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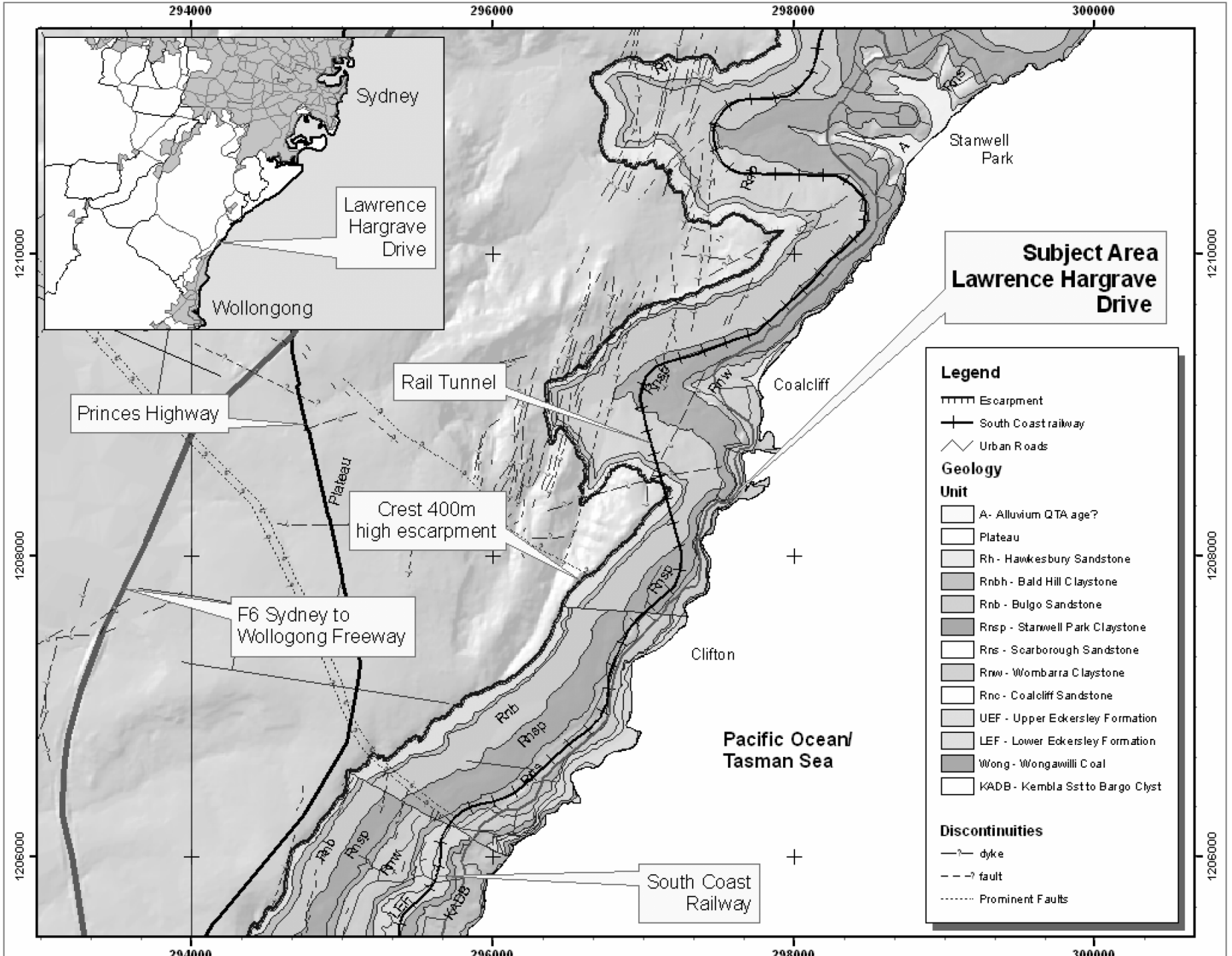
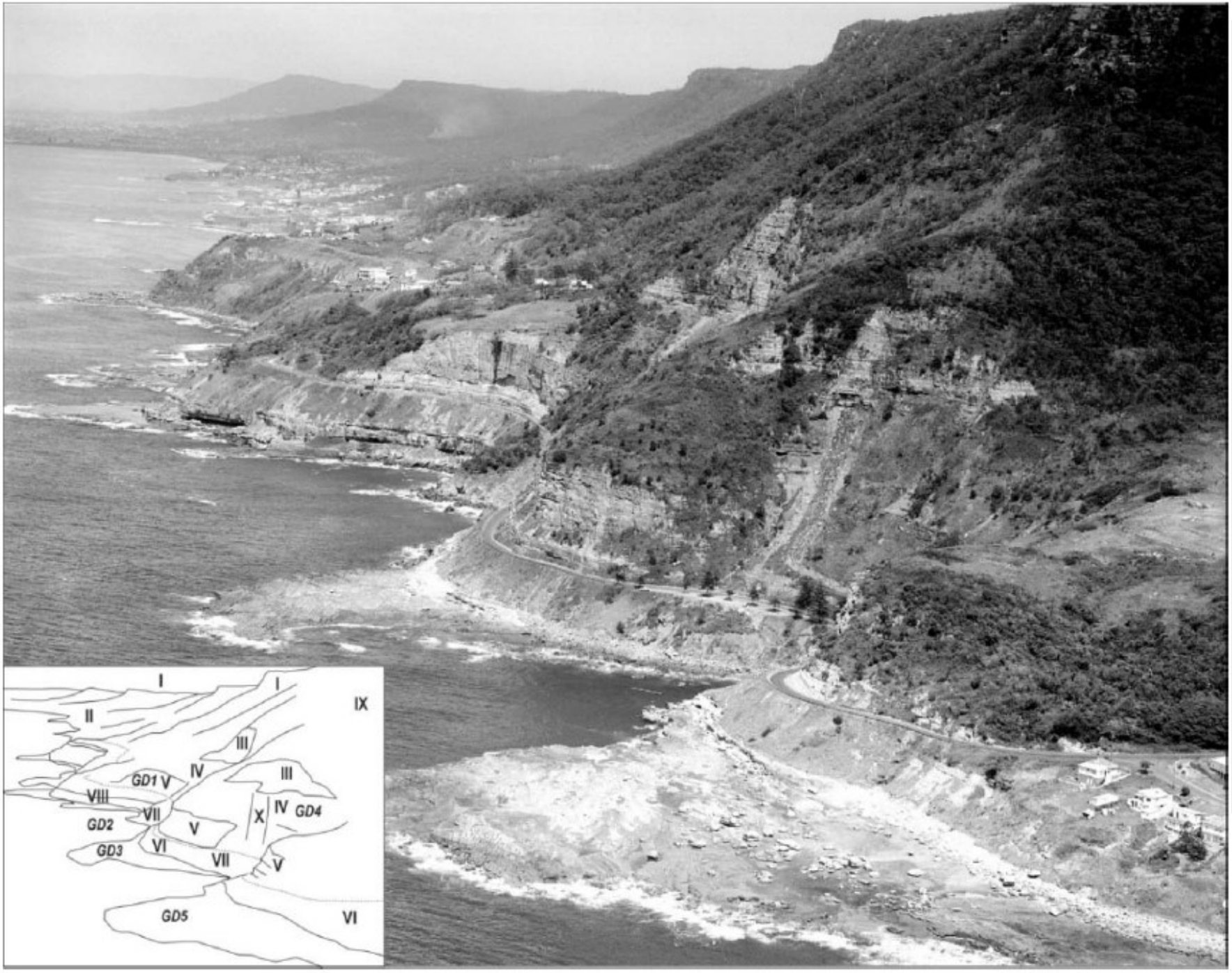
SPECIALISTS MANAGING THE EARTH

LAWRENCE HARGRAVE DRIVE
Risk Assessment and Hazard Reduction


294000
296000
298000
300000
1210000
1208000
1206000
Sydney
Wollongong
Lawrence Hargrave Drive
Stanwell Park
Coalcliff
Clifton
Rail Tunnel
Princes Highway
Plateau
Crest 400m high escarpment
F6 Sydney to Wollogong Freeway
South Coast Railway
Pacific Ocean/ Tasman Sea
Subject Area Lawrence Hargrave Drive
Legend
Escarpment
South Coast railway
Urban Roads
Geology
Unit
A- Alluvium QTA age?
Plateau
Rh - Hawkesbury Sandstone
Rnbh - Bald Hill Claystone
Rnb - Bulgo Sandstone
Rnsp - Stanwell Park Claystone
Rns - Scarborough Sandstone
Rnw - Wombarra Claystone
Rnc - Coalcliff Sandstone
UEF - Upper Eckersley Formation
LEF - Lower Eckersley Formation
Wong - Wongawilli Coal
KADB - Kembla Sst to Bargo Clyst
Discontinuities
dyke
fault
Prominent Faults


I
I
IX
II
III
IV
III
GD1
V
VIII
VII
X
IV
GD4
GD2
V
GD3
VI
VII
V
GD5
VI

Background

- History of severe embankment instability, rock fall, debris slide and debris flow problems.
- Rated by the NSW Roads and Traffic Authority (RTA) as the highest for slope instability risk to roads in NSW.
- August 29th, 2003, the Minister for Roads closed the road for safety reasons.
- Alliance was formed between the RTA, Barclay Mowlem, Coffey Geosciences and Maunsell to develop an engineering solution to reduce the risk to ‘acceptable’ levels.
- The road was closed for a period of 2.5 years during remediation

COFFEY G

ROAD IS DEATH TRAP

● SOME of the boulders which hurtled down on the south coast ocean road yesterday. Motorists who waited for graders to re-open the road said the rock-fall would have crushed a car.

'Someone will be killed'

FOR the third time this week, tons of rock and debris hurtled down a cliff-face at Clifton yesterday, blocking the Coast road.

The huge rock which crushed under the cliff-face had broken off from a large shelf of rock hanging over the inland road.

One fall blocked the Helensburgh from a meeting of Wollongong City Council, almost drove into the hill to the dark.

Only yesterday local residents had urged from Clifton, who wrote to the Minister on behalf of neighbours in the area said last night:

"Mr Morton said he felt there was no need for money to be spent

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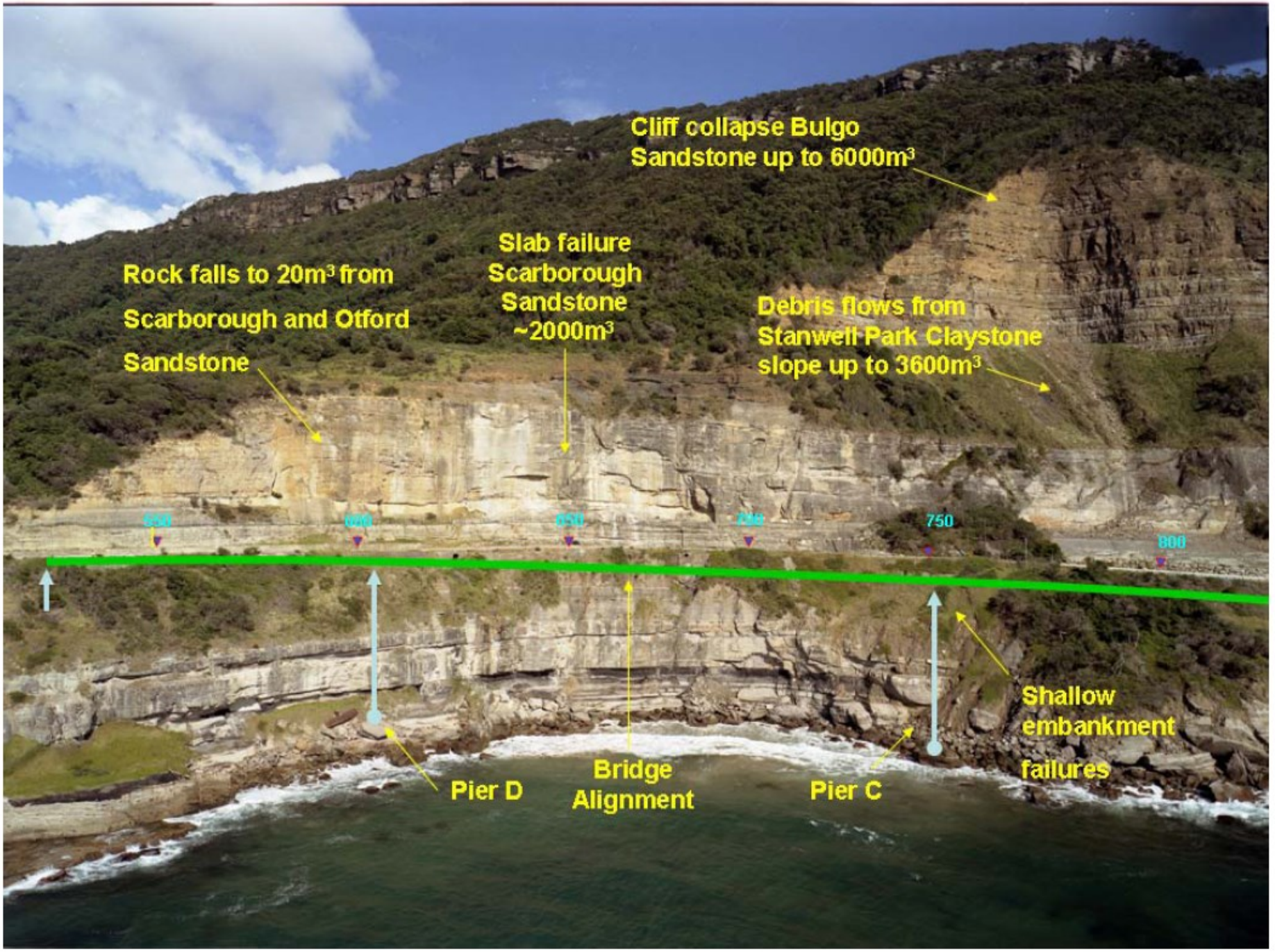
Figure 6. Toe failure below a large slab of Scarborough Sandstone from cliffs in GD1 in 1987 about 90 t of rock.

Overview of Geotechnical Work Undertaken

- Geological and Geomorphological mapping
- Assessment of Slope retreat rates
- Quantitative Risk Assessments – Risk to life for road users
- Assessment of remedial options


Cliff collapse Bulgo
Sandstone up to 6000m3
Slab failure
Scarborough
Sandstone
~2000m3
Rock falls to 20m3 from
Scarborough and Otford
Sandstone
Debris flows from
Stanwell Park Claystone
slope up to 3600m3
550
600
650
700
750
800
Shallow
embankment
failures
Pier D
Bridge
Alignment
Pier C

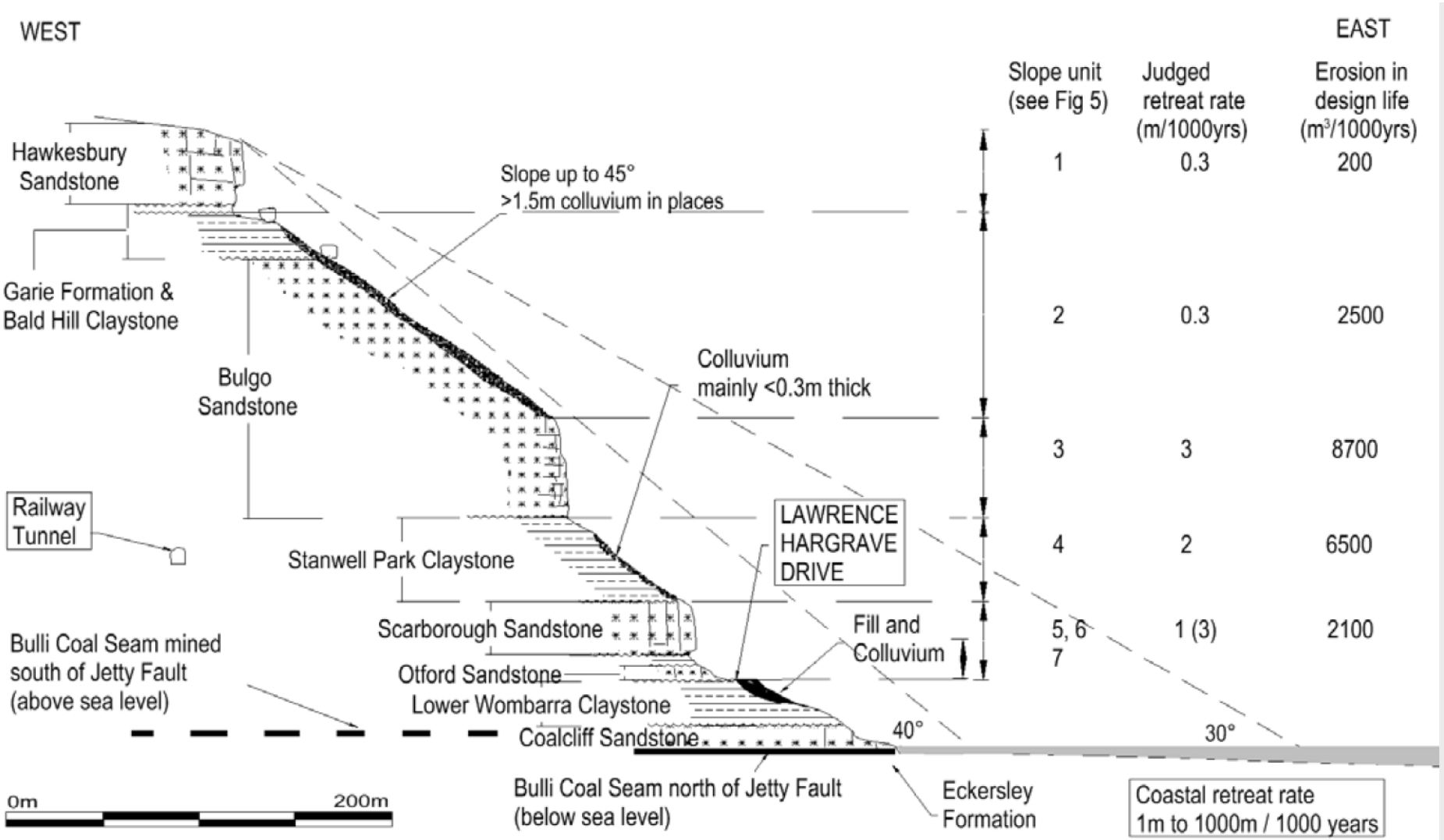


Figure 4. Cross section through GD2 that illustrates the landforms, geology and slope retreat rates

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Outcomes

- Quantitative risk assessment used to justify a radically different solution.
- Management over decades had consisted of rock bolting, mesh and catch fences. This didn't solve the problem or reduce the risk.
- Millions spent but in the end RTA had to close road because large scale rock falls continued and fatalities were assessed to be inevitable.
- The major hazard sections of road were bypassed by bridges that now support the road over the ocean.
- Rock fall mesh, catch fences and anchors installed in lower risk areas.


Geologists assessing
scaling works

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