APPENDIX N

INLAND RAIL

Hydrology and Flooding Technical Report

PART 3 OF 3

Appendices D to I

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

IR_1381

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

APPENDIX N

Hydrology and Flooding Technical Report

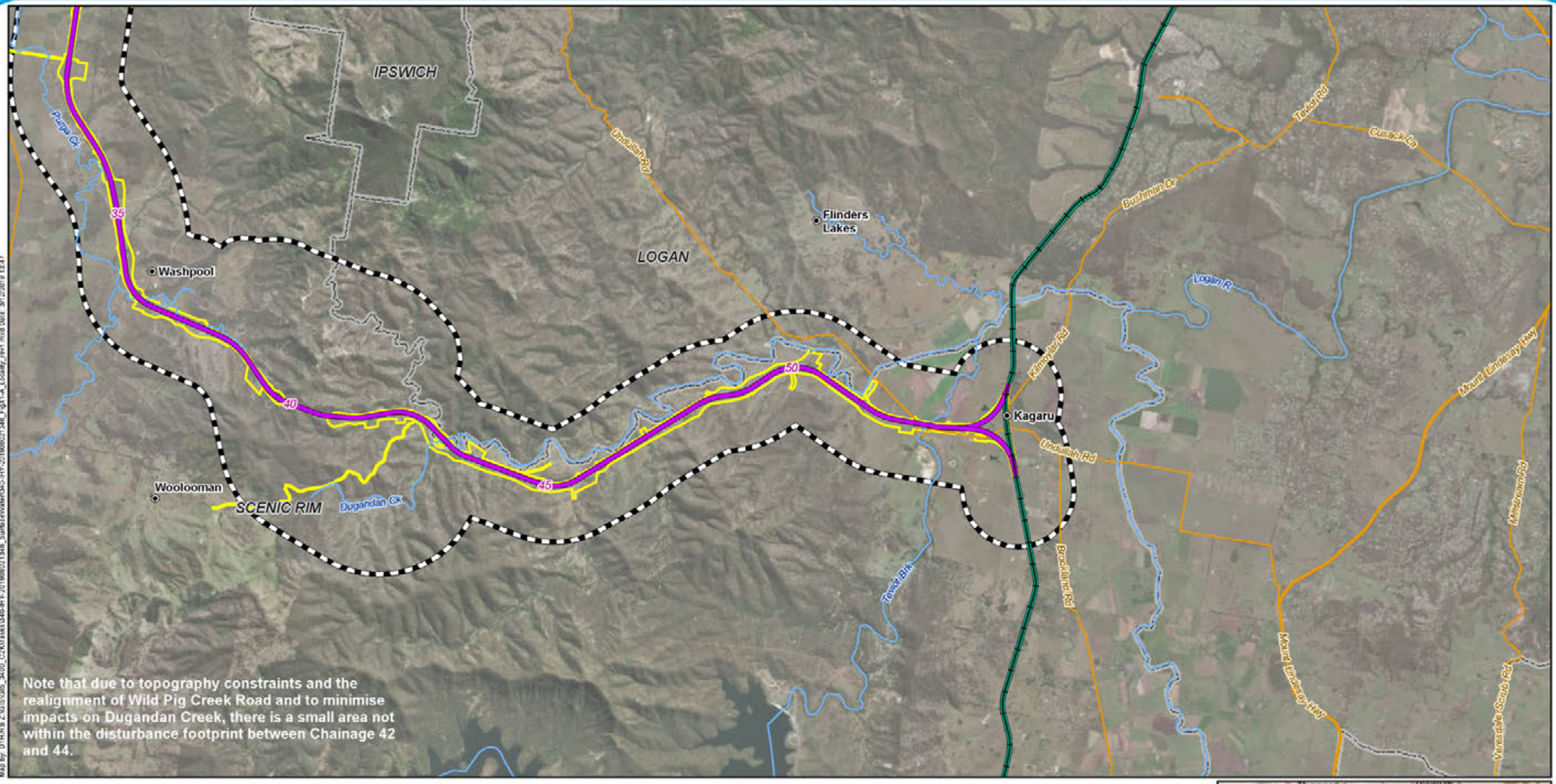
Appendix D Teviot Brook Figures

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

IR_1381

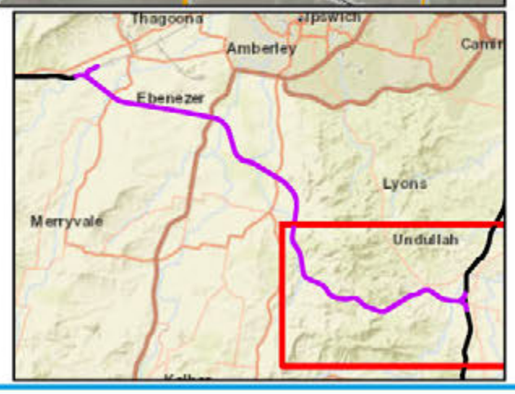
Appendix D
Teviot Brook Figures

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Watercourses
- Major roads
- Minor roads
- EIS disturbance footprint
- EIS investigation corridor
- Local Government Areas



A3 scale: 1:75,000
0 0.55 1.1 1.65 2.2 2.75 km

Future Freight
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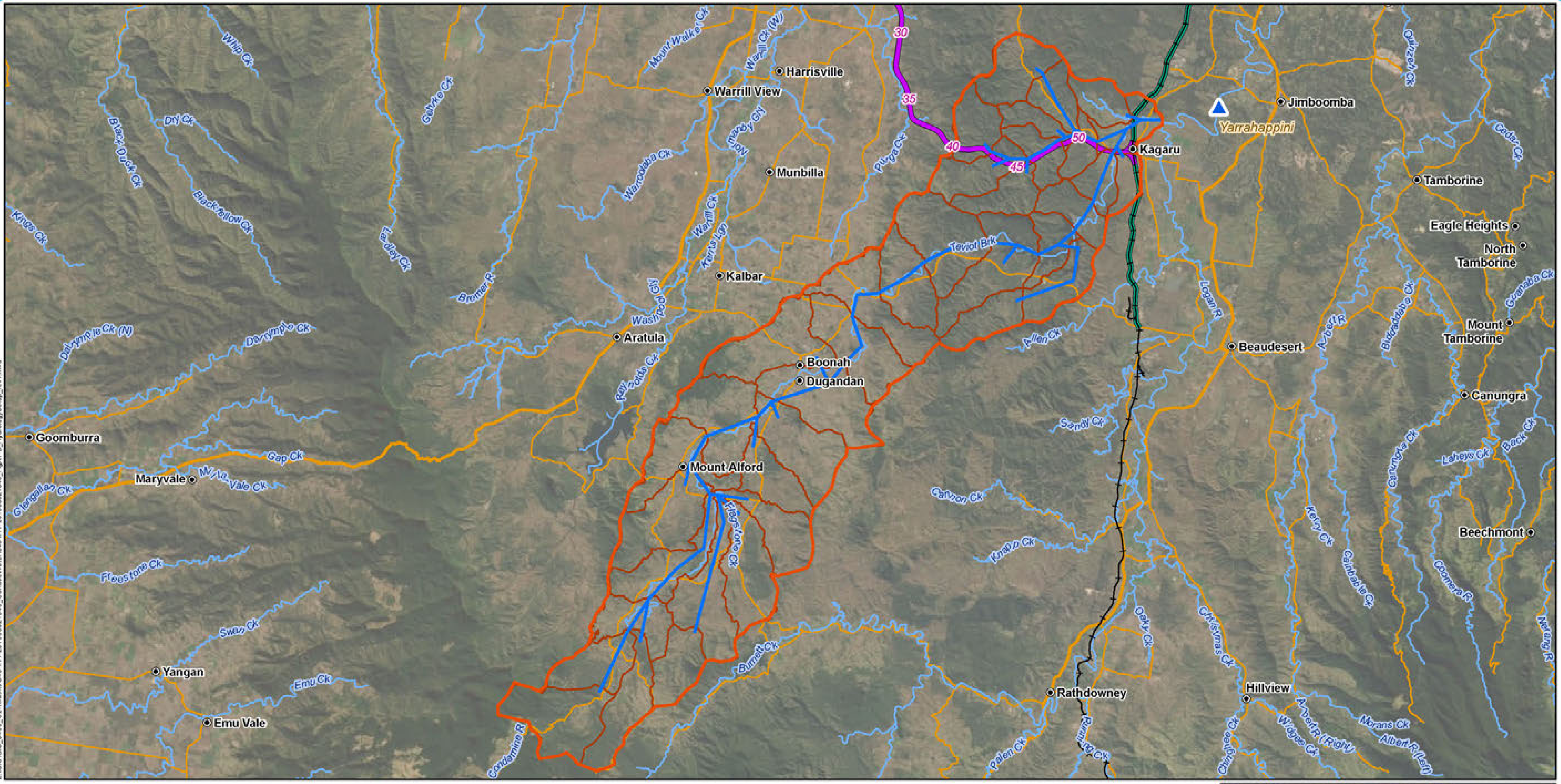
Coordinate System: GDA 1994 MGA Zone 56

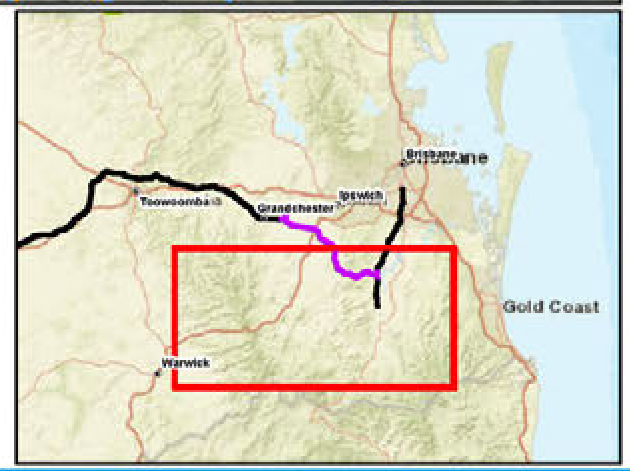
Calvert to Kagaru
Figure D1-A: Locality: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Watercourses
- Major roads
- Minor roads
- Stream gauge
- Teviot Brook model subcatchments
- Model subcatchments
- Hydrologic model links



A3 scale: 1:300,000

0 2 4 6 8 10km

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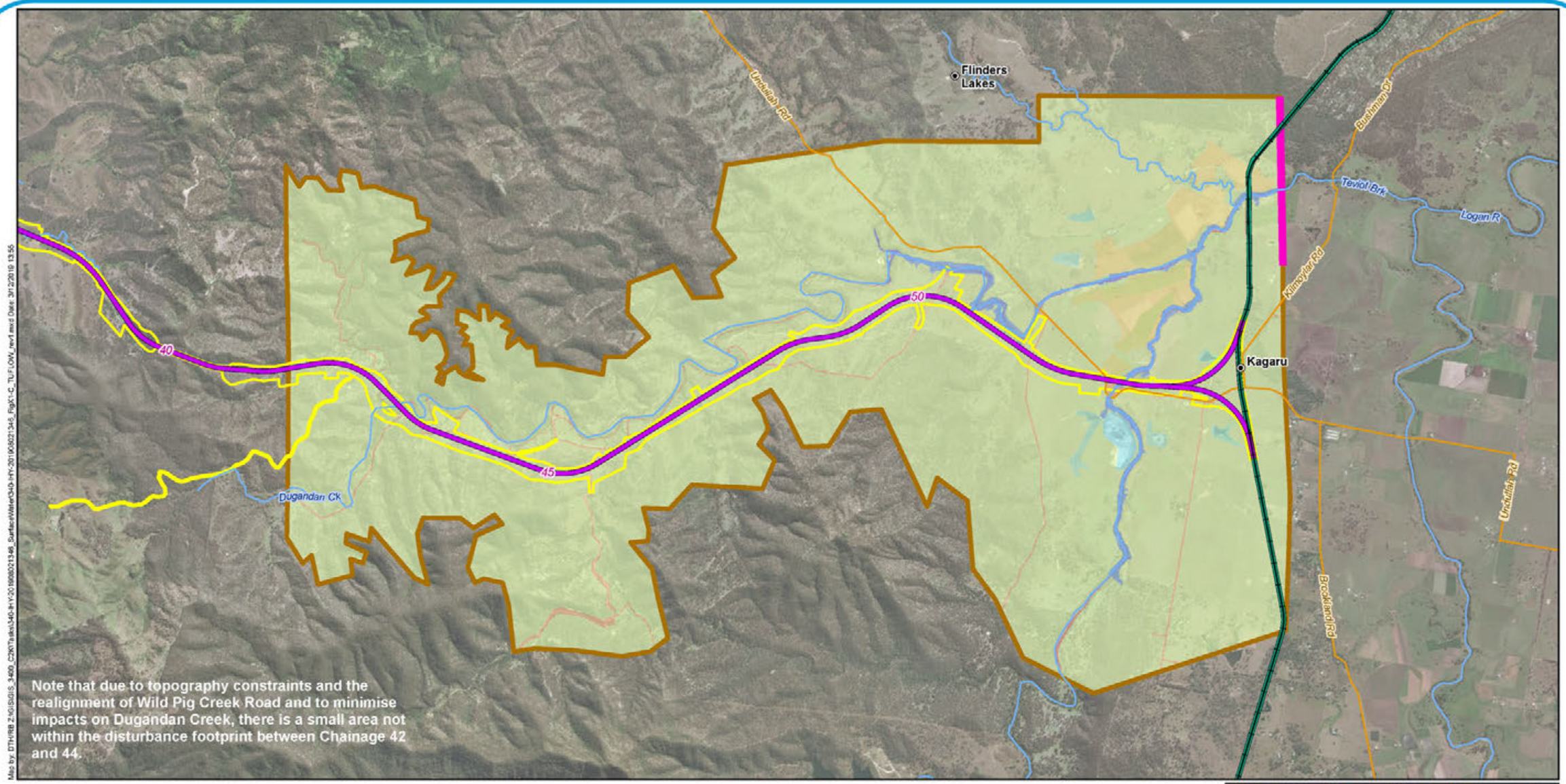
Issue date: 06/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure D1-B: Hydrology setup: Teviot Brook

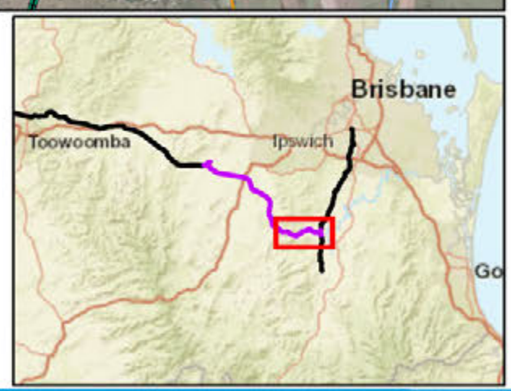


Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Watercourses
- Major roads
- Minor roads
- EIS disturbance footprint
- Downstream boundary
- Code boundary

Materials

- Non Tidal Waterway
- Road/ Carparks
- Grassland
- Light Vegetation
- Dam
- Quarries
- Riverbank Vegetation
- Non Tidal Water



A3 scale: 1:50,000
0 0.35 0.7 1.05 1.4 1.75km

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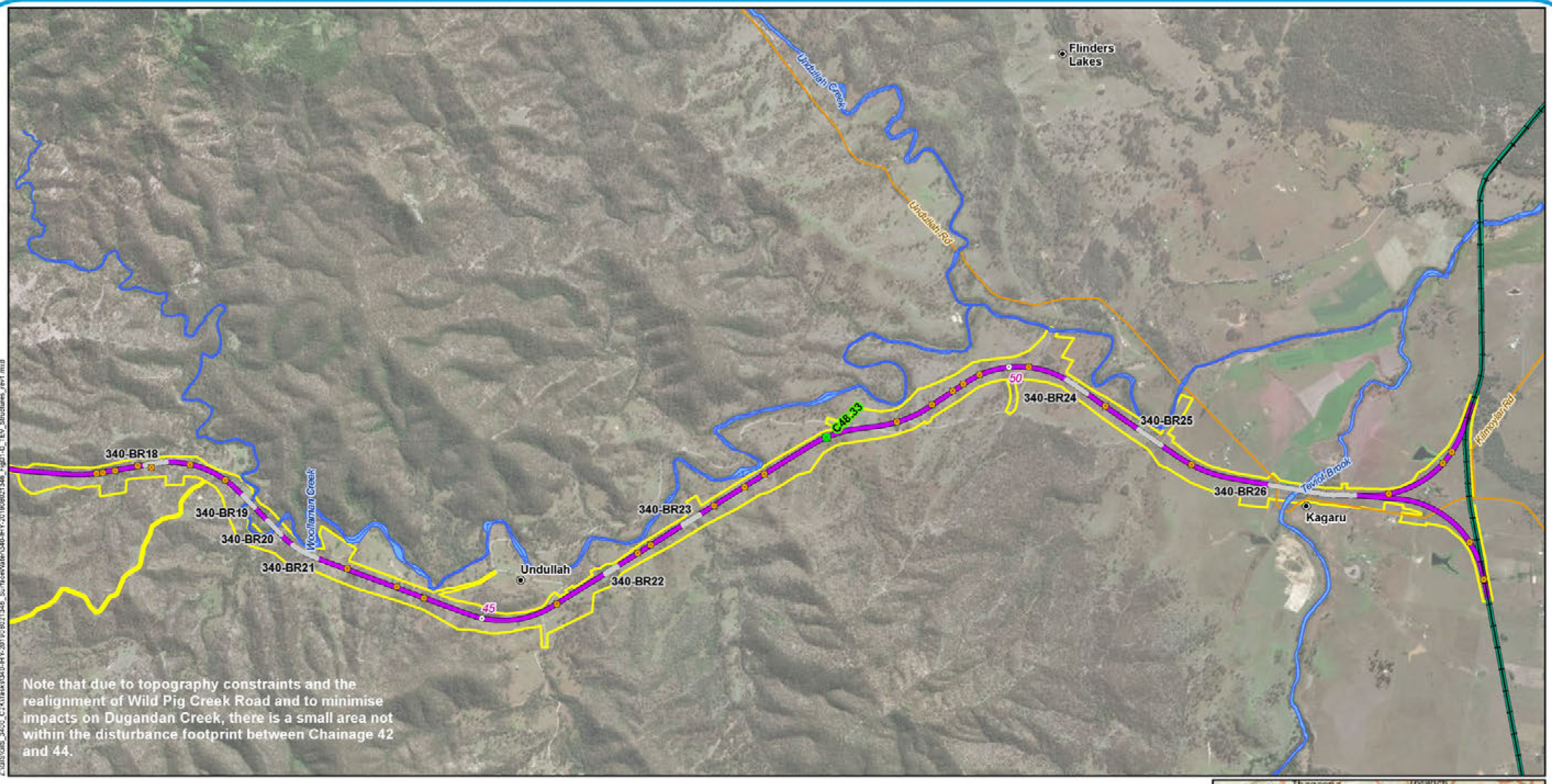
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure D1-C: TUFLOW model setup: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Defined watercourses
- Minor roads
- EIS disturbance footprint

Drainage Structures

- Bridges
- Flood culvert
- Local drainage culvert
- Bridges

A3 scale: 1:35,000

0 0.25 0.5 0.75 1 1.25km

Future Freight
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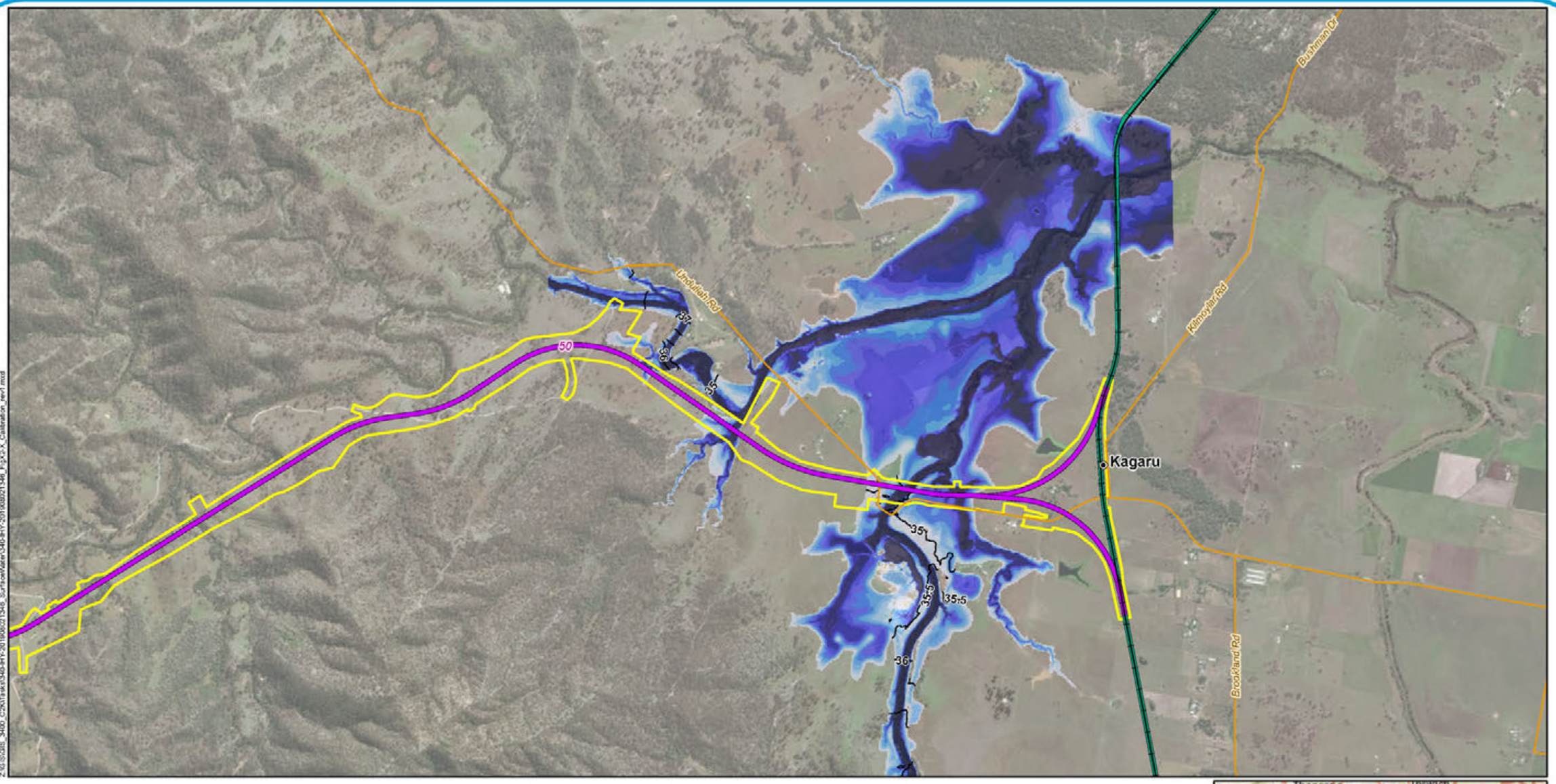
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure D1-D: Design structures: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Minor roads
- EIS disturbance footprint
- 0.5m Contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

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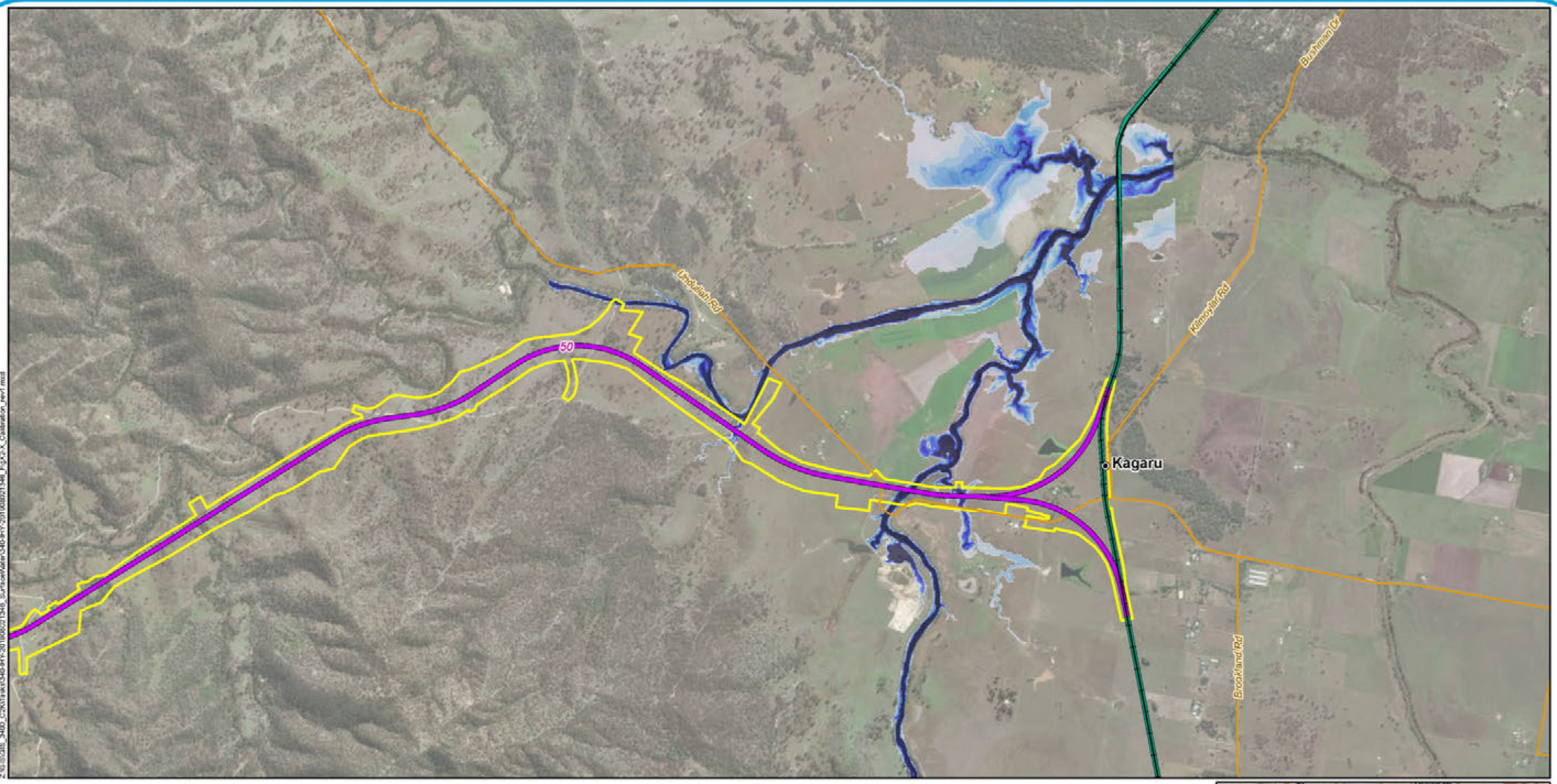
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure D2-A: 1974 Calibration event: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTH/RB Date: 18/11/2019 16:12
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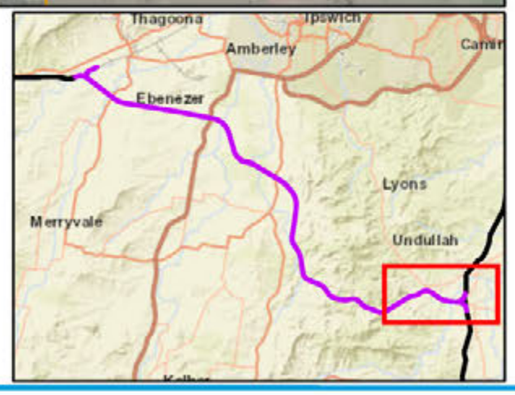
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Minor roads
- EIS disturbance footprint
- 0.5m Contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000
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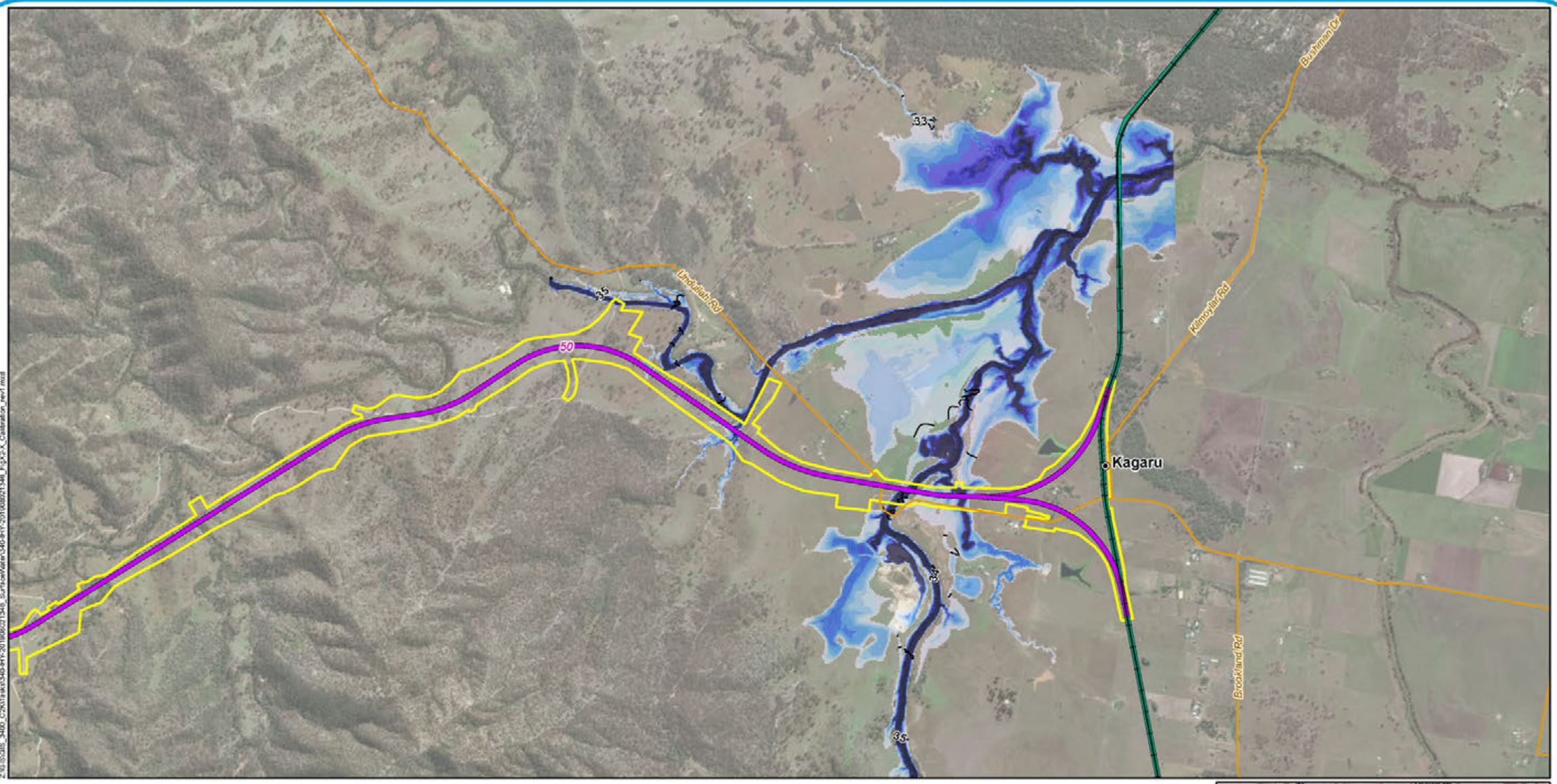
Future Freight
Integrating Community, Environment and Engineering

Issue date: 18/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure D2-B: 1990 Calibration event: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTH/RB Date: 18/11/2019 16:12
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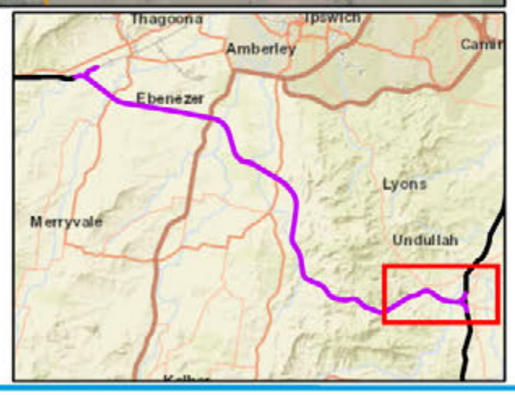
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Minor roads
- EIS disturbance footprint
- 0.5m Contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

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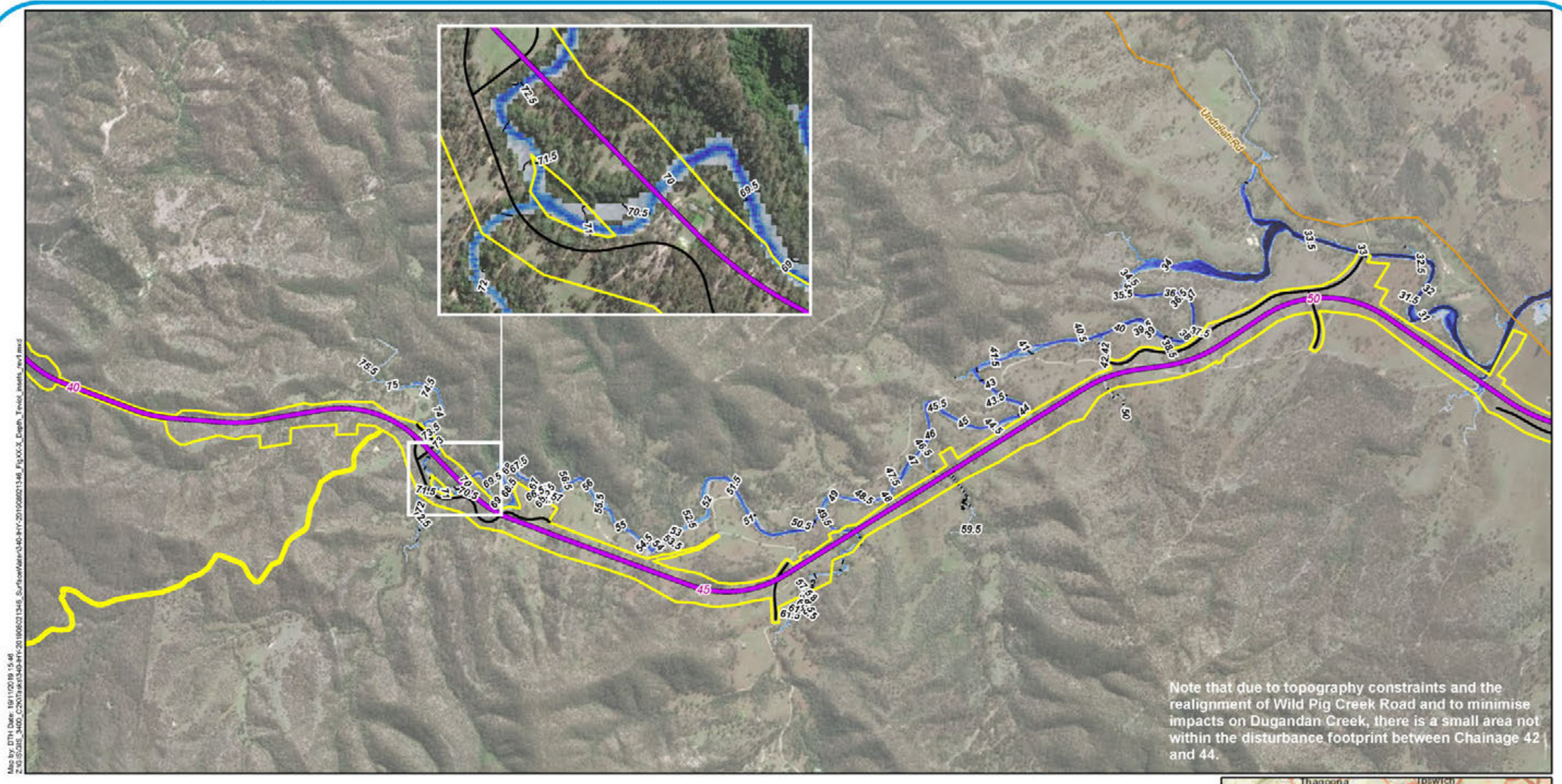
Issue date: 18/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
Figure D2-C: 2013 Calibration event: Teviot Brook



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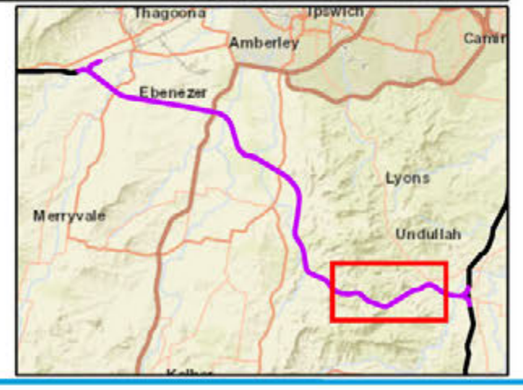
Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1 km

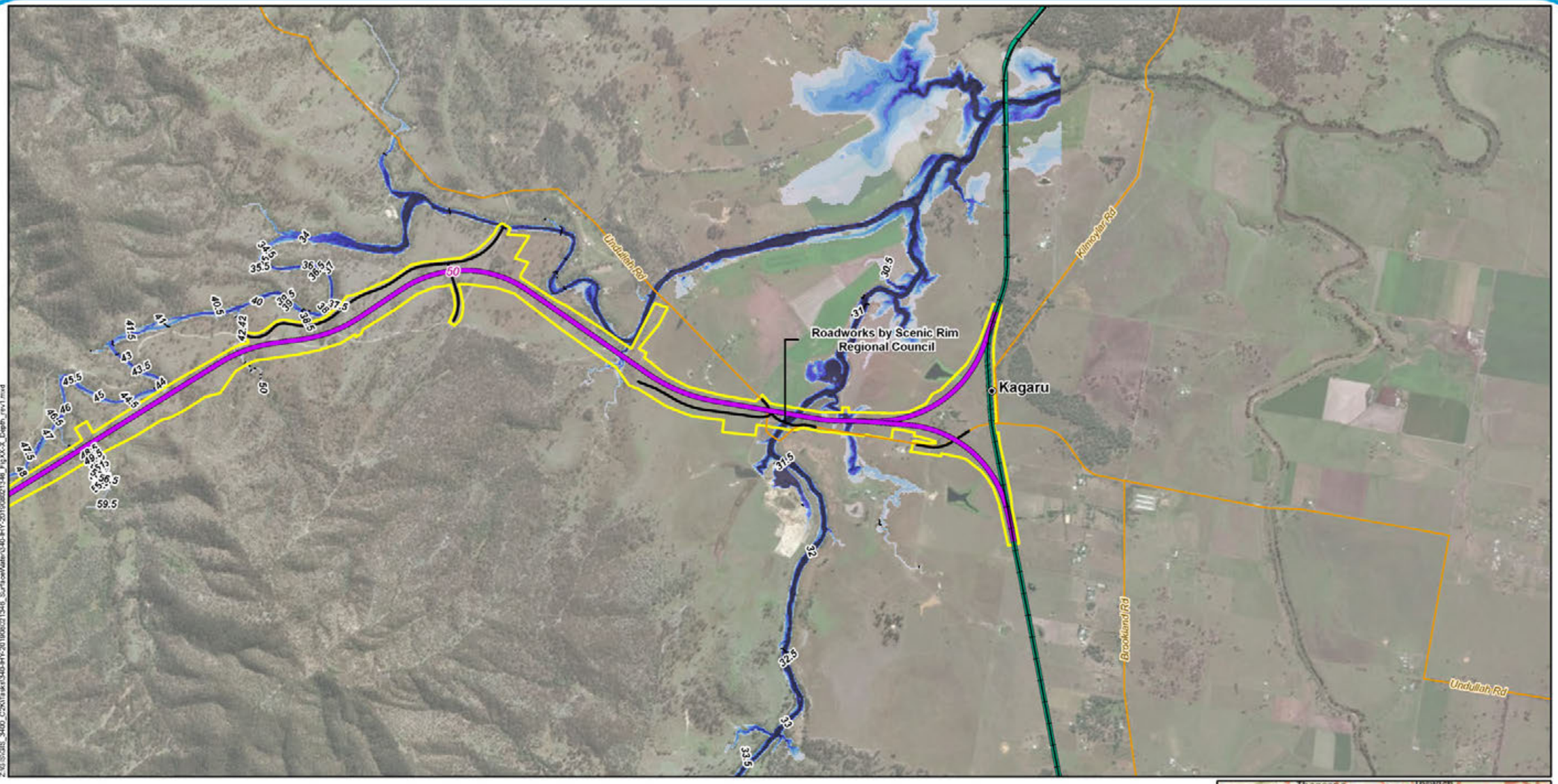
Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D3-A-1: 20% AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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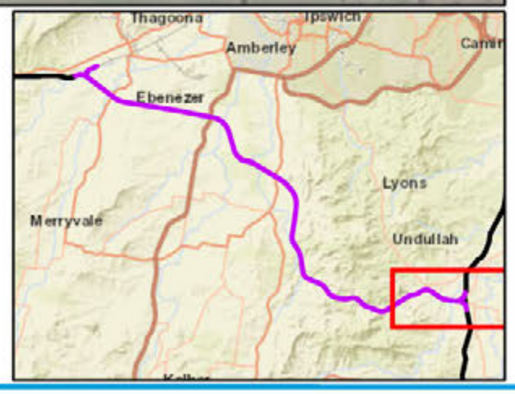
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

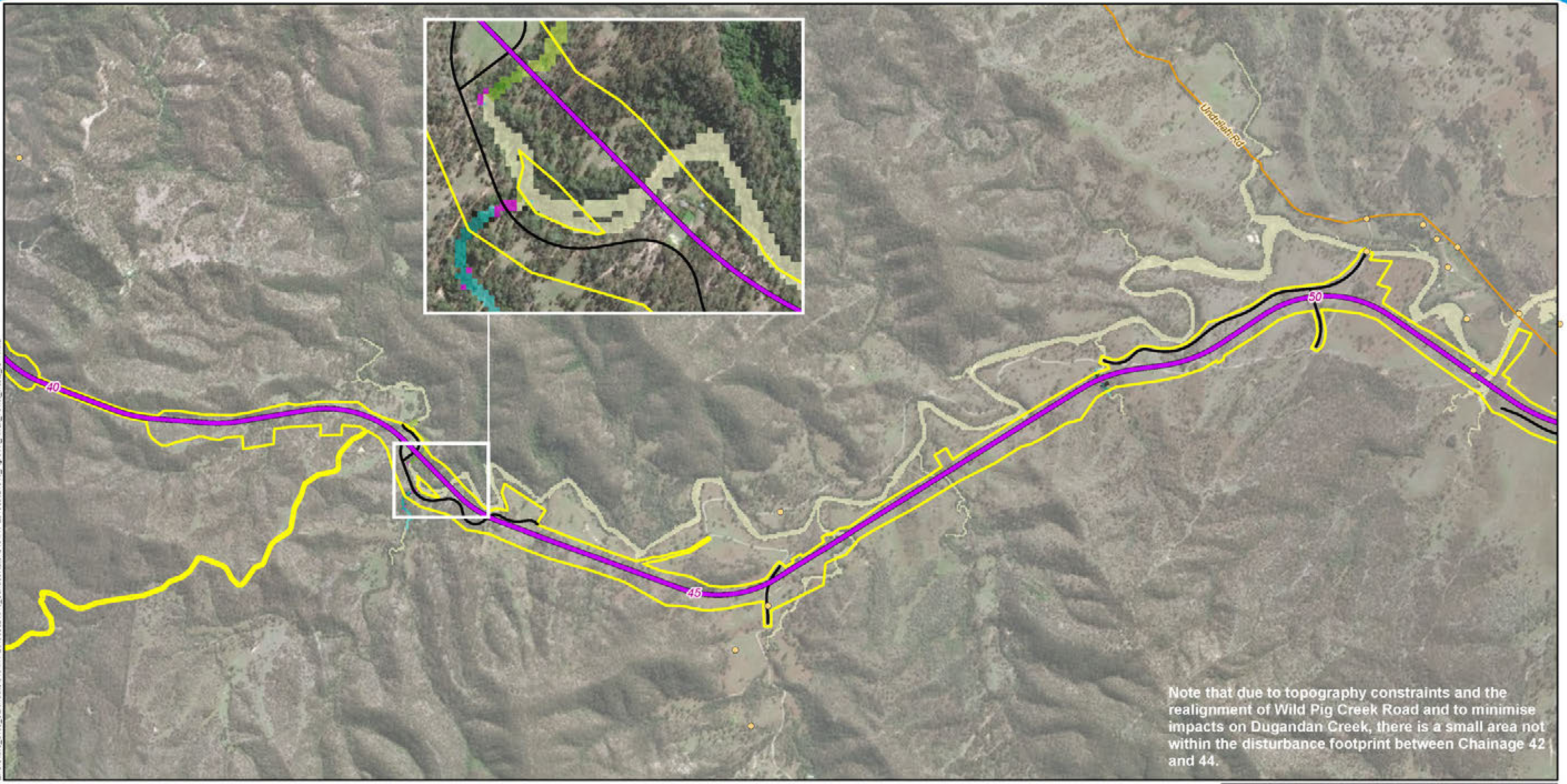
Future Freight
Integrating Community, Environment and Engineering

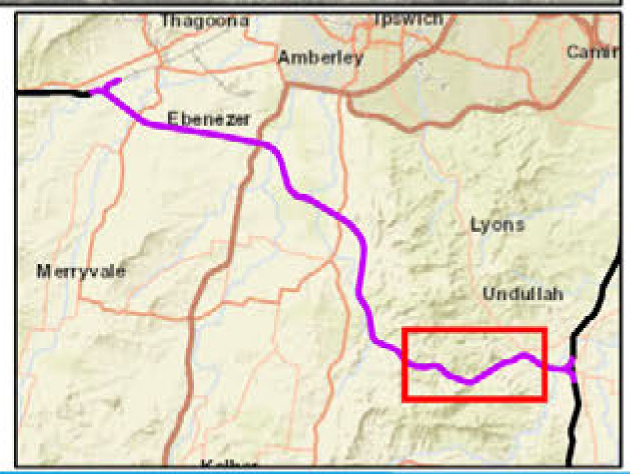
Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D3-A-2: 20% AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5

A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

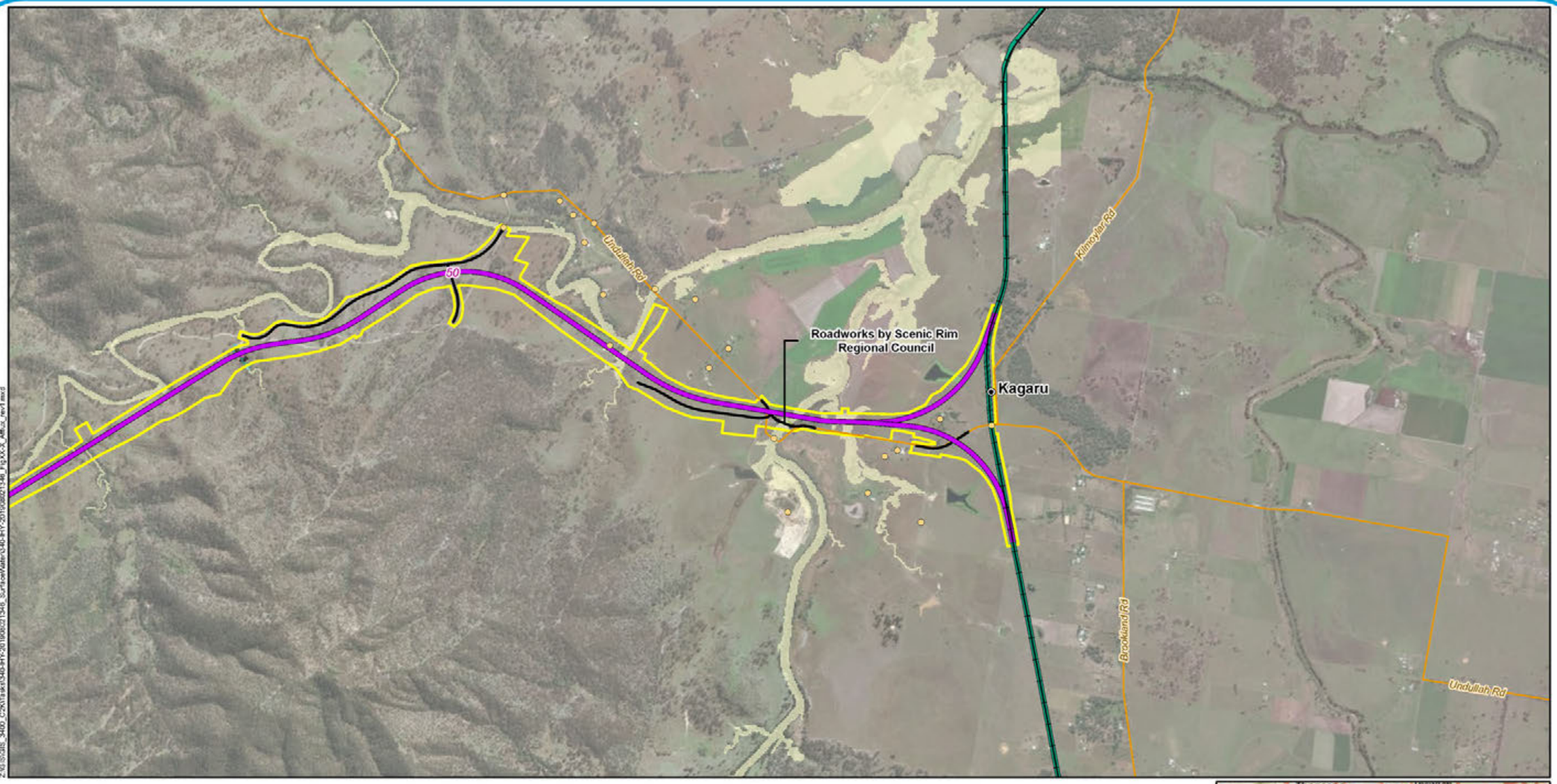
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D3-B-1: 20% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTMRB Date: 11/11/2019 21:22
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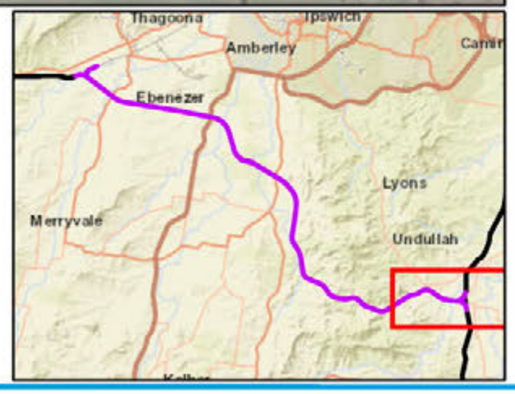
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

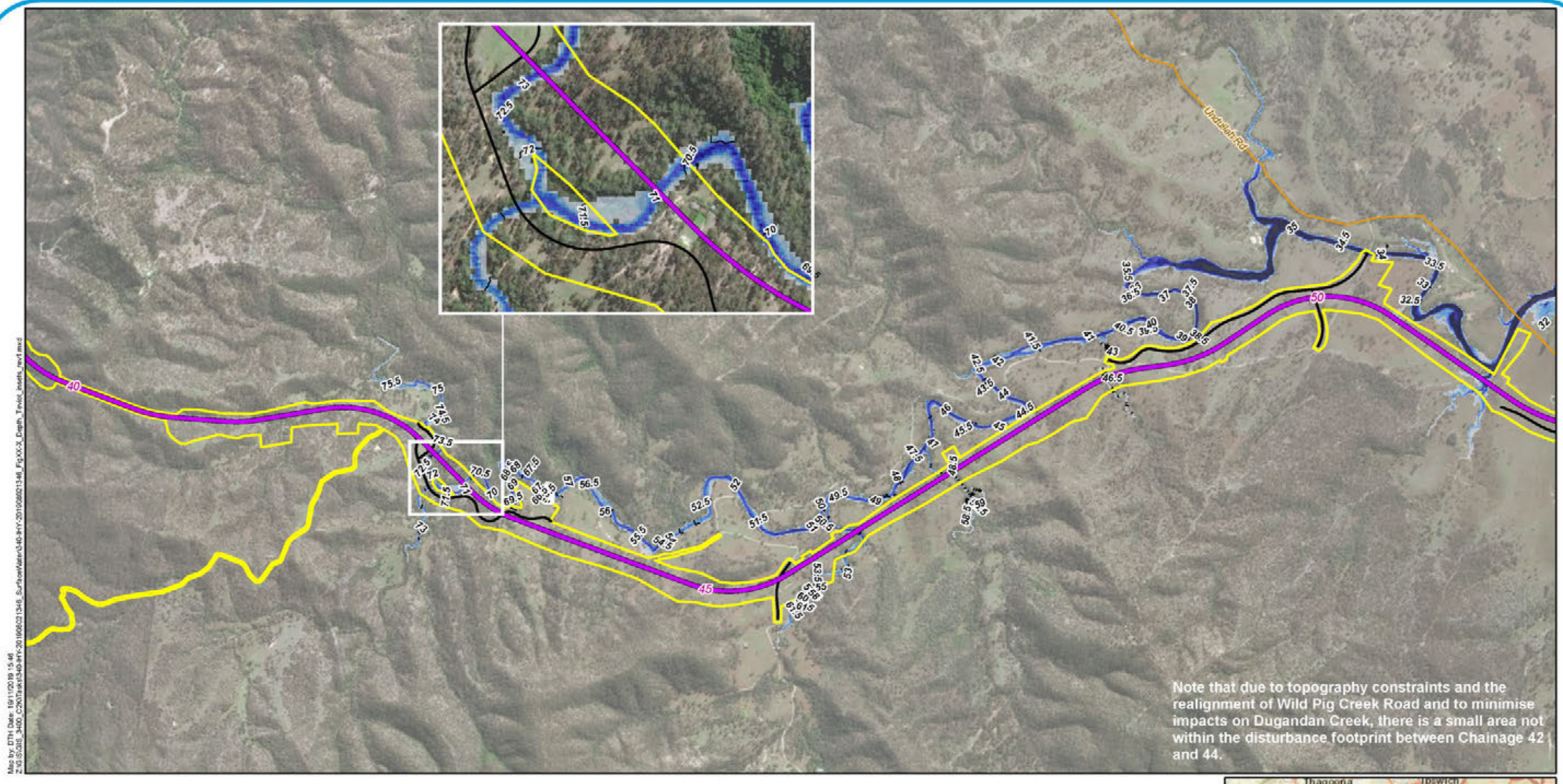
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D3-B-2: 20% AEP event Developed Case afflux: Teviot Brook



Legend

- Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0

A3 scale: 1:30,000

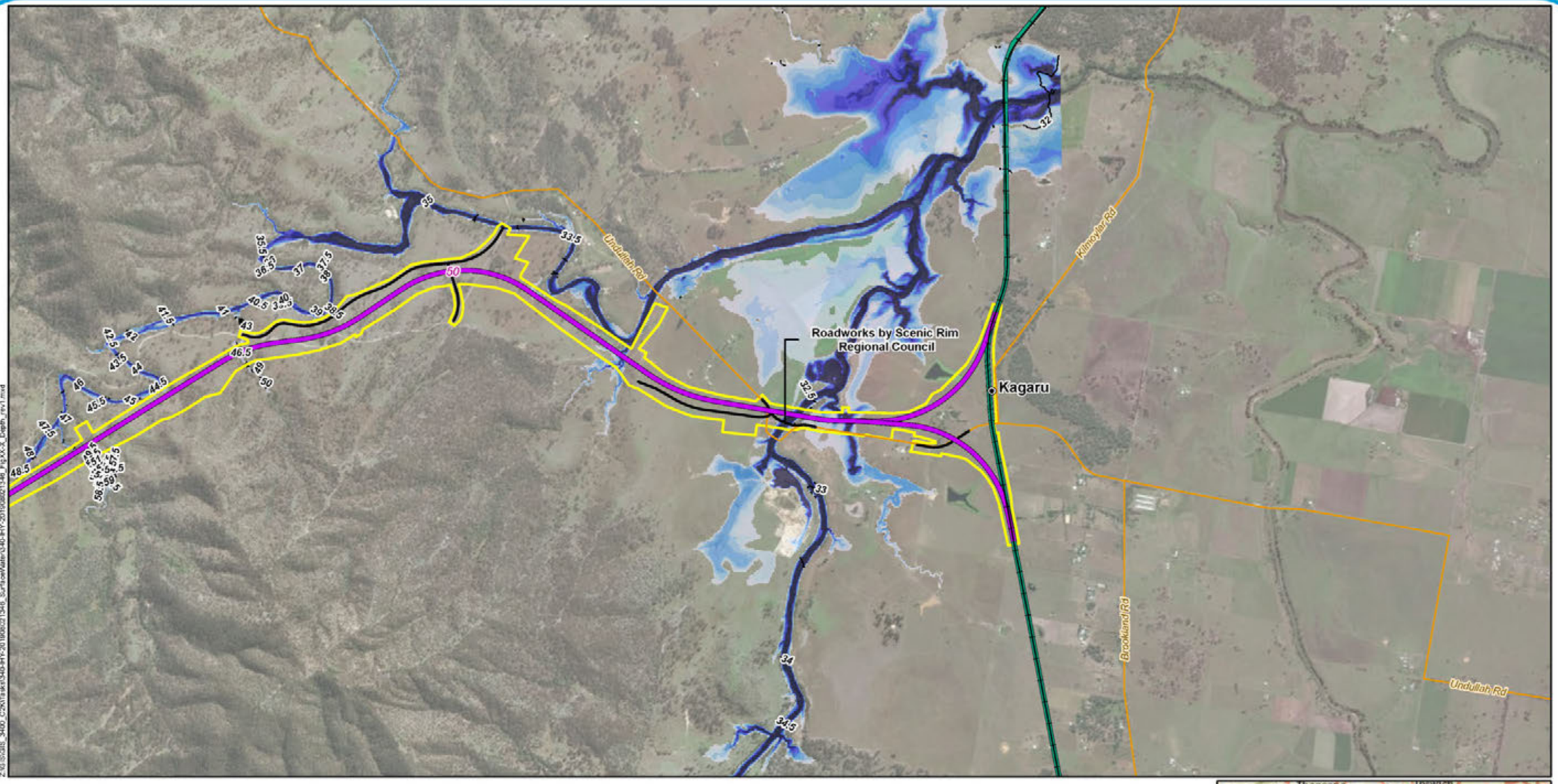
0 0.2 0.4 0.6 0.8 1 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D4-A-1: 10% AEP event Existing Case inundation extent: Teviot Brook



Map by: DTH/RB Date: 12/11/2019 11:35
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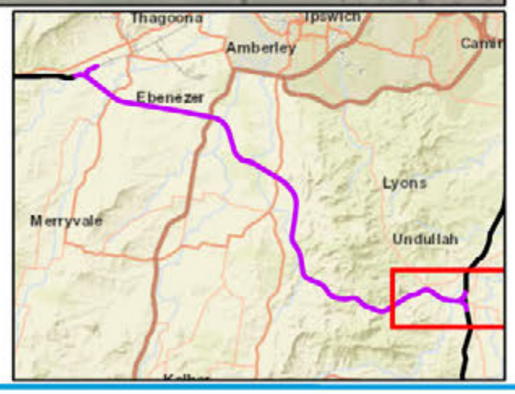
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

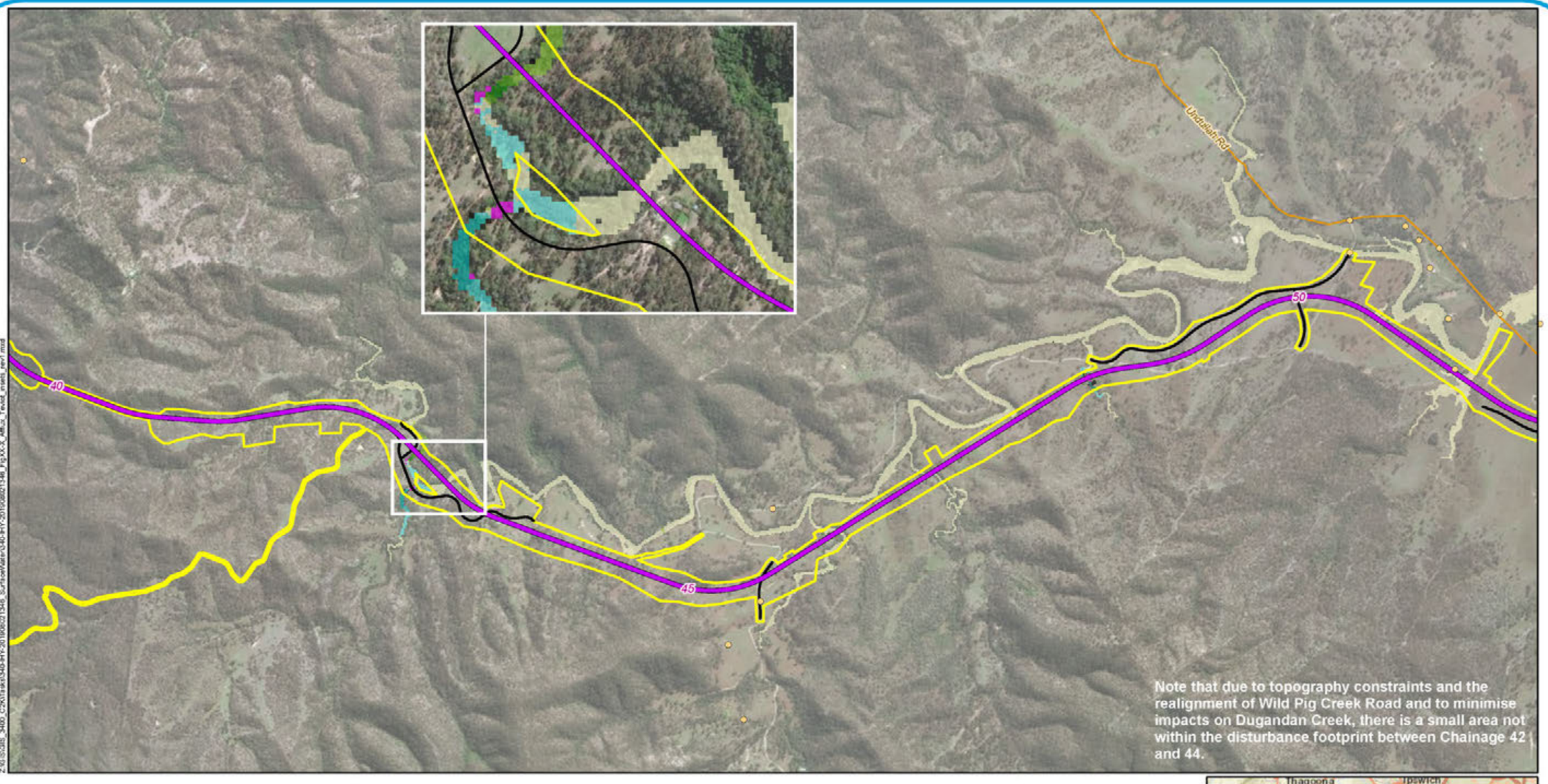
Future Freight
Integrating Community, Environment and Engineering

Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D4-A-2: 10% AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

Misc by: DTH Date: 27/11/2019 11:34
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Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5

A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

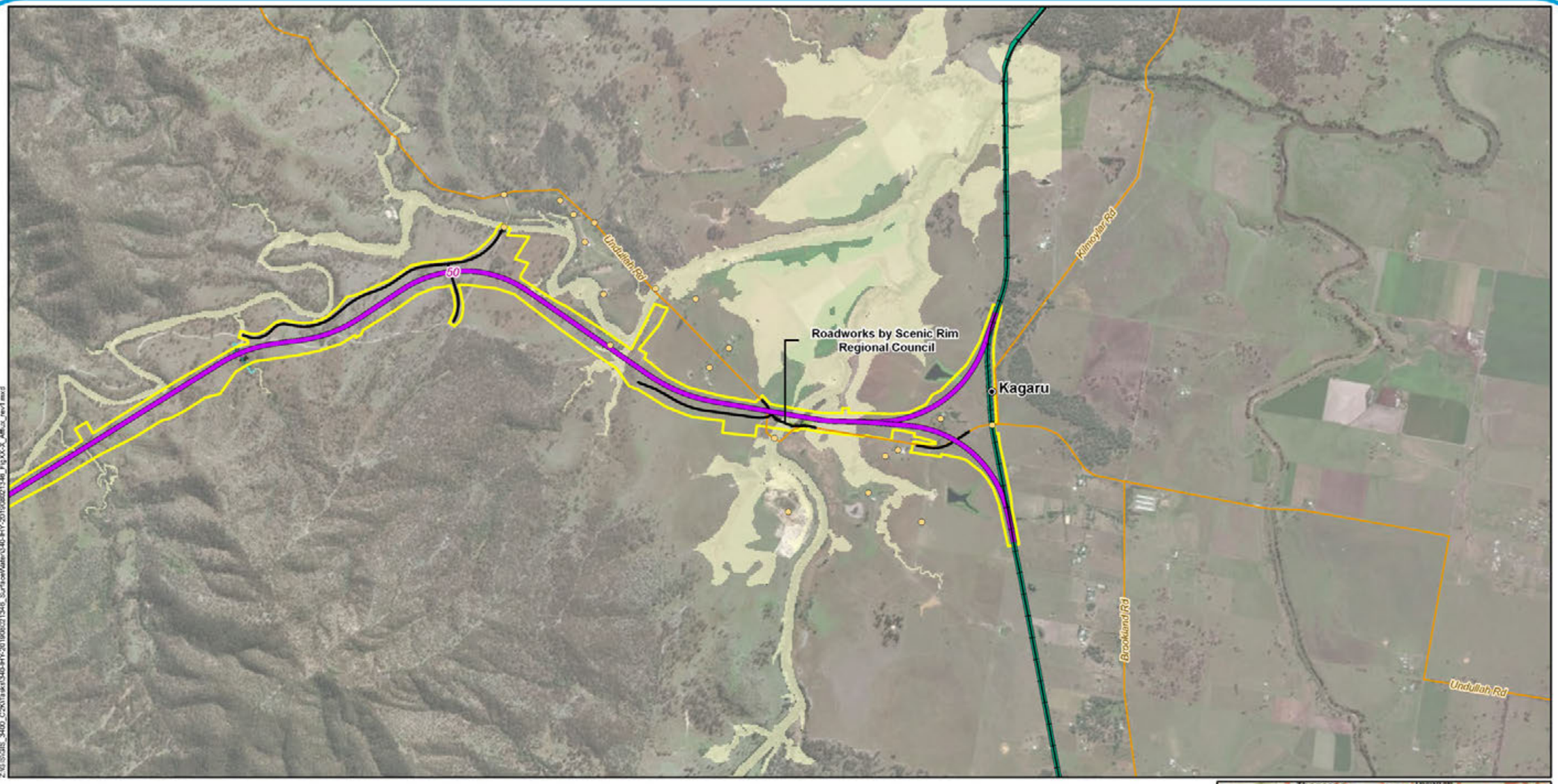
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D4-B-1: 10% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTH/RB Date: 11/11/2019 21:22
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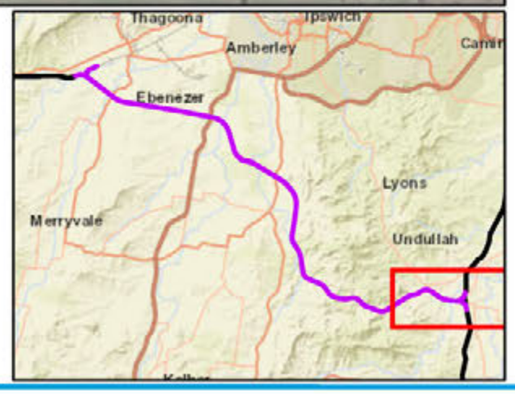
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

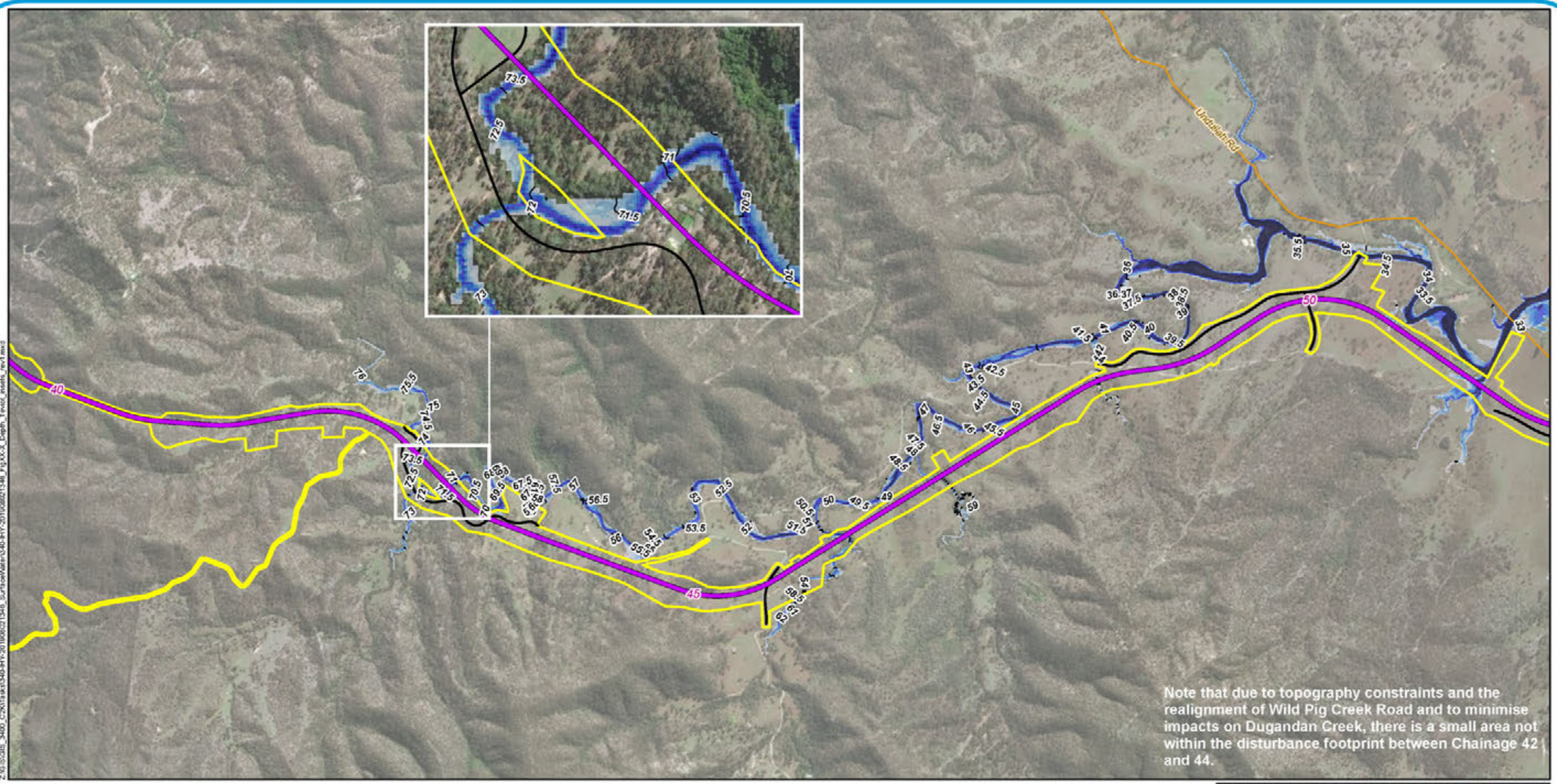
Future Freight
Integrating Communities, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D4-B-2: 10% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



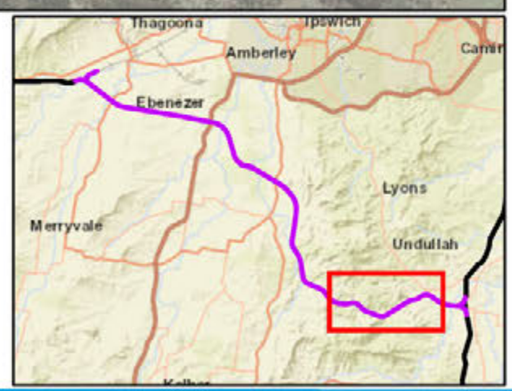
Misc by: DTH Date: 19/11/2019 15:46
Z:\GIS\285_3400_C2K\Tasks\3400-RHY-20190802\1346_Fig XX-X_Depth_Teviot_Insets_rev1.mxd

Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1 km

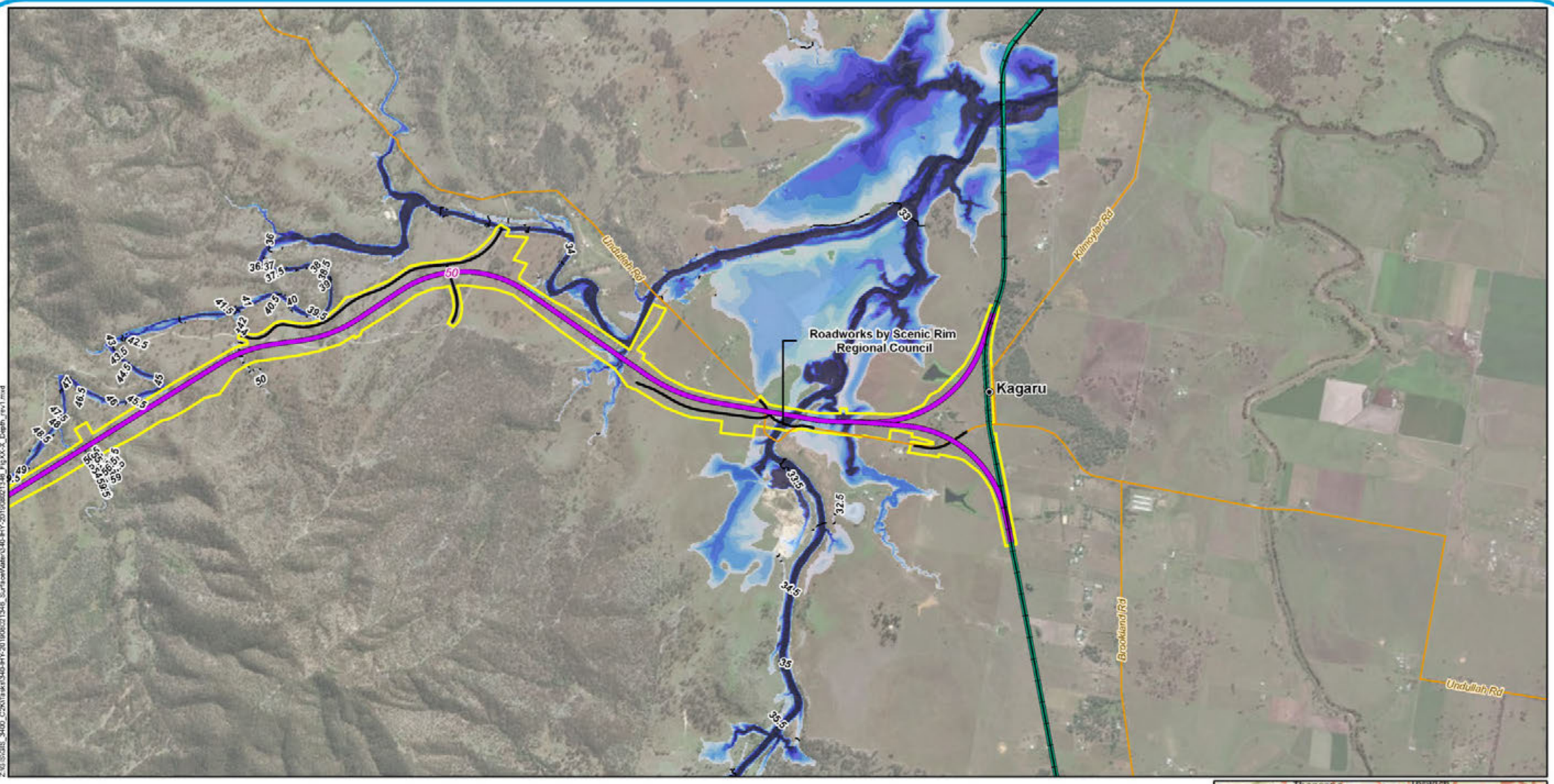
Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D5-A-1: 5% AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Misc by: DTH/RB Date: 12/11/2019 11:35
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Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0

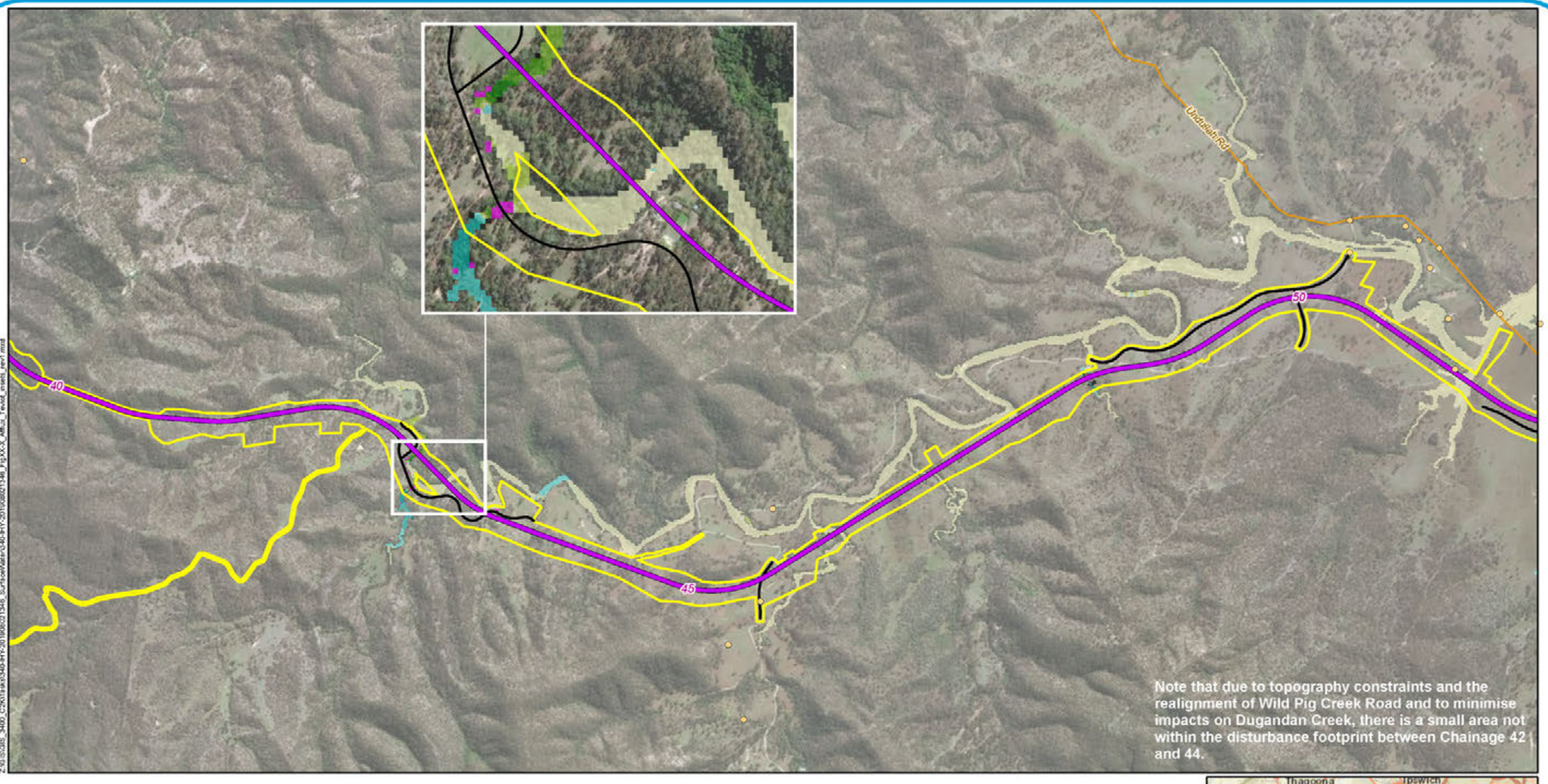
A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D5-A-2: 5% AEP event Existing Case inundation extent: Teviot Brook



Map by: DTH Date: 27/11/2019 11:34
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Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5

A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

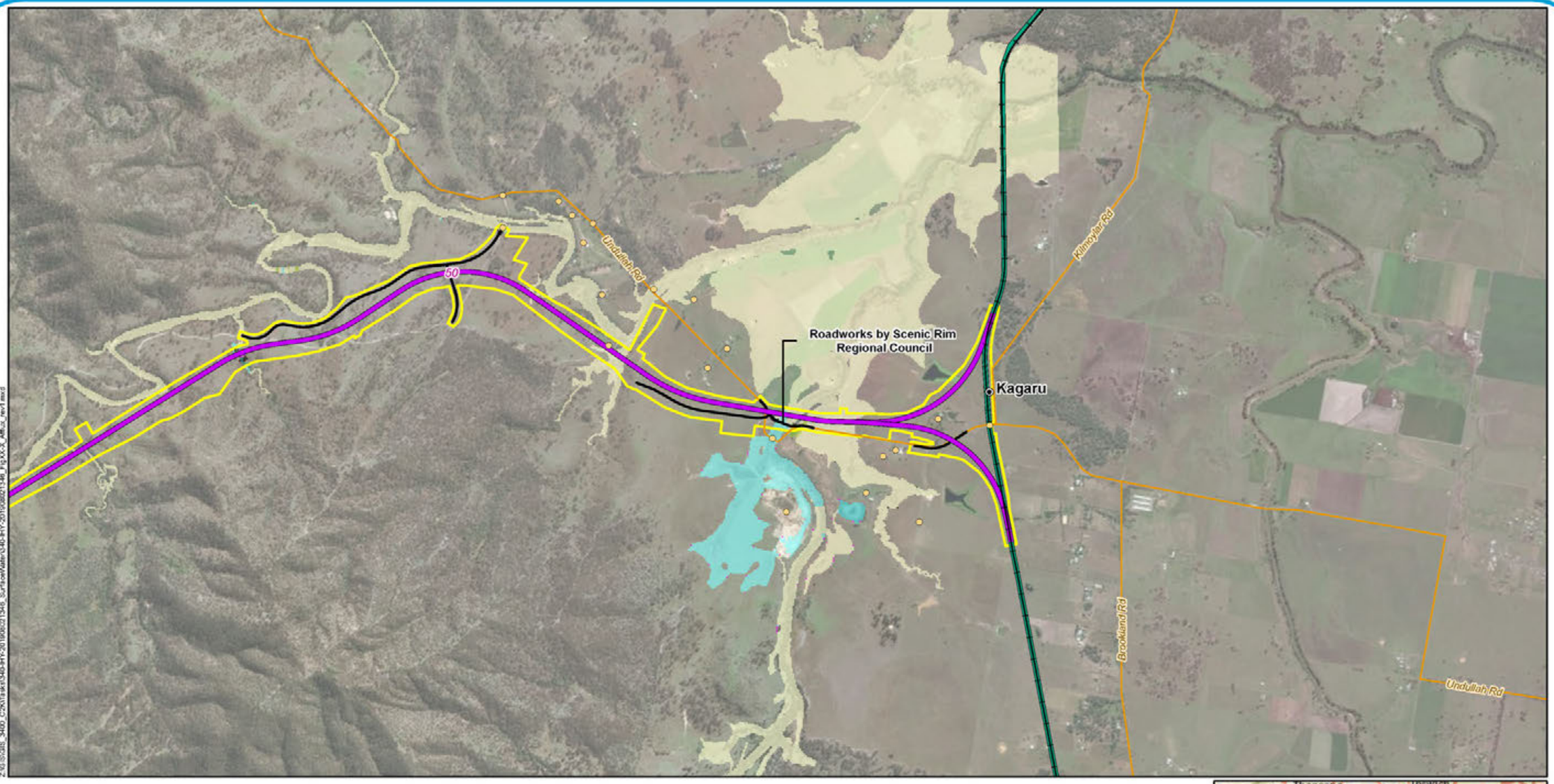
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D5-B-1: 5% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTMRB Date: 11/11/2019 21:22
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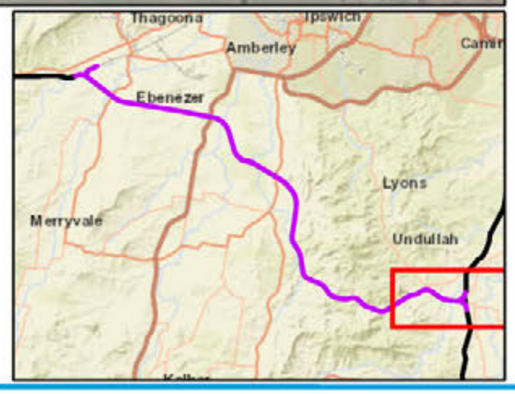
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

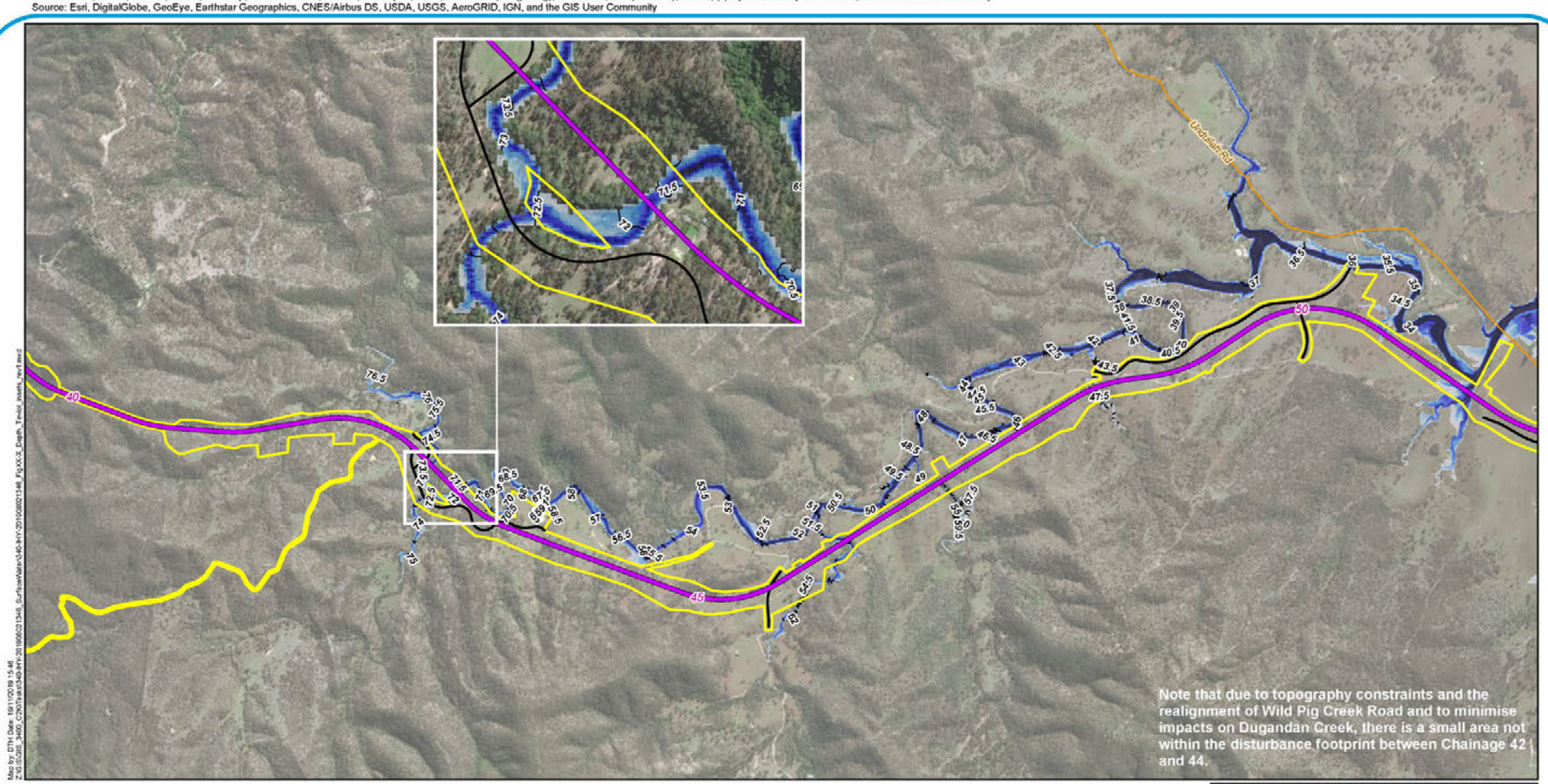
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D5-B-2: 5% AEP event Developed Case afflux: Teviot Brook



Misc by: DTH Date: 19/11/2019 15:46
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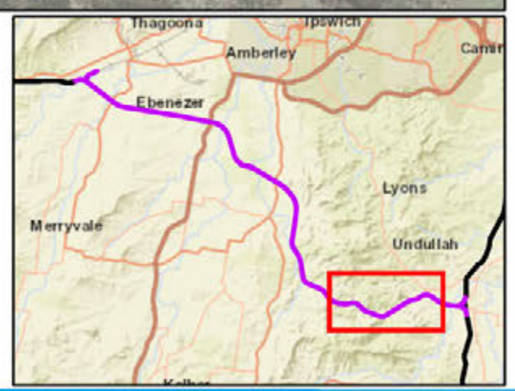
Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

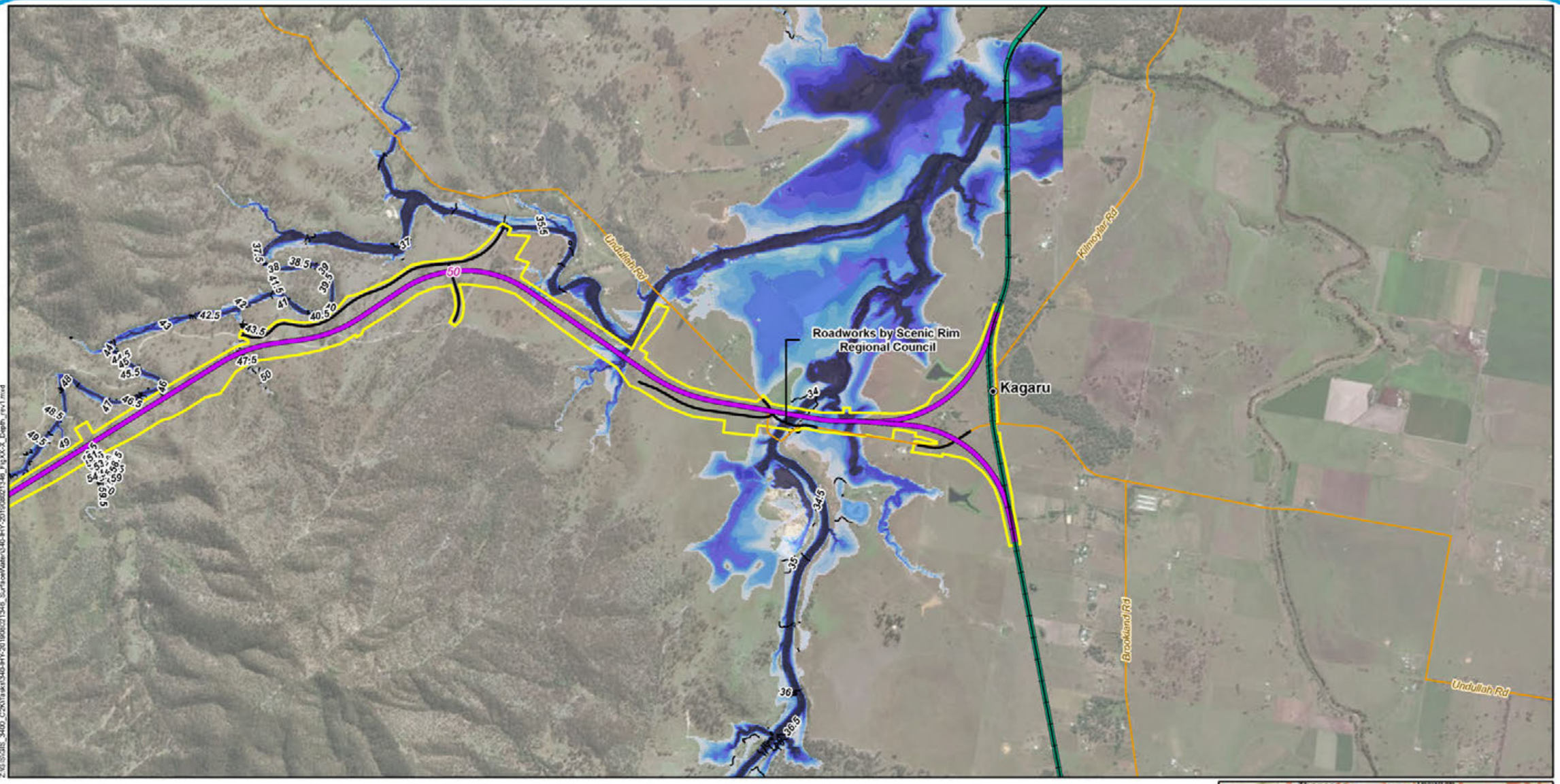
0 0.2 0.4 0.6 0.8 1 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D6-A-1: 2% AEP event Existing Case inundation extent: Teviot Brook

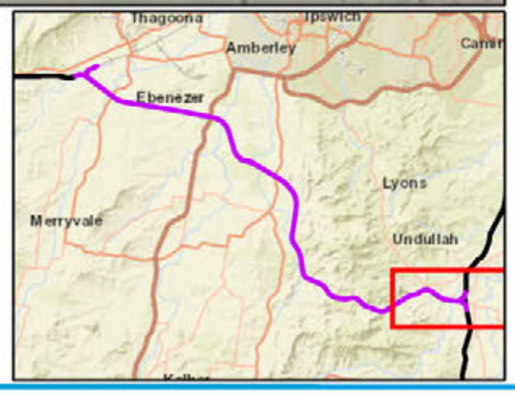


Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

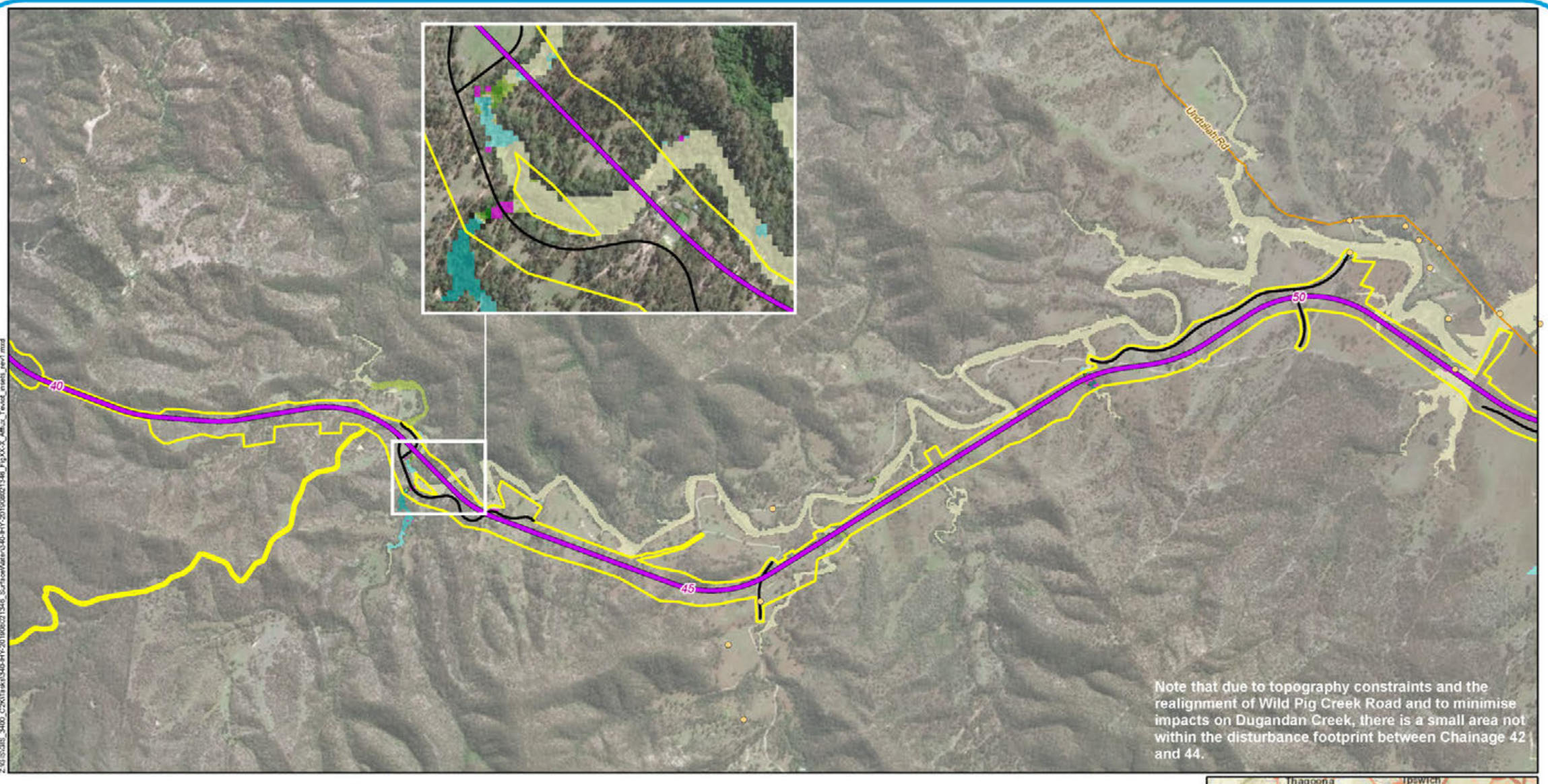
Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D6-A-2: 2% AEP event Existing Case inundation extent: Teviot Brook

Map by: DTH/RB Date: 12/11/2019 11:35
Z:\GIS\Jobs_3400_C2K\Tasks\3400-94Y-20190802\1346_SurfaceWater\3400-1346-94Y-20190802\1346_Fig XX-X_Depth_rev1.mxd

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

Misc by: DTH Date: 27/11/2019 11:34
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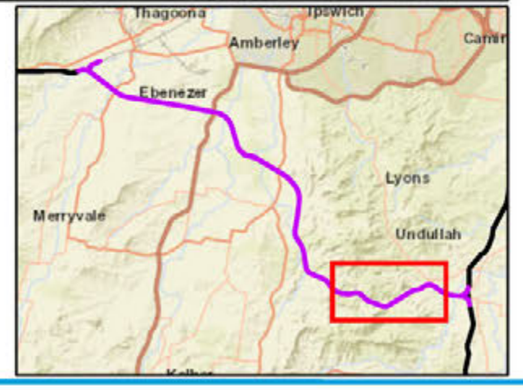
Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

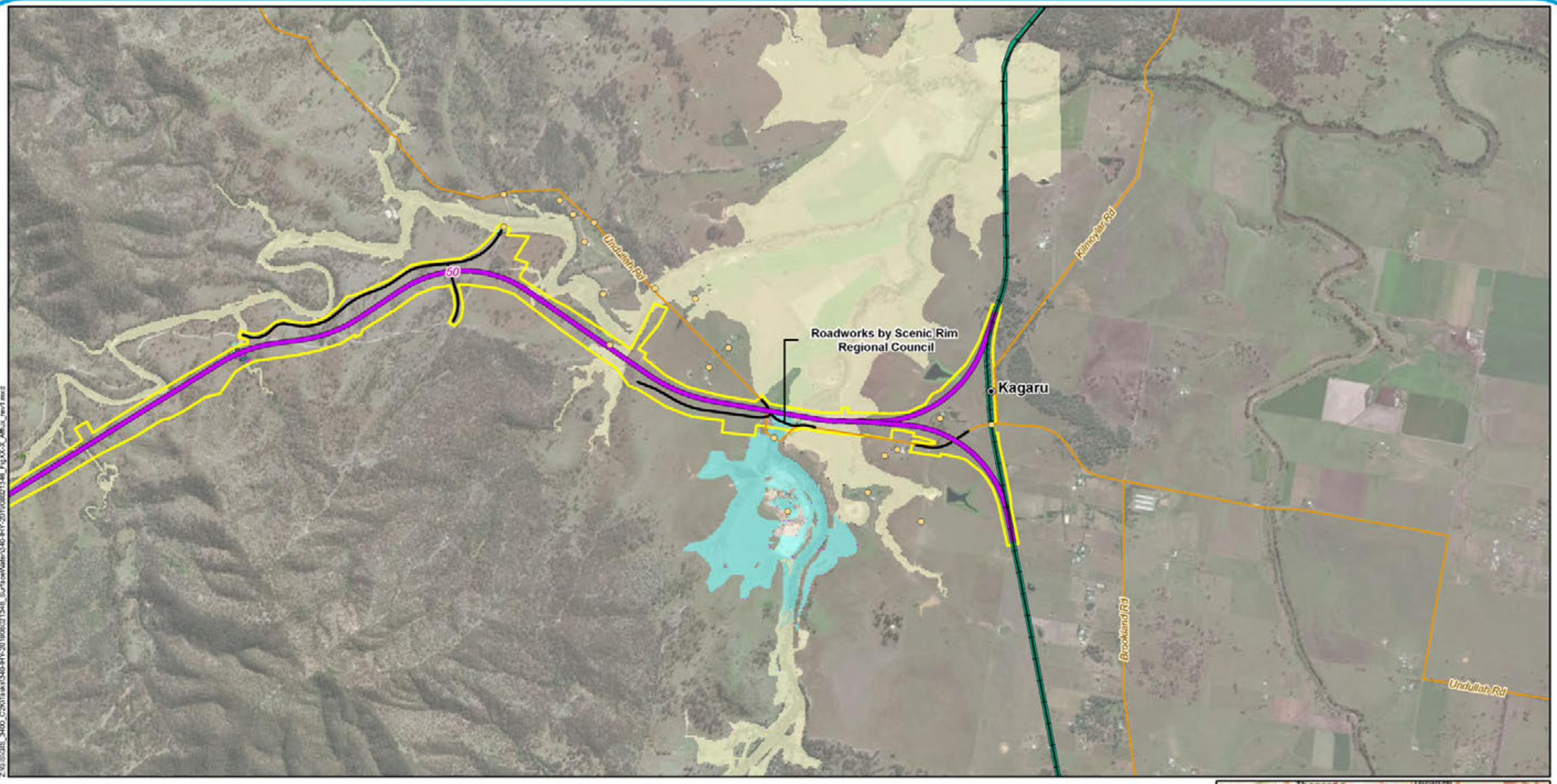
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D6-B-1: 2% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Misc by: DTH/RB Date: 11/11/2019 21:22
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Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5

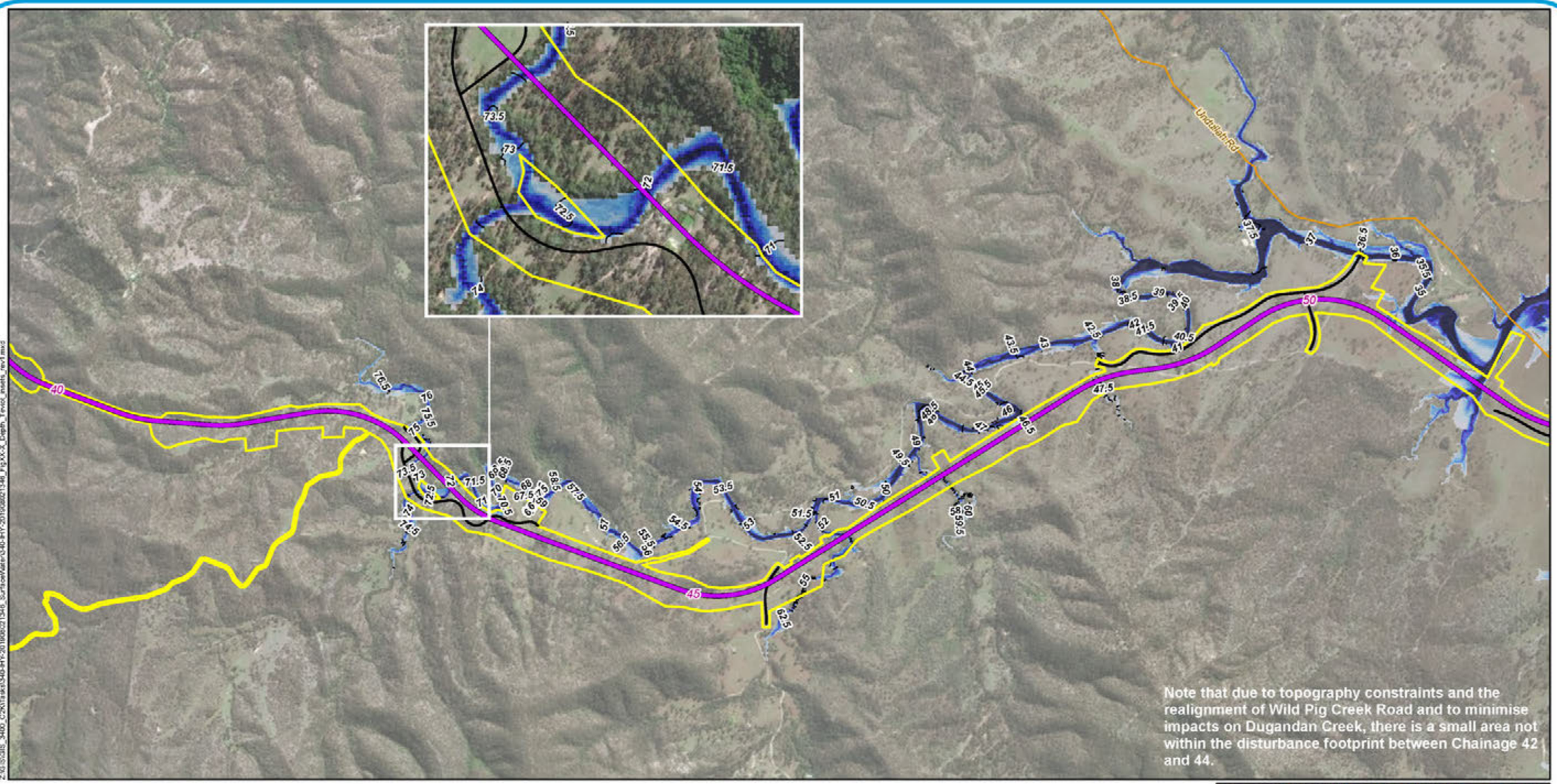
A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D6-B-2: 2% AEP event Developed Case afflux: Teviot Brook



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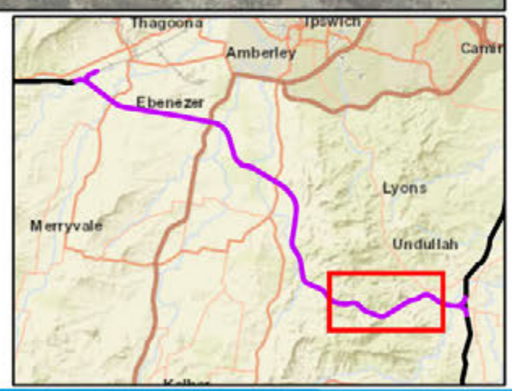
Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1 km

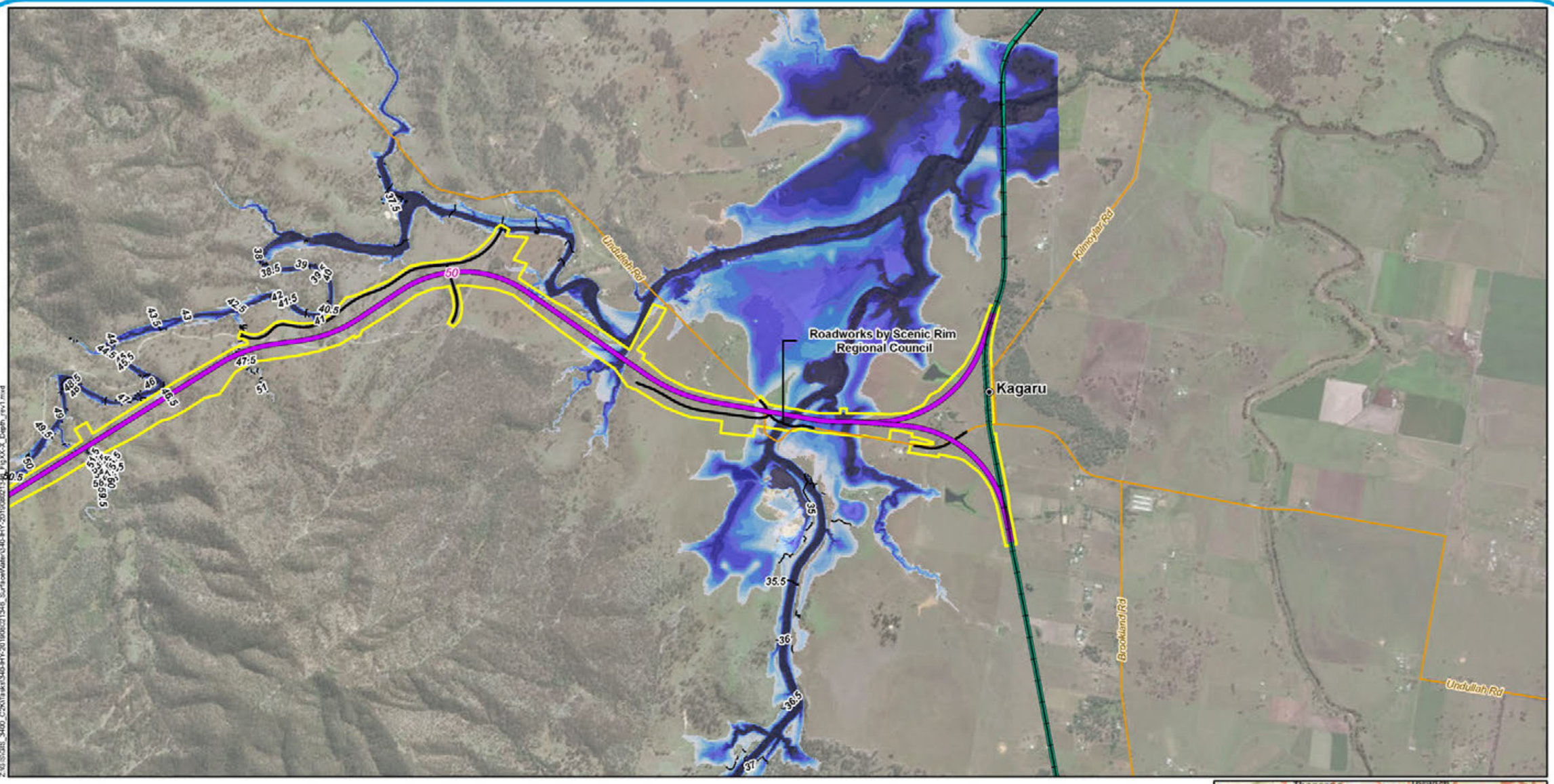
Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-A-1: 1% AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0

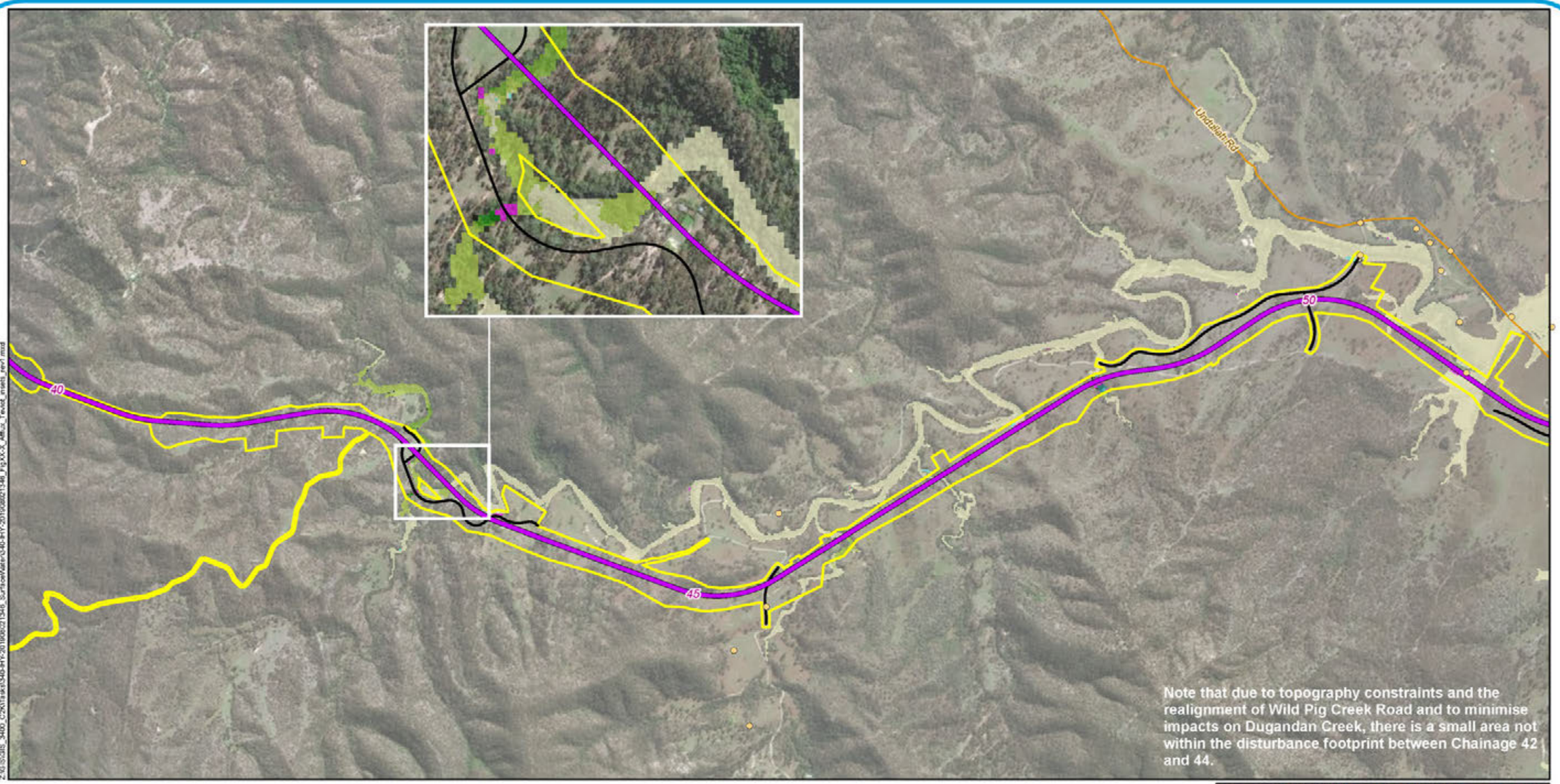
A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-A-2: 1% AEP event Existing Case inundation extent: Teviot Brook



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

Misc by: DTH Date: 27/11/2019 11:34
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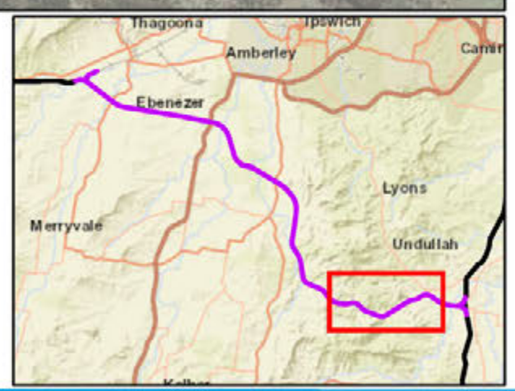
Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

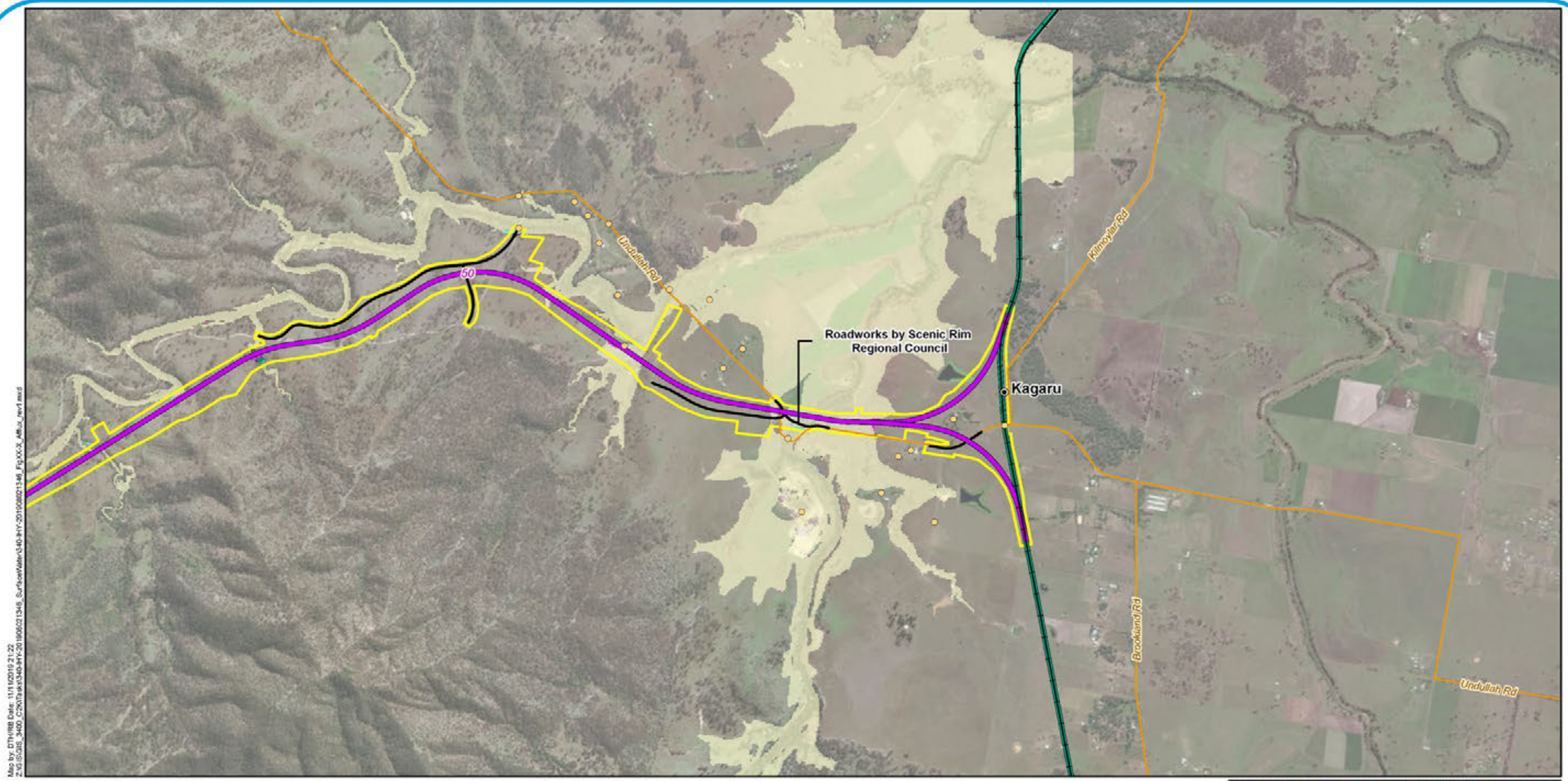
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-B-1: 1% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



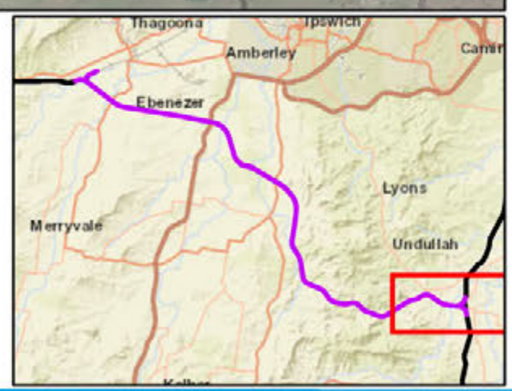
Misc by: DTH/RB Date: 11/11/2019 21:22
Z:\GIS\285_3400_C2K\Tasks\349-WY-20190802\1348_Fig XX-X_Afflux_rev1.mxd

Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

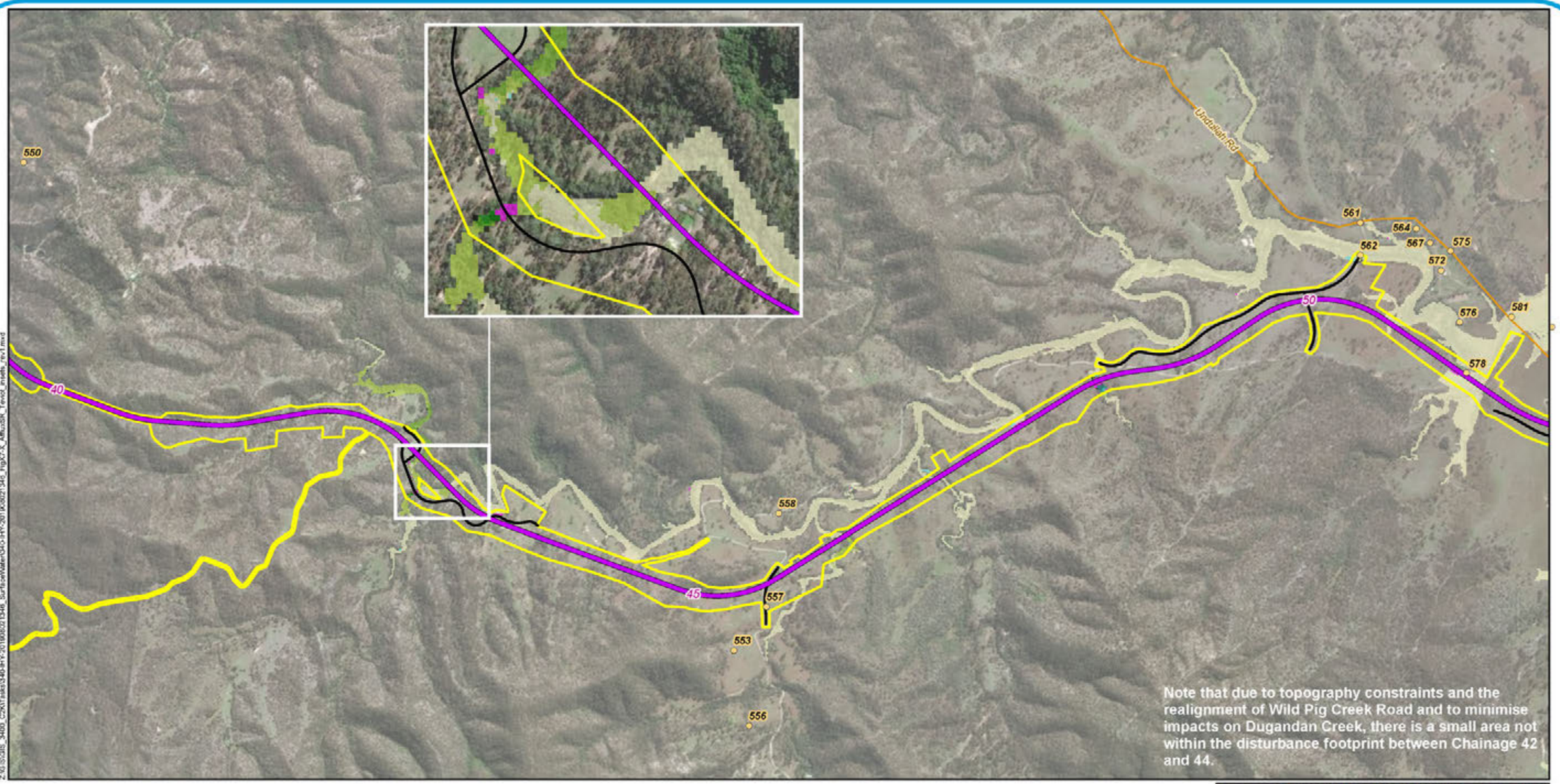
Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-B-2: 1% AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

Misc by: DTH Date: 3/12/2019 14:12
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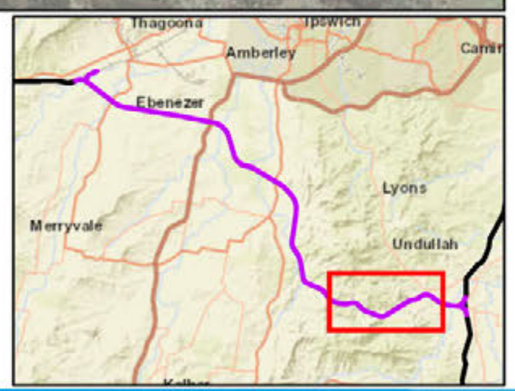
Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

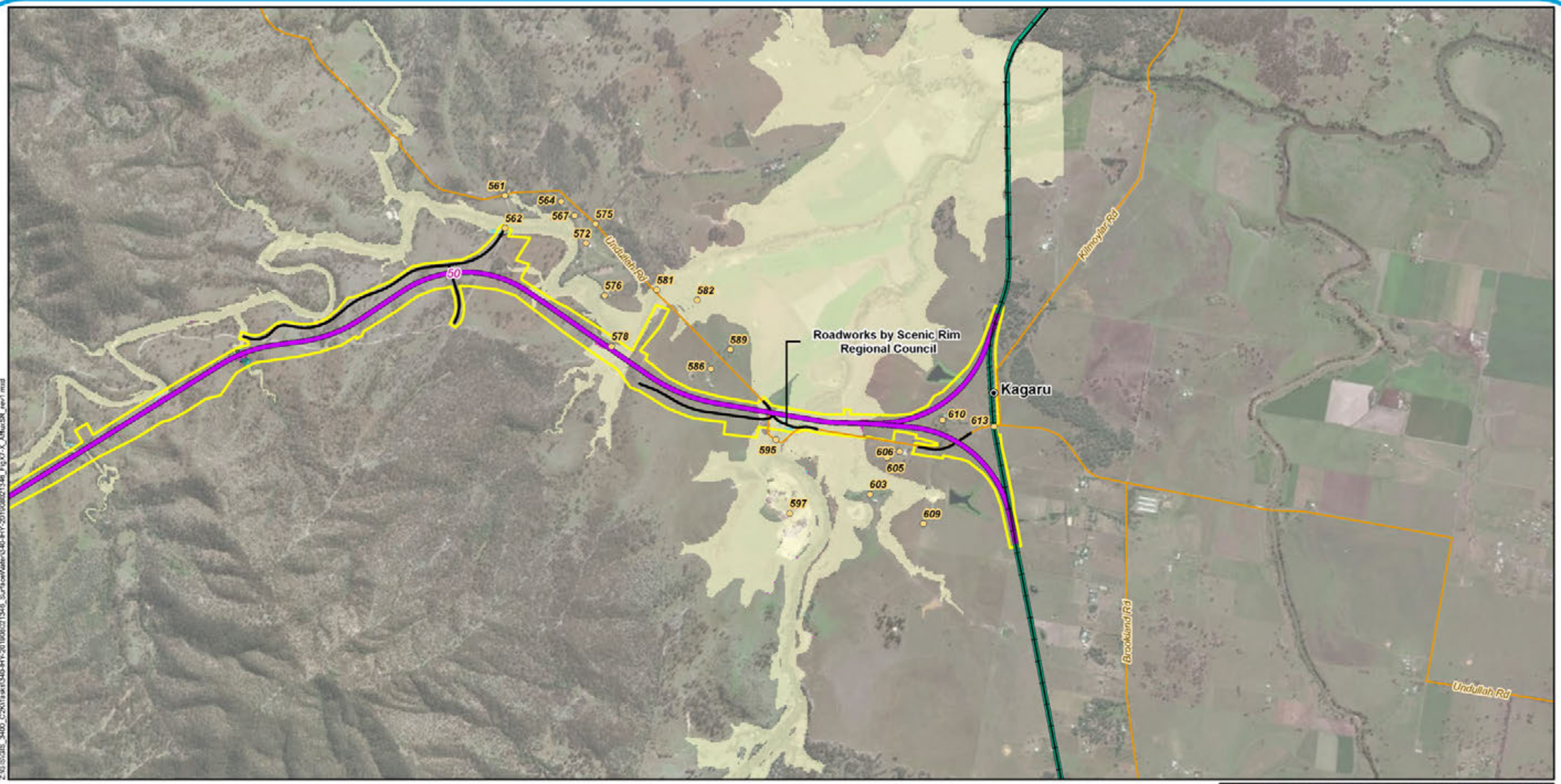
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-C-1: 1% AEP event Developed Case afflux with flood sensitive receptors: Teviot Brook



Misc by: DTH Date: 12/11/2019 11:33
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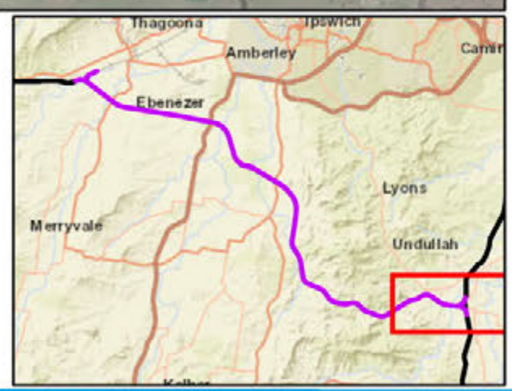
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

Future Freight
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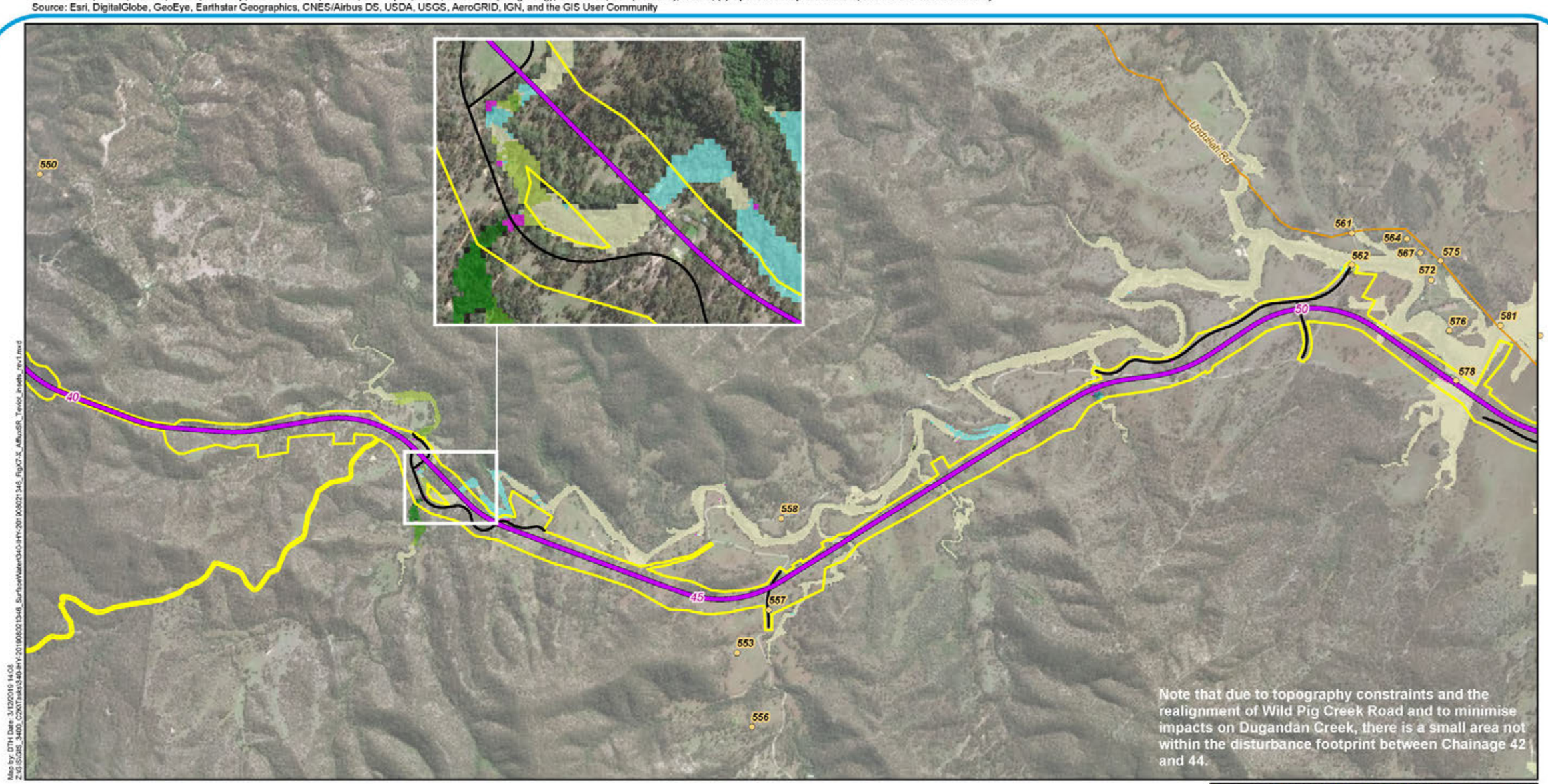
Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-C-2: 1% AEP event Developed Case afflux with flood sensitive receptors: Teviot Brook



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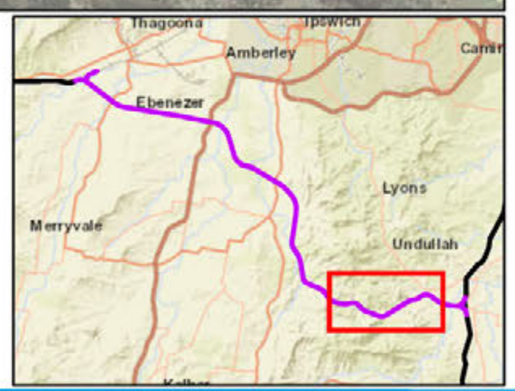
Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

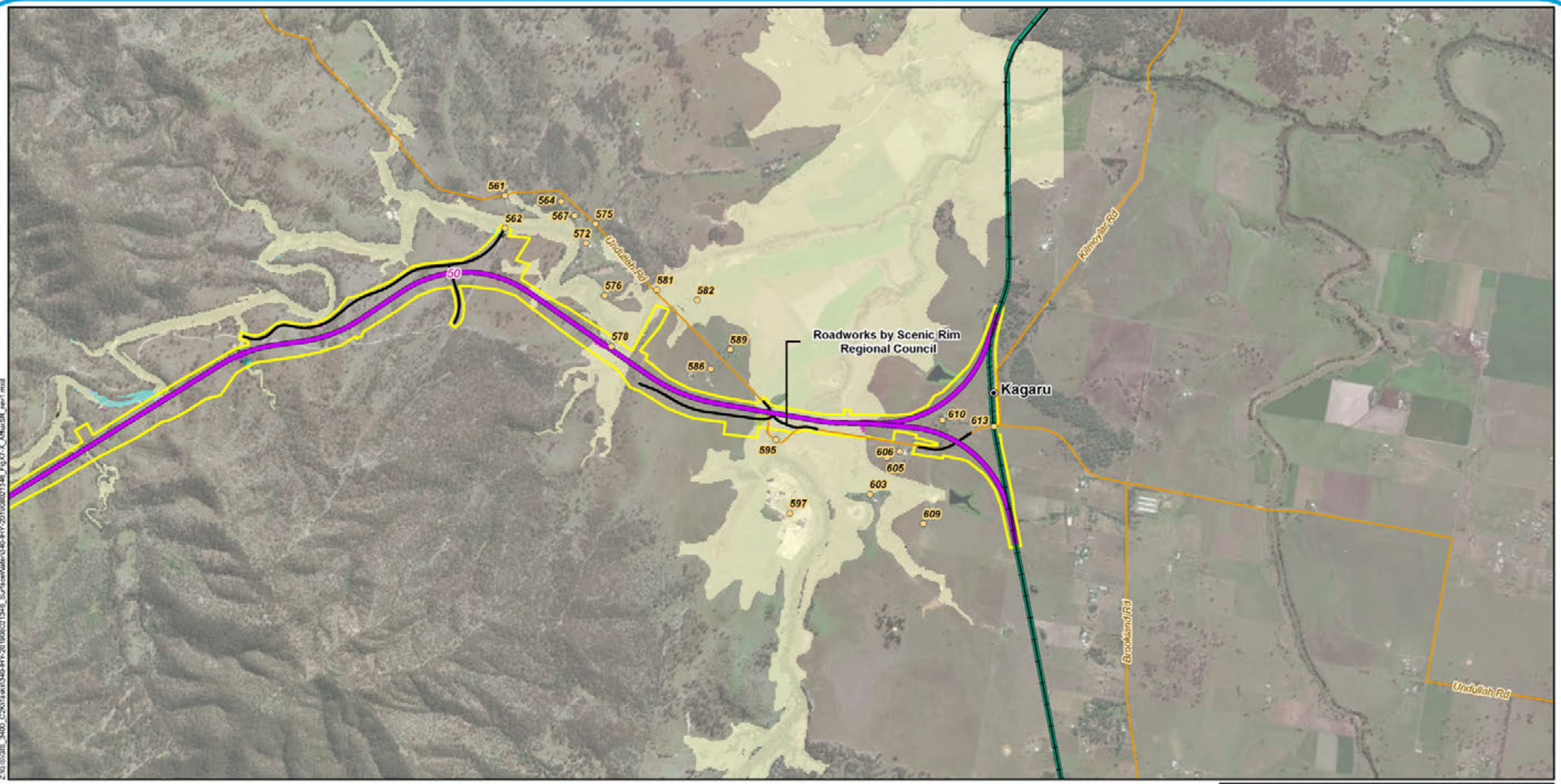
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-D-1: 1% AEP event with climate change afflux and flood sensitive receptors: Teviot Brook



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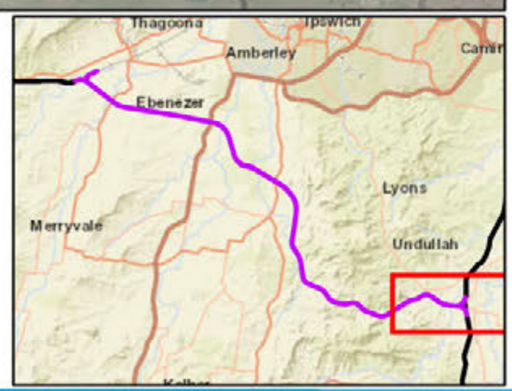
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

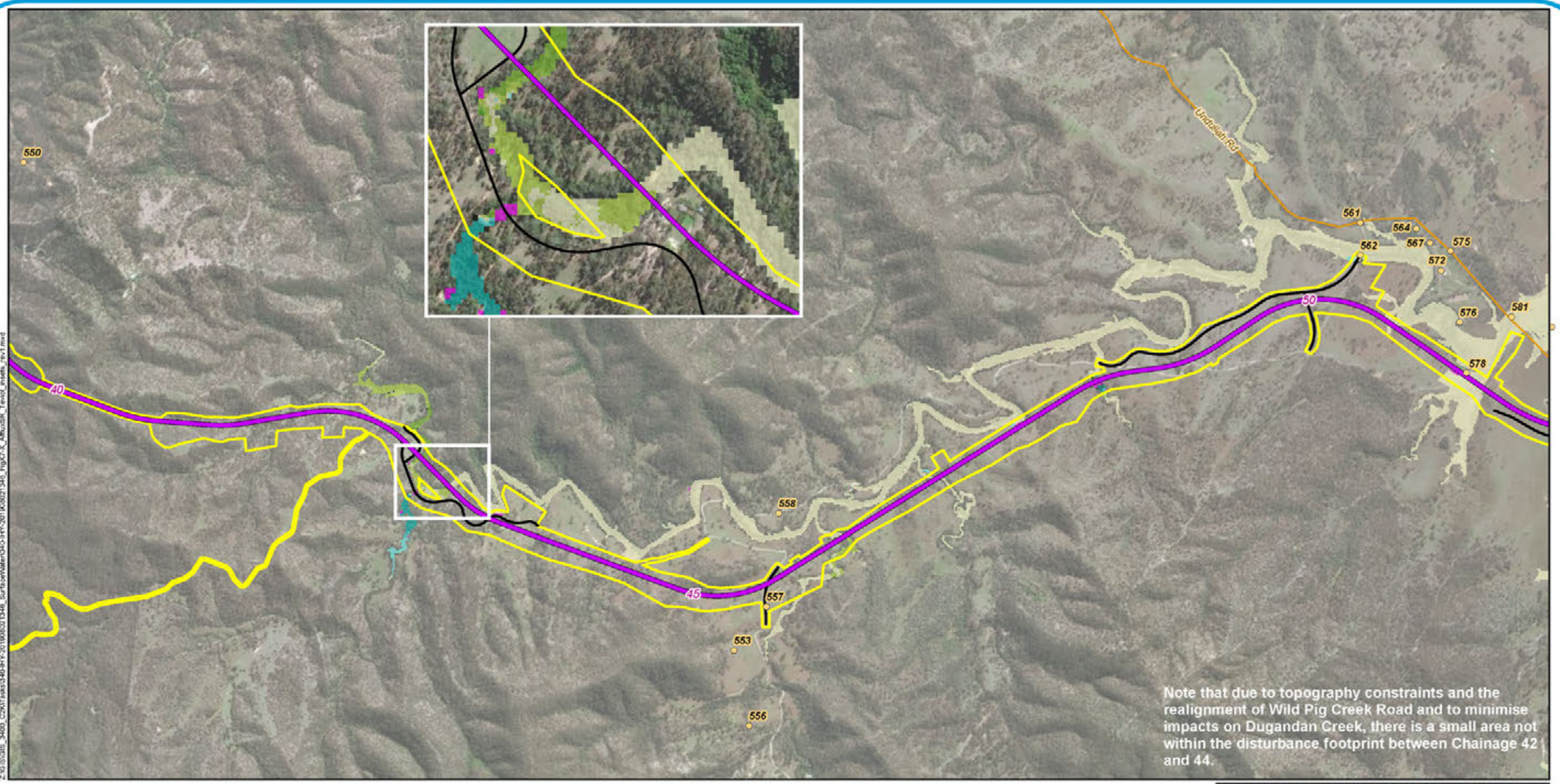
Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-D-2: 1% AEP event with climate change afflux and flood sensitive receptors: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

Misc by: DTH Date: 3/12/2019 14:12
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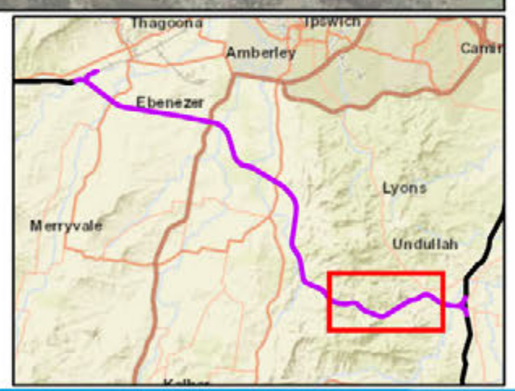
Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

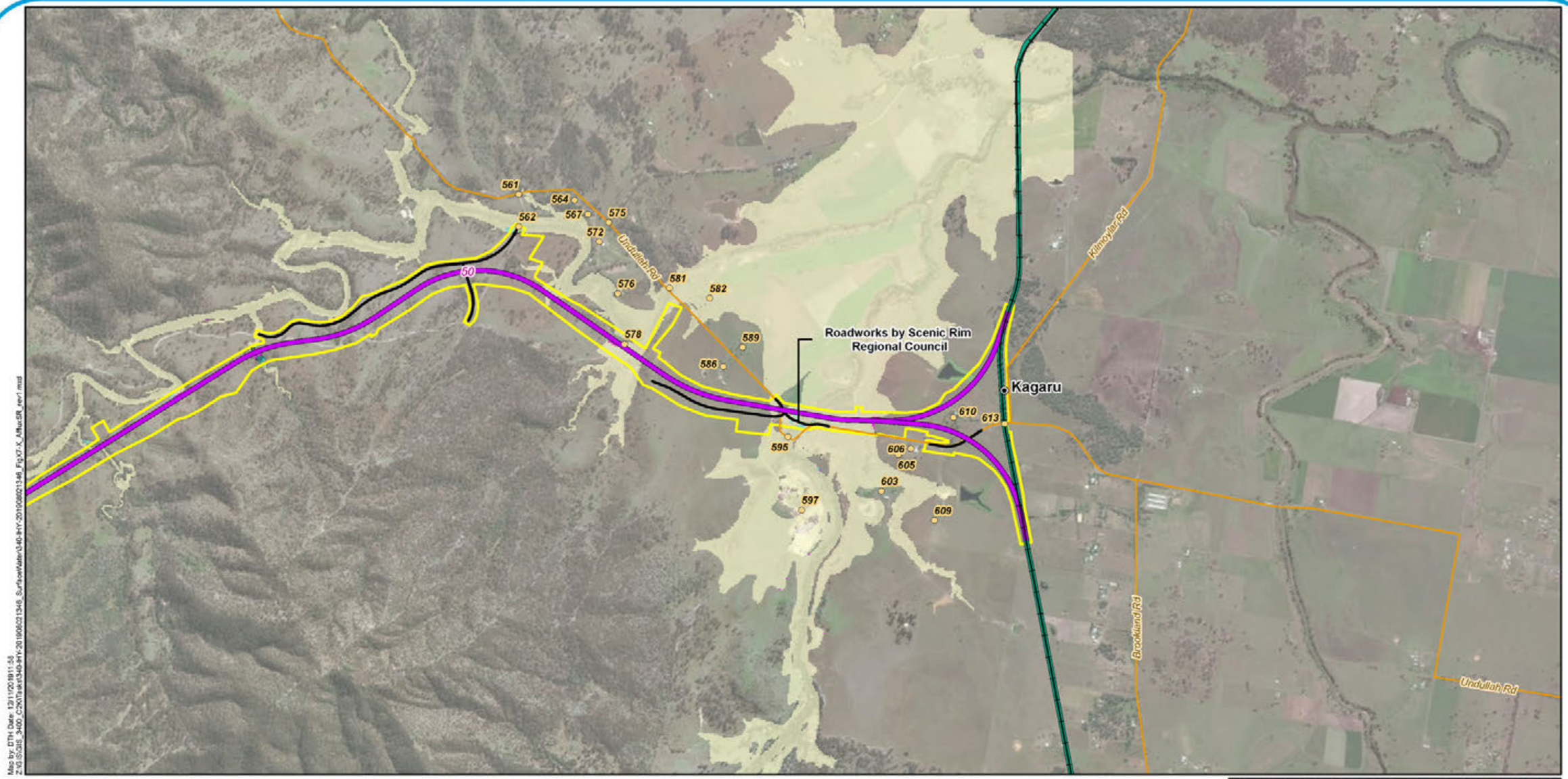
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-E-1: 1% AEP event with 0% blockage afflux and flood sensitive receptors: Teviot Brook



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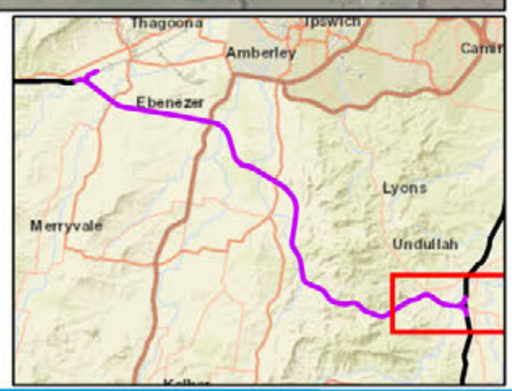
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

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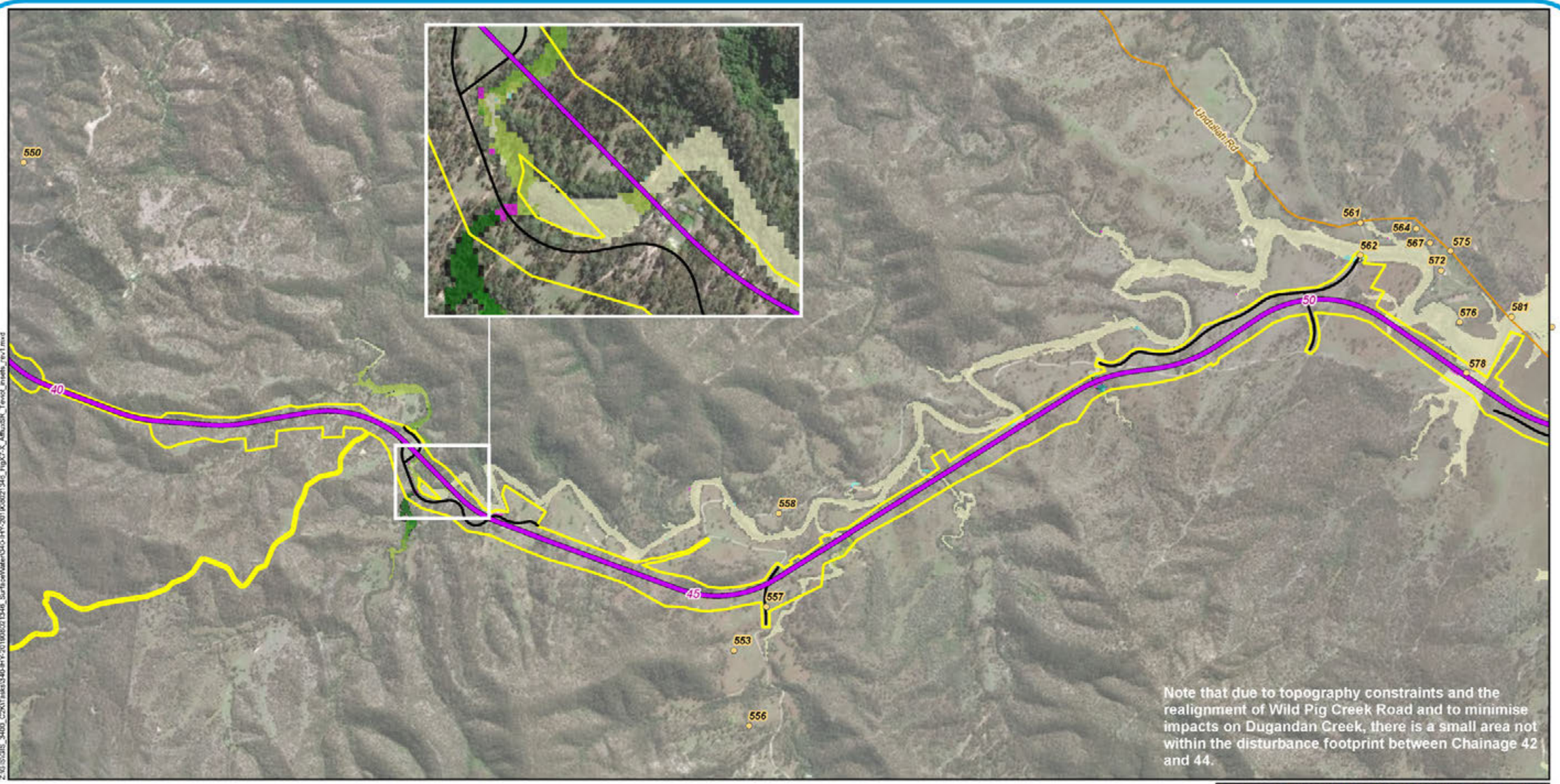
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-E-2: 1% AEP event with 0% blockage afflux and flood sensitive receptors: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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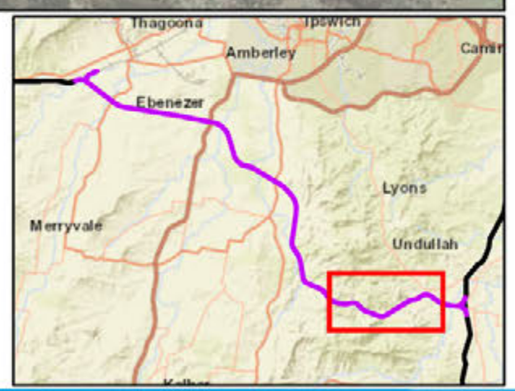
Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

Future Freight
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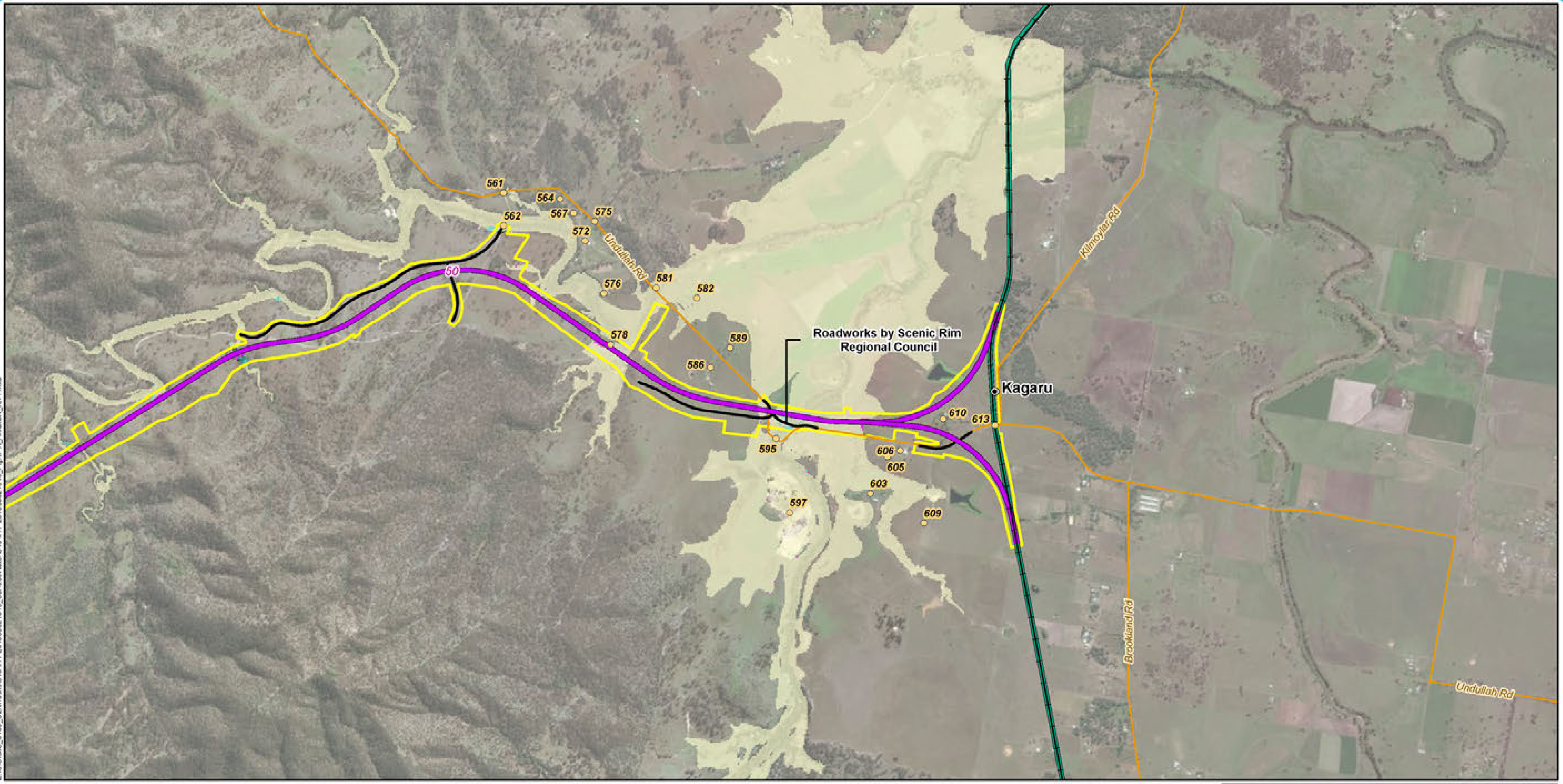
Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-F-1: 1% AEP event with 50% blockage afflux and flood sensitive receptors: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- \> 0.5

A3 scale: 1:30,000

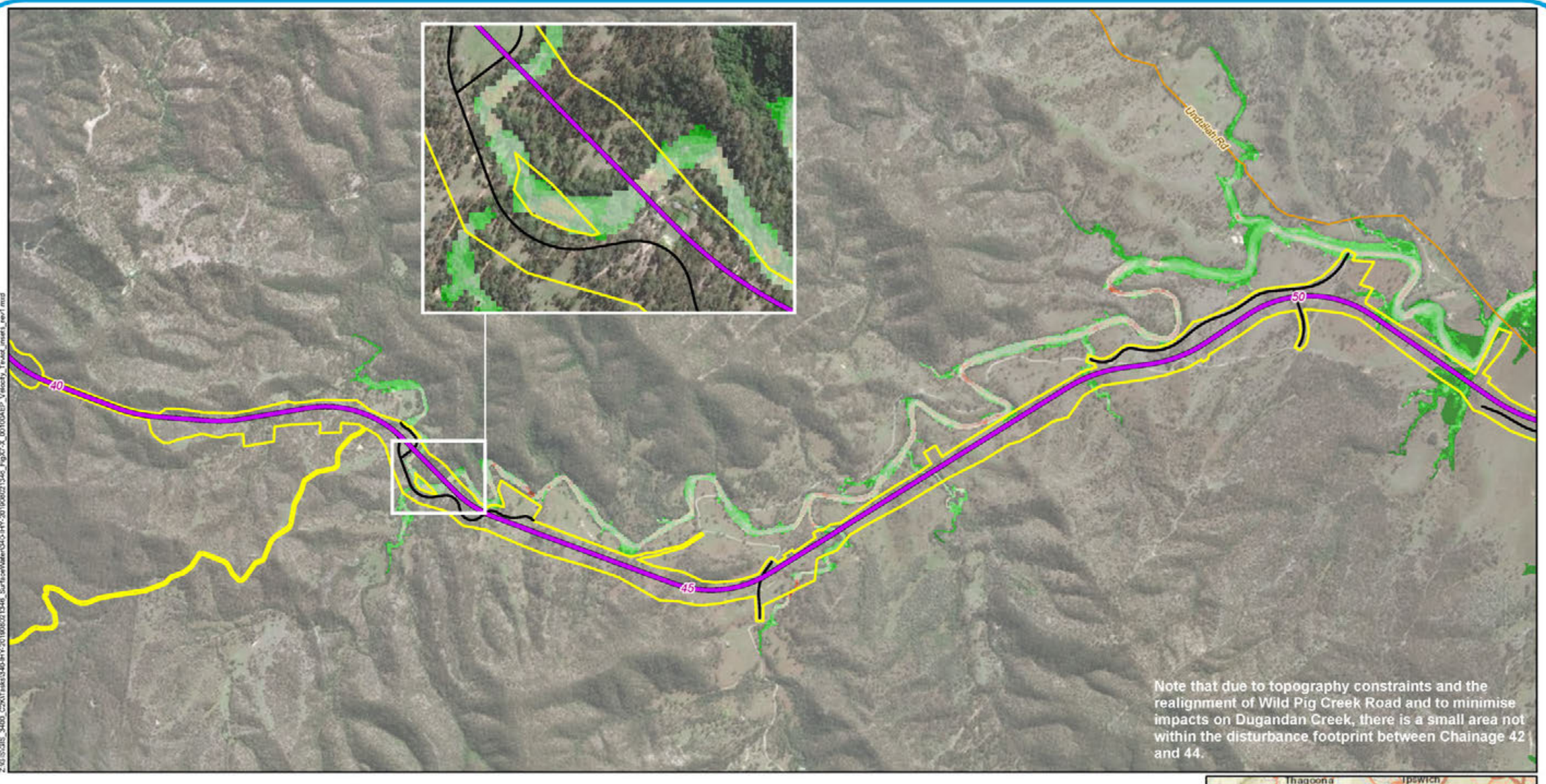
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-F-2: 1% AEP event with 50% blockage afflux and flood sensitive receptors: Teviot Brook



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Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint

Peak velocity (m/s)

- 0.0
- 0.5
- 1.0
- 1.5
- 2.0
- 2.5
- 3.0
- 3.5
- 4.0
- 4.5
- 5.0

A3 scale: 1:30,000

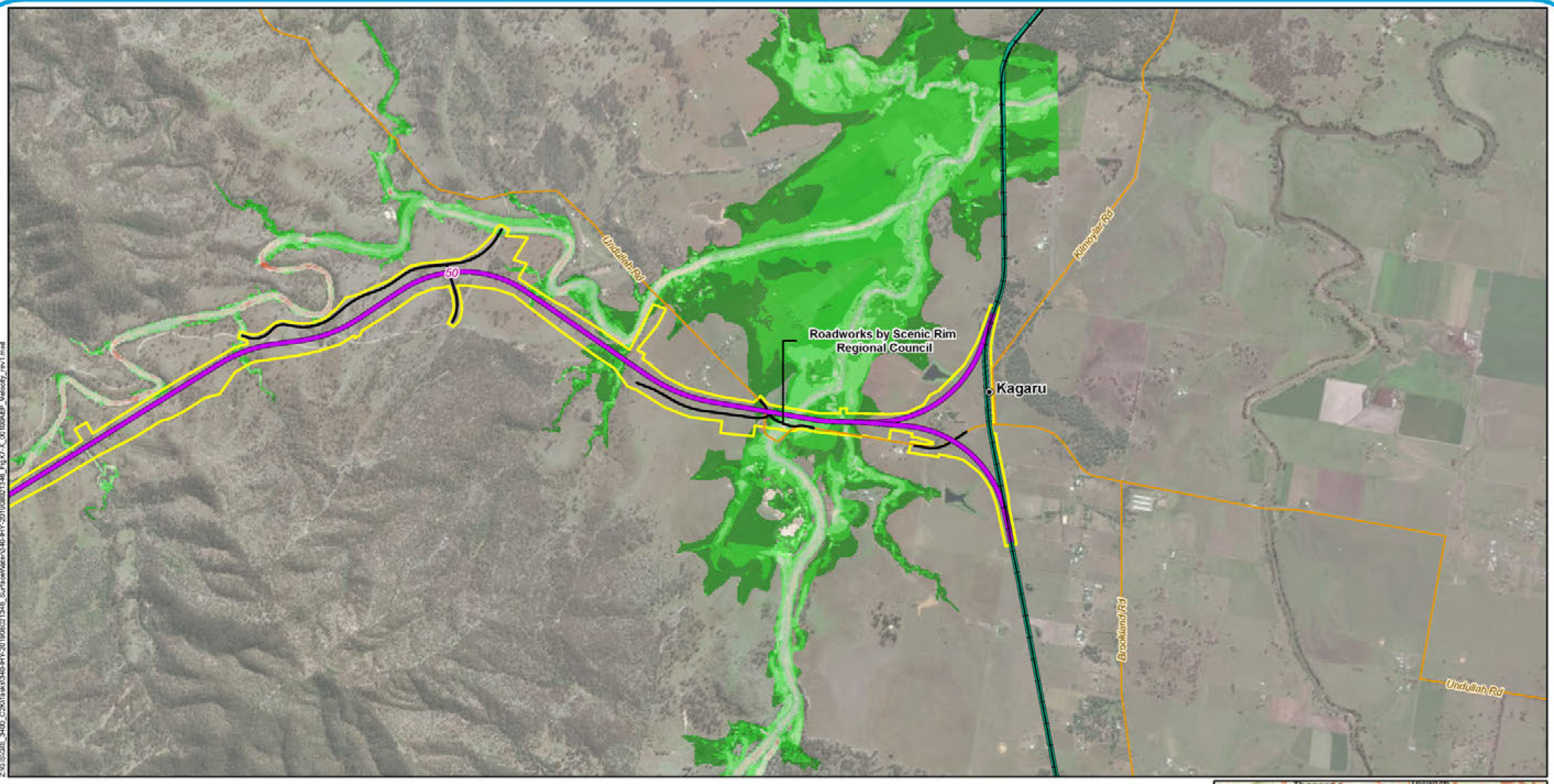
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-G-1: 1% AEP event Developed Case velocity: Teviot Brook



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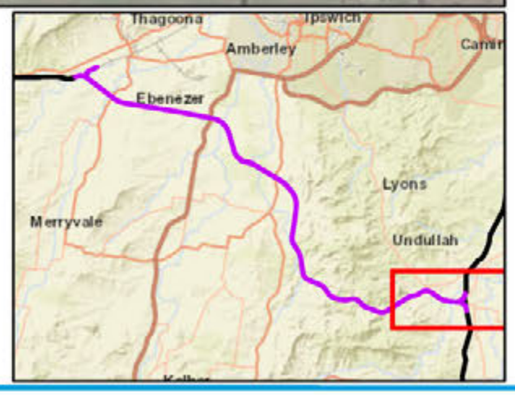
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Minor roads
- Proposed roadworks
- EIS disturbance footprint

Peak velocity (m/s)

- 0.0
- 0.5
- 1.0
- 1.5
- 2.0
- 2.5
- 3.0
- 3.5
- 4.0
- 4.5
- 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

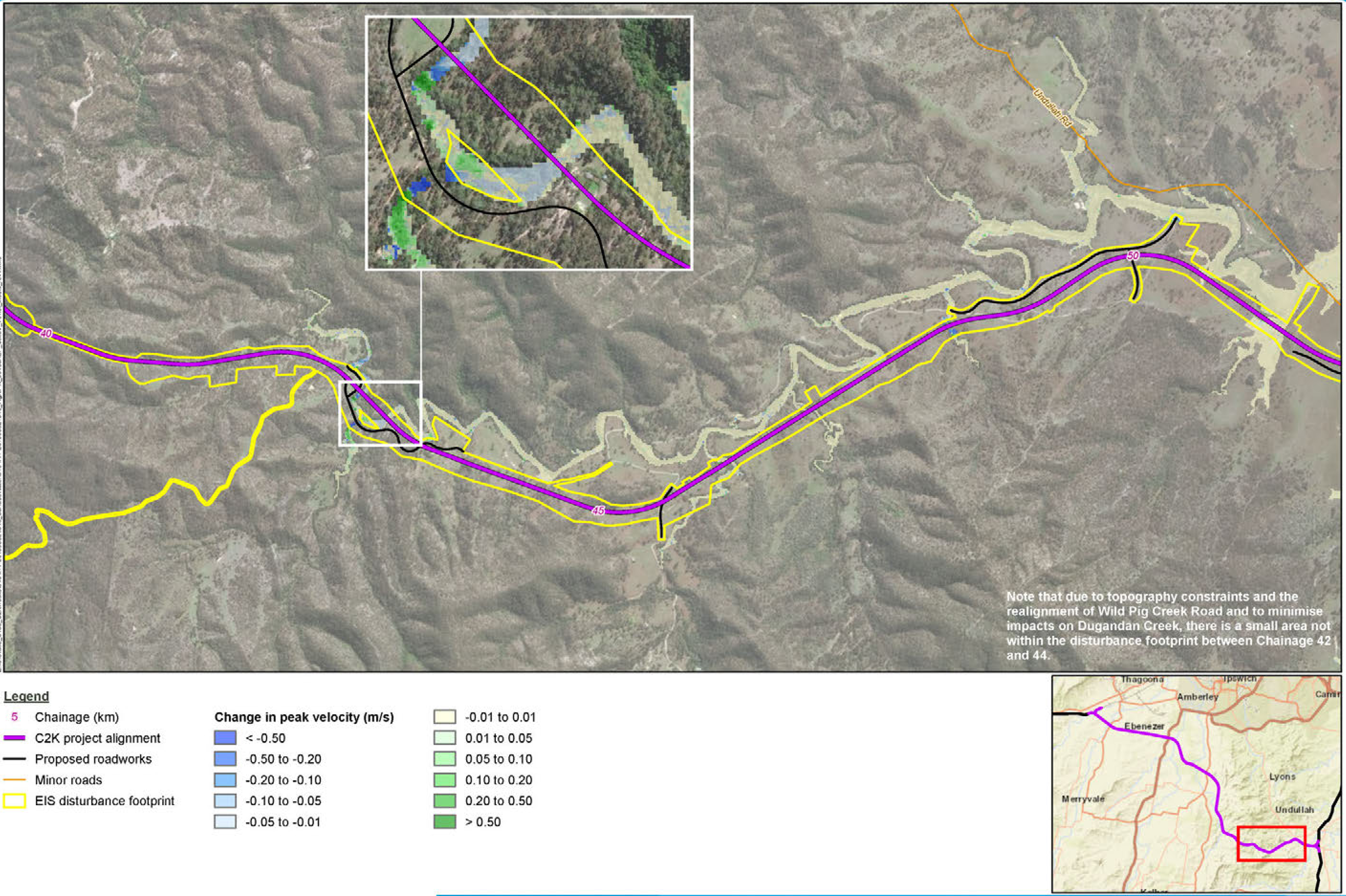
Future Freight
Integrating Community, Environment and Engineering

Issue date: 18/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-G-2: 1% AEP event Developed Case velocity: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint

Change in peak velocity (m/s)

- < -0.50
- -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
- > 0.50

A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

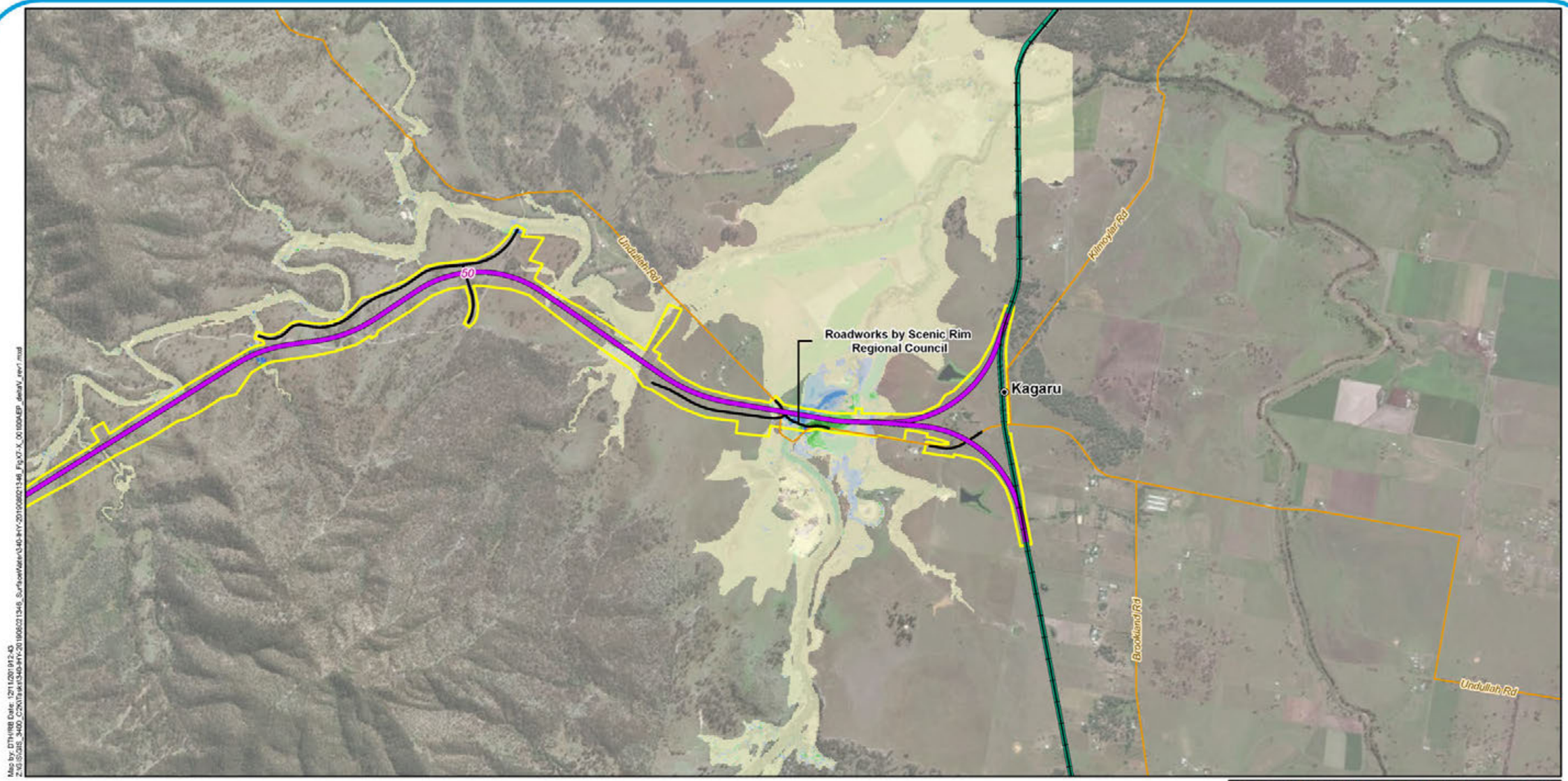
Future Freight
Integrating Community, Environment and Engineering

Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-H-1: 1% AEP event Developed Case difference in velocity: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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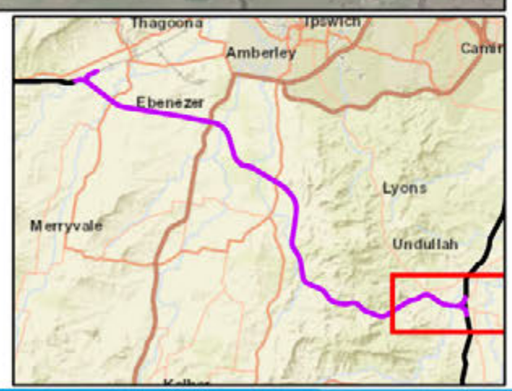
Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint

Change in peak velocity (m/s)

- < -0.50
- -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
- > 0.50



A3 scale: 1:30,000

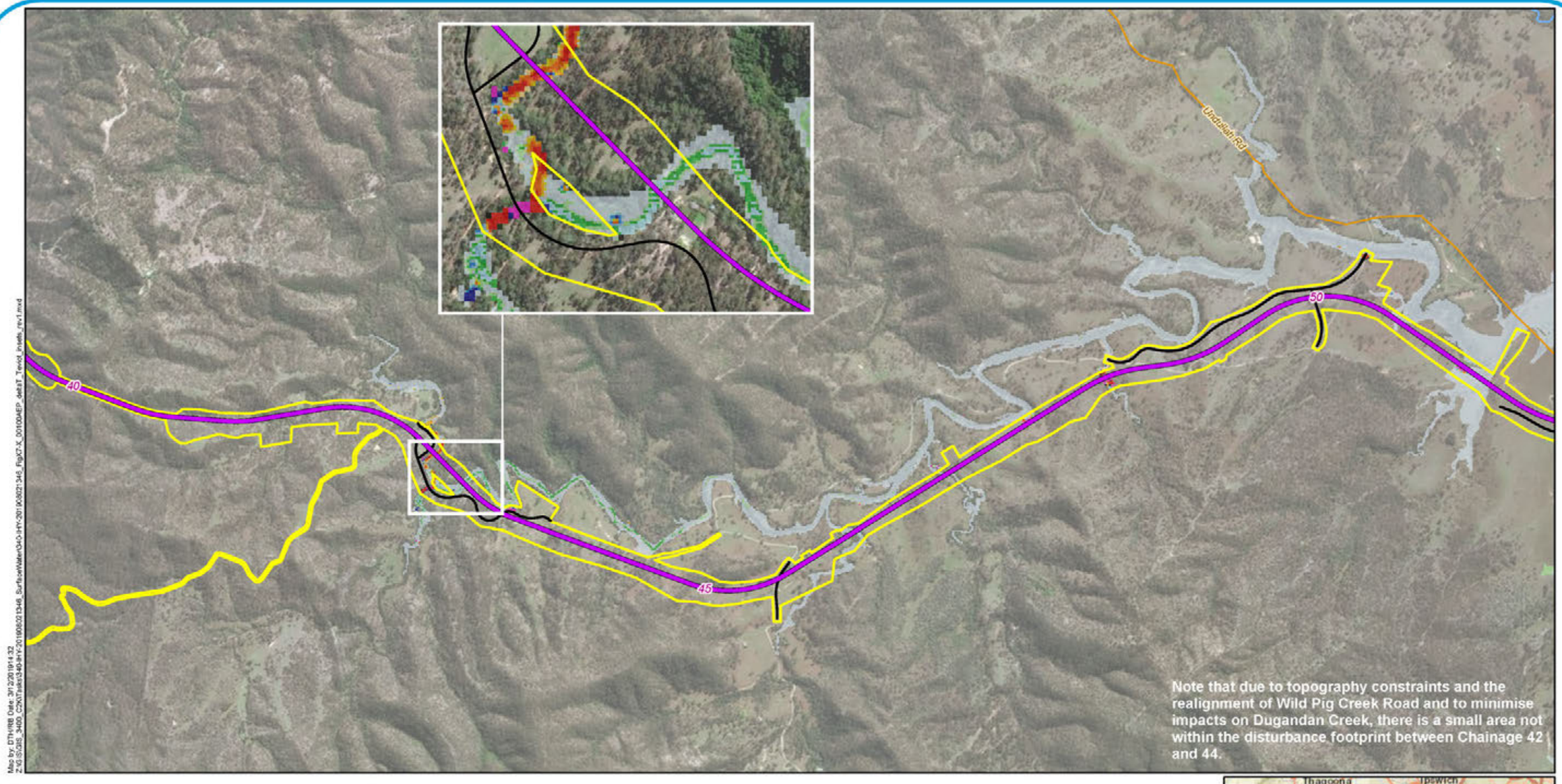
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-H-2: 1% AEP event Developed Case difference in velocity: Teviot Brook



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

Misc by: DTH/RB Date: 3/12/2019 14:32
Z:\GIS\Jobs_3400_C2K\Tasks\3400-HY-20190802\DS46_SurfaceWater\340-HY-20190802-DS46_SurfaceWaterQAQC-HY-20190802-345_RgX7-X_001\00\MXD\340-HY-20190802-345_RgX7-X_001\00MXD_deltaT_Teviot_Inlets_rev1.mxd

Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Difference in Time of Submergence

- Over 10 hour decrease
- Up to 10 hour decrease
- Up to 5 hour decrease
- Up to 2 hour decrease
- Up to 1 hour decrease
- Up to 0.5 hour decrease
- Within 15 minutes
- Up to 0.5 hour increase
- Up to 1 hour increase
- Up to 2 hour increase
- Up to 5 hour increase
- Up to 10 hour increase
- Over 10 hour increase

A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

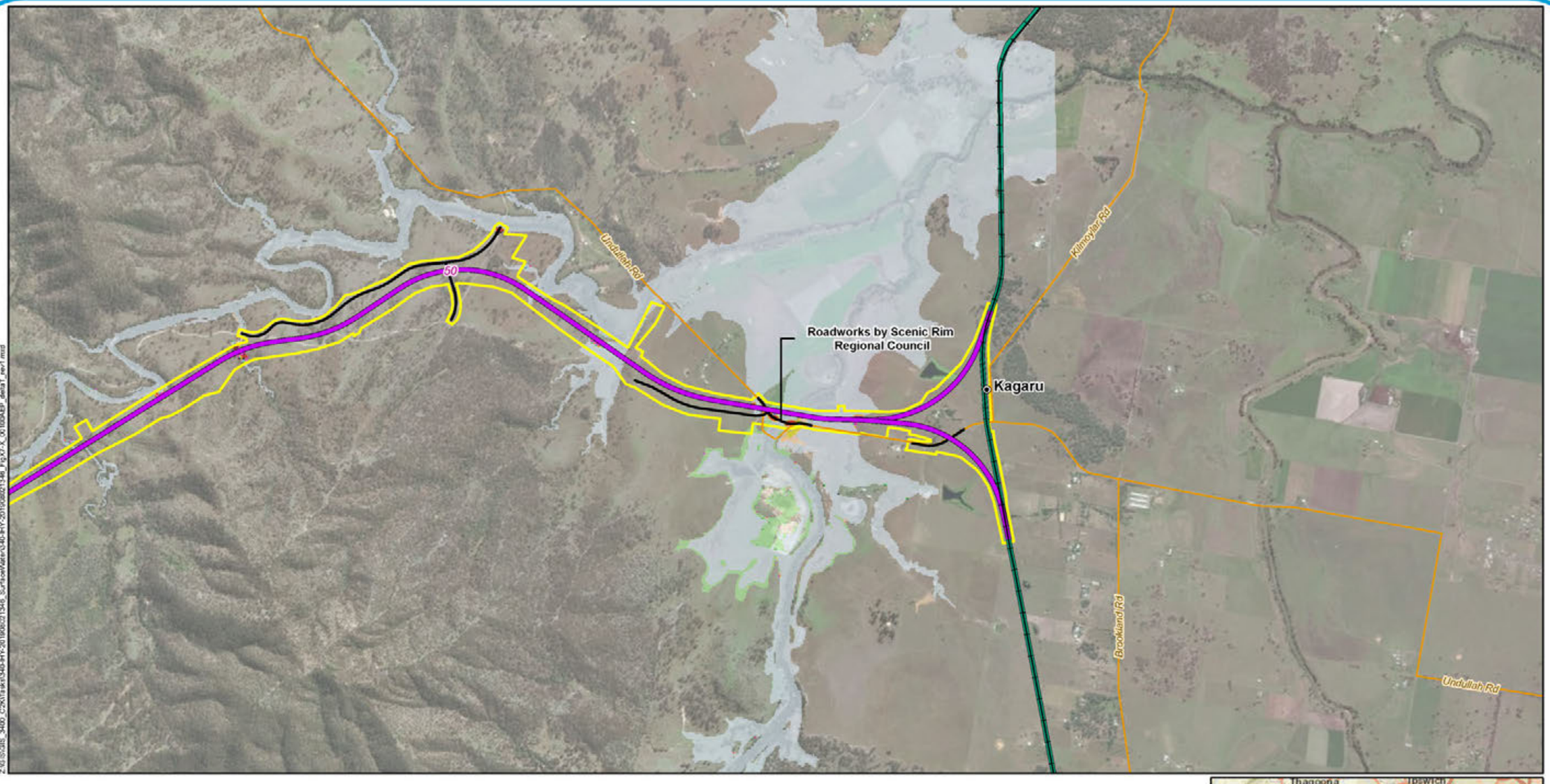
Future Freight
Integrating Community, Environment and Engineering

Issue date: 12/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-I-1: 1% AEP event Developed Case difference in time of submergence: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



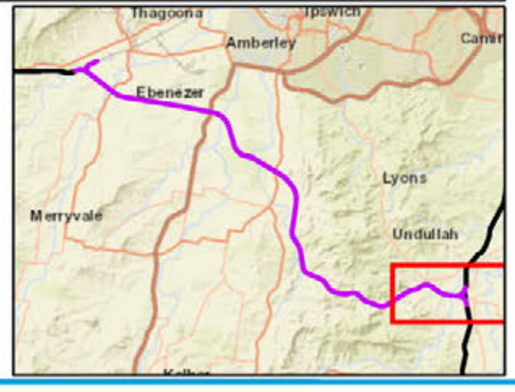
Map by: DTH Date: 8/11/2019 15:15
Z:\GIS\385_3400_C2K\Tasks\340-RHY-20190802\346_SurfaceWater\3-40-RHY-20190802\346_Fig.X7-X_001600AEP_deltaT_rev1.mxd

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Difference in Time of Submergence

- Over 10 hour decrease
- Up to 10 hour decrease
- Up to 5 hour decrease
- Up to 2 hour decrease
- Up to 1 hour decrease
- Up to 0.5 hour decrease
- Within 15 minutes
- Up to 0.5 hour increase
- Up to 1 hour increase
- Up to 2 hour increase
- Up to 5 hour increase
- Up to 10 hour increase
- Over 10 hour increase



A3 scale: 1:30,000

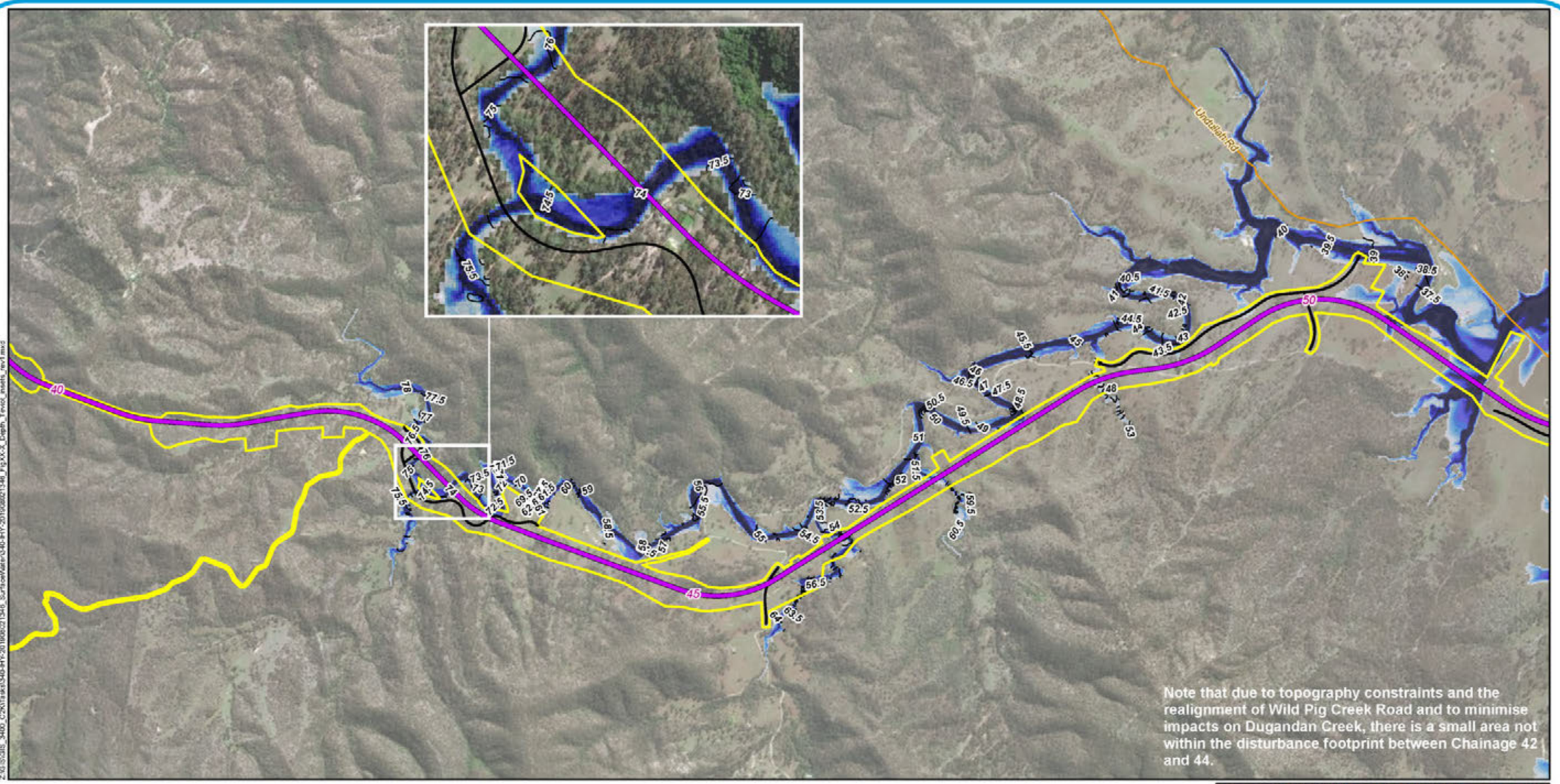
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D7-I-2: 1% AEP event Developed Case difference in time of submergence: Teviot Brook



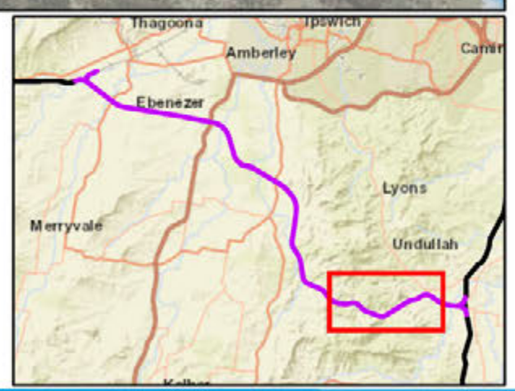
Misc by: DTH Date: 19/11/2019 15:46
Z:\GIS\285_3400_C2K\Tasks\3400-tHY-20190821346_Fig XX-X_Depth_Teviot_Insets_rev1.mxd

Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1 km

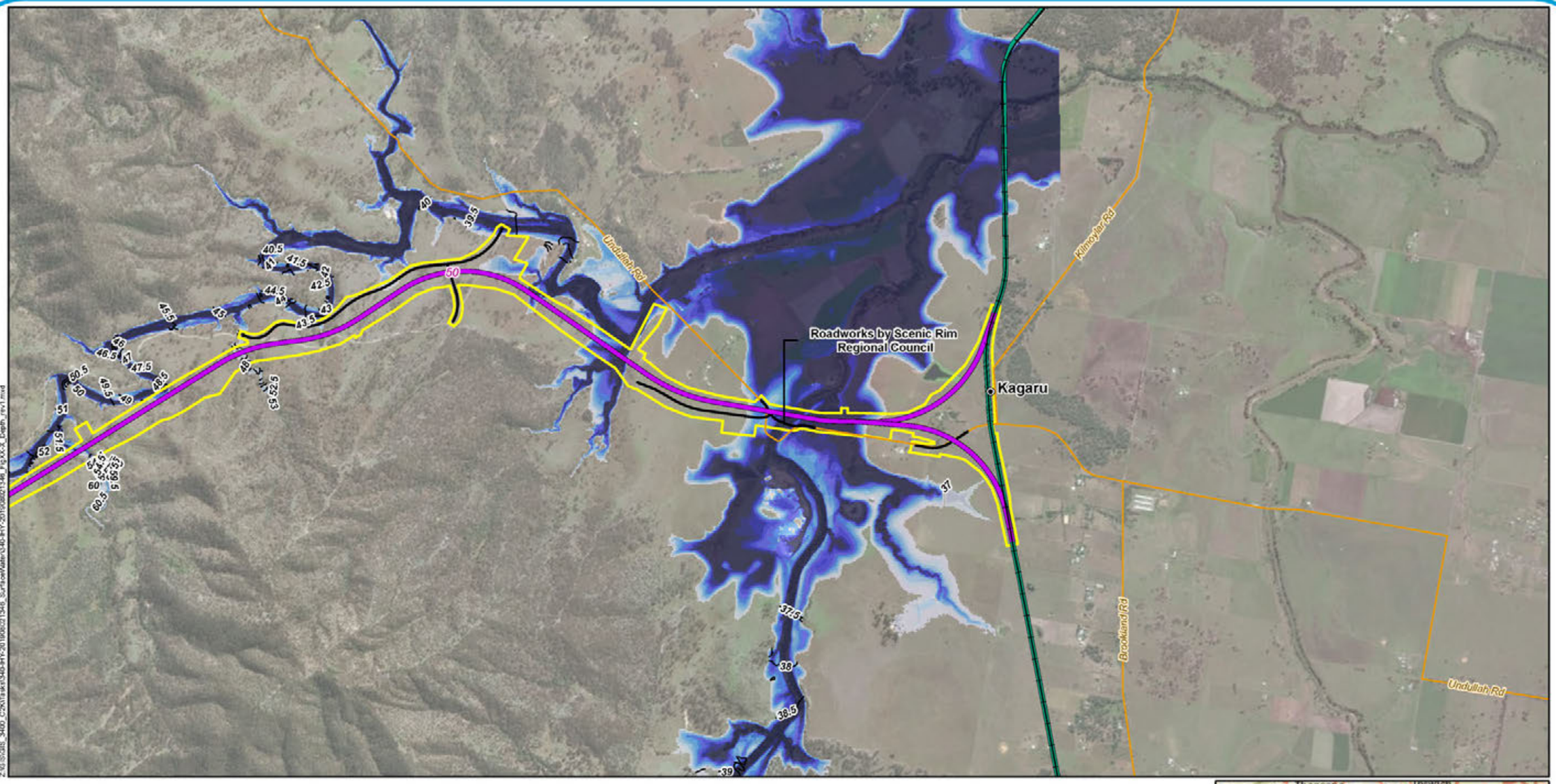
Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D8-A-1: 1 in 2,000 AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Misc by: DTH/RB Date: 12/11/2019 11:35
Z:\GIS\GIS_3400_C2K\Maps\3400-RHY-20190802\1348_SurfaceWater\3400-RHY-20190802\1348_Fig XX-X_Depth_rev1.mxd

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

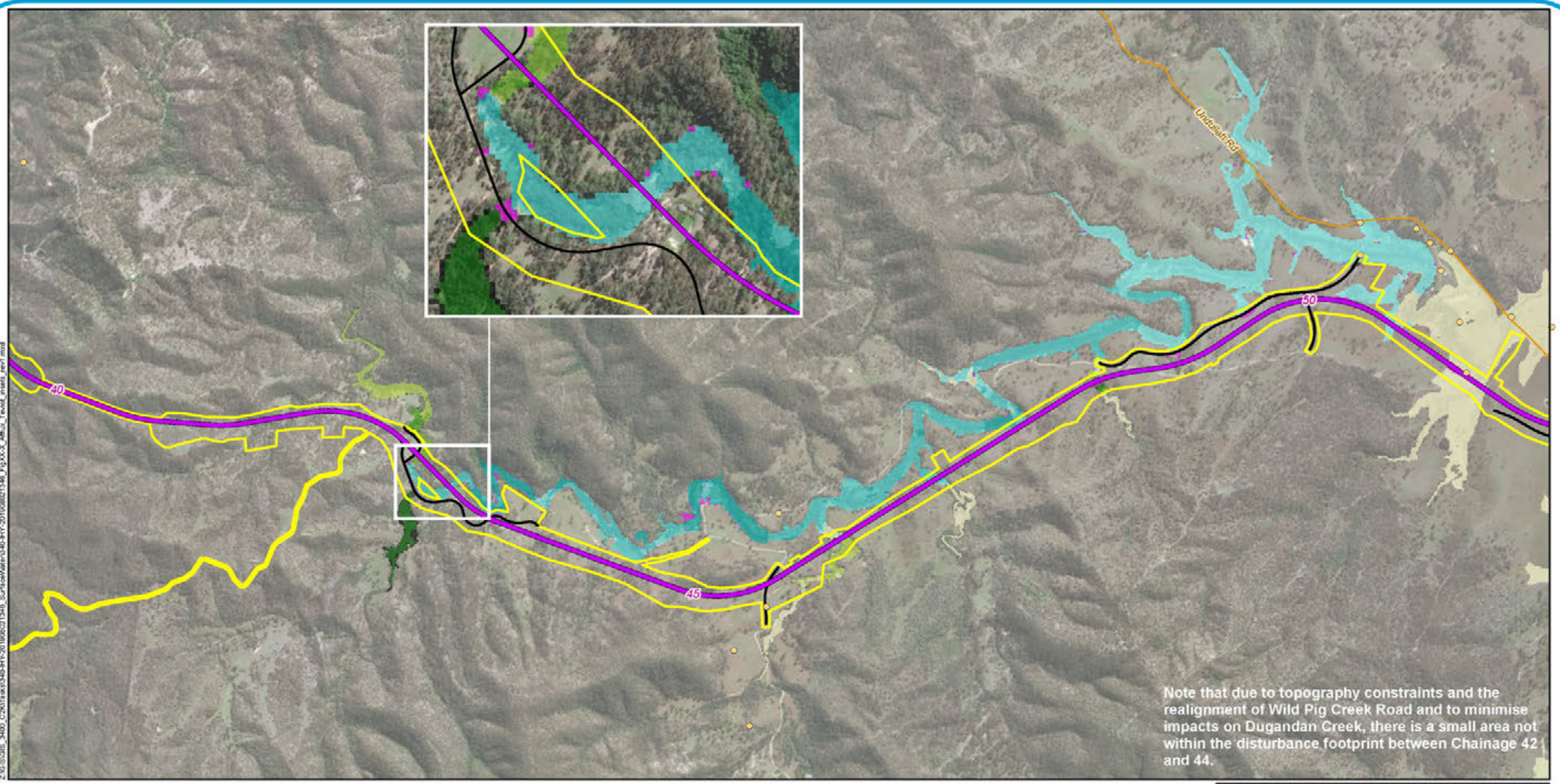
Future Freight
Integrating Community, Environment and Engineering

Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D8-A-2: 1 in 2,000 AEP event Existing Case inundation extent: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

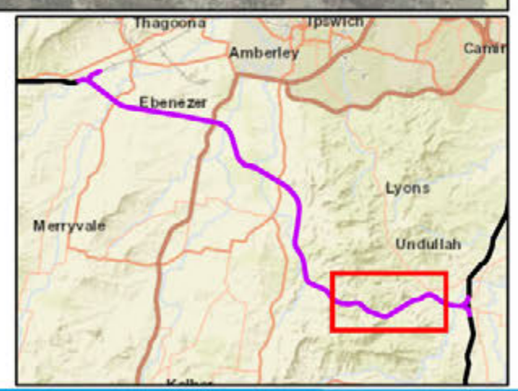
Misc by: DTH Date: 27/11/2019 11:34
Z:\GIS\285_3400_C2K\Tasks\3400-RHY-20190802\1346_Fig XX-X_Afflux_Teviot_insets_rev1.mxd

Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

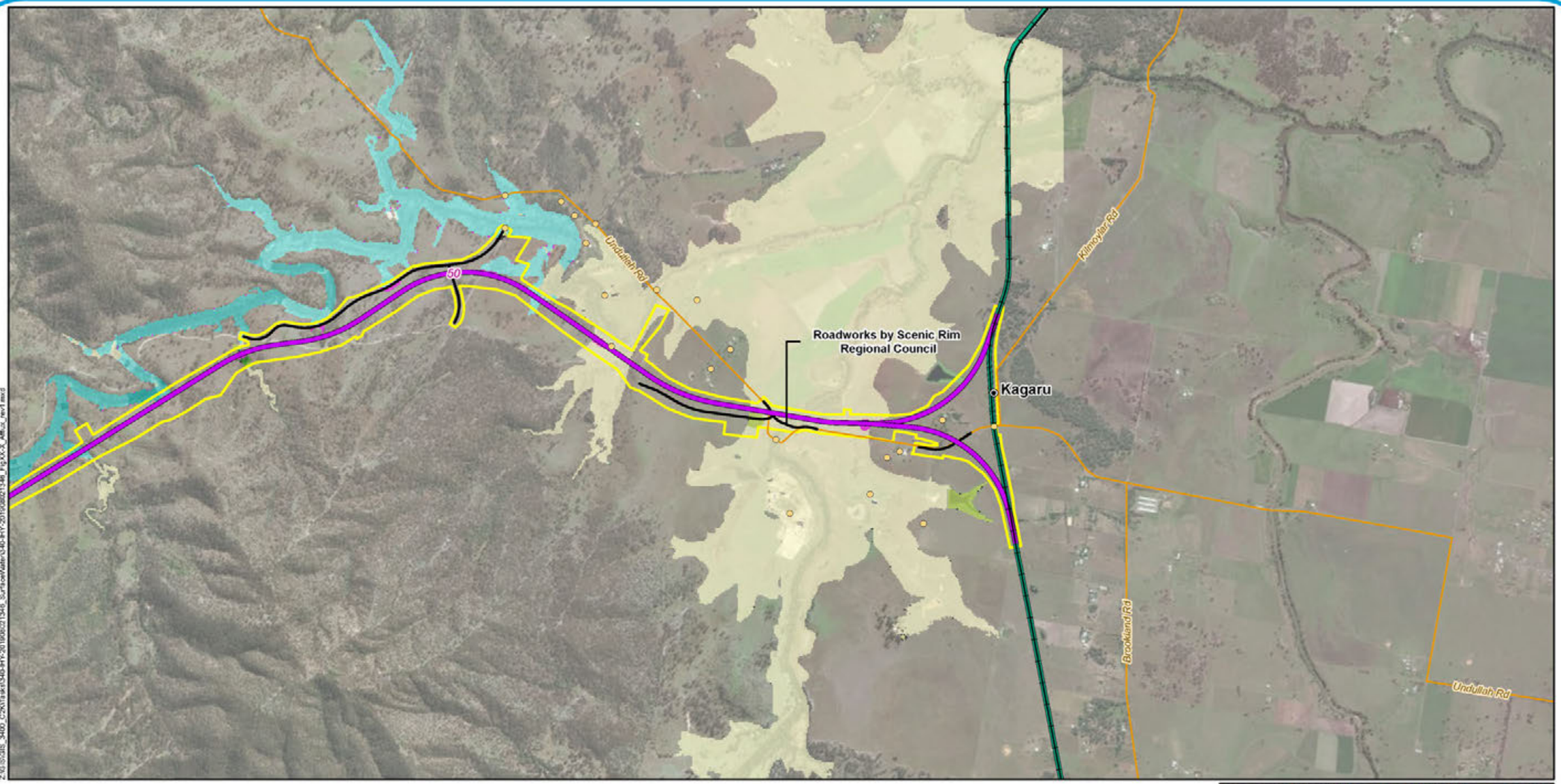
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D8-B-1: 1 in 2,000 AEP event Developed Case afflux: Teviot Brook



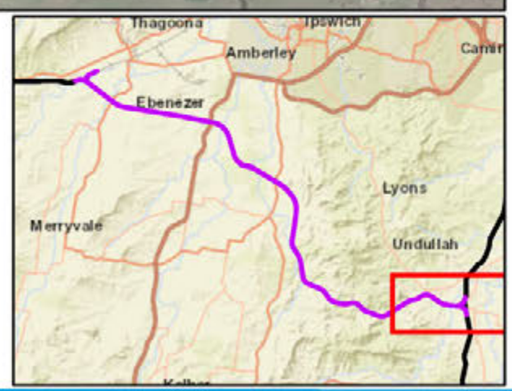
Misc by: DTH/RB Date: 11/11/2019 21:22
Z:\GIS\285_3400_C2K\Tasks\349-IHY-20190802\1348_Fig XX-X_Afflux_rev1.mxd

Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

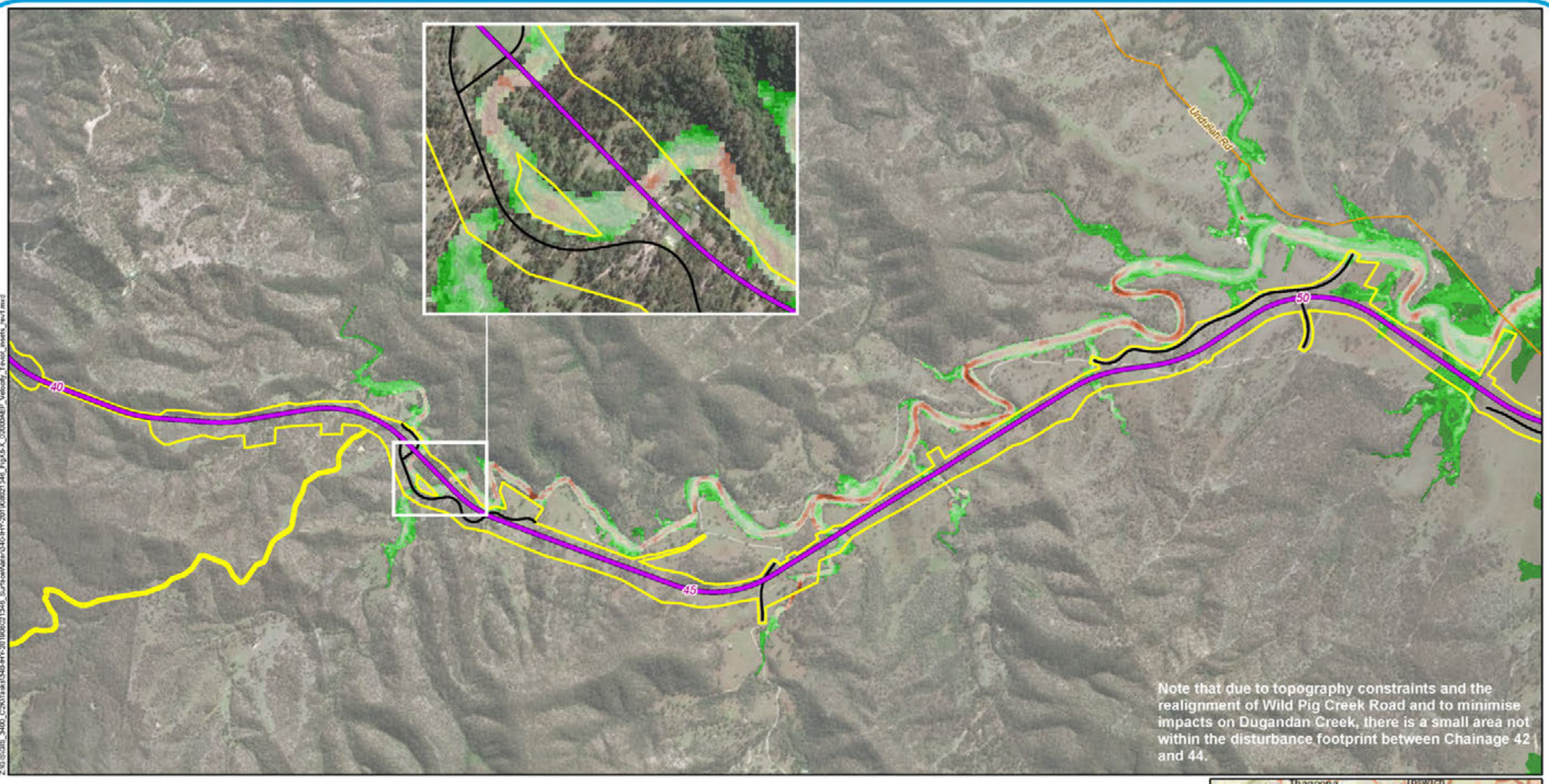
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D8-B-2: 1 in 2,000 AEP event Developed Case afflux: Teviot Brook



Map by: DTH/RB Date: 2/12/2019 12:14
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Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint

Peak velocity (m/s)

- 0.0
- 0.5
- 1.0
- 1.5
- 2.0
- 2.5
- 3.0
- 3.5
- 4.0
- 4.5
- 5.0

A3 scale: 1:30,000

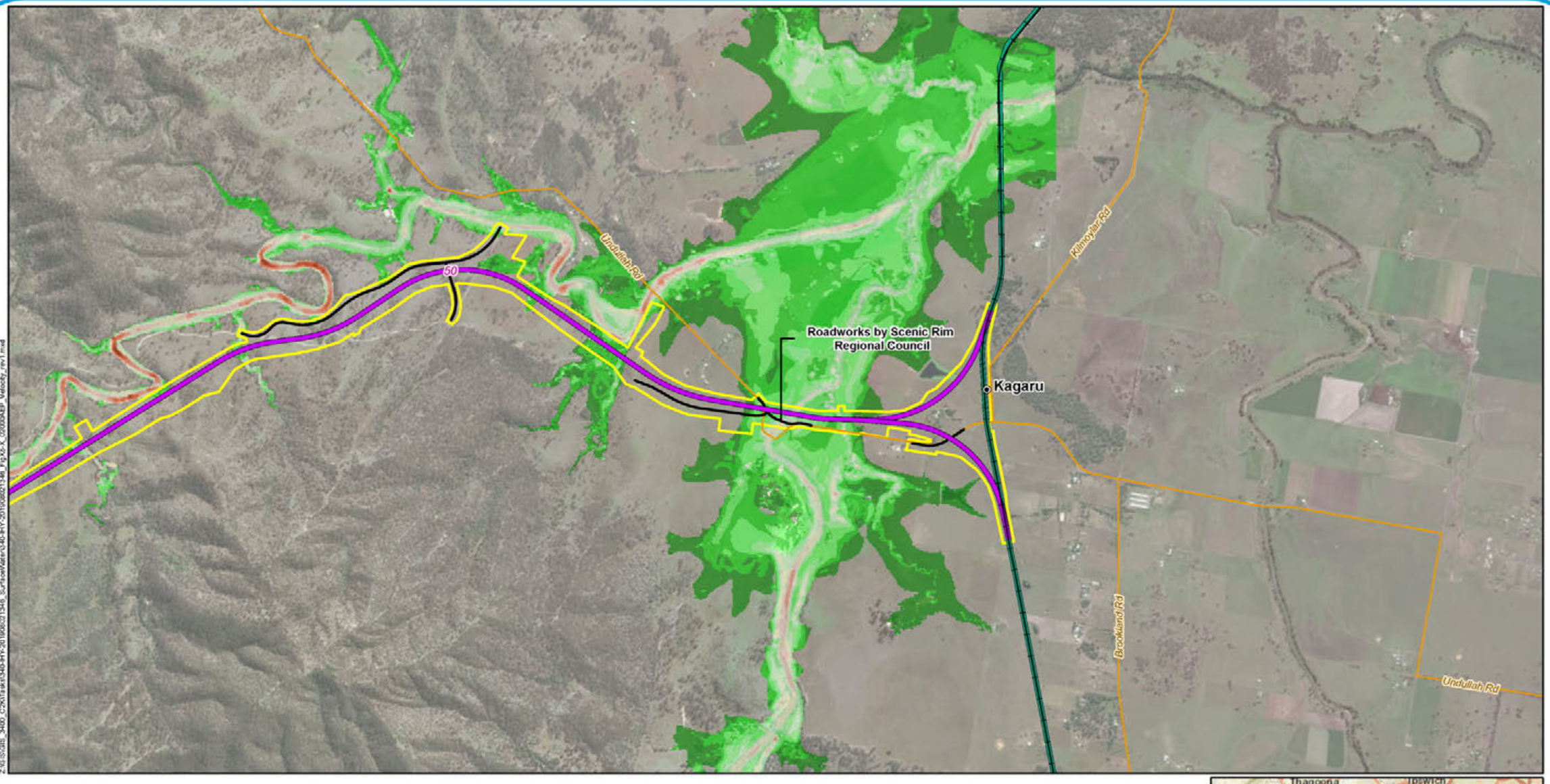
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 02/12/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D8-C-1: 1 in 2000 AEP event Developed Case velocity: Teviot Brook



Map by: DTH Date: 12/11/2019 13:16
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Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Major roads
- Minor roads
- EIS disturbance footprint

Peak velocity (m/s)

- 0.0
- 0.5
- 1.0
- 1.5
- 2.0
- 2.5
- 3.0
- 3.5
- 4.0
- 4.5
- 5.0

A3 scale: 1:30,000

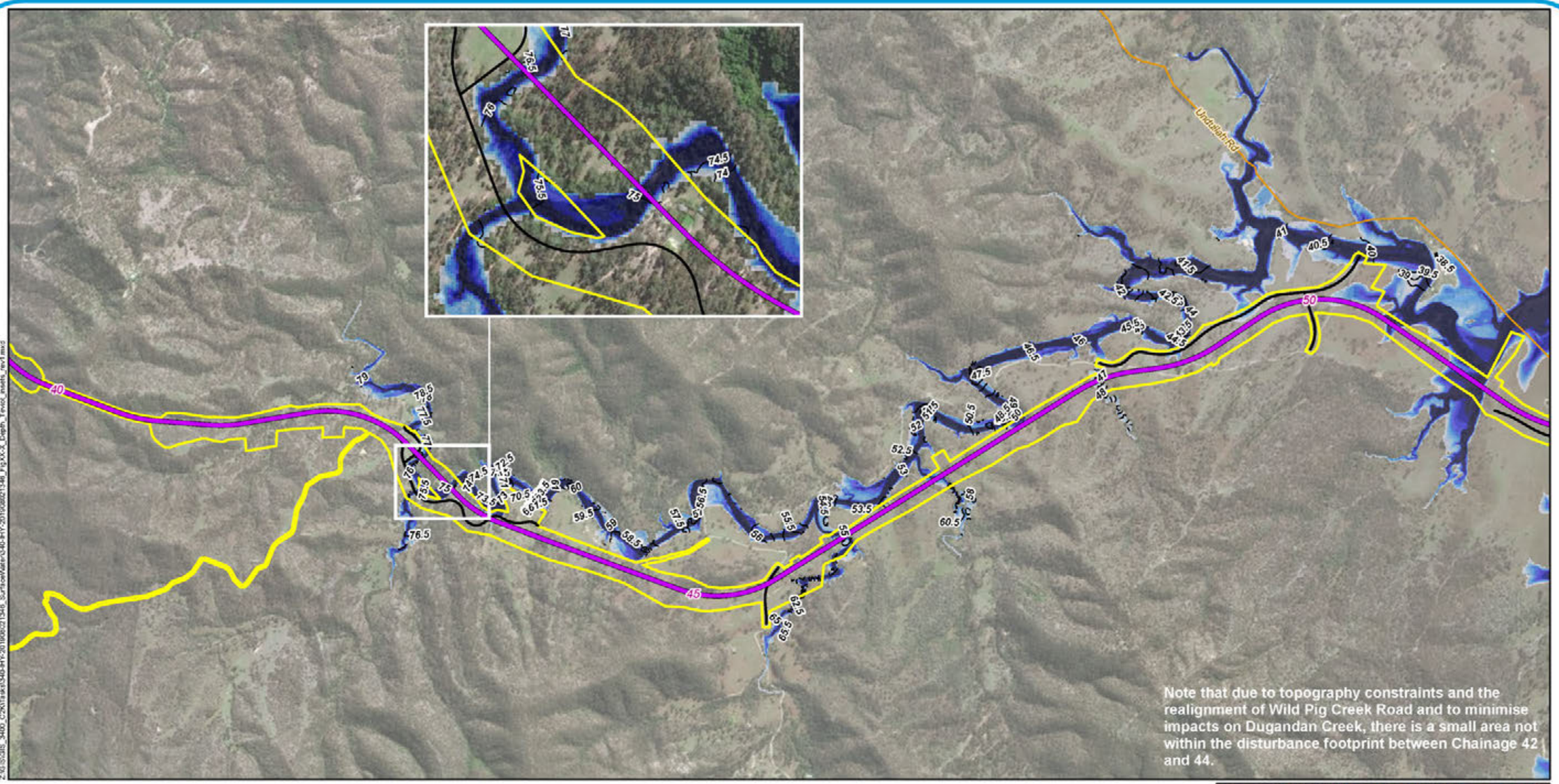
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D8-C-2: 1 in 2000 AEP event Developed Case velocity: Teviot Brook



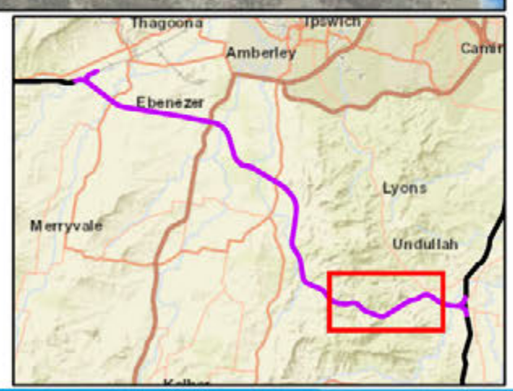
Misc by: DTH Date: 19/11/2019 15:46
Z:\GIS\285_3400_C2K\Tasks\3400-tHY-20190802\1346_Fig XX-X_Depth_Teviot_Insets_rev1.mxd

Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

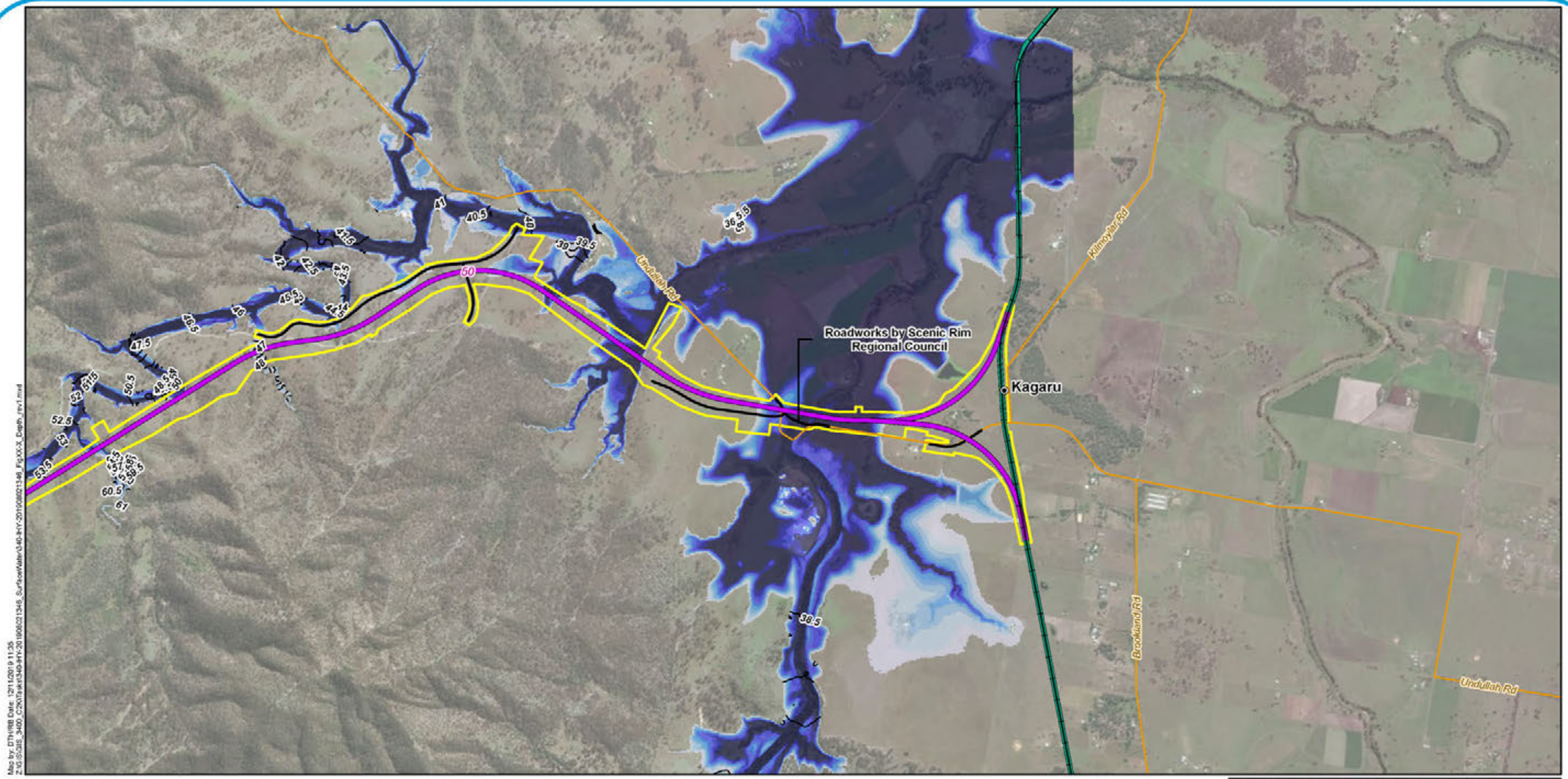
0 0.2 0.4 0.6 0.8 1 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D9-A-1: 1 in 10,000 AEP event Existing Case inundation extent: Teviot Brook



Misc by: DTH/RB Date: 12/11/2019 11:35
Z:\GIS\285_3400_C2K\Tasks\349-WY-20190821348_SurfaceWater\349-WY-20190821348_Fig XX-X_Depth_rev1.mxd

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0

A3 scale: 1:30,000

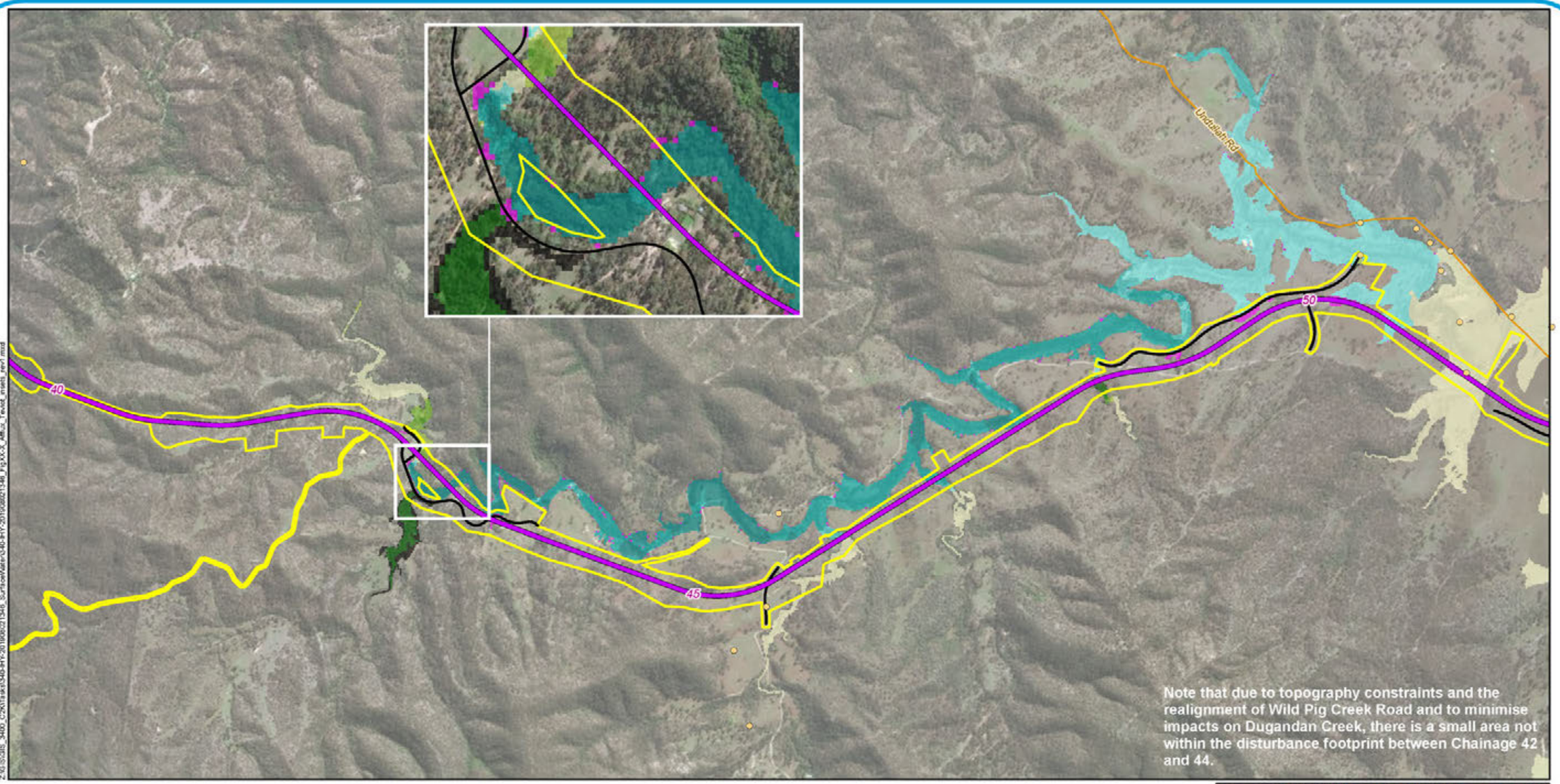
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D9-A-2: 1 in 10,000 AEP event Existing Case inundation extent: Teviot Brook



Note that due to topography constraints and the realignment of Wild Pig Creek Road and to minimise impacts on Dugandan Creek, there is a small area not within the disturbance footprint between Chainage 42 and 44.

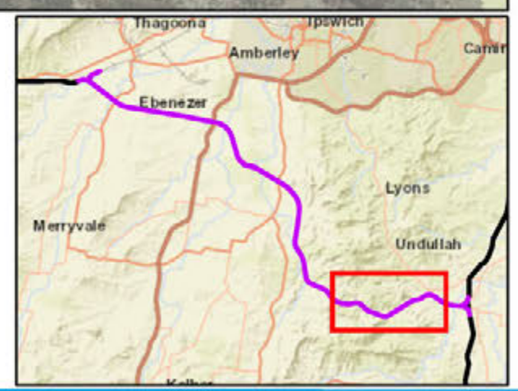
Misc by: DTH Date: 27/11/2019 11:34
Z:\GIS\285_3400_C2K\Tasks\3400-RHY-20190802\1346_Fig XX-X_Afflux_Teviot_insets_rev1.mxd

Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

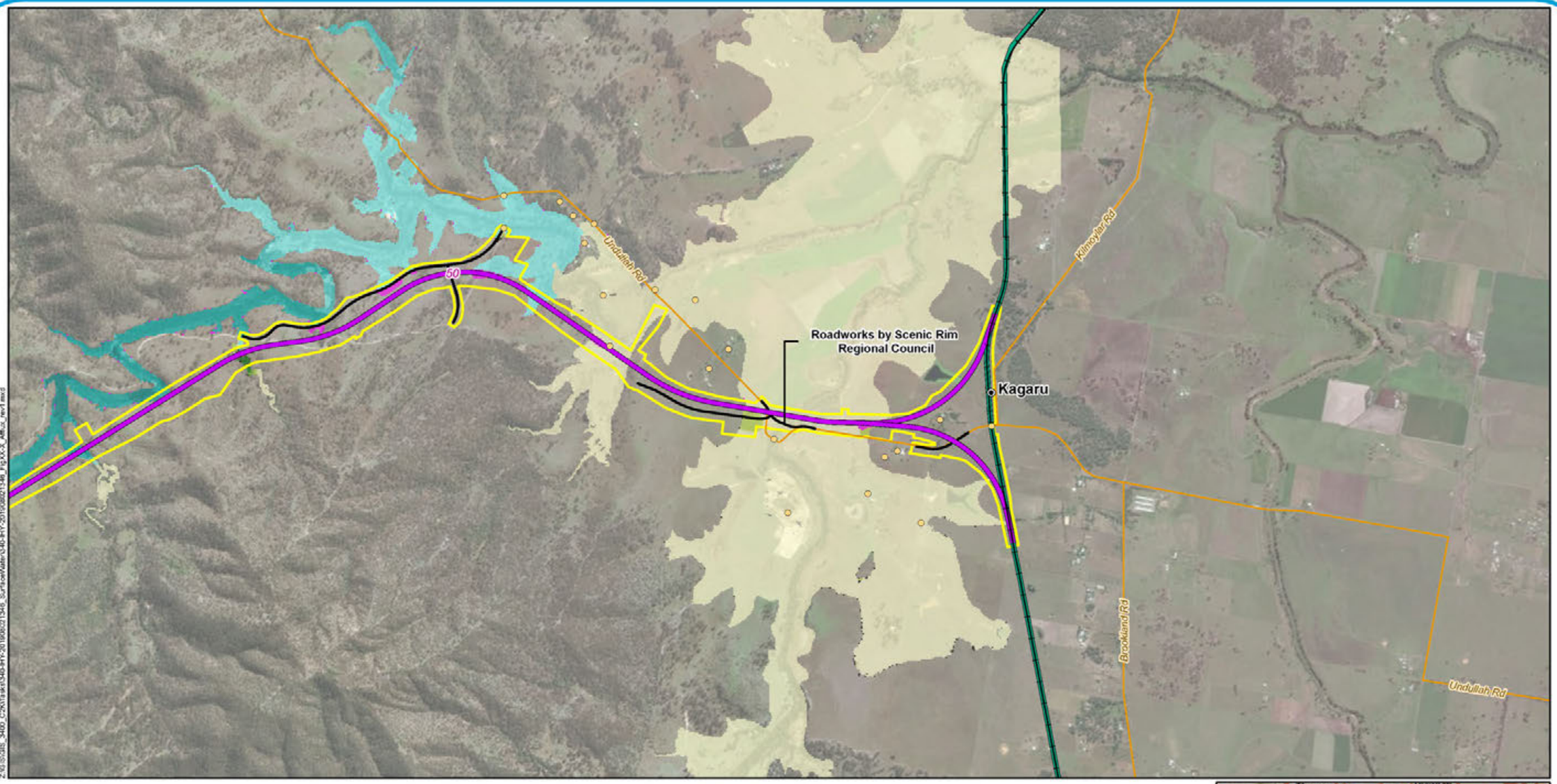
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D9-B-1: 1 in 10,000 AEP event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTH/RB Date: 11/11/2019 21:22
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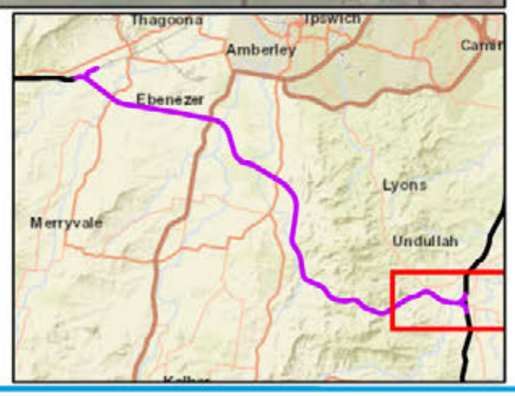
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

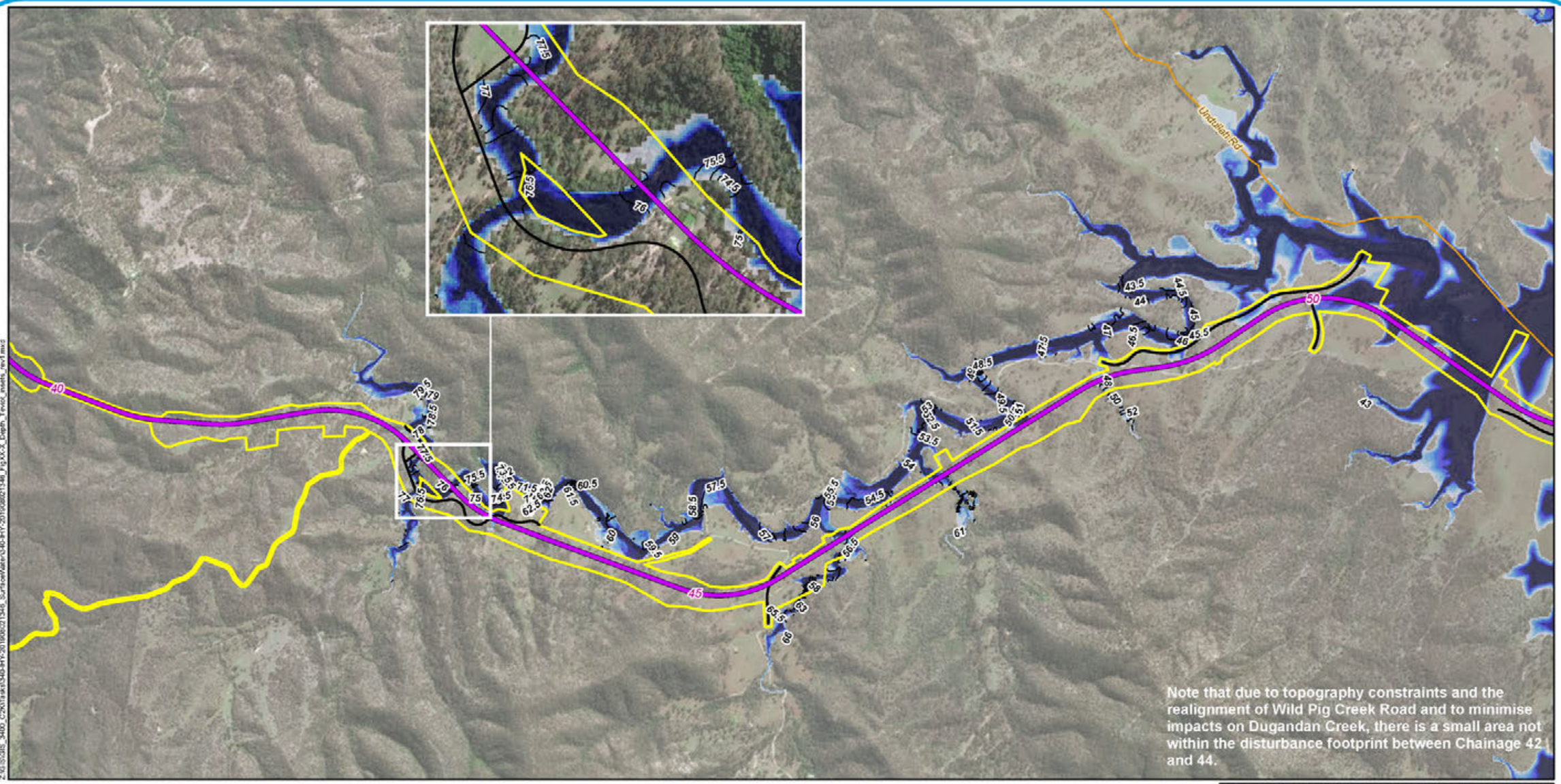
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Communities, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D9-B-2: 1 in 10,000 AEP event Developed Case afflux: Teviot Brook



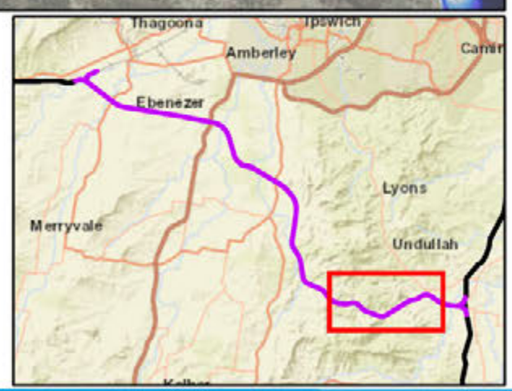
Misc by: DTH Date: 19/11/2019 15:46
Z:\GIS\285_3400_C2K\Tasks\3400-tHY-20190822\346_Fig XX-X_Depth_Teviot_Insets_rev1.mxd

Legend

- 5 Chainage (km)
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

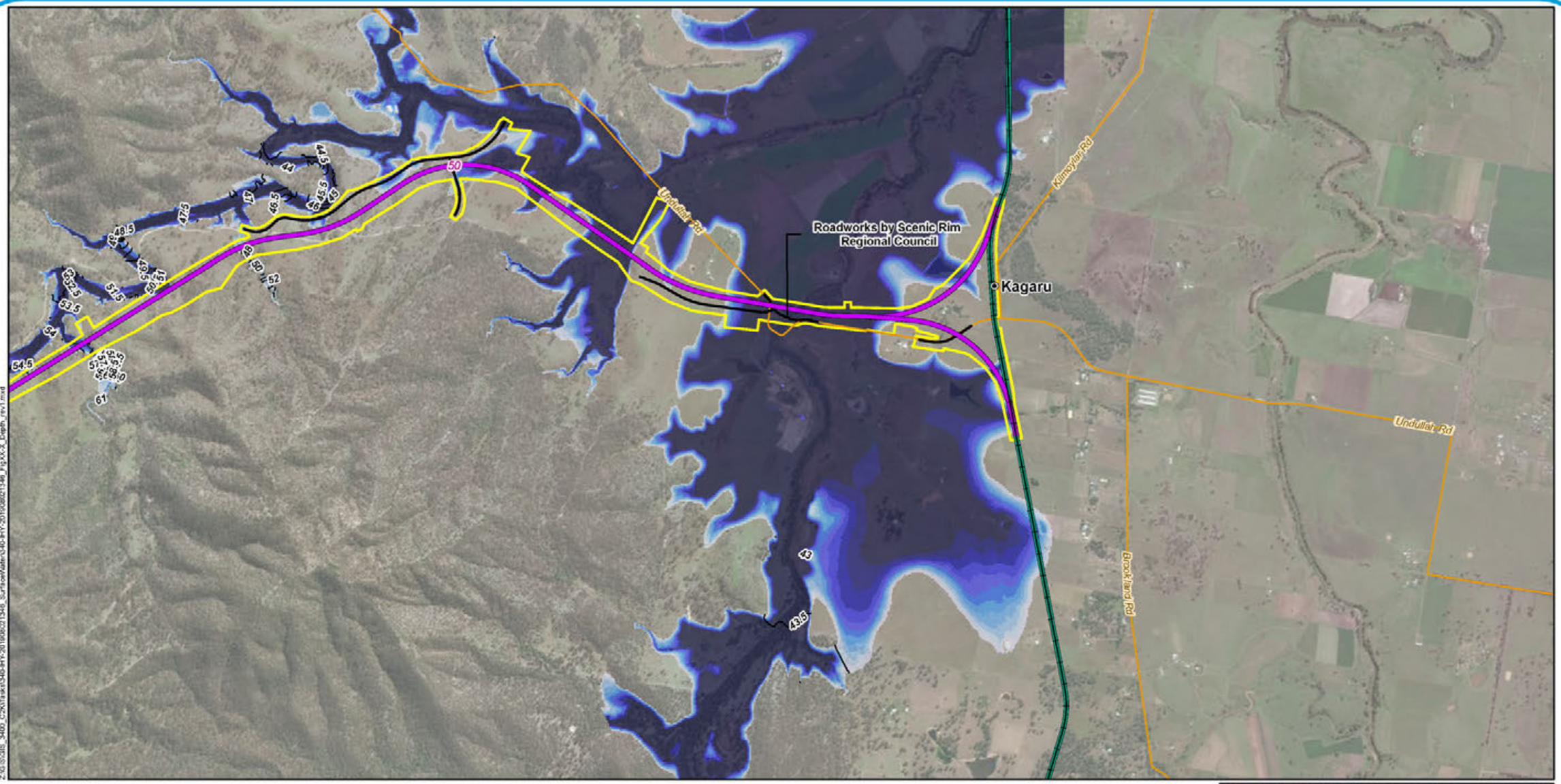
0 0.2 0.4 0.6 0.8 1 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 19/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D10-A-1: PMF event Existing Case inundation extent: Teviot Brook



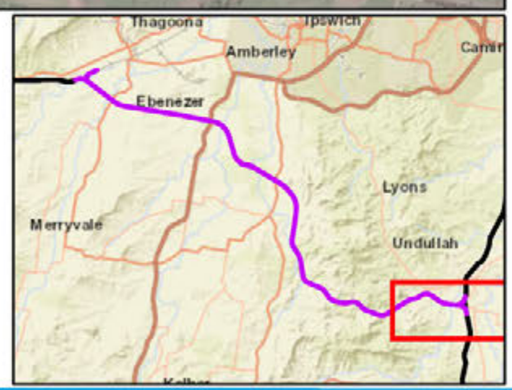
Misc by: DTH/RB Date: 12/11/2019 11:35
Z:\GIS\285_3400_C2K\Tasks\340-WY-20190821346_Fig XX-X_Depth_rev1.mxd

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- 0.5m contour mAHD

Depth (m)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5
- 3.5 - 4.0
- 4.0 - 4.5
- 4.5 - 5.0
- > 5.0



A3 scale: 1:30,000

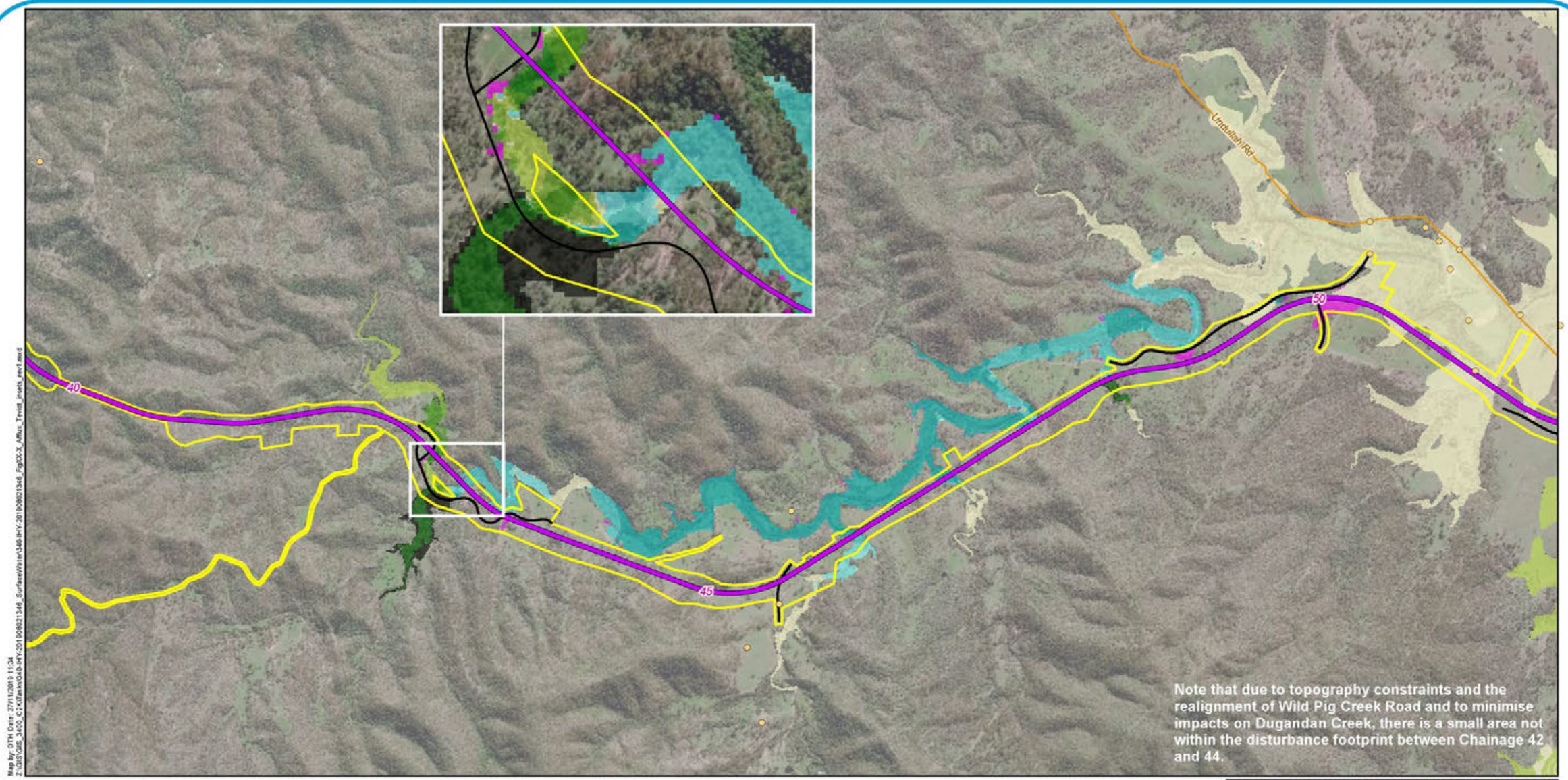
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 07/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D10-A-2: PMF event Existing Case inundation extent: Teviot Brook

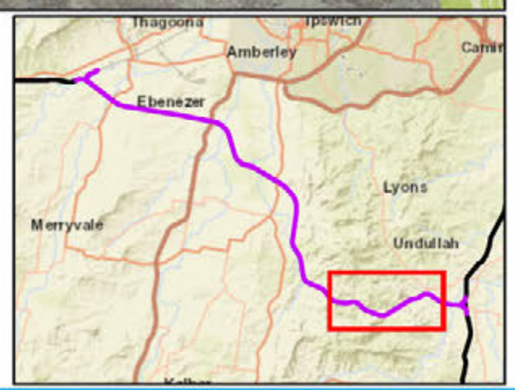


Legend

- 5 Chainage (km)
- Flood sensitive receptors
- C2K project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

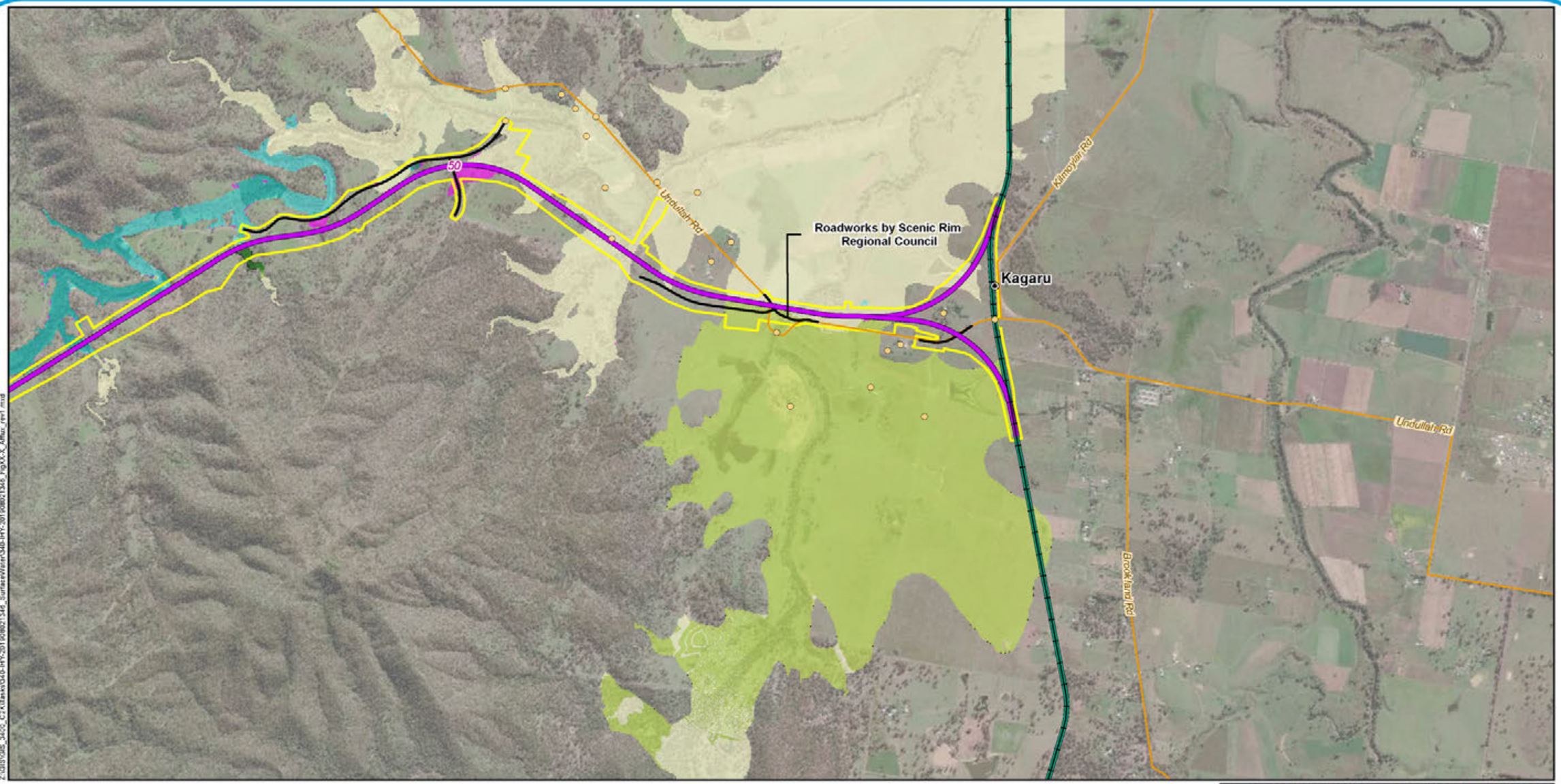
Future Freight
Integrating Community, Environment and Engineering

Issue date: 27/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D10-B-1: PMF event Developed Case afflux: Teviot Brook

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: OTHURB Date: 12/11/2019 14:22
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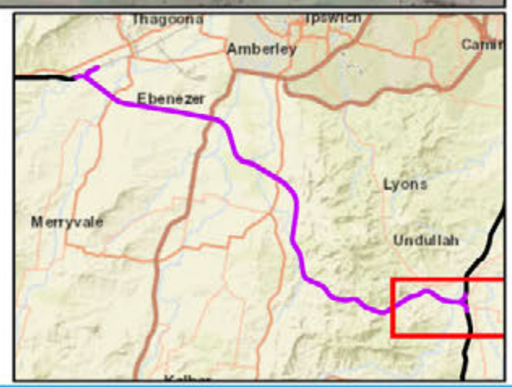
Legend

- 5 Chainage (km)
- Localities
- Flood sensitive receptors
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Proposed roadworks
- Minor roads
- EIS disturbance footprint
- Was Wet Now Dry
- Was Dry Now Wet

Change in peak water levels (m)

- < -0.5
- -0.5 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- > 0.5



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 08/11/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru

Figure D10-B-2: PMF event Developed Case afflux: Teviot Brook

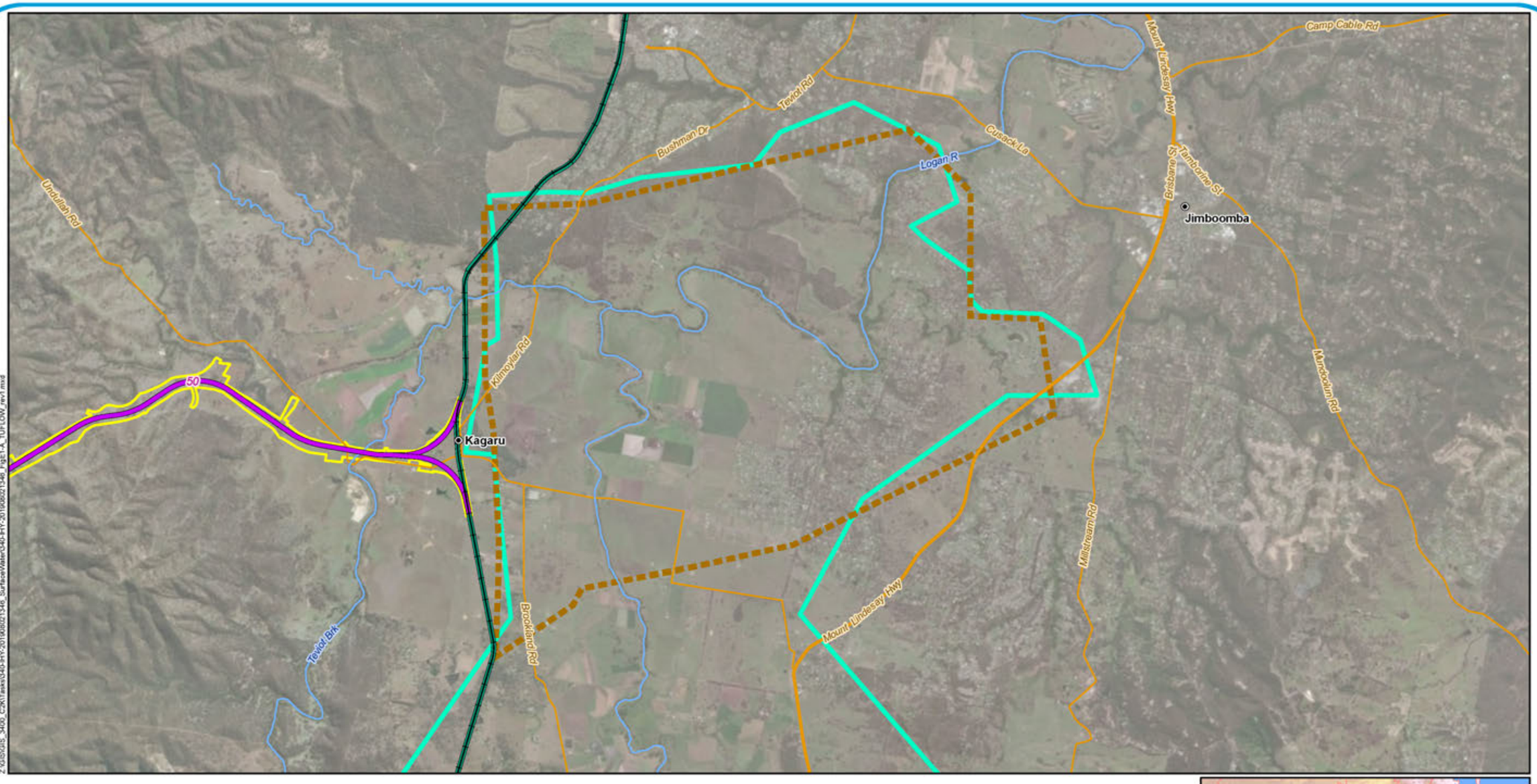
APPENDIX N

Hydrology and Flooding Technical Report

Appendix E Logan River Figures

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

IR_1381



Legend

- 5 Chainage (km)
- Localities
- Existing rail
- C2K project alignment
- K2ARB project alignment
- Major roads
- Minor roads
- Watercourses
- EIS disturbance footprint
- Logan sub-model code boundary
- Logan regional model code boundary

A3 scale: 1:60,000

0 0.45 0.9 1.35 1.8 2.25km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 03/12/2019 Version: 1
Coordinate System: GDA 1994 MGA Zone 56

Calvert to Kagaru
E1- A: TUFLOW sub-model extent: Logan River

APPENDIX N

Hydrology and Flooding Technical Report

Appendix F Hydraulic results at structures

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

IR_1381

Appendix F

Hydraulic results at structures

20% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	52.6	2.0	2.3	287
2.95		Bridge	51.2	4.2	1.9	290
5.38		RCP	43.7	3.9	0.2	0
6.20		Bridge	43.0	6.4	2.1	342
7.38		RCP	42.8	14.6	1.0	3
7.45		RCP	42.8	14.9	1.3	18
7.70		RCP	43.4	15.8	1.5	7
7.83		RCP	43.4	16.4	1.6	12
17.65	Warrill Creek	Bridge	31.3	3.6	1.5	496
23.55	Purga Creek	Bridge	39.6	8.2	0.9	84
24.75		Bridge	40.5	8.7	0.8	113
28.72		Bridge	58.8	9.2	2.5	66
33.40		RCP	N/A	N/A	N/A	N/A
33.83		RCBC	61.3	6.8	0.1	2
34.20		RCP	N/A	N/A	N/A	N/A
35.70		Bridge	69.1	5.9	1.3	34
35.70		RCP (road)	69.5	1.9	1.8	34
36.01		RCP	N/A	N/A	N/A	N/A
36.10		RCP	N/A	N/A	N/A	N/A
36.65		Bridge	70.8	8.0	1.9	24
36.70		RCP (road)	70.9	0.8	0.9	26
36.95		Bridge	N/A	80.3	N/A	

20% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.10		RCP (road)	75.9	1.0	0.4	4
37.30		RCP (road)	78.0	0.5	1.7	22
37.50		RCP (road)	N/A	N/A	N/A	N/A
37.55		Bridge	80.1	4.7	2.2	24
37.80		Bridge	82.2	4.7	1.8	24
42.80	Teviot Brook	Bridge	72.9	24.4	1.2	36
43.00		RCP (road)	71.4	2.1	1.2	37
43.10		Bridge	70.4	21.7	2.5	57
43.45		Bridge	N/A	N/A	N/A	N/A
46.20		Bridge	51.2	12.0	1.8	35
47.00		Bridge	48.3	10.9	1.3	10
48.37		RCP	46.3	9.1	0.7	4
50.60		Bridge	N/A	N/A	N/A	0
51.40		Bridge	30.8	13.2	0.8	4
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	31.4	10.2	1.1	274
53.90		RCP	N/A	N/A	N/A	N/A

10% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	52.7	1.9	2.2	336
2.95		Bridge	51.3	4.1	1.9	339
5.38		RCP	43.9	3.7	0.4	1
6.20		Bridge	43.2	6.2	2.0	415
7.38		RCP	42.8	14.6	1.0	3
7.45		RCP	42.9	14.9	1.3	18
7.70		RCP	43.4	15.8	1.5	7
7.83		RCP	43.4	16.4	1.6	12
17.65	Warrill Creek	Bridge	31.8	3.1	1.5	759
23.55	Purga Creek	Bridge	39.7	8.1	1.0	116
24.75		Bridge	40.5	8.7	0.8	138
28.72		Bridge	58.9	9.1	2.5	72
33.40		RCP	N/A	N/A	N/A	N/A
33.83		RCBC	61.5	6.6	0.1	2
34.20		RCP	N/A	N/A	N/A	N/A
35.70		Bridge	69.1	5.9	1.3	35
35.70		RCP (road)	69.5	1.9	1.7	35
36.01		RCP	N/A	N/A	N/A	N/A
36.10		RCP	68.3	9.4	0.6	0
36.65		Bridge	70.8	8.0	2.1	25
36.70		RCP (road)	70.9	0.8	0.8	26
36.95		Bridge	N/A	N/A	N/A	N/A
37.10		RCP (road)	75.9	0.9	0.5	5
37.30		RCP (road)	78.0	0.5	1.6	22
37.50		RCP (road)	N/A	N/A	N/A	N/A

10% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	80.1	4.7	2.3	26
37.80		Bridge	82.2	4.7	1.7	25
42.80	Teviot Brook	Bridge	73.4	23.9	1.4	57
43.00		RCP (road)	72.0	1.6	1.3	41
43.10		Bridge	71.0	21.1	2.7	89
43.45		Bridge	N/A	N/A	N/A	N/A
46.20		Bridge	52.0	11.2	1.9	54
47.00		Bridge	49.0	10.2	1.3	16
48.37		RCP	46.4	9.0	0.8	6
50.60		Bridge	32.5	13.7	1.0	0
51.40		Bridge	32.1	11.9	0.9	6
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	32.7	8.9	1.4	443
53.90		RCP	N/A	N/A	N/A	N/A

5% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	52.7	1.9	2.2	417
2.95		Bridge	51.3	4.1	1.9	412
5.38		RCP	44.1	3.5	0.6	2
6.20		Bridge	43.2	6.2	2.0	527
7.38		RCP	42.8	14.5	1.1	4
7.45		RCP	42.9	14.8	1.4	22
7.70		RCP	43.5	15.6	1.7	10
7.83		RCP	43.6	16.2	1.8	16
17.65	Warrill Creek	Bridge	32.2	2.7	1.6	994
23.55	Purga Creek	Bridge	39.8	8.0	1.1	153
24.75		Bridge	40.6	8.6	1.1	166
28.72		Bridge	59.2	8.8	2.5	87
33.40		RCP	N/A	N/A	N/A	N/A
33.83		RCBC	61.8	6.3	0.1	2
34.20		RCP	N/A	N/A	N/A	N/A
35.70		Bridge	69.3	5.7	1.3	41
35.70		RCP (road)	69.8	1.6	1.7	42
36.01		RCP	N/A	N/A	N/A	N/A
36.10		RCP	68.5	9.2	0.7	0
36.65		Bridge	70.9	7.9	2.3	31
36.70		RCP (road)	71.0	0.7	0.8	30
36.95		Bridge	N/A	N/A	N/A	N/A
37.10		RCP (road)	76.2	0.7	0.5	5
37.30		RCP (road)	78.1	0.4	1.6	25
37.50		RCP (road)	79.4	0.5	0.3	0

5% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	80.2	4.6	2.3	30
37.80		Bridge	82.4	4.5	1.7	31
42.80	Teviot Brook	Bridge	73.7	23.6	1.8	76
43.00		RCP (road)	72.3	1.2	1.5	45
43.10		Bridge	71.4	20.7	2.8	120
43.45		Bridge	N/A	N/A	N/A	N/A
46.20		Bridge	52.4	10.8	2.2	72
47.00		Bridge	49.3	9.9	1.8	21
48.37		RCP	46.6	8.9	0.9	7
50.60		Bridge	33.1	13.1	2.3	1
51.40		Bridge	33.0	11.0	0.9	8
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	33.3	8.3	1.7	618
53.90		RCP	N/A	N/A	N/A	N/A

2% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	53.0	1.6	2.3	551
2.95		Bridge	51.5	3.9	2.1	537
5.38		RCP	44.4	3.2	0.8	2
6.20		Bridge	43.8	5.6	2.0	680
7.38		RCP	42.9	14.5	1.2	6
7.45		RCP	43.0	14.8	1.5	25
7.70		RCP	43.7	15.5	1.9	10
7.83		RCP	43.7	16.1	1.9	20
17.65	Warrill Creek	Bridge	32.6	2.3	1.8	1458
23.55	Purga Creek	Bridge	39.9	7.9	1.2	207
24.75		Bridge	40.9	8.3	1.4	218
28.72		Bridge	60.1	7.9	3.0	138
33.40		RCP	N/A	N/A	N/A	N/A
33.83		RCBC	62.1	6.0	0.7	22
34.20		RCP	62.1	7.7	0.1	1
35.70		Bridge	69.6	5.4	2.1	59
35.70		RCP (road)	70.4	1.0	2.4	60
36.01		RCP	N/A	N/A	N/A	N/A
36.10		RCP	68.7	9.0	0.7	1
36.65		Bridge	71.0	7.8	2.3	41
36.70		RCP (road)	71.3	0.4	1.2	42
36.95		Bridge	N/A	N/A	N/A	N/A
37.10		RCP (road)	76.4	0.4	1.0	11
37.30		RCP (road)	78.3	0.2	2.0	30
37.50		RCP (road)	79.6	0.3	0.9	2

2% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	80.5	4.3	2.4	41
37.80		Bridge	82.6	4.3	1.8	43
42.80	Teviot Brook	Bridge	74.1	23.2	1.9	107
43.00		RCP (road)	73.1	0.5	2.1	64
43.10		Bridge	71.9	20.2	2.8	171
43.45		Bridge	N/A	N/A	N/A	N/A
46.20		Bridge	52.9	10.3	2.1	103
47.00		Bridge	50.0	9.2	2.9	33
48.37		RCP	46.8	8.7	1.1	11
50.60		Bridge	34.3	11.9	2.1	1
51.40		Bridge	34.0	10.0	0.9	24
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	34.1	7.5	1.8	806
53.90		RCP	N/A	N/A	N/A	N/A

1% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	53.2	1.4	2.3	647
2.95		Bridge	51.5	3.9	2.1	628
5.38		RCP	44.6	3.0	1.0	3
6.20		Bridge	44.1	5.3	2.0	808
7.38		RCP	42.9	14.4	1.3	8
7.45		RCP	43.0	14.7	1.5	28
7.70		RCP	43.7	15.4	2.0	11
7.83		RCP	43.7	16.1	1.9	22
17.65	Warrill Creek	Bridge	32.8	2.1	1.9	1765
23.55	Purga Creek	Bridge	40.0	7.8	1.3	248
24.75		Bridge	41.0	8.2	1.6	260
28.72		Bridge	60.4	7.6	3.4	170
33.40		RCP	N/A	N/A	N/A	N/A
33.83		RCBC	62.3	5.8	0.7	19
34.20		RCP	62.3	7.5	0.2	1
35.70		Bridge	70.2	4.8	2.3	91
35.70		RCP (road)	71.4	N/A	3.0	91
36.01		RCP	N/A	N/A	N/A	N/A
36.10		RCP	68.9	8.8	0.7	1
36.65		Bridge	71.3	7.5	2.6	64
36.70		RCP (road)	71.7	N/A	1.8	64
36.95		Bridge	N/A	N/A	N/A	N/A
37.10		RCP (road)	76.9	N/A	2.0	22
37.30		RCP (road)	78.6	N/A	2.3	35
37.50		RCP (road)	79.9	N/A	1.4	7

1% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	80.7	4.1	2.7	56
37.80		Bridge	82.9	4.0	2.0	64
42.80	Teviot Brook	Bridge	74.2	24.3	1.9	131
43.00		RCP (road)	73.6	N/A	2.5	77
43.10		Bridge	72.2	21.1	3.0	203
43.45		Bridge	N/A	N/A	N/A	N/A
46.20		Bridge	53.2	11.2	2.3	126
47.00		Bridge	50.2	10.2	2.9	38
48.37		RCP	46.9	8.5	1.3	13
50.60		Bridge	34.8	12.6	1.9	2
51.40		Bridge	34.7	10.5	1.1	36
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	34.8	8.0	1.8	917
53.90		RCP	N/A	N/A	N/A	N/A

0.05% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	53.7	0.9	2.6	1114
2.95		Bridge	51.9	3.5	2.3	1089
5.38		RCP	45.3	2.3	1.5	5
6.20		Bridge	45.1	4.3	2.0	1476
7.38		RCP	43.5	13.9	2.0	26
7.45		RCP	43.5	14.2	2.1	69
7.70		RCP	44.1	15.0	2.2	16
7.83		RCP	44.2	15.6	2.4	27
17.65	Warrill Creek	Bridge	33.5	1.4	2.1	3005
23.55	Purga Creek	Bridge	40.3	7.5	1.6	434
24.75		Bridge	41.6	7.6	1.9	537
28.72		Bridge	61.7	6.3	3.8	318
33.40		RCP	N/A	N/A	N/A	N/A
33.83		RCBC	63.1	5.0	1.1	31
34.20		RCP	63.1	6.6	0.7	23
35.70		Bridge	71.1	3.9	2.4	156
35.70		RCP (road)	72.4	-1.0	3.7	114
36.01		RCP	69.6	7.8	0.4	0
36.10		RCP	69.6	8.1	0.7	3
36.65		Bridge	71.6	7.2	2.7	112
36.70		RCP (road)	72.6	-0.9	2.7	102
36.95		Bridge	74.0	6.3	0.5	0
37.10		RCP (road)	77.6	-0.7	3.2	34
37.30		RCP (road)	78.8	-0.2	2.6	40
37.50		RCP (road)	80.1	-0.2	1.6	8

0.05% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	81.6	3.2	2.8	82
37.80		Bridge	84.8	2.1	2.4	113
42.80	Teviot Brook	Bridge	76.2	21.1	3.0	348
43.00		RCP (road)	77.9	-4.4	5.5	169
43.10		Bridge	74.4	17.7	3.4	505
43.45		Bridge	72.9	15.0	0.5	1
46.20		Bridge	54.8	8.4	3.3	332
47.00		Bridge	51.7	7.5	3.1	101
48.37		RCP	48.6	6.8	3.3	33
50.60		Bridge	37.3	8.9	1.5	5
51.40		Bridge	37.2	6.8	1.3	107
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	37.2	4.4	2.2	1900
53.90		RCP	N/A	N/A	N/A	N/A

0.01% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	53.9	0.7	2.4	1298
2.95		Bridge	52.0	3.4	2.5	1275
5.38		RCP	45.5	2.1	2.0	7
6.20		Bridge	45.2	4.2	2.0	1759
7.38		RCP	44.1	13.2	2.3	39
7.45		RCP	44.1	13.6	2.3	78
7.70		RCP	44.4	14.8	2.2	19
7.83		RCP	44.4	15.4	2.4	30
17.65	Warrill Creek	Bridge	33.7	1.2	2.2	3380
23.55	Purga Creek	Bridge	40.5	7.3	1.7	527
24.75		Bridge	42.0	7.2	1.7	714
28.72		Bridge	61.8	6.2	3.4	341
33.40		RCP	62.2	4.1	0.3	0
33.83		RCBC	63.5	4.6	1.2	34
34.20		RCP	63.6	6.2	0.8	34
35.70		Bridge	71.1	3.9	2.1	148
35.70		RCP (road)	72.4	-0.9	3.6	111
36.01		RCP	69.9	7.5	0.4	2
36.10		RCP	69.9	7.8	0.8	2
36.65		Bridge	71.5	7.3	2.4	105
36.70		RCP (road)	72.5	-0.8	2.6	99
36.95		Bridge	74.0	6.3	0.5	0
37.10		RCP (road)	77.6	-0.7	3.1	34
37.30		RCP (road)	78.8	-0.2	2.6	40
37.50		RCP (road)	80.1	-0.2	1.6	8

0.01% AEP Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	81.6	3.2	2.8	80
37.80		Bridge	84.7	2.2	2.4	105
42.80	Teviot Brook	Bridge	76.9	20.4	3.1	433
43.00		RCP (road)	79.6	-6.0	6.5	198
43.10		Bridge	74.9	17.2	3.7	617
43.45		Bridge	73.6	14.3	0.5	0
46.20		Bridge	55.3	7.9	3.3	410
47.00		Bridge	52.6	6.6	3.2	123
48.37		RCP	49.4	6.0	4.0	41
50.60		Bridge	38.3	7.9	1.6	8
51.40		Bridge	38.2	5.8	1.3	131
51.81		RCP	N/A	N/A	N/A	N/A
52.90		Bridge	38.2	3.4	2.6	2361
53.90		RCP	N/A	N/A	N/A	N/A

PMF Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
1.30	Bremer River/ Western Creek	Bridge	54.9	-0.3	3.5	2945
2.95		Bridge	52.8	2.6	3.2	2638
5.38		RCP	46.9	0.7	3.1	11
6.20		Bridge	46.5	2.9	3.1	4211
7.38		RCP	47.1	10.2	5.7	97
7.45		RCP	47.1	10.6	4.8	164
7.70		RCP	47.1	12.0	4.6	39
7.83		RCP	47.1	12.7	4.7	60
17.65	Warrill Creek	Bridge	35.4	-0.5	4.0	7426
23.55	Purga Creek	Bridge	41.6	6.2	2.6	1647
24.75		Bridge	43.5	5.7	3.0	2380
28.72		Bridge	63.6	4.4	4.3	781
33.40		RCP	63.2	3.1	1.0	4
33.83		RCBC	65.7	2.5	2.6	75
34.20		RCP	66.0	3.8	1.9	79
35.70		Bridge	71.8	3.2	2.9	342
35.70		RCP (road)	72.8	-1.4	4.3	134
36.01		RCP	71.7	5.6	0.7	5
36.10		RCP	71.7	5.9	1.4	8
36.65		Bridge	72.5	6.3	3.4	307
36.70		RCP (road)	74.1	-2.4	3.1	118
36.95		Bridge	74.1	6.2	1.6	27
37.10		RCP (road)	78.2	-1.3	4.3	40
37.30		RCP (road)	79.2	-0.7	3.6	55
37.50		RCP (road)	80.4	-0.5	1.7	9

PMF Event						
Chainage (km)	**Waterway**	**Structure type**	**Upstream Peak Water Level (m AHD)**	**Freeboard to rail formation level (m)**	**Outlet velocity (m/s)**	**Peak discharge (m^3/s)**
37.55		Bridge	82.3	2.5	3.2	167
37.80		Bridge	85.3	1.6	3.8	335
42.80	Teviot Brook	Bridge	77.8	19.5	3.5	577
43.00		RCP (road)	80.8	-7.3	6.7	206
43.10		Bridge	75.9	16.2	4.0	888
43.45		Bridge	74.7	13.2	0.9	1
46.20		Bridge	56.2	7.0	3.7	552
47.00		Bridge	54.0	5.2	3.3	164
48.37		RCP	50.8	4.6	5.0	51
50.60		Bridge	43.1	3.1	1.5	11
51.40		Bridge	43.1	0.9	1.4	180
51.81		RCP	43.1	2.0	0.4	0
52.90		Bridge	43.1	-1.5	2.5	4951
53.90		RCP	43.1	0.2	0.9	3

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Appendix G Flood sensitive receptors

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

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Appendix G

Flood sensitive receptors

ID	Waterway	Flood sensitive receptor
1	Bremer River/Western Creek	House - Sheds
3	Bremer River/Western Creek	House - Sheds
7	Bremer River/Western Creek	House - Sheds
8	Bremer River/Western Creek	House
11	Bremer River/Western Creek	House - Shed
12	Bremer River/Western Creek	Shed
14	Bremer River/Western Creek	Near intersection of Waters Road and Kuss Road
16	Bremer River/Western Creek	House - Roads
22	Bremer River/Western Creek	House - Sheds
28	Bremer River/Western Creek	House - Sheds
34	Bremer River/Western Creek	House - Sheds
47	Bremer River/Western Creek	House
50	Bremer River/Western Creek	House
54	Bremer River/Western Creek	House
55	Bremer River/Western Creek	House
58	Bremer River/Western Creek	House
59	Bremer River/Western Creek	House
66	Bremer River/Western Creek	House - Sheds
67	Bremer River/Western Creek	House
84	Bremer River/Western Creek	House
91	Bremer River/Western Creek	House
98	Bremer River/Western Creek	Sheds
99	Bremer River/Western Creek	House
101	Bremer River/Western Creek	Shed
119	Bremer River/Western Creek	House - Sheds
125	Bremer River/Western Creek	House - Sheds
126	Bremer River/Western Creek	House- Sheds
136	Bremer River/Western Creek	House - Sheds
143	Bremer River/Western Creek	House - sheds
144	Bremer River/Western Creek	House - Sheds
151	Bremer River/Western Creek	House
154	Bremer River/Western Creek	Shed
157	Bremer River/Western Creek	Sheds
160	Bremer River/Western Creek	House - Sheds
163	Bremer River/Western Creek	House - Shed
168	Bremer River/Western Creek	Shed
172	Bremer River/Western Creek	House - Sheds
187	Bremer River/Western Creek	House - Sheds
193	Bremer River/Western Creek	House

ID	Waterway	Flood sensitive receptor
196	Warrill Creek	Unsealed Road
202	Warrill Creek	House - Sheds
203	Warrill Creek	Industrial - Shed
207	Warrill Creek	House - Sheds
209	Warrill Creek	House - Commercial
210	Warrill Creek	House - Shed
213	Warrill Creek	Sealed Road
217	Warrill Creek	Multiple Houses
219	Warrill Creek	Multiple Sheds
222	Warrill Creek	Sheds
223	Warrill Creek	House
225	Warrill Creek	Shed
227	Warrill Creek	Shed
234	Warrill Creek	House - Sheds
235	Warrill Creek	Access road
236	Warrill Creek	Shed/Structure
237	Warrill Creek	Shed
239	Warrill Creek	Access road
240	Warrill Creek	Sheds
252	Warrill Creek	Shed
254	Warrill Creek	House - Sheds and stables
255	Warrill Creek	Sheds
256	Warrill Creek	Sheds
258	Warrill Creek	House - Shed
262	Warrill Creek	House - Shed
264	Warrill Creek	House - Sheds
265	Warrill Creek	House - Shed
275	Warrill Creek	House - Sheds
277	Warrill Creek	Houses
278	Warrill Creek	House - Sheds
279	Warrill Creek	Unsealed Road
283	Warrill Creek	House - Sheds
285	Warrill Creek	House - Shed
287	Warrill Creek	Shed
291	Warrill Creek	House - Sheds
292	Warrill Creek	House
293	Warrill Creek	House - Sheds
301	Warrill Creek	House - Sheds
302	Warrill Creek	House - Shed
304	Warrill Creek	House - Shed
307	Warrill Creek	House - Sheds
309	Purga Creek	Houses – Sheds
312	Warrill Creek	House - Shed

ID	Waterway	Flood sensitive receptor
313	Purga Creek	Houses – Sheds
316	Purga Creek	Houses
317	Purga Creek	Houses
321	Purga Creek	Sheds
325	Purga Creek	Houses – Sheds
329	Purga Creek	Houses – Sheds
333	Purga Creek	Houses – Sheds
340	Purga Creek	Houses – Sheds
341	Purga Creek	Industrial
342	Purga Creek	Sheds
346	Purga Creek	Houses – Sheds
370	Purga Creek	Houses – Sheds
375	Purga Creek	Houses – Sheds
377	Purga Creek	Houses – Commercial – Sheds
379	Purga Creek	Houses – Sheds
382	Purga Creek	Houses – Sheds
383	Purga Creek	Sheds
384	Purga Creek	Houses – Sheds
387	Purga Creek	Houses – Sheds
389	Purga Creek	Houses – Sheds
392	Purga Creek	Sheds
394	Purga Creek	Houses – Sheds
398	Purga Creek	Houses – Sheds
403	Purga Creek	Sheds
404	Purga Creek	Houses – Sheds
408	Purga Creek	Houses – Sheds
411	Purga Creek	Houses
414	Purga Creek	Houses – Sheds
416	Purga Creek	Houses – Sheds
420	Purga Creek	Houses
422	Purga Creek	Houses – Sheds
423	Purga Creek	Agricultural
424	Purga Creek	Mining
426	Purga Creek	Houses – Sheds
427	Purga Creek	Houses – Sheds
428	Purga Creek	Houses – Sheds
431	Purga Creek	Houses – Sheds
438	Purga Creek	Houses – Sheds
442	Purga Creek	Sheds
443	Purga Creek	Houses
446	Purga Creek	Houses – Sheds
449	Purga Creek	Houses – Sheds
452	Purga Creek	Sheds

ID	Waterway	Flood sensitive receptor
458	Purga Creek	Houses – Sheds
460	Purga Creek	Sheds
461	Purga Creek	Bridge
462	Purga Creek	Houses – Sheds
467	Purga Creek	Houses – Sheds – Agricultural
468	Purga Creek	Houses – Sheds
475	Purga Creek	Houses – Sheds
477	Purga Creek	Houses – Sheds
478	Purga Creek	Sheds
482	Purga Creek	Houses – Sheds
483	Purga Creek	Sheds
484	Purga Creek	Sheds
485	Purga Creek	Houses – Sheds
488	Purga Creek	Houses – Sheds
490	Purga Creek	Houses – Sheds
491	Purga Creek	Houses
495	Purga Creek	Houses – Sheds
497	Purga Creek	Houses – Sheds
498	Purga Creek	Houses – Sheds
502	Purga Creek	Bridge
505	Purga Creek	Agricultural
508	Purga Creek	Industrial
522	Purga Creek	Houses – Sheds
523	Purga Creek	Houses – Sheds
525	Purga Creek	Houses – Sheds
529	Purga Creek	Houses – Sheds
530	Purga Creek	Sheds
534	Purga Creek	Houses – Sheds
535	Purga Creek	Bridge
537	Purga Creek	Houses – Sheds
540	Purga Creek	Houses – Sheds
544	Purga Creek	Houses – Sheds
545	Purga Creek	Houses – Sheds
548	Purga Creek	Sheds
550	Purga Creek	Houses
553	Teviot Brook	House - Shed
556	Teviot Brook	House - Shed
557	Teviot Brook	Sealed road
558	Teviot Brook	Sealed Road
561	Teviot Brook	Sealed road
562	Teviot Brook	Woollaman Creek bridge
564	Teviot Brook	House - Shed
567	Teviot Brook	House

ID	Waterway	Flood sensitive receptor
572	Teviot Brook	House - Several sheds
575	Teviot Brook	Sealed road
576	Teviot Brook	Shed
578	Teviot Brook	Sheds
581	Teviot Brook	Creek bed crossing
582	Teviot Brook	Shed
586	Teviot Brook	House
589	Teviot Brook	House
595	Teviot Brook	Bridge over Teviot Brook
597	Teviot Brook	Mining
603	Teviot Brook	Sheds
605	Teviot Brook	House
606	Teviot Brook	House - Sheds
609	Teviot Brook	Unsealed Road
610	Teviot Brook	House - Shed
613	Teviot Brook	Bridge over existing rail
690	Bremer River/Western Creek	Shed
691	Bremer River/Western Creek	Sheds
692	Bremer River/Western Creek	Sheds
693	Bremer River/Western Creek	House - Sheds
694	Bremer River/Western Creek	House - Sheds
695	Bremer River/Western Creek	House - Sheds
696	Warrill Creek	Sheds - house closeby
697	Warrill Creek	House - sheds
698	Warrill Creek	Sheds - possibly house
699	Purga Creek	House - sheds
700	Purga Creek	House - sheds
701	Purga Creek	House
702	Purga Creek	House - Sheds
703	Purga Creek	House - sheds
704	Purga Creek	House
705	Purga Creek	House
706	Purga Creek	House - Sheds
707	Purga Creek	House - sheds
708	Purga Creek	House
709	Purga Creek	House - sheds
710	Purga Creek	House - sheds
711	Purga Creek	House
712	Purga Creek	House
713	Purga Creek	House - sheds
714	Purga Creek	House
715	Purga Creek	House - sheds

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Appendix H Afflux at flood sensitive receptors

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

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Appendix H

Afflux at flood sensitive receptors

Waterway	Flood sensitive receptor number	20% AEP Afflux (mm)	10% AEP Afflux (mm)	5% AEP Afflux (mm)	2% AEP Afflux (mm)	1% AEP Afflux (mm)	1% AEP Afflux with Climate Change (mm)
Bremer River/ Western Creek	14 (Near intersection of Waters Road and Kuss Road)	+0	+0	+1	+4	+7	+14
Warrill Creek	227 (Shed)	Dry	Dry	Dry	+4	+5	+12
Warrill Creek	236 (Shed)	Dry	Dry	+4	+6	+8	+20
Warrill Creek	237 (Shed)	Dry	Dry	Dry	Dry	+6	+14
Warrill Creek	239 (Access road)	+3	+3	+3	+4	+5	+13
Purga Creek	461 (Bridge)	+29	+27	+61	+52	+41	+22
Purga Creek	535 (Bridge)	+33	+1	-3	+22	+180	+535

Table note:

Details only provided for locations where afflux is greater than 10 mm under the 1% AEP event with climate change.

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Appendix I Local drainage structures and impact outcomes

CALVERT TO KAGARU ENVIRONMENTAL IMPACT STATEMENT

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Appendix I

Local drainage structures and impact outcomes

Culvert ID	Chainage (km)	Type	Number	Diameter/ Span/ Width (m)	Height (m)/ Soffit Level (m AHD)	1% AEP Flow Through Structure (m^3/s)	1% AEP Upstream Water Level - Design (m AHD)	1% AEP Upstream Headwater Depth - Design (m)	1% AEP Freeboard to Formation (m)	Impacts at Rail Corridor	
										1% AEP Afflux (mm)	Change in Time of Inundation (hrs)
C2K Alignment											
C8.68	8.68	RCP	4	1.20	-	9.0	56.87	1.57	6.10	+30	0.14
C8.98	8.98	RCP	2	1.50	-	7.9	61.04	2.02	3.41	+20	0.07
C11.31	11.31	RCP	5	1.20	-	5.1	59.56	0.27	6.08	+130	1.37
C11.93	11.93	RCP	12	1.20	-	10.3	53.72	0.70	8.96	+70	2.53
C12.53	12.53	RCP	12	1.20	-	5.8	57.14	0.37	2.82	+20	0.26
C13.44	13.44	RCP	15	2.40	-	48.3	41.32	2.55	8.98	+330	2.06
C13.54	13.54	RCP	18	1.20	-	12.4	40.83	0.57	8.67	+330	2.06
C13.63	13.63	RCP	15	1.20	-	11.1	40.70	0.55	7.96	+330	2.06
C13.68	13.68	RCP	5	1.20	-	4.5	40.60	0.58	7.84	+330	2.06
C13.74	13.74	RCP	10	1.20	-	9.5	40.54	0.68	7.88	+330	2.06
C13.80	13.80	RCP	5	1.20	-	4.5	40.42	0.55	8.00	+330	2.06
C13.86	13.86	RCP	25	1.20	-	12.5	40.20	0.26	8.22	+330	2.06
C13.91	13.91	RCP	25	1.20	-	10.2	40.10	0.36	8.32	+330	2.06
340-BR05	14.45	BRIDGE	-	207	46.44	66.2	39.50	N/A	6.94	0	0
C19.38	19.38	RCP	27	1.20	-	25.7	35.10	0.84	1.34	+390	1.52
C20.48	20.48	RCP	8	1.20	-	4.6	38.63	0.56	1.68	+270	1.50
C20.57	20.57	RCP	10	1.20	-	4.1	38.68	0.51	1.83	+220	1.08
C20.62	20.62	RCP	16	1.20	-	8.5	38.70	0.60	1.93	+220	1.08
C21.40	21.40	RCP	21	1.05	-	16.6	41.12	0.80	1.21	+400	1.74

Culvert ID	Chainage (km)	Type	Number	Diameter/ Span/ Width (m)	Height (m)/ Soffit Level (m AHD)	1% AEP Flow Through Structure (m^3/s)	1% AEP Upstream Water Level - Design (m AHD)	1% AEP Upstream Headwater Depth - Design (m)	1% AEP Freeboard to Formation (m)	Impacts at Rail Corridor	
										1% AEP Afflux (mm)	Change in Time of Inundation (hrs)
C26.99	26.99	RCP	8	1.20	-	18.6	61.96	1.76	0.39	+60	0.54
C27.15	27.15	RCP	4	1.05	-	3.9	62.20	0.94	0.95	0	0
C27.70	27.70	RCBC	4	2.10	2.10	12.4	59.58	1.23	6.00	+140	0.22
C27.84	27.84	RCP	1	1.05	-	1.4	60.76	1.10	5.46	0	0.25
C28.18	28.18	RCP	15	2.10	-	24.8	60.37	0.85	7.07	+300	1.24
C28.60	28.60	RCP	3	1.20	-	2.6	61.78	0.74	6.70	+210	0.56
C29.24	29.24	RCP	2	1.05	-	3.6	65.78	1.51	4.20	0	0.02
C29.38	29.38	RCP	4	0.90	-	4.0	65.52	0.99	4.79	+20	0
C29.76	29.76	RCP	2	1.50	-	7.1	65.36	1.71	5.84	0	0.02
C29.94	29.94	RCBC	9	2.10	2.10	13.8	64.31	0.98	7.32	+360	0.08
C30.31	30.31	RCP	2	2.10	-	9.7	67.37	1.63	5.15	+290	0.34
C30.41	30.41	RCP	3	1.20	-	2.5	68.22	0.75	4.52	+10	0.16
C31.14	31.14	RCP	3	2.40	-	28.1	63.88	3.53	9.08	+120	0.28
C31.78	31.78	RCP	6	1.20	-	6.6	68.78	0.91	1.85	+100	0.57
C32.12	32.12	RCBC	2	3.00	2.40	17.7	62.39	1.99	6.99	+140	0.08
C32.26	32.26	RCP	1	1.20	-	0.8	63.27	0.70	5.62	+20	0.31
C32.92	32.92	RCP	7	0.90	-	6.4	64.68	0.97	1.83	+20	0.06
C33.21	33.21	RCP	5	0.90	-	2.2	62.40	0.57	3.15	+50	0.76
C33.31	33.31	RCBC	5	2.40	2.40	24.9	63.17	1.64	2.64	+60	1.30
C33.38	33.38	RCP	7	1.35	-	9.2	62.93	0.88	3.17	+130	0.92
C33.71	33.71	RCP	2	0.90	-	2.5	66.09	1.43	1.45	+50	0.17
C38.82	38.82	RCBC	2	3.00	2.70	20.2	97.08	2.14	4.76	+370	0.85
C41.37	41.37	RCP	1	2.10	-	7.9	107.62	2.27	6.92	+20	0.02
C41.43	41.43	RCP	1	1.20	-	0.4	108.98	0.43	4.85	0	0
C41.53	41.53	RCP	1	1.20	-	0.8	106.03	0.82	6.57	0	0

Culvert ID	Chainage (km)	Type	Number	Diameter/ Span/ Width (m)	Height (m)/ Soffit Level (m AHD)	1% AEP Flow Through Structure (m^3/s)	1% AEP Upstream Water Level - Design (m AHD)	1% AEP Upstream Headwater Depth - Design (m)	1% AEP Freeboard to Formation (m)	Impacts at Rail Corridor	
										1% AEP Afflux (mm)	Change in Time of Inundation (hrs)
C41.73	41.73	RCP	4	2.40	-	34.9	95.72	3.32	14.79	0	1.05
C42.17	42.17	RCP	1	1.65	-	5.1	97.91	2.55	7.29	+10	0
C42.50	42.50	RCP	2	1.50	-	4.5	88.69	1.15	12.72	0	0
340-BR18	41.87	BRIDGE	-	184	105.69	2.4	93.36	N/A	12.39	0	0
C43.80	43.80	RCP	2	1.50	-	8.1	69.31	1.88	17.17	0	0.02
C44.24	44.24	RCP	6	1.50	-	15.7	63.62	1.98	17.82	-40	0
C44.48	44.48	RCP	1	1.20	-	2.2	70.39	1.44	8.19	0	0
C45.66	45.66	RCP	4	1.20	-	4.4	66.36	0.91	1.74	+250	0.37
C46.47	46.47	RCP	1	2.40	-	1.4	57.76	0.50	6.35	0	0
C46.60	46.60	RCP	1	2.40	-	6.0	57.24	1.74	6.21	+190	0.57
C47.22	47.22	RCBC	8	1.20	0.90	5.1	59.55	0.70	0.59	0	0
C47.52	47.52	RCP	1	1.35	-	2.9	56.55	1.55	1.76	0	0.05
C47.72	47.72	RCP	1	1.05	-	1.3	52.06	1.04	5.44	+40	0
C48.94	48.94	RCP	1	2.10	-	7.1	45.69	2.17	7.83	0	0
C49.27	49.27	RCP	2	1.05	-	3.3	51.81	1.53	0.73	0	0.05
C49.48	49.48	RCP	2	1.20	-	2.7	44.59	0.95	7.32	+70	0.28
C49.59	49.59	RCP	1	1.80	-	1.0	46.55	0.64	5.04	+30	0.04
C49.75	49.75	RCP	1	1.65	-	0.9	46.90	0.52	4.22	+60	0.14
C50.17	50165	RCP	6	1.50	-	13.0	39.11	1.14	10.71	+60	0.13
C50.90	50.90	RCP	1	1.20	-	1.8	41.51	0.86	6.14	+10	0
C51.78	51.78	RCP	2	1.35	-	6.0	42.72	1.80	2.30	0	0.01
C53.47	53.47	RCP	1	1.20	-	1.0	43.66	0.78	3.79	+50	0.09
C54.01	54.01	RCP	2	1.80	-	6.6	39.86	1.38	9.61	+200	0.02
C54.13	54.13	RCP	2	1.35	-	4.5	43.59	2.01	6.39	+200	0.02

Culvert ID	Chainage (km)	Type	Number	Diameter/ Span/ Width (m)	Height (m)/ Soffit Level (m AHD)	1% AEP Flow Through Structure (m^3/s)	1% AEP Upstream Water Level - Design (m AHD)	1% AEP Upstream Headwater Depth - Design (m)	1% AEP Freeboard to Formation (m)	Impacts at Rail Corridor	
										1% AEP Afflux (mm)	Change in Time of Inundation (hrs)
Kagaru Interstate Line Connection											
C1.08	1.08	RCP	3	1.65	-	13.5	39.96	2.02	3.32	0	0.31
C1.42	1.42	RCBC	3	1.5	1.5	12.5	39.27	1.70	4.81	0	0
RMAR Alignment											
C41.87	41.87	RCBC	1	1.2	0.9	2.4	98.92	1.72	2.45	0	0