

HumeLink Route Options Assessment

Final Report

March 23, 2022

Summary

Transgrid has engaged GHD Pty Ltd (GHD) to conduct a comparison of transmission line route options for the HumeLink project and recommend an optimal route that meets agreed criteria.

The objectives of the assessment are to:

- Identify a preferred route in the Tumut/Blowering area within HumeLink’s existing study corridor.
- Assess new routes outside the study corridor, between Maragle and Yass, maximising the use of public land.
- Compare the alternative route/s and recommend an optimal route that meets agreed criteria.

The findings of the assessment are summarised in Table 1, including a description of the length and property impacts for each route, the numerical ratings assigned to each constraint relevant to each route, the multi-criteria analysis (MCA) score for each route, and the cost estimate (construction, biodiversity offsetting and property acquisition) for each route.

Constraints in Table 1 were rated as follows:

- 0 No constraint
- 20 Very low constraint
- 40 Low constraint
- 60 Medium constraint
- 80 High constraint
- 100 Very high constraint
- 999 NO GO.

A high MCA score reflects a high level of enviro-social impact, with a low score reflecting a lesser impact.

The assessment summarised in Table 1 found the optimal route for the HumeLink project is the Maragle to Yass via Tumut North option. The Wondalga to Maragle to Yass via Kosciuszko National Park route option is the least optimal route with substantially higher enviro-social impacts and significantly higher costs.

Table 1 Comparative summary of findings

Item	Tumut North	Blowering	Kosciuszko
Description			
Total length	158.50 km	160.90 km	193.00 km
Length of private property	120.85 km	123.04 km	99.52 km
Length of public property (government owned land)	37.65 km	37.86 km	93.48 km
Constraints			
Aboriginal sites (known sites)	0	100	100
Existing transmission lines (two or more existing lines present)	0	100	0
Defence land	0	0	0
Licensed airstrips	0	0	0
Towns	0	0	0
Wilderness areas	0	0	100
RAMSAR sites	0	0	0
Unlicensed (private) airstrips (within 500 m of route)	20	20	20
National parks/ nature reserves	0	0	100
Wetlands	0	0	100
Commonwealth land	0	0	0
Native title	80	80	80
Residential dwellings close to the corridor (within 500 m)	60	60	60
State heritage site	0	0	80
Local heritage sites	0	0	0
Bush fire prone land	40	40	40
Biophysical strategic agricultural land	60	0	0
State forest	0	60	60
Industrial land (industrial land use zone)	0	0	0
Key waterway crossings (> 800 m)	0	0	0
Endangered ecological communities	80	80	80
Multi-criteria analysis			
Total score	962,300	1,005,680	1,384,240
% Increase on lowest score (Tumut North)	Base	4.51%	43.85%
Cost estimates			
Construction (\$M)	487.64	510.48	615.64
Biodiversity offsetting (\$M)	196.90	227.72	321.24
Property acquisition (\$M)	27.06	26.69	30.27
TOTAL (\$M)	711.60	764.89	967.15

A more detailed description of the methodology and analysis results is given in the following sections.

Approach and methodology

The methodology employed to undertake the assessment included the following key steps:

- Establish a project-specific geographic information system (GIS) with all possible route options and available GIS data layers provided by Transgrid and other relevant publicly available data.
- Segregate routes into smaller segments to enable more detailed assessment and cost calculation.
- Based on GIS review, identify constraints within approximately 500 metres of each route and rate relevant constraints in terms of their potential enviro-social impact using a numerical rating system.
- Complete an MCA, using GHD's GIS-based methodology known as the 'InDeGO' method (Infrastructure Development – Geospatial Options) to quantitatively assess the preferred route subject to the least constraints. InDeGO assigns a score to each route based on the length of the route that overlays relevant constraints and the rating of the constraint. The higher the score, the higher the enviro-social impact.
- Calculate construction costs for each route using the Australian Energy Market Operator (AEMO) transmission cost database (TCD) tool, which is aligned to the Association for the Advancement of Cost Engineering (AACE) guidelines.
- Calculate biodiversity offsetting costs for each route completed by Niche (2022) with reference to the Biodiversity Assessment Method (BAM) using the BAM credit calculator to determine credit number estimates for both species and ecosystem impacts.
- Calculate property acquisition costs for each route using GIS analysis to:
 - Measure the length and area of the proposed 70 metre wide easement within each land parcel.
 - Collate land parcels owned by the same entity / landowner into landholdings.
 - Calculate the distance of houses / buildings from the edge of the proposed 70 metre wide easement.
 - Collate the different Crown land descriptions into one.
 - Apply assumptions to calculate easement acquisition costs for each route.
- Identify the optimal route based on the MCA results and cost estimation.

Three possible route options were assessed:

- Maragle to Yass via Tumut North
- Maragle to Yass via Blowering
- Wondalga to Maragle to Yass via Kosciuszko National Park.

Route options analysis

Maragle to Yass via Tumut North

Route description

The Maragle to Yass via Tumut North route option is 158.4 kilometres long and is co-located with existing transmission lines for approximately 20 kilometres to minimise access track construction, visual impacts and impacts to aerial operations, see Figure 1.

Key constraints

Key constraints for the Maragle to Yass via Tumut North route option (based on GIS review) are:

- Unlicensed (private) airstrips
- Indigenous Land Use Agreement - Tumut Brungle Area Agreement (NIA1998/001)
- Residential dwellings close to the corridor
- Bush fire prone land
- Biophysical strategic agricultural land
- Endangered ecological communities.

Multi-criteria analysis

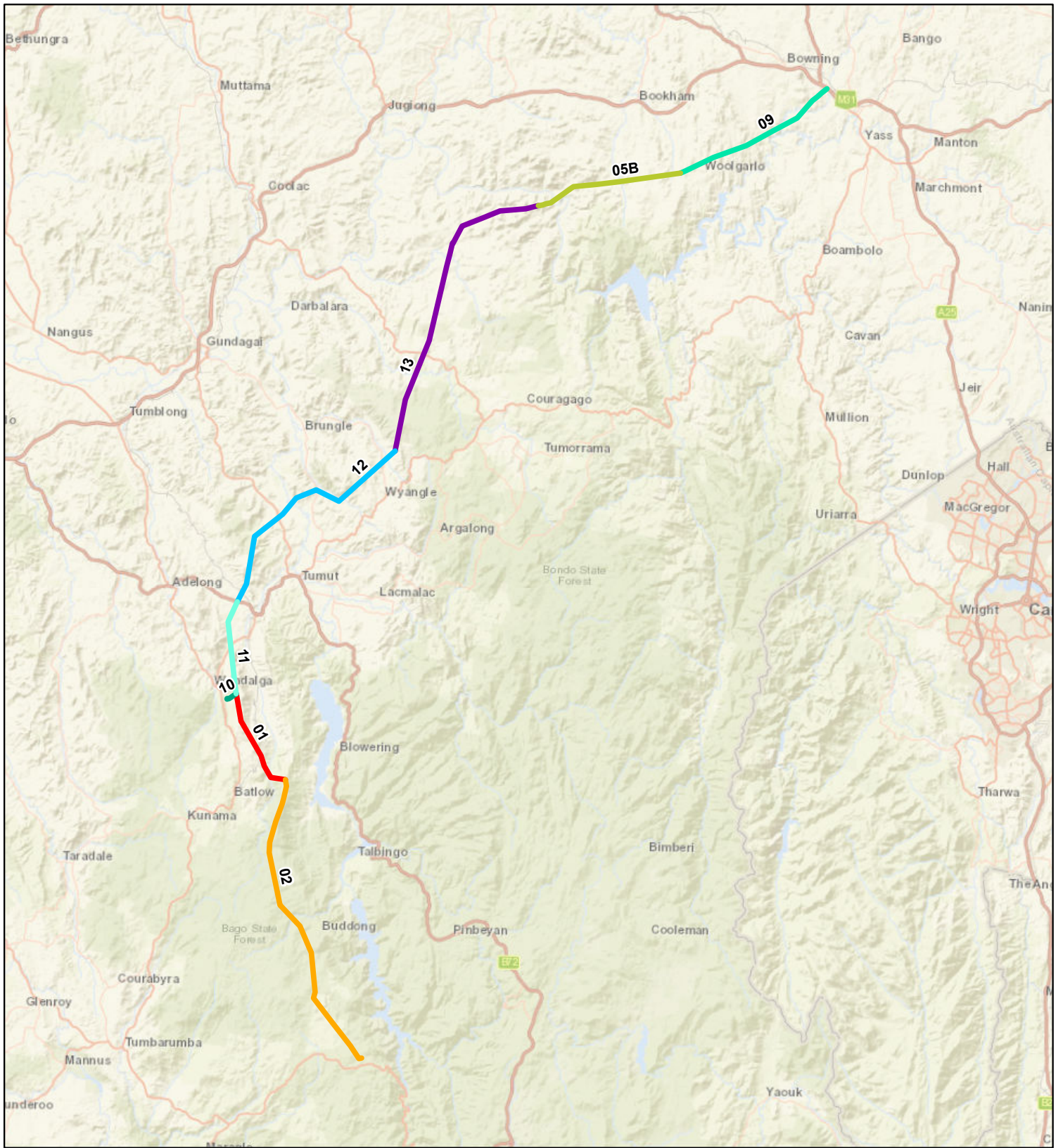
The total InDeGO score resulting from the MCA of the Maragle to Yass via Tumut North route option is 962,300. A breakdown of the scores is shown in Figure 2.

Cost estimate results

The estimated total costs for the Maragle to Yass via Tumut North route option are summarised in Table 2.

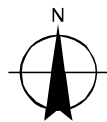
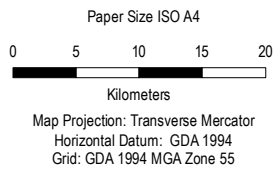
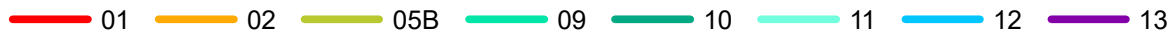
Table 2 Maragle to Yass via Tumut North option – total estimated costs

Item	Components	Cost estimates
1	Construction cost estimate (Class 4) (\$M)	\$487.64
2	Biodiversity offsetting cost estimate (\$M)	\$196.90
3	Property acquisition cost estimate (\$M)	\$27.06
Total estimated costs (\$M)		\$711.60



Legend

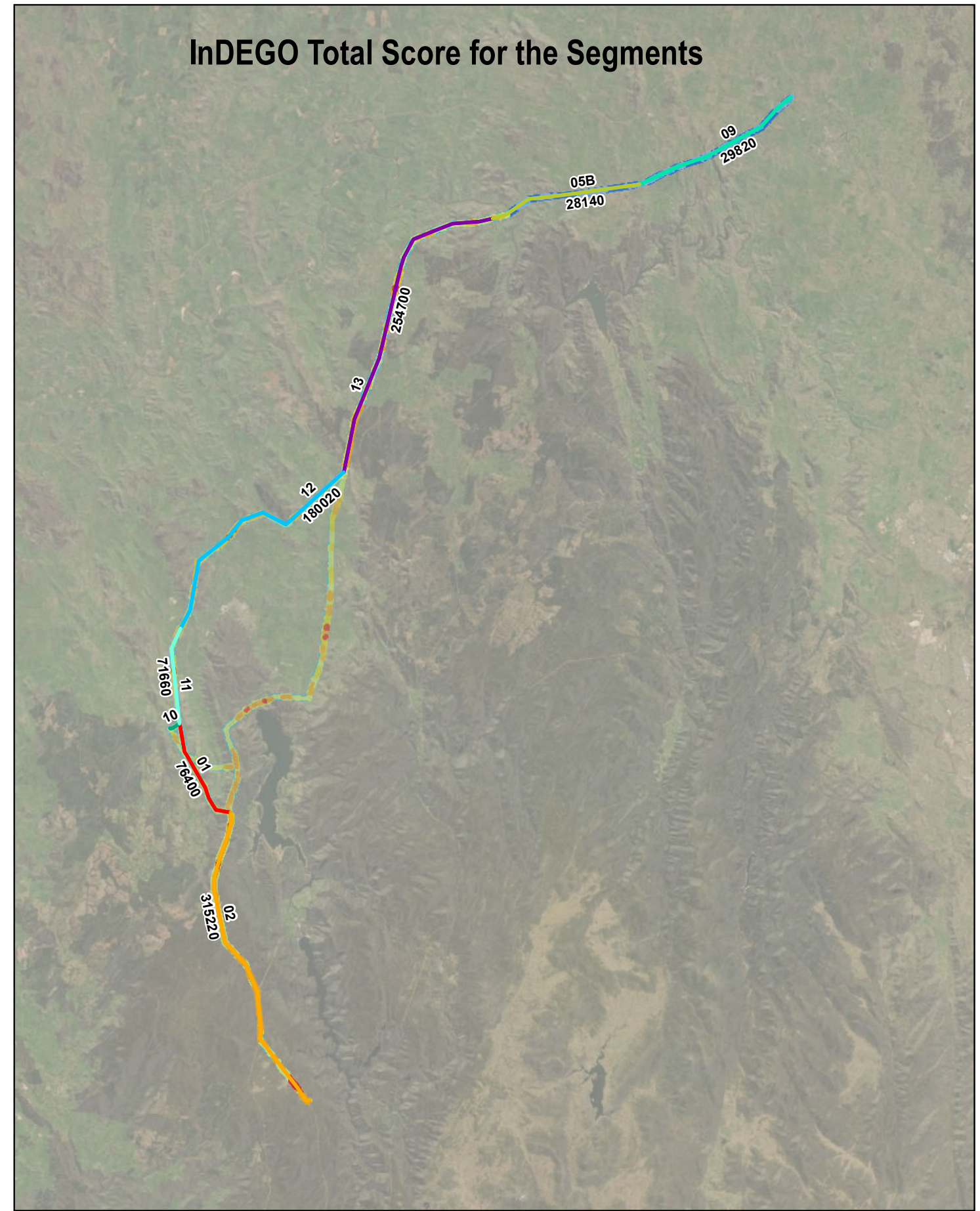
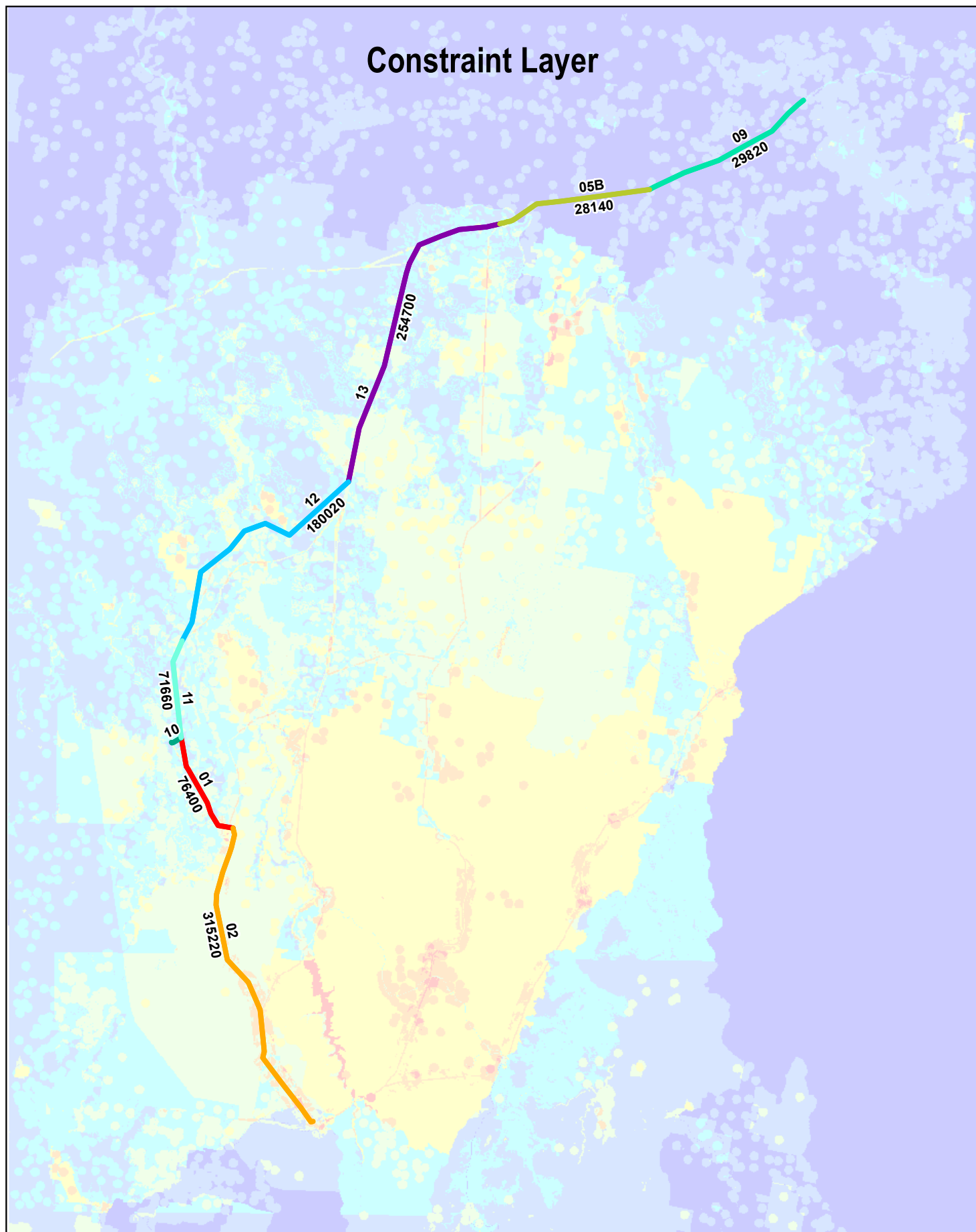
Segment



Transgrid
HumeLink Route Options Assessment

Maragle to Yass
Via Tumut North

Project No. 12566012
Revision No. 0
Date 3/9/2022



Paper Size ISO A3

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

Legend

—	01	—	05B	—	10	—	12
—	02	—	09	—	11	—	13

InDEGO Total Score

■	0 - 50	■	101 - 150	■	201 - 250	■	301 - 500
■	50.1 - 100	■	151 - 200	■	251 - 300		

Transgrid
HumeLink Route Options Assessment

Maragle to Yass via Tumut North
InDEGO Total Scores: **962300**

Project No. **12566012**
Revision No. **1**
Date **3/17/2022**

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Data Disclaimer: © 2022. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. GHD: Total Scores - 202112
Created by: jichen; Print date: 17 Mar 2022 - 17:11

Maragle to Yass via Blowering

Route description

The Maragle to Yass via Blowering route option is 160.9 kilometres long and is co-located with existing transmission lines for approximately 65 kilometres to minimise access track construction, visual impacts and impacts to aerial operations, see Figure 3.

Key constraints

Key constraints for the Maragle to Yass via Blowering route option (based on GIS review) are:

- Aboriginal sites
- Existing transmission lines
- Unlicensed (private) airstrips
- Indigenous Land Use Agreement - Tumut Brungle Area Agreement (NIA1998/001)
- Residential dwellings close to the corridor
- Bush fire prone land
- State Forest – Wee Jasper, Bondo, Bago
- Key waterway crossings – Murrumbidgee River, Goodradigbee River, Tumut River
- Endangered ecological communities.

Multi-criteria analysis

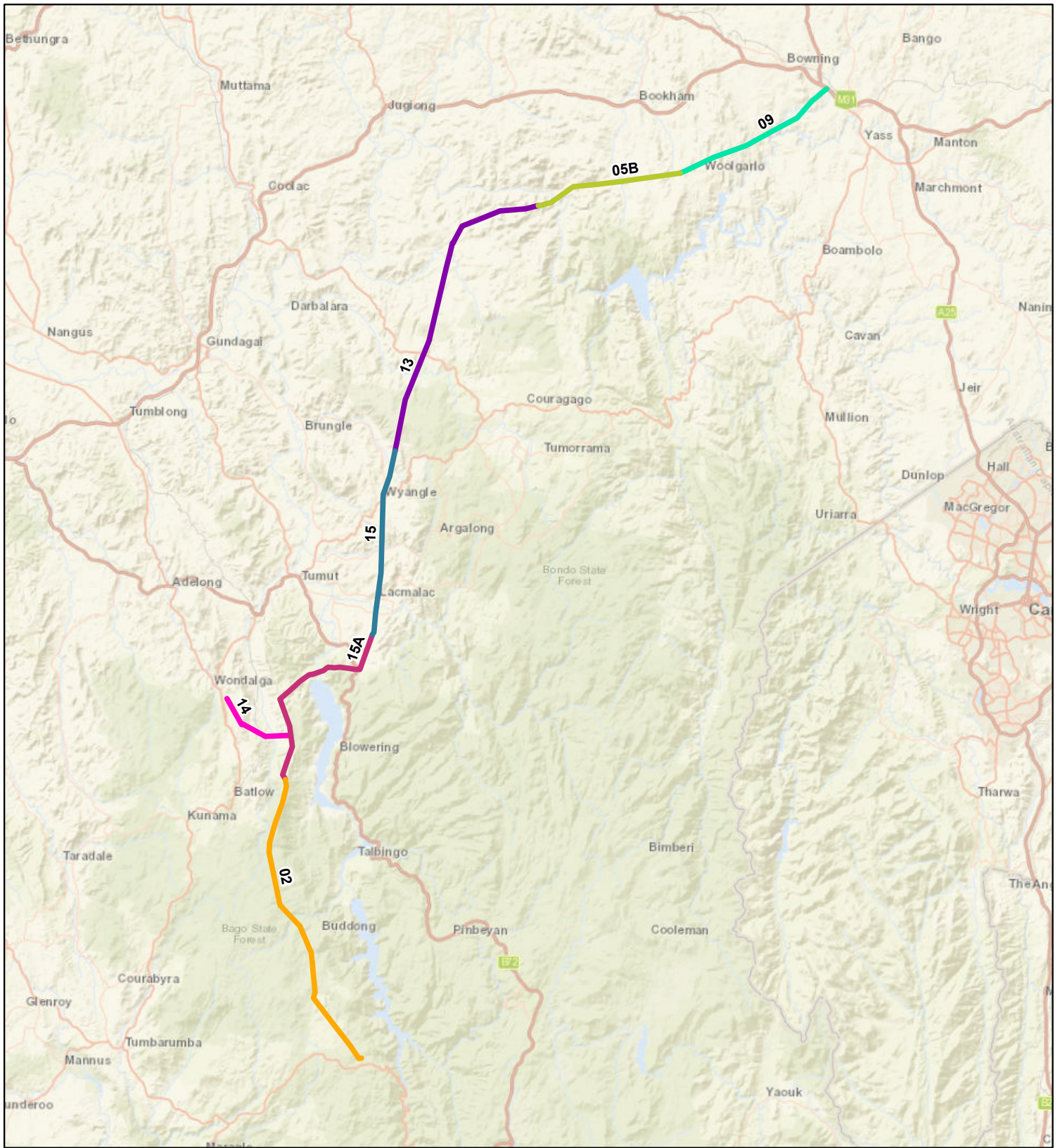
The total InDeGO score resulting from the MCA of the Maragle to Yass via Blowering route option is 1,005,680. A breakdown of the scores is shown in Figure 4.

Cost estimate results

The estimated total costs for the Maragle to Yass via Blowering route option are summarised in Table 3.

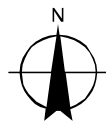
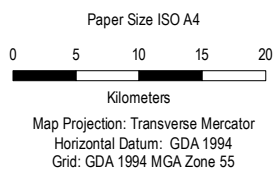
Table 3 Maragle to Yass via Blowering route option – total estimated costs

Item	Components	Cost estimates
1	Construction cost estimate (Class 4)	\$510.48 M
2	Biodiversity offsetting cost estimate	\$227.72 M
3	Property acquisition cost estimate	\$26.69 M
Total estimated costs		\$764.89 M



Legend

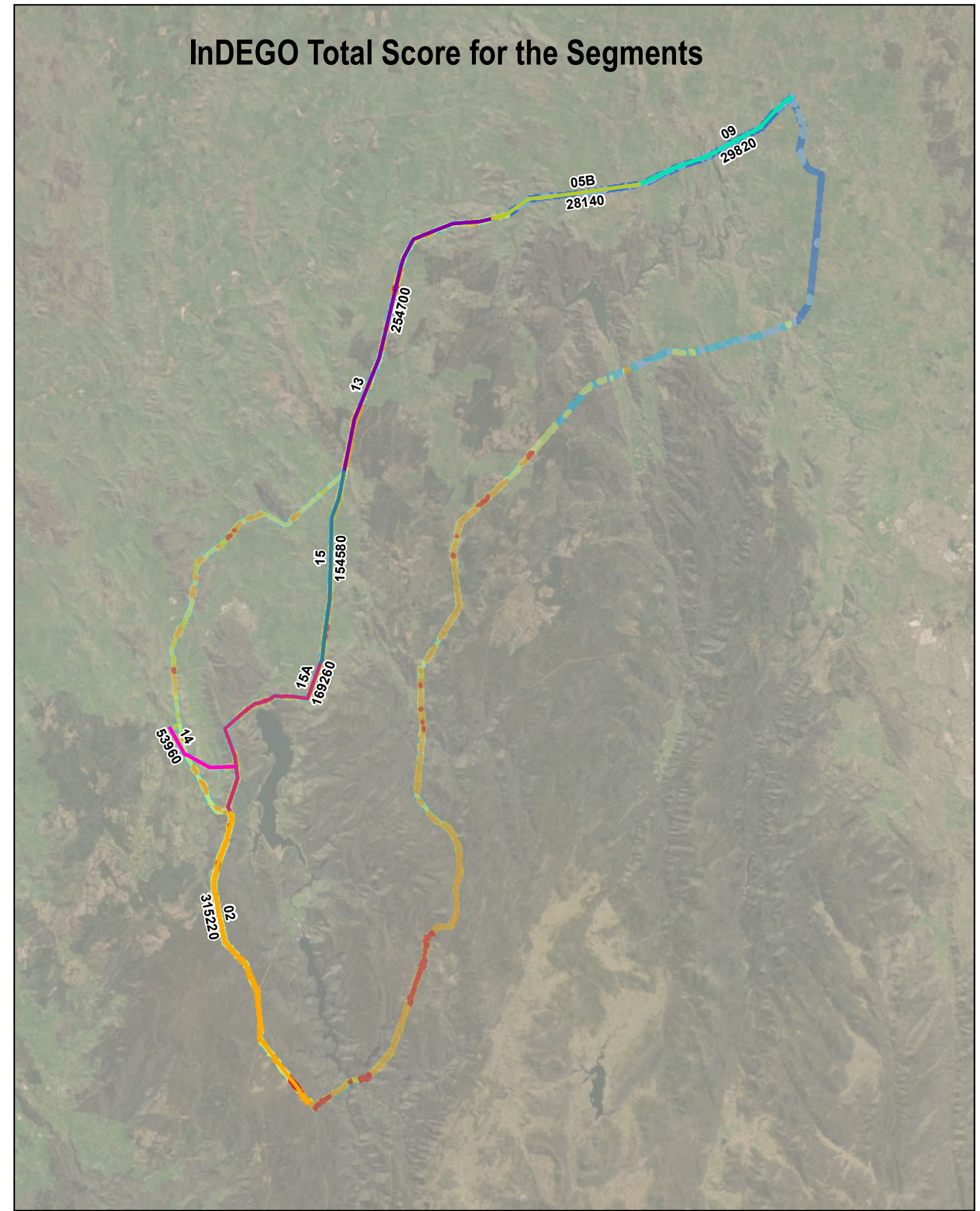
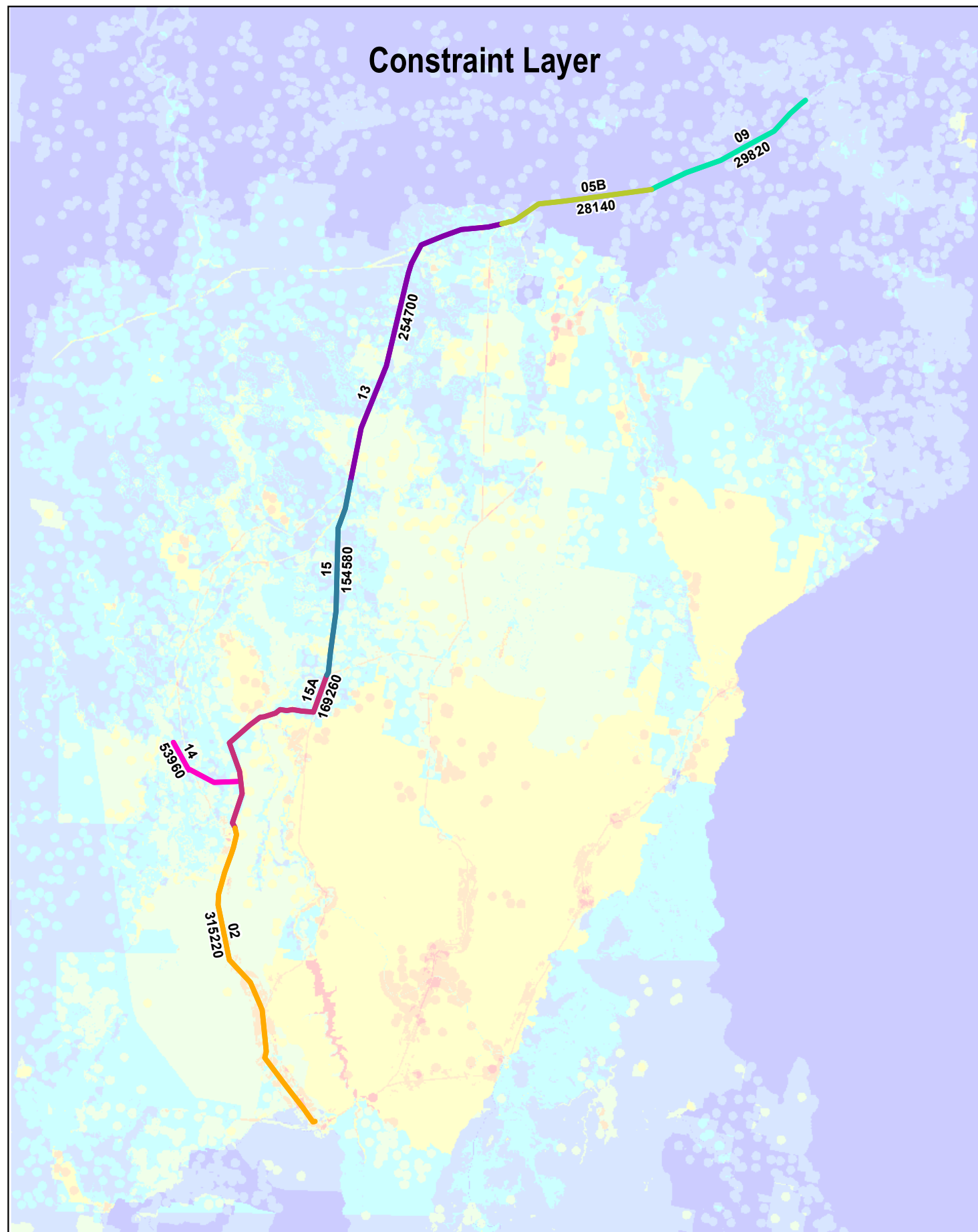
Segment



Transgrid
HumeLink Route Options Assessment

Maragle to Yass
Via Blowering

Project No. 12566012
Revision No. 0
Date 3/9/2022



Paper Size ISO A3

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Legend

02	09	14	15A
05B	13	15	

InDEGO Total Score

0 - 50	101 - 150	201 - 250	301 - 500
50.1 - 100	151 - 200	251 - 300	

Transgrid
HumeLink Route Options Assessment

Maragle to Yass Via Blowering
InDEGO Total Scores: 1005680

Project No. **12566012**
Revision No. **0**
Date **3/10/2022**

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Data Disclaimer: © 2022. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. GHD: Total Scores - 202112
Created by: jhchen; Print date: 10 Mar 2022 - 12:23

Wondalga to Maragle to Yass via Kosciuszko National Park

Route description

The Wondalga to Maragle to Yass via Kosciuszko National Park route option is 193 kilometres long, and was chosen to maximise the length of the route on public land to reduce private property impacts, see Figure 5.

Key constraints

Key constraints for the Wondalga to Maragle to Yass via Kosciuszko National Park route option (based on GIS review) are:

- Aboriginal sites
- Unlicensed (private) airstrips
- NPWS protected areas –Kosciuszko National Park, Oak Creek Nature Reserve
- Wetlands – Tumut Wetlands
- Wilderness areas – Bogong Peaks
- Indigenous Land Use Agreement - Tumut Brungle Area Agreement (NIA1998/001)
- Residential dwellings close to the corridor
- Burrinjuck Dam state heritage site
- Local heritage sites
- Bush fire prone land
- State Forest – Bago, Bondo, Billapaloola, Wee Jasper
- Key waterway crossings – Tumut River, Yarangobilly River, Goodradigbee River, Murrumbidgee River, Yass River
- Endangered ecological communities

Multi-criteria analysis

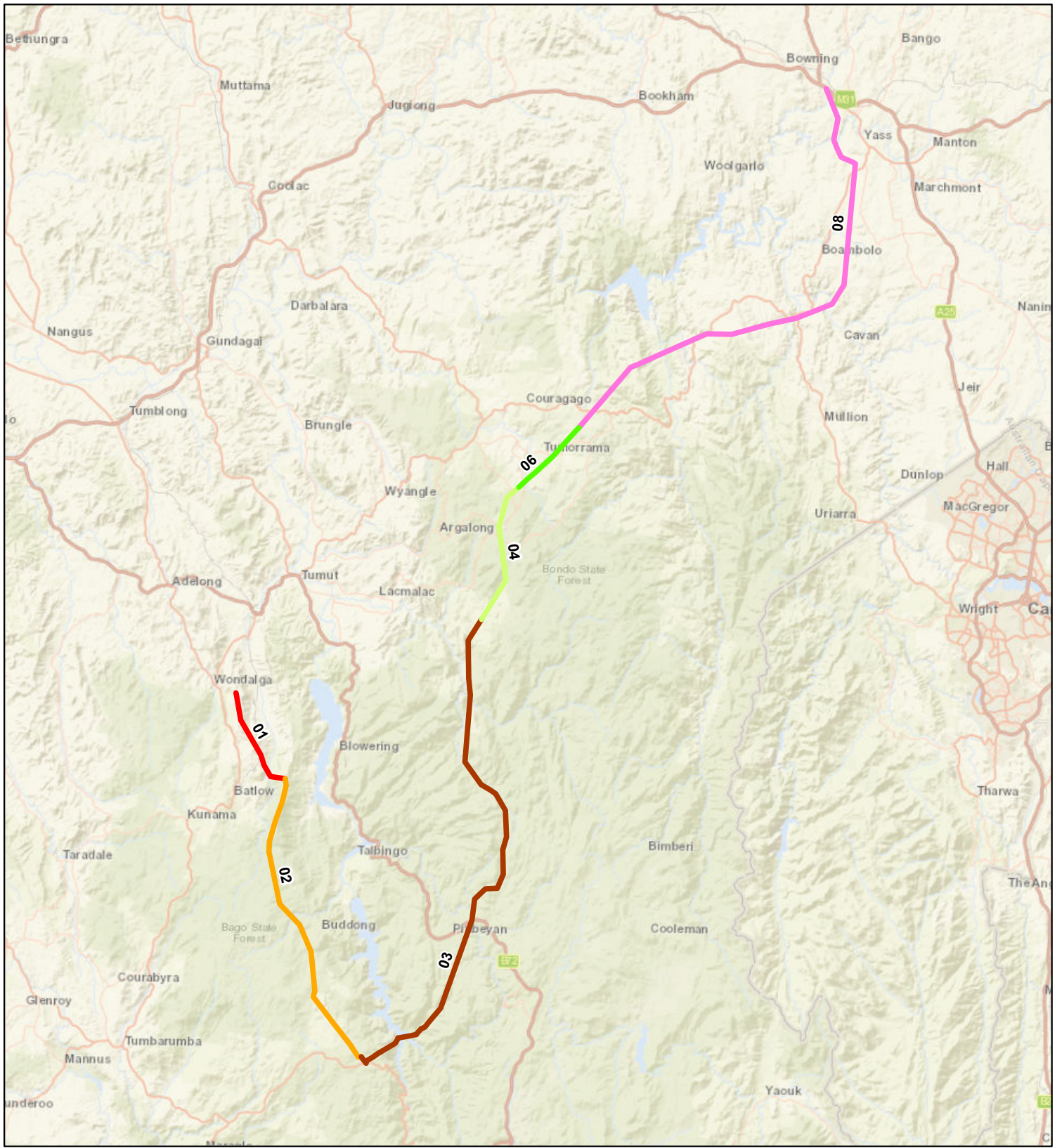
The total InDeGO score resulting from the MCA of the Wondalga to Maragle to Yass via Kosciuszko National Park route option is 1,384,240. A breakdown of the scores is shown in Figure 6.

Cost estimate results

The estimated total costs for the Wondalga to Maragle to Yass via Kosciuszko National Park route option are summarised in Table 4.

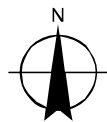
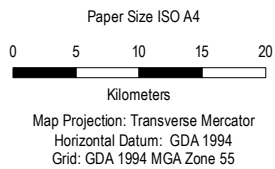
Table 4 Wondalga to Maragle to Yass via Kosciuszko National Park route option – total estimated costs

Item	Component	Cost estimate
1	Construction cost estimate	\$615.64 M
2	Biodiversity offsetting cost estimate	\$321.24 M
3	Property acquisition cost estimate	\$30.27 M
Total estimated costs		\$967.15 M



Legend

Segment

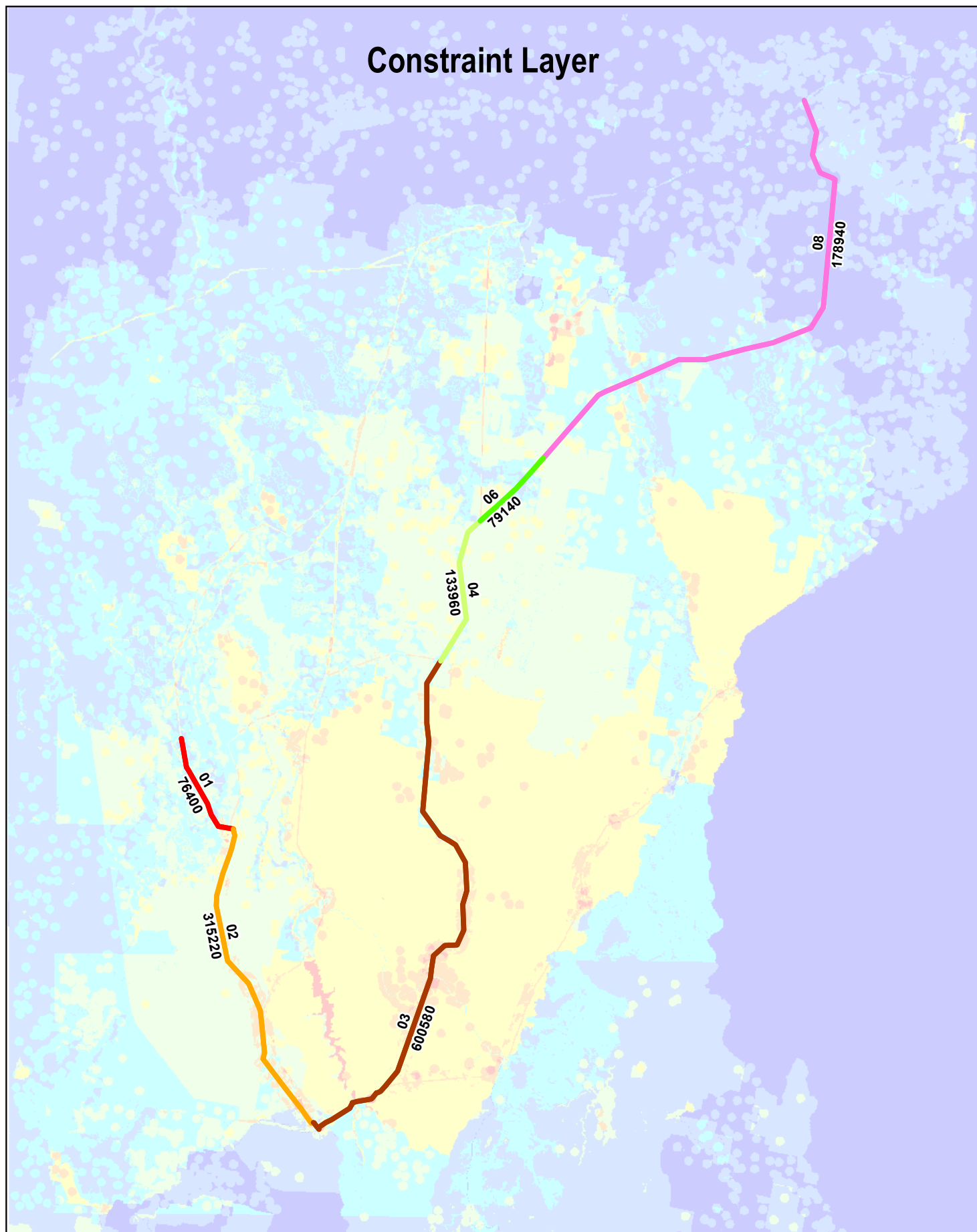


Transgrid
HumeLink Route Options Assessment

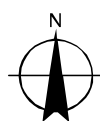
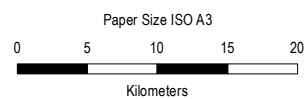
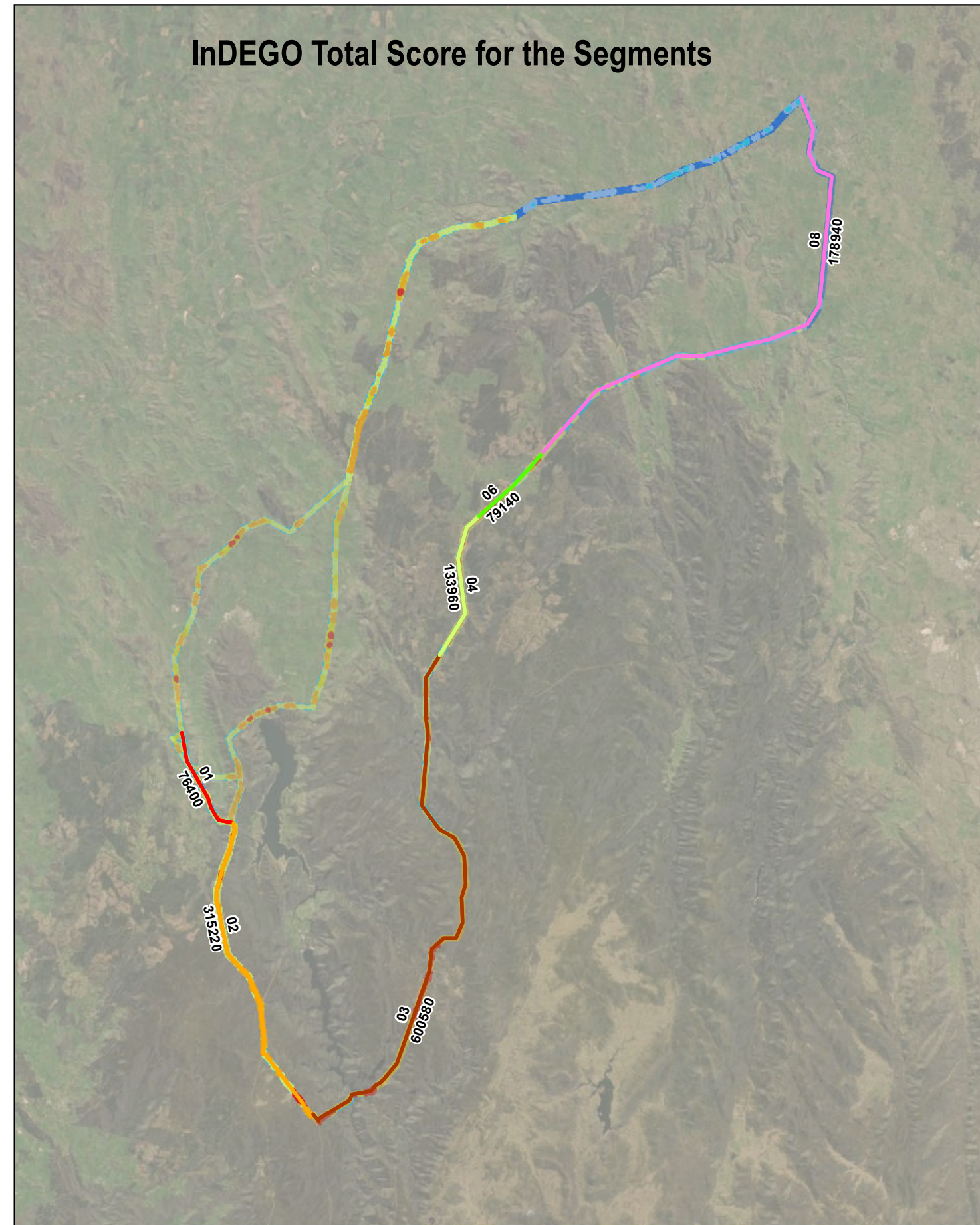
Wondalga to Maragle to Yass
Via Kosciuszko

Project No. 12566012
Revision No. 0
Date 3/9/2022

Constraint Layer



InDEGO Total Score for the Segments



Legend

- 01
- 03
- 06
- 02
- 04
- 08

InDEGO Total Score

- | | | | |
|------------|-----------|-----------|-----------|
| 0 - 50 | 101 - 150 | 201 - 250 | 301 - 500 |
| 50.1 - 100 | 151 - 200 | 251 - 300 | |

Transgrid
HumeLink Route Options Assessment

Via Kosciuszko
InDEGO Total Scores: **1384240**

Project No. **12566012**
Revision No. **0**
Date **3/10/2022**

Optimal route

The assessment found the optimal route for the HumeLink project is the Maragle to Yass via Tumut North option, as:

- It has fewer enviro-social impacts, with a total InDeGO score 43,380 less than the next lowest scoring Blowering option, and 421,940 less than the Kosciuszko option.
- It is the least cost option; estimated at \$53.29 million less expensive than the next highest cost Blowering option, and \$255.55 million less than the Kosciuszko option.

The Wondalga to Maragle to Yass via Kosciuszko National Park route option is the least optimal route due to:

- The substantially higher InDeGO (MCA) score likely due to the significant environmental impacts associated with the route traversing the national park and potential impacts on the Burrinjuck Dam heritage site.
- The much higher costs largely due to the complexity of construction through the alpine region, the cost of acquiring State Forest and national park land, and the cost of offsetting the biodiversity impacts of the route.

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The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described below. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has conducted an assessment using data and evaluation criteria provided by Transgrid and other publicly available data.