
WELCOME TO THE HOCKEN
Friends of the Hocken Collections
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Geology in historical documents

THE HOCKEN COLLECTIONS are generally considered to be the preserve of scholars of the Humanities or genealogists, and many people believe that scientists are not interested in historical documents. In particular, geologists are thought to study rocks and fossils that are older than human evolution: and since time is measured in millions or billions of years, what is the relevance to such scientists of a collection that is not even 100 years old, with only a proportion of its holdings even older than that?

That, of course, is rather misleading. The Hocken has very substantial scientific holdings, including all standard New Zealand works in the fields of geology and geomorphology, and long runs of most of the relevant journals.

But this bulletin is not concerned with those standard texts, but has been compiled in order to point out some of the uses of historical documents to active research geologists. It is not intended to be exhaustive, but merely to describe the types of information that are useful to geologists. In some cases, the catalogued holdings with respect to geological uses appear rather sparse. In such cases, this account is intended as a plea to future Friends, librarians, archivists, and members of the public to preserve this type of information from now on, and to highlight it when they come across it in old documents.

Most documents in the Hocken of significance to geologists have some relationship to the mining history of New Zealand. This bulletin concentrates on the South Island, and Otago in particular, but similar types of information may be available on North Island mining areas as well.

MINING RECORDS

Mining was an important part of early European settlement in Otago, and a good many early documents relate to that industry. Most of these documents are more relevant to the human dimension of early colonial life, but some documents are important geologically as well.

Descriptions of geological features

Many parts of Otago are covered in grass and soil, with little for the geologist to see. Excavations such as mines and quarries give a geologist a rare view of what lies beneath the soil and grass. Old mines scar the Otago landscape, but most of these have partially collapsed and/or have become revegetated, and geological details are obscure.

Fortunately, early geologists visited these mines when they were active, and saw the perfect outcrops then exposed. The writings and drawings of these geologists are an invaluable reference for modern geology studies. Astute observations by people such as Vincent Pyke, James Hector, Alexander Mackay, James Park and Julius von Haast are recorded in various government publications, such as *Reports of Geological Explorations*, and early *NZ Geological Survey Bulletins*.

The *Reports on Geological Explorations*, in particular, are annual compilations of numerous short but informative accounts of general observations made by government geologists sent around the countryside in the 1870s and 1880s. Hector (as Provincial Geologist) focused initially on Otago, while von Haast focused on Canterbury and Westland, although they very nearly converged in a 'race' for a pass over the Main Divide in 1863.

Mackay's *Report on the Older Auriferous Drifts Of Central Otago* (1897, Government Printer) is still considered to be a classic geological document, and his insightful descriptions and illustrations proved useful, for example, when modern geologists tried to unravel the geology in the area near the Clyde Dam in the 1980s.

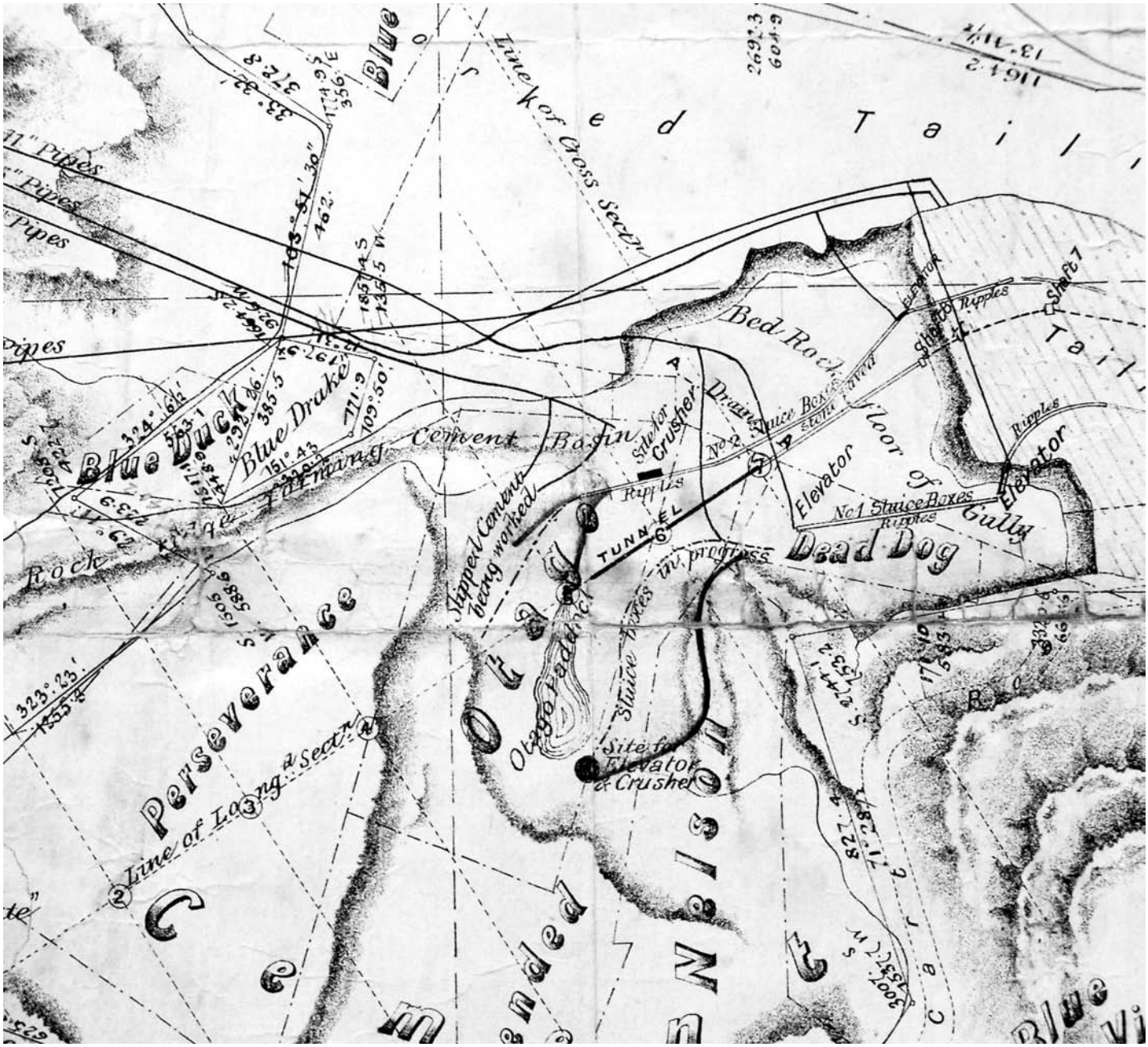
Many of the above geologists produced regional geological maps as well, and some of these are remarkably similar to modern maps. Early photographs of mines and mining techniques also provide valuable records of what the areas were like, such as those catalogued by the now-defunct Department of Lands & Survey in 1982. James Park, as a professor in the Otago School of Mines, produced numerous publications on mining techniques as applied in New Zealand and overseas at a time when the New Zealand mining industry was a leader in the application of new technology.

Old mine production

Our mining forebears, some with previous experience in Cornwall, California and Australia, were extremely astute in finding the best gold deposits, and all subsequent mines have been developed around old workings. It is standard practice for mineral exploration geologists to examine historic records of mine production, to determine where the best ore was, and potentially to define where ore was not taken out.

Large gold mines in the Nokomai valley in the 1990s were initiated when it was determined from old records that historic miners abandoned rich ore because they lacked the means to move large volumes of overlying gravel. Modern miners easily removed that gravel, extracted the gold, and returned the gravel to its original place. The Macraes mine near Palmerston was developed in rocks that historic miners abandoned because they contained too little gold. Nowadays, the economy of scale allows profitable mining on rocks with less than one-tenth of the gold the old-timers required. Even better economies of scale will presumably arise in the future, so accumulation of records from present mines is an important asset for the next generation of miners. Alas, that may not be happening.

Records of mine sites and their production are contained in a wide variety of historical documents. The *Appendices to the Journal of the House of Representatives*



Detail of map of Special Claim of Blue Spur Consolidated Gold Co. Ltd., Gabriel's Gully, 1891.
(call no. Maps Hocken Horizontal 882 1891)

(Section C) provide probably the most complete account of mine activity in the late 1800s. The *NZ Mining Handbook* (1906) provides some compilation data and gives good accounts of the various active and recently inactive mining fields. Several early *NZ Geological Survey Bulletins* were devoted to particular mining areas and contain remarkably complete accounts of the nature of the mines and their production, e.g. *NZGS Bulletins* 2 (Alexandra Subdivision) and 5 (Cromwell Subdivision).

Some local history volumes are also useful: for example *Heart of the Desert* (J.C.Parcell) describes the Cromwell-Bannockburn area; *Gold, Quartz and Cyanide* (John Ingram) the Barewood mining area near Middlemarch; *Gold in a Tin Dish* (Mike Johnston) is an excellent and detailed account of mining and production in Nelson-Marlborough area; and D.Latham and N.G.Hancox describe the Reefton and Blackwater miningareas. A good summary of the history of gold dredging in Central Otago, with references, is provided by K. Robinson (1987).

Underground mine maps

Many historic gold-quartz mines and coal mines involved construction of a network of underground tunnels. Larger mines were properly surveyed, and complex drawings of mine plans were drawn up and added to as the mine expanded. When the mines closed, these records were commonly lost, unless preserved in company or government archives. Some have been preserved in the Hocken Collections, although few appear in the catalogue as yet. A list of available West Coast mine plans is available from the Map Curator. Representative maps have also been published in *NZ Geological Survey Bulletins* (mentioned above).

The mine maps are useful for mineral prospecting purposes, when a new phase of exploration begins, as they give geologists an indication of where the old miners found the best ore, and how much they removed. The maps are also useful when an old mining area is being redeveloped for roads or houses, as they show where potential ground subsidence can occur. Recent mine subsidence events in built-up areas of Waihi (Coromandel) and Ocean View (Green Island) have highlighted the significance of these maps, or the lack of them.

Environmental aspects of historic mines

The above mining records are also useful for defining the environmental impact of mines. Maps show the scale of underground workings, and the locations of exit sites for potentially polluted water. Gold-quartz mines involved crushing large volumes of ore and disposing of the tailings in the nearest creek. It is possible to determine the tonnage of tailings from gold-quartz mines that have been disposed of into the river systems. Descriptions of the processing systems included in many historical accounts, such as the local histories described above, can give an indication of the locations of sites of the processing plants, and potential chemical hazards left behind at these sites.

QUARRIES

Early settlers soon found useful supplies of local stones for building, and some of those buildings still stand. It can now be difficult to relate these buildings back to particular quarries. Historical and geological detective work has helped to provide these links for some buildings. Bruce Hayward (Geological Society of NZ Guidebook 8) gives a New Zealand-wide sample, Ian Church gives a local (Port Chalmers) view, and Ron Tyrrell describes some important east Otago quarries and related industries. One might also mention Patrick Marshall's *Building-Stones of New Zealand* (1929) which contains many useful southern New Zealand references.

EARLY LANDSCAPES AND EVENTS

Mining is not the only geological subject on which the Hocken contains information. New Zealand is a dynamic geological environment, and the landscape is constantly changing, although generally slowly to the human eye. However, with over 150 years of written records, there is scope for quantitative observations of some landscape changes. The early European settlers rapidly transformed the landscape of their new homeland, particularly with respect to vegetation. Earlier Polynesian settlers had also had an impact on the vegetation, although somewhat less dramatically. As a result of this activity, rates of sedimentation of rivers and estuaries rose and the coastal landscape began to change. Some of this is mentioned casually by observant settlers and professionals.

Paintings and, later, photographs, are all the record we have of such events, and many of these are in the Hocken collection. Separating long-term (geological) changes from short-term (human-induced) changes is extremely difficult. Changes in the position of the coastline are also of interest, particularly to those who live close to the shore. For example, the North Otago coastline is retreating, as shown up by direct observations, historical surveying records and photographs — not least the dramatic effects of erosion on the grounds of Waitaki Boys' High School. Warrington spit is advancing, as determined from similar records.

Another change of considerable interest to our future environment is the fate of our glaciers. Earth scientists are studying the advance and retreat of glaciers to document the long-term change during what is perceived to be a period of global warming. The period of detailed observations has been short, but historical accounts and records are potentially useful in extending that record. Again, the best records are found in old paintings and photographs. NZ Alpine Club archives provide an invaluable record of the nature of the mountains in past times, and photographs

by other climbers, such as in the Bowden collection, give breadth to the coverage. This resource has not yet been fully examined, and would make an excellent research study.

Southern New Zealand experiences major earthquakes relatively rarely, but many potentially active faults exist. We were reminded of this with a significant shake in Dunedin in 1974. Geologists, engineers, and the insurance industry, are very keen to know how often such earthquakes happen. Geological investigations tell us that very large earthquakes have happened in the South Island on the 250- to 500-year time scale. Were there more, smaller, ones in the early history of the colonies? Wellington and Marlborough had some very significant earthquakes in this period. Historical accounts are very useful (see G. Downes & R. Grapes on the 1855 Wairarapa earthquake), but some settlers tried to hush such things up in case new emigrants were discouraged.

Likewise, tsunamis ('tidal waves') are a natural hazard and there is geological evidence for some dramatic ones on our shores. Human descriptions of tsunamis are restricted to newspaper accounts: for example, large tsunami waves from South American earthquakes affected Timaru and Oamaru in 1868 and 1877. How vulnerable are we to these hazards from local or off-shore earthquakes? The human record is too sparse to tell.

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This *Bulletin* compiled by Dave Craw (OU Geology Department) and Karen Craw (Hocken Map curator). Thanks are due to the late David Macdonald, Reference Librarian at the Hocken, who was known widely through the New Zealand minerals industry as a helpful and resourceful extractor of geological and mining information from the Hocken Collection.

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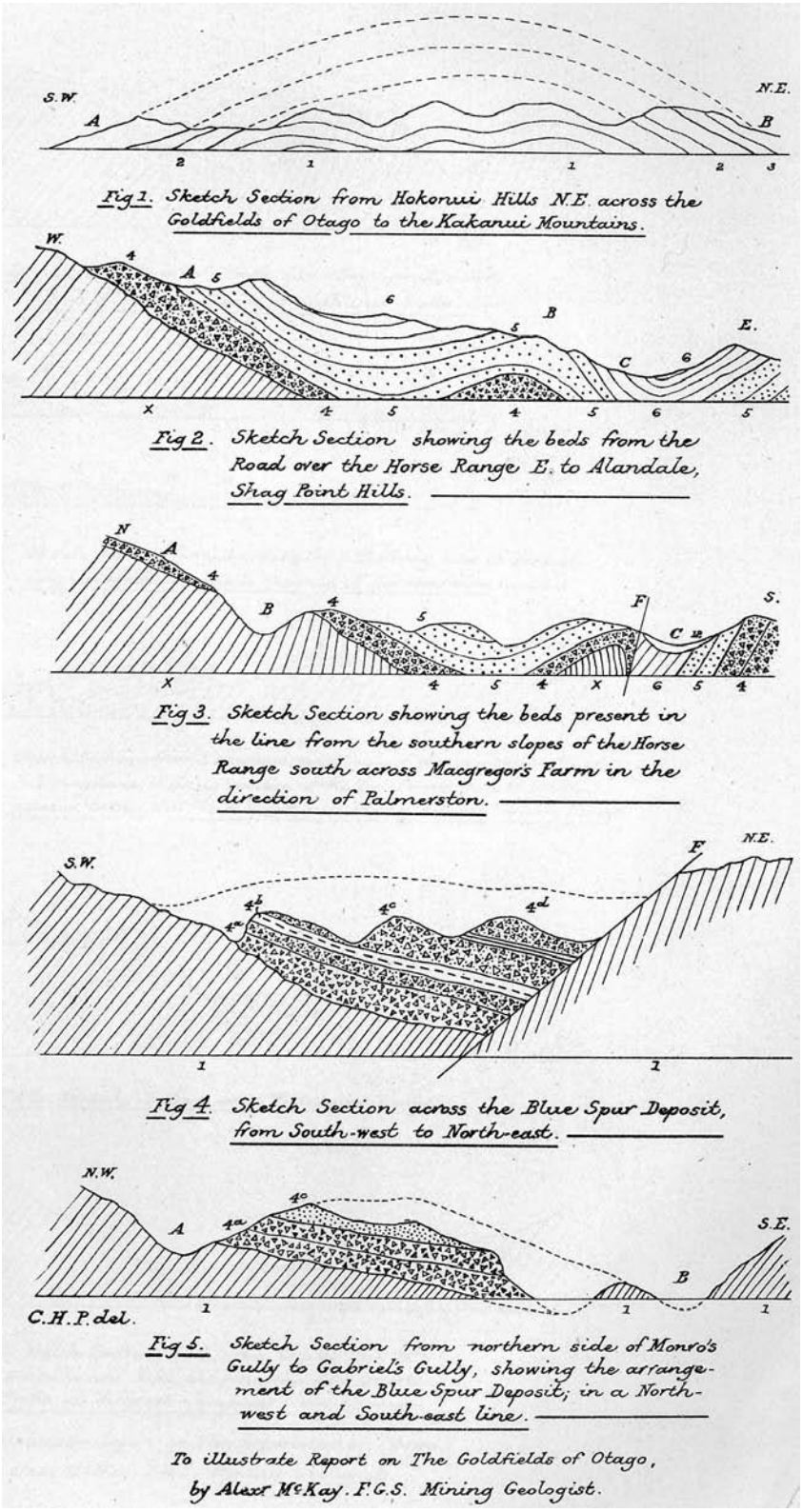

Illustration reproduced from 'Report on the Older Auriferous Drifts of Central Otago' by Alexander McKay (2nd ed), 1897