

consideration of the respective Governments of Australia :—

- (a.) A uniform system of delimiting the different Artesian Water basins of Australia ;
- (b.) A hydrographic survey, with the view of arriving, so far as is possible, at an estimate of the water annually absorbed by the respective basins ;
- (c.) Legislation to prevent an unnecessary multiplication of bores, with the object of effectively conserving for all time the underground water resources of all Australian artesian basins ;
- (d.) Uniform legislation to ensure the effective control by the States of all existing and future bores within all artesian basins ;
- (e.) No new irrigation enterprises, which depend for their supplies of water upon artesian wells, being inaugurated until certain investigations recommended by the Conference have been carried out ;
- (f.) A uniform system of casing all artesian wells ;
- (g.) Investigations into the composition and structure of the metals of which bore casings are made, and into the efficiency of coatings or linings in such casings in so far as their powers of resisting corrosion are concerned ;
- (h.) The formation of a permanent Interstate Board for the discussion, correlation and recording data in regard to the artesian basins of the Commonwealth ; and
- (i.) The cost of any special investigations recommended by the present Conference to be borne in equitable proportions by the respective States.

It may perhaps be of interest to note that this Conference virtually forms a part of that great modern scientific movement of the Conservation of Natural Resources which is slowly but surely making itself felt throughout the whole civilised world.

Rottnest Island Bore.

A deep bore in search for artesian water was put down to a depth of over 2,500 feet.

Owing to difficulties in connection with the boring plant operations were stopped, without the (Jurassic) water-bearing sandstones, which are believed to be beneath Perth, having been reached.

The strata pierced in this bore hole were of considerable geological interest and the bore cores were submitted to Mr. Etheridge, of the Australian Museum, Sydney, who reported :—

“The core pieces can be at once divided into two series, Nos. 20ft.-209ft. and 1285ft.-2185ft.

Nos. 20ft.-209ft. are clearly of very recent geological date, probably upraised Post Tertiary marine beds, a chalk-like calcareous deposit. Numbers 1285ft.-2185ft. can only be one of two things, viz., Tertiary or Late Mesozoic. Many of the core portions, comprised within these numbers (except 2021ft.-31ft.) shown on the fractured surfaces broken up shells quite impossible of determination or of significance. On numbers 1480ft.-1541ft. charred vegetable tissue is visible. The small objects on numbers 1575ft.-95ft. and numbers 1595ft.-2021ft. puzzle me very much. If they be not fragments of a Crustacean integument, I do not know what they are. Numbers 1595ft.-2021ft. are certainly portions of one of the higher Crustacea. Numbers 1595ft.-2031ft. I believe to be one of the valves of an Entomostracan. Numbers 1595ft.-2021ft. is, I think, a very elegant and small example of a *Pinna*. Of the several little objects under No. 1595ft.-2021ft. I know not what to make, unless they are small bivalve shells,

and yet they seem too delicate and thin for this to be the case. I at first took them to be an *Estheria*, but have failed to detect the characteristic sculpture of that genus.

The objects, so far as they go, are all new to me. The character of the matrix is similar to that of some of our Lower Cretaceous beds, but of course, matrix alone is not of much value. I think it will be quite safe to assume the age of the deposit to be not older than that mentioned.”

AGRICULTURE.

Limestone Deposits of the South-West.

An examination of the principal limestone deposits in portion of the South-West District was made in the interests of Agriculture by Mr. E. C. Saint-Smith.

This officer submitted the following preliminary report. The localities visited were—Pinjarra, Capel, Busselton, and Waroona.

At *Pinjarra* there is an apparently extensive deposit of limestone on the property of Mr. Paterson. This deposit has already been reported upon and sampled to a limited extent by Messrs. Mann, Government Analyst, and H. P. Woodward, Assistant Government Geologist. There is nothing to add to their reports other than that before any action in the direction of purchase be taken the deposit should be systematically bored and analysed. By far the greater portion of the deposit is soil-covered, and the exact delimitation of the area over which the limestone extends can only be determined by boring operations. The deposit is situated right on the railway line, about $1\frac{1}{2}$ miles north of Pinjarra railway station.

A fairly extensive deposit of limestone also occurs in the district between “Ravenswood” and Mandurah ; the material here is also for the most part sand and soil covered.

Capel.—On what is known locally as the Tuart Reserve, about three miles West of Capel, there is a very extensive deposit of Coastal Limestone which outcrops to a few inches above the surface in odd places. This deposit is largely composed of shells. Where any considerable outcrop was visible the loose blocks were collected and burnt for lime with, it is stated, good results. As this deposit could be worked without the initial cost of purchase, being on a Government Reserve, and also appears to be of fairly pure composition in parts, it should, in my opinion, be bored and accurately mapped.

Busselton.—Around Busselton are several deposits of coastal limestone which find their greatest development in the Yallingup district and Southwards thereof, but in view of the more conveniently situated deposits at Capel, Pinjarra, etc., I am not of opinion that much attention need be paid to these Southerly situated occurrences for the present, seeing that similar material more centrally situated is to be found all along the coastline between Busselton and Perth.

Lake Clifton, Waroona.—Lake Clifton is situated about 14 miles West of Waroona, and about three miles from the ocean. It is approximately 10 miles in length and half a mile in average width.

At the time of my examination in December, the water was only slightly brackish, but I am informed that by the end of summer it is noticeably more saline though not nearly so salt as the ocean water. In winter the water is practically fresh.

The lime occurs in the form of a very loose white material forming the bed and shores of the lake. Trials of the depth of the deposit were made by me with a pole across the centre of the lake at frequent intervals, from which it is certain that a minimum average depth of 13ft. 6in. of the material

is present. The lime is for the most part quite impalpable and has been produced by an accumulation of tiny gasteroped shells, exfoliated shells, shell fragments, and chemically precipitated lime, the last mentioned substance forming apparently the bulk of the deposit. Associated with this material are numerous diatoms.

Partly surrounding the lake, more especially along its Western side are ridges of Coastal Limestone, the material from which finds its way into the lake during the heavy winter rains; as the summer approaches the lake shrinks considerably in volume, with the result that the water becomes supersaturated with lime and chemical deposition takes place.

Judging from a cursory examination of the shores of the lake, I have little doubt but that an extension of the deposit will be found to occur to the West of the lake on the Government reserve.

Where resistance to the further passage of the pole through the lime was met, an examination of the bottom surface of the pole indicated the existence of a thin deposit of guano beneath the loose lime.

Mr. Claude Newnham of the Boulder Farm, Waroona, has a lease (No. 411/41A) of about 700 acres of the central portion of the lake bed, but the deposit certainly extends far beyond his lease boundaries. The existence of the lime here had apparently not been detected previously to Mr. Newnham's discovery, and some credit is due to that gentleman for the persistence with which he sought for suitable lime deposits in his district for agricultural purposes; the actual fact that the water-covered bed of the lake was one immense deposit of lime might easily have escaped the notice of a geologist.

A strong smell somewhat resembling that of phosphoretted hydrogen is given off when the lime is disturbed below the surface.

Especially along the Eastern shore small circular patches of fairly compact lime are forming as the result of the growth of colonies of small organisms, but the deposit appears to be entirely superficial.

Owing to the receding of the water of the lake in the summer months, the lime forming edges of the lake becomes dried and is inclined to form small soft lumps, but this feature disappears with the return of the winter months.

A carefully averaged sample of the centre of the lake was secured by me from a depth of one foot below the surface of the deposit; this sample has been reported upon by Mr. Simpson, Chemist and Assayer, in the following terms:—

The material submitted was a fresh marl composed mainly of carbonate of lime precipitated partly by organic and partly by inorganic chemical agencies in a very finely divided state. An analysis on a sample dried at 100°C showed the presence of:—

	Per cent.
Lime, CaO	48.88
Carbon dioxide, CO ₂	37.07
Organic matter (including Nitrogen, 8.93 0.32 per cent.)	
Silica, SiO ₂	1.61
Magnesia, MgO	1.01
Iron oxide and Alumina24
Sulphur trioxide, SO ₃39
Phosphoric oxide, P ₂ O ₅09
Salt, NaCl	2.02
	<hr/> 100.24

Approximately 47 per cent of the lime is present as carbonate (84 % CaCO₃), the small remainder being present in combination as sulphate and as a salt of one or more organic acids.

The variety of carbonate of lime in the sample is not calcite, which is that found in almost all limestones, but aragonite. This is of importance in connection with the utilisation of this material as a fertiliser since aragonite is known to be more susceptible to the attack of rain water and ground water than calcite. The minute size of the particles of aragonite will ensure a maximum activity in the soil.

A considerable percentage of nitrogenous organic matter is present, the value of which as a fertilising agent must not be overlooked.

The silica shown by analysis exists almost entirely in the form of siliceous skeletons of diatoms and fresh water sponges.

The proportion of salt in the marl will naturally vary with the season, being dependent entirely on the quantity and degree of concentration of the water associated with the deposit. It will be least during the rainy season, and highest at the end of summer.

A considerable deposit of somewhat similar material occurs in Martin Tank, Salt Lake, and a group of small salt lakes near by, but owing to the heavy amount of saline matter present I do not consider that much attention need be directed to these occurrences in view of the more accessible deposit in Lake Clifton itself. In view of the possible deterioration of the lime by the deposition of salt at the end of the summer, I would suggest that the material be raised during the early part of the season in order that the extra supply of water may be present in the lake; at this portion of the year the salt present would be in solution and would therefore be practically absent from the lime itself.

At the present time this deposit is, of course, too far removed from a railway for cheap transport, but in the event of the construction of the suggested Pinjarrah to Brunswick Junction loop line it would only be about 1½ miles from the latter, to which it could be easily connected by a spur line.

The working of the deposit presents no difficulties whatever as the material could be cheaply taken out either by a dredge or by means of a sand pump or other similar appliance; staging would need to be erected on which the material could be dried before being removed.

Taking into consideration the fact that there are many millions of tons of lime cheaply available and in an excellent physical condition for direct application, there is no doubt but that in Lake Clifton the State has a remarkably fine asset which will very materially assist in the utilisation of the extensive swamp and other lands in the South-West and elsewhere. In my opinion the material forming the lake bed is all of a very similar composition to that of the sample referred to previously, but careful systematic sampling of the deposit is recommended before any serious attempt is made to exploit the deposit.

MINING, ETC.

The Country North of Lake Way.

The principal results of Mr. Talbot's field work in the country to the North of Lake Way are set out in the preliminary report which he has prepared and which is given *in extenso*:—

The following is a short description of the country examined during the past season.

In addition to the Wiluna greenstone area,* the boundaries of which were mapped to its southern limits and northwards as far as the Gascoyne River, three greenstone areas have been placed upon the maps with some degree of accuracy. The most westerly of these † lies about 20 miles to the S.-W. of Wiluna. Its southern point reaches the Wiluna-Nannine road at the Bore well, at its northern end it disappears under the sedimentary series which extends westwards from the Finlayson Range and, in all probability, it is only a branch

* Lands Department Lithos. 53/300, 60/300 and 71/300.

† Lands Department Litho. 60/300.