



HARGRAVES – A GOLDFIELD REBORN

CONTROLS TO MINERALIZATION

HILL END – HARGRAVES

GOLDFIELDS

Disclaimer

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Outline

Location and geologic setting

Short history of mining

Mining and Processing

Discussion of mineralization

Faults – Feeders & Folds

Regional Scale & Continuity

Hargraves – in greater depth

Nuggets

Completed & Proposed

Geological setting of Hill End – Hargraves mineralization

Stratigraphy

Hill End

Late Silurian Chesleigh Group – lowest turbidite
Late Silurian – Early Devonian deep water trough
Overlying shallow water rhyolitic volcanics, shale limestone
Macquarie Arc - Ordovician – Early Silurian mafic
Intermediate volcanic basement.

Hargraves

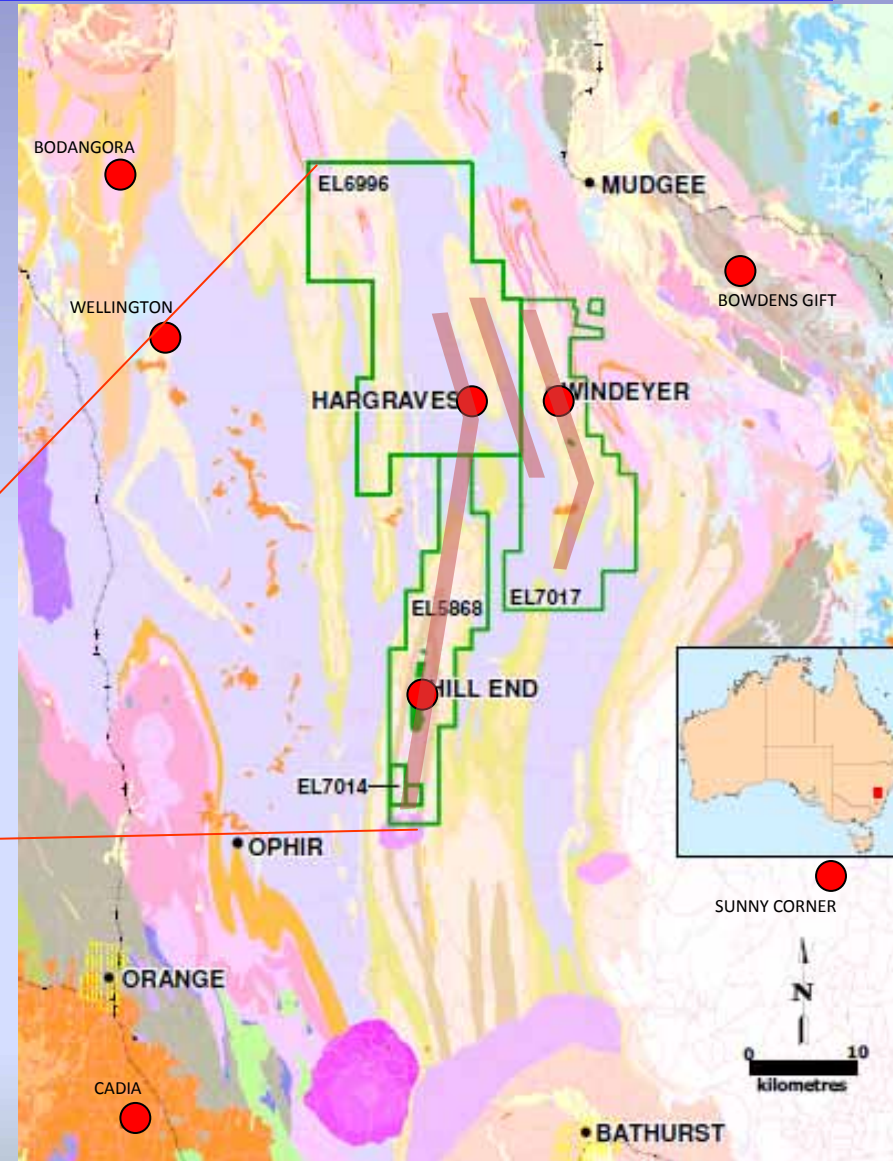
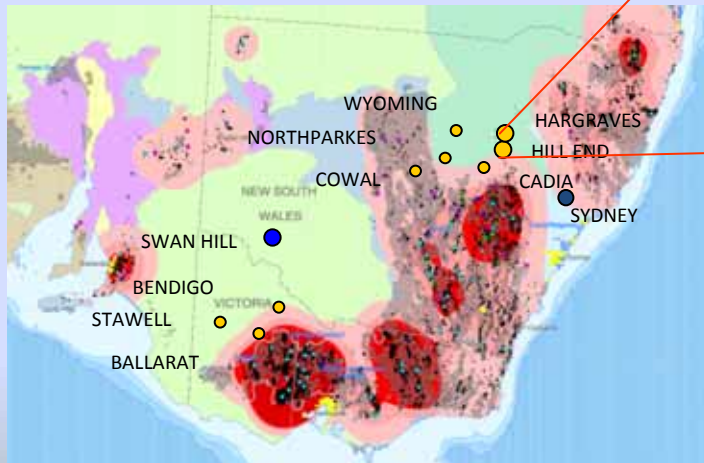
Cunningham Formation shallow water mudstones

Metamorphism

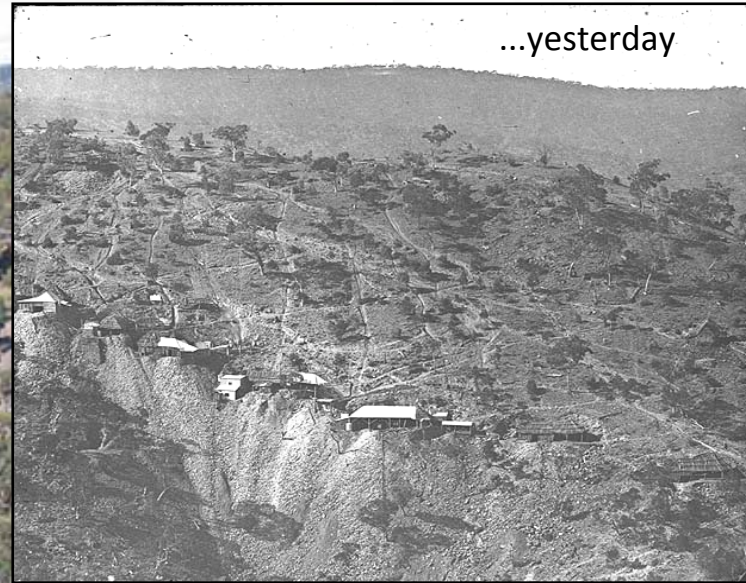
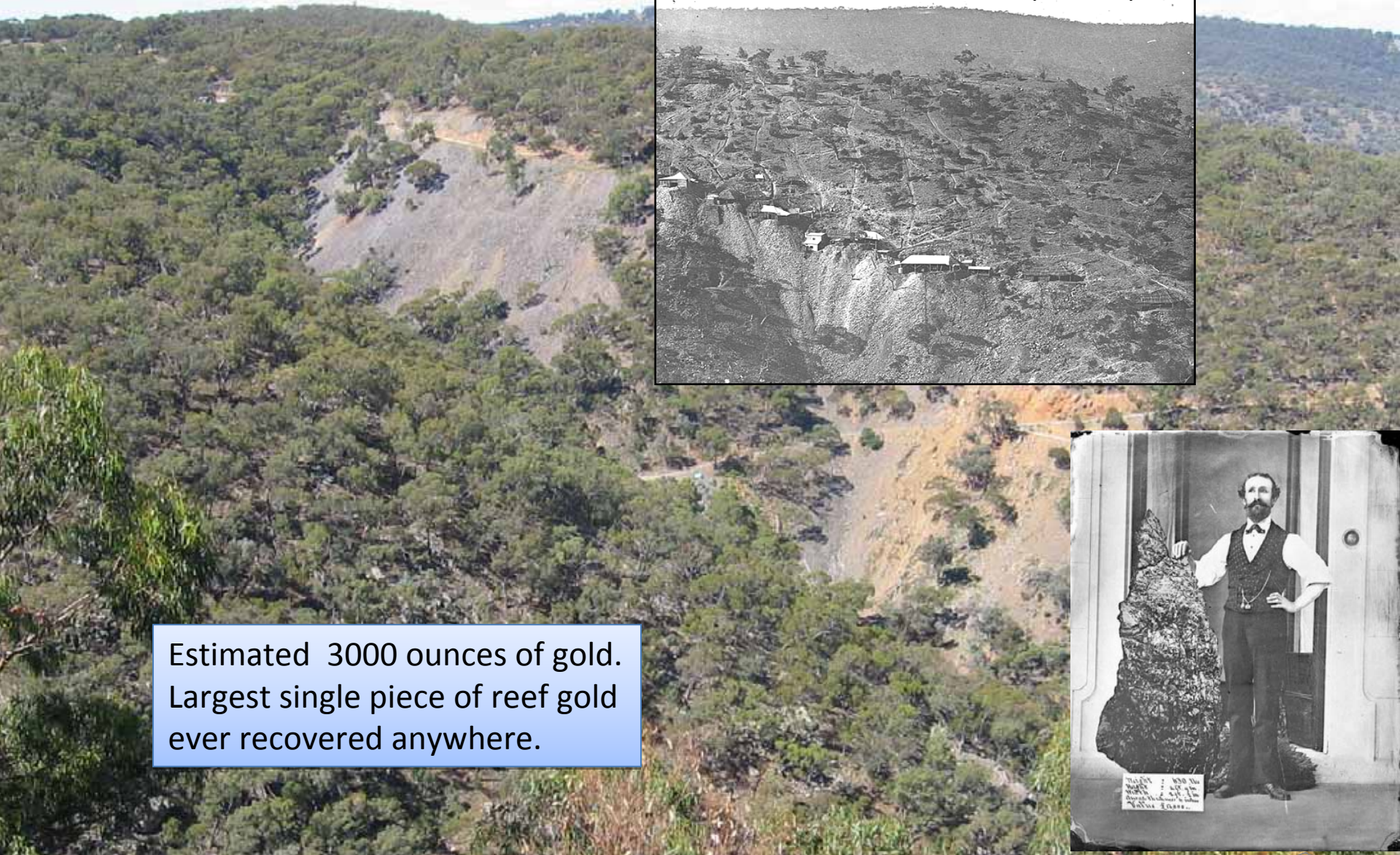
Mid Devonian – Early Carboniferous deformations
and regional biotite grade greenschist facies

Structure

Dominated by large, high amplitude, first order fold,
Possibly linked to steep west dipping thrust.



Hawkins Hill

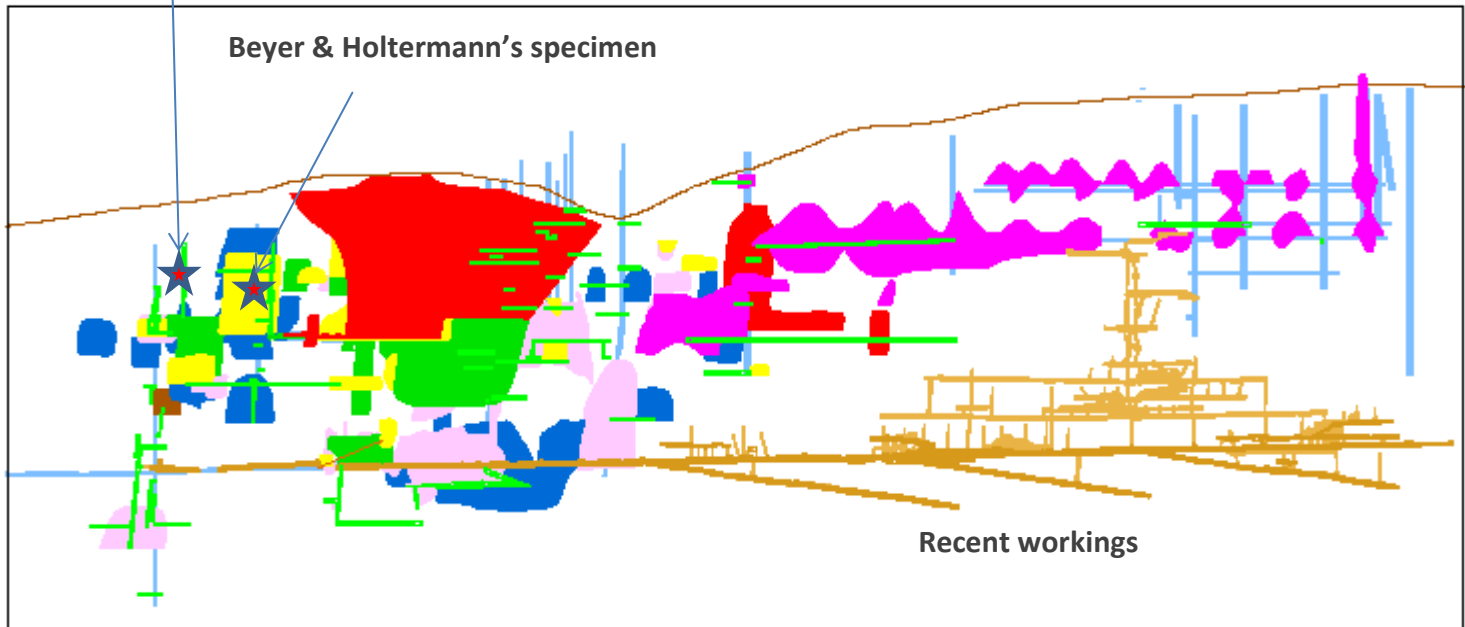


Estimated 3000 ounces of gold.
Largest single piece of reef gold
ever recovered anywhere.



Hawkins Hill & Reward

Krohman's Jewelry box



Recent production

11,196oz gold @91.2% recovery from 35,446tonnes @ 10.8g/tAu

Current Resources	tonnes	g/tAu	oz
Measured	41,900	16.8	22,600
Indicated	46,100	10.1	15,000
Inferred	201,000	7.8	50,300
sub-total	289,000	9.5	87,900
Extrapolated inferred	369,100	11.4	135,800
TOTAL	658,100	10.6	223,700

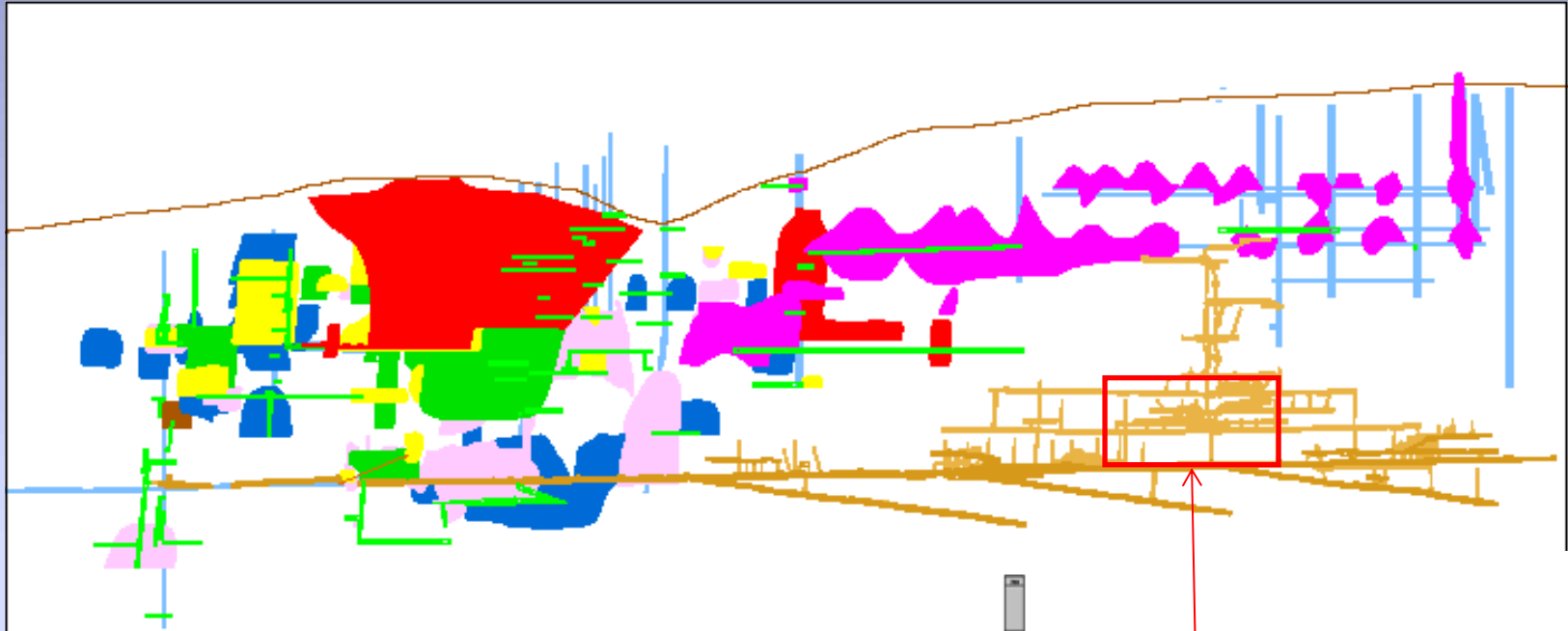
Past Production

One million ounces from hard rock, alluvial and eluvial deposits.
 Hawkins Hill alone reported over 400,000 ounces at 10oz/t
 including 24,480 ounces from 443 tonnes.... 55oz/t
 16,280 ounces from 422 tonnes... 39oz/t

Brief history of the Louisa Creek-Hargraves gold field

- July 1851 Kerr's Hundred Weight found ~136 kg mass of gold and quartz - 50.8 kg gold.
- Started rush to region with 2000-3000 miners working rich alluvial deposits mined in Louisa Field streams.
- Early 1850s reports 124-156 kg gold shipped from field under police escort every fortnight.
- 1858 production 1265 kg Au, 1858 – 1874 production 6394 kg (376kg/yr).
- Big Nugget Hill Shaft first licensed underground mine in Australia.
- Numerous shafts to 52 m deep along axis of anticlines, especially on Big Nugget Hill.
- Gold in saddle reefs and leg veins with grades up to 933 gpt.
- 1929 to 1939 extensive reworking of alluvial deposits produced 118 kg Au.
- Total 250,000 oz

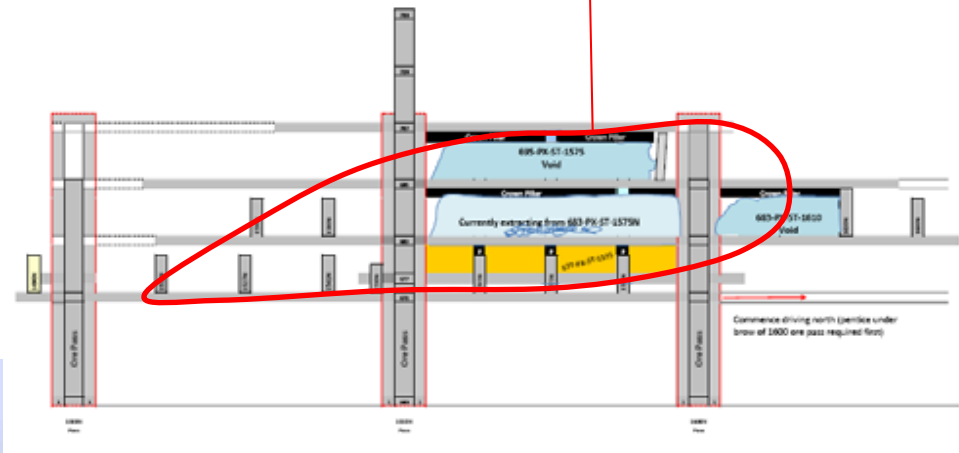
Mining and Processing



Gold shoot
95 metres in length
30 metres dip extent

Tonnes 3900
grade 24g/tAu
Ounces 3000oz

Bulk sample
Reconciliation 104%



Narrow vein trial mining



640 Mica 2

695 Paxtons

- Scraper drives and crosscuts
- Underhand benching
- Overhand shrink stoping
- Ladder rising





Face sampling 5-10kg -> visual gold estimate within hours

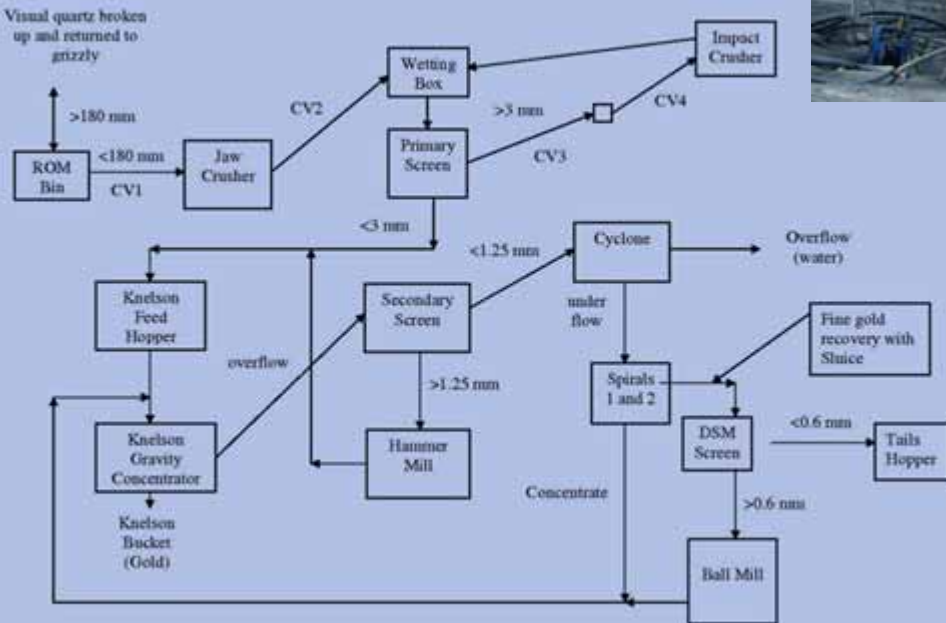


Hill End: Gravity plant

Gravity only
100 t/day (35000 t/a)
Recovery now at 97%
Tail approx. 0.3 g/t Au



HILL END GOLD PLANT FLOW CHART



Primary Jaw crusher then subsequent Impact crusher, Hammer mill and Ball mill re-circulations to reduce grind size

30" Knelson concentrator and 2 spirals are the gold recovery assets

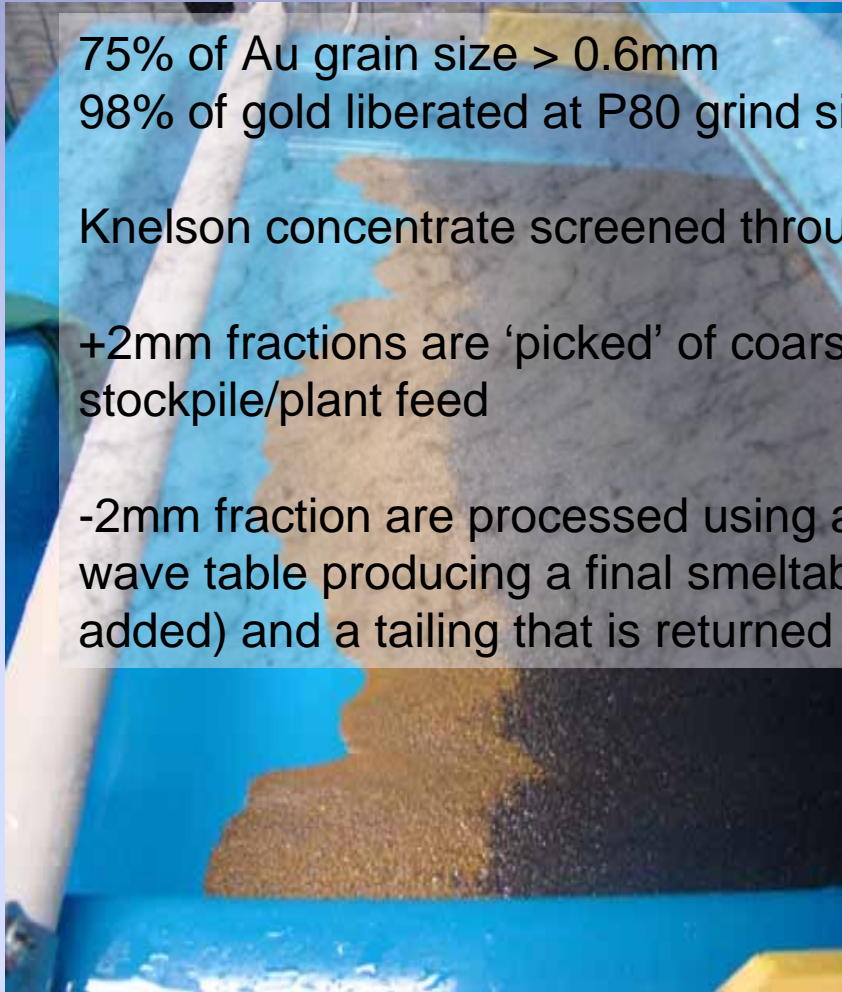
Gold concentrator (Wave table)

75% of Au grain size $> 0.6\text{mm}$
98% of gold liberated at P80 grind size of 0.67mm


Knelson concentrate screened through a nest of sieves

+2mm fractions are 'picked' of coarse gold, with reject sent to LG stockpile/plant feed

-2mm fraction are processed using a combination of panning, Wilfley table and wave table producing a final smeltable concentrate (with picked coarse gold added) and a tailing that is returned to plant feed/LG stockpile.



The Rocks



Orogenic – mesothermal- low sulphidation – slate belt – high grade – narrow quartz vein – nuggety – gold.

Similar deposits include:

Bendigo-Ballararat (Victoria, Australia)
Mathinna (Tasmania, Australia)
Meguma Terrane (Nova Scotia, Canada)
Buller Terrane (New Zealand)
Juneau Terrane (Alaska, USA)
Dolgellau belt (Wales, Great Britain)

The Rocks



Gold is deposited at the intersection between

Tabberabberan vein architecture

and

Kanimblan faults

within the brittle – ductile transition zone



TABBERABBERAN VEIN ARCHITECTURE

bedding parallel – crack seal laminated
remarkable continuity – marker
horizons
host rocks - not mineralized

flexural slip – competency contrast
bedding planes – syn folding
vein material sourced locally by
metamorphogenic processes

Veins occurring in shaley tops of
Metre scale turbidites.

The Rocks

GOLD

Gold in crack seal lamination
lower part of vein

In shoots within shoots
sharp boundaries
internal continuity

metal association:

sphalerite - galena – chalcopyrite

pyrite – pyrrhotite – arsenopyrite

calcite – sericite – muscovite - chlorite



MINERALIZED CORRIDOR

INDICATOR FAULTS

En echelon – bleached – minor reverse offsets only – 2nd order faults off major thrust system

FEEDER ZONES

Cleavage parallel stringer arrays – stockworking – breccia – bonanza grades at intersection with reefs

FOLD MORPHOLOGY

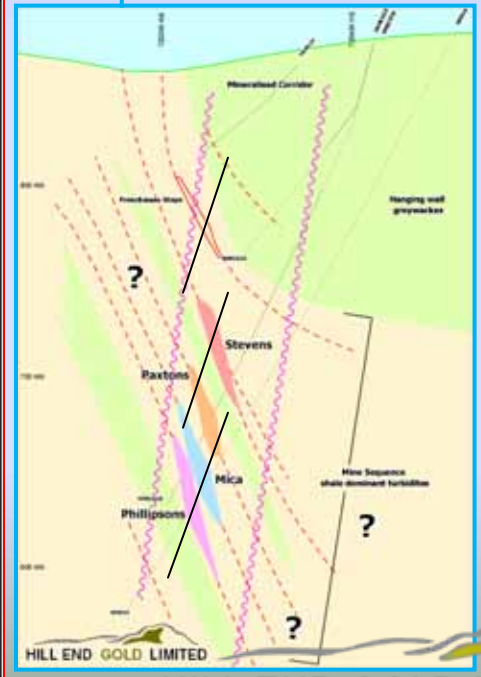
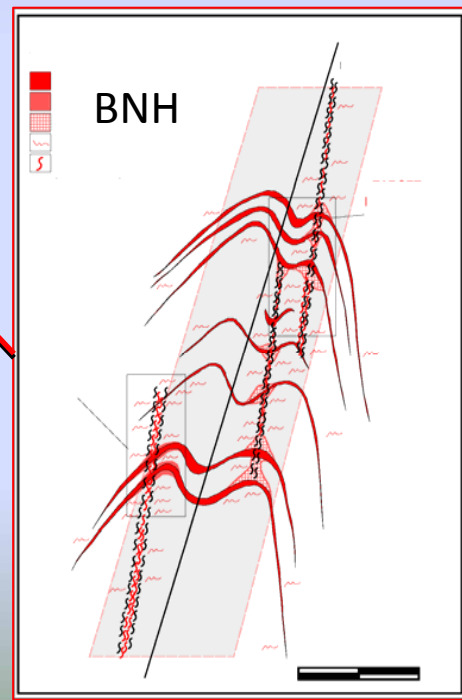
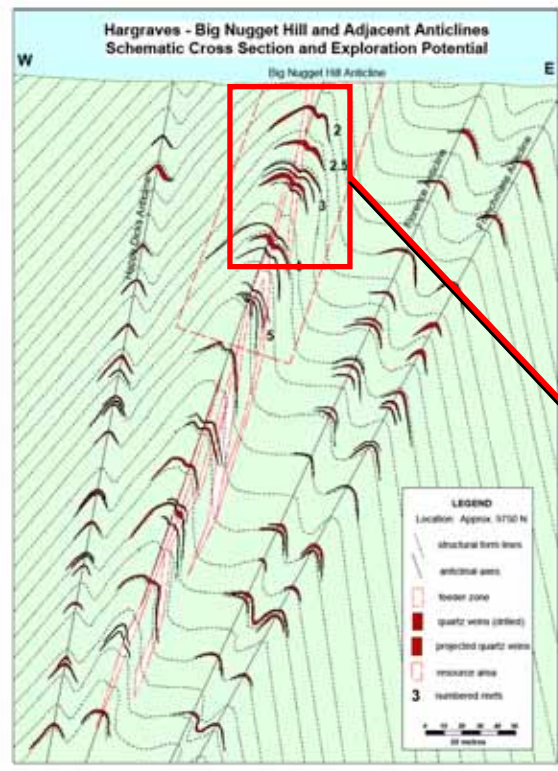
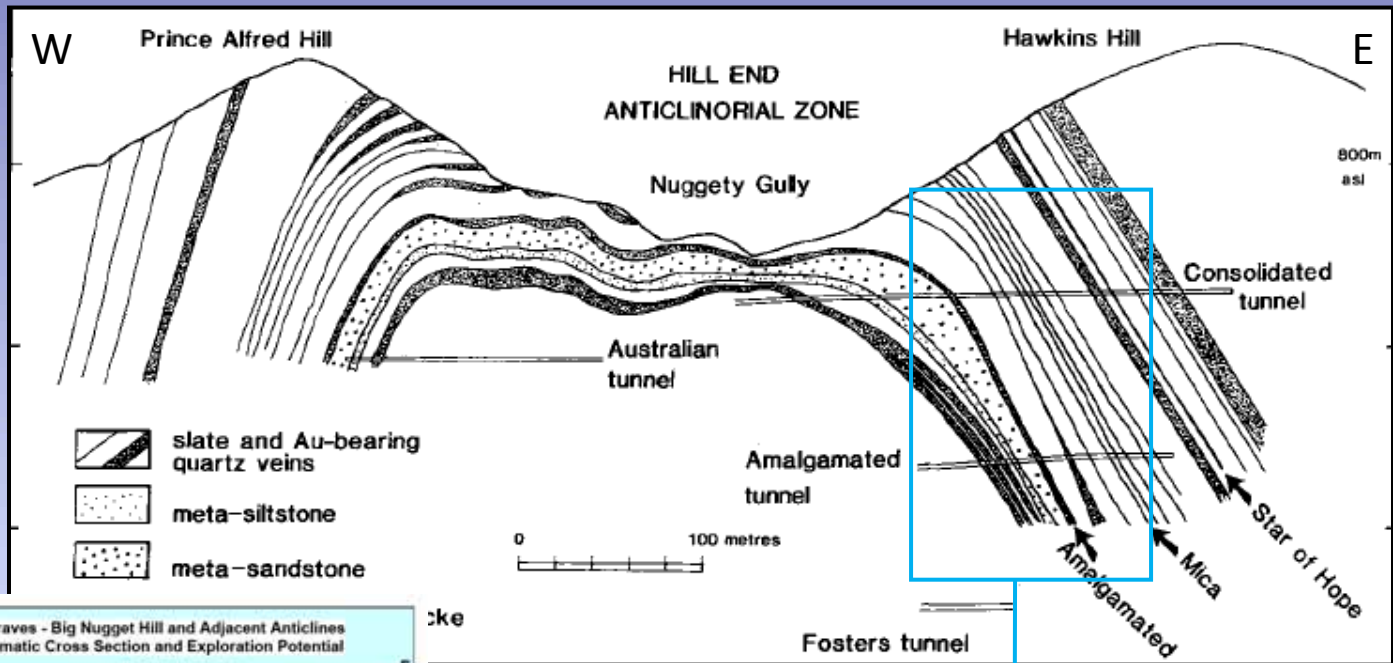
LITHOLOGY

Hawkins Hill / Reward style - Big Nugget Hill style

SCALE & CONTINUITY

indicator faults / feeder structures have minimal offset – 2nd or 3rd order manifestation
fundamental basement scale thrusts – mineralizing pathways
structural control of fold evolution





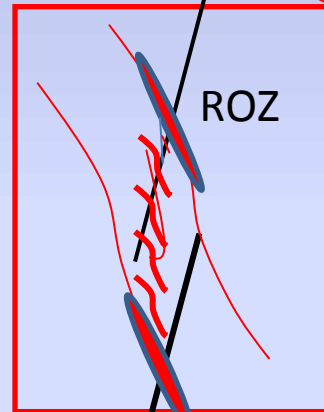
Relationship between Indicator Faults and ore shoots

Plan view

Cross section

500m

- Mica vein
- Paxton's vein
- En echelon Indicator faults

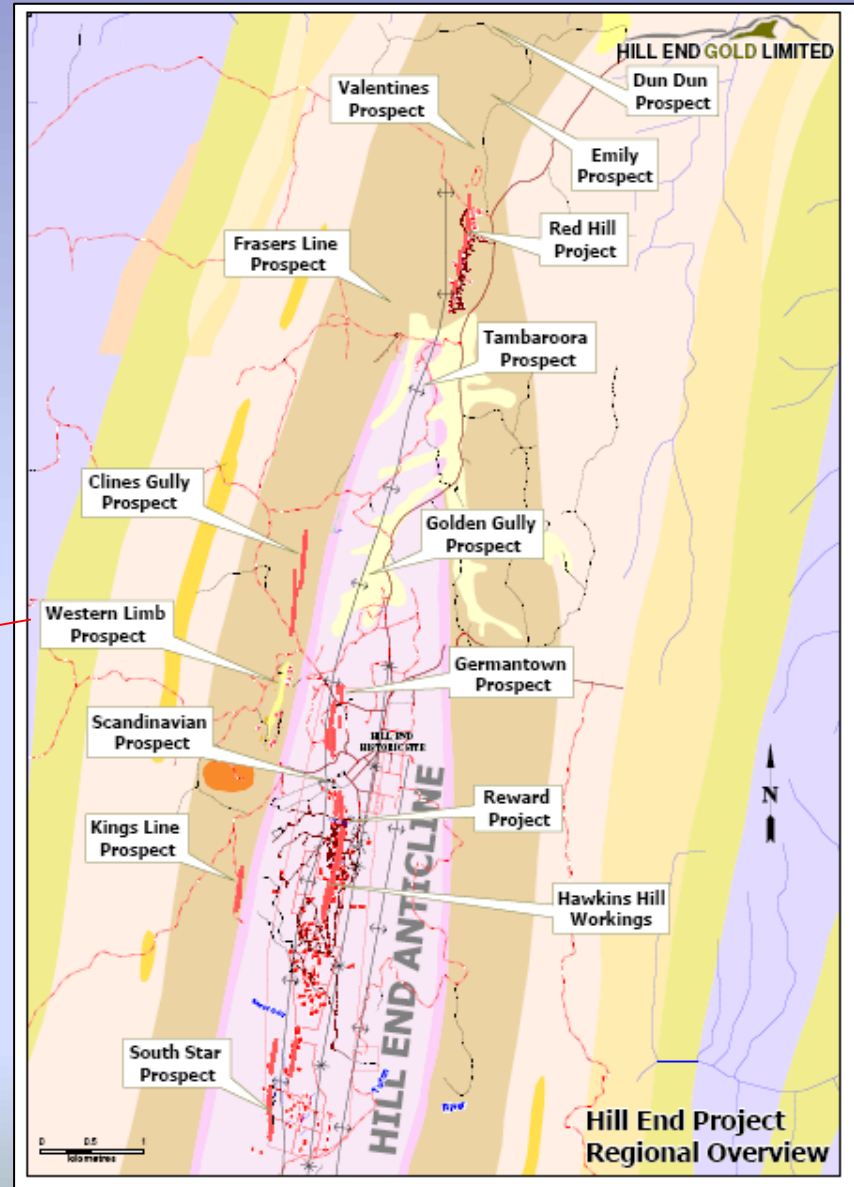
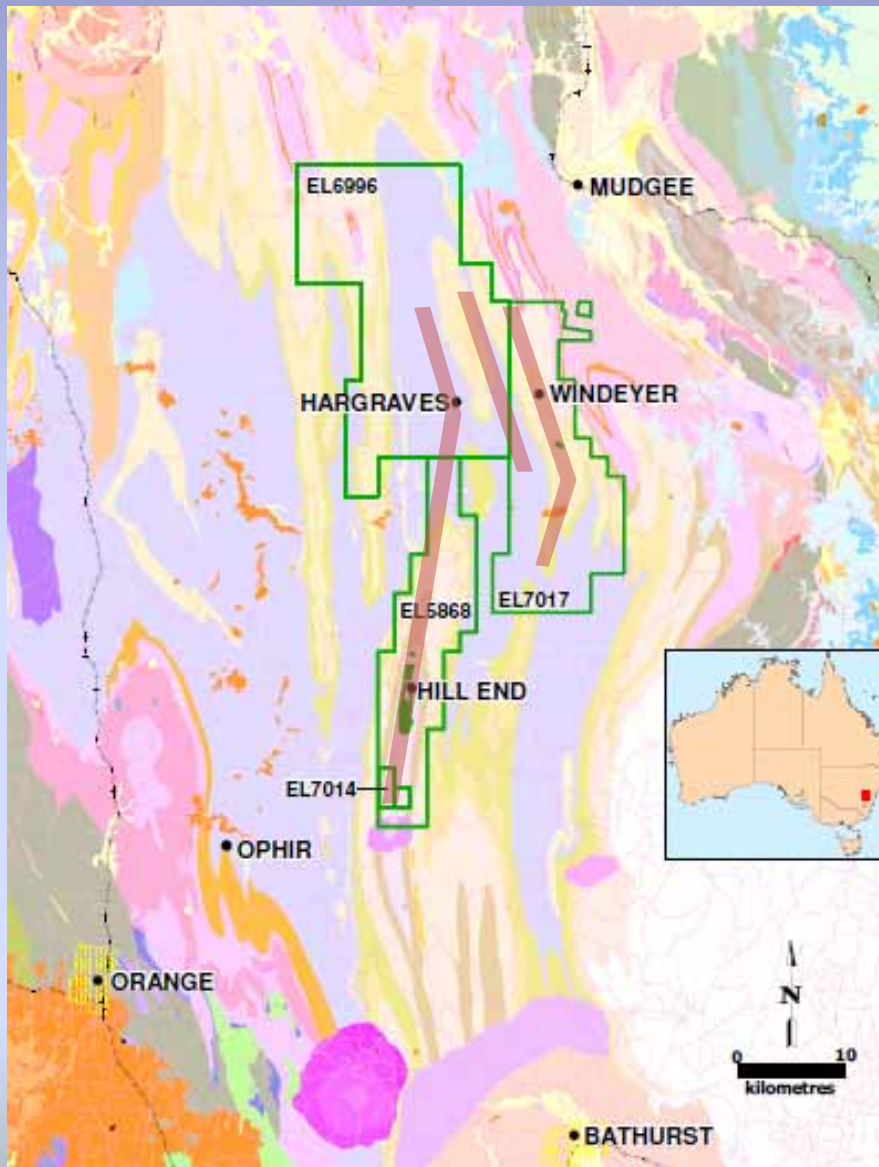


Gold shoots

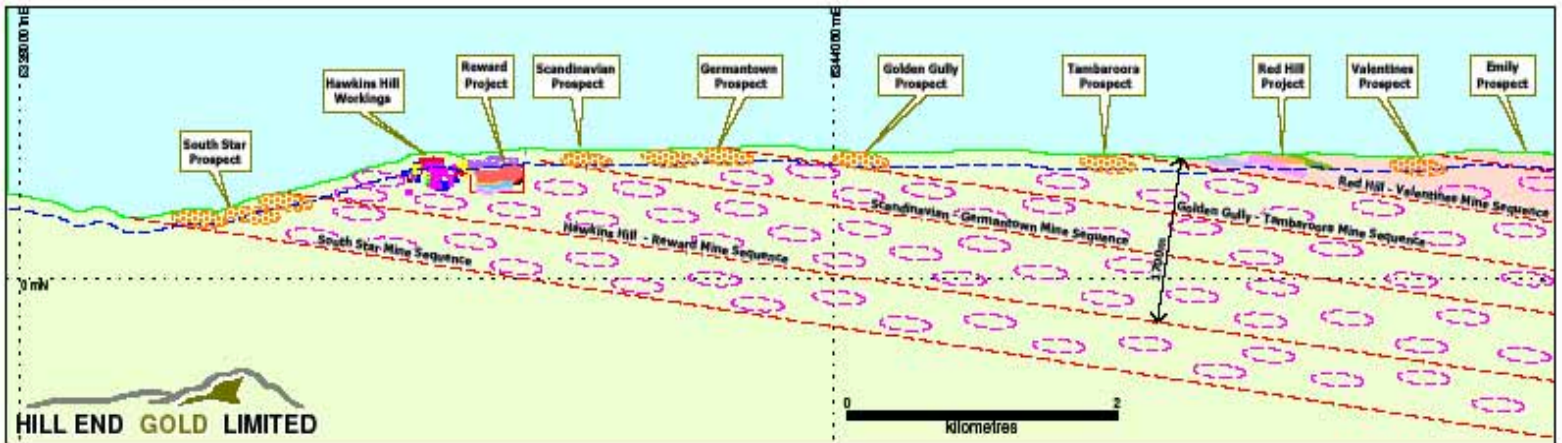
Reward Ore Zone (ROZ) - Frenchman's "Ballroom"



REGIONAL SCALE CONTINUITY



Hill End Project



South Star to Valentines Long Section

Closer look at Hargraves

Goldfield 4 x 10 km

Numerous mineralised structures with little modern exploration.

First target - Big Nugget Hill

- 50kg gold in quartz outcrop 1851.
- Large nugget field.
- Part mined to water table only.

Drilled 1,000m of BNH structure.

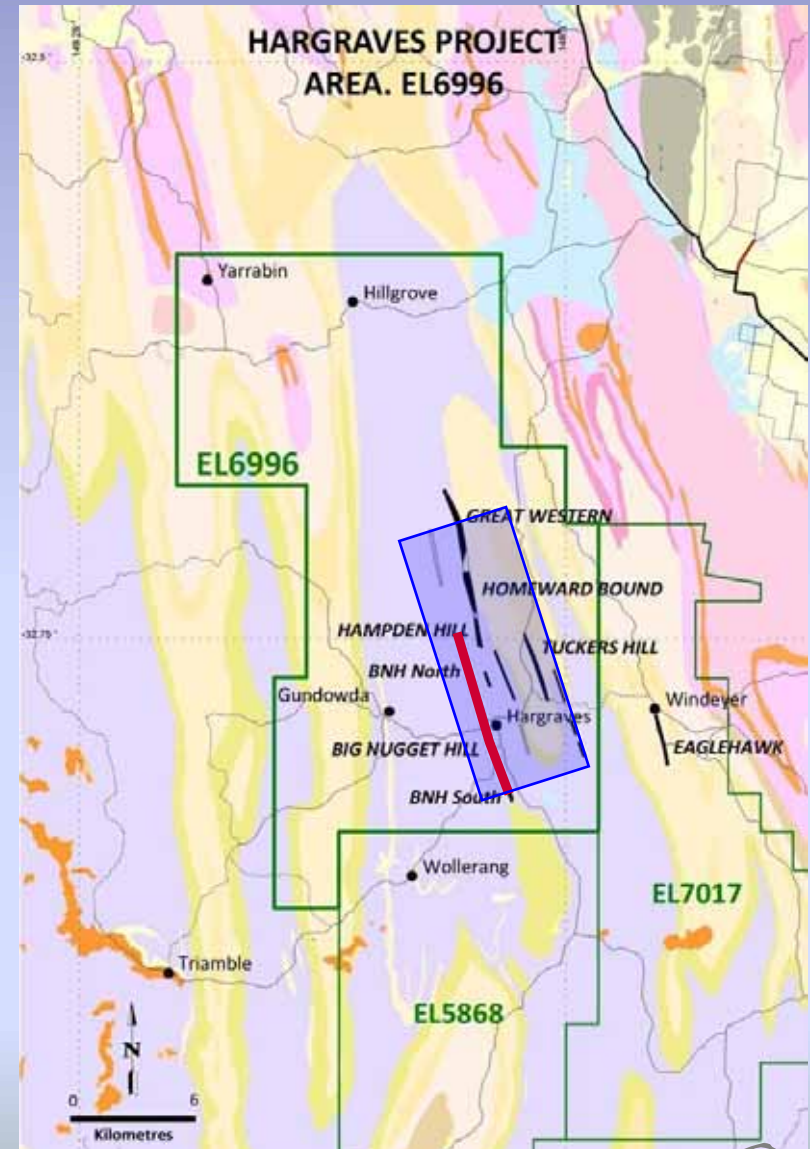
- 16,000m program to 400m depth.
- Initial resource estimate to 150m.

HGD13 : 4.2g/t over 75m.

HGCD32 : 3.6g/t over 52m from 33m
incl. 20g/t over 8.1m.

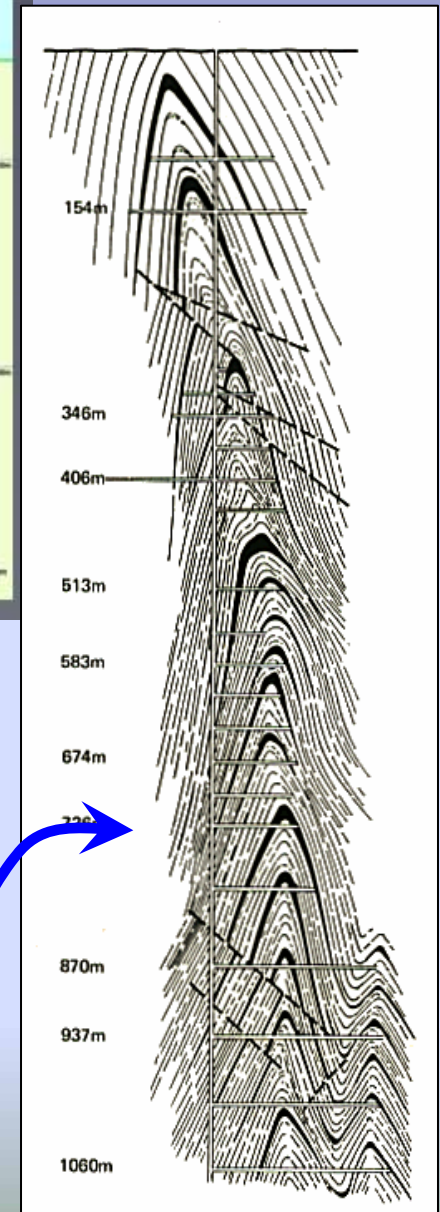
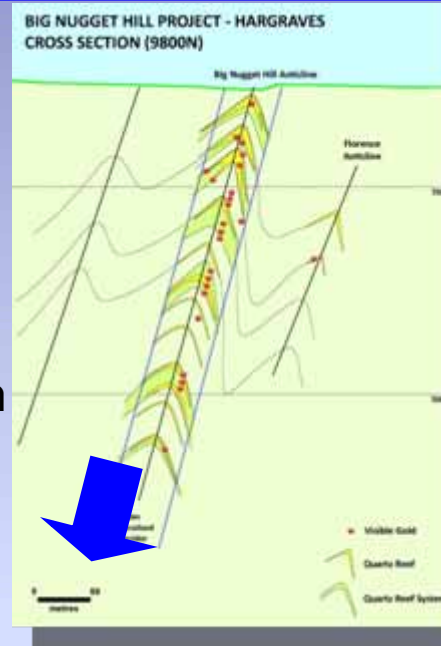
HGD35 : 20oz/t over 0.8m from 38m
and 8oz/t over 3.6m from 107m.

Start to explore other projects



Hargraves: BNH Potential

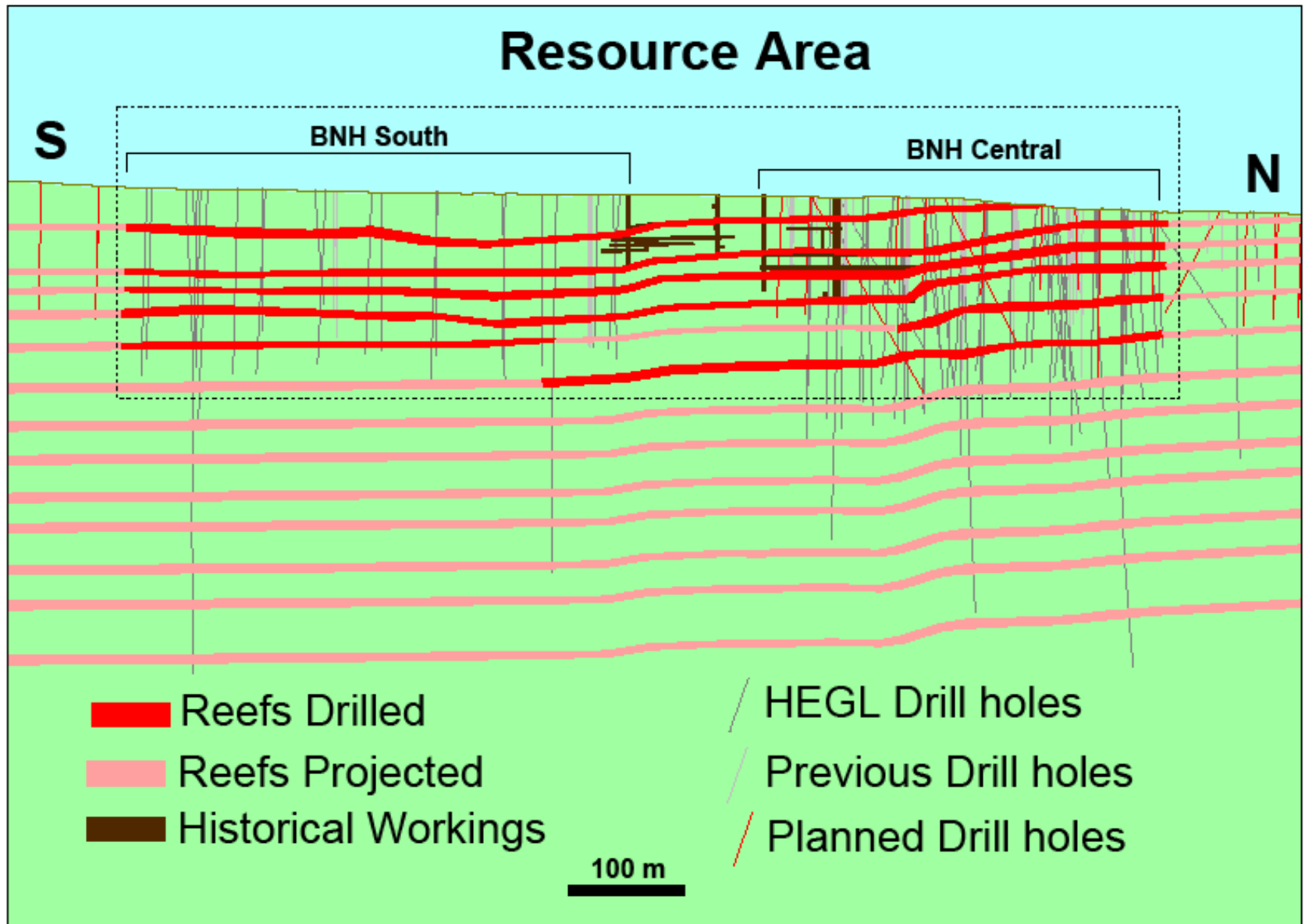
- 40m wide structure.
- Unmined from near surface.
- Open at 400m depth and over 1000m along strike.
- Bulk mining, large scale potential.
- Coarse gold – simple processing.

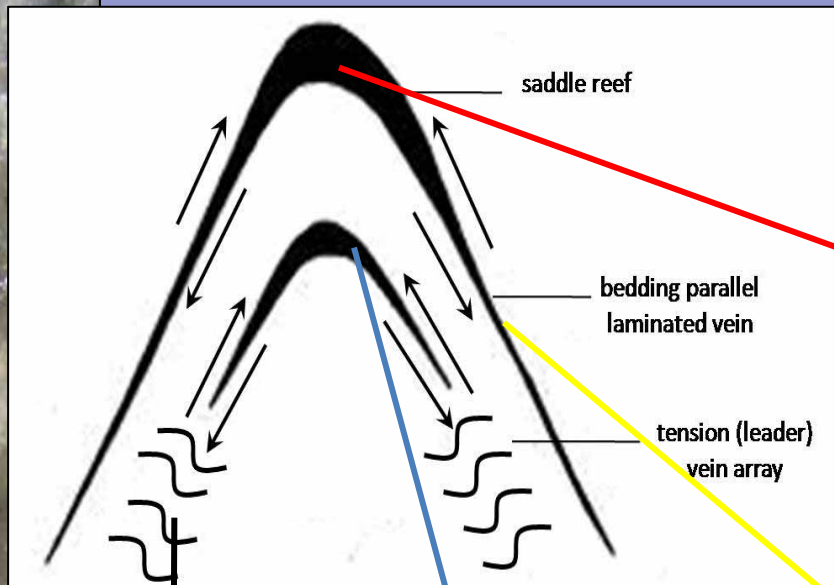


Bendigo (~20m ounces)
Reefs ~100m apart.
Mining over 750m depth.

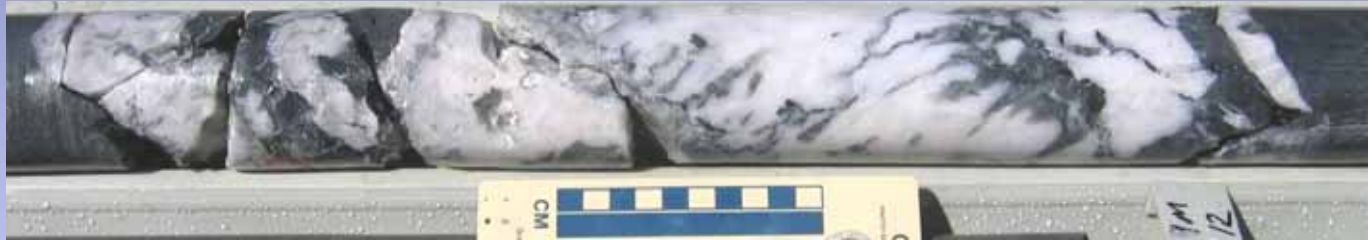
Great Extended Hustlers shaft

Big Nugget Hill – long section





The Final Product



HGD12@167.13-167.63; small saddle with early (Stage 1) banded phase overprinted by coarse, vitreous white quartz + carbonate (Stage 2) along cross-fractures and both cut by vuggy white quartz + pyrite (Stage 3).



Second saddle reef complex in HGD12 @ 65-78 metres (13 m) with four generations of mineral assemblages in multiple saddle veins and dense stockwork of leader veins, cross-cutting, and cleavage-parallel veins.

What and where are the nuggets?

Hargraves – BNH (Louisa Ponds Creek) – Dalys Creek – Meroo Creek - The Potato Fields

Year	Location	Weight (ozs)	Description	Today's gold price
				<i>(\$1348AUD)</i>
1851a,b	Hargraves	1633	"Kerrs Hundredweight"	\$2,201,284
1851a	Meroo Creek	840	2 nuggets of the same size	\$1,132,320
1851a	Meroo Creek	720		\$970,560
1851a	Meroo Creek	366		\$493,368
1851a	Meroo Creek	364	"The Brennan Nugget"	\$490,672
1852a	Meroo Creek	2680	"The King of the Waterworn Nuggets"	\$3,612,640
1852a	Meroo Creek	157		\$211,636
1852a	Louisa Creek	82		\$110,536
1852a	Meroo Creek	71		\$95,708
1852b	Louisa Creek	312	"Darby's Nugget"	\$420,576
1856b	Louisa Creek	2800	"5 Hundredweight Nugget"	\$3,774,400
1856b	Louisa Creek	72	"Cork Jack Nugget I"	\$97,056
1856b	Louisa Creek	36	"Cork Jack Nugget II"	\$48,528
1856b	Louisa Creek	89	"Bryant's Nugget"	\$119,972
1856b	Louisa Creek	77	"Reid's Nugget"	\$103,796
1856b	Louisa Creek	197	"Turner's Nugget"	\$265,556
1856b	Louisa Creek	103	"John the Dutchman's Nugget"	\$138,844
1856b	Louisa Creek	77	"Winnan's Nugget"	\$103,796
1856b	Louisa Creek	73	Turner (2 pieces)	\$98,404
1887b	Meroo Creek	344	"Maitland Bar Nugget"	\$463,712
1887b	Hargraves	357		\$481,236
1887b	Hargraves	200		\$269,600
1887b	Hargraves	47		\$63,356
1887b	Hargraves	32		\$43,136

sum \$15,810,692





What and where are the nuggets?

Hargraves – BNH (Louisa Ponds Creek) – Dalys Creek – Meroo Creek - The Potato Fields

Hill End especially Tambaroora rich alluvial fields but no similar reported nuggets.

Lumps of gold have been found – Holterman's specimen (3000oz), Krohman's jewelry box (provided specimens for 1872 Paris Exhibition) – where access was aided by the incision of the gorge,

And Emmett's mine and Suttor's blow and Sargent's Hill (30,000oz)

These concentrations may be Supergene or hydrothermally reworked vein gold. What ever they are can we expect them to occur in similar sites along the extensive line of old workings?

At Hargraves they have been unearthed and dumped on surface by erosion...

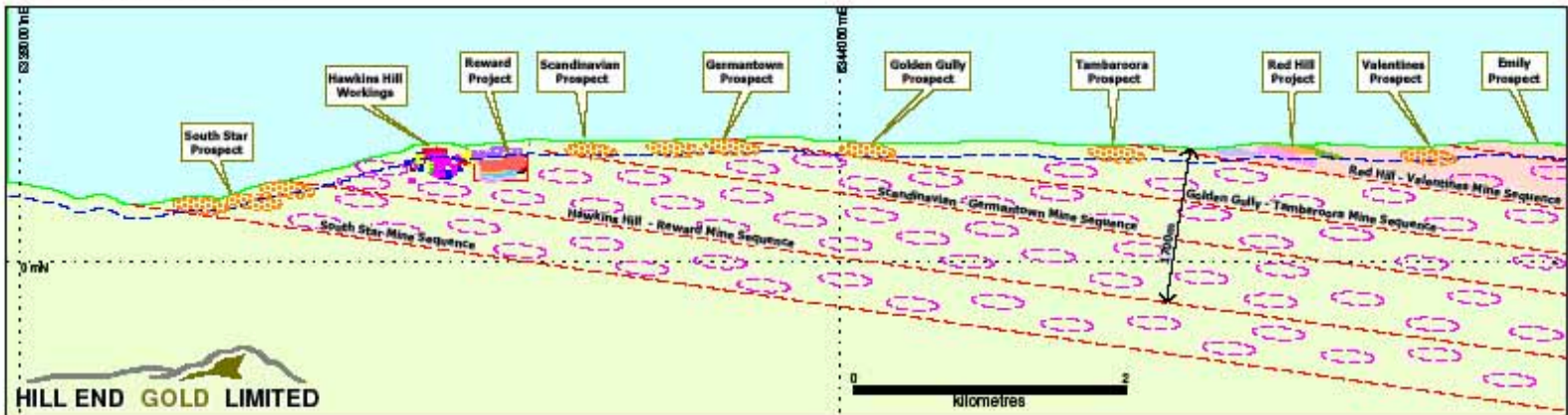
At Hawkins Hill they have been found in place close to surface.....

If they haven't been tripped over or found in shallow workings, Are they still in place throughout the field yet to be found?

HOW DO WE FIND THEM?

WHERE ARE THE NUGGETS?

Hill End Project



South Star to Valentines Long Section

Work completed to date & Proposed for the future

Hawkins Hill – Reward

Completed bulk sampling trial mining stage - established we can - explore
– mine – treat this type of deposit

Next stage:

- Define 1-2 years production underground;
- Extend resources along strike and at depth;
- Test satellite projects to MLA to get future supply on line.

Hargraves

Drilled Big Nugget Hill to resource stage with 16,000m HQ3 in 91 DDH.

Next stage:

- MLA – scoping study
- extend resource at depth and along strike;
- drill proximal lines of lode and
- regional projects similar in extent to the BNH line of lode
- for future MLs and mill feed

Hill End – Hargraves mineralization CONCLUSION

*Gold is focussed along a fundamental structure over a strike length of >30 KMS
With a translated depth extent of kms...*

*We have identified controls of mineralization
How to target gold shoots*

We have numerous untested projects

*NOT AS BIG AS BENDIGO OR BALLERAT.....
BUT GIVE US TIME*

