

# SOUTH ISLAND LIGNITE

## ► Resources

At least 6.2 billion tonnes of lignite is technically and economically recoverable in 10 major deposits in Otago and Southland. The in-ground lignite resource is 11 billion tonnes.

The total energy content of recoverable lignite is about 75,000 PJ. This is equivalent to about 20 times the energy content of the Maui gas field and more than 60 times current gas reserves.

The energy content of each of the larger deposits is between 7000 and 12,000 PJ, compared with 400 PJ for the Kupe oil and gas field and 700 PJ for the Pohokura gas field.



Mining a lignite seam up to 17.5 m thick, Waimumu, Eastern Southland. Photo: M Isaac

COALFIELD	RESOURCE (million tonnes)	RECOVERABLE (million tonnes)	RECOVERABLE ENERGY (PJ)
Hawkdun	812	649	7,185
Home Hills	346	246	2,731
Roxburgh	245	132	1,678
Benhar	1,200	89	12,941
Gore	304		
Croyden	484	309	4,388
Waimumu	296	217	2,817
Mataura	2,940	1,808	22,925
Edendale	618		
Morton Mains	1,226	507	4,345
Waimatua	962	775	7,533
Ashers-Waituna	1,357	746	7,654
Makarewa	1,026		
<b>TOTAL</b>	<b>11,816</b>	<b>6,276</b>	<b>74,127</b>

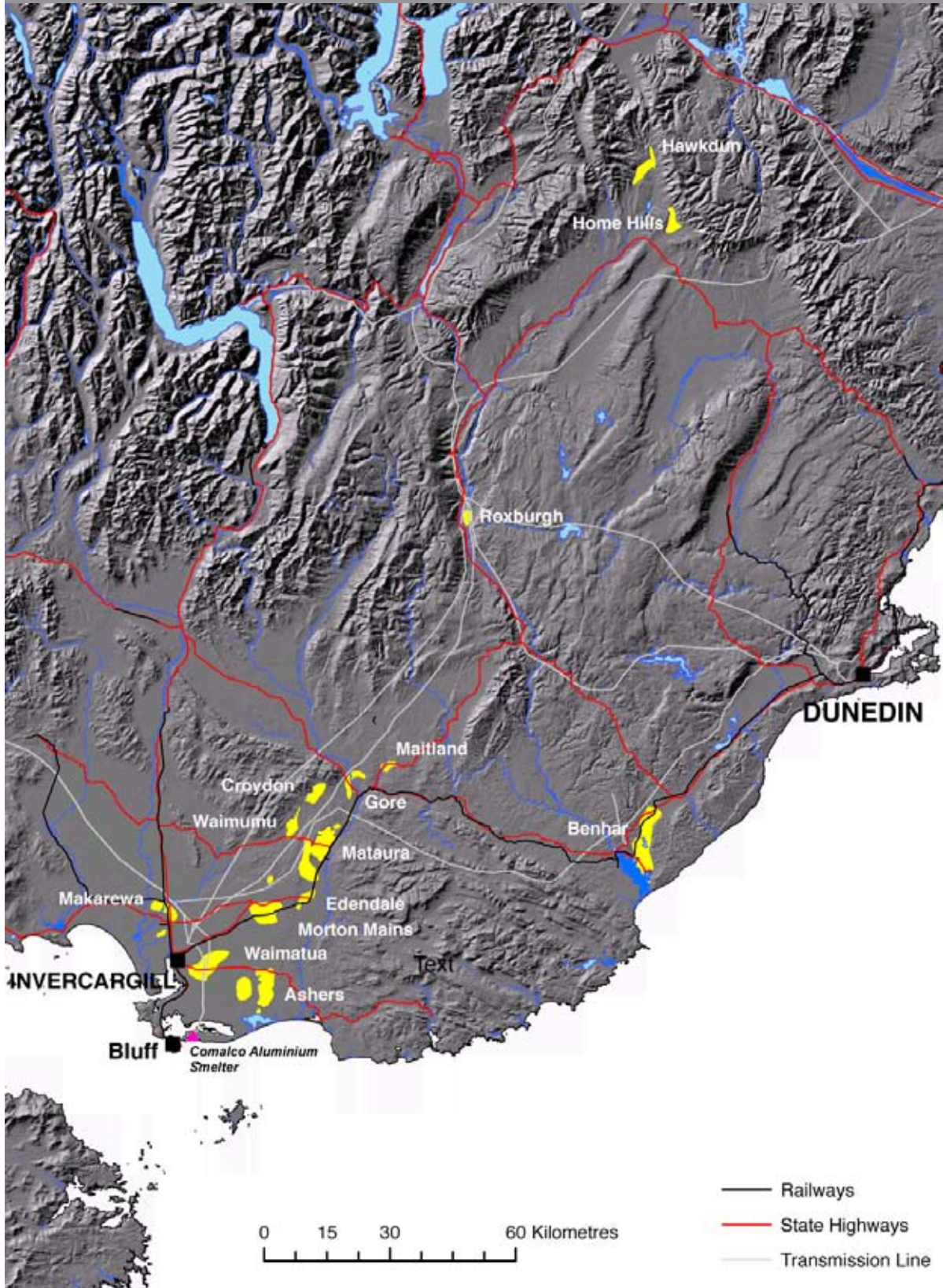
**South Island lignite resources.** Resource estimates are from NZ Coal Resource Survey reports. Recoverable estimates and energy equivalents are from LFTB studies documented by RDL (2006) and do not imply that there is no recoverable lignite in the other deposits.

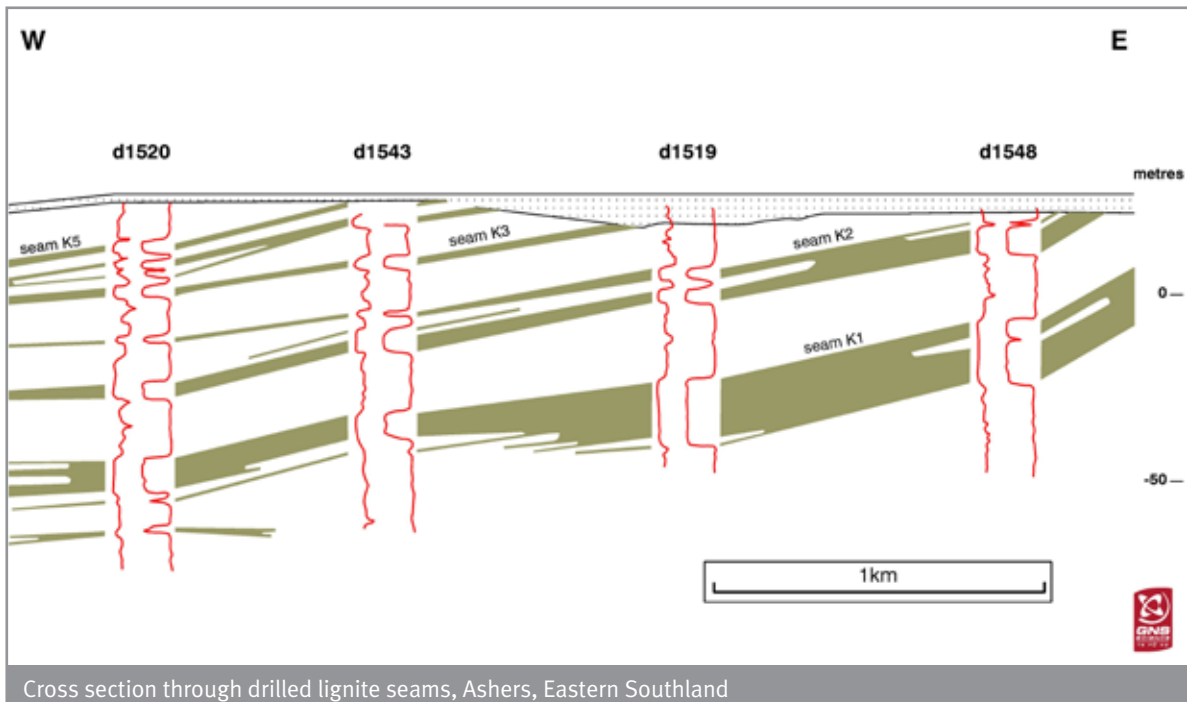
## ► Exploration history

The first significant evaluations of the Southland lignite fields were carried out by DSIR between 1948 and 1974. The Otago lignite deposits remained virtually unexplored over that period. Total resource estimates for South Island lignites prior to the mid-1970s were between about 400 and 1400Mt, indicative of the lack of knowledge at the time.

The New Zealand Coal Resources Survey (NZCRS) was a government-funded coal exploration programme that ran from the mid 1970s to the late 1980s and explored almost all realistic coal prospects in the country. As part of NZCRS exploration, 450 holes were drilled in eastern Southland between 1976 and 1978. Drillhole spacing was initially 2 to 2.5 km, intended to intersect any lignite resource greater than 50 million tonnes. Where significant lignite intersections were made, short infill lines were drilled and the more promising prospects were then drilled down to 750 m spacing. Extensive resources with opencast mining potential were identified at Croyden, Waimumu, Mataura, Morton Mains, Waimatua and Ashers-Waituna.

▶ South Island Lignite Deposits





NZCRS exploration drilling was subsequently extended to Central Otago, discovering major deposits at Hawkdun, Home Hills and Roxburgh.

The NZ Geological Survey independently completed a separate series of reports on lignite resources and geology. Detailed descriptions of the geology of the eastern Southland lignite measures and a regional map of lignite resources were published in 1990 (Isaac and Lindqvist 1990, Isaac 1990). The geology of the Central Otago lignite deposits was also studied by Douglas (1986).

NZCRS investigation of the lignite resources was passed over to the Liquid Fuels Trust Board (LFTB), a government-funded organisation set up to investigate alternative fuel options for New Zealand following the oil shocks of the 1970s. The main purpose of the LFTB investigations was to establish a resource of sufficient size to meet LFTB's production targets, although deposit models were constructed that allowed estimation of in-ground resources. LFTB carried out exploration and mining feasibility studies on most of the South Island lignite deposits in two phase. The objective of the studies was to prepare costed mine plans to rank the deposits to identify the single deposit that, coupled with synfuel process technology, could most beneficially be mined at the nominal rate of 10 million tonnes/year to provide feedstock for a commercial synthetic fuel facility over a 30-year period.

The LFTB Phase I programme included additional exploration drilling, detailed analysis of lignite properties, geotechnical, hydrological and environmental studies, and preliminary mining feasibility studies.

Screening by LFTB of the lignite deposits investigated during the Phase I programme selected three deposits (Benhar, Hawkdun and Ashers-Waituna) for Phase II evaluation.

The LFTB work left New Zealand with a legacy of detailed knowledge about a world-scale energy resource that is again being evaluated for petrochemical projects to substitute for increasingly uncertain oil supplies.

### ► Utilisation potential

South Island lignite is a major indigenous energy resource which is amongst the most competitively priced anywhere in the world. The resource is suitable for extraction and conversion to high value energy products through use as a feedstock for a petrochemical industry, rather than as a resource for combustion for electricity generation. The key will be application of gasification technology to convert lignite to petrochemicals and transport fuels based on a world-scale plant, coupled with CO<sub>2</sub> capture and storage.

If extracted at a rate of 20 million tonnes per year, the lignite resource could provide energy and feedstock for most of New Zealand's transport fuel and petrochemical requirements for over 300 years.



Lignite mines, Waimumu, Eastern Southland.  
Photo: A Sherwood

## ► References

Barry M, Duff SW, MacFarlane DAB 1994. Coal resources of New Zealand. Resource information report 16. Energy and resources division, Ministry of Commerce.

Douglas BJ 1986. Lignite resources of Central Otago. NZ Research and Development Committee publication P104 368pp.

Hooper RJ 2005. The value opportunity for New Zealand's lignite deposits. 2005 New Zealand Minerals Conference Proceedings. Crown Minerals/AusIMM. [http://www.crownminerals.govt.nz/minerals/conference/papers/001\\_Papers\\_22.pdf](http://www.crownminerals.govt.nz/minerals/conference/papers/001_Papers_22.pdf)

Isaac M 1990. Lignite resources of Eastern Southland. *NZ Geological Survey miscellaneous series map 20*.

Isaac MJ, Lindqvist JK 1990. Geology and lignite resources of the East Southland Group, New Zealand. *NZ Geological Survey bulletin 101*.

Natusch DFS 2005. Relevance of the Liquid Fuels Trust Board work to present-day energy issues. 2005 New Zealand Minerals Conference Proceedings. Crown Minerals/AusIMM. [http://www.crownminerals.govt.nz/minerals/conference/papers/Papers\\_23.pdf](http://www.crownminerals.govt.nz/minerals/conference/papers/Papers_23.pdf)

Resource Development Ltd 2006. The value of New Zealand's lignite reserves: Hawkdun and Home Hills. Unpublished report, Crown Minerals, Ministry of Economic Development.