

low water, extend for 350 yards along the sea-front. The narrow strip of beach seen at low water is cumbered with large blocks of sandstone detached from the cliffs. For a mile and a half to the eastward there is a low coast, fronted by a blacksand beach about 70 yards wide when the tide is out. Although containing much material of good quality, the ironsand-deposits at and immediately above high-water mark will be difficult and expensive to work, owing to the presence of much timber carried down by the Patea River. The dunes that extend inland, in places reaching half a mile from the shore, contain much ironsand, which in general appears to be of better quality than that of the dunes on the western side of the Patea River.

Samples of the ironsand (sixteen in all) were taken at various points that seemed representative of different stages of concentration. The areas of the beaches and sandhills mentioned above form the basis of the calculations made in order to obtain a rough approximation of the iron oxide available for smelting purposes. Deposits that seemed to contain more than 25 per cent. by volume of quartz, sand, or shell-fragments have not been taken into account. There is, in fact, an immense amount of low-grade material which will be available when a sufficiently cheap method of concentration has been evolved. As regards the sea-beaches, the amount present is liable to addition or subtraction, according to the action of the sea, and doubtless if the present deposits on them were removed they would sooner or later be renewed.

The following figures, which are on a conservative basis, give the results of the measurement made:—

	Tons.
Dunes between Patea River and Kakaramea	2,486,000
Beach for three-quarters of a mile west of breakwater (including area between high-water mark and cliff)	265,000
Beach for two miles east of Patea River mouth	92,000
Dunes between Taranaki Road and Patea River	1,276,000
Dunes for one mile east of Patea River	1,255,000
Total	5,374,000

The control of the sands examined is vested in the Patea Harbour Board, which has given an option over them for a period of six months, dating from May, 1915.

The surrounding district, unfortunately, does not contain the limestone and coal required for smelting operations. Limestone can be obtained by sea from several points, the nearest of which are the Golden Bay district, Nelson, and the Mokau River. In the latter case there is some uncertainty about the quality. Good limestone occurs at Te Kuiti and other places in the interior of the North Island, but the cost of railage at ordinary rates will be very heavy. Suitable coal or coke for smelting can be procured from the west coast of the South Island.

It is claimed that by means of magnetic separation the somewhat objectionable titanium oxide, generally present to the extent of from 5 to 10 per cent. in the ironsand, can be largely eliminated. The removal of this constituent, however, in the manner suggested is probably accompanied by an appreciable loss of iron.^a

The degree of success attending the operations of the experimental works lately erected at Moturoa, near New Plymouth, for the treatment of ironsand by a patented process will probably be a determining factor in the formation of a company to operate on the Patea sands.

Owing to analyses of the samples taken by the writer not yet being available, the following are quoted from Dominion Laboratory reports:—

	1.	2.
*Ferrous oxide (FeO)	27.60	40.68
*Ferric oxide (Fe ₂ O ₃)	51.32	36.05
Manganous oxide (MnO)	0.48	0.35
Titanium dioxide (TiO ₂)	9.60	9.20
Alumina (Al ₂ O ₃)	1.04	4.00
Lime (CaO)	1.25	1.80
Magnesia (MgO)	2.60	2.77
Silica (SiO ₂)	5.30	3.90
†Phosphoric anhydride (P ₂ O ₅)	0.25	0.09
‡Sulphuric anhydride (SO ₃)	0.04	0.01
Vanadium pentoxide (V ₂ O ₅)	0.32	n.d.
Water lost at 100° C.	0.20	0.25
	100.00	99.10
*Equivalent to metallic iron (per cent.)	57.39	56.87
† „ phosphorus	0.11	0.39
‡ „ sulphur	0.016	0.004

(1.) Ironsand from Patea, forwarded by A. D. Bayfield. Dom. Lab. Rep. No. 47, 1914, p. 26.

(2.) Ironsand from New Plymouth beach, forwarded by E. M. Smith. Dom. Lab. Rep. No. 36, 1903, p. 10.

The following analyses represent ironsand from Manutahi, near Patea, No. 1 being from beach, and No. 2 from drive, forwarded by A. D. Bayfield. (See Dom. Lab. Rep. No. 47, 1914, p. 26.)

	1.	2.
*Metallic iron (per cent.)	28.33	20.50
Titanium dioxide (TiO ₂)	4.20	2.40
Vanadium pentoxide (V ₂ O ₅)	0.13	0.34
*Equivalent to magnetic iron oxide (Fe ₃ O ₄)	39.11	28.29

^a See, in this connection, analyses of ironsand and of tailing after treatment in magnetic separator quoted in Dom. Lab. Rep. No. 43, 1910, p. 13.