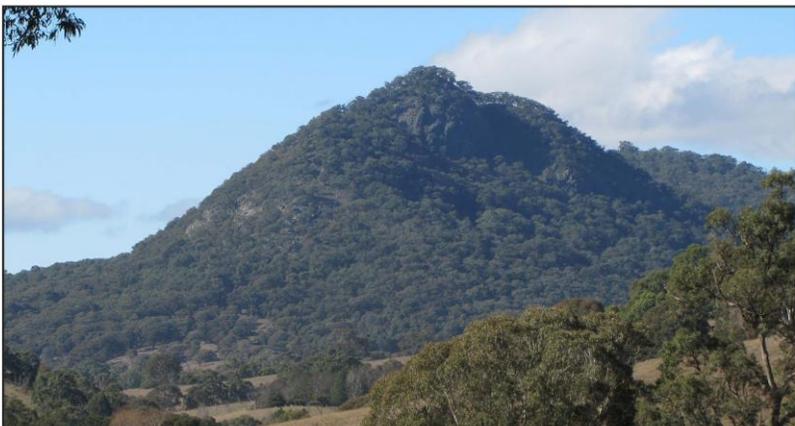


Soil and Landscape Hazards Proposed Windfarm and Infrastructure -Nundle



cb

COOBER BULGA



Landscape—122.4 km² very steep to precipitous colluvial mountains and hillslopes on Tertiary basalt of the southern Liverpool Range. Total relief <600 m, local relief 80–220 m; elevation 500–1300 m; long, benched slopes >33%. Continuous, erosional, convergent and tributary drainage. 20% cleared open-forest and dense woodlands with rainforest on sheltered southerly slopes and along drainage lines.

Soils—well to moderately well-drained, moderate to deep (50–>150 cm) Red Dermosols (Euchrozems and Chocolate Soils) and Red Ferrosols (Euchrozems) on crests and upper slopes. Well to imperfectly drained, shallow to very deep (20–>200 cm) Black Dermosols (Chocolate Soils and Black Earths) and moderately well-drained, deep to very deep (150–250 cm) Brown Chromosols (Prairie Soils) on mid to lower slopes and drainage lines.

Qualities and Limitations—soils with high organic matter content, low permeability, high shrink-swell, acidity, and stoniness. Localised low permeability, low wet bearing strength, high plasticity, high erodibility, and hardsetting surfaces. Widespread steep slopes, mass movement hazard, high runoff, high sheet and rill erosion risk, and engineering hazard. Localised limitations include rock outcrop, shallow soils, rockfall hazard, high run-on (lower slopes) and gully erosion risk (drainage lines).

LOCATION AND SIGNIFICANCE

122.4 km² very steep to precipitous mountainsides and hillslopes of the southern Liverpool Range extending onto the adjacent Blackville sheet. The main difference between this landscape and Langs Neck (ln) on the north side of the Liverpool Range is that the generally moister conditions and a southerly aspect have resulted in slightly different soils and very different vegetation. Type location is at Cedar Brush (map reference: 2 81000E, 64 74000N).

LANDSCAPE

Geology and Regolith

Liverpool Range Beds (T1)—Tertiary basalt, dolerites and occasional tuffs and zeolitised breccias and colluvium derived from these rocks. Soils have developed on unconsolidated material ranging in depth from a few centimetres to tens of metres. Degree of weathering ranges from moderate to massive saprolites.

Terrain

Steep to precipitous mountain slopes of >33%, but typically 50–90%. Slopes are moderately long (500 m) to very long (2500 m), but are typically 1300 m. Elevation ranges 500–1300 m. Total relief is <600 m, local relief (<300 m) is 80–220 m. Crests are very narrow (<100 m), sideslopes are long and uneven with flow benches up to 40 m wide. Drainage is deeply incised, erosional and spaced at regular intervals across the slope.

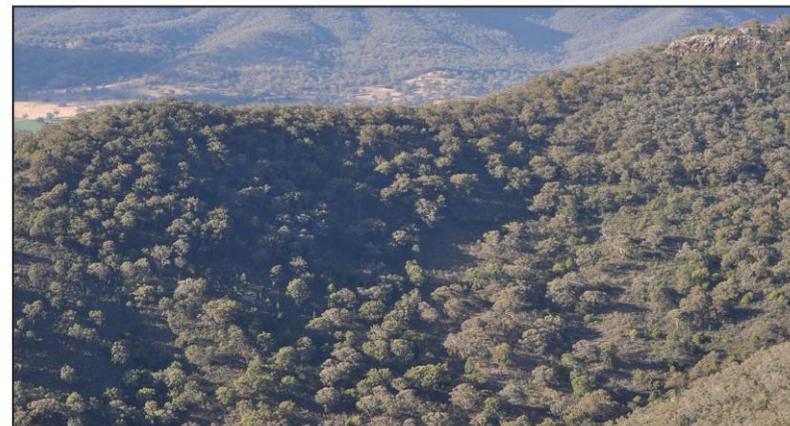
Vegetation

Vegetation in this landscape is complex and diverse. Generally dominated by tall, moist open-forest and woodlands, with patches of *Poa* sp. (snow grass) in frost hollows on lower slopes. Species are limited due to site access problems. Many more species are likely to dominate this landscape across its mosaic of microclimates and soil types.

Species encountered on mid to upper slopes include *Eucalyptus melliodora* (yellow box), *E. goniacalyx* (long-leaved box), *E. laevopinea* (silvertop stringybark), *E. viminalis* (manna gum), *E. dalrympleana* (mountain gum), *E. moluccana* (grey box) and *E. pauciflora* (snow gum). Common species in the understorey include *Acmena smithii* (lilly pilly), *Acacia dealbata* (silver wattle), *Acacia melanoxylon* (blackwood), *Acacia implexa* (hickory wattle), *Myoporum montanum* (water bush), *Allocasuarina torulosa* (forest oak) and *Hymenosporum flavum* (native frangipani).

ln

LANGS NECK



Landscape—166.4 km² steep to precipitous mountain slopes and scarps on Tertiary basalt in the Liverpool Ranges. Total relief <450 m, local relief 100–200 m; elevation 500–1250 m; slopes 30–200%. Slopes generally quite long; rock outcrop <10%. Woodland to very tall open-forest, with rainforest restricted to some moist drainage lines, 20% cleared.

Soils—moderately well to well-drained, shallow to moderately deep (40–>90 cm) Black Dermosols (Black Earths and Chocolate Soils) on sideslopes and crests. Well-drained, very shallow (<20 cm) Leptic Tenosols (Lithosols) on crests and flow benches. Well to moderately well-drained, moderately deep (>50 cm) Red Dermosols and Ferrosols (Euchrozems) on upper and midslopes. Moderately well-drained, moderately deep (>60 cm) Black Vertosols (Chocolate Soils) on mid to lower slopes.

Qualities and Limitations—soils of low permeability and high organic matter content. Localised high plasticity, low wet bearing strength, stoniness, hardsetting surfaces and acidity. Steep slopes, mass movement hazard, high runoff, high erosion hazard, shallow soils and engineering hazard. Localised rock outcrop, rockfall hazard, high run-on (lower slopes) and gully erosion risk (drainage lines).

LOCATION AND SIGNIFICANCE

166.4 km² extensive, largely inaccessible, steep to precipitous mountains of the northern Liverpool Ranges extending onto the adjacent Blackville sheet. Langs Neck (ln) occurs on the northern side of the Liverpool Range and is the equivalent of the Coober Bulga (cb) soil landscape that occurs on the southern side of the Liverpool Range. It is distinguished by a drier climate that has resulted in drier, more open vegetation and slightly different soils. Examples occur on Cedar Brush stock route, Brees Mountain, Mount Gregson

and Mount Helen. Type location is on the Merriwa Road on the Liverpool Range (map reference: 2 66000E, 64 74000N).

This soil landscape was originally described on the Blackville sheet, but has been modified to include the former Mount Tamarang (mt) soil landscape in this survey.

LANDSCAPE

Geology and Regolith

Liverpool Range Beds (T1)—Tertiary basalt, dolerites with occasional tuffs and zeolitised breccias and colluvium derived from these rocks. Soils have formed on unconsolidated material that may vary from a few centimetres to tens of metres deep. Soil depths are also extremely variable from <10–>150 cm.

Terrain

Steep to precipitous hills and mountains that are occasionally capped with vertical escarpments. Slopes range from 30–200%, although typically range 30–50%. Slopes are typically 500–2000 m long. Elevation ranges 500–1250 m. Total relief is <450 m, local relief is <200 m. Typical landform elements include narrow crests, occasional scree slopes below cliff faces and long, benched sideslopes. Rock outcrop is <10%. Drainage lines are deeply incised and unidirectional.

Vegetation

Species composition is dependent on location. There are three main divisions in this landscape into which the different plant communities fall.

The tall, open-forest of mid to upper slopes includes some areas of woodland (lower slopes). Dominant species are variable. Tree species include *Angophora floribunda* (rough-barked apple), *Eucalyptus laevopinea* (silvertop stringybark), *E. viminalis* (manna gum), *E. macrorhyncha* (red stringybark) (localised), *E. dalrympleana* (mountain gum), *E. moluccana* (grey box), *E. melliodora* (yellow box),

Maps

- EIS used base maps with little understanding of scale, and implications of greater detail given in soil landscape mapping.
- The review process appears to be one of ignoring reviewers' comments or the game saying of “no it isn’t” to credible information saying “yes it is”.
- Available soil landscape maps show that the main landscapes of concern from an erosion point of view is Langs Neck and Coober-Bulga. Very steep basalt soil landscapes dominated by mass movement processes.
- Although some detailed slope mapping has been done by client within these landscapes detailing areas with low slope, the hazard still exists from above and below where it is steeper.

Hazards??

Coober-Bulga Soil Landscape

Qualities and Limitations—soils of low permeability and high organic matter content. Localised high plasticity, low wet bearing strength, stoniness, hardsetting surfaces and acidity. Steep slopes, mass movement hazard, high runoff, high erosion hazard, shallow soils and engineering hazard. Localised rock outcrop, rockfall hazard, high run-on (lower slopes) and gully erosion risk (drainage lines).

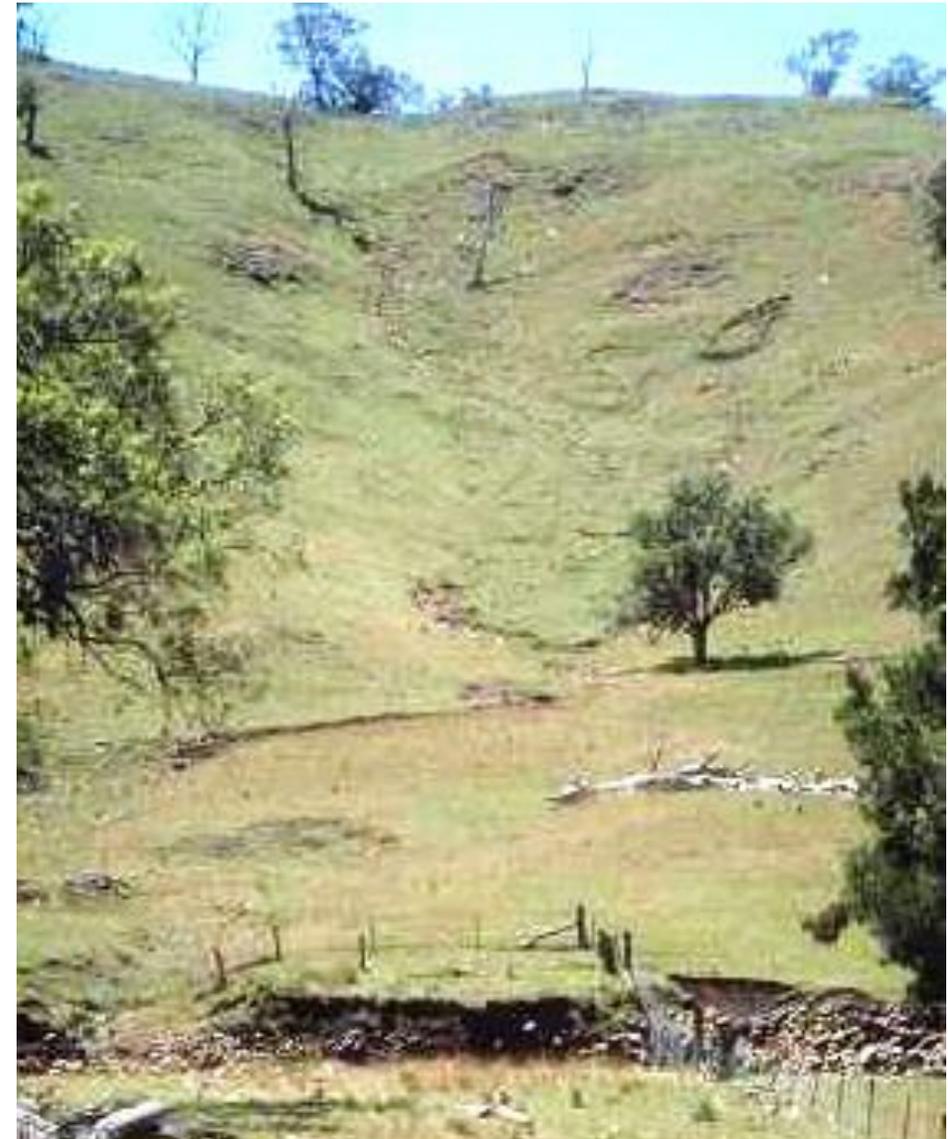
Langs Neck Soil Landscape

Qualities and Limitations—soils with high organic matter content, low permeability, high shrink-swell, acidity, and stoniness. Localised low permeability, low wet bearing strength, high plasticity, high erodibility, and hardsetting surfaces. Widespread steep slopes, mass movement hazard, high runoff, high sheet and rill erosion risk, and engineering hazard. Localised limitations include rock outcrop, shallow soils, rockfall hazard, high run-on (lower slopes) and gully erosion risk (drainage lines).



Debris flow – locations alpine area overseas – from web

Small Debris Flows – Isis Valley south of development footprint – Source Soil Con Archive (SALIVA)





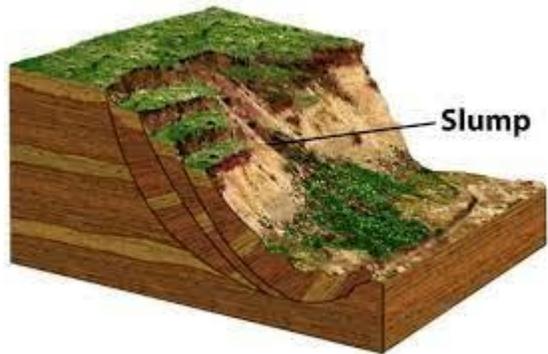
Australian Debris Flows

Photo Source: Walcha Road – from web





Photo Source – N hemisphere basalt
From web

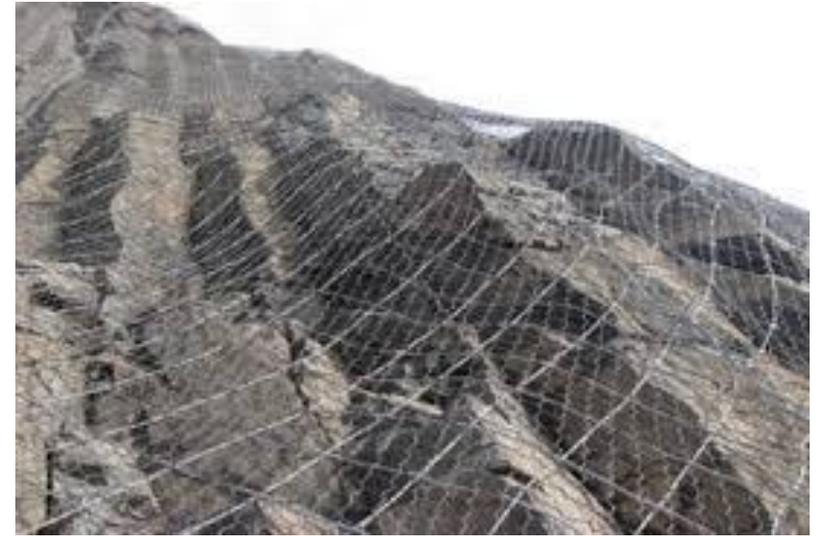


Slumps

Photo: North Coast basalt slope
Soil con archive (SALIVA)



Rock falls on columnar basalt Australia
Photo: Near Warrick from web





Liquefaction and failure of road
Base.

Foto:SoilCon archive (SALIVA)

Downslope deposition fills streams and can be dangerous to infrastructure and people



The hazards have been highlighted

And problems calculated in terms of Sediment delivery and risk for placement of Stable infrastructure large enough to install The wind farm.

No detailed plans at a proper planning scale suitable for a state significant development provided

So far only general statements given about dealing with Landscape hazards etc.

Concluding remarks

- Location in same landscapes as at Nowlands pass (NE HWY), which had to be finally rebuilt at a cost of tens of millions of dollars to make stable and address these issues. Prior to that, mass movement kept closing the road.
- Same Landscape at Merriwa – Willow Tree currently costing circa \$80 million to repair 1 km of road.
- These issues relating to mass movement in all its forms have not been addressed except by gainsaying that they are addressed.
- Even if there are flatter areas of land within the main soil landscapes, they are still at risk from mass movement above or below
- Hi risk of mass sediment delivery into Peel and Isis valleys has no mitigation measures in any of proponent's documentation.