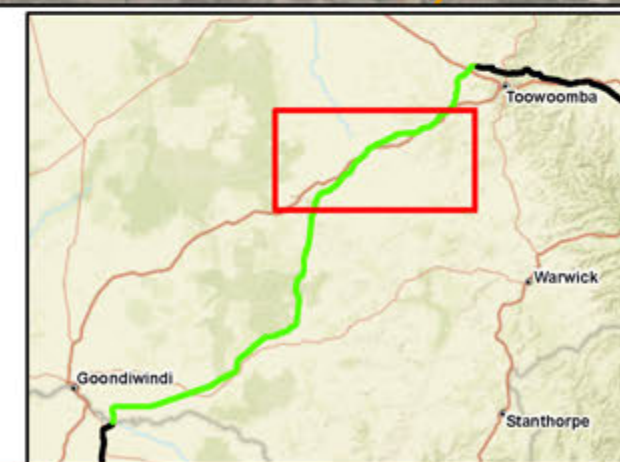


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

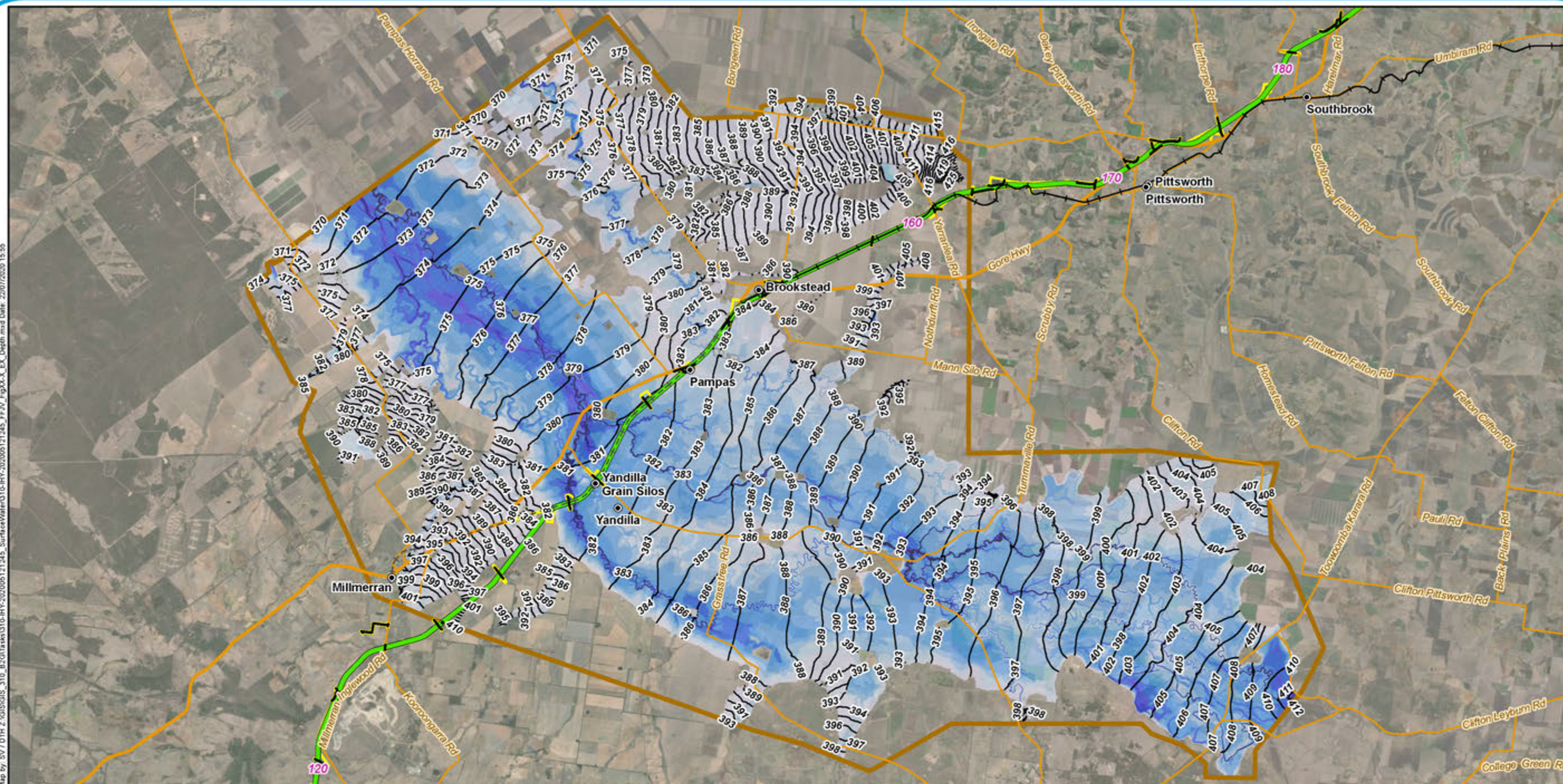
Depth (m)

- | | |
|--|--|
| □ 0 - 0.5 | □ 3.0 - 3.5 |
| □ 0.5 - 1.0 | □ 3.5 - 4.0 |
| □ 1.0 - 1.5 | □ 4.0 - 4.5 |
| □ 1.5 - 2.0 | □ 4.5 - 5.0 |
| □ 2.0 - 2.5 | □ > 5.0 |
| □ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

Map by SV / DTM 2:10USGS, 310_8201Task1310-1HY-202005121245_SurfaceWater310-1HY-202005121245_FF3V_FigC3-F_EX_Depth.mxd Date: 22/07/2020 15:55



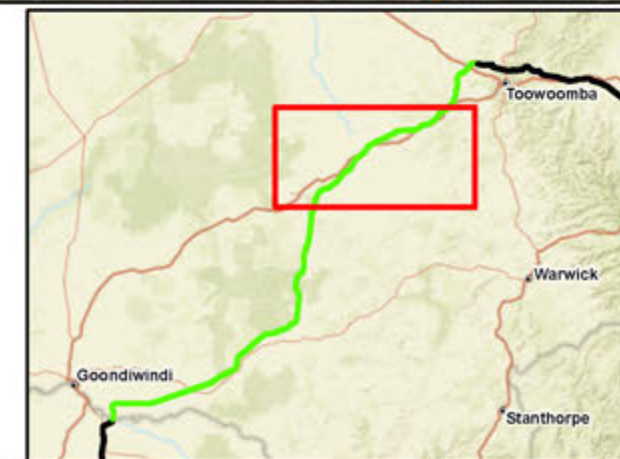
Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint

Hydraulic model extent

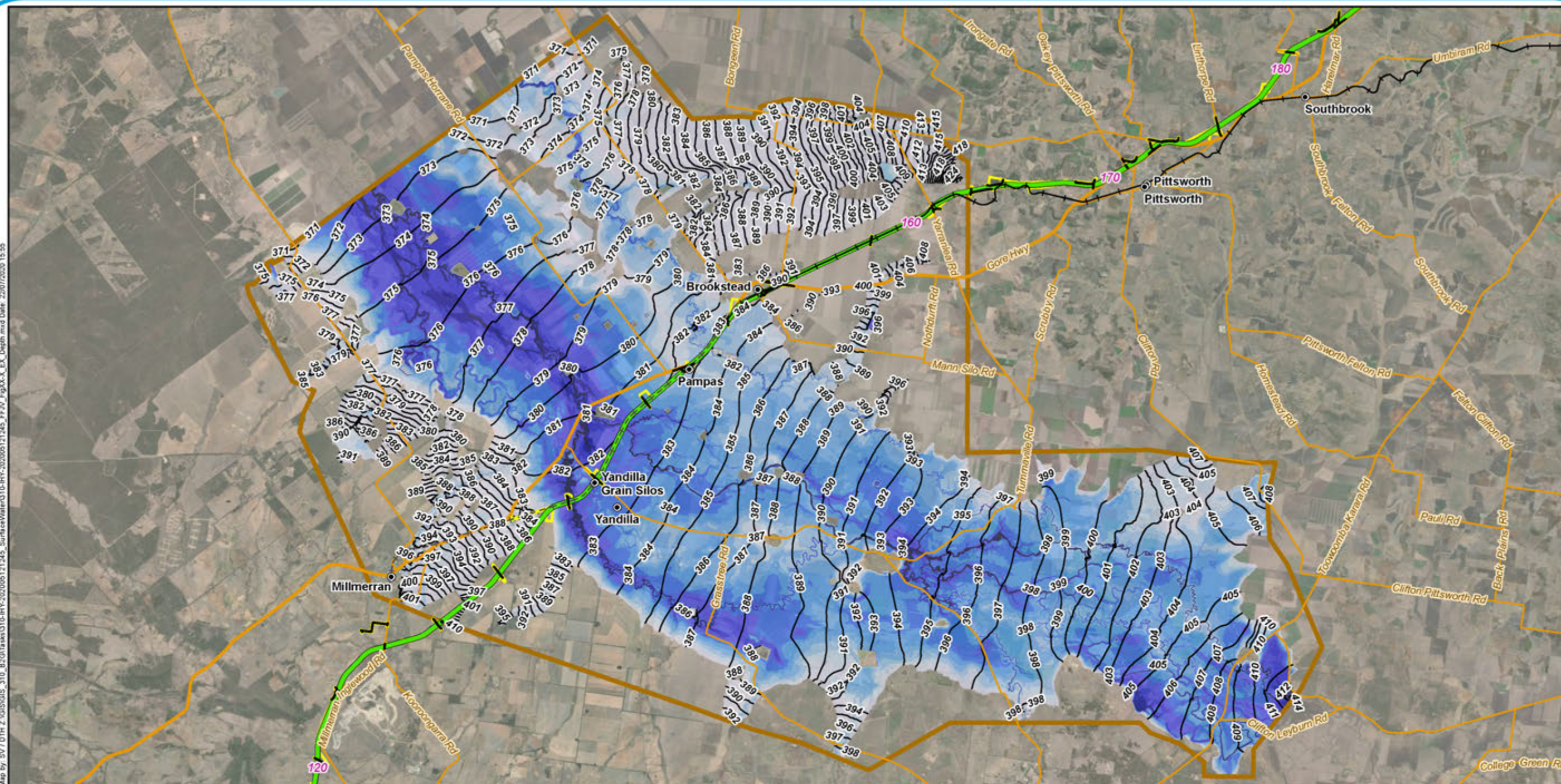
Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

Map by SV / DTM 2:10USGS, 310_8201Task1310-1HY-202005121245_SurfaceWater310-1HY-202005121245_FF3V_FigC3-G_EX_Depth.mxd Date: 22/07/2020 15:55



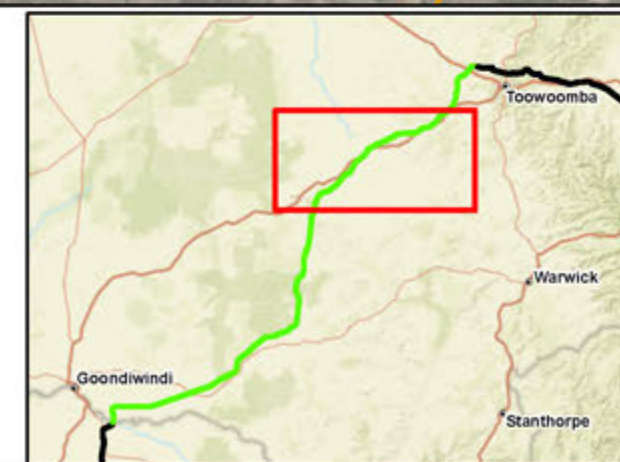
Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint

Hydraulic model extent

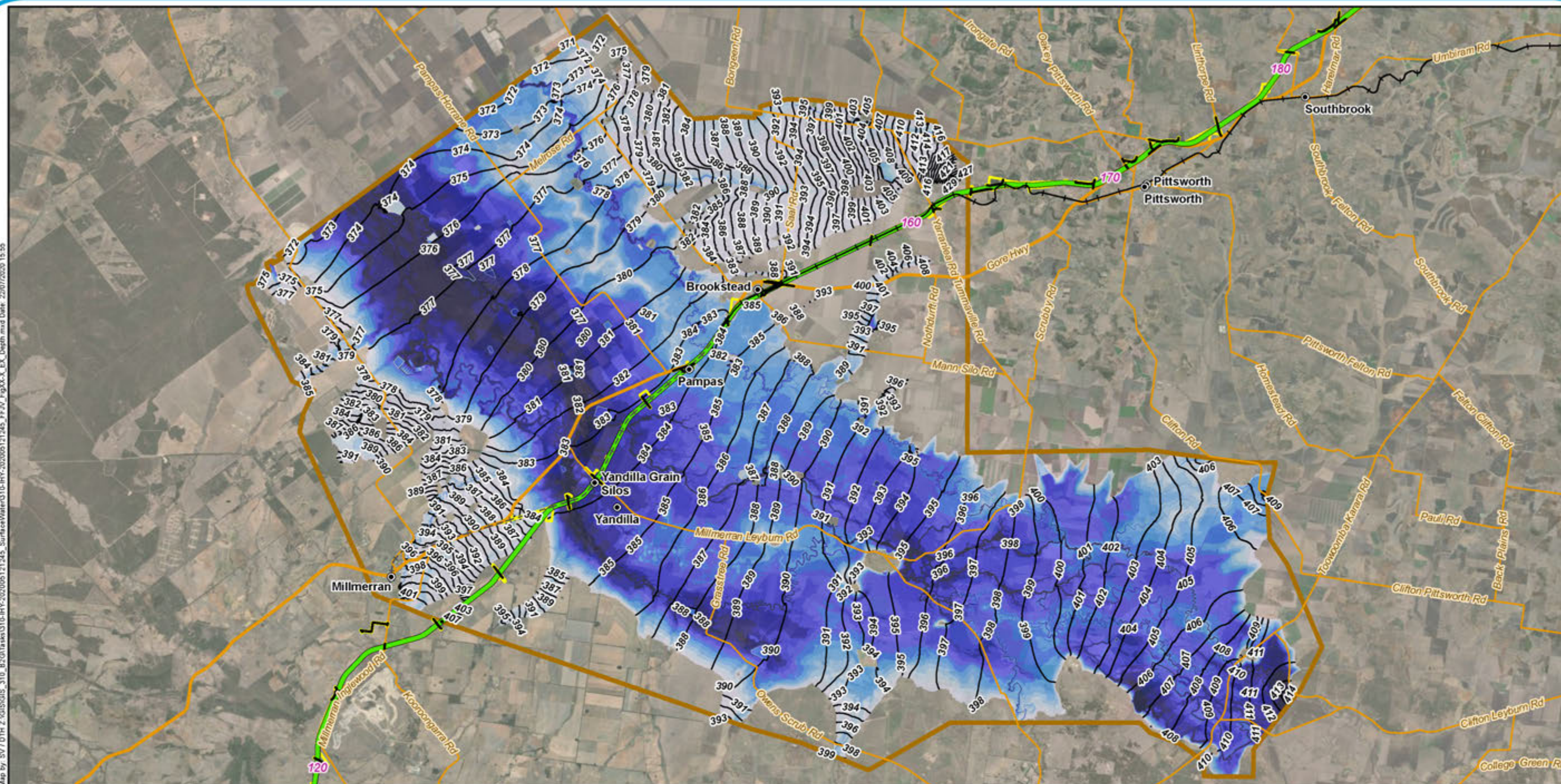
Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km

Map by SV / DTM 2:10USGS, 310_8200Task1310-1HY-202005121245_SurfaceWater310-1HY-202005121245_FF_N_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55

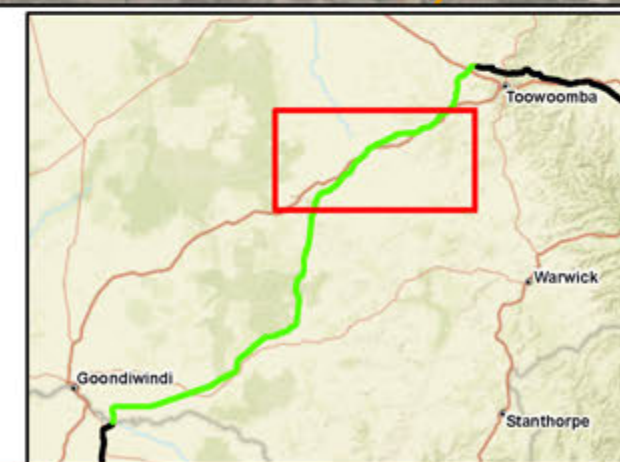


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| □ 0 - 0.5 | □ 3.0 - 3.5 |
| □ 0.5 - 1.0 | □ 3.5 - 4.0 |
| □ 1.0 - 1.5 | □ 4.0 - 4.5 |
| □ 1.5 - 2.0 | □ 4.5 - 5.0 |
| □ 2.0 - 2.5 | □ > 5.0 |
| □ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:200,000
 0 2 4 6 8 10km



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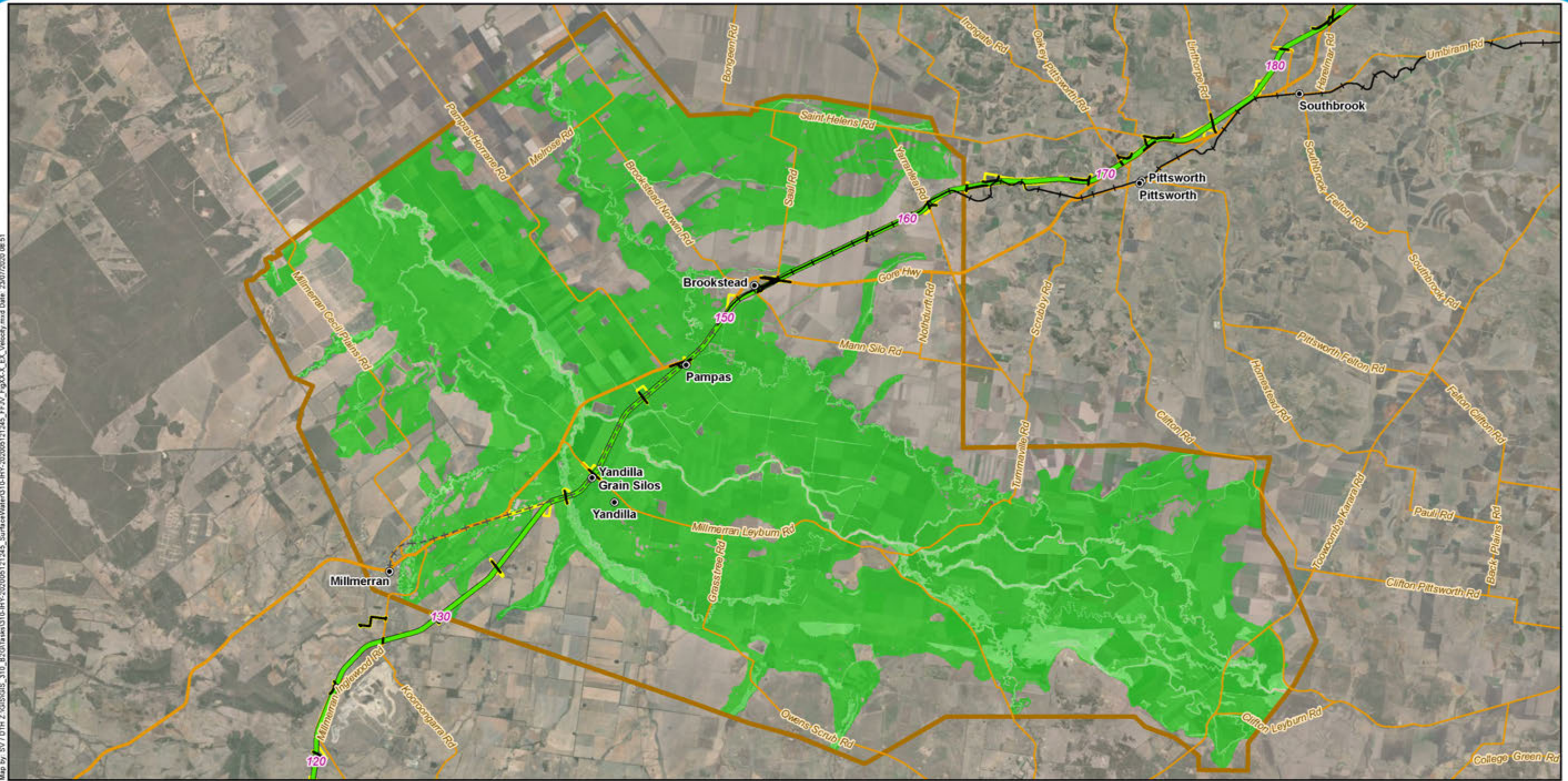
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C3-H:

PMF peak water levels - Existing Case - Condamine River

Map by SV / DTM 2:10USGS, 310_B20TTask310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigC4-A_EX_Velocity.mxd Date: 23/07/2020 08:51

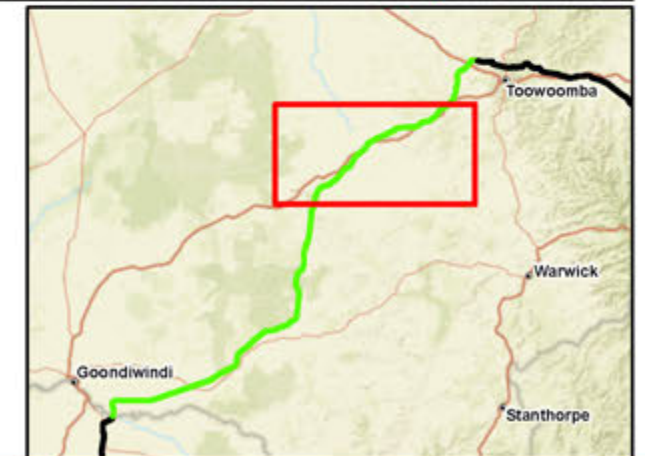


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Peak velocity (m/s)

0.0	3.0
0.5	3.5
1.0	4.0
1.5	4.5
2.0	5.0
2.5	



A3 scale: 1:200,000
 0 2 4 6 8 10km



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Border to Gowrie

Figure C4-A:

1% AEP peak velocity - Existing Case - Condamine River



Legend

- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|--|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

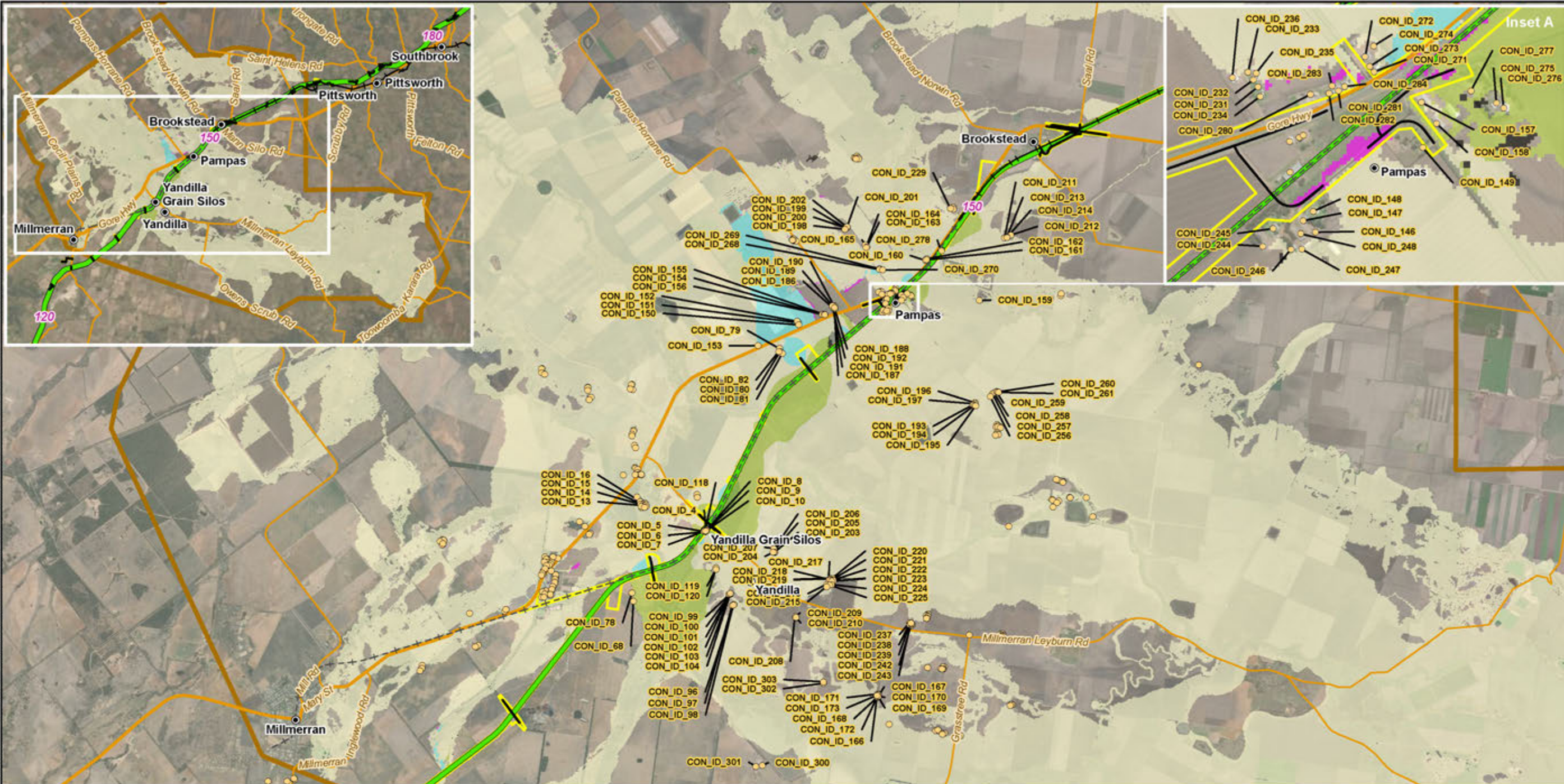
- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|--|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

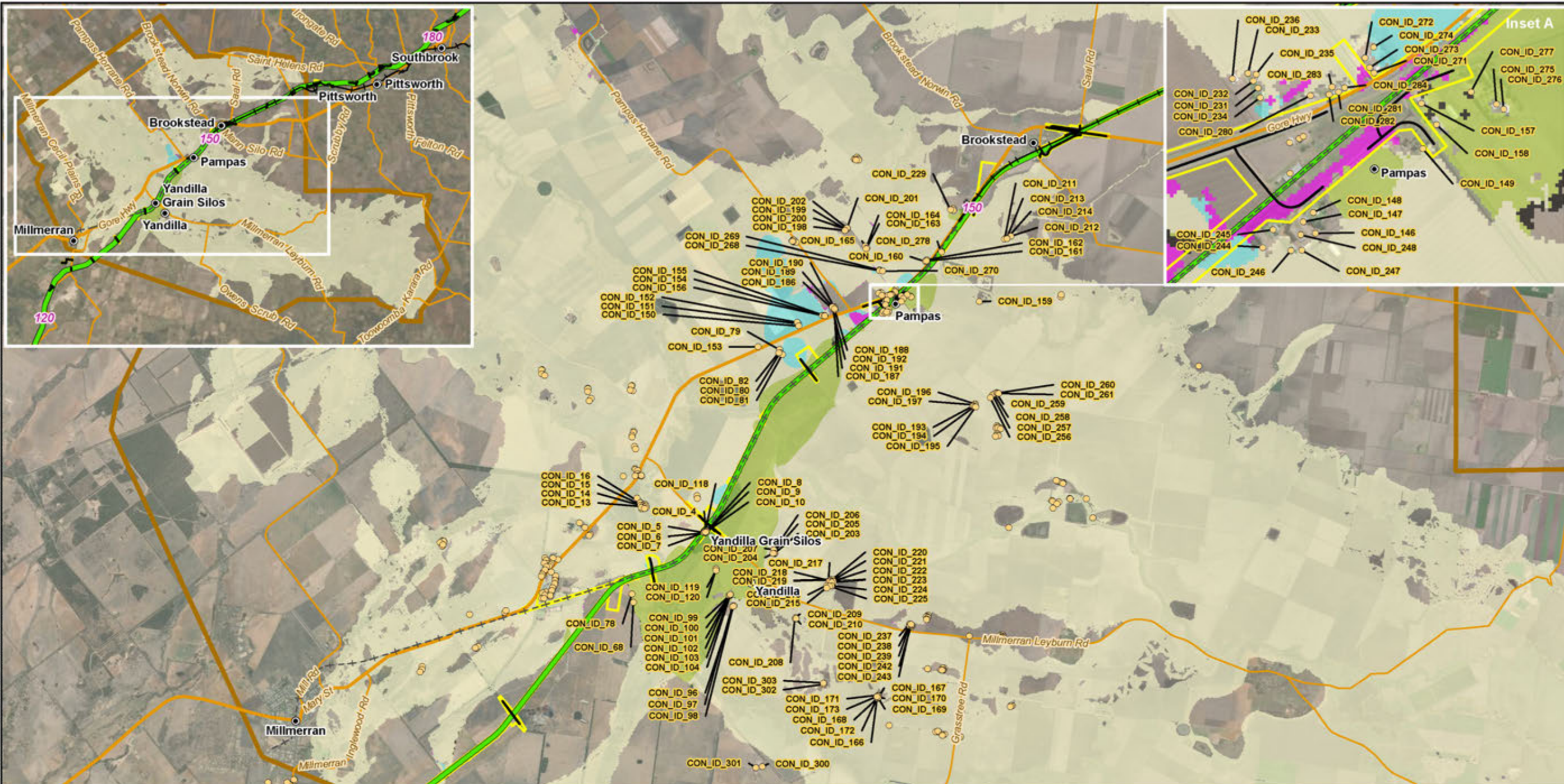
- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

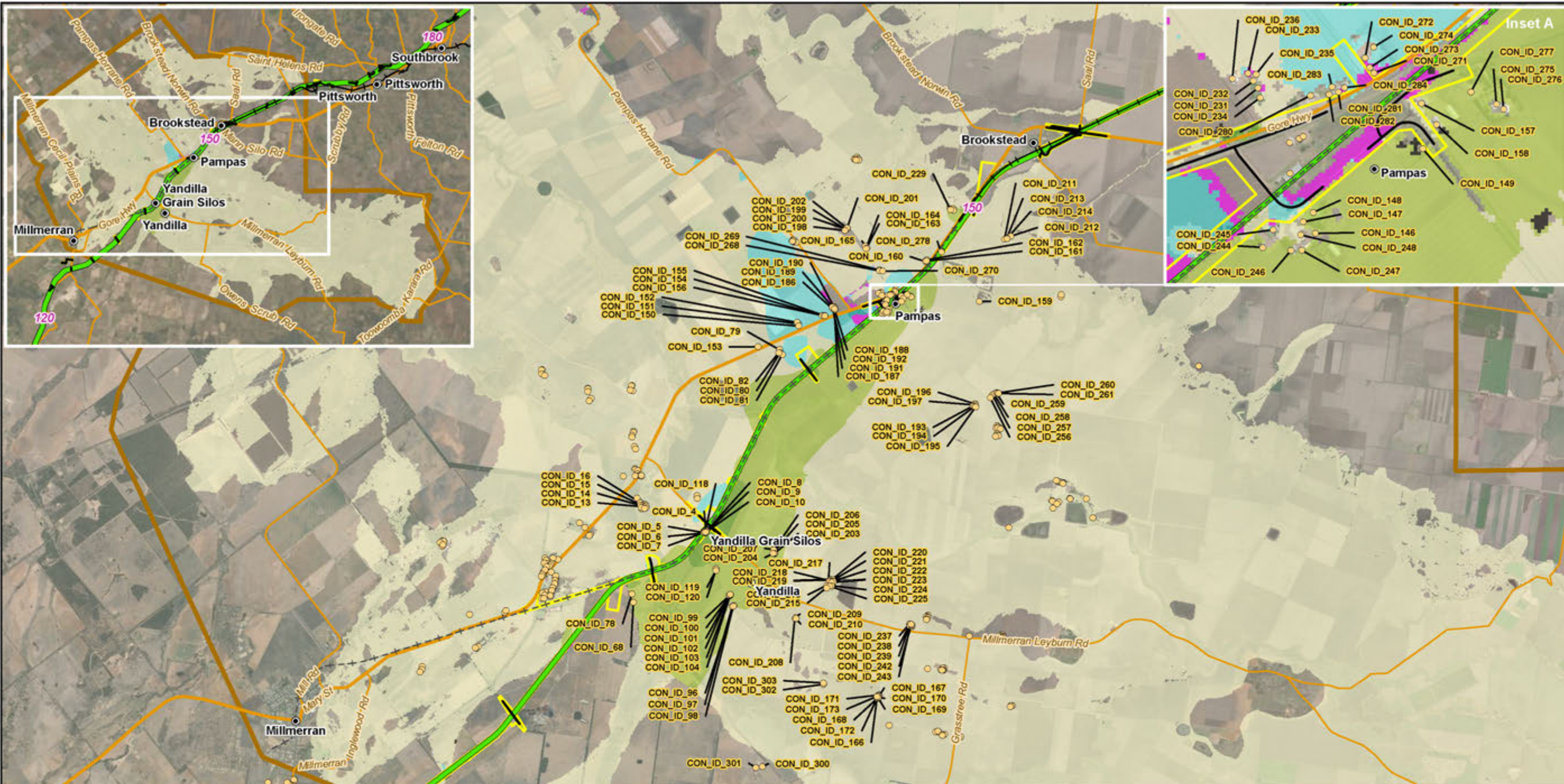
- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- 0.50 to -0.20
- 0.20 to -0.10
- 0.10 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.50
- > 0.5



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|--|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



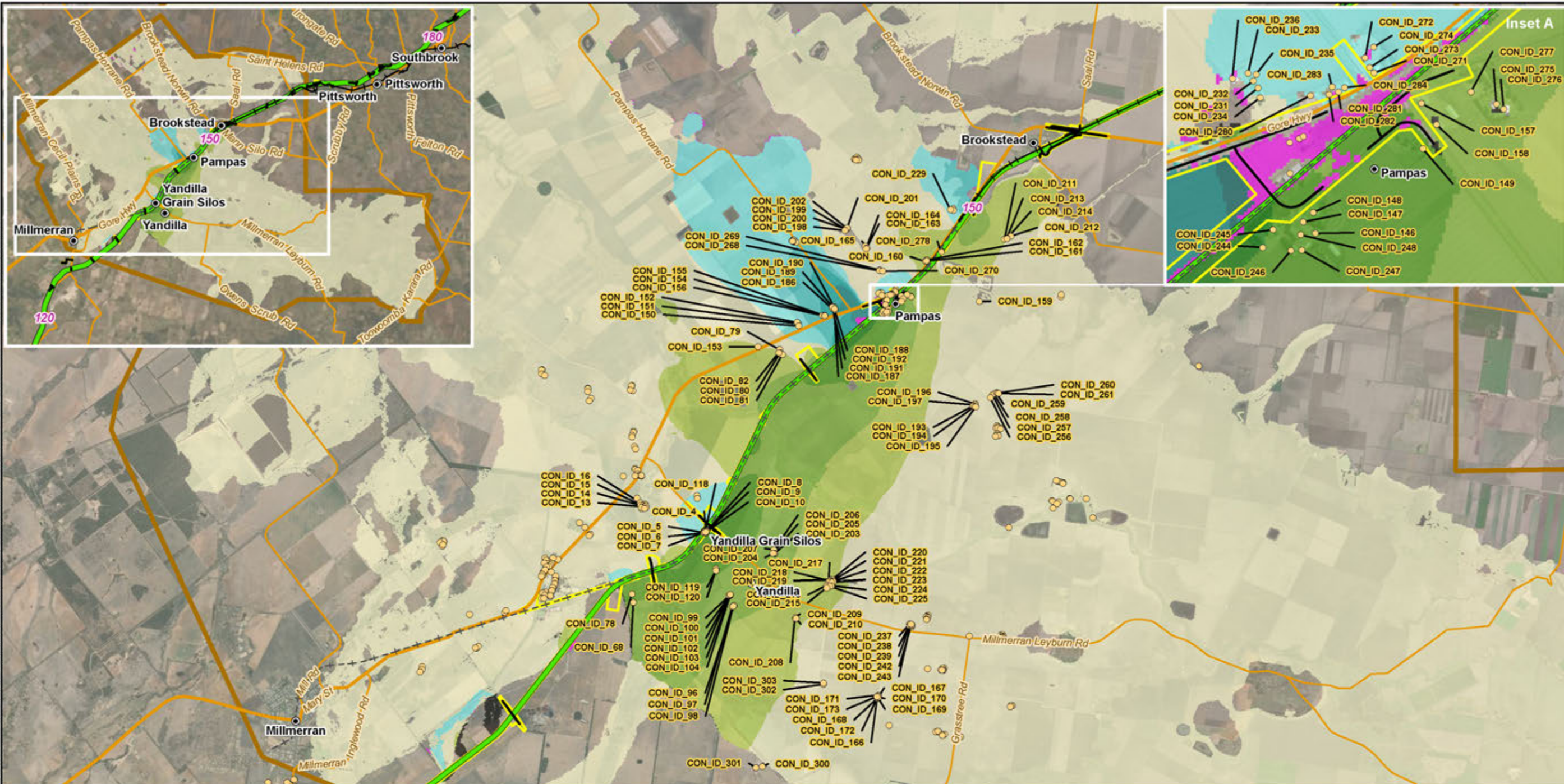
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Border to Gowrie

Figure C5-E:

1% AEP - design afflux - Condamine River



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|--|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |





Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Sub-model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in Time of Inundation (percentage)

- | | |
|---|--|
| ■ < -50% | ■ 10% to 20% |
| ■ -50% to -40% | ■ 20% to 30% |
| ■ -40% to -30% | ■ 30% to 40% |
| ■ -30% to -20% | ■ 40% to 50% |
| ■ -20% to -10% | ■ > 50% |
| ■ -10% to 10% | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



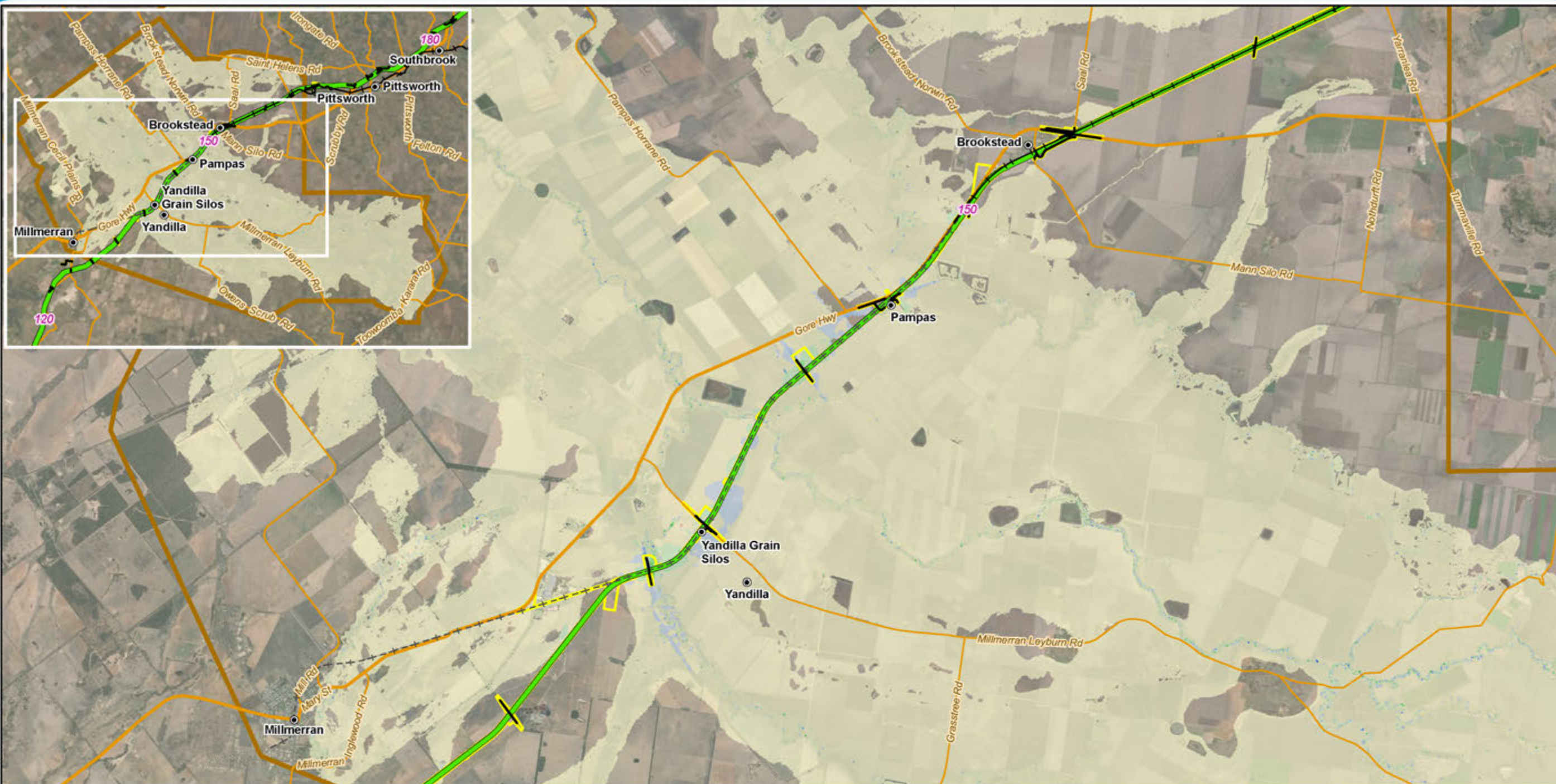
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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C5-I:

1% AEP - change in time of inundation - Condamine River



Legend

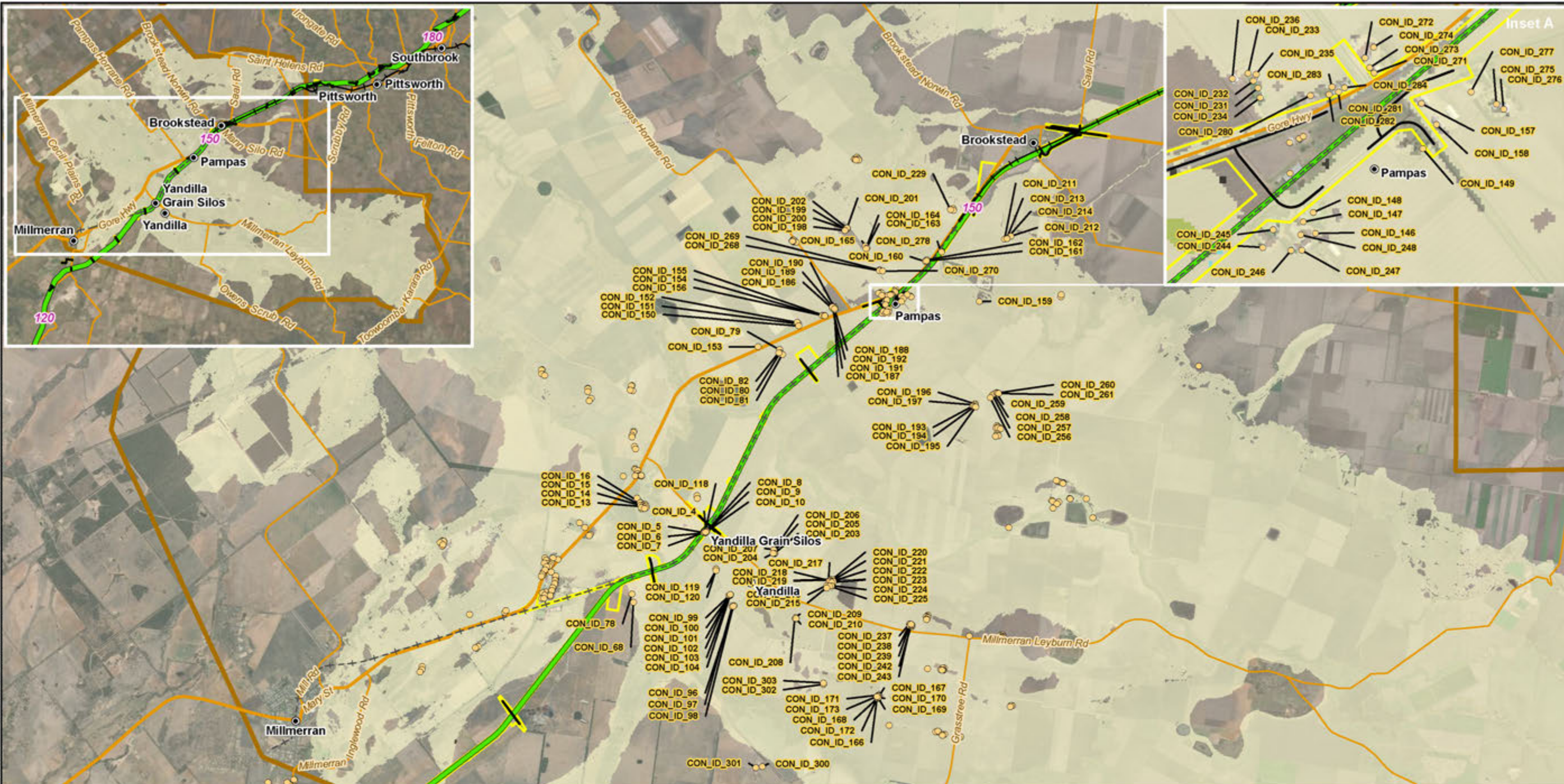
- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Change in peak velocity (m/s)

- | | |
|----------------|--------------|
| < -0.50 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.50 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

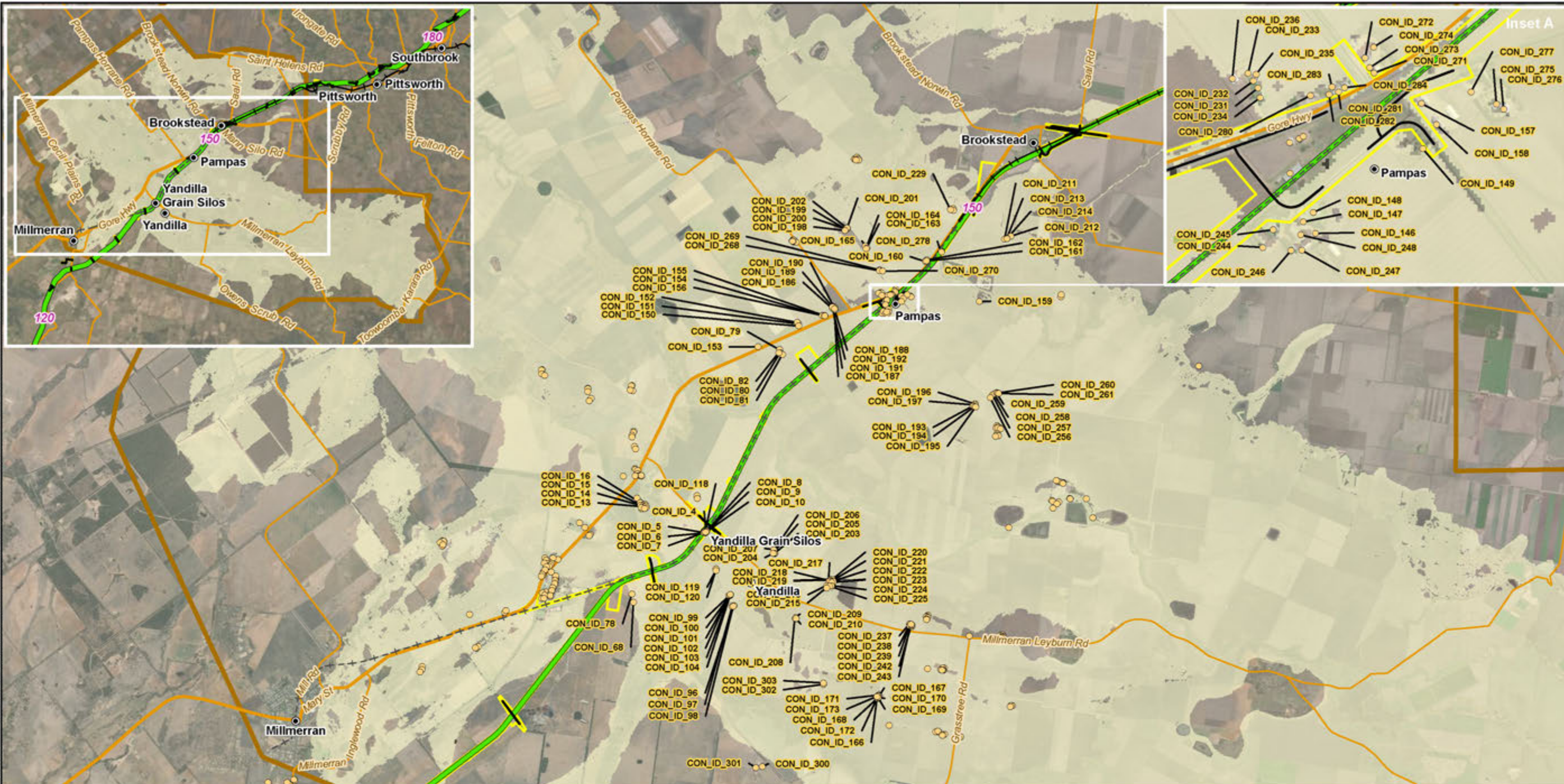
- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



Legend

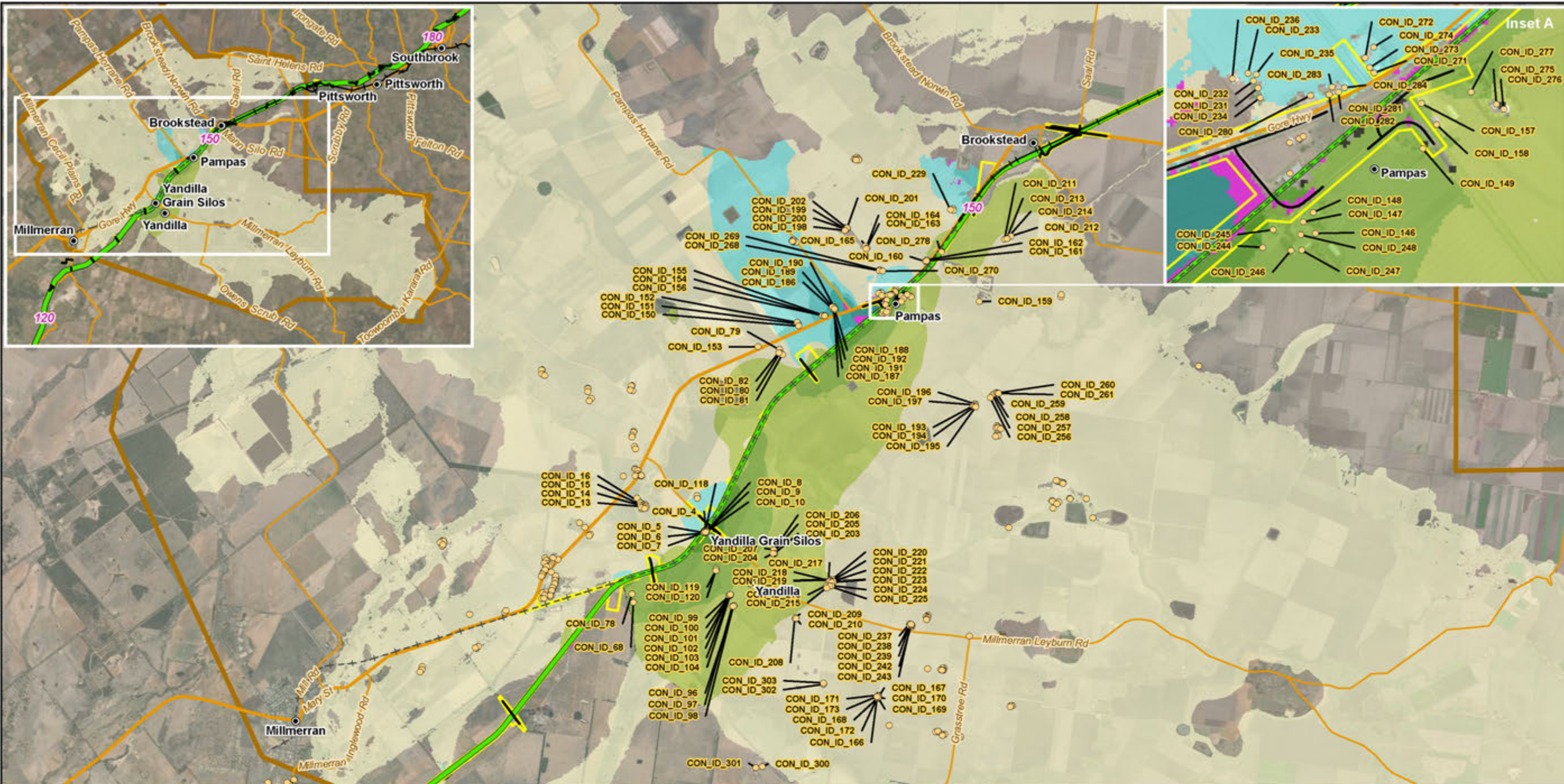
- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|--|--|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:100,000
0 1 2 3 4 5km



Legend

- Flood sensitive receptor
- Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:100,000
 0 1 2 3 4 5km



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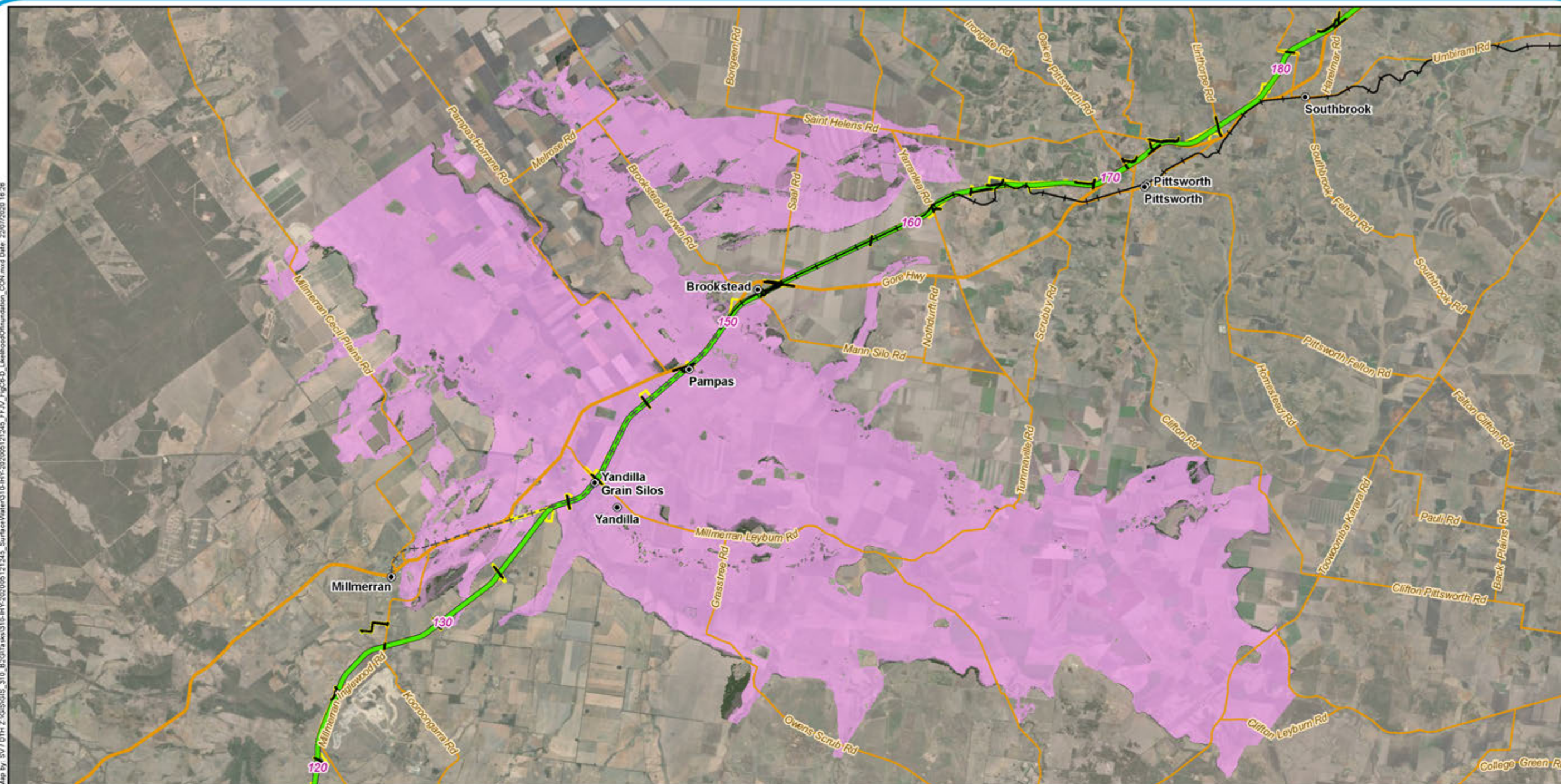
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure C6-C:

1% AEP sensitivity - climate change RCP8.5 - peak water levels - Condamine River

Map by SV / DTM 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FFIV_FigC6-D_LiveloodOffroadroutin_CON.mxd Date: 22/07/2020 16:28

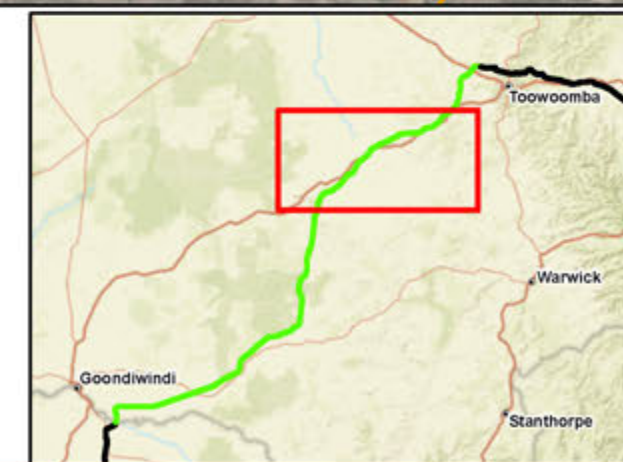


Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- - - Existing rail (non-operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint

Likelihood of Inundation

- < 20%
- < 40%
- < 60%
- < 80%
- < 100%



A3 scale: 1:200,000
 0 2 4 6 8 10 km



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Border to Gowrie

Figure C6-D:

1% AEP sensitivity - roughness variations – likelihood of inundation - Condamine River

APPENDIX

Q2

Hydrology and Flooding Technical Report—Volume II

Appendix D Back Creek Flood Maps

INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

Appendix D

Back Creek Flood Maps

Figure D1-A	Locality plan
Figure D1-B	Survey data
Figure D1-C	Hydrologic model setup
Figure D1-D	Hydraulic model setup
Figure D1-E	Landuse classifications
Figure D1-F	Proposed design structures
Figure D2-A	20% AEP peak water levels – Existing Case
Figure D2-B	10% AEP peak water levels – Existing Case
Figure D2-C	5% AEP peak water levels – Existing Case
Figure D2-D	2% AEP peak water levels – Existing Case
Figure D2-E	1% AEP peak water levels – Existing Case
Figure D2-F	1 in 2,000 AEP peak water levels – Existing Case
Figure D2-G	1 in 10,000 AEP peak water levels – Existing Case
Figure D2-H	PMF peak water levels – Existing Case
Figure D3-A	1% AEP peak velocity – Existing Case
Figure D4-A	20% AEP – design afflux
Figure D4-B	10% AEP – design afflux
Figure D4-C	5% AEP – design afflux
Figure D4-D	2% AEP – design afflux
Figure D4-E	1% AEP – design afflux
Figure D4-F	1 in 2,000 AEP – design afflux
Figure D4-G	1 in 10,000 AEP – design afflux
Figure D4-H	PMF – design afflux
Figure D4-I	1% AEP – change in time of inundation
Figure D4-J	1% AEP – change in velocity
Figure D5-A	1% AEP sensitivity – 0% blockage
Figure D5-B	1% AEP sensitivity – 50% blockage
Figure D5-C	1% AEP sensitivity – climate change RCP8.5 – peak water levels



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Watercourses
- Major roads
- Minor roads
- Road design
- Project footprint



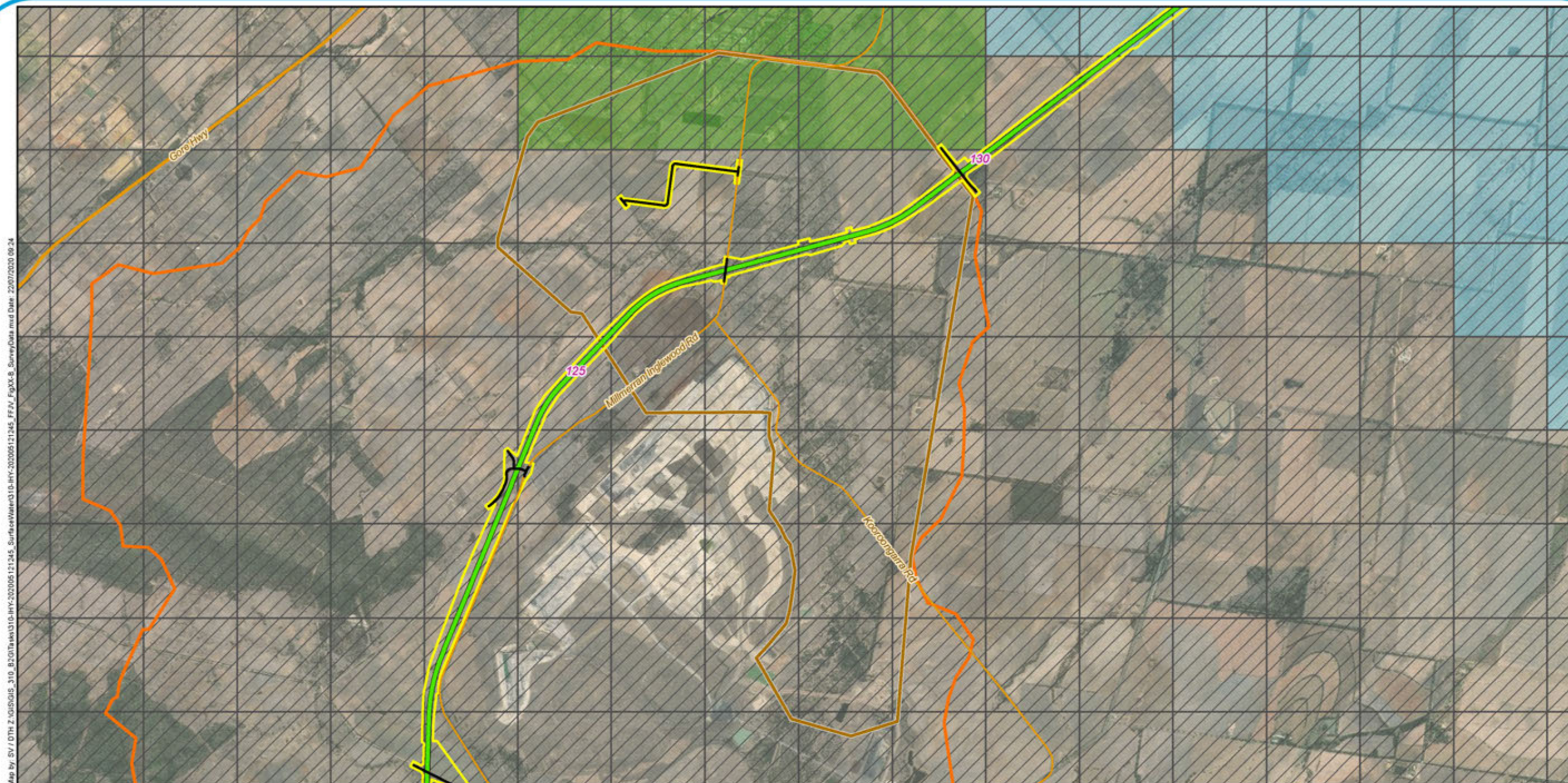
A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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Border to Gowrie
Figure D1-A:
Locality plan - Back Creek



Legend

- | | |
|------------------------------------|-------------------------|
| 5 Chainage (km) | Major roads |
| -- Existing rail (non-operational) | Minor roads |
| Border to Gowrie alignment | Road design |
| | Project footprint |
| | Hydraulic model extent |
| | Hydrologic model extent |

LiDAR datasets (1m grid)

- | |
|---------------------------|
| Inland Towns Stage 4 2012 |
| Toowoomba 2010 |
| 2015 ARTC LiDAR 1m |



A3 scale: 1:45,000
 0 0.45 0.9 1.35 1.8 2.25 km



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Border to Gowrie
Figure D1-B:
Survey data - Back Creek

Map by SV / DTH 2:10USGS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3N_FigD1-C_HydroSetup.mxd Date: 21/07/2020 12:58



Legend

- | | | |
|------------------------------------|-------------------------|-------------------------|
| 5 Chainage (km) | Major roads | Catchment links |
| -- Existing rail (non-operational) | Minor roads | Sub-catchments |
| Border to Gowrie alignment | Road design | Hydrologic model extent |
| Project footprint | Daily rainfall stations | |



A3 scale: 1:80,000
 0 0.8 1.6 2.4 3.2 4km



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Border to Gowrie

Figure D1-C:

Hydrologic model setup - Back Creek



Legend

- | | | |
|----------------------------|-------------------|------------------------|
| 5 Chainage (km) | Major roads | Hydraulic model extent |
| Border to Gowrie alignment | Minor roads | Outflow boundaries |
| | Road design | Inflow boundaries |
| | Project footprint | |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



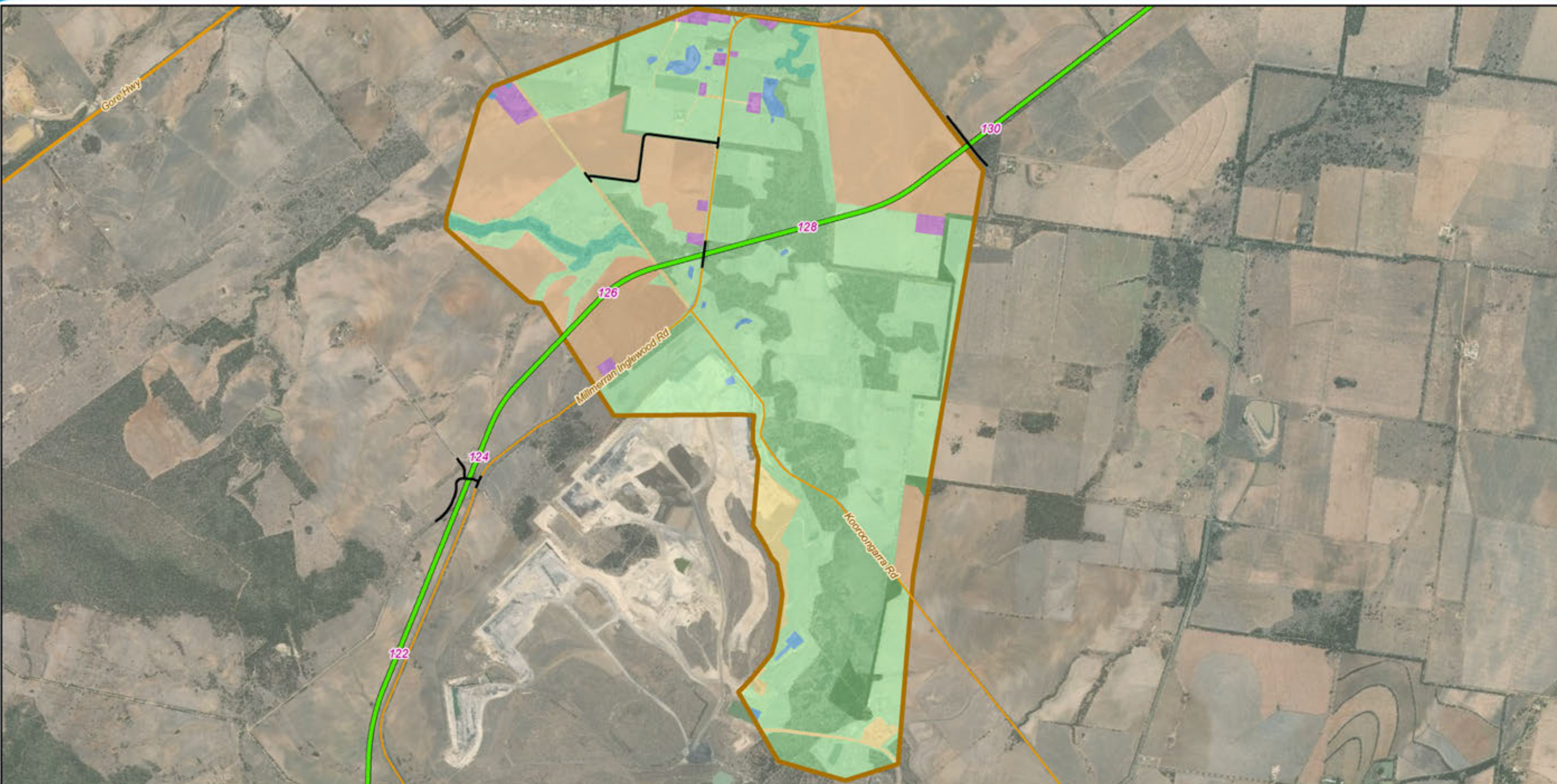
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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D1-D:

Hydraulic model setup - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Hydraulic model extent

Landuse classification

- River (n=0.035)
- Sealed road corridor (n=0.015)
- Unsealed road corridor (n=0.025)
- Rural residential (n=0.090)
- Open space - min veg (n=0.045)
- Open space - mod veg (n=0.055)
- Openspace - heavy veg (n=0.065)
- Riparian (n=0.040)
- Crop (n=0.109)



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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Border to Gowrie

Figure D1-E:

Landuse classifications - Back Creek

Map by: SV / DTH 2:10USGS_310_B201Task310-HY-202006121245_SurfaceWater310-HY-202006121245_FF3V_FigD1-F_SurfacesBAC.mxd Date: 22/07/2020 15:12



Legend

- 5 Chainage (km)
- Floodplain culvert
- Local drainage culvert
- Bridges
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent



A3 scale: 1:20,000
 0 0.2 0.4 0.6 0.8 1 km



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D2-A:

20% AEP peak water levels - Existing Case - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D2-B:

10% AEP peak water levels - Existing Case - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D2-C:

5% AEP peak water levels - Existing Case - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D2-D:

2% AEP peak water levels - Existing Case - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



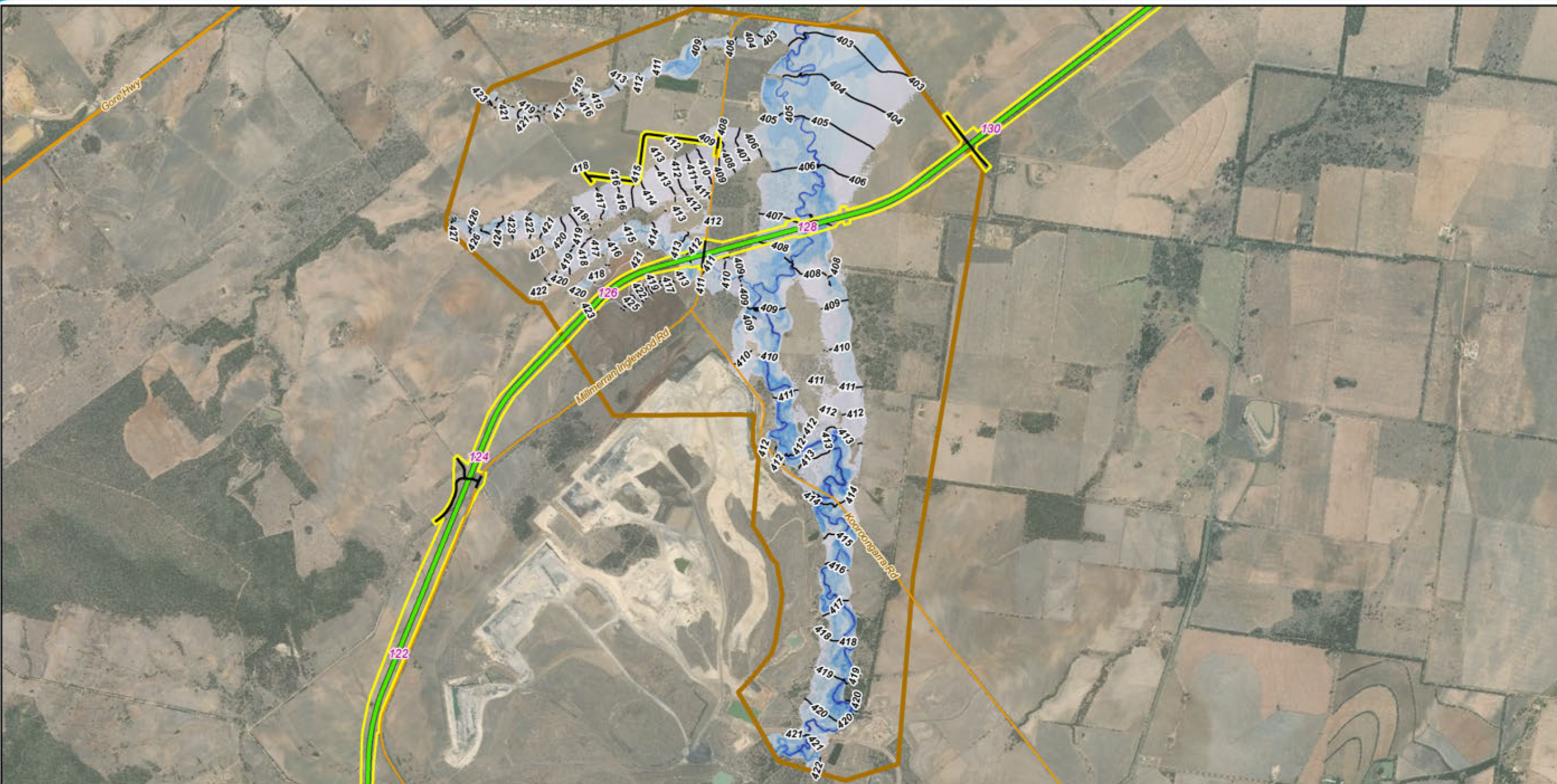
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 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D2-E:

1% AEP peak water levels - Existing Case - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km

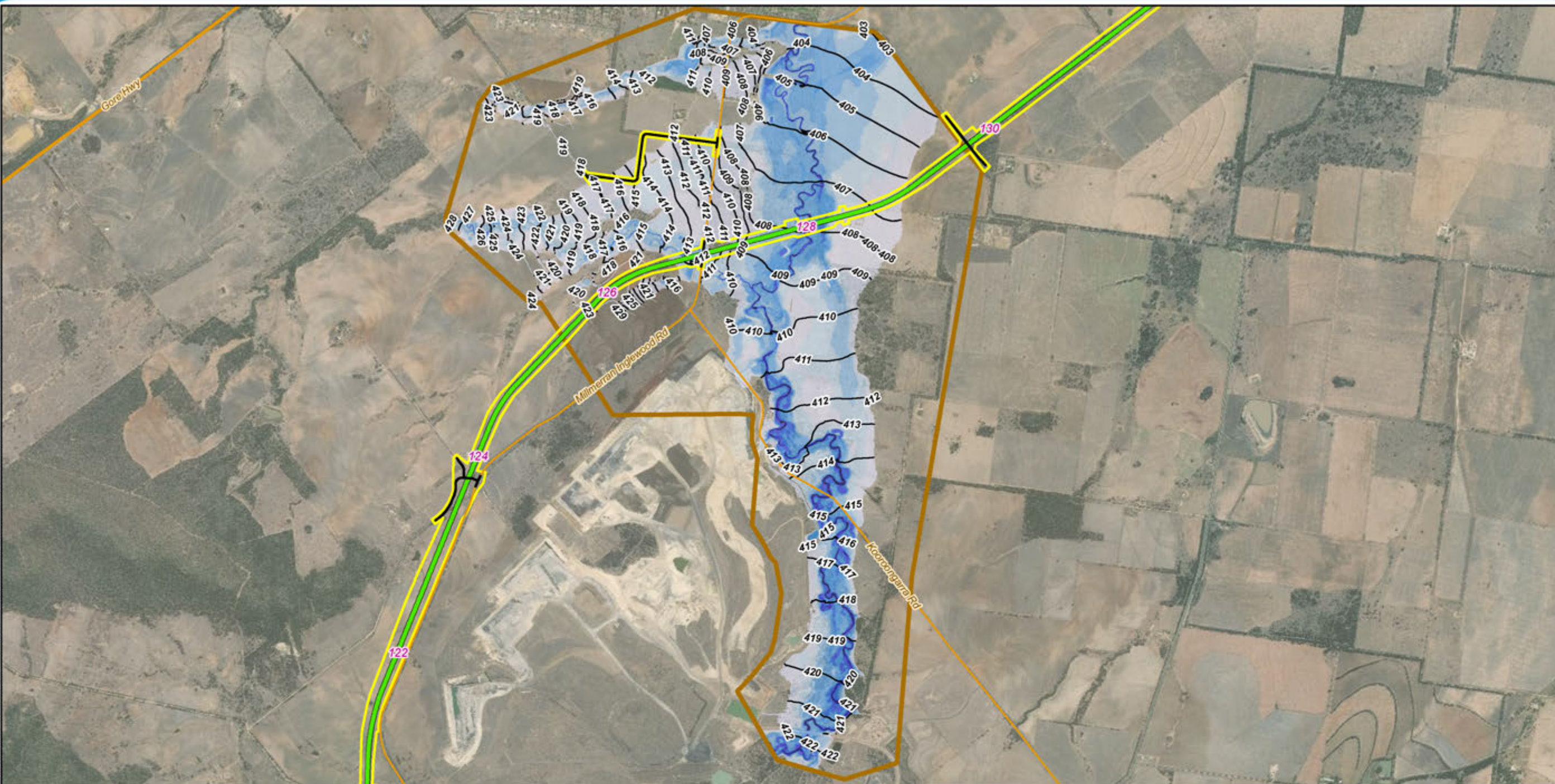


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Border to Gowrie

Figure D2-F:

1 in 2,000 AEP peak water levels - Existing Case - Back Creek



Legend

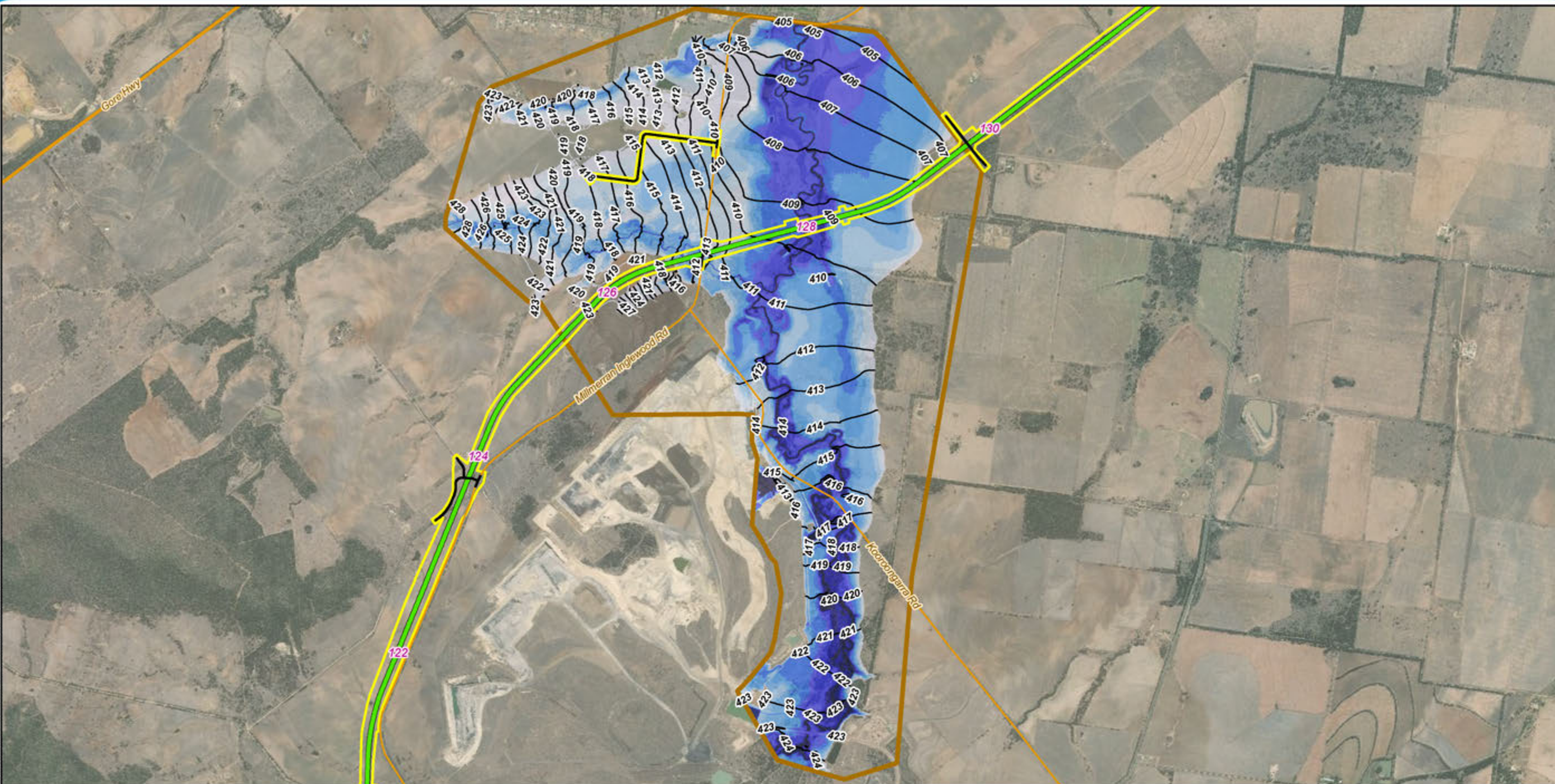
- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|--|--|
| □ 0 - 0.5 | □ 3.0 - 3.5 |
| □ 0.5 - 1.0 | □ 3.5 - 4.0 |
| □ 1.0 - 1.5 | □ 4.0 - 4.5 |
| □ 1.5 - 2.0 | □ 4.5 - 5.0 |
| □ 2.0 - 2.5 | □ > 5.0 |
| □ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Depth (m)

- | | |
|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



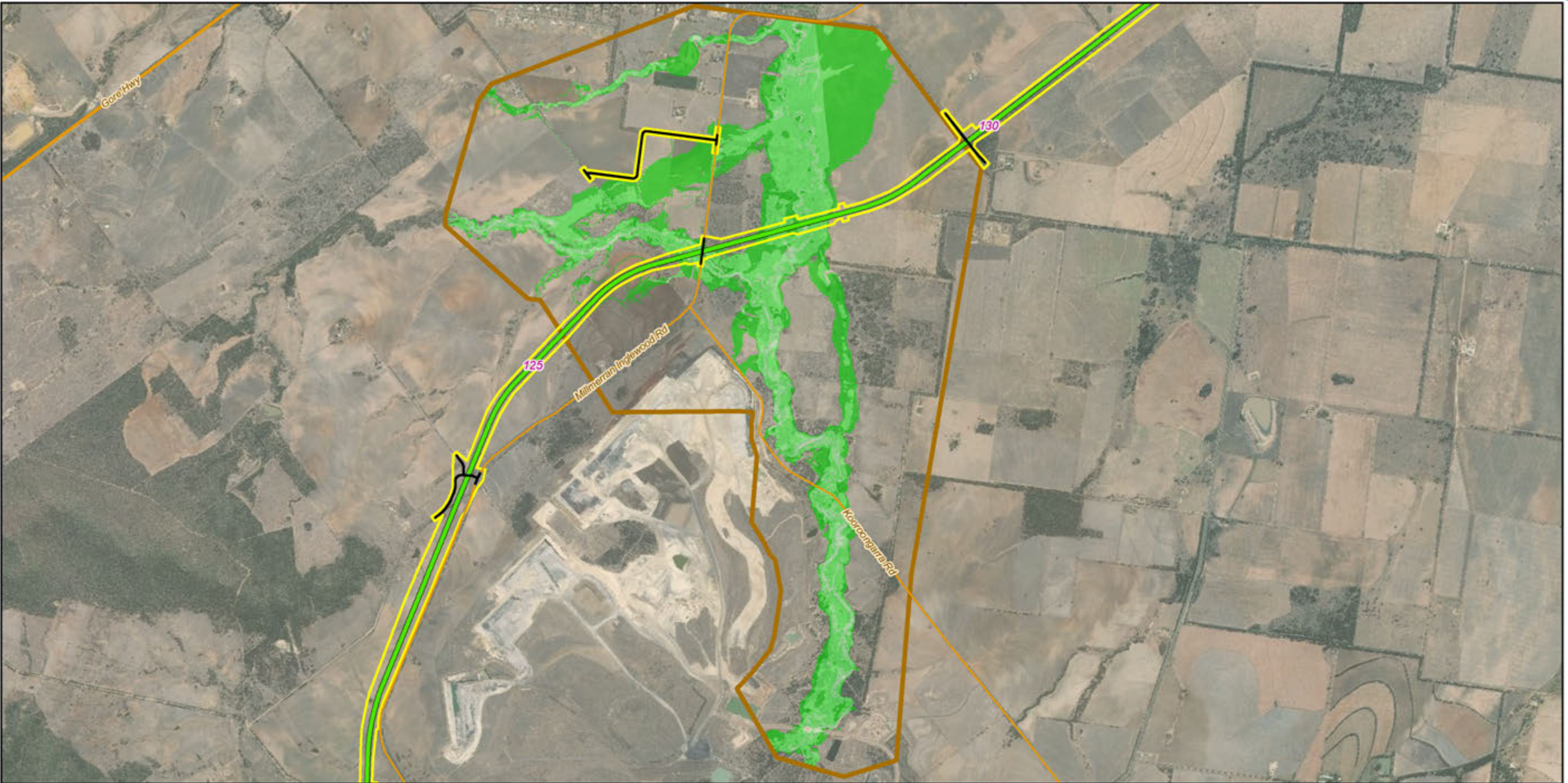
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Border to Gowrie

Figure D2-H:

PMF peak water levels - Existing Case - Back Creek



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Peak velocity (m/s)

0.0	3.0
0.5	3.5
1.0	4.0
1.5	4.5
2.0	5.0
2.5	



A3 scale: 1:40,000
 0 0.4 0.8 1.2 1.6 2km



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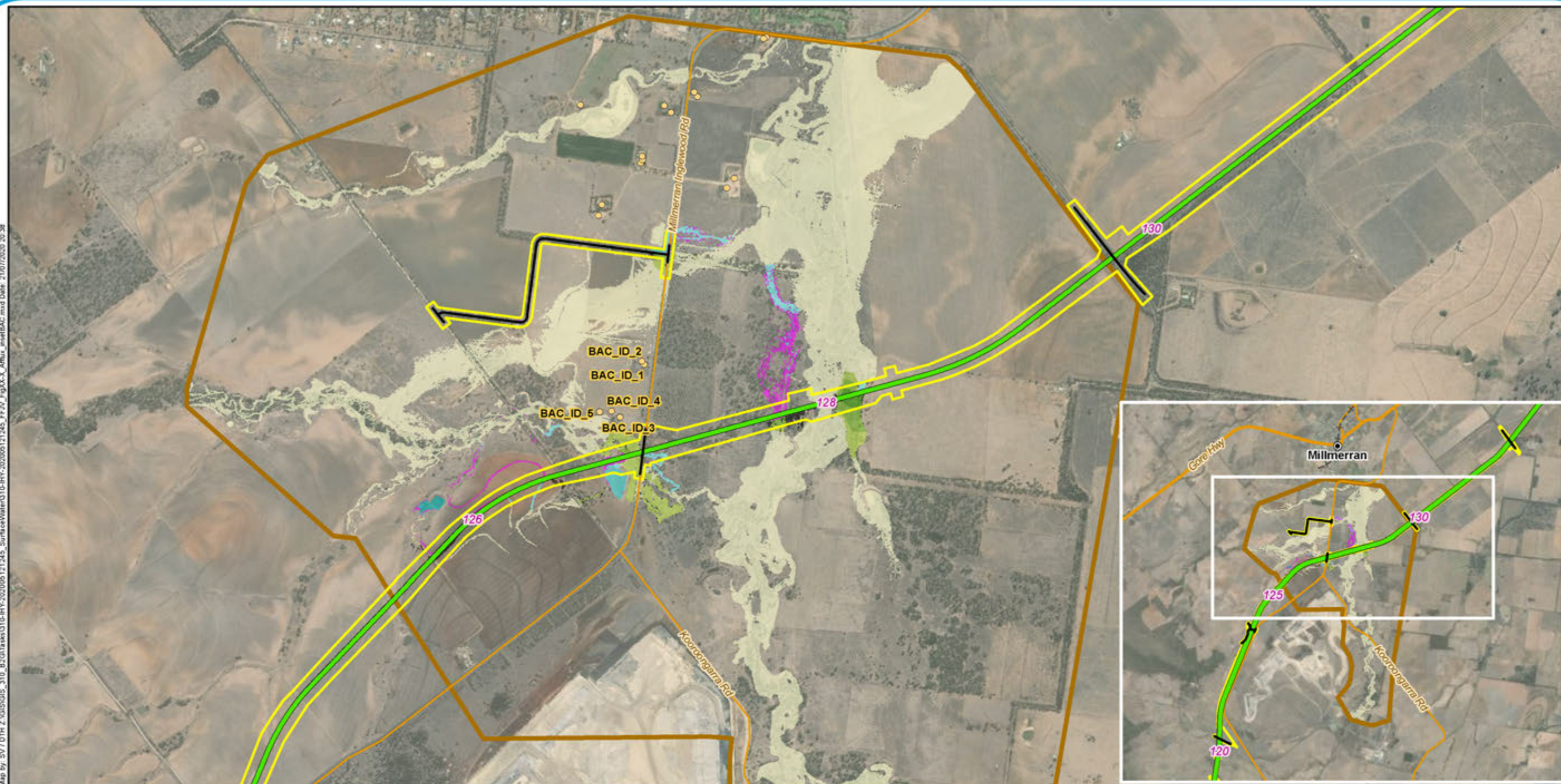
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D3-A:

1% AEP peak velocity - Existing Case - Back Creek

Map by: SV / DTH 2:10:50:310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3N_FigD4-A_Afflu_insetBAC.mxd Date: 21/07/2020 20:38



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km



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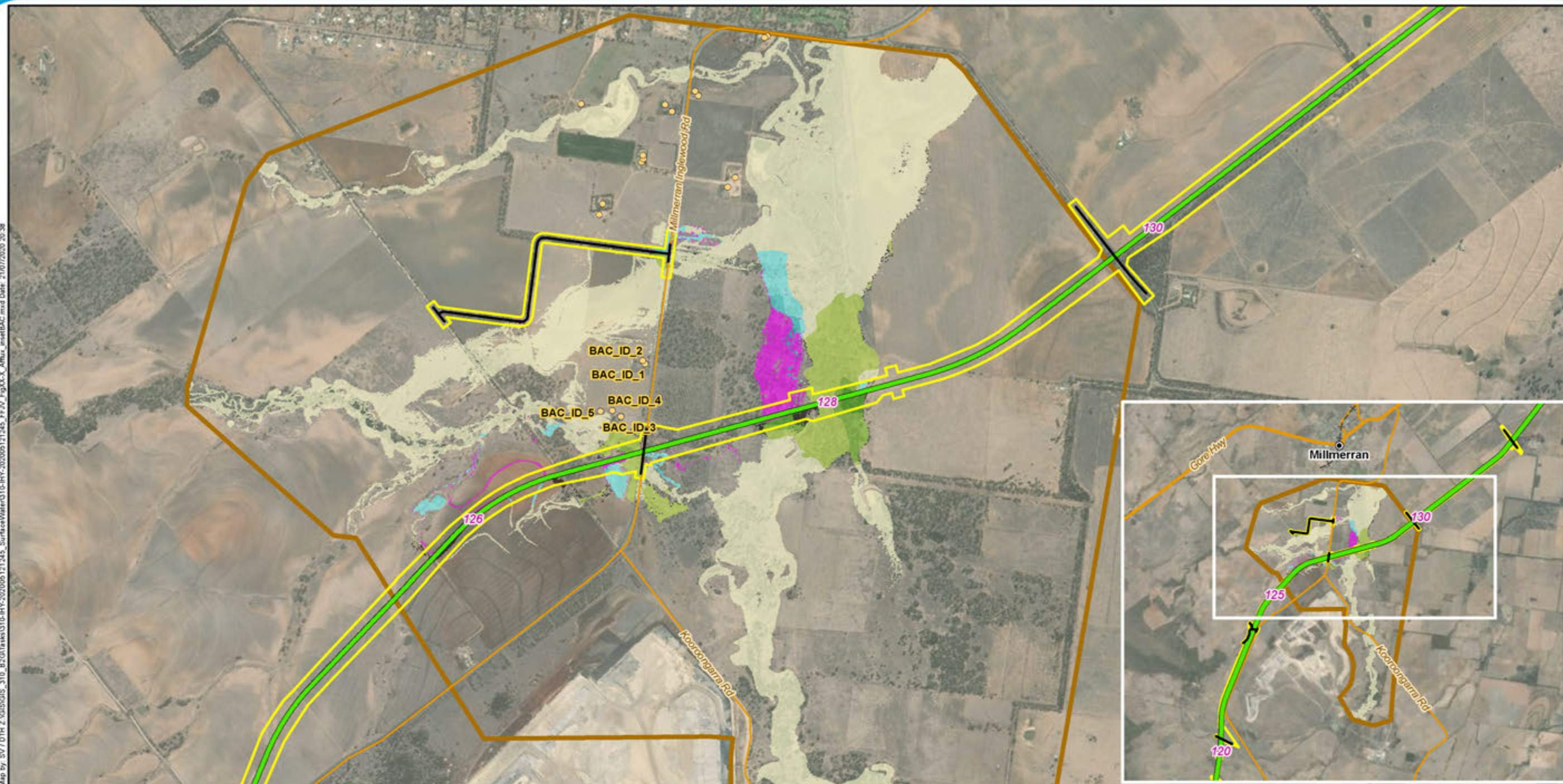
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure D4-A:

20% AEP - design afflux - Back Creek

Map by: SV / DTH 2:10:50:310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3N_FigD4-B_Afflu_insetBAC.mxd Date: 21/07/2020 20:38



Legend

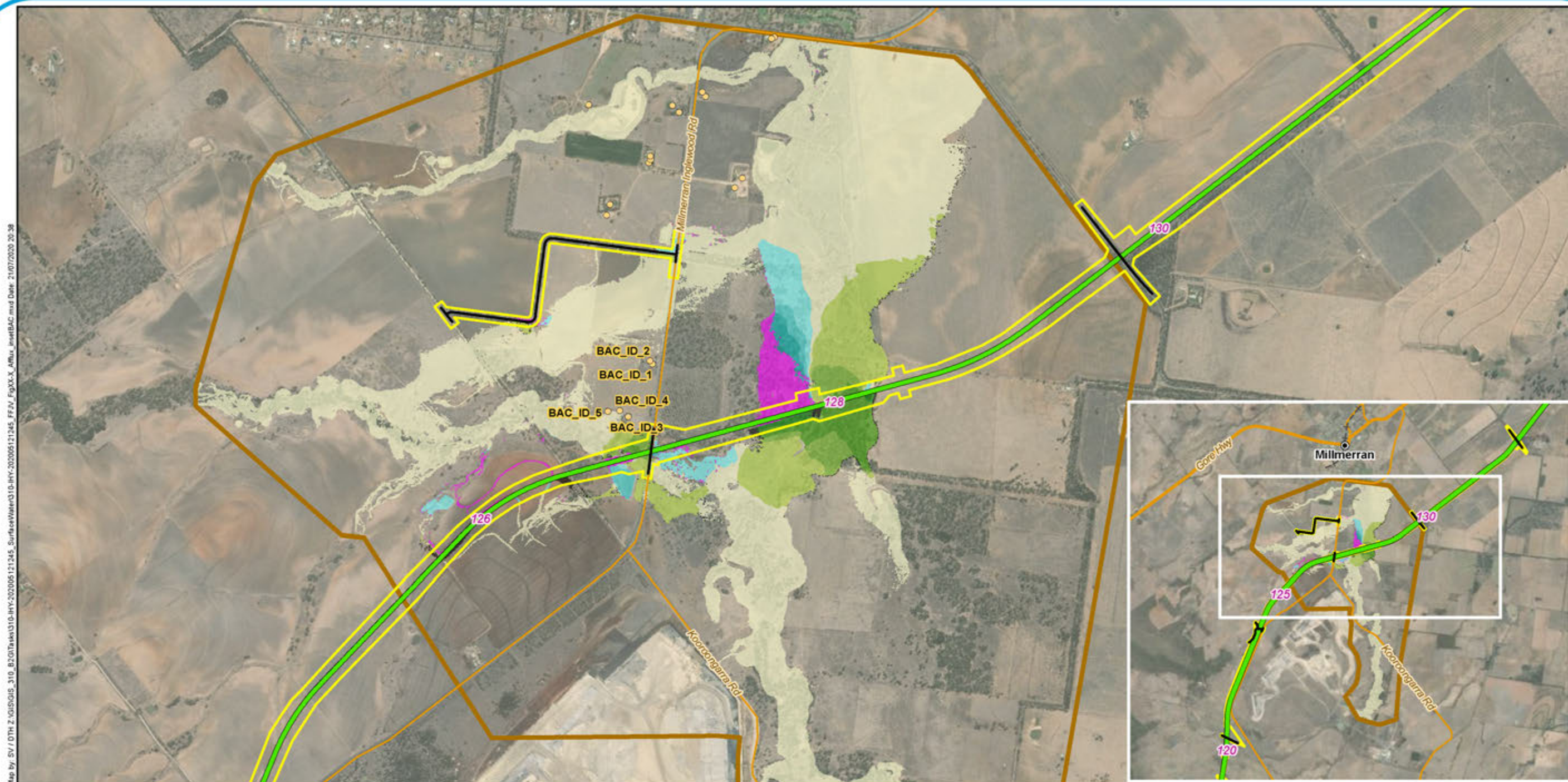
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1 km



Legend

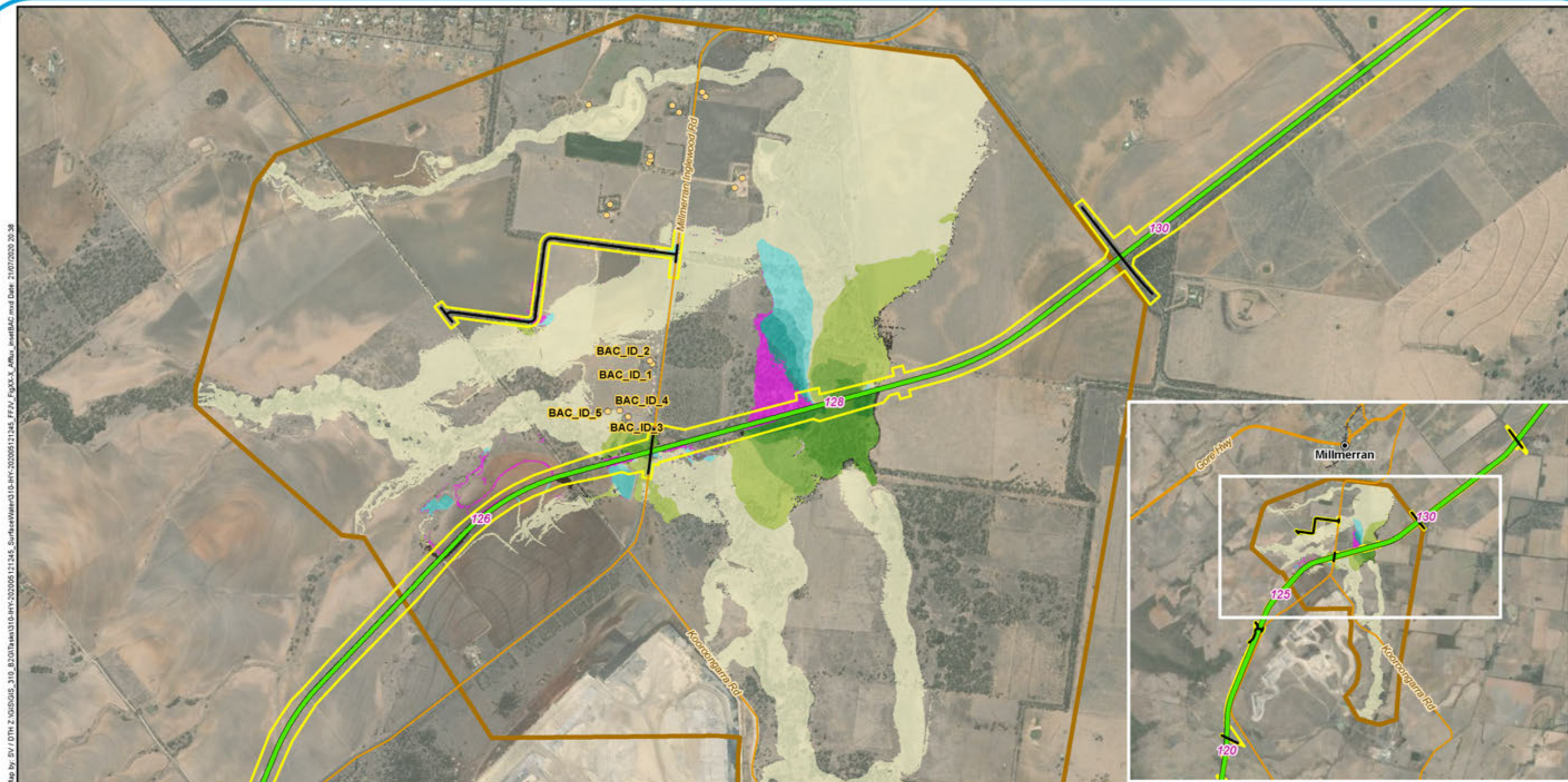
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km



Legend

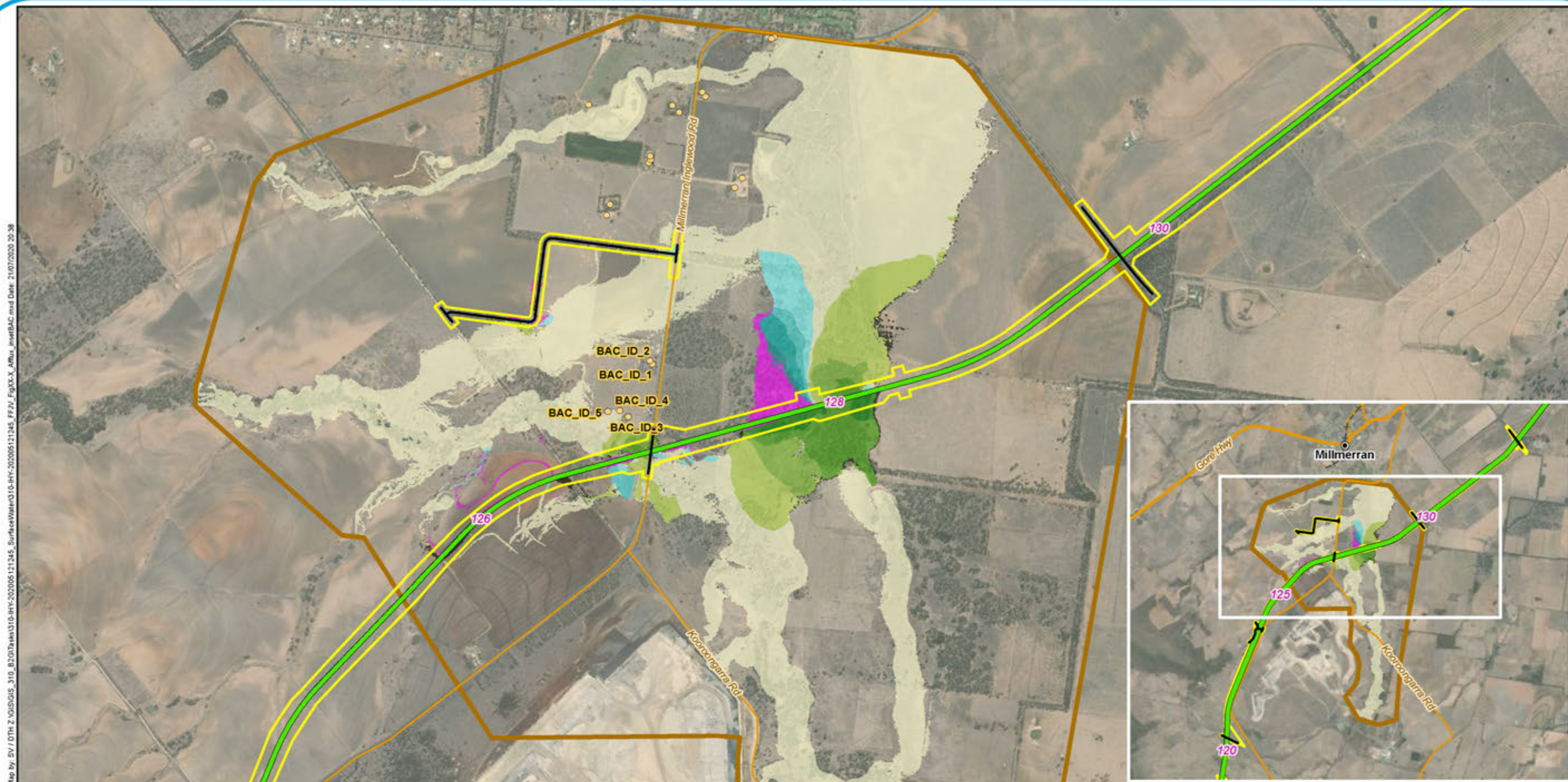
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km



Legend

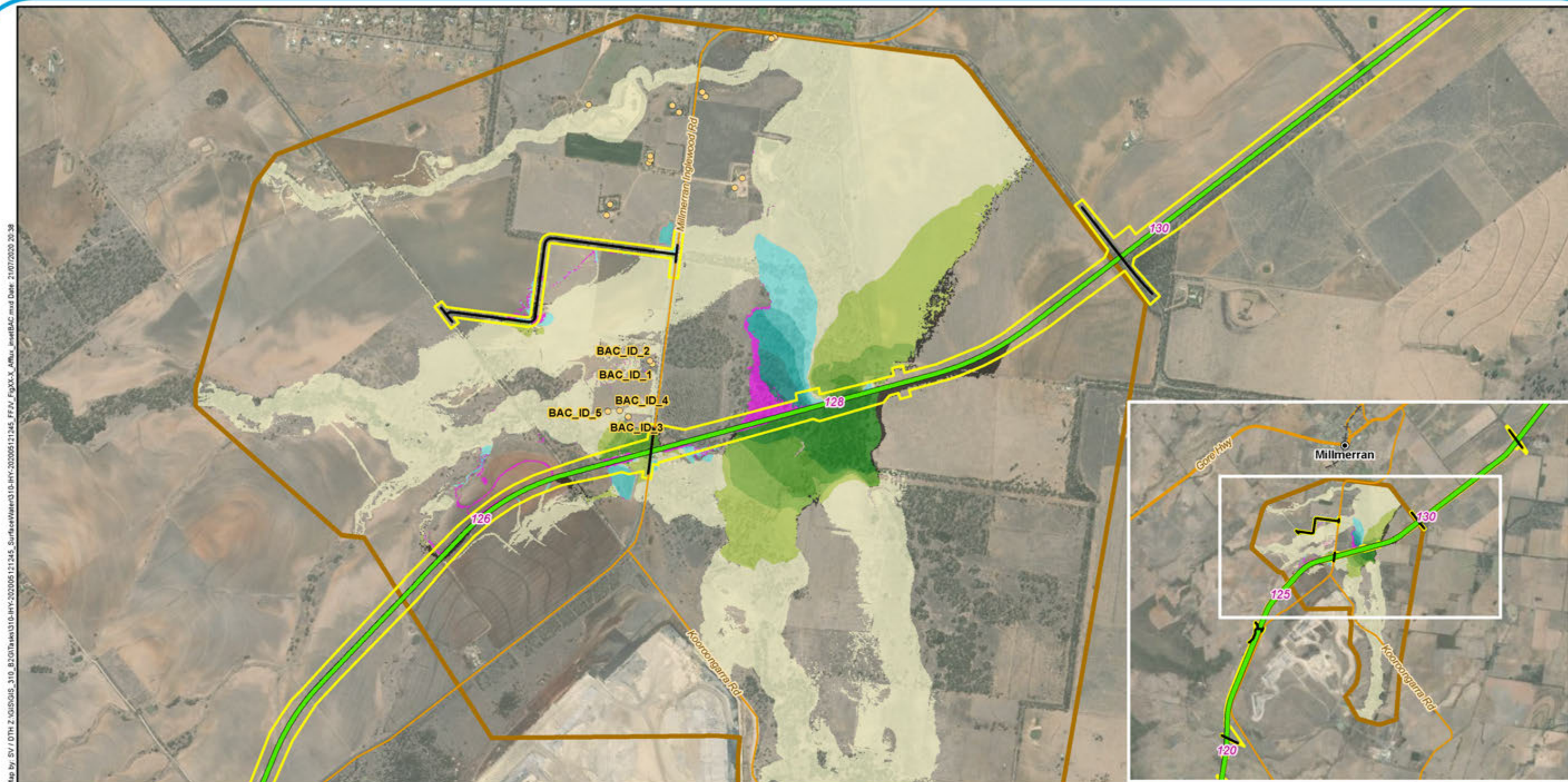
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km



Legend

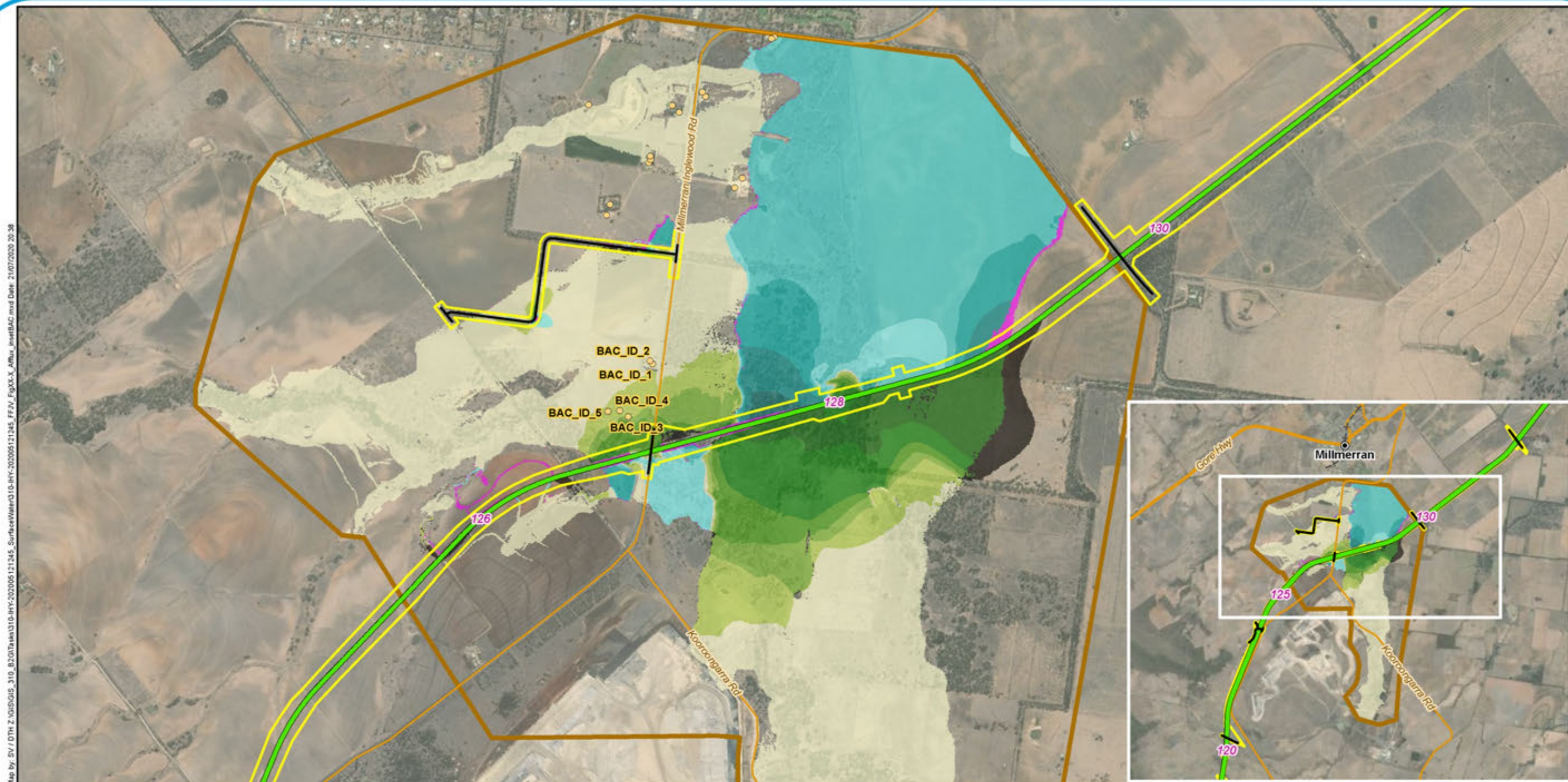
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km

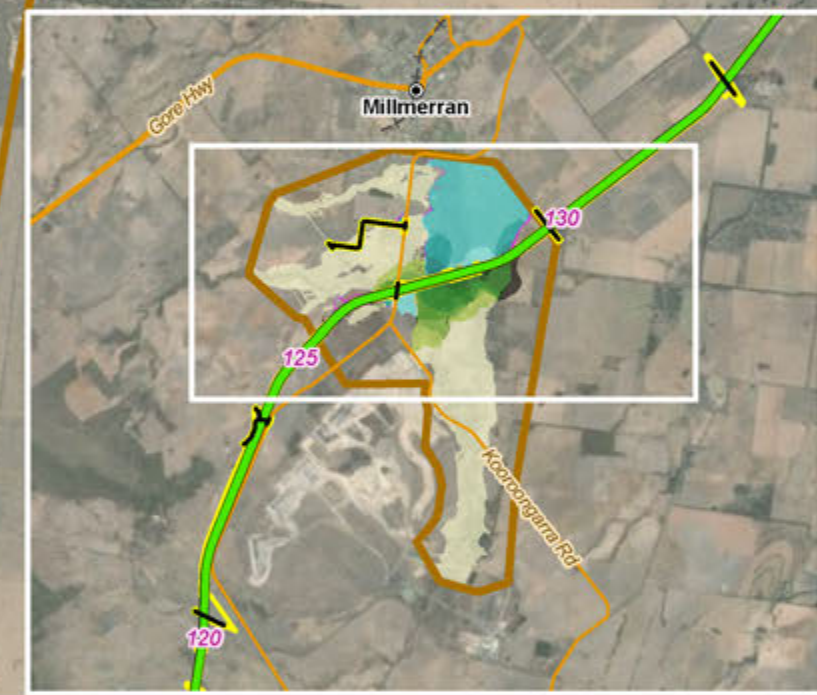


Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

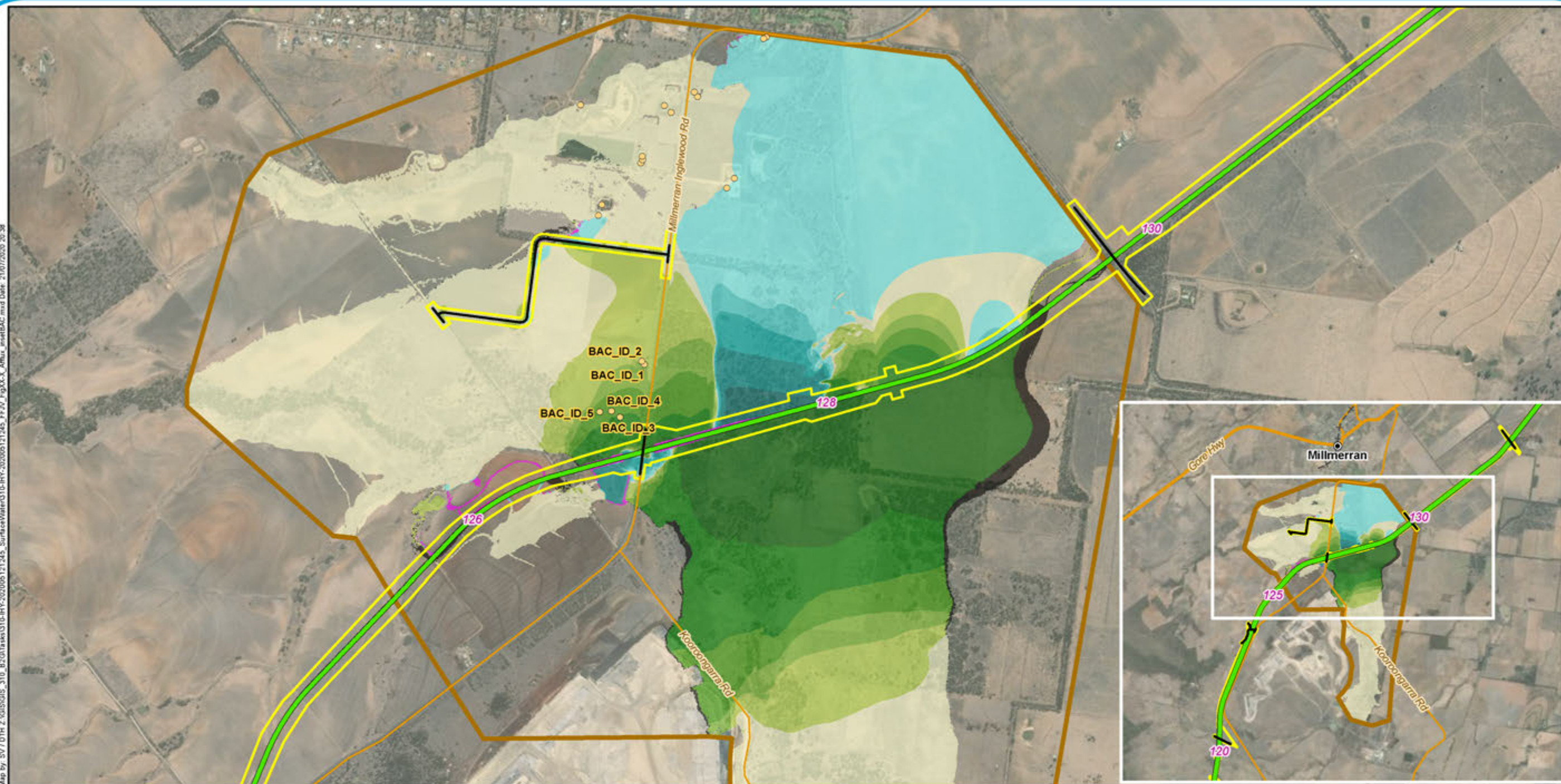
Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km

Map by: SV / DTH 2:10:50:310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_FigD4-H_Afflux_insetBAC.mxd Date: 21/07/2020 20:38



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

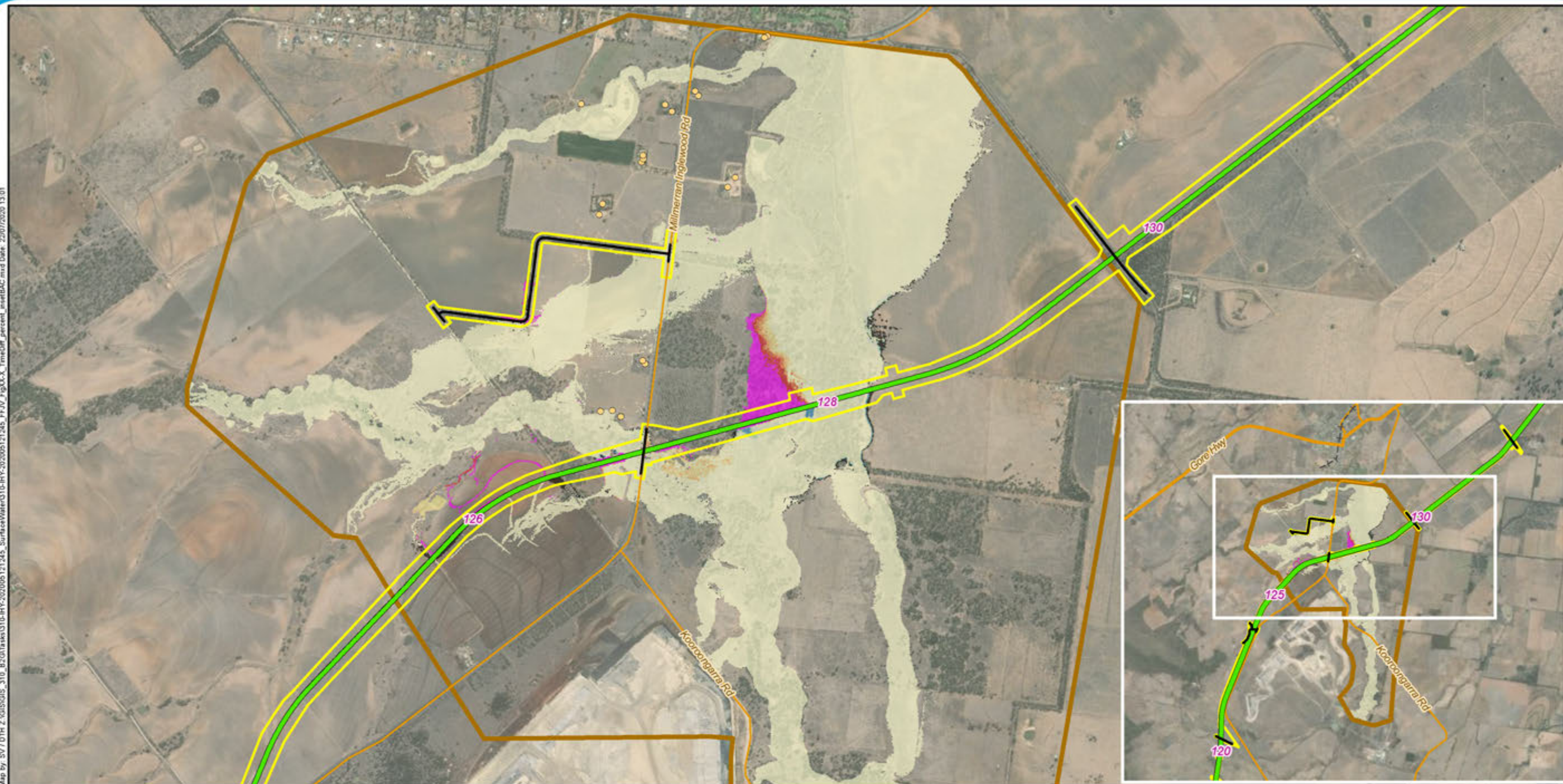
Change in peak water levels (m)

- | | |
|---|---|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km

Map by SV / DTH 2:10:50:310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF JV_FigD4-I_TimeDiff_percent_insetBAC.mxd Date: 22/07/2020 13:01



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

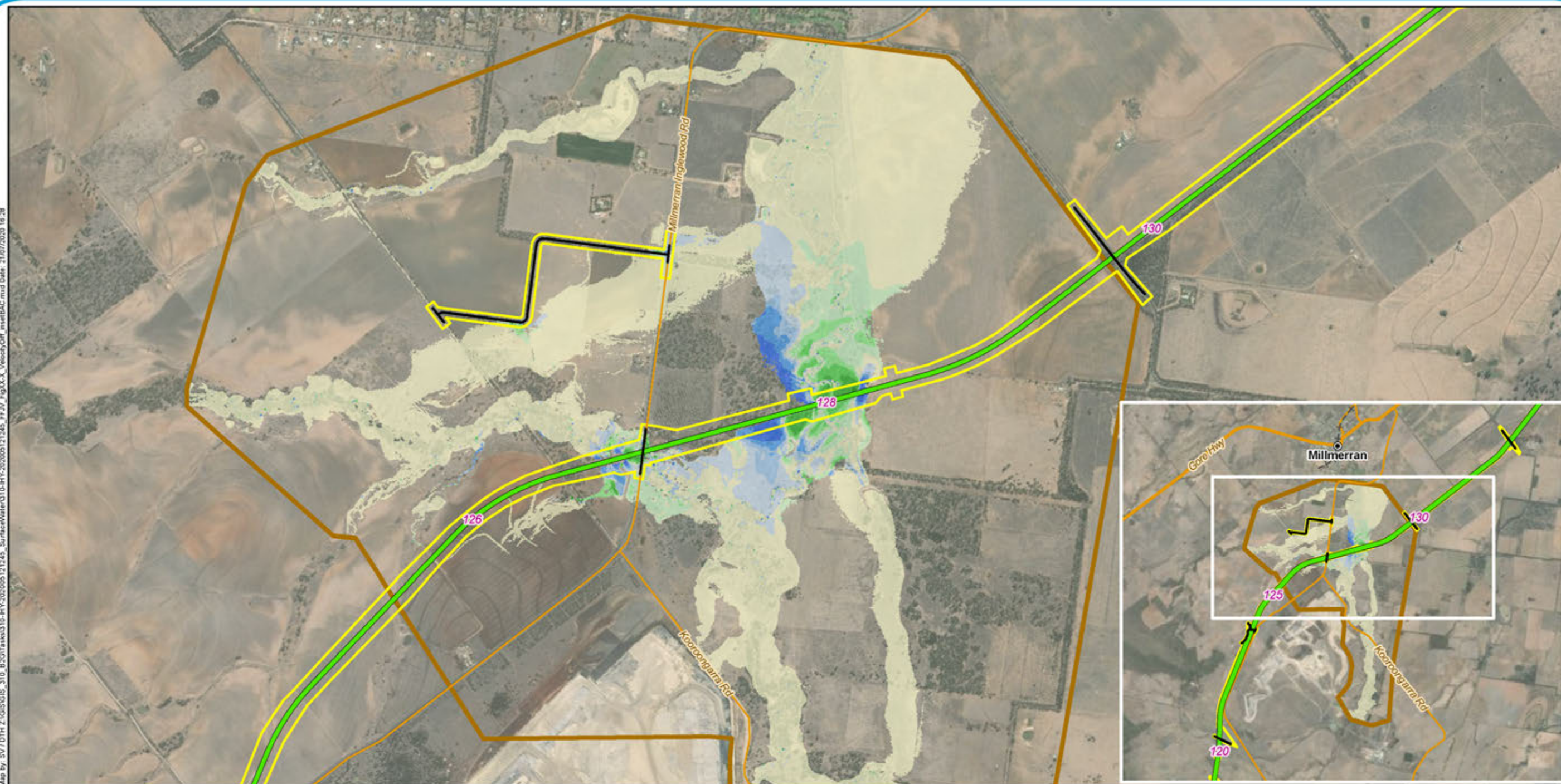
Change in Time of Inundation (percentage)

- < -50%
- -50% to -40%
- -40% to -30%
- -30% to -20%
- -20% to -10%
- -10% to 10%
- 10% to 20%
- 20% to 30%
- 30% to 40%
- 40% to 50%
- > 50%



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km

Map by SV / DTH 2:10:50:310_8207Task310-HY-20200512145_SurfaceWater310-HY-20200512145_FF_A3_FigD4-J_VelocityOff_invelBAC.mxd Date: 21/07/2020 16:28



Legend

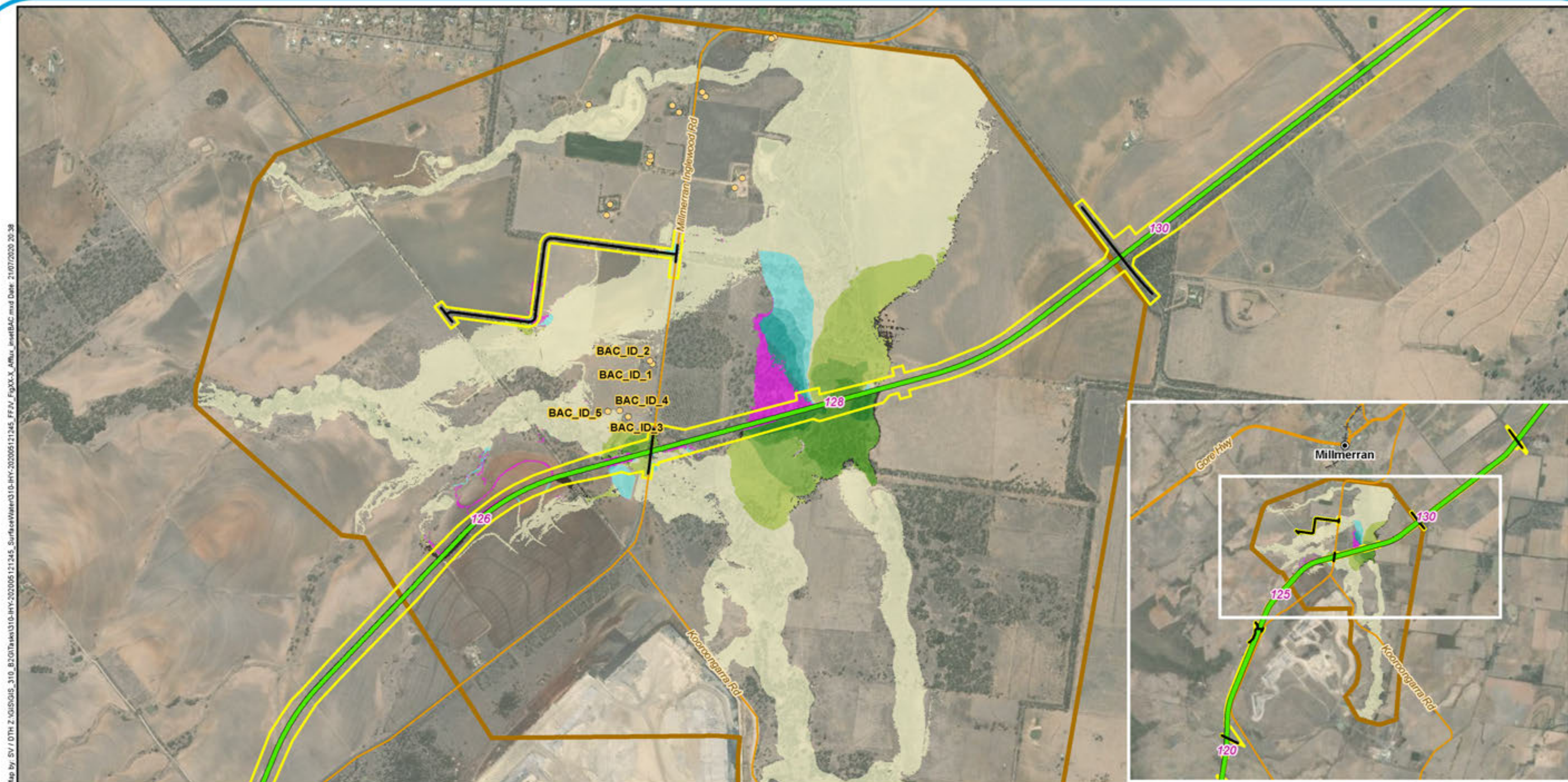
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Change in peak velocity (m/s)

- | | |
|--|---|
| ■ < -0.50 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.50 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km



Legend

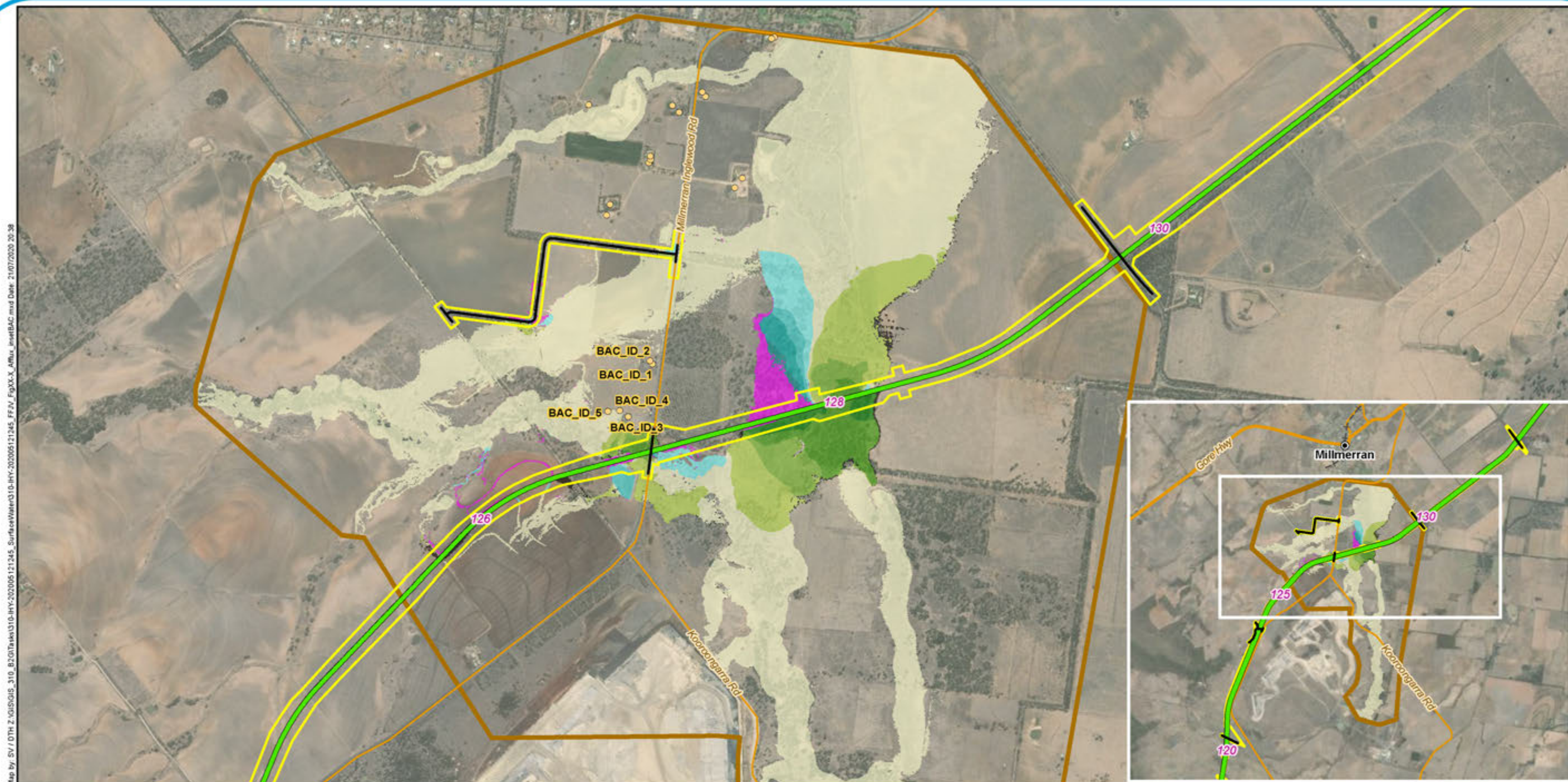
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1 km



Legend

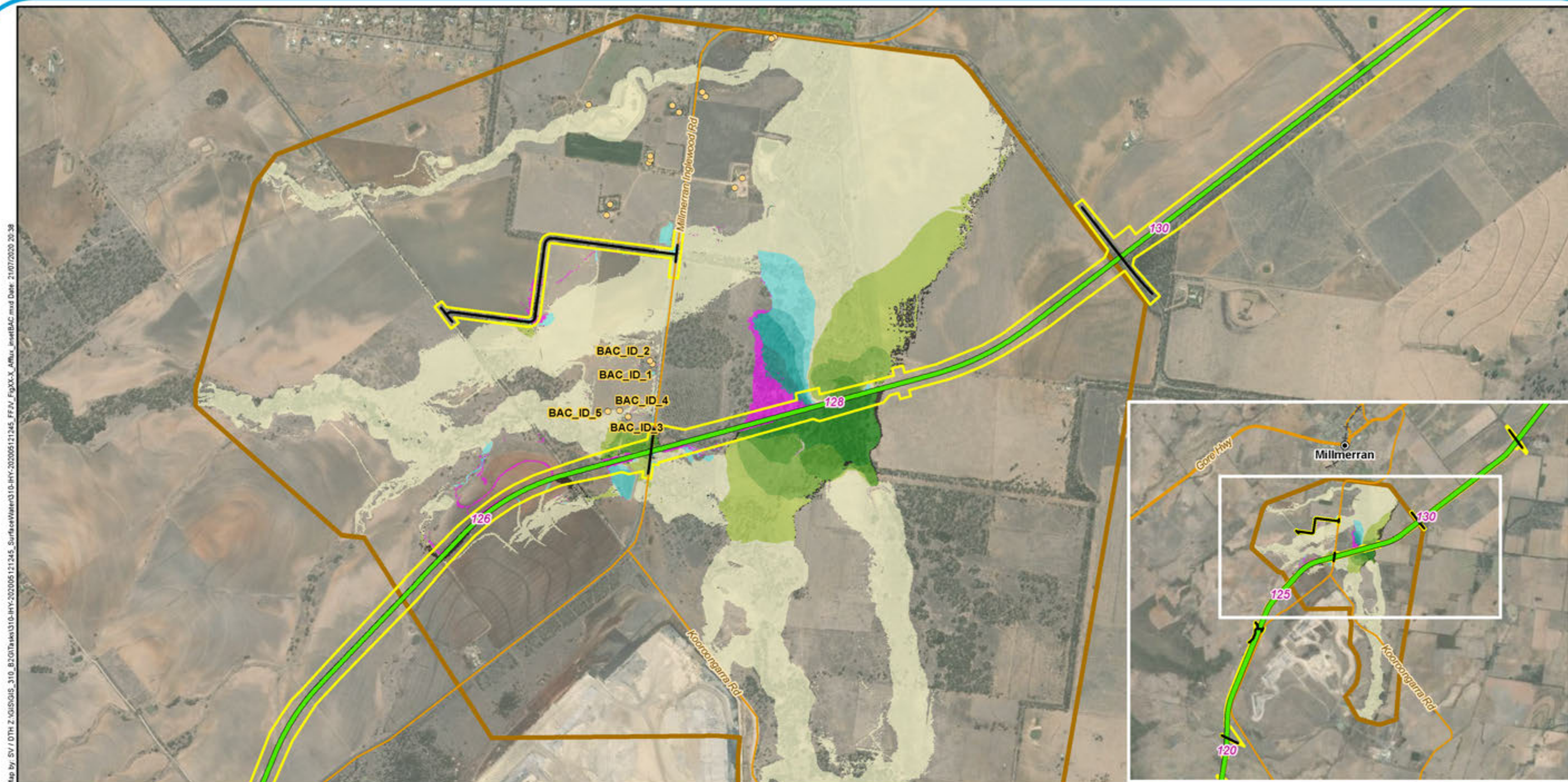
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:22,500
 0 0.2 0.4 0.6 0.8 1km

APPENDIX

Q2

Hydrology and Flooding Technical Report—Volume II

Appendix E Nicol Creek Flood Maps

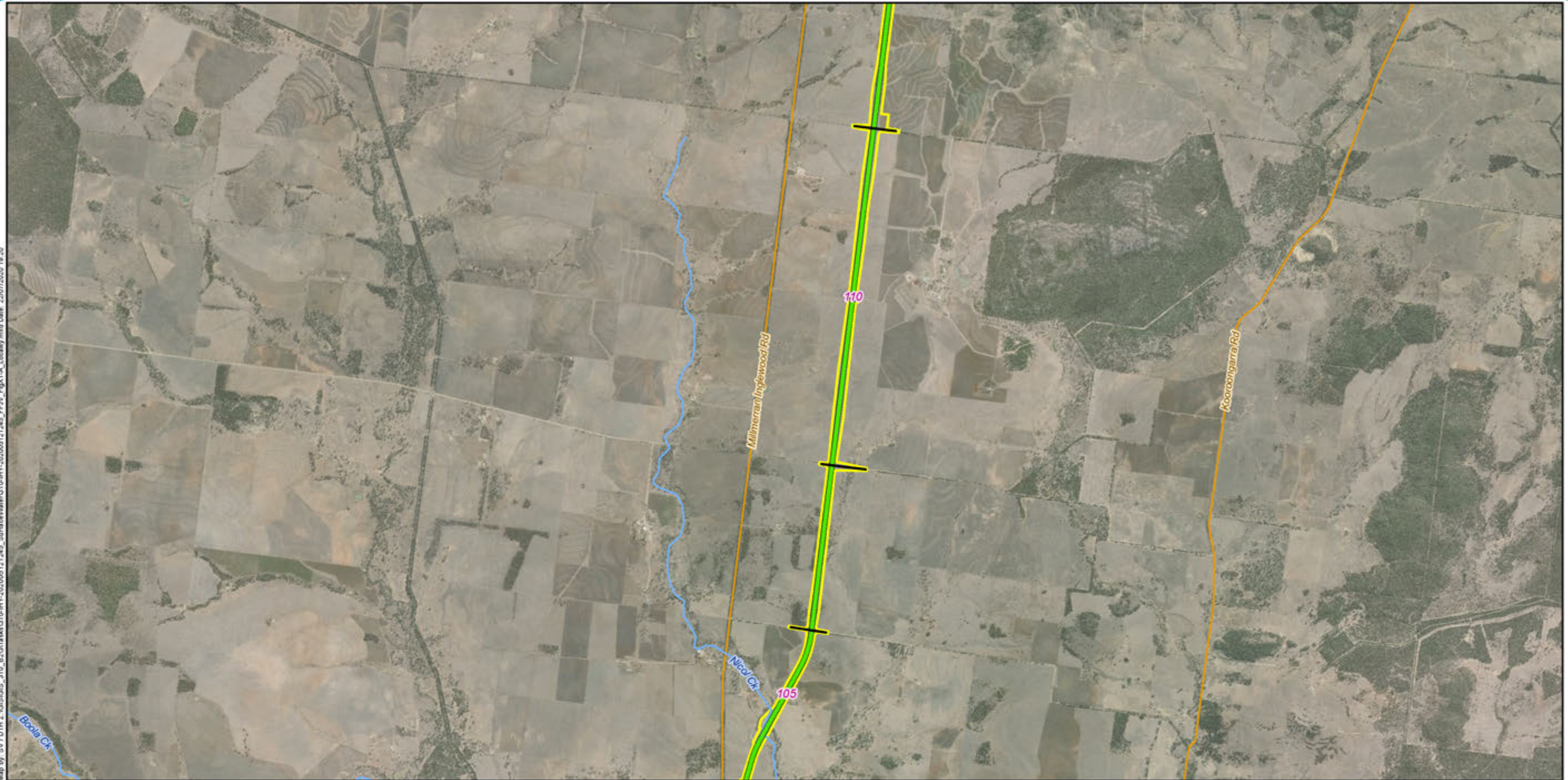
INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

Appendix E

Nicol Creek Flood Maps

Figure E1-A	Locality plan
Figure E1-B	Survey data
Figure E1-C	Hydrologic model setup
Figure E1-D	Hydraulic model setup
Figure E1-E	Landuse classifications
Figure E1-F	Proposed design structures
Figure E2-A	20% AEP peak water levels – Existing Case
Figure E2-B	10% AEP peak water levels – Existing Case
Figure E2-C	5% AEP peak water levels – Existing Case
Figure E2-D	2% AEP peak water levels – Existing Case
Figure E2-E	1% AEP peak water levels – Existing Case
Figure E2-F	1 in 2,000 AEP peak water levels – Existing Case
Figure E2-G	1 in 10,000 AEP peak water levels – Existing Case
Figure E2-H	PMF peak water levels – Existing Case
Figure E3-A	1% AEP peak velocity – Existing Case
Figure E4-A	20% AEP – design afflux
Figure E4-B	10% AEP – design afflux
Figure E4-C	5% AEP – design afflux
Figure E4-D	2% AEP – design afflux
Figure E4-E	1% AEP – design afflux
Figure E4-F	1 in 2,000 AEP – design afflux
Figure E4-G	1 in 10,000 AEP – design afflux
Figure E4-H	PMF – design afflux
Figure E4-I	1% AEP – change in time of inundation
Figure E4-J	1% AEP – change in velocity
Figure E5-A	1% AEP sensitivity – 0% blockage
Figure E5-B	1% AEP sensitivity – 50% blockage
Figure E5-C	1% AEP sensitivity – climate change RCP8.5 – peak water levels

Map by SV / DTH 2:10USQGIS_310_B20Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_Fig1-A_Locality.mxd Date: 22/07/2020 19:20



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Watercourses
- Minor roads
- Road design
- Project footprint



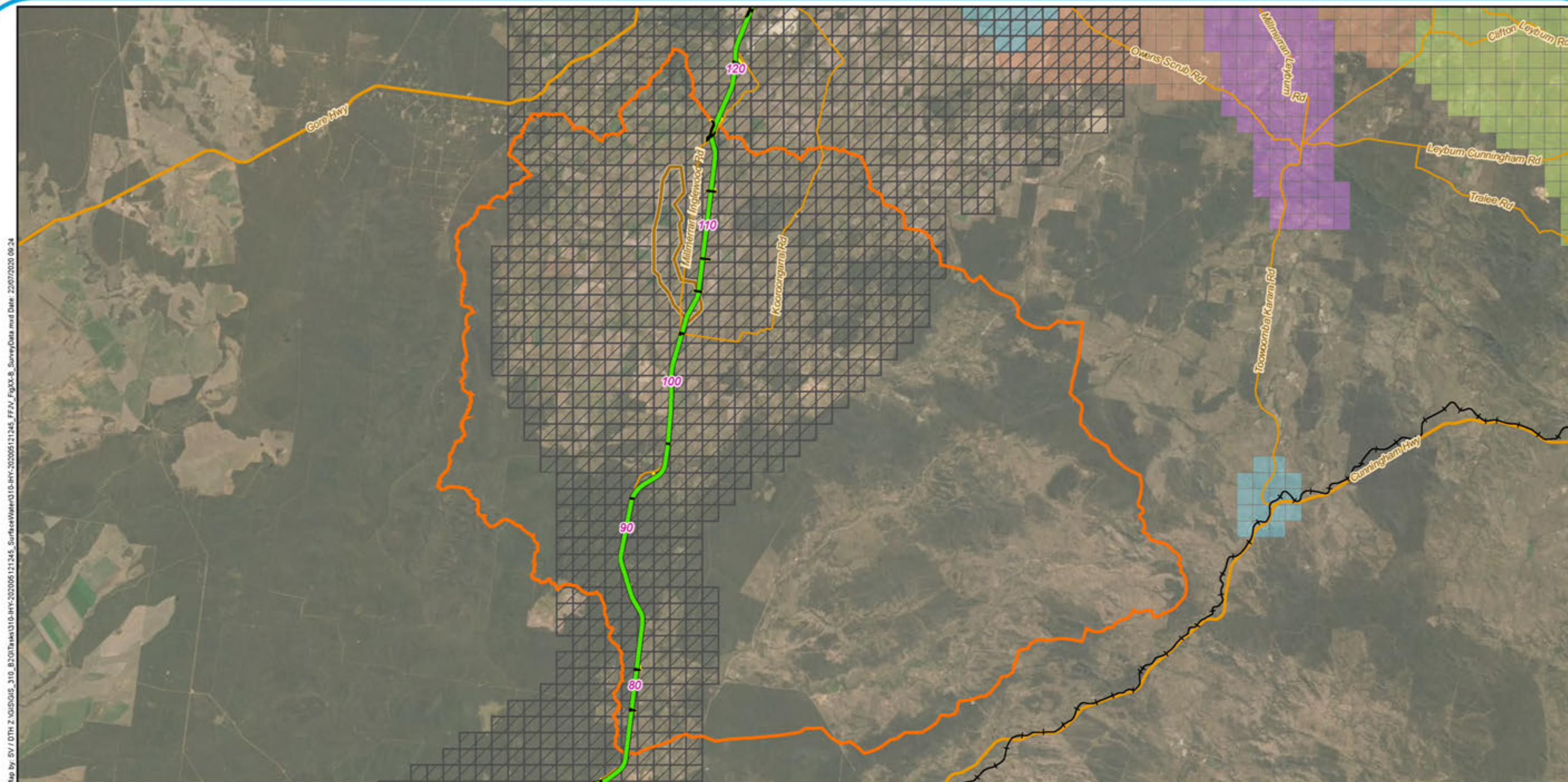
A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km



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Border to Gowrie
Figure E1-A:
Locality plan - Nicol Creek

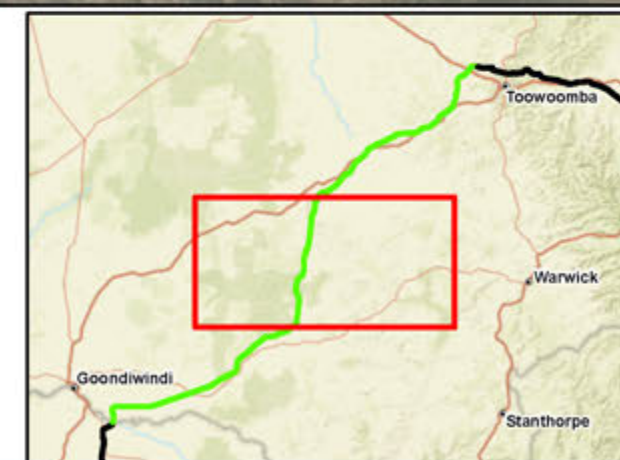


Legend

- 5 Chainage (km)
- Existing rail (operational)
- Border to Gowrie alignment
- Major roads
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Hydrologic model extent

LiDAR datasets (1m grid)

- Inland Towns Stage 2 2011
- Inland Towns Stage 4 2012
- Inland Towns Stage 6 2014
- Southern Downs 2010
- 2015 ARTC LiDAR 1m



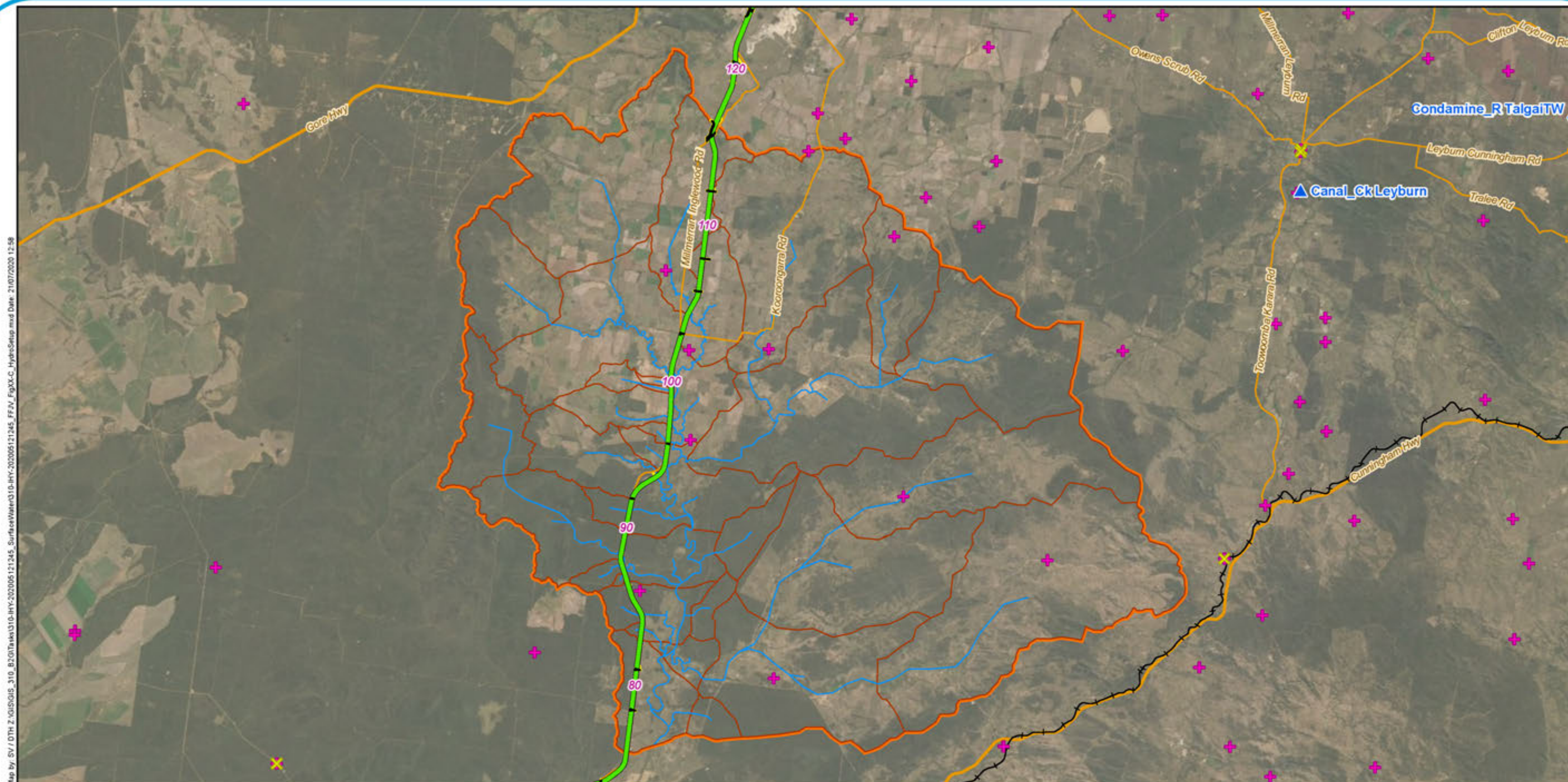
A3 scale: 1:260,000
 0 2.5 5 7.5 10 12.5 km



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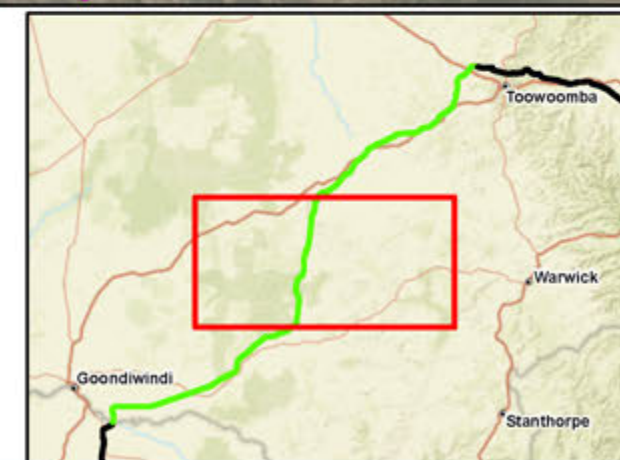
Issue date: 22/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie
Figure E1-B:
Survey data - Nicol Creek



Legend

- | | | | |
|-----------------------------|-------------------|-------------------------|---------------------------|
| 5 Chainage (km) | Major roads | Catchment links | X Pluviograph stations |
| Existing rail (operational) | Minor roads | Sub-catchments | + Daily rainfall stations |
| Border to Gowrie alignment | Road design | Hydrologic model extent | ▲ Stream gauge locations |
| | Project footprint | | |



A3 scale: 1:260,000
 0 2.5 5 7.5 10 12.5 km



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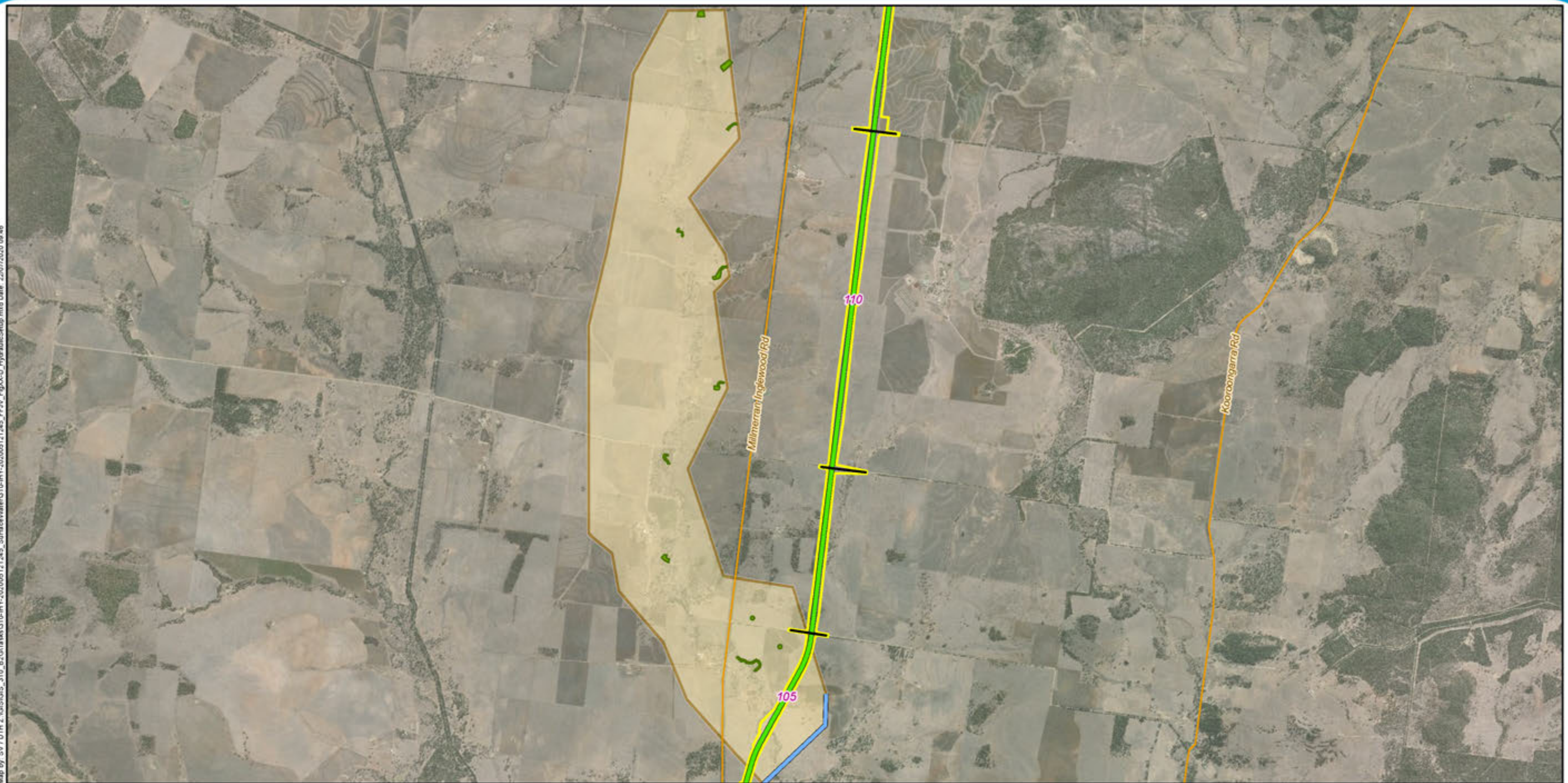
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E1-C:

Hydrologic model setup - Nicol Creek

Map by SV / DTH 2:10:50:310, 8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_FigX-D_HydraulicSetup.mxd Date: 22/07/2020 09:48



Legend

- | | | |
|----------------------------|-------------------|------------------------|
| 5 Chainage (km) | Minor roads | Hydraulic model extent |
| Border to Gowrie alignment | Road design | Outflow boundaries |
| | Project footprint | Inflow boundaries |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5 km



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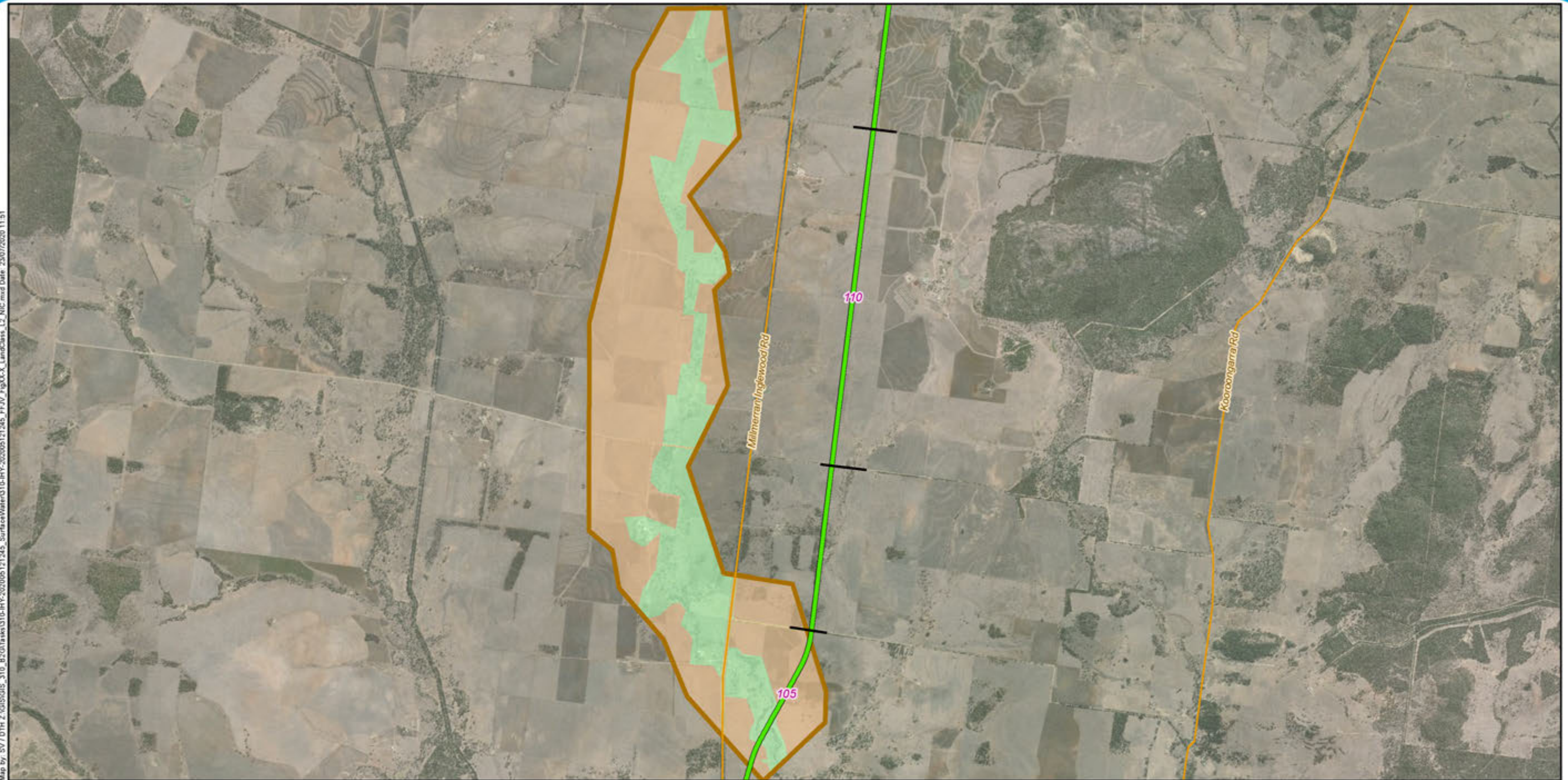
Issue date: 22/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E1-D:

Hydraulic model setup - Nicol Creek

Map by SV / DTH 2:10USGS_310_B20Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FFJV_Fig00-X_LandClass_12_NIC.mxd Date: 23/07/2020 11:51

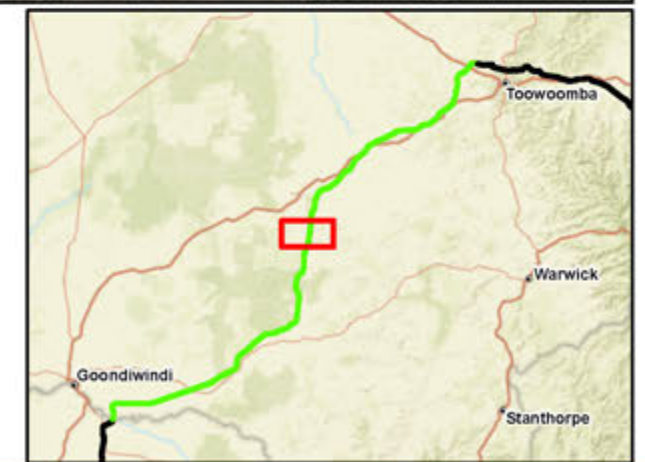


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Hydraulic model extent

Landuse classification

- Unsealed road corridor (n=0.025)
- Open space - min veg (n=0.045)
- Crop (n=0.109)



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km



Legend

- 5 Chainage (km)
- Floodplain culvert
- Local drainage culvert
- Bridges
- Border to Gowrie alignment
- Minor roads
- Project footprint
- Hydraulic model extent



A3 scale: 1:6,000
 0 0.06 0.12 0.18 0.24 0.3km



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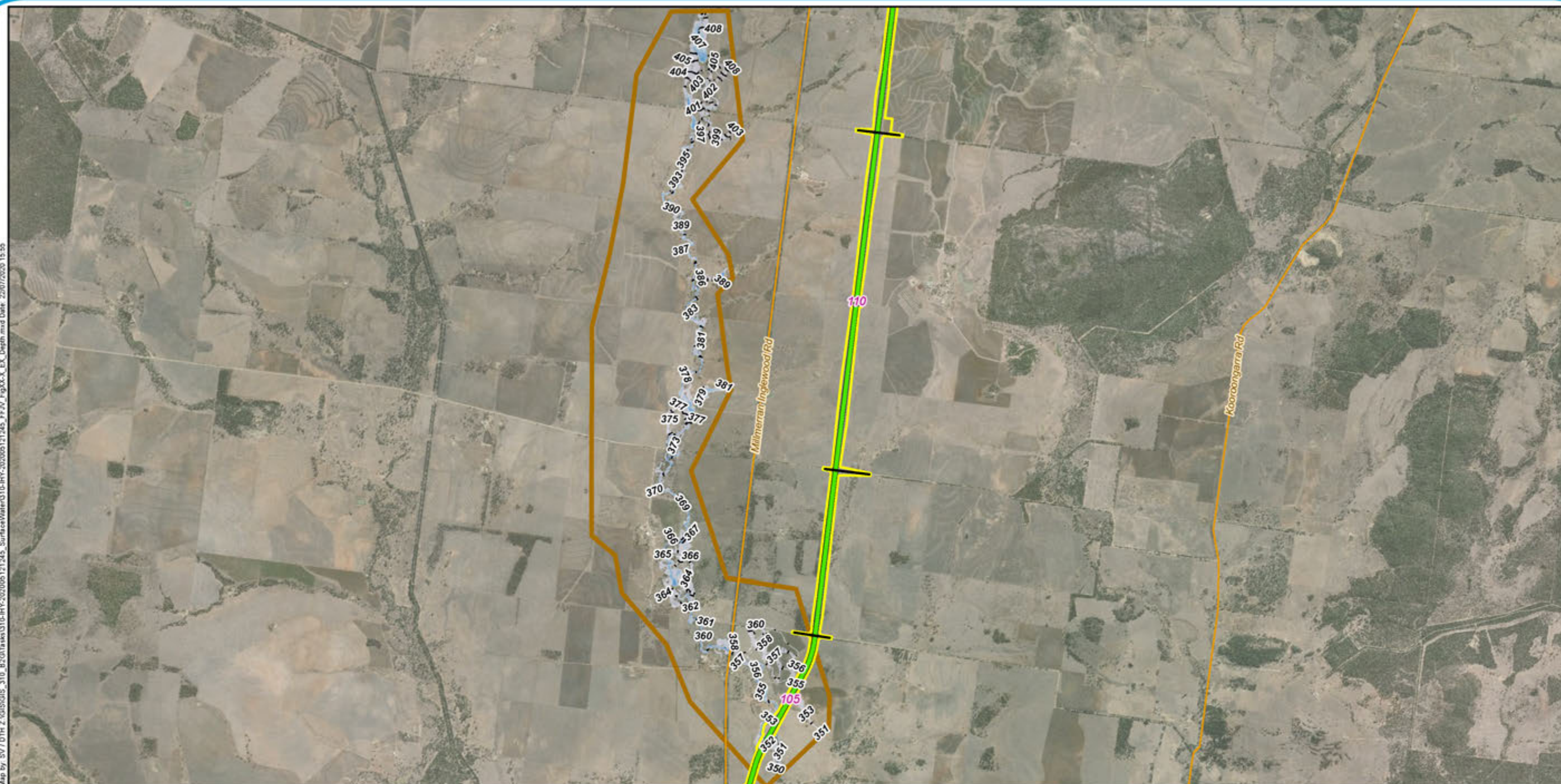
Issue date: 22/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E1-F:

Proposed design structures - Nicol Creek

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55

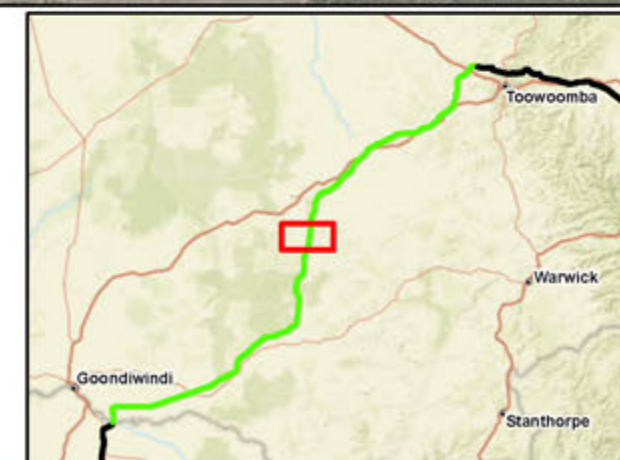


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

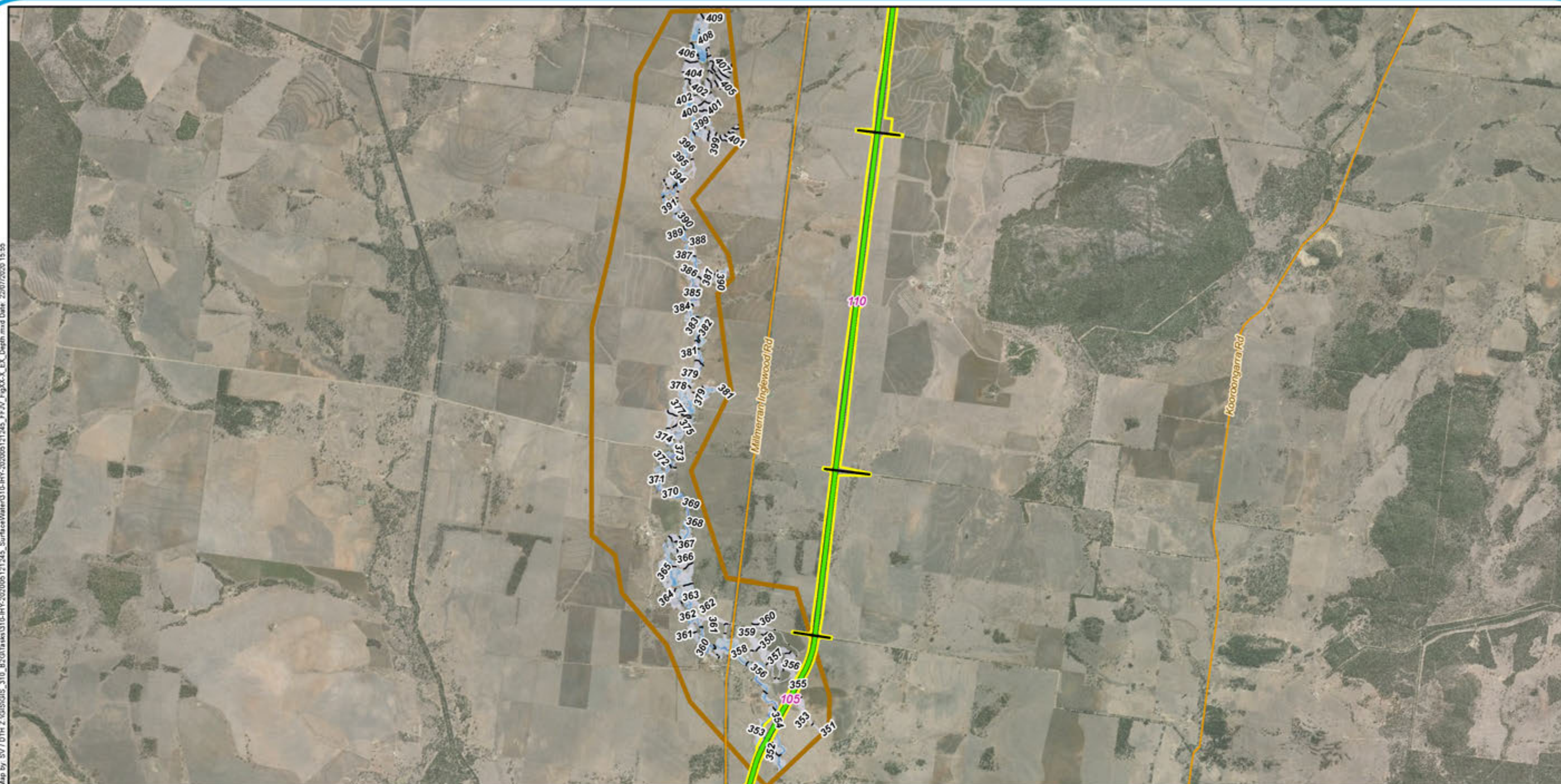
Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55

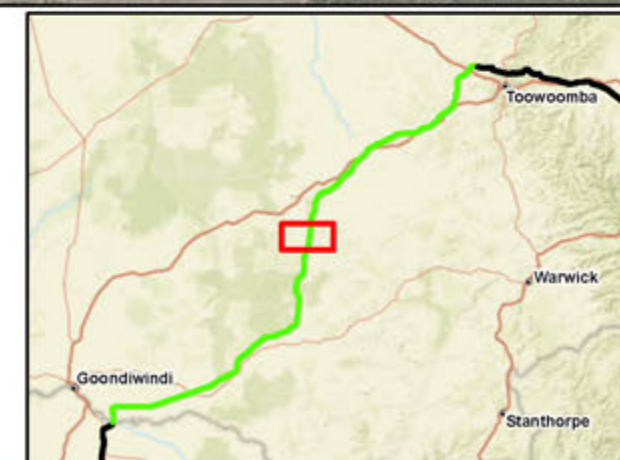


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

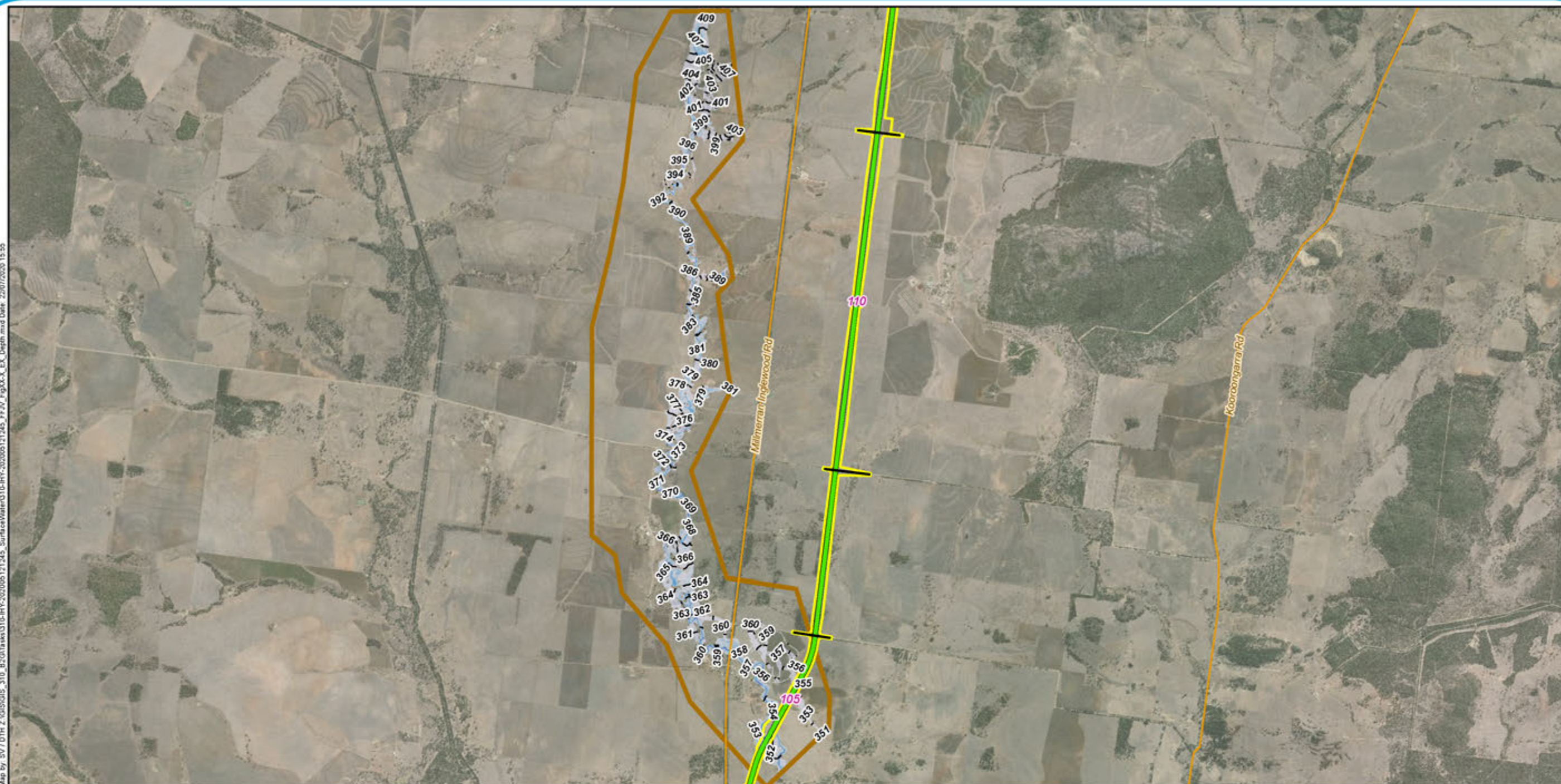
Depth (m)

- | | |
|--|--|
| □ 0 - 0.5 | □ 3.0 - 3.5 |
| □ 0.5 - 1.0 | □ 3.5 - 4.0 |
| □ 1.0 - 1.5 | □ 4.0 - 4.5 |
| □ 1.5 - 2.0 | □ 4.5 - 5.0 |
| □ 2.0 - 2.5 | □ > 5.0 |
| □ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5 km

Map by SV / DTH 2:10:50GIS_310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55

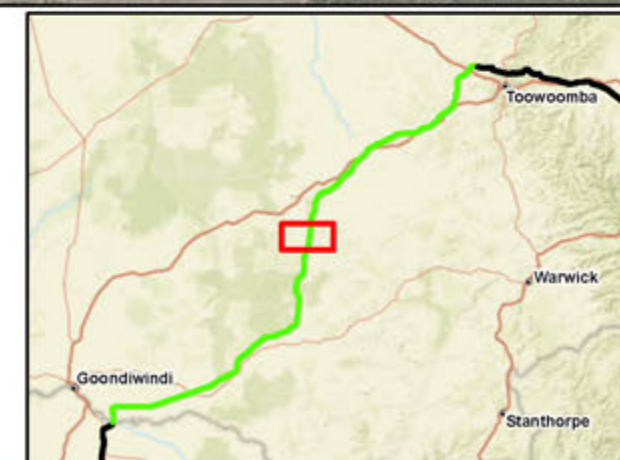


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

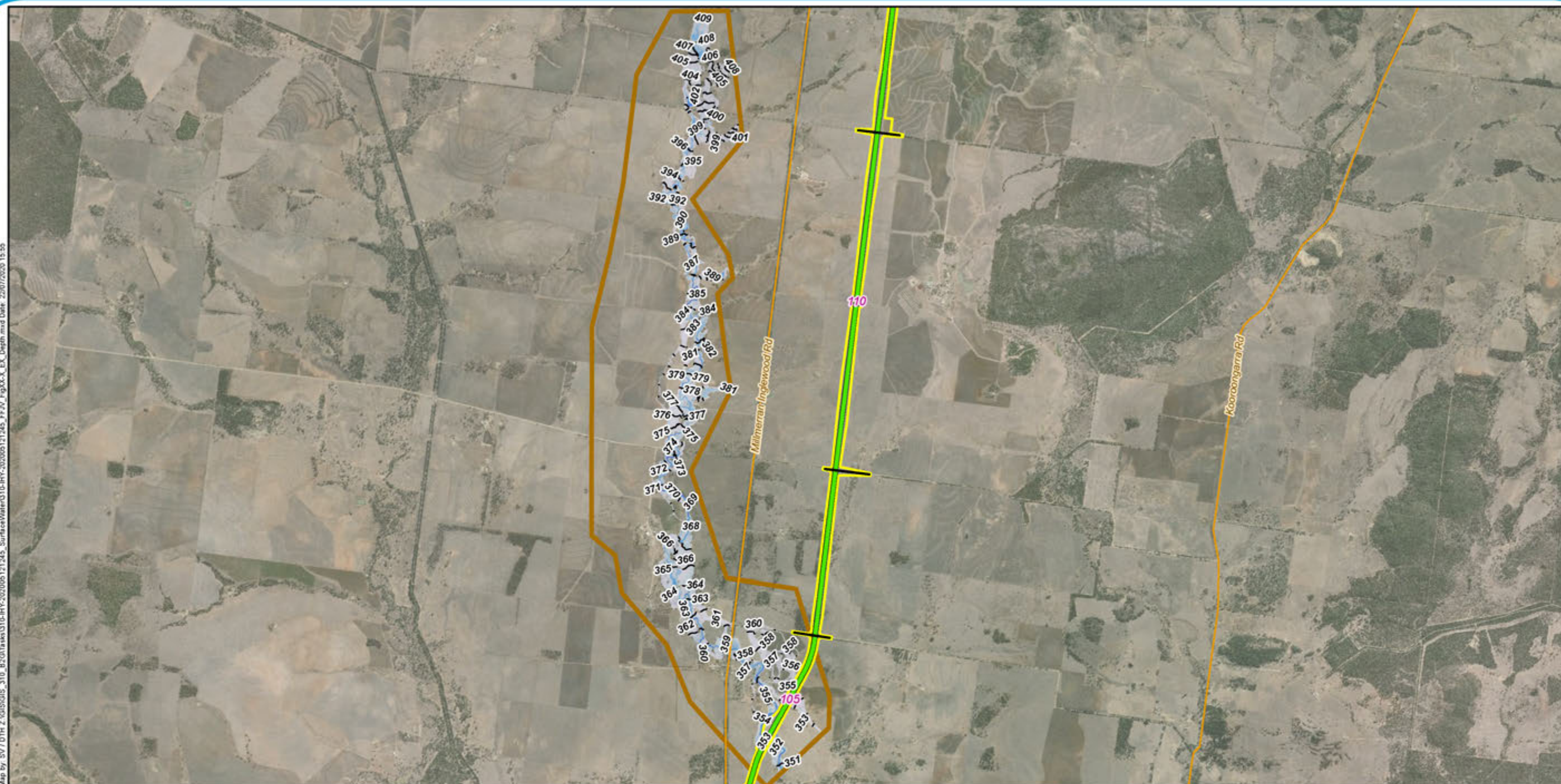
Depth (m)

- | | |
|-----------|-------------------|
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| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55



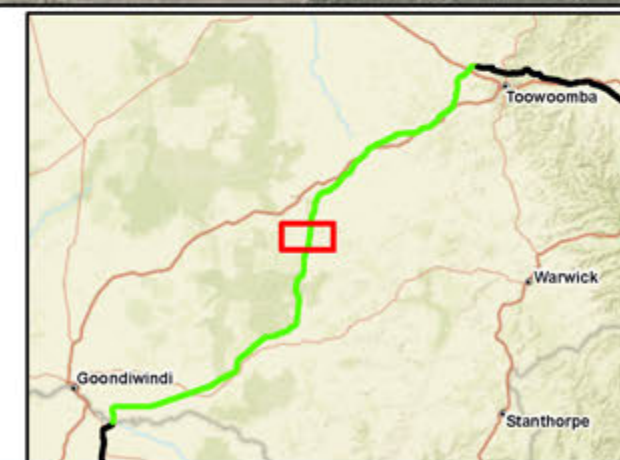
Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint

Hydraulic model extent

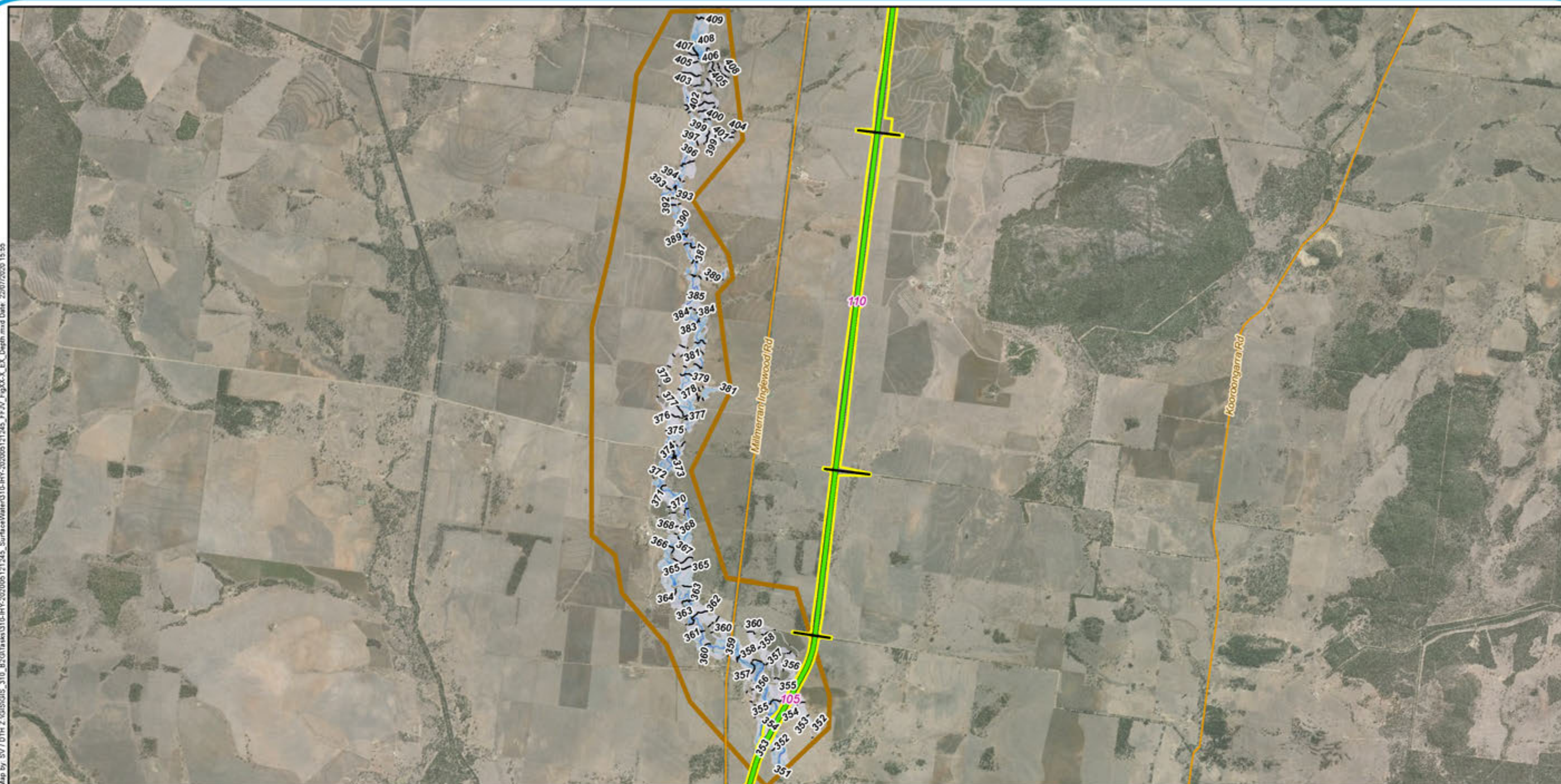
Depth (m)

- | | |
|-----------|-------------------|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55

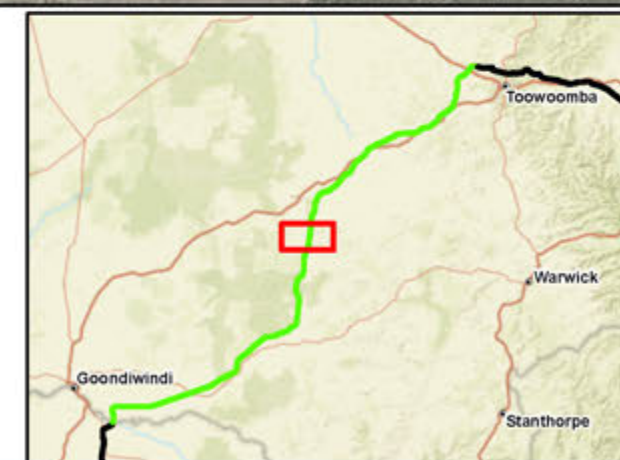


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

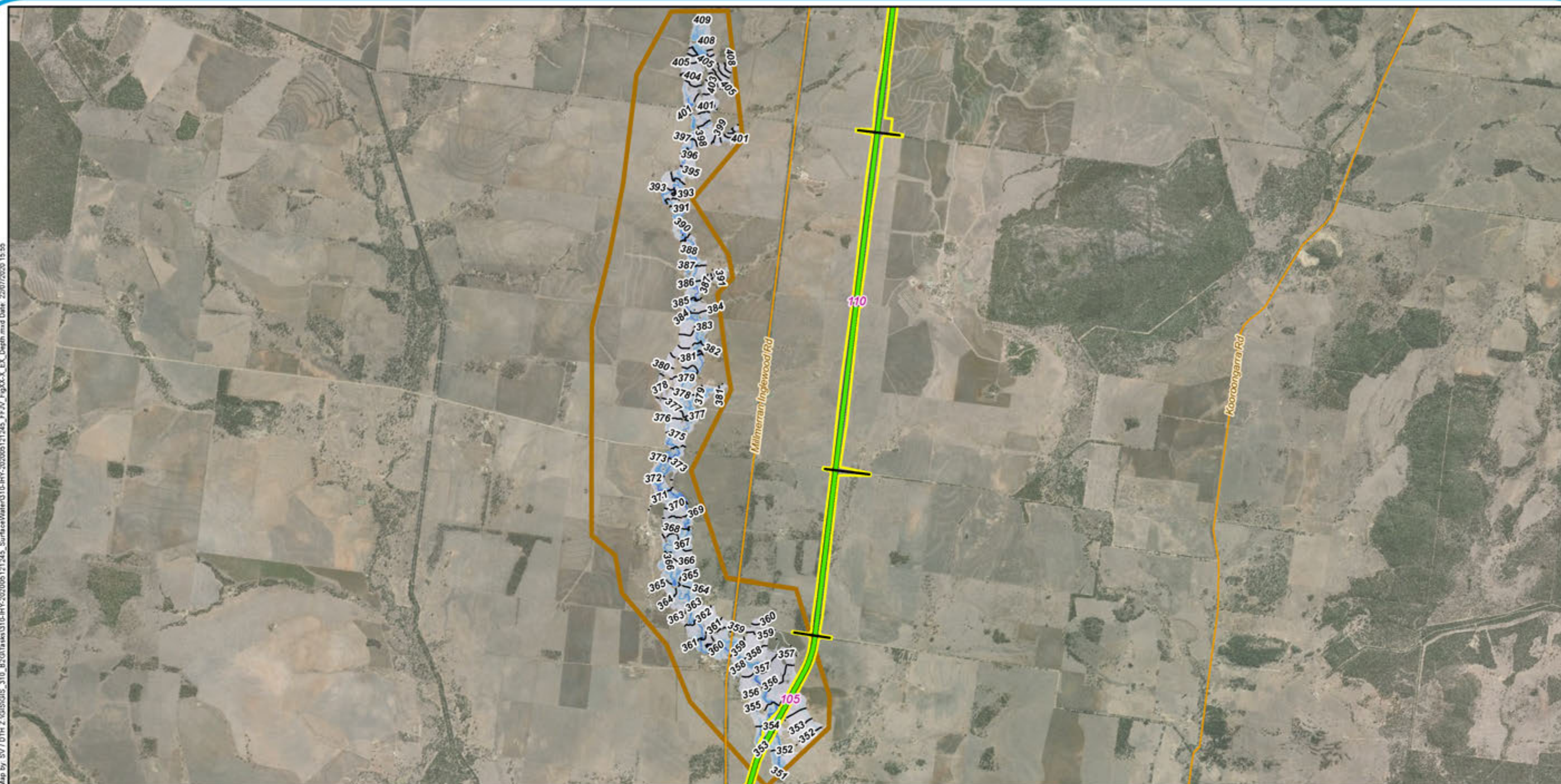
Depth (m)

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|---|---|
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| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55

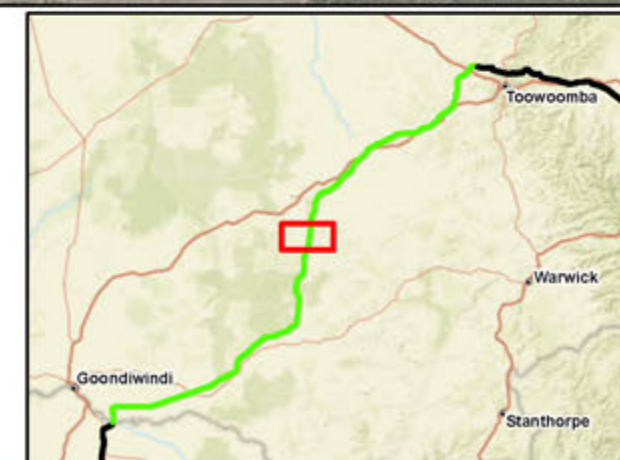


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

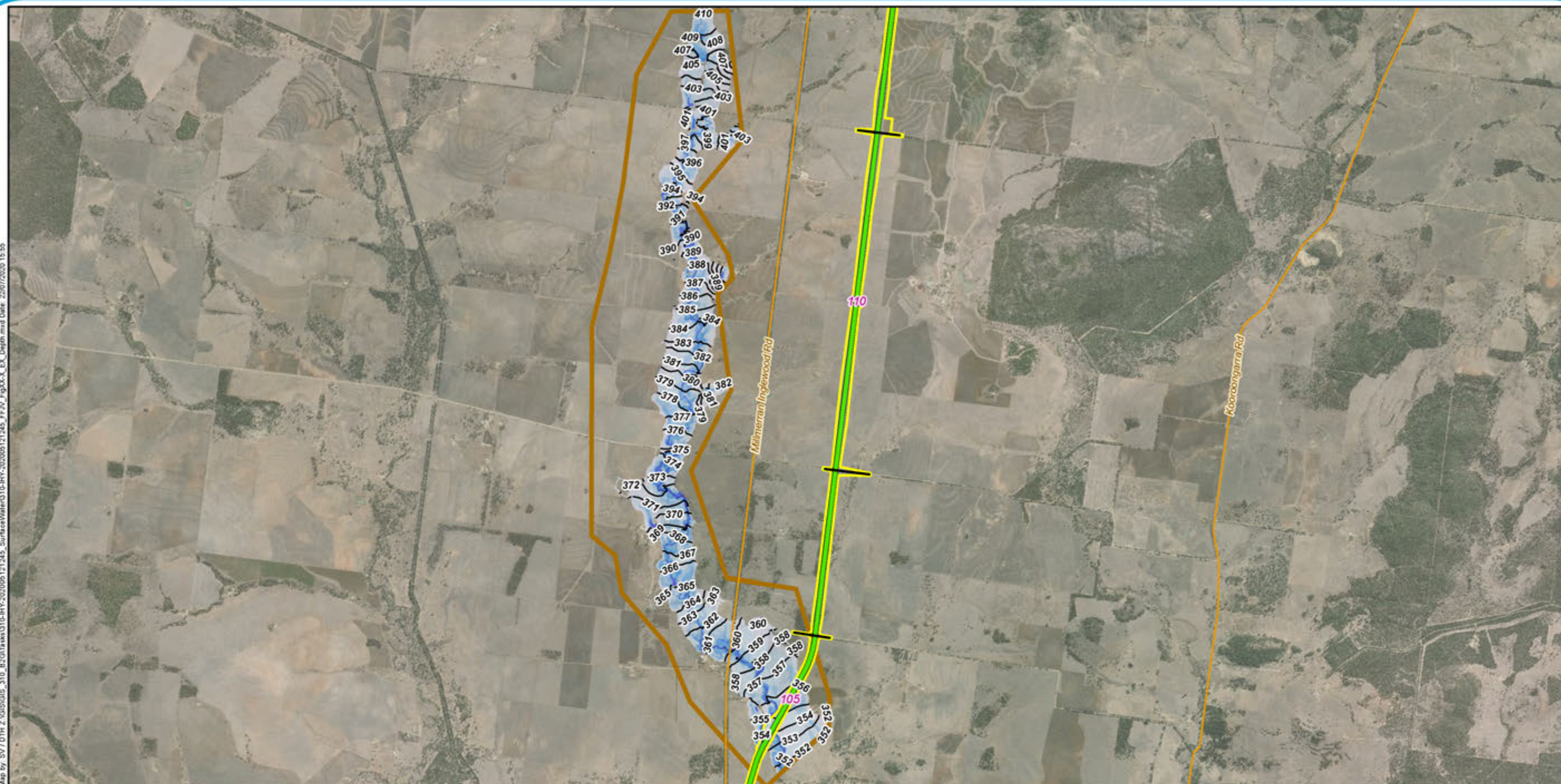
Depth (m)

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|---|---|
| 0 - 0.5 | 3.0 - 3.5 |
| 0.5 - 1.0 | 3.5 - 4.0 |
| 1.0 - 1.5 | 4.0 - 4.5 |
| 1.5 - 2.0 | 4.5 - 5.0 |
| 2.0 - 2.5 | > 5.0 |
| 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5 km

Map by SV / DTH 2:10USGIS_310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_FigXX-X_EX_Depth.mxd Date: 22/07/2020 15:55

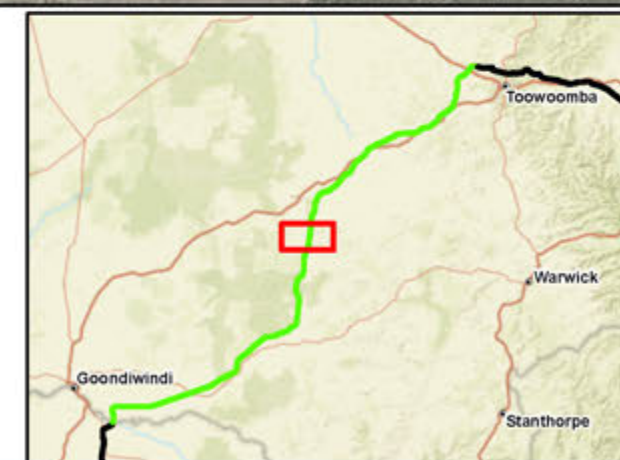


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

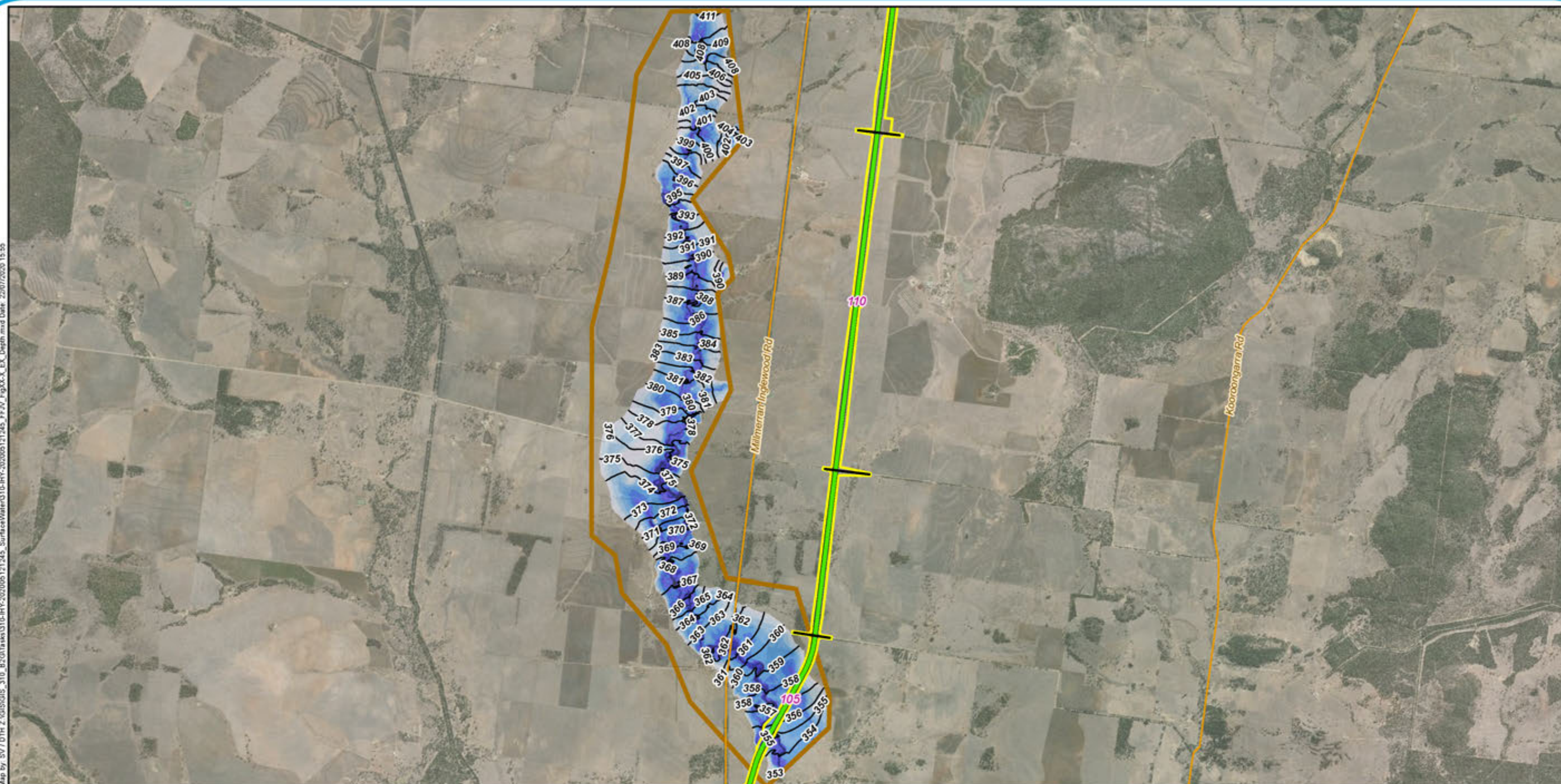
Depth (m)

- | | |
|--|--|
| □ 0 - 0.5 | □ 3.0 - 3.5 |
| □ 0.5 - 1.0 | □ 3.5 - 4.0 |
| □ 1.0 - 1.5 | □ 4.0 - 4.5 |
| □ 1.5 - 2.0 | □ 4.5 - 5.0 |
| □ 2.0 - 2.5 | □ > 5.0 |
| □ 2.5 - 3.0 | — 1m contour (mAHD) |



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km

Map by SV / DTH 2:10USGS, 310_8201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_EX_Depth.mxd Date: 22/07/2020 15:55



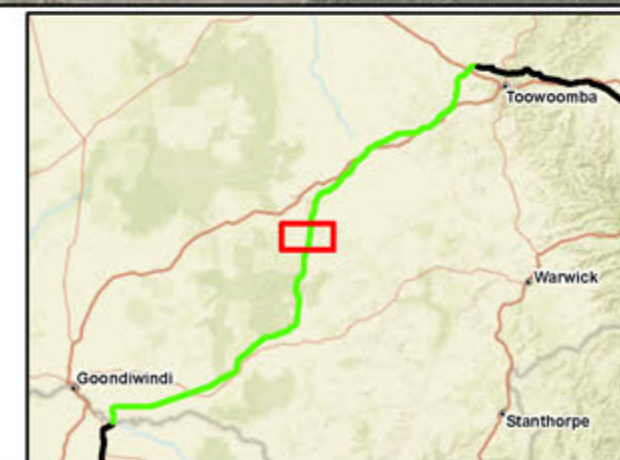
Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint

Hydraulic model extent

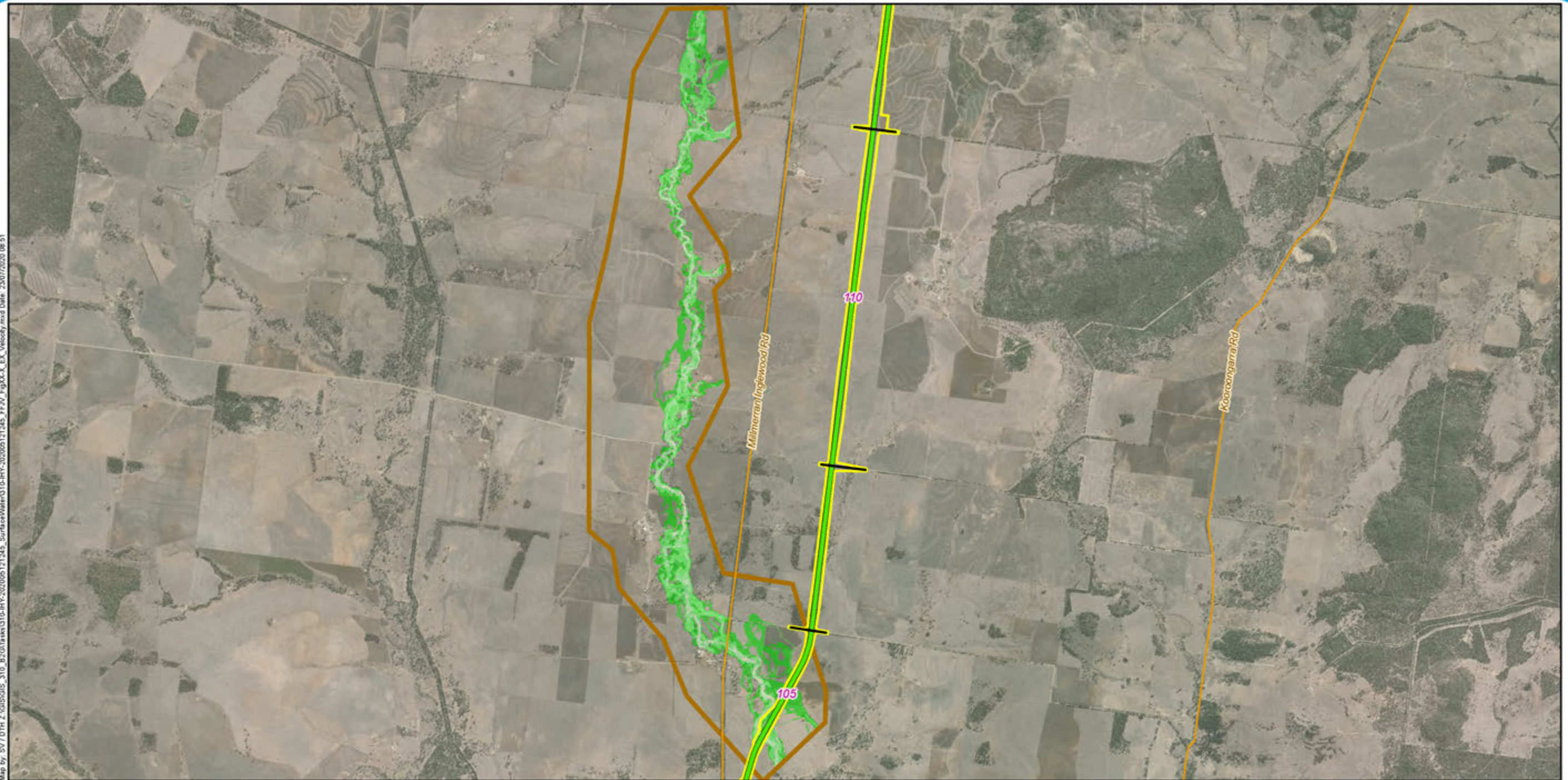
Depth (m)

 0 - 0.5	 3.0 - 3.5
 0.5 - 1.0	 3.5 - 4.0
 1.0 - 1.5	 4.0 - 4.5
 1.5 - 2.0	 4.5 - 5.0
 2.0 - 2.5	 > 5.0
 2.5 - 3.0	— 1m contour (mAHD)



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km

Map by SV / DTH 2:10USQGIS_310_B20Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF_N_Fig00-X_EX_Velocity.mxd Date: 23/07/2020 08:51

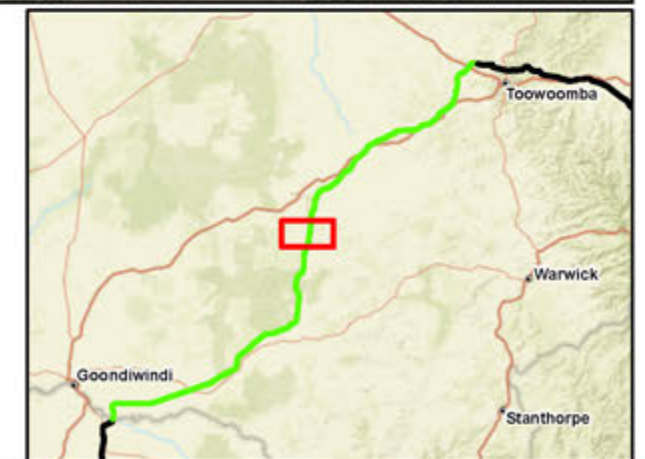


Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Peak velocity (m/s)

0.0	3.0
0.5	3.5
1.0	4.0
1.5	4.5
2.0	5.0
2.5	



A3 scale: 1:52,000
 0 0.5 1 1.5 2 2.5km



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Border to Gowrie

Figure E3-A:

1% AEP peak velocity - Existing Case - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32

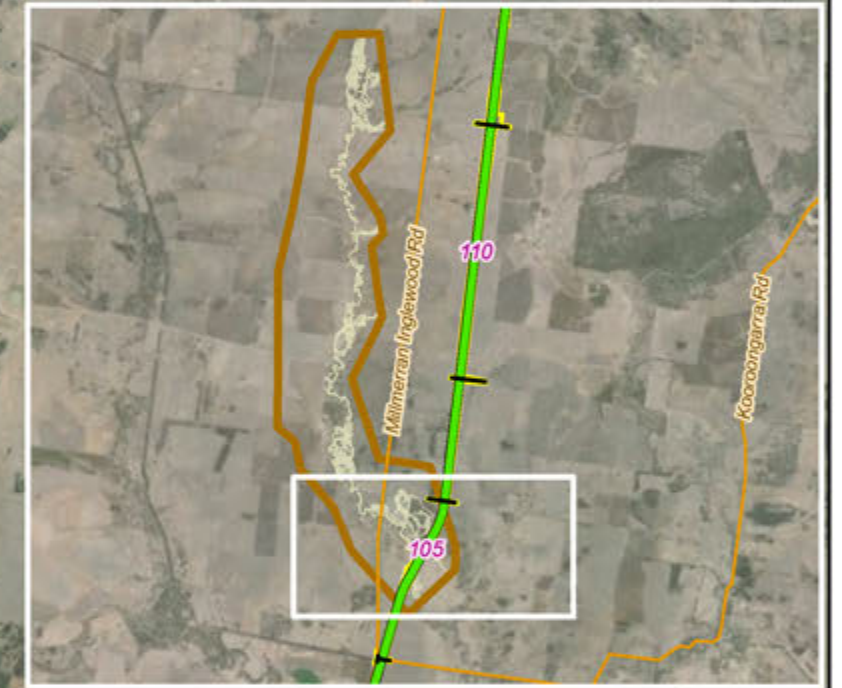


Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
 Integrating Community, Environment and Engineering

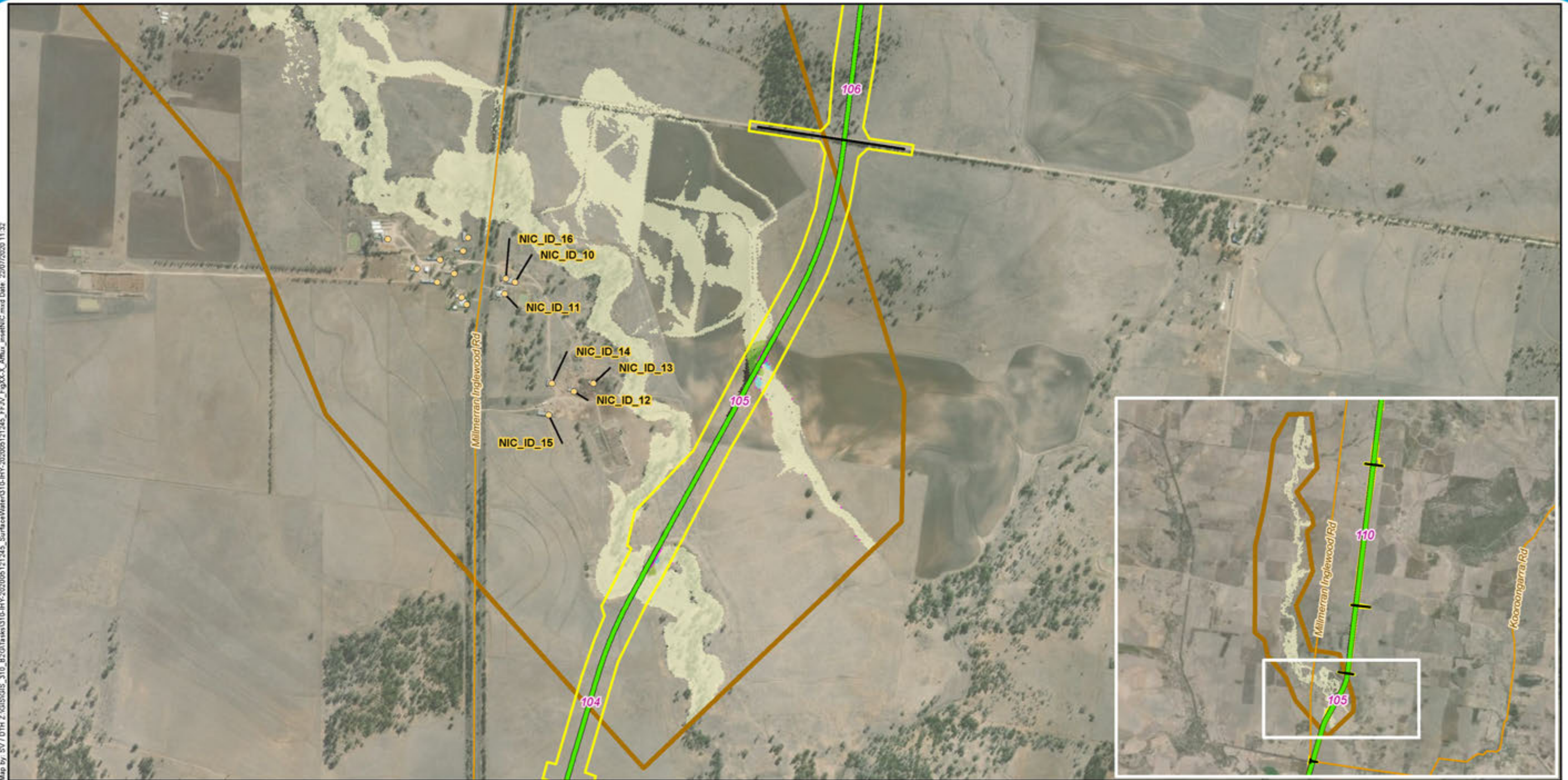
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-A:

20% AEP - design afflux - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigX-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

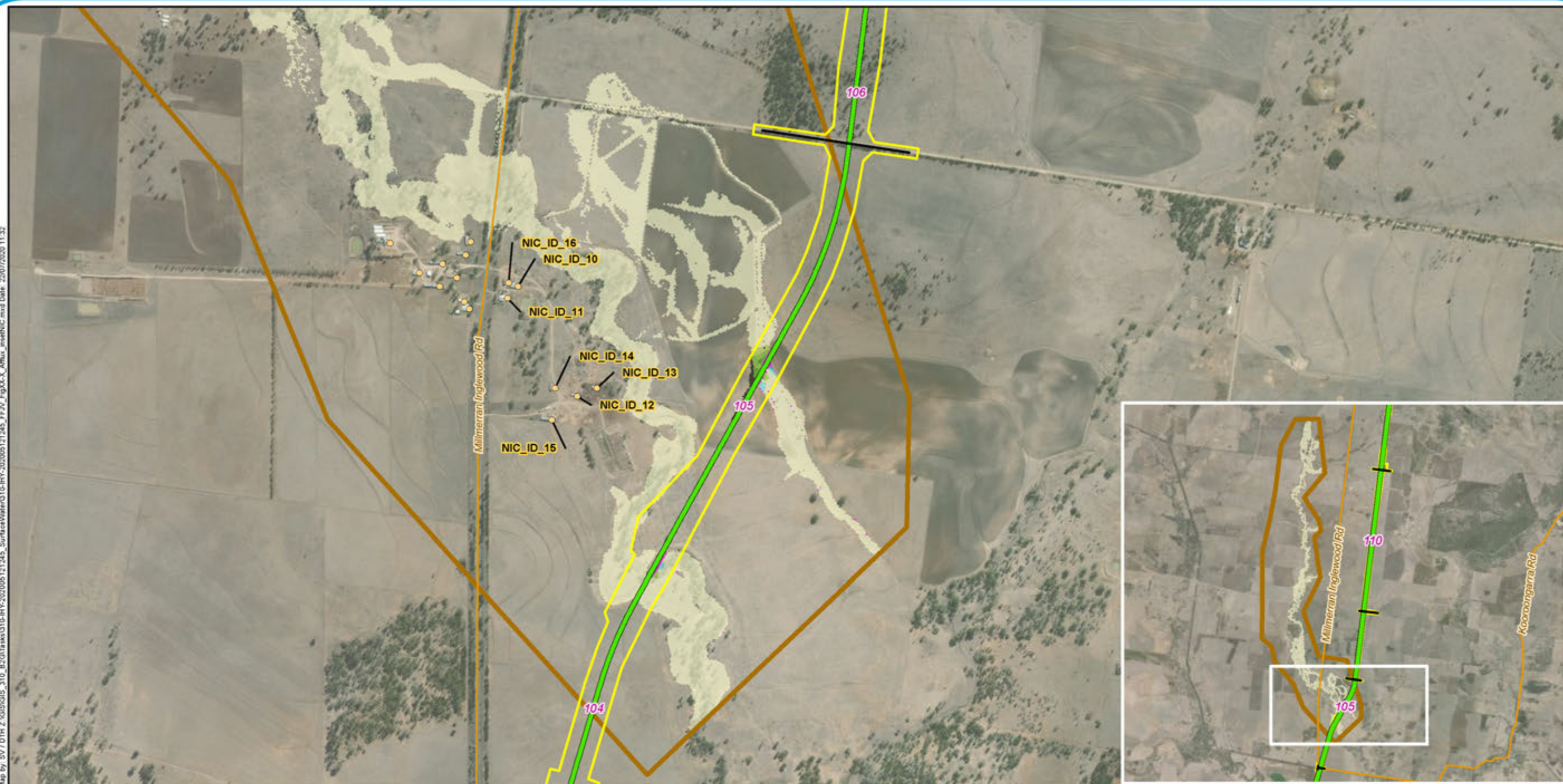
Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32

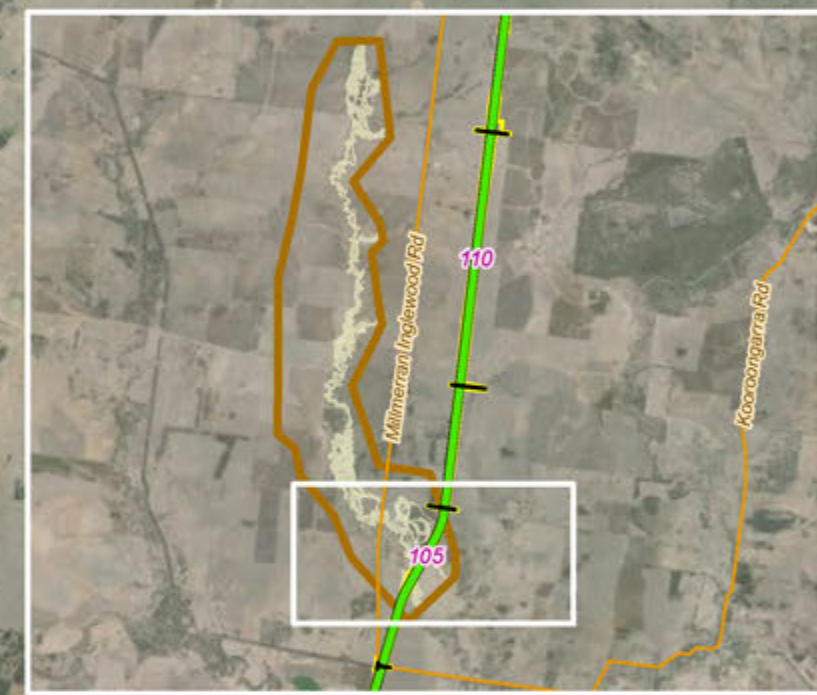


Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

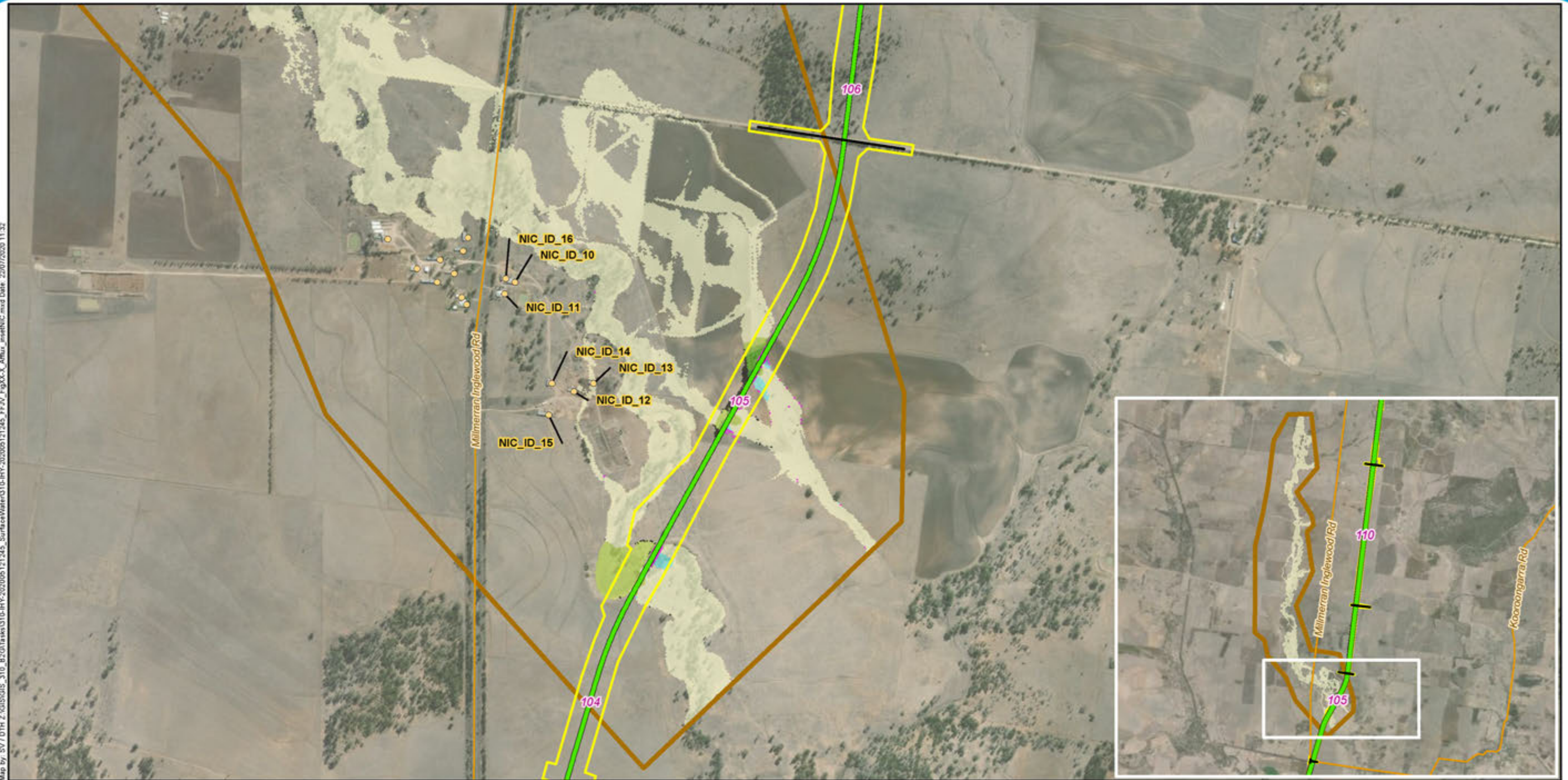
Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| — < -0.5 | — 0.01 to 0.05 |
| — -0.50 to -0.20 | — 0.05 to 0.10 |
| — -0.20 to -0.10 | — 0.10 to 0.20 |
| — -0.10 to -0.05 | — 0.20 to 0.50 |
| — -0.05 to -0.01 | — > 0.5 |
| — -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
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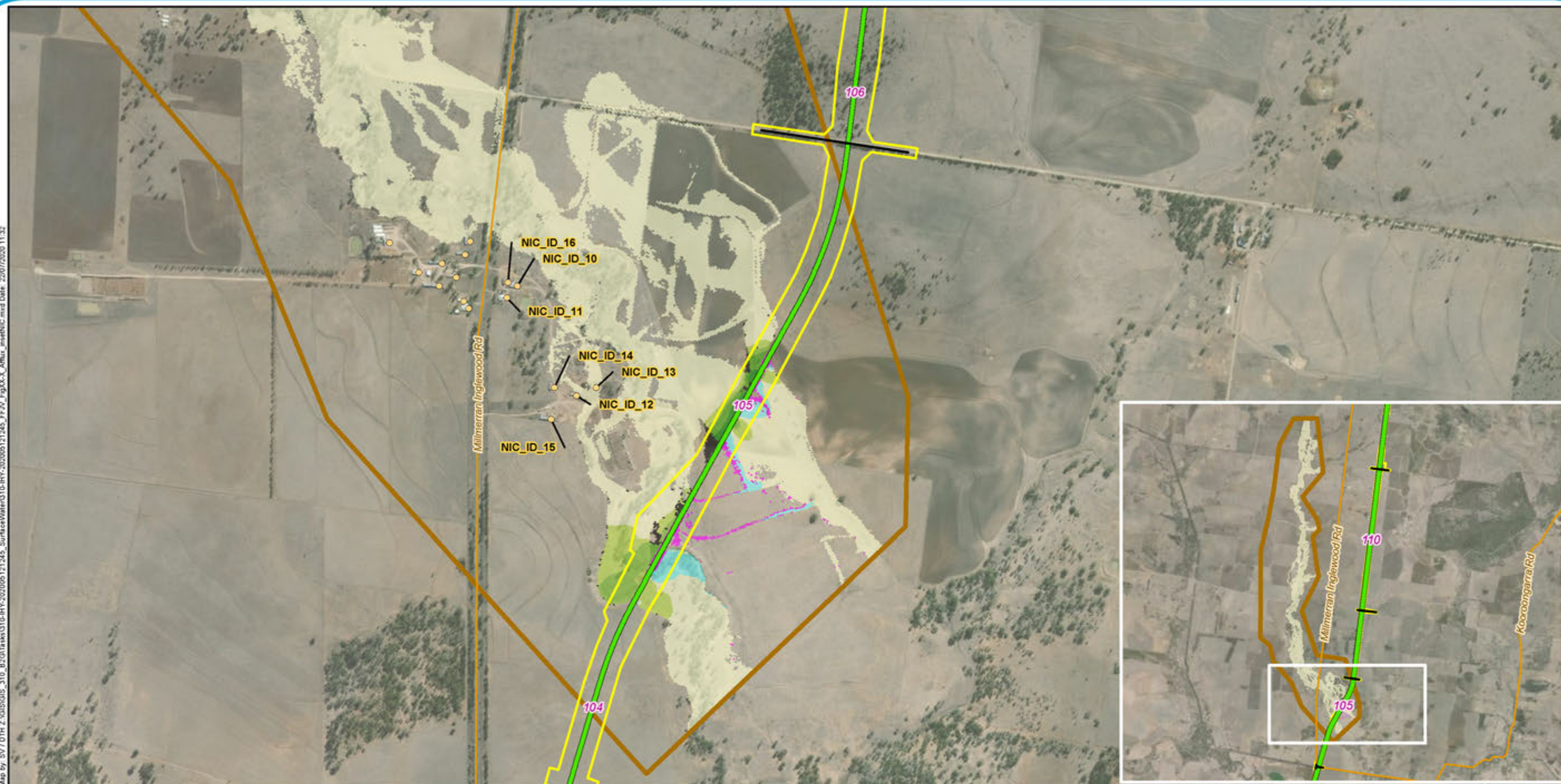
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-D:

2% AEP - design afflux - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig04-X_Afflux_insetNIC.mxd Date: 22/07/2020 11:32



Legend

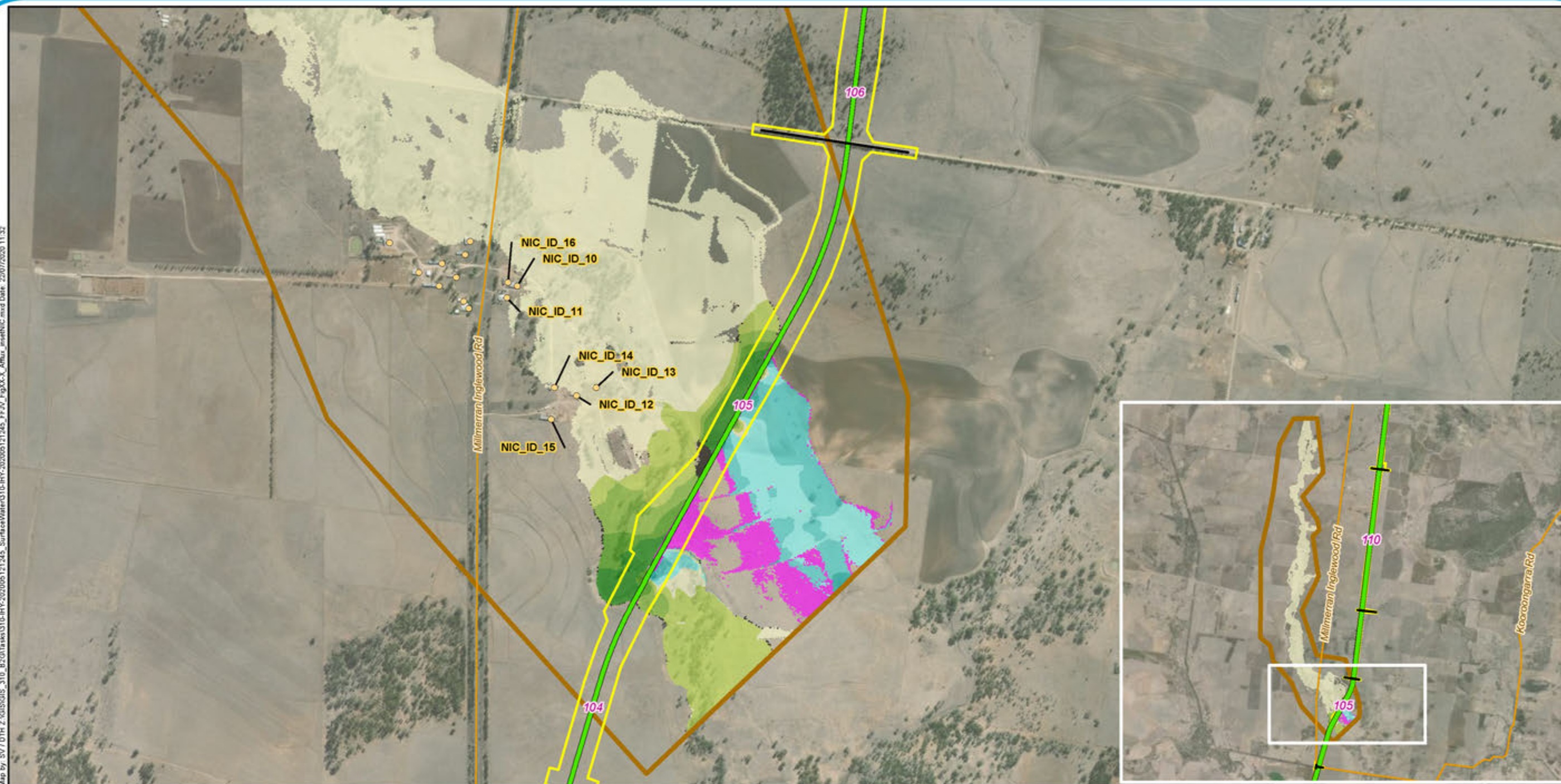
- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|--|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_FigX-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32

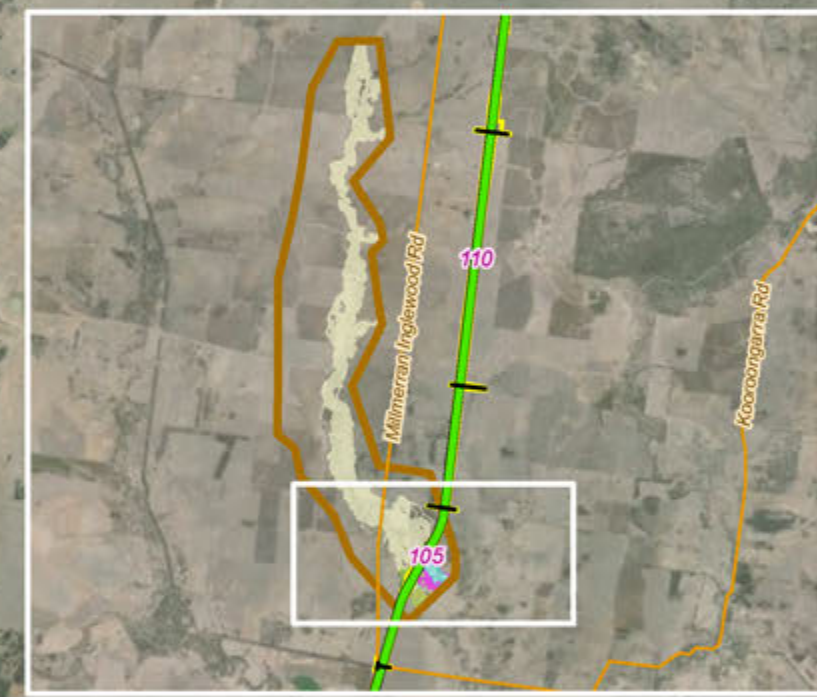


Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



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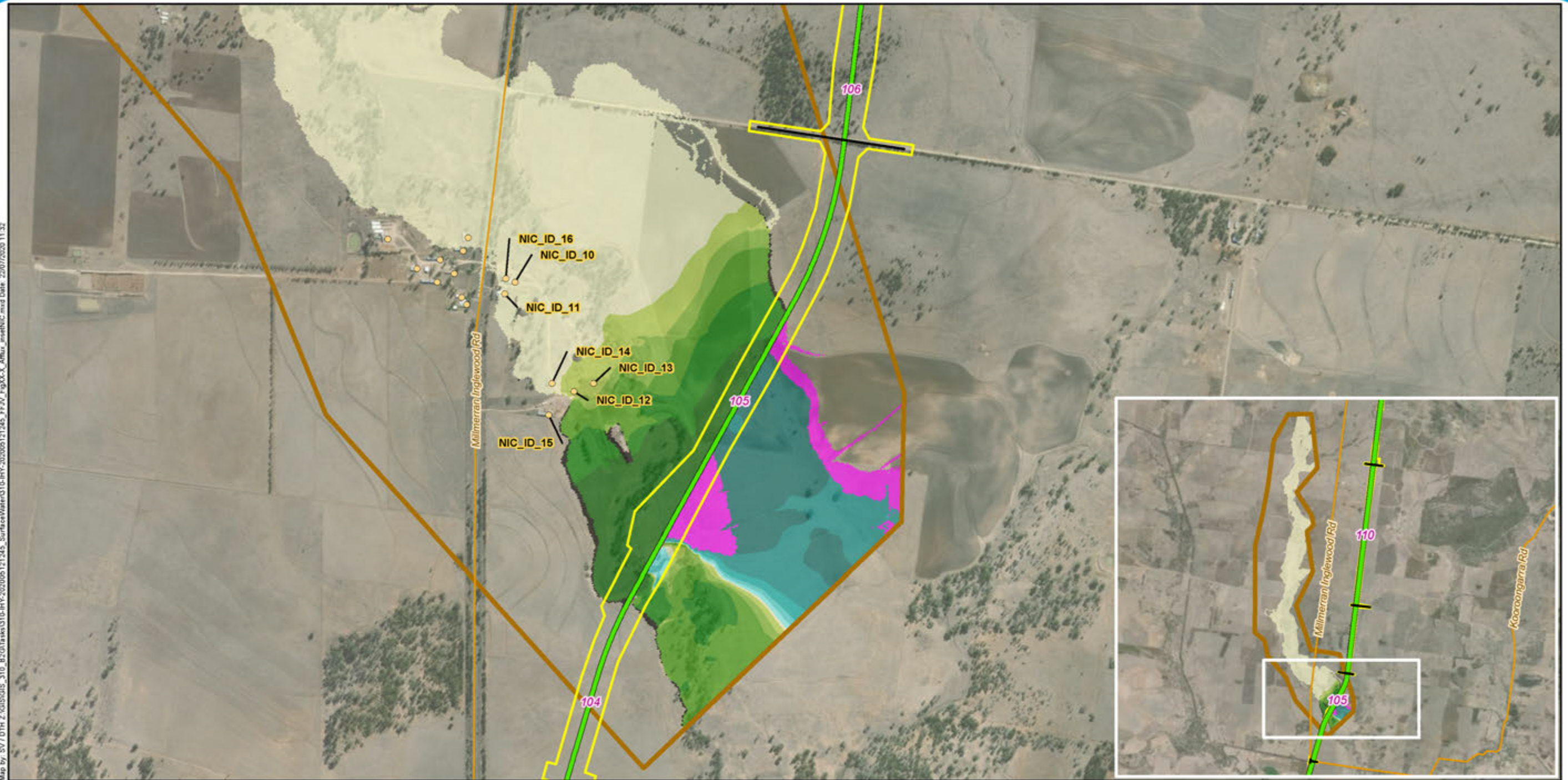
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-F:

1 in 2,000 AEP - design afflux - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig04-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| < -0.5 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.5 |
| -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
 Integrating Community, Environment and Engineering

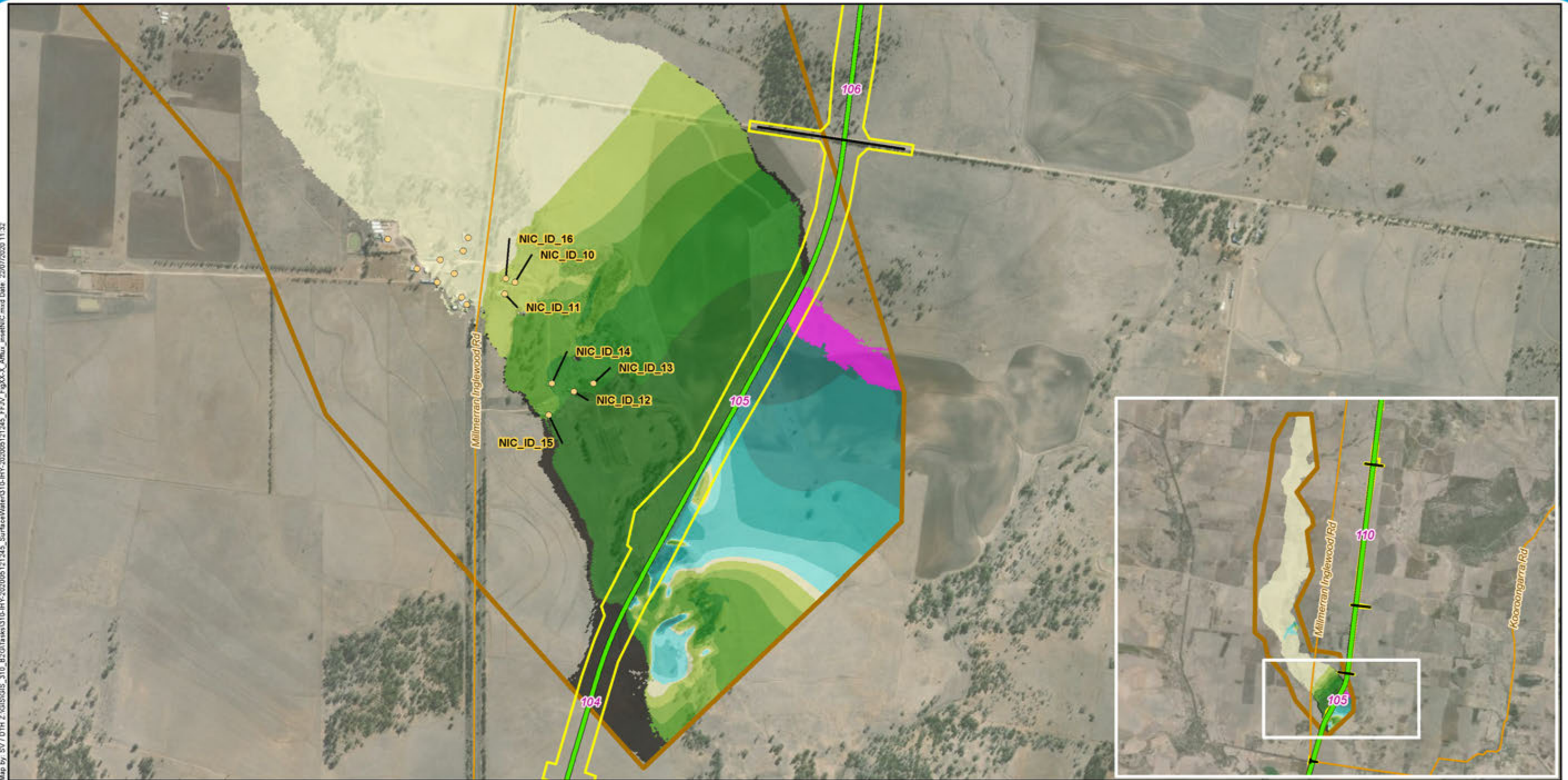
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-G:

1 in 10,000 AEP - design afflux - Nicol Creek

Map by SV / DTH 2:10USGIS_310_B20Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Afflu_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
 Integrating Community, Environment and Engineering

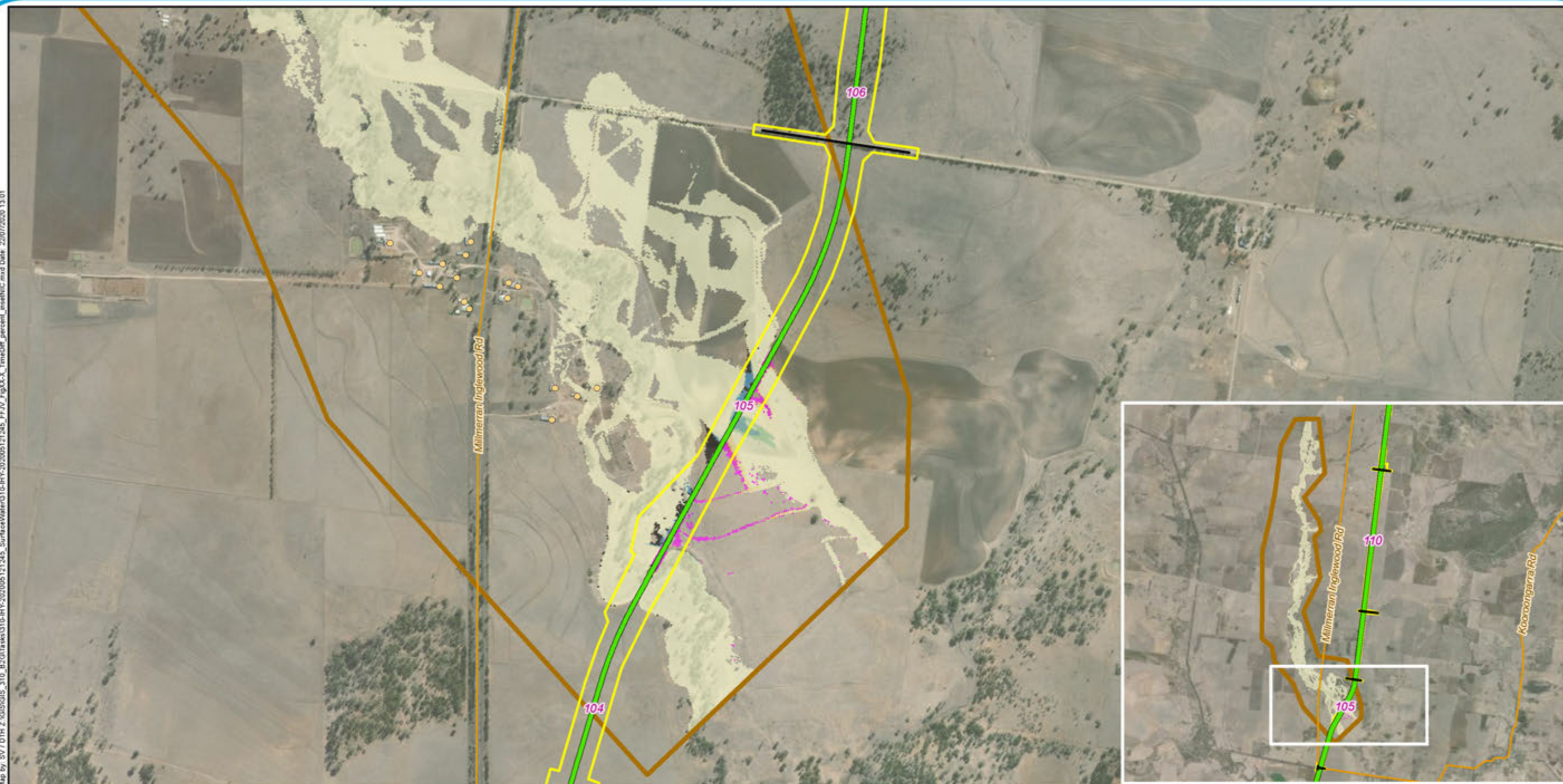
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-H:

PMF - design afflux - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF JV_Fig04-X_TimeDiff_Percent_InsetNIC.mxd Date: 22/07/2020 13:01



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in Time of Inundation (percentage)

- | | |
|---|---|
| — < -50% | — 10% to 20 % |
| — -50% to -40% | — 20% to 30 % |
| — -40% to -30% | — 30% to 40 % |
| — -30% to -20% | — 40% to 50 % |
| — -20% to -10% | — > 50% |
| — -10% to 10 % | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
 Integrating Community, Environment and Engineering

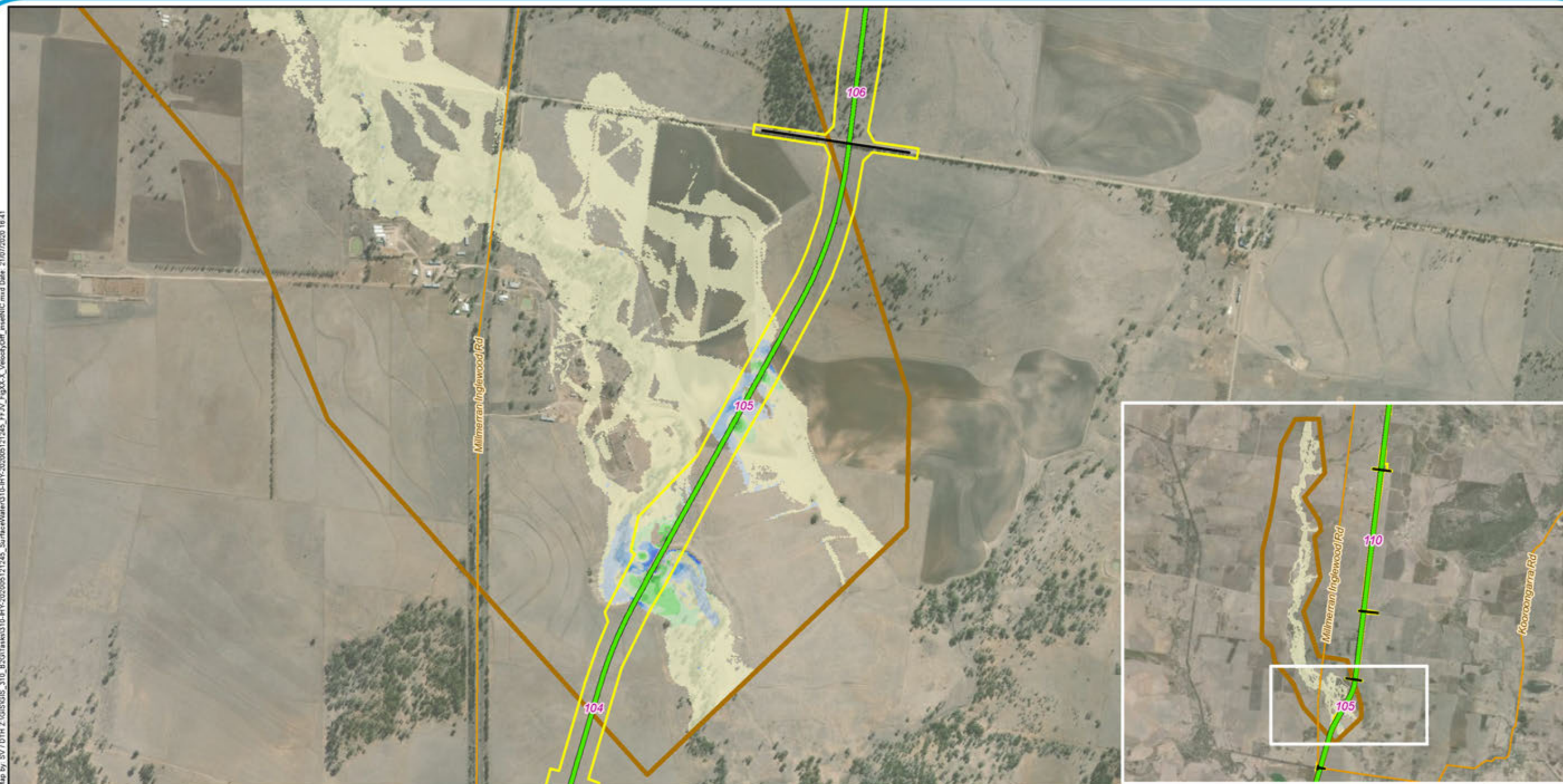
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-I:

1% AEP - change in time of inundation - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-20200512145_SurfaceWater310-HY-20200512145_FF_AV_FigXX-X_VelocityOff_Invent mxd Date: 21/07/2020 16:41



Legend

- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent

Change in peak velocity (m/s)

- | | |
|----------------|--------------|
| < -0.50 | 0.01 to 0.05 |
| -0.50 to -0.20 | 0.05 to 0.10 |
| -0.20 to -0.10 | 0.10 to 0.20 |
| -0.10 to -0.05 | 0.20 to 0.50 |
| -0.05 to -0.01 | > 0.50 |
| -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
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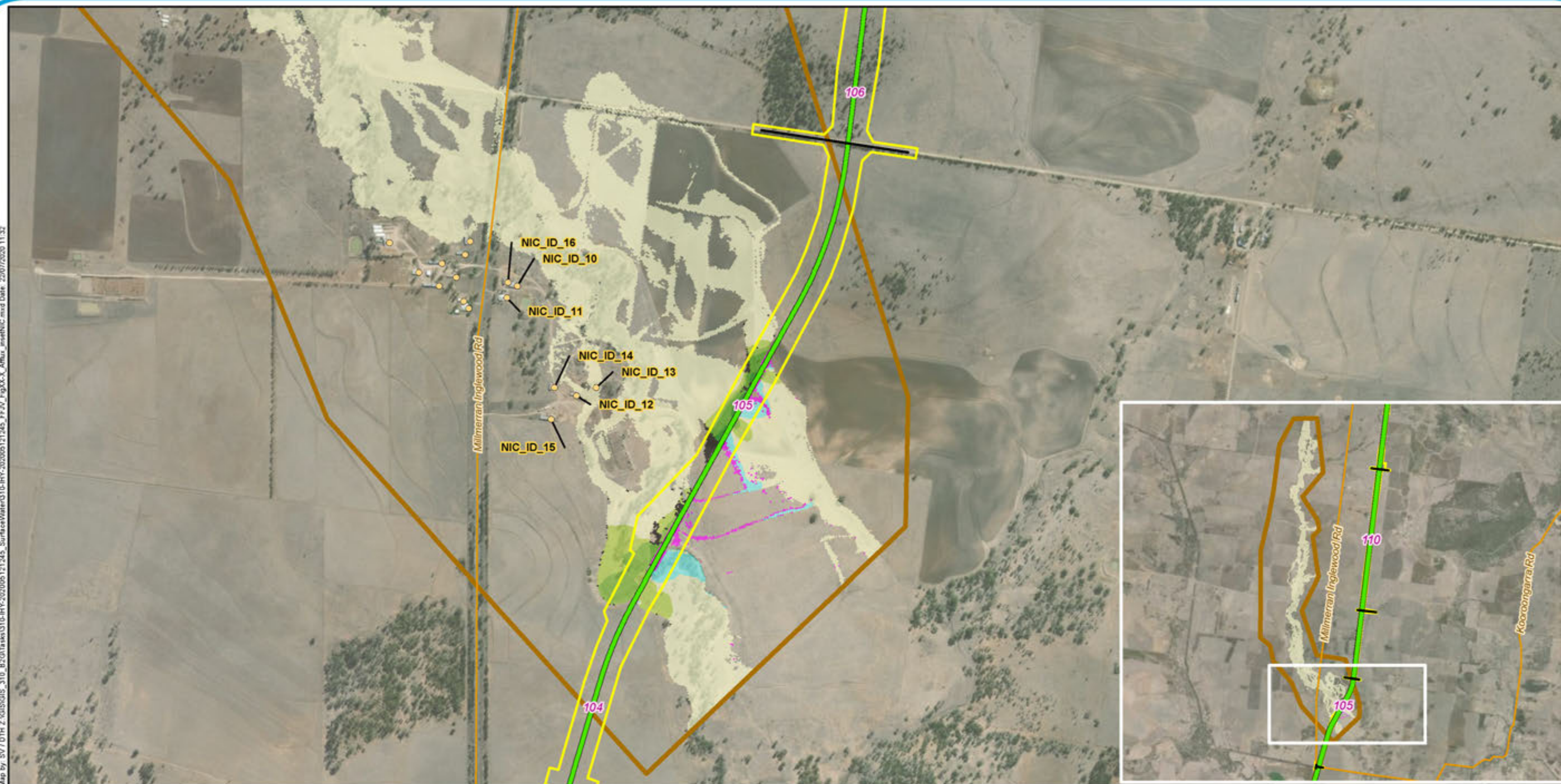
Issue date: 21/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E4-J:

1% AEP - change in velocity - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Affix_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km



Future Freight
 Integrating Community, Environment and Engineering

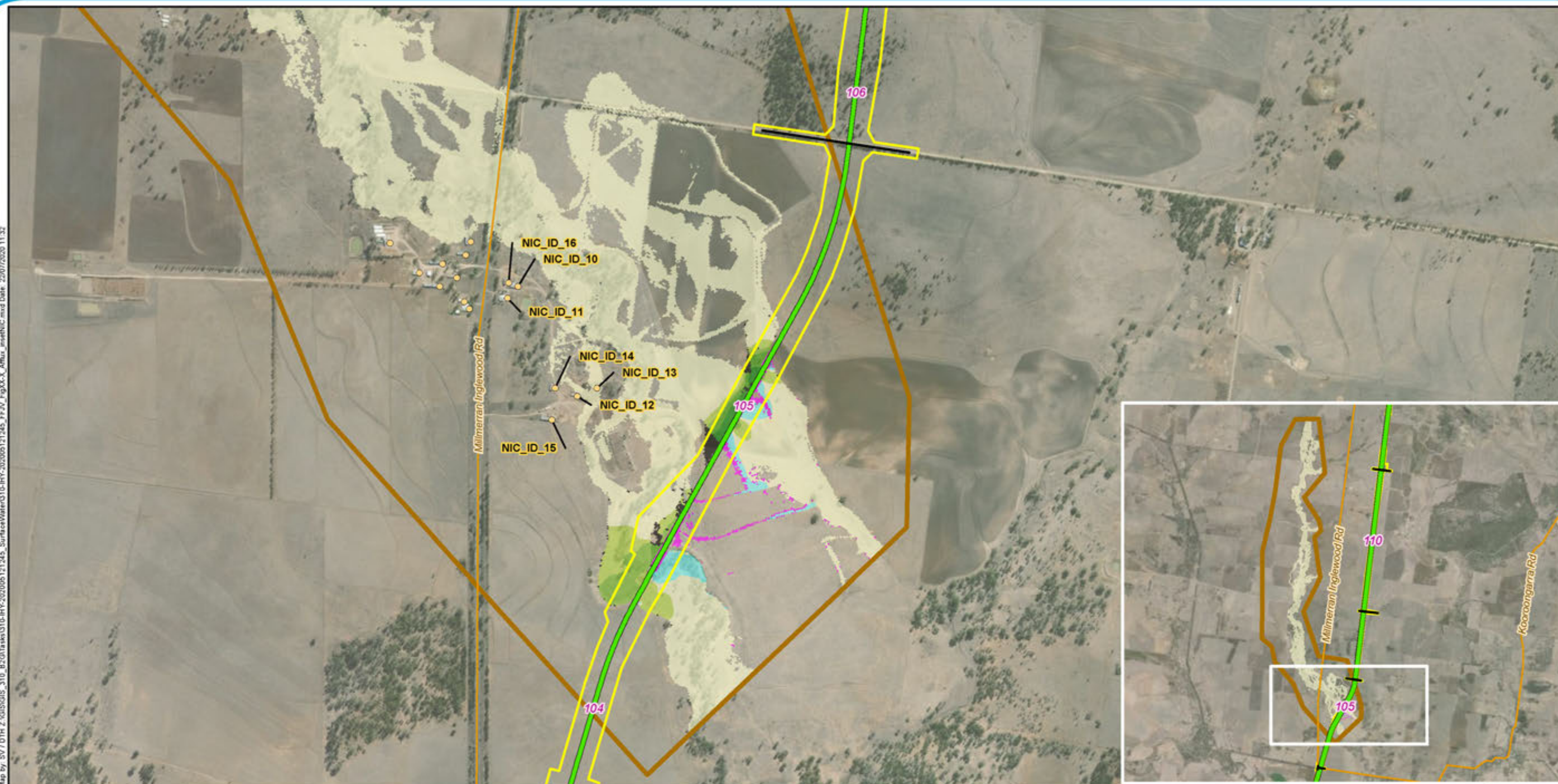
Issue date: 20/07/2020 Version: 1
 Coordinate System: GDA 1994 MGA Zone 56

Border to Gowrie

Figure E5-A:

1% AEP sensitivity - 0% blockage - Nicol Creek

Map by SV / DTH 2:10USGIS_310_820Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Affix_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

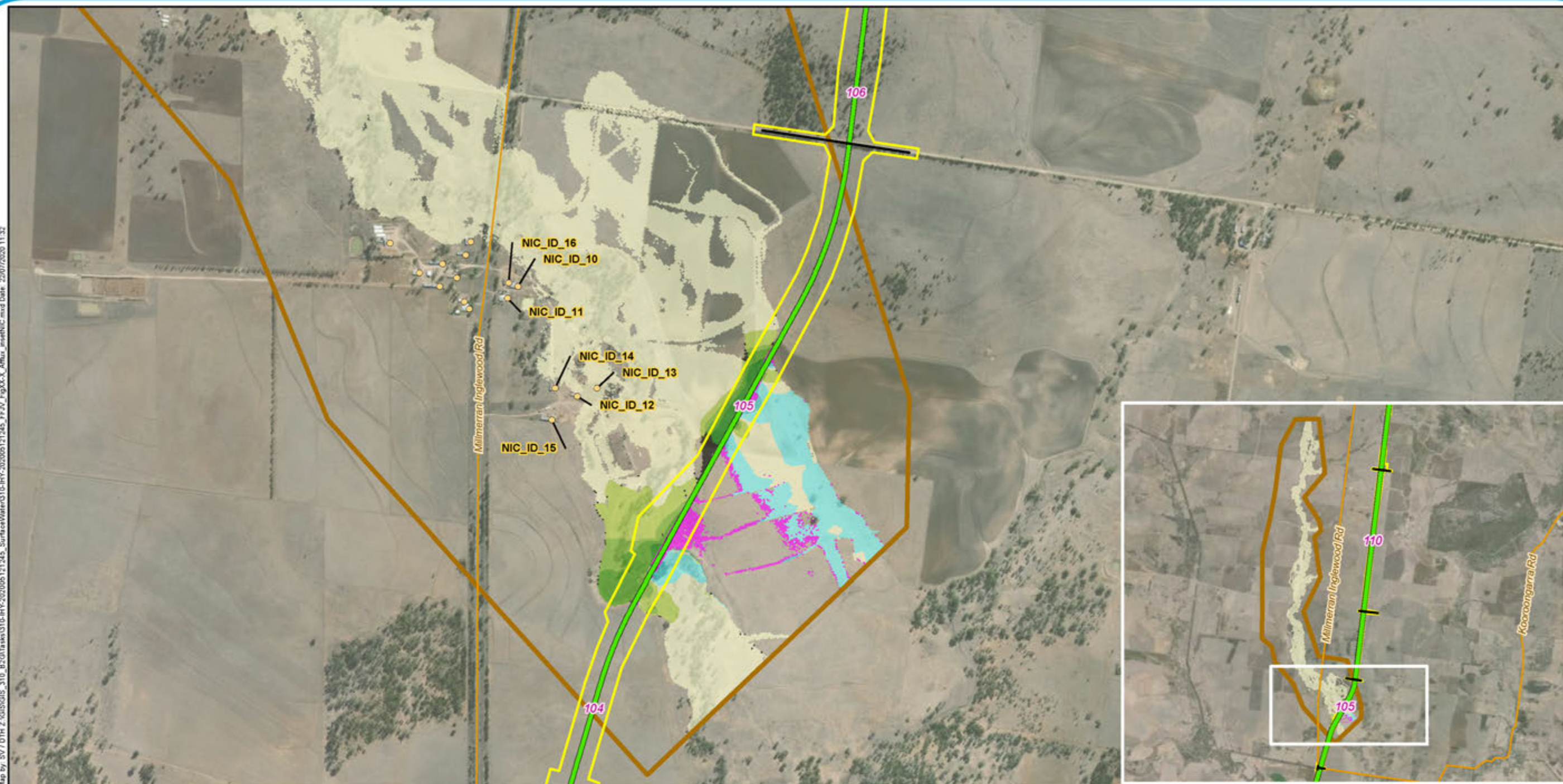
Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km

Map by SV / DTH 2:10USGIS_310_R201Task310-HY-202005121245_SurfaceWater310-HY-202005121245_FF3V_Fig00-X_Affix_insetNIC.mxd Date: 22/07/2020 11:32



Legend

- Flood sensitive receptor
- 5 Chainage (km)
- Border to Gowrie alignment
- Minor roads
- Road design
- Project footprint
- Hydraulic model extent
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- | | |
|---|---|
| ■ < -0.5 | ■ 0.01 to 0.05 |
| ■ -0.50 to -0.20 | ■ 0.05 to 0.10 |
| ■ -0.20 to -0.10 | ■ 0.10 to 0.20 |
| ■ -0.10 to -0.05 | ■ 0.20 to 0.50 |
| ■ -0.05 to -0.01 | ■ > 0.5 |
| ■ -0.01 to 0.01 | |



A3 scale: 1:12,500
 0 0.1 0.2 0.3 0.4 0.5km