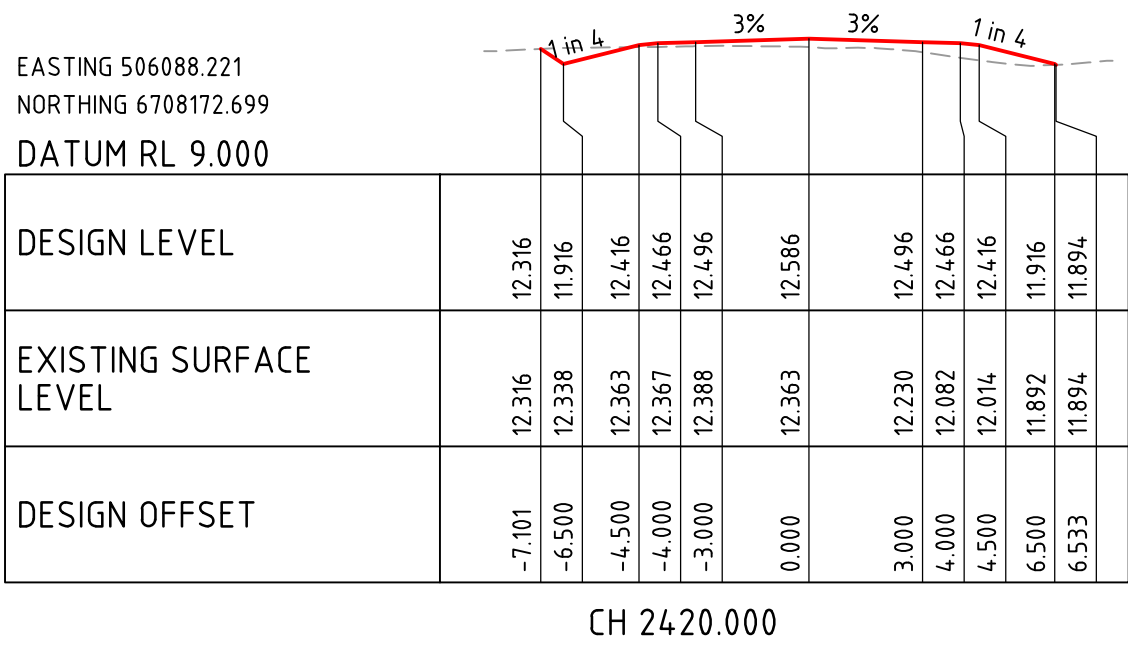
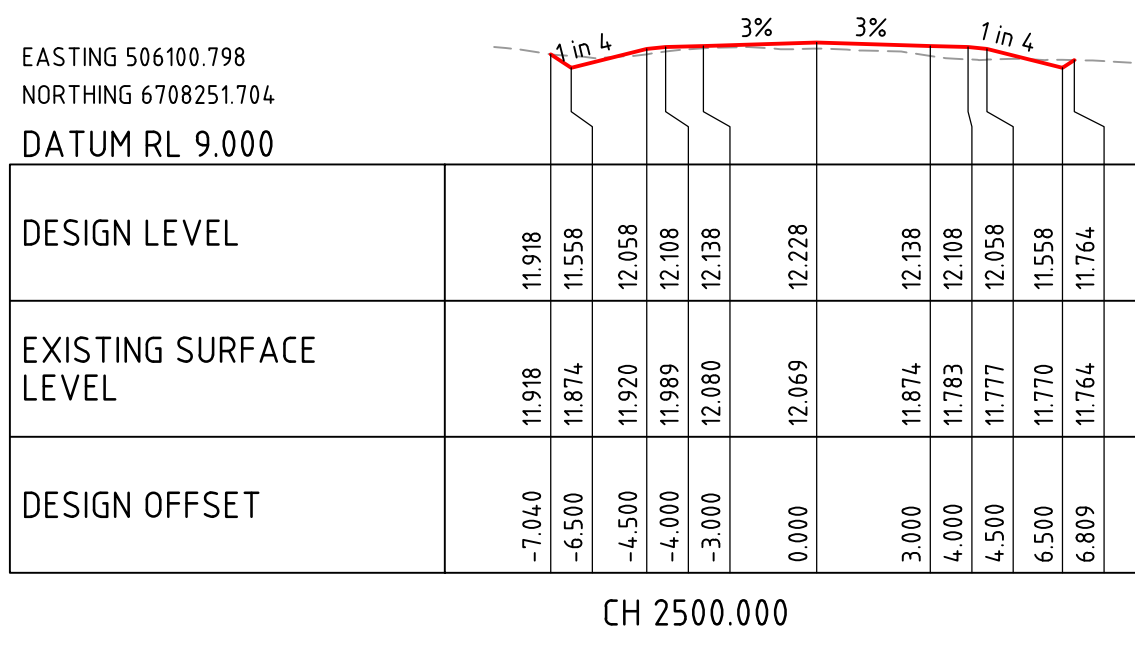


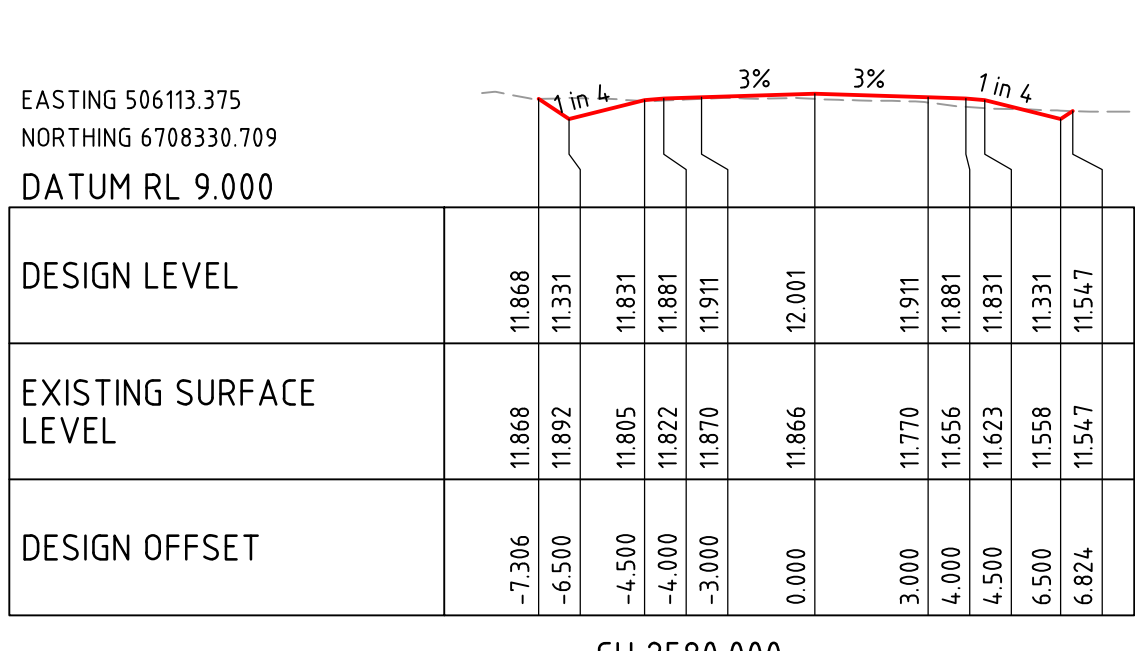
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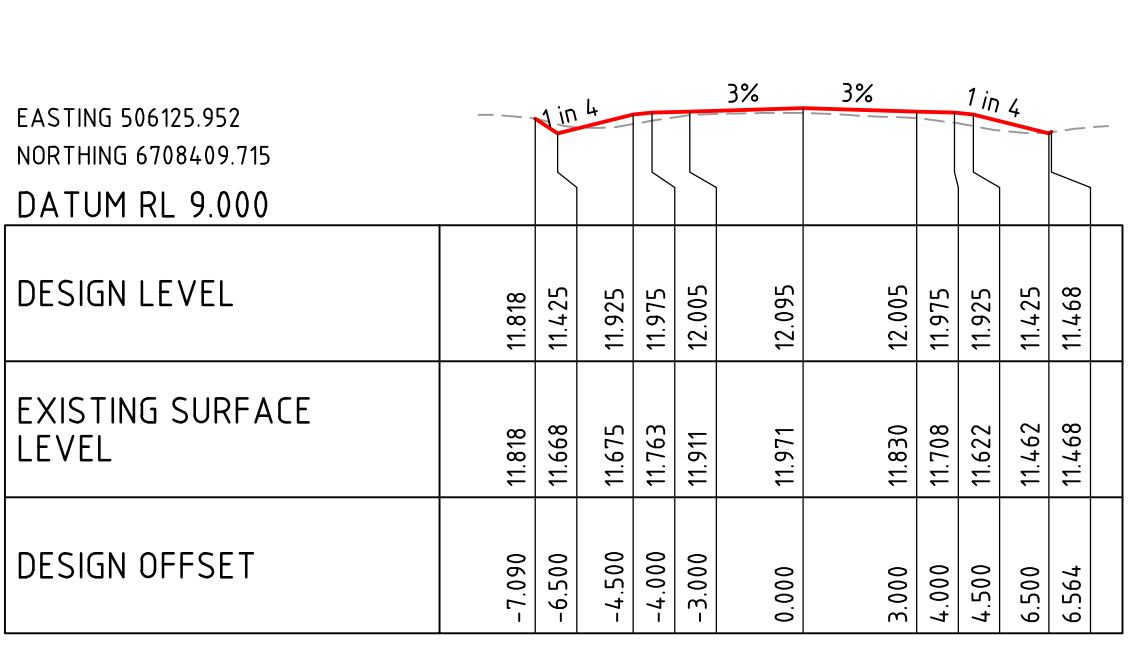
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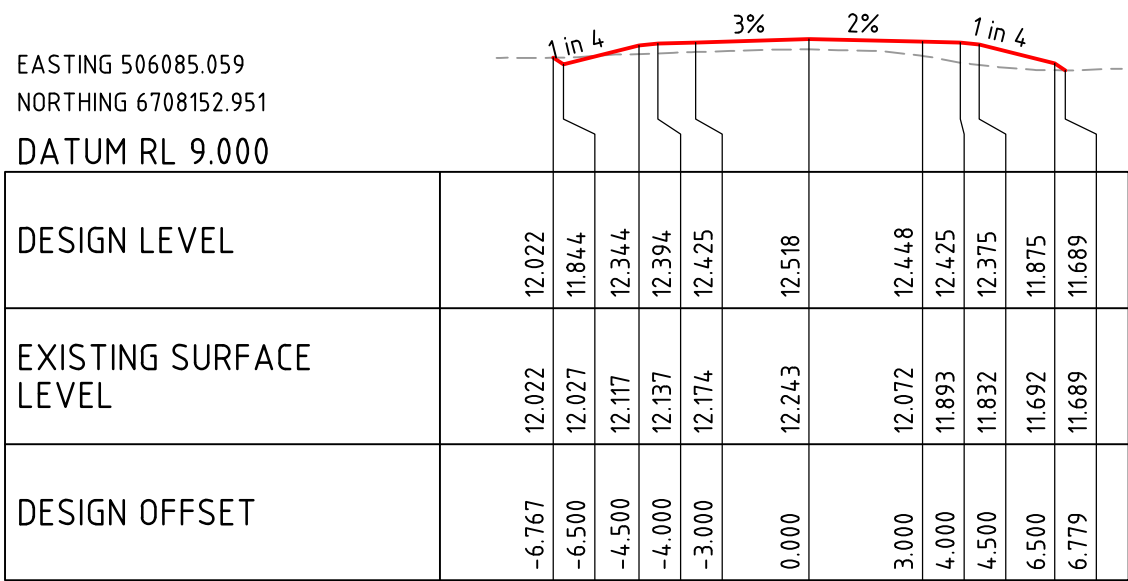
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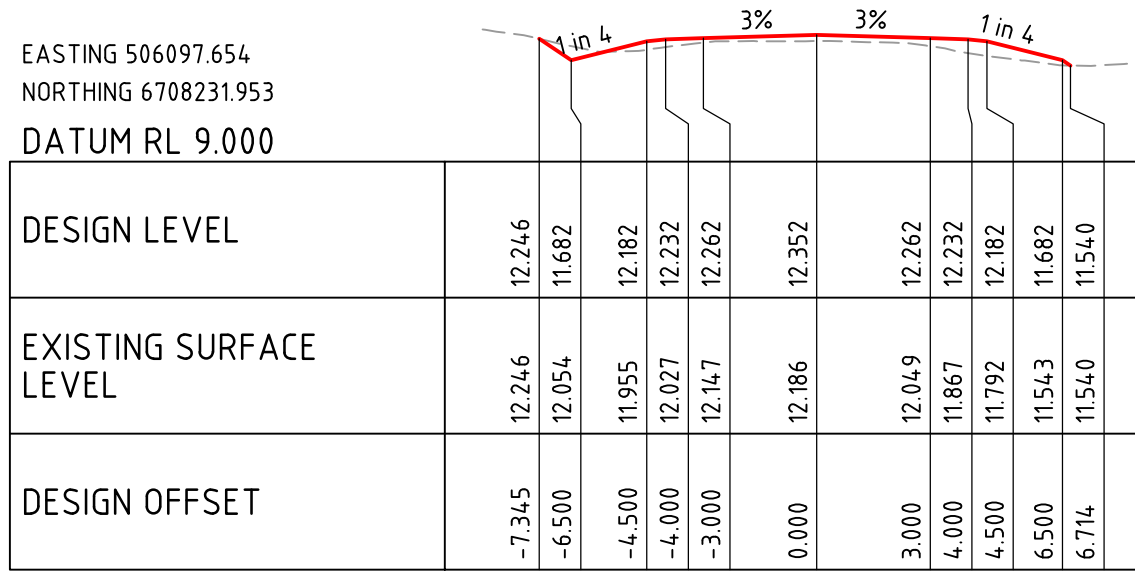
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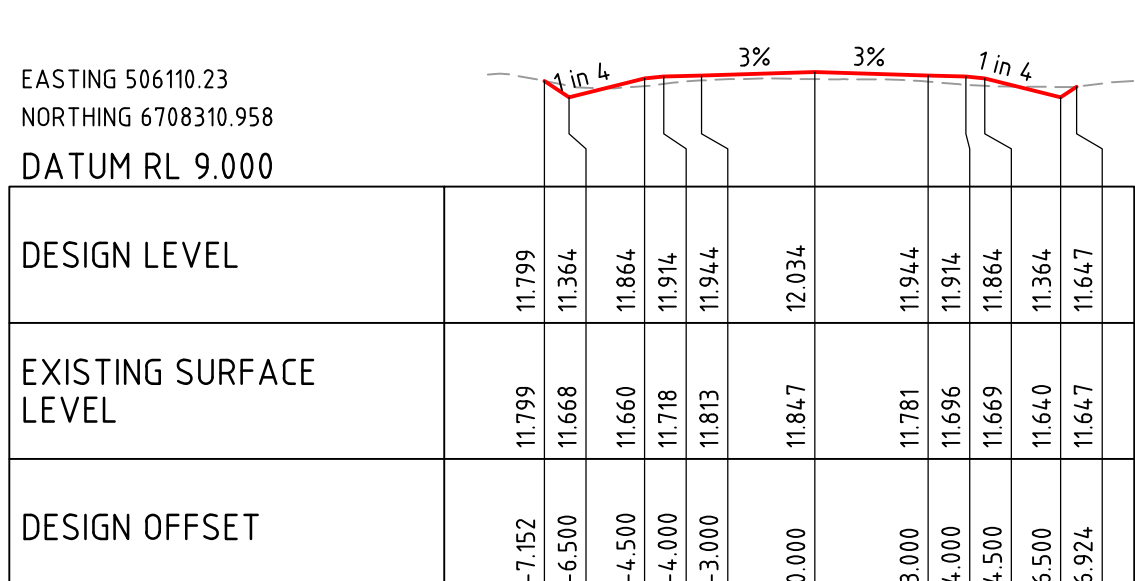
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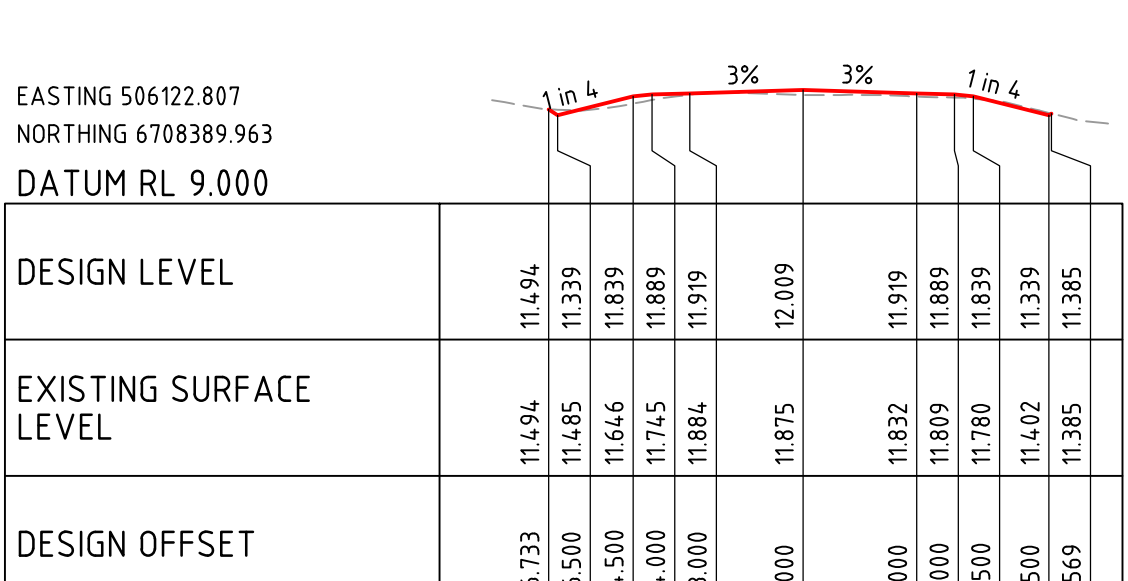
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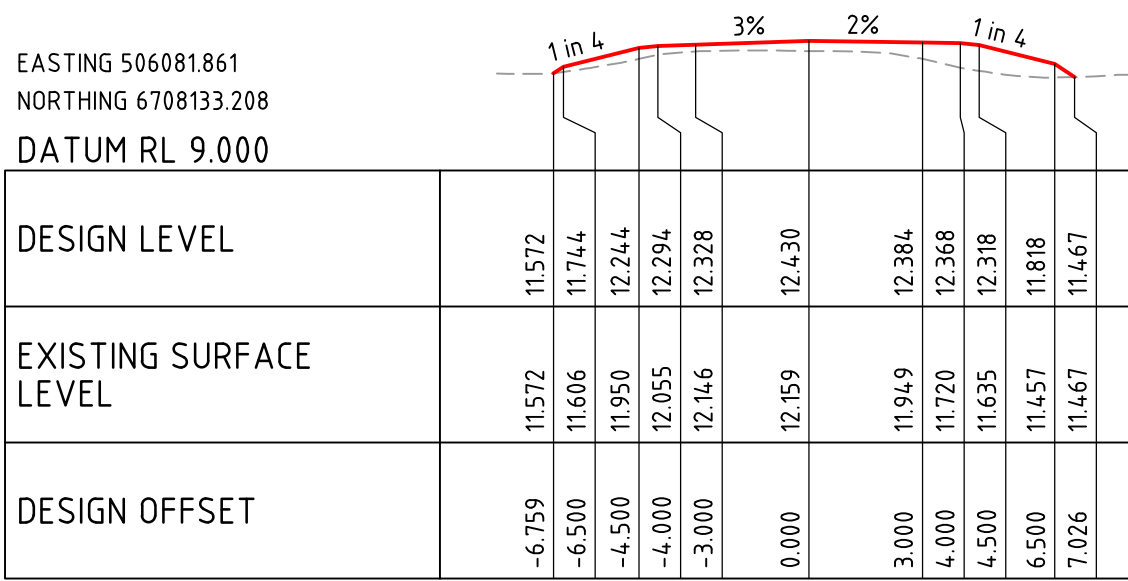
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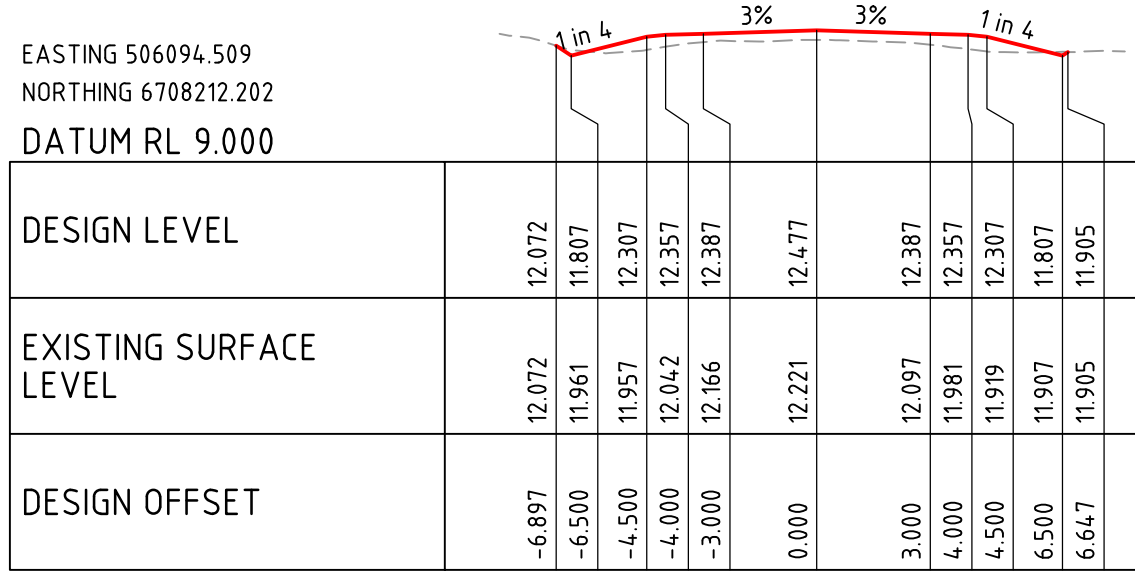
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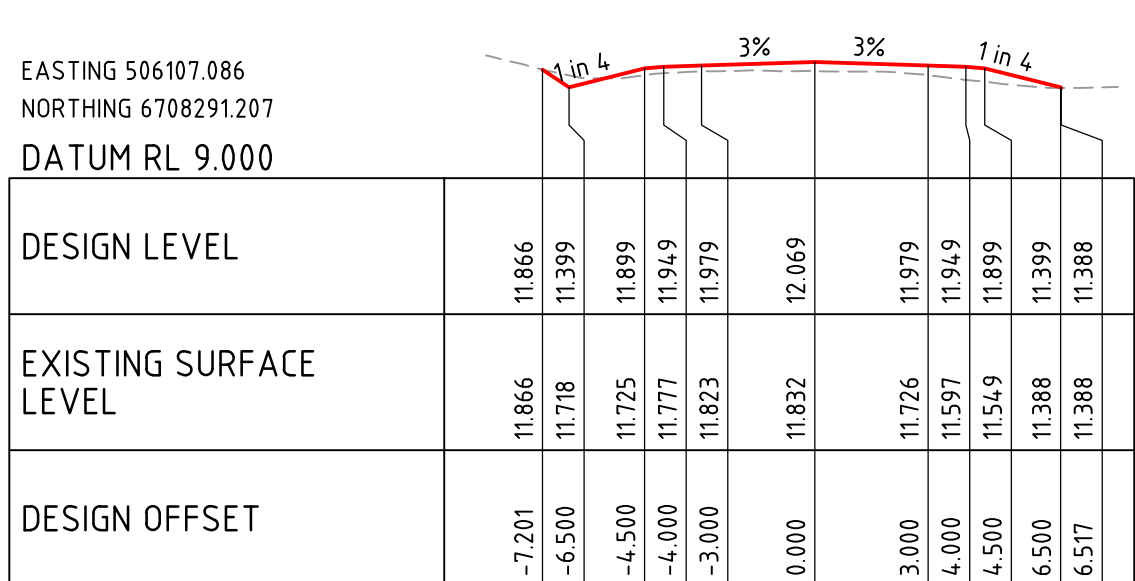
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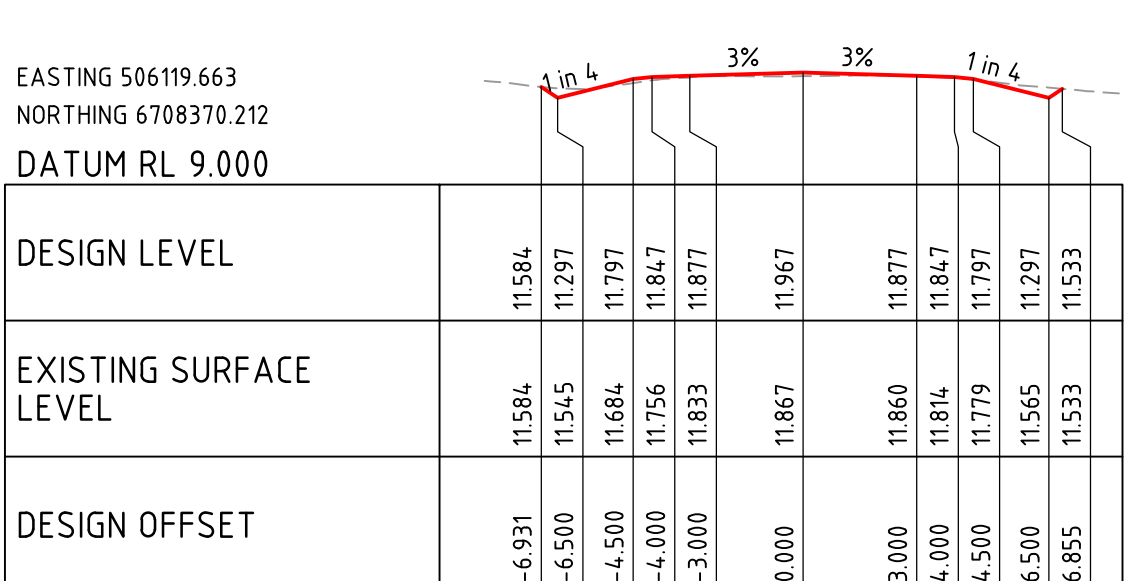
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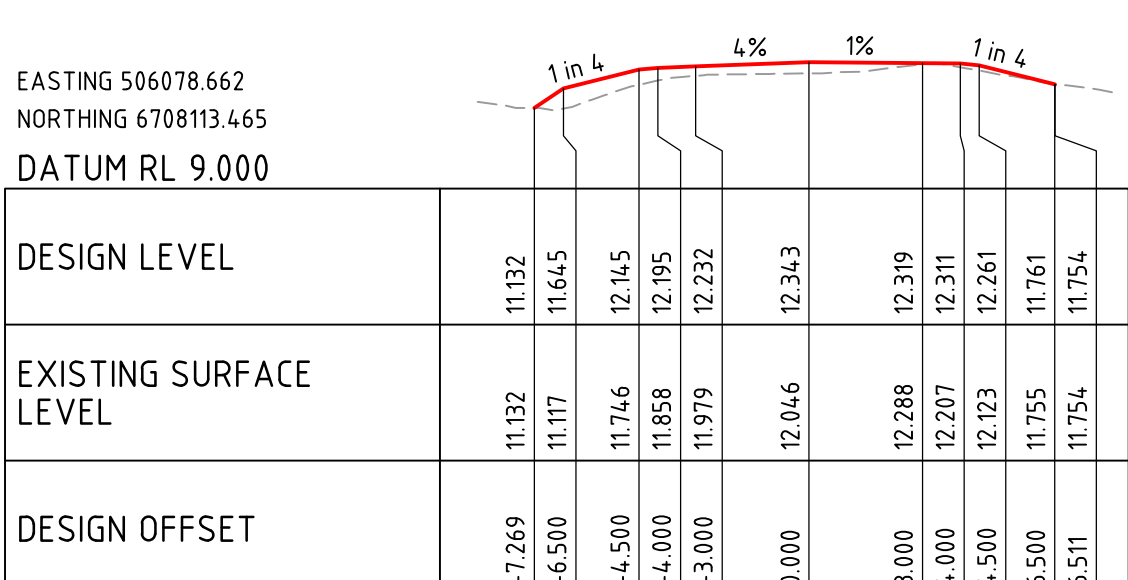
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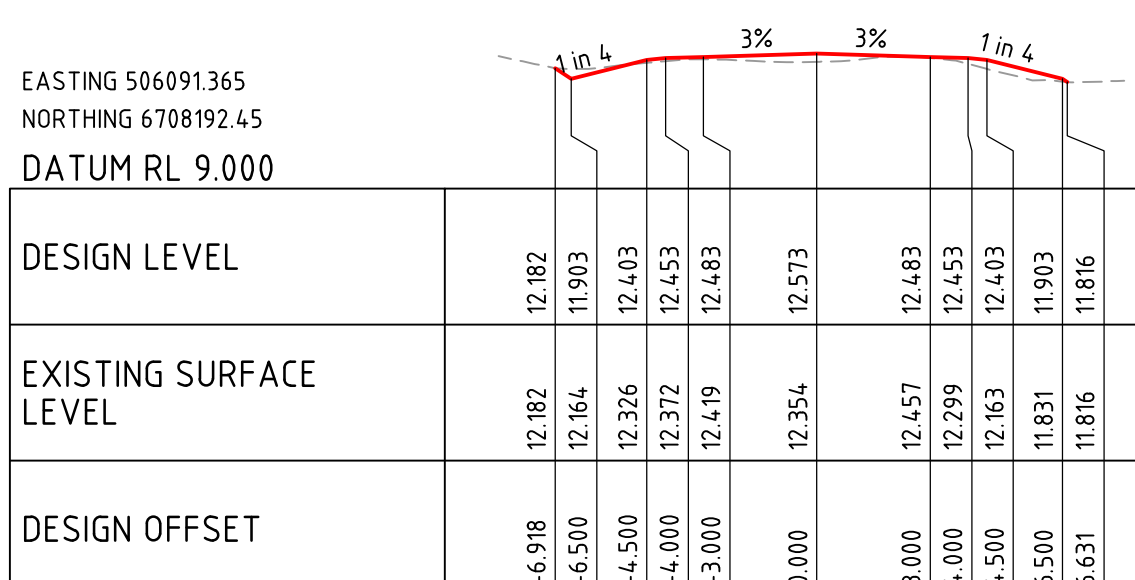
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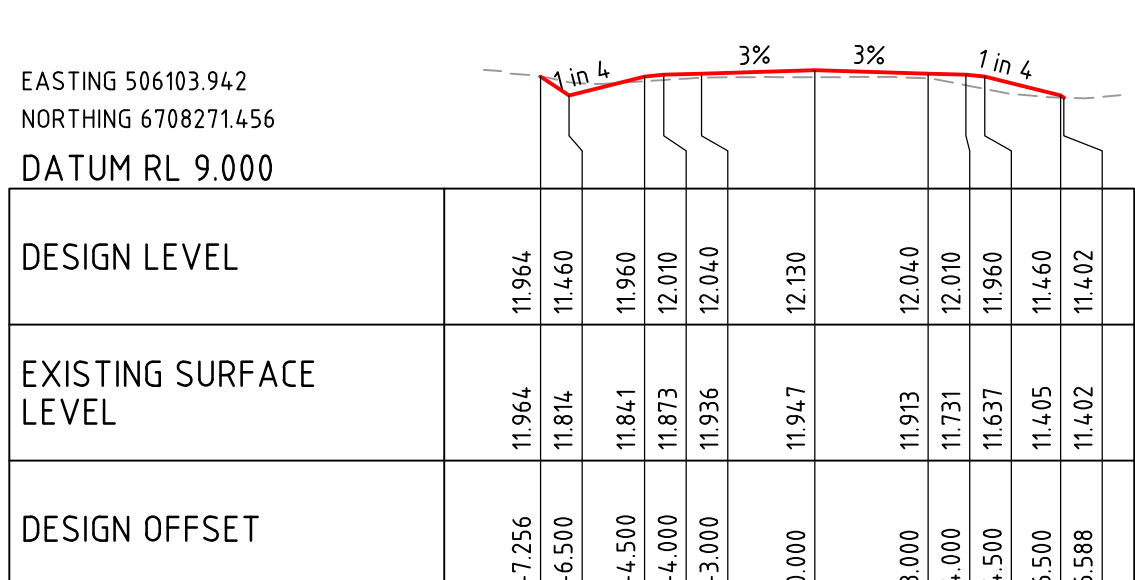
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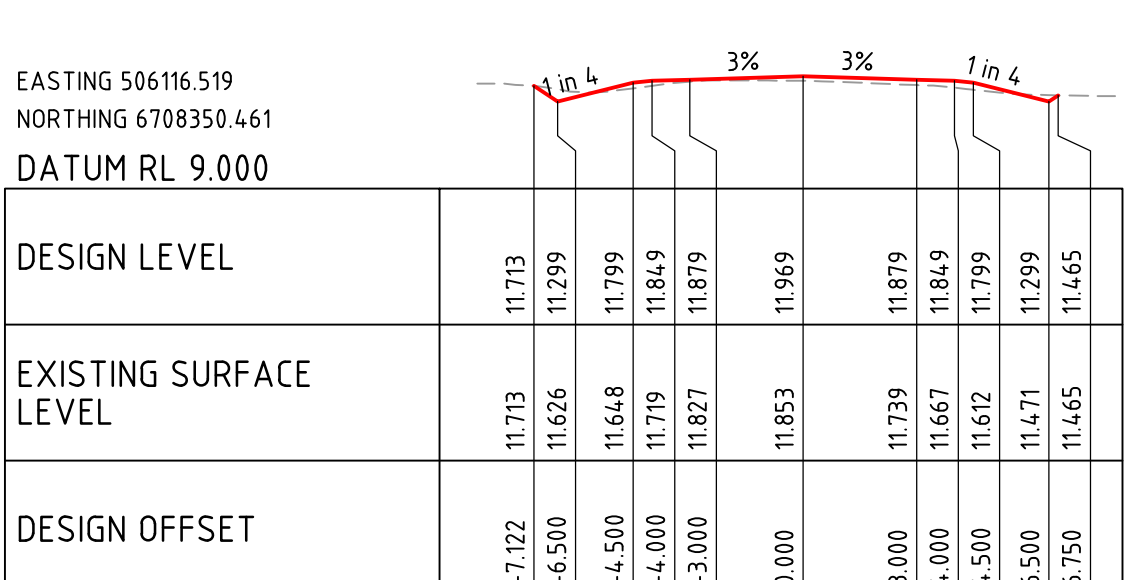
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CH 2440.000



CH 2520.000



CH 2600.000

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Project Name
AVENUE ROAD UPGRADE
TUCABIA NSW 2462

Drawing Title
CROSS SECTIONS
MC50 CH 2360 TO CH 2660
SHEET 1 OF 9

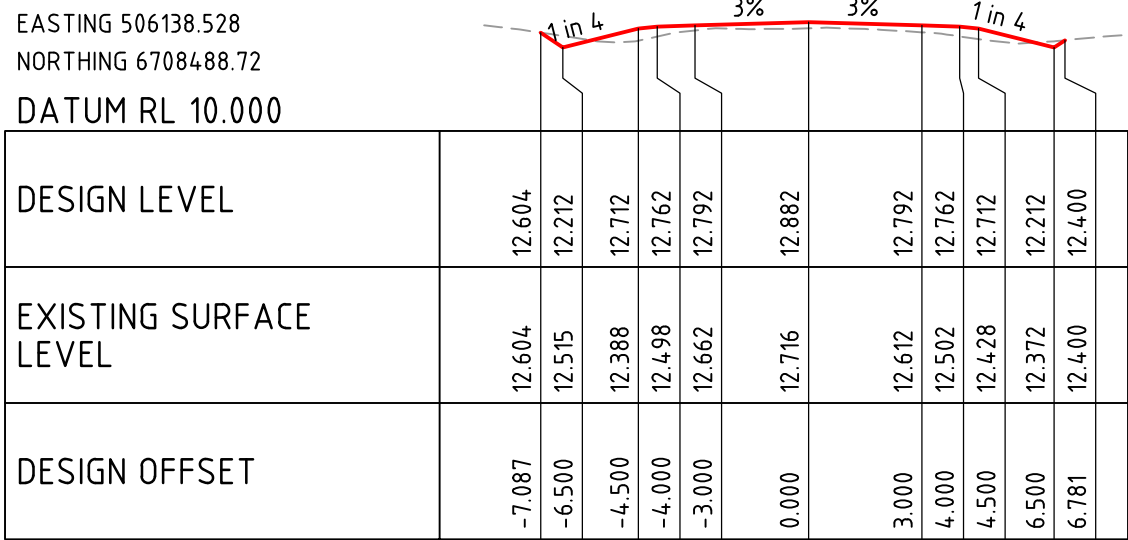
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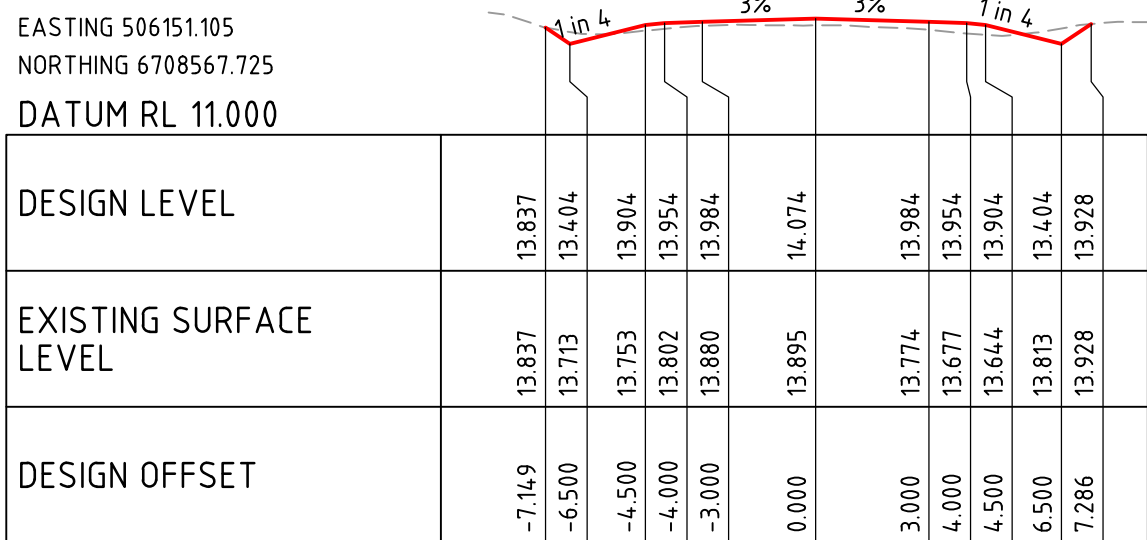
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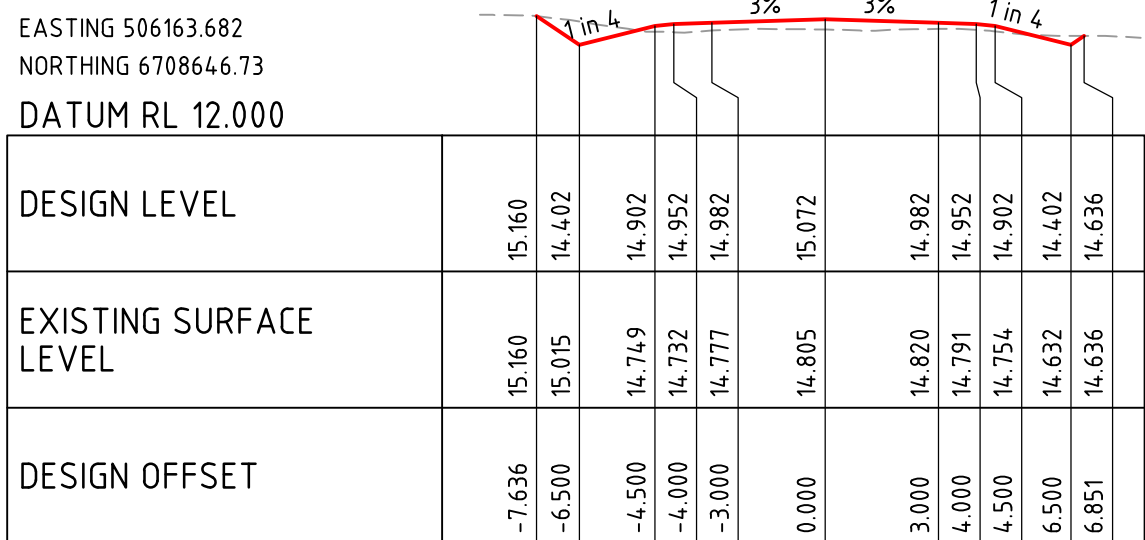
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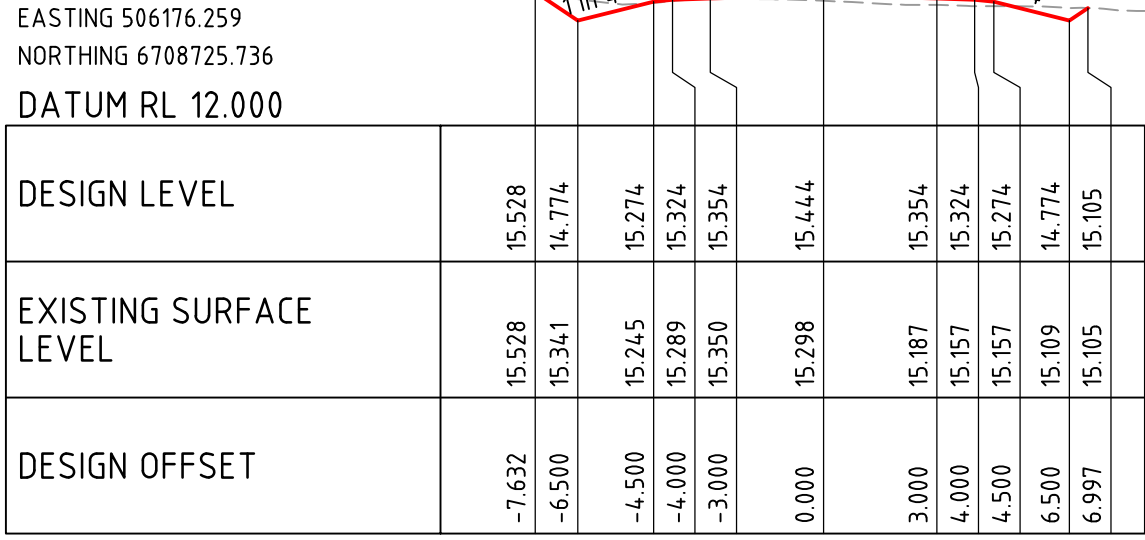
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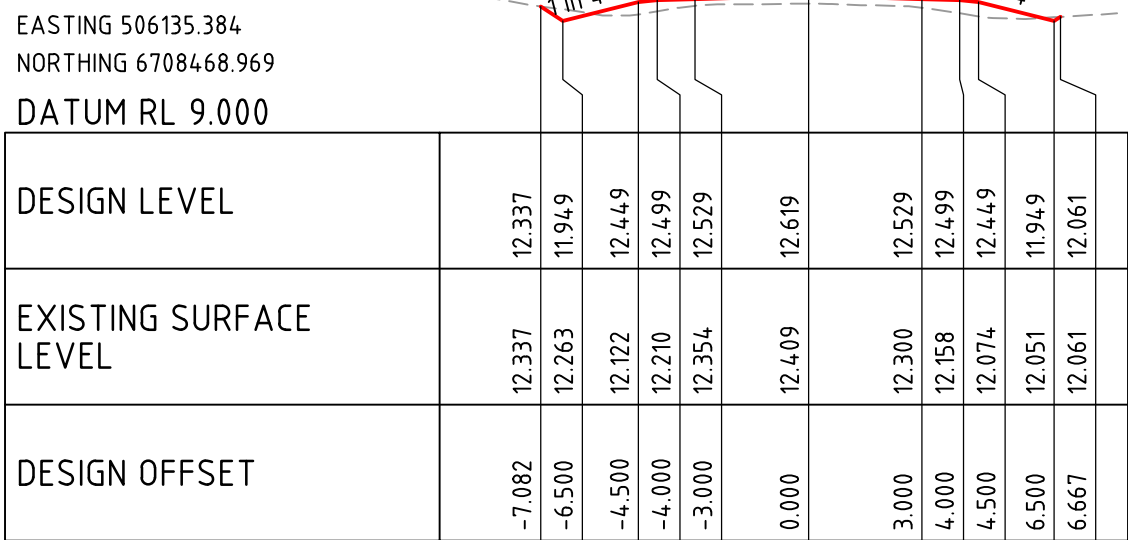
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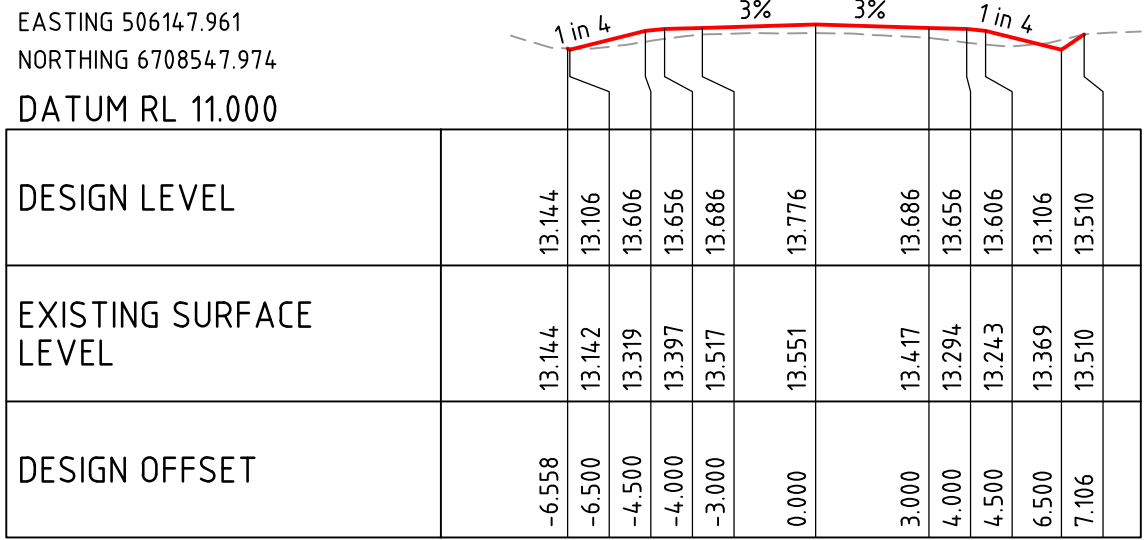
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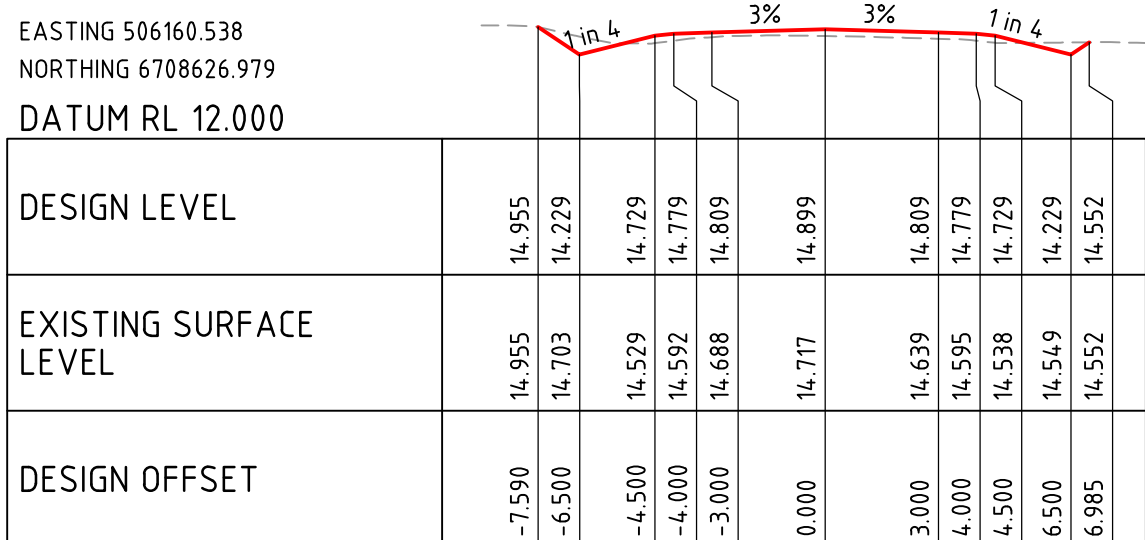
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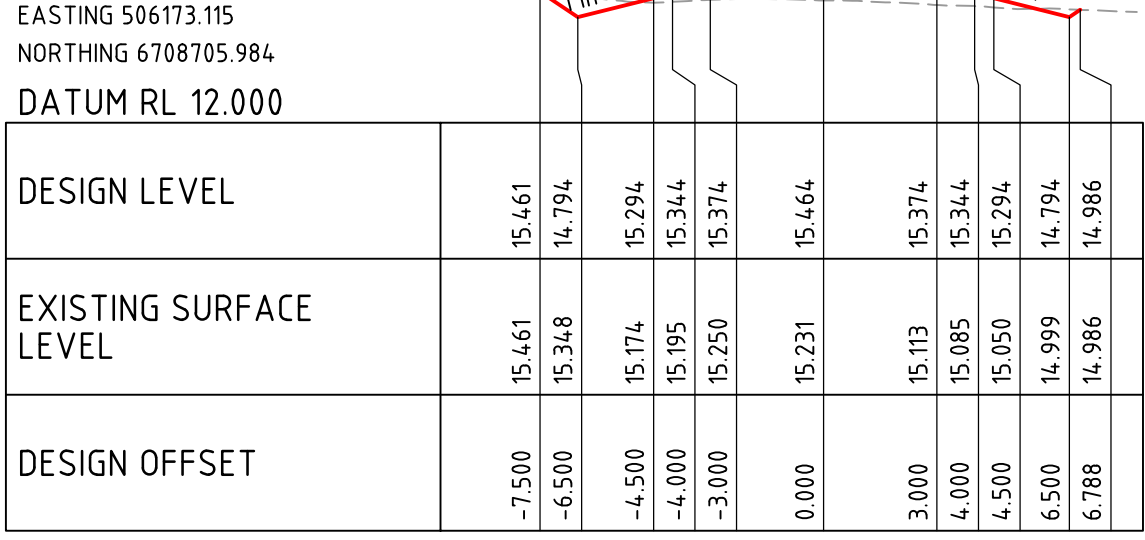
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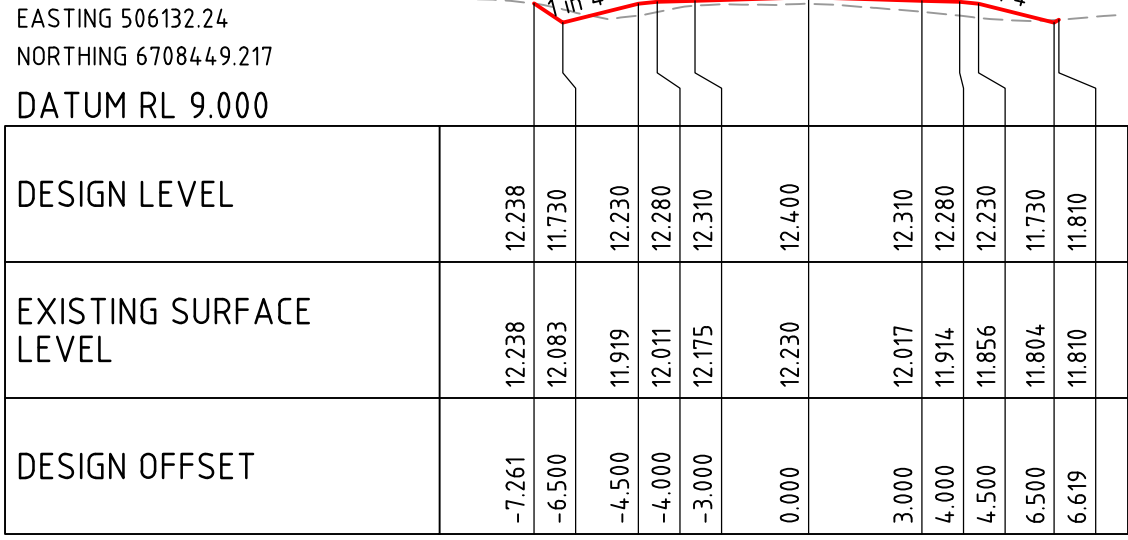
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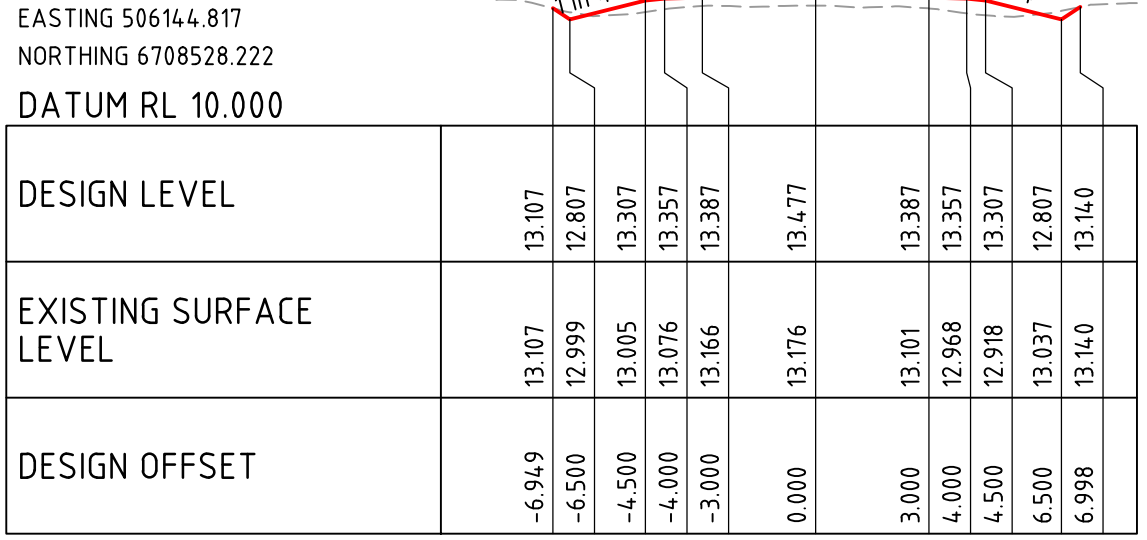
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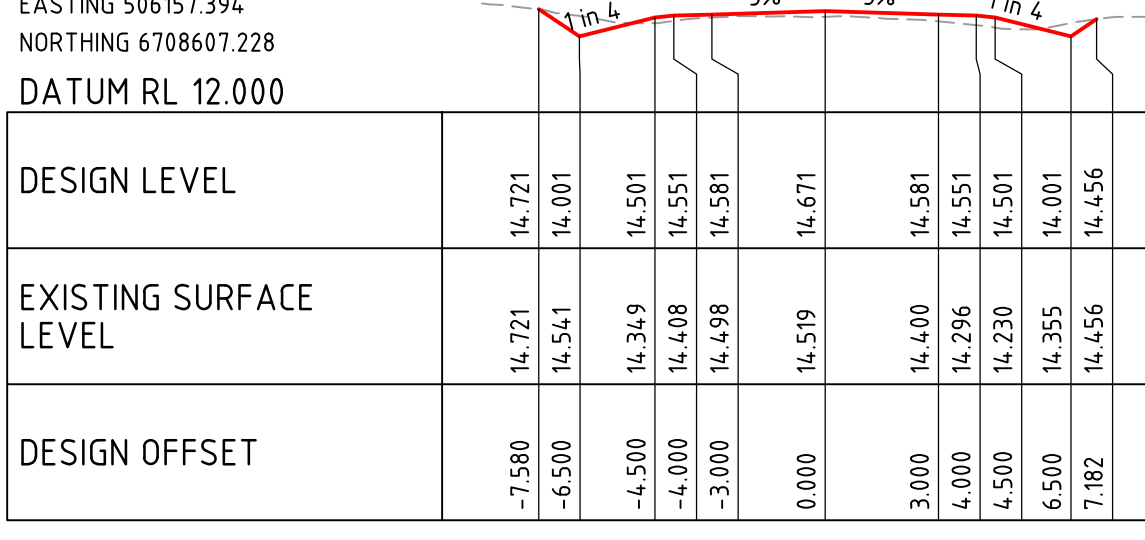
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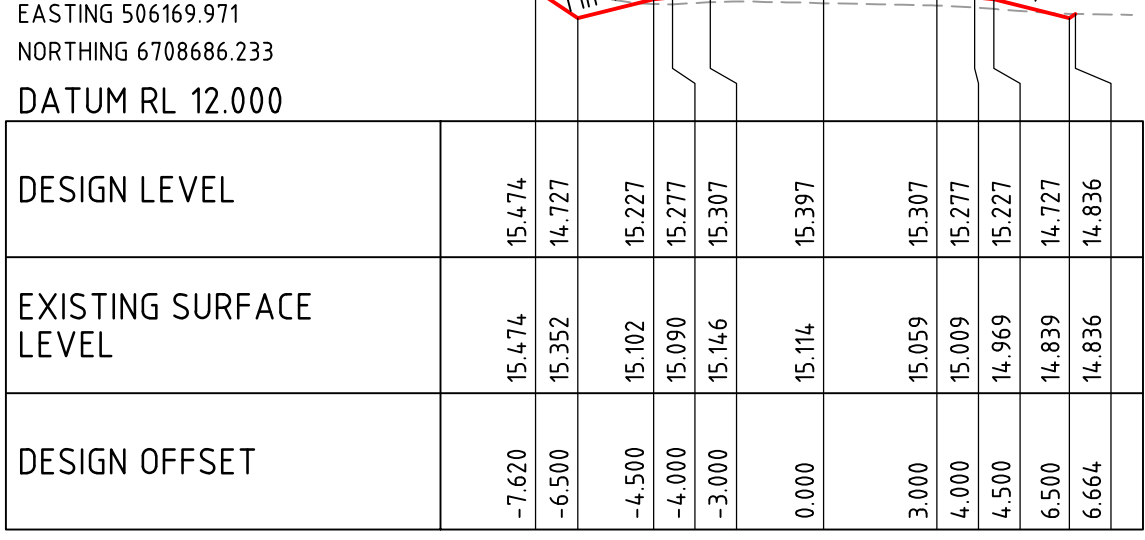
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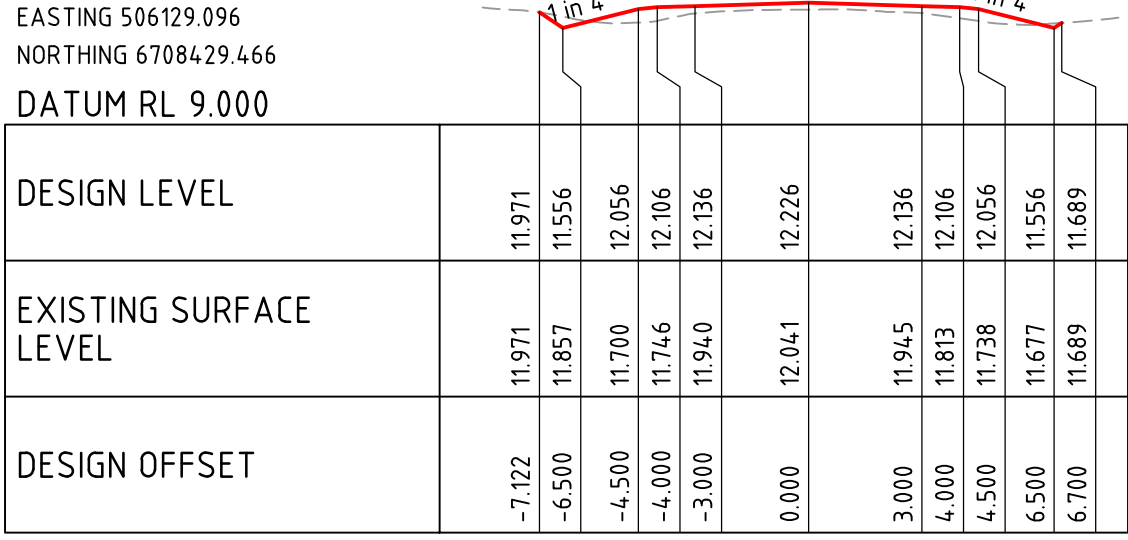
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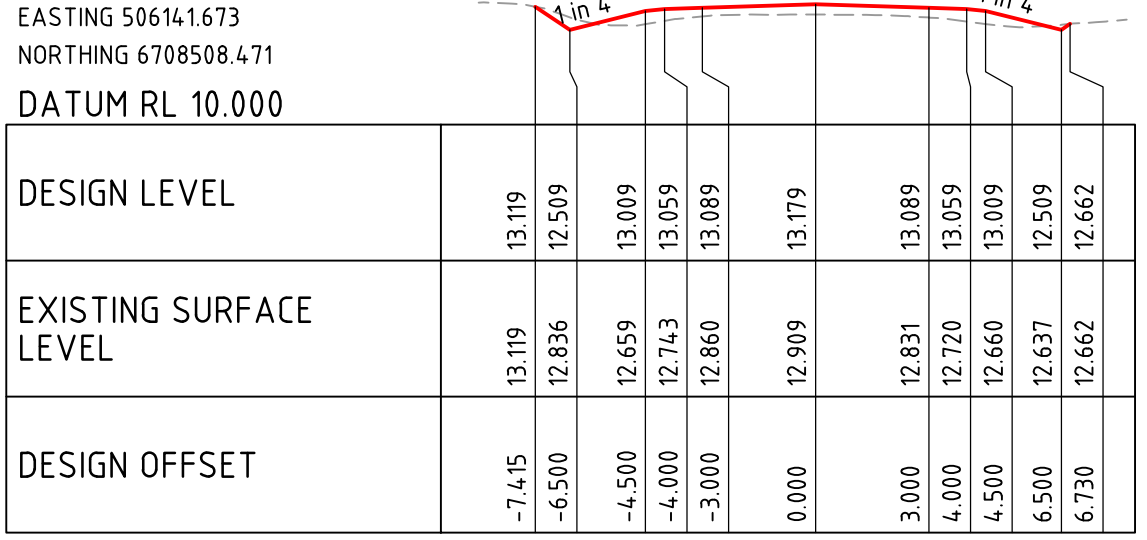
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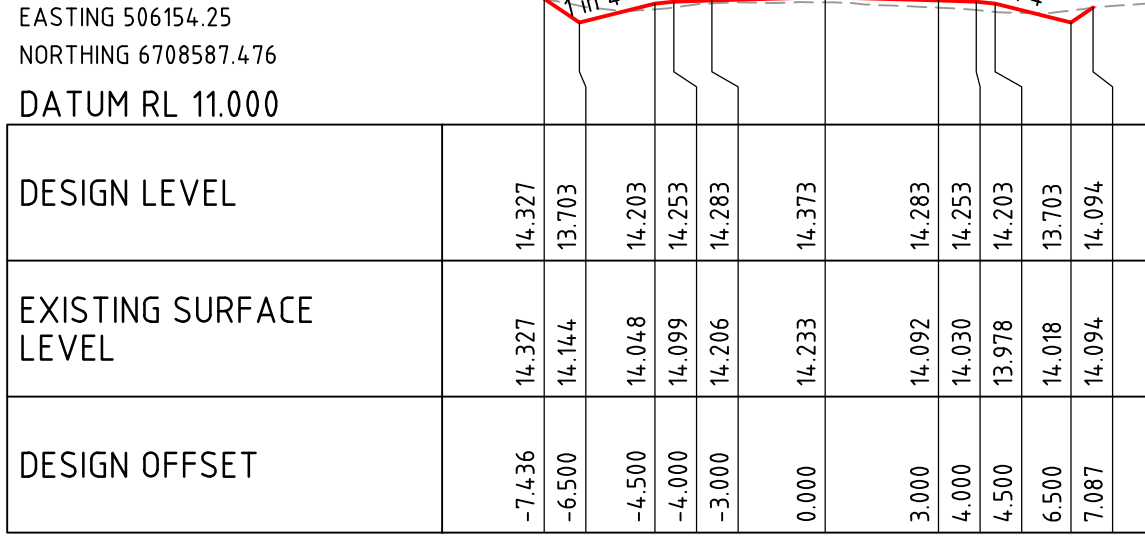
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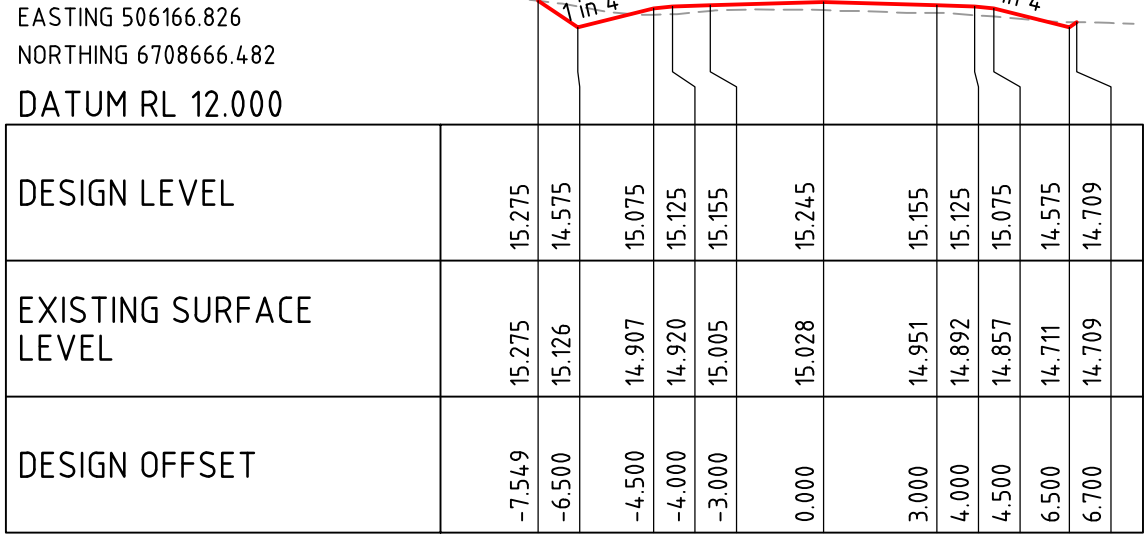
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CH 2760.000



CH 2840.000



CH 2920.000

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Project Name	AVENUE ROAD UPGRADE TUCABIA NSW 2462		
Drawing Title	CROSS SECTIONS MC50 CH 2680 TO CH 2980 SHEET 2 OF 9		
Designed	JF	Project Director Approved	Date
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Date	DEC 2016		Rev
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NORTHING 6709902.007
DATUM RL 14.000

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EXISTING SURFACE LEVEL		17.234	17.234	16.868	16.703	16.715	16.835	16.717	16.560	16.455	16.403	16.335	16.335
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CH 4180.000

EASTING 506415.528
NORTHING 6709980.973
DATUM RL 14.000

DESIGN LEVEL		17.217	16.255	16.755	16.805	16.835	16.925	16.835	16.805	16.755	16.255	16.439
EXISTING SURFACE LEVEL		17.217	16.867	16.686	16.743	16.823	16.824	16.698	16.566	16.493	16.429	16.439
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CH 4260.000

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NORTHING 6710059.94
DATUM RL 13.000

DESIGN LEVEL		15.585	15.585	15.804	15.854	15.884	15.974	15.884	15.854	15.804	15.585	15.368
EXISTING SURFACE LEVEL		15.585	15.558	15.558	15.607	15.705	15.698	15.591	15.423	15.335	15.304	15.368
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CH 4340.000

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DATUM RL 12.000

DESIGN LEVEL		14.874	14.532	15.032	15.082	15.112	15.202	15.112	15.082	14.532	14.748
EXISTING SURFACE LEVEL		14.874	14.759	14.728	14.796	14.974	15.057	14.970	14.843	14.784	14.748
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CH 4420.000

EASTING 506399.509
NORTHING 6709882.265
DATUM RL 13.000

DESIGN LEVEL		17.034	16.136	16.636	16.686	16.716	16.806	16.716	16.686	16.636	16.136	16.110
EXISTING SURFACE LEVEL		17.034	16.731	16.474	16.686	16.716	16.539	16.405	16.286	16.206	16.110	16.110
DESIGN OFFSET		-7.847	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.538

CH 4160.000

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NORTHING 6709961.232
DATUM RL 14.000

DESIGN LEVEL		17.245	16.357	16.857	16.907	16.937	17.027	16.937	16.907	16.857	16.357	16.385
EXISTING SURFACE LEVEL		17.245	16.977	16.780	16.827	16.919	16.911	16.757	16.590	16.494	16.379	16.385
DESIGN OFFSET		-7.832	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.542

CH 4240.000

EASTING 506425.139
NORTHING 6710040.199
DATUM RL 13.000

DESIGN LEVEL		16.369	15.571	16.071	16.121	16.151	16.241	16.151	16.121	16.071	15.571	15.710
EXISTING SURFACE LEVEL		16.369	15.996	15.923	15.974	16.062	15.972	15.879	15.786	15.768	15.716	15.710
DESIGN OFFSET		-7.697	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.709

CH 4320.000

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DATUM RL 12.000

DESIGN LEVEL		15.178	14.688	15.188	15.238	15.268	15.358	15.268	15.238	15.188	14.688	14.860
EXISTING SURFACE LEVEL		15.178	15.075	14.893	15.141	15.238	15.090	15.066	15.047	14.935	14.851	14.860
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CH 4400.000

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DATUM RL 13.000

DESIGN LEVEL		16.523	15.927	16.427	16.477	16.507	16.597	16.507	16.477	16.427	15.927	15.957
EXISTING SURFACE LEVEL		16.523	16.408	16.272	16.298	16.373	16.379	16.282	16.149	16.085	16.027	15.957
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CH 4140.000

EASTING 506409.12
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DATUM RL 14.000

DESIGN LEVEL		16.679	16.396	16.896	16.946	16.976	17.066	16.976	16.946	16.896	16.396	16.232
EXISTING SURFACE LEVEL		16.679	16.588	16.745	16.823	16.900	16.887	16.703	16.548	16.482	16.396	16.232
DESIGN OFFSET		-6.925	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.746

CH 4220.000

EASTING 506421.935
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DATUM RL 13.000

DESIGN LEVEL		16.726	15.862	16.362	16.412	16.442	16.532	16.442	16.412	16.362	15.862	15.937
EXISTING SURFACE LEVEL		16.726	16.375	16.310	16.361	16.428	16.411	16.253	16.069	16.005	15.931	15.937
DESIGN OFFSET		-7.796	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.614

CH 4300.000

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DATUM RL 12.000

DESIGN LEVEL		15.122	14.869	15.056	15.141	15.419	15.449	15.539	15.449	15.141	14.869	14.910
EXISTING SURFACE LEVEL		15.122	15.084	15.056	15.141	15.218	15.266	15.266	15.213	15.166	15.069	14.910
DESIGN OFFSET		-6.879	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.561

CH 4380.000

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DATUM RL 13.000

DESIGN LEVEL		16.449	15.705	16.205	16.255	16.285	16.375	16.285	16.255	16.205	15.705	15.832
EXISTING SURFACE LEVEL		16.449	16.274	16.029	16.068	16.134	16.090	16.106	15.964	15.899	15.832	15.832
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CH 4120.000

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DATUM RL 14.000

DESIGN LEVEL		16.906	16.372	16.872	16.922	16.952	17.042	16.952	16.922	16.872	16.372	16.443
EXISTING SURFACE LEVEL		16.906	16.681	16.620	16.714	16.832	16.857	16.780	16.659	16.602	16.446	16.443
DESIGN OFFSET		-7.301	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.606

CH 4200.000

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DATUM RL 14.000

DESIGN LEVEL		16.903	16.090	16.590	16.640	16.670	16.760	16.670	16.640	16.590	16.090	16.353
EXISTING SURFACE LEVEL		16.903	16.767	16.575	16.589	16.633	16.655	16.642	16.571	16.537	16.378	16.353
DESIGN OFFSET		-7.720	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.995

CH 4280.000

EASTING 506431.547
NORTHING 6710079.682
DATUM RL 12.000

DESIGN LEVEL		15.219	15.075	15.175	15.223	15.625	15.655	15.745	15.655	15.223	15.075	15.075
EXISTING SURFACE LEVEL		15.219	15.204	15.223	15.282	15.397	15.477	15.477	15.332	15.172	15.078	15.075
DESIGN OFFSET		-6.716	-6.500	-4.500	-4.000	-3.000	0.000	3.000	4.000	4.500	6.500	6.584

CH 4360.000

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Project Name
AVENUE ROAD UPGRADE
TUCABIA NSW 2462
Drawing Title
CROSS SECTIONS
MC50 CH 4120 TO CH 4420
SHEET 7 OF 9

PRELIMINARY
Designed JF
Drawn JF
Scale 1:200
Date DEC 2016
Sheet A1
Project Ref
20 21836 01
Drawing No
C246
Rev
P1



Appendix B

Threatened Species Potential Occurrence and Seven-part Test of Significance



Table B.1 Threatened Fauna Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and Need for Assessment of Significance
		TSC Act	EPBC Act			
INSECTS						
<i>Petalura litorea</i>	Coastal Petaltail	V	-	Permanent wetlands, swamps and bogs with some free water and open vegetation. Restricted to coastal and near coastal lowlands between Coffs Harbour and Ballina. L	Low	Low; no further assessment required.
AMPHIBIANS						
<i>Crinia tinnula</i>	Wallum Froglet	V	-	Acid paperbark and sedge swamps known as ‘wallum’, this is a banksia-dominated lowland heath ecosystem characterised by acidic waterbodies.	Low	Low; no further assessment required.
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-	Rainforest, moist to dry eucalypt forest and heath, typically where surface water gathers after rain.	Low	Low; no further assessment required.
<i>Mixophyes balbus</i>	Stuttering Frog	V	V	Cool rainforest, moist eucalypt forest and occasionally along creeks in dry eucalypt forest.	Low	Low. No OEH records within locality; no further assessment required.
<i>Mixophyes iteratus</i>	Giant Barred Frog	V	V	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	Low	Low; no further assessment required.
REPTILES						
<i>Saiphos reticulatus</i>	Three-toed Snake-tooth Skink	V	V	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils.	Low	Low. No OEH records within locality; no further assessment required.
AVIFAUNA						
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Low	Low. No OEH records within locality; no further assessment required.
<i>Anseranas semipalmata</i>	Magpie Goose	V	-	Shallow wetlands (<1 m deep), large swamps and dams with dense growth of rushes or sedge.	Low	Low; no further assessment required.



Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEI Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and Need for Assessment of Significance
		TSC Act	EPBC Act			
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	Woodlands and dry open sclerophyll forests, usually dominated by eucalypts; also recorded in shrublands, heathlands and various modified habitats.	Low	Low; no further assessment required.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	Low	Low; no further assessment required.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	Lightly timbered open forest and woodland, and partly cleared farmland with woodland remnants, preferring areas with dry leaf-litter, fallen timber and sparse ground cover.	Low	Low; no further assessment required.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE	Tidal mudflats, sandy ocean shores and occasionally inland freshwater or salt-lakes.	Low	Low. No OEI records within locality; no further assessment required.
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1,000 m.	Low	Low; no further assessment required.
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	Eucalyptus dominated communities with sparse shrubs and grassy understorey.	Low	Low; no further assessment required.
<i>Circus assimilis</i>	Spotted Harrier	V	-	Grassy open woodland, inland riparian woodland, grassland and shrub steppe.	Low	Low; no further assessment required.
<i>Climacteris picumnus</i>	Brown Treecreeper	V	-	Eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range, and less commonly on coastal plains and ranges.	Low	Low; no further assessment required.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Low	Low; no further assessment required.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	High elevation open forest, woodland with dense tussock or sedge understorey adjacent to rainforest or wet eucalypt forest.	Low	Low. No OEI records within locality; no further assessment required.



Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and Need for Assessment of Significance
		TSC Act	EPBC Act			
<i>Dromaius novaehollandiae</i>	Emu population NSW North Coast Bioregion	E	-	Open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	Low	Low; no further assessment required.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	Swamps, mangroves, mudflats, dry floodplains.	Low	Low; no further assessment required.
<i>Erythroriorchis radiatus</i>	Red Goshawk	CE	V	In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Low	Low; no further assessment required.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Forages primarily in the canopy of open <i>Eucalyptus</i> forest and woodland, yet also sources food in <i>Angophora</i> , <i>Melaleuca</i> and other tree species.	High	Small flocks recorded foraging near Old Six Mile Lane in late 2016 (pers. obs.). Assessment of significance completed.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	Low	Low. No OEH records within locality; no further assessment required.
<i>Grus rubicunda</i>	Brolga	V	-	Shallow swamps, floodplains, grasslands and pastoral lands, usually in pairs or parties.	Low	Low; no further assessment required.
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-	Open beaches, intertidal flats, sandbanks and occasionally rocky headlands.	Low	Low; no further assessment required.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	V	-	Coastal seas, rivers, fresh and saline lakes, lagoons, reservoirs and terrestrial habitats such as grasslands.	Low	Low; no further assessment required.
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used.	Low	Low; no further assessment required.
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V	-	Among vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	Low	Low; no further assessment required.
<i>Lathamus discolor</i>	Swift Parrot	E	E	Forests, woodlands, plantations, and banksias.	Low	Low; no further assessment required.



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		TSC Act	EPBC Act			
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Dry woodland and open forest, particularly along major rivers and belts of trees in urban or semi-urban areas. Home range can extend over at least 100 km ² .	Low	Low; no further assessment required.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	-	Drier open forests or woodlands dominated by box and ironbark eucalypts, and open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	Low	Low; no further assessment required.
<i>Ninox connivens</i>	Barking Owl	V	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland.	Moderate	May forage in locality. Assessment of significance completed.
<i>Ninox strenua</i>	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest, common along drainage lines.	Low	Low; no further assessment required.
<i>Numenius madagascariensis</i>	Eastern Curlew	CE	CE	Estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass	Low	Low. No OEH records within locality; no further assessment required.
<i>Pandion cristatus</i>	Eastern Osprey	V	-	Forages for fish in fresh, brackish or saline waters of rivers, lakes, estuaries with suitable nesting sites nearby.	Low	Low; no further assessment required.
<i>Melanodryas cucullata</i>	Hooded Robin	V	-	Drier Eucalypt forest, woodland, scrub with fallen logs, debris.	Low	Low; no further assessment required.
<i>Petroica boodang</i>	Scarlet Robin	V	-	Dry eucalypt forests and woodlands, usually with an open grassy understorey with few scattered shrubs. An abundance of logs and fallen timber appear to be an important habitat feature for this species.	Low	Low; no further assessment required.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V	-	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	Moderate	Heard calling on adjacent land. Assessment of significance completed.



Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEI Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and Need for Assessment of Significance
		TSC Act	EPBC Act			
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V	-	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests.	Low	Low; no further assessment required.
<i>Ptilinopus regina</i>	Rose-crowned Fruit-dove	V	-	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	Low	Low; no further assessment required.
<i>Rostratula australis</i>	Australian Painted Snipe	E	V	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	Low	Low. No OEI records within locality; no further assessment required.
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	Grassy eucalypt woodlands, open forest, mallee, temperate grassland, and secondary grassland derived from other communities, riparian areas, and sometimes in lightly wooded farmland.	Low	Low; no further assessment required.
<i>Turnix melanogaster</i>	Black-breasted Button-quail	V	V	Drier rainforests and viney scrubs, often in association with Hoop Pine and a deep moist leaf litter layer.	Low	Low. No OEI records within locality; no further assessment required.
<i>Tyto longimembris</i>	Eastern Grass Owl	V	-	Areas of tall grass, including tussocks in swampy areas, grassy plains, swampy heath, cane grass, sedges on flood plains.	Low	Low; no further assessment required.
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Dry eucalypt forest and woodlands.	Moderate	May forage in locality. Assessment of significance completed.
MAMMALS						
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V	-	Tall moist eucalypt forest to open woodland with tussock grass understorey.	Moderate	May forage in locality. Assessment of significance completed.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Sandstone cliffs and fertile woodland valley habitat within close proximity of each other.	Low	Low. No OEI records within locality; no further assessment required.



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		TSC Act	EPBC Act			
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V	-	Inhabits dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests.	Moderate	May forage in locality. Assessment of significance completed.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Low	Low; no further assessment required.
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	Low	Low; no further assessment required.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	Low	Low; no further assessment required.
<i>Mormopterus lumsdenae</i>	Northern Freetail-bat	V	-	Rainforests to open forests and woodlands often along watercourses.	Moderate	May forage in locality. Assessment of significance completed.
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests..	Moderate	May forage in locality. Assessment of significance completed.
<i>Myotis macropus</i>	Southern Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	Low	Low; no further assessment required.
<i>Petauroides volans</i>	Greater Glider	-	V	Wide range of habitats including tall open woodland, eucalypt forests and low woodlands.	Low	Low. No OEH records within locality; no further assessment required.
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	Low	Low; no further assessment required.
<i>Petaurus norfolkensis</i>	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum forest inland.	Moderate	May forage in locality. Assessment of significance completed.
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	V	V	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves and overhangs.	Low	Low. No OEH records within locality; no further assessment required.



Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Suitability of Site Habitat	Potential Occurrence and Need for Assessment of Significance
		TSC Act	EPBC Act			
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	Drier forests and woodlands with hollow-bearing trees and sparse ground cover.	Moderate	May forage in locality. Assessment of significance completed.
<i>Phascolarctos cinereus</i>	Koala	V	V	Appropriate food trees in forests and woodlands, and treed urban areas.	Moderate	May forage in locality. Assessment of significance completed.
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	V	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	Low. No OEH records within locality; no further assessment required.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Moderate	May forage in locality. Assessment of significance completed.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	Forages in a variety of habitats, roosts in tree hollows and buildings.	Moderate	May forage in locality. Assessment of significance completed.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Moderate	May forage in locality. Assessment of significance completed.
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	Cave roosting species found in dry open forest and woodland near cliffs and rocky overhangs.	Low	Low; no further assessment required.

V = Vulnerable; E = Endangered; CE = Critically Endangered



Assessments of significance have been completed for the following threatened fauna species for which foraging/ breeding/ roosting habitat occurs within the project footprint:

- Barking Owl
- Brush-tailed Phascogale
- Eastern Freetail-bat
- Greater Broad-nosed Bat
- Grey-crowned Babbler
- Grey-headed Flying-fox
- Hoary Wattled Bat
- Koala
- Little Lorikeet
- Masked Owl
- Northern Free-tailed Bat
- Rufous Bettong
- Squirrel Glider
- Yellow-bellied Sheath-tail-bat

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Barking Owl

The Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It roosts in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. Barking Owls preferentially hunt small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits.

The species requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats. Nesting occurs in living eucalypts and sometimes dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas). Nesting occurs during mid-winter and spring but is variable between pairs and among years. Laying generally occurs during August and fledging occurs in November. Fledging occurs 2-3 weeks later.

Threatening processes for this species include:

- Clearing and degradation of habitat, mostly through cultivation, intense grazing and the establishment of exotic pastures.
- Inappropriate forest harvesting practices that remove old, hollow-bearing trees and change open forest structure to dense regrowth.
- Firewood harvesting resulting in the removal of fallen logs and felling of large dead trees.
- Too-frequent fire leading to degradation of understorey vegetation which provides shelter and foraging substrates for prey species.

- Disturbance of nesting and excessive disturbance of foraging by inappropriate use of call-playback surveys.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of Avenue Road. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

The Proposal represents a minor reduction of foraging habitat from the broader area which may be utilised by the Barking Owl. It would be highly unlikely that an adverse effect on the life cycle of the Barking Owl would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Brush-tailed Phascogale

Brush-tailed Phascogales prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. They are agile climbers foraging preferentially in rough barked trees of 25 cm DBH or greater. The diet mostly comprises arthropods but also includes other invertebrates, nectar and sometimes small vertebrates. Females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha. Brush-tailed Phascogales nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span. Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.

Threatening processes for this species include:

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Predation by foxes and cats.
- Competition for nesting hollows with the introduced honeybee.

Potential Impacts of the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.



Given the occurrence of extensive forested habitat within the locality, the Proposal represents a minor reduction of foraging habitat which may be utilised by the Brush-tailed Phascogale. On this basis it would be highly unlikely that an adverse effect on the life cycle of the Brush-tailed Phascogale would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Freetail-bat

Eastern Freetail-bats occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. They mainly roost in tree hollows but would also roost under bark or in man-made structures. Roosting is usually solitary but communal roosting has also been recorded. Females give birth in late November/ early December.

Threatening processes for this species include:

- Loss of hollow-bearing trees.
- Loss of foraging habitat.
- Application of pesticides in or adjacent to foraging areas.
- Artificial light sources spilling onto foraging and/or roosting habitat
- Large scale wildfire or hazard reduction burns on foraging and/or roosting habitat

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Eastern Freetail-bat such that a viable local population of the species is placed at risk of extinction.

Greater Broad-nosed Bat

The Greater Broad-nosed Bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although usually roosting in tree hollows, the species has also been found in buildings. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of the reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of a single young.

Threatening processes for this species include:

- Disturbance to roosting and summer breeding sites.

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- Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.
 - Loss of hollow-bearing trees.
 - Pesticides and herbicides may reduce the availability of insects, or result in the accumulation of toxic residues in individuals' fat stores.
 - Changes to water regimes are likely to impact food resources, as is the use of pesticides and herbicides near waterways.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Greater Broad-nosed Bat such that a viable local population of the species is placed at risk of extinction.

Grey-crowned Babbler

Grey-crowned Babblers inhabit open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains; in coastal regions Woodlands on fertile soils are typical habitat. Babblers live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. They feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses.

Grey-crowned Babblers build and maintain several conspicuous, dome-shaped stick nests about the size of a football, which are used as a dormitory for roosting each night. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones.

Breeding occurs between July and February. Usually two to three eggs are laid and incubated by the female. During incubation, the adult male and several helpers in the group may feed the female as she sits on the nest. Young birds are fed by all other members of the group. Territories range from one to fifty hectares (usually around ten hectares) and are defended all year.

Threatening processes for this species include:

- Loss, degradation and fragmentation of woodland habitat on high fertility soils.
- Excessive total grazing pressure and loss of coarse woody debris is resulting in degradation and loss of important habitat components.
- Infestation of habitat by invasive weeds including exotic perennial grasses.

- Inappropriate fire regimes - excessive fires lead to loss of tree and shrub regeneration and absence of fire may lead to the grass sward being too dense and therefore unsuitable for foraging by babblers.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Climate change impacts including reduction in resources due to drought.
- Nest predation by species such as ravens and butcherbirds may be an issue in some regions where populations are small and fragmented.

Potential Impacts of the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

Given the occurrence of extensive forested habitat within the locality, the proposal represents a minor reduction of foraging habitat which may be utilised by the Grey-crowned Babbler. On this basis it would be highly unlikely that an adverse effect on the life cycle of the Grey-crowned Babbler would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox

Grey-headed Flying-foxes have a distribution that typically extends approximately 200 km from the coast of Eastern Australia, from Rockhampton in Queensland to Adelaide in South Australia. Foraging areas include subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Feed on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines, as well as from cultivated gardens and orchards. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.

Eby and Law (2008) have identified 10 trees that are key foraging resource for the Grey-headed Flying-fox in north-east NSW, consisting of Swamp Mahogany (*Eucalytus robusta*), Coastal Blackbutt (*E. pilularis*), Grey Ironbark (*E. siderophloia*), Forest Red Gum (*E. tereticornis*), Spotted Gum (*Corymbia variegata*), Large-leaved Spotted Gum (*C. henryi*), Red Bloodwood (*C. gummifera*), Pink Bloodwood (*C. intermedia*), Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Silky Oak (*Grevillea robusta*).

Threatening processes for this species include:

- Clearing of woodlands for agriculture.

- Loss of roosting and foraging sites.
- Electrocution on powerlines, entanglement in netting and on barbed-wire.
- Heat stress.
- Conflict with humans.
- Incomplete knowledge of abundance and distribution across the species' range.

Potential Impacts of the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

Given the occurrence of extensive forested habitat within the locality, the proposal represents a minor reduction of foraging habitat which may be utilised by the Grey-headed Flying-fox. On this basis it would be highly unlikely that an adverse effect on the life cycle of the Grey-headed Flying-fox would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Hoary Wattled Bat

In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat. The species roosts in hollows and rock crevices and will occupy urban areas with suitable habitat. Birthing usually occurs during October and November when twins are born.

Threatening processes for this species include:

- Clearing and fragmentation of dry forest and woodland habitat through clearing for agriculture and development.
- Loss of tree hollows for roosting and maternity sites from forest management favouring younger stands of trees.
- Loss of hollow-bearing trees used for roosting and maternity sites as a result of too-frequent burning for grazing and forestry management activities.
- Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals. The use of pesticides also reduces available insect food sources.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash



(*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Hoary Wattled Bat such that a viable local population of the species is placed at risk of extinction.

Koala

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales it mainly occurs on the central and north coasts, with populations on the western side of the Great Dividing Range.

Habitat consists of eucalypt woodlands and forests, in which the Koala feeds on more than 70 eucalypt species and 30 non-eucalypt species. Preferred browse species are differ across regions. Koalas are inactive for most of the day and do most of their feeding and moving during the night. Although predominantly arboreal, Koalas would descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than 2 hectares to several hundred hectares in size. Generally solitary, the Koala has complex social hierarchies based on a dominant male with a territory that overlaps that of several females, with sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

In Clarence Valley LGA, preferred food trees include Forest Red Gum (*Eucalyptus tereticornis*), Swamp Mahogany (*E. robusta*), Red Mahogany (*E. resinifera*) and Tallowwood (*E. microcorys*), with Small-fruited Grey Gum (*E. propinqua*) and several other species recognised as secondary feed trees (Mitchell 2008).

Threatening processes for this species include:

- Loss, modification and fragmentation of habitat.
- Predation by feral and domestic dogs.
- Intense fires that scorch or kill the tree canopy.
- Road-kills.
- Human-induced climate change, especially drought.

Potential Impacts of the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.



One Schedule 2 feed tree species (Forest Red Gum; *Eucalyptus tereticornis*) occurs infrequently on site and does not comprise >15% of the canopy. The site therefore does not comprise potential Koala habitat.

The proposal would not increase the risk of Koala roadkill during construction as plant and vehicles would only be operational during daytime hours with extensive mitigation measures. Given the occurrence of extensive forested habitat within the locality, the proposal represents a minor reduction of foraging habitat which may be utilised by the Koala. On this basis it would be highly unlikely that an adverse effect on the life cycle of the Koala would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet

The distribution of the Little Lorikeet encompasses the coast, tablelands and slopes of eastern Australia from Cape York to South Australia. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year. The Little Lorikeet mostly forages in the canopy of open eucalypt forest and woodland, utilising *Eucalyptus*, *Angophora*, *Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. This species feeds mostly on nectar and pollen, but occasionally also on native fruits such as mistletoe. Nests are generally located in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of a smooth-barked *Eucalyptus*. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including species like *Allocasuarina*. Nesting season extends from May to September.

Threatening processes for this species include:

- Clearing of woodlands for agriculture.
- The loss of old hollow bearing trees.
- Competition with the introduced Honeybee.
- Infestation of habitat by invasive weeds.
- Inappropriate fire regimes.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Climate change impacts including reduction in resources due to drought.
- Degradation of woodland habitat and vegetation structure due to overgrazing.

Potential Impacts of the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

Given the occurrence of extensive forested habitat within the locality, the proposal represents a minor reduction of foraging habitat which may be utilised by the Little Lorikeet. On this basis it would be



highly unlikely that an adverse effect on the life cycle of the Little Lorikeet would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl

Masked Owls live in dry eucalypt forests and woodlands from sea level to 1100 m. While forest owls, they often hunt along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. They roost and breed in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Threatening processes for this species include:

- Loss of mature hollow-bearing trees and changes to forest and woodland structure, which leads to fewer such trees in the future.
- Clearing of habitat for grazing, agriculture, forestry or other development.
- A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides.
- Being hit by vehicles.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

The Proposal would result in the loss of a negligible area of poor quality foraging habitat for the Masked Owl, which due to its small and fragmented nature is unlikely to be a significant source of prey. The proposed works would be unlikely to have an adverse effect on the life cycle of the Masked Owl such that a viable local population of the species is placed at risk of extinction.

Northern Freetail-bat

Northern Freetail-bats occur within a range of vegetation types in northern Australia, from rainforests to open forests and woodlands, and are often recorded along watercourses. They may also occur in towns and cities. They mainly roost in tree hollows but relatively large colonies have been found under house roofs in urban areas in Queensland

Threatening processes for this species include:

- Clearing of forest and woodland habitat for agricultural, residential and infrastructure development.
- Loss of hollow-bearing trees used for roosting and maternity sites as the result dieback, too frequent burning and forest management favouring younger stands.

- 
- Use of pesticides.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Northern Freetail-bat such that a viable local population of the species is placed at risk of extinction.

Rufous Bettong

Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter. They sleep during the day in cone-shaped nests constructed of grass in a shallow depression at the base of a tussock or fallen log. At night they feed on grasses, herbs, seeds, flowers, roots, tubers, fungi and occasionally insects.

Threatening processes for this species include:

- Changes to the grassy understorey by inappropriate burning and grazing.
- Competition from rabbits.
- Predation by feral cats and foxes, whose numbers appear to increase when dingoes are reduced through baiting.
- Loss of habitat through clearing, logging and collection of fallen timber.
- Poor knowledge of the species' abundance and distribution in the western parts of its range.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

It would be highly unlikely that an adverse effect on the life cycle of the Rufous Bettong would occur such that a viable local population of the species is likely to be placed at risk of extinction.



Squirrel Glider

Squirrel Gliders inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. They prefer mixed species stands with a shrub or Acacia midstorey. Squirrel Gliders live in family groups of a single adult male one or more adult females and offspring and require abundant tree hollows for refuge and nest sites. The diet varies seasonally and consists of *Acacia* gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.

Threatening processes for this species include:

- Habitat loss and degradation.
- Fragmentation of habitat.
- Loss of hollow-bearing trees.
- Loss of understorey food resources.
- Inappropriate fire regimes.
- Reduction in food resources due to drought.
- Mortality due to entanglement on barbed wire.
- Occupation of hollows by exotic species.
- Mortality due to collision with vehicles.
- Predation by exotic predators.
- Changes in spatial and temporal distribution of habitat due to climate changes.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Squirrel Glider such that a viable local population of the species is placed at risk of extinction.

Yellow-bellied Sheathtail-bat

The Yellow-bellied Sheathtail-bat forages in most habitats across a very wide range, with and without trees; the species appears to defend an aerial territory. It roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements of Sheathtail-bats are unknown; there is speculation about a migration to southern Australia in late summer and autumn.

Threatening processes for this species include:

- Disturbance to roosting and summer breeding sites.
- Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.
- Loss of hollow-bearing trees; clearing and fragmentation of forest and woodland habitat.
- Pesticides and herbicides may reduce the availability of insects, or result in the accumulation of toxic residues in individuals' fat stores.

Potential Impacts from the Proposal

The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina glauca*). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

The proposed works would have little impact on foraging habitat of the Yellow-bellied Sheath-tail-bat, given that foraging habitat would be reduced by a negligible amount. It is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Yellow-bellied Sheath-tail-bat such that a viable local population of the species is placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

No endangered populations are likely to occur; consideration under this part of the assessment is not required.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

No endangered ecological communities occur.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

The works occur within a highly modified environment and utilise an existing disturbed footprint within the road reserve. The Proposal would require removal of up to 420 native trees (i.e. trees >10 cm DBH or >3 m in height) along a 2.6 km long section of the roadside verge of Avenue Road which is disturbed habitat. This includes numerous small trees such as regrowth Swamp Oak (*Casuarina*



glauca). Species most commonly affected are Spotted Gum and Grey Box. Other affected species include Red Ash (*Alphitonia excelsa*), Swamp Oak, Wattles (*Acacia concurrens*, *A. disparrima* subsp. *disparrima*) and Forest Red Gum (*E. tereticornis*).

An estimated 110 dead native trees will also require clearing; it is noted that the majority of these are immature Swamp Oak less than 5 metres in height. Up to 23 habitat trees may require removal, all of which contain hollows.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The site is located within an already fragmented rural environment; the proposed road upgrade will not increase habitat fragmentation or create barriers to movement of dispersal for any of the subject species.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

The works footprint represents the edge of mature forest within a rural environment which represents a minor contraction of forest and subsequent loss of habitat trees. As such, impacts to the subject species/communities will be negligible in a local context.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No areas of critical habitat listed under the TSC Act occur within Clarence Valley LGA.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Part 4 of the TSC Act states “The object of a recovery plan is to promote the recovery of the threatened species, population or ecological community to which it relates to a position of viability in nature.” Any action which adversely affects threatened species or their habitat, or contributes to relevant key threatening processes (KTP) may be interpreted as being inconsistent with this general objective. Specific recovery and threat abatement strategies are discussed below.

A recovery plan has not been prepared for any of the subject species, with the exception of the Koala, Masked Owl and Barking Owl. The proposal seeks to minimise vegetation/ habitat loss where possible and minimise other threatening processes, and as such is not inconsistent with the objectives of approved recovery plans or recovery strategies in the Saving Our Species program.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A key threatening process is defined under the TSC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of key threatening processes under the TSC Act, and whether the Proposal is recognised as a threatening process is shown in **Table B.1**.

Table B.1 Key Threatening Processes

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Alteration of habitat following subsidence due to longwall mining			✓
Aggressive exclusion of birds by noisy miners (<i>Manorina melanocephala</i>)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bush rock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit (<i>Oryctolagus cuniculus</i>)			✓
Competition and habitat degradation by feral goats (<i>Capra hircus</i>)			✓
Competition from feral honeybees (<i>Apis mellifera</i>)			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Herbivory and environmental degradation caused by feral deer			✓
Importation of red imported fire ants (<i>Solenopsis invicta</i>)			✓
Infection by <i>Psittacine circoviral</i> (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by <i>Phytophthora cinnamomi</i>			✓
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae			✓
Introduction of the large earth bumblebee (<i>Bombus terrestris</i>)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch broom (<i>Cytisus scoparius</i>)			✓
Invasion and establishment of the Cane Toad (<i>Bufo marinus</i>)			✓
Invasion, establishment and spread of <i>Lantana camara</i>			✓
Invasion of native plant communities by African Olive (<i>Olea europaea</i> L. subsp. <i>cuspidata</i>)			✓
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the yellow crazy ant (<i>Anoplolepis gracilipes</i>) into NSW			✓



Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees	✓		
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation of feral dogs (<i>Canis lupus familiaris</i>)			✓
Predation by the European red fox (<i>Vulpes vulpes</i>)			✓
Predation by the feral cat (<i>Felis catus</i>)			✓
Predation by <i>Gambusia holbrooki</i> Girard, 1859 (Plague Minnow or Mosquito Fish)			✓
Predation by the Ship Rat (<i>Rattus rattus</i>) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>)			✓
Removal of dead wood and dead trees	✓		

The proposed improvements may contribute to listed KTPs as follows:

- Clearing of native vegetation: loss of scattered trees within the road reserve.
- Loss of hollow-bearing trees: removal of up to 23 hollow-bearing trees within the road reserve.
- Removal of dead wood and dead trees: Loss of minor amounts of debris (branches etc) in the ground layer.

The degree that the Proposal will contribute to any KTP is not considered likely to place the local population of any of the subject species at significant risk of extinction.

Conclusion

It is considered unlikely that the local population of any of the subject species will be placed at significant risk of extinction as a result of the proposed works.



Weeping Paperbark (*Melaleuca irbyana*) Seven-part Test

- a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,***

Weeping Paperbark has a restricted distribution in NSW and occurs in open eucalypt forest on poorly drained soils (usually clay, sandstone or alluvial soils). Flowering occurs between spring and summer.

Threatening processes for this species include:

- Clearing of habitat for agriculture and development.
- Fire, particularly when too frequent to allow regeneration.
- Grazing by domestic stock.
- Invasion of habitat by weeds particularly introduced grasses.
- Plantation development and logging activities.
- Road-works, including grading and slashing.
- Risk of local extinction because populations are small and may also lack genetic diversity.

Potential Impacts from the Proposal

Several hundred Weeping Paperbark (*Melaleuca irbyana*) occur on adjacent land to the east of the proposed works area (Lots 19, 20 & 30 DP751376). The closest Weeping Paperbark is within 5 m of the road reserve. Thorough searches of the eastern road reserve were completed and no Weeping Paperbark were recorded. No Weeping Paperbark therefore occur within the proposed works footprint. Trees and patches of Weeping Paperbark on private land adjacent to the works are isolated from the works footprint and there is little chance of any direct or indirect impacts to these trees. On this basis it would be highly unlikely that an adverse effect on the life cycle of Weeping Paperbark would occur such that a viable local population of the species is likely to be placed at risk of extinction.

- b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,***

No endangered populations are likely to occur; consideration under this part of the assessment is not required.

- c) *in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,***

No endangered ecological communities occur; consideration under this part of the assessment is not required.

- d) *in relation to the habitat of a threatened species, population or ecological community:***

- (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed,***



No Weeping Paperbark occurs within the road reserve. The proposal would remove native trees, including habitat trees from the disturbed road verge. Given the broad extent of well-connected contiguous dry sclerophyll forest habitat in the locality, loss of this habitat would not be significant for Weeping Paperbark. No Weeping Paperbark will be removed for the proposed works.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposal would not further fragment available habitat for Weeping Paperbark in the locality.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The habitat to be removed is of minor value for the life cycle requirements of Weeping Paperbark.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No areas of critical habitat listed under the TSC Act occur within the locality.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Part 4 of the TSC Act states “The object of a recovery plan is to promote the recovery of the threatened species, population or ecological community to which it relates to a position of viability in nature.” Any action which adversely affects threatened species or their habitat, or contributes to relevant key threatening processes (KTP) may be interpreted as being inconsistent with this general objective. Specific recovery and threat abatement strategies are discussed below.

An approved recovery plan has not been prepared under the TSC Act for the Weeping Paperbark. The proposal does not affect the aims or proposed actions of any threat abatement plan or recovery actions in the *Save our Species* program prepared for Weeping Paperbark.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A key threatening process is defined under the TSC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of key threatening processes under the TSC Act, and whether the proposal is recognised as a threatening process is shown in **Table B.2**.

Table B.2 Key Threatening Processes

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Alteration of habitat following subsidence due to longwall mining			✓
Aggressive exclusion of birds by noisy miners			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bush rock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit			✓
Competition and habitat degradation by feral goats			✓
Competition from feral honeybees			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Herbivory and environmental degradation caused by feral deer			✓
Importation of red imported fire ants			✓
Infection by <i>Psittacine circoviral</i> (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by <i>Phytophthora cinnamomi</i>			✓
Introduction and Establishment of Exotic Rust Fungi of the			✓

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
order Pucciniales pathogenic on plants of the family Myrtaceae			
Introduction of the large earth bumblebee			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch broom			✓
Invasion and establishment of the Cane Toad			✓
Invasion, establishment and spread of <i>Lantana camara</i>			✓
Invasion of native plant communities by African Olive			✓
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the yellow crazy ant into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees		✓	✓
Loss or degradation of sites used for hill-topping by butterflies			✓
Predation and hybridisation of feral dogs			✓
Predation by the European red fox			✓
Predation by the feral cat			✓
Predation by <i>Gambusia holbrooki</i>			✓
Predation by the Ship Rat on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs			✓
Removal of dead wood and dead trees	✓		

KTPs that the proposal may contribute to include the clearing of native vegetation, loss of hollow-bearing trees and removal of dead wood and dead trees (as ground litter). Clearing is defined under the TSC Act as 'the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of stand or stands'.



The proposal will require the removal of scattered sclerophyll forest along a disturbed road verge, loss of up to 23 hollow-bearing trees, and removal; of small amounts of woody debris (fallen branches). No Weeping Paperbark will be removed. The degree that the proposal would contribute to any threatening process is not considered likely to place the local population of Weeping Paperbark at significant risk of extinction.

Conclusion

It is considered unlikely that the local population of Weeping Paperbark would be placed at significant risk of extinction as a result of the proposal.