FIGURE 17. MAP OF BARRIER ENDS,

a) NORTHWESTERN END. S1, S2 = ERODED SHORELINES; S3 = KAHAROA SHORELINE; K" = KAHAROA TEPHRA IN WETLAND DEPOSITS; K = KAHAROA TEPHRA IN DUNE DEPRESSION; A-B = PROFILE SHOWN IN FIG. 10.

b) SOUTHEASTERN END. LP = LOCATIONS OF LOISELS PUMICE; L-K = PROFILE SHOWN IN FIG.10; NZ NUMBERS REFER TO RADIOCARBON-DATED SAMPLE LOCATIONS (TABLE 1). APPARENT LOW BROAD RIDGES SHOWN AS "-?-?-".

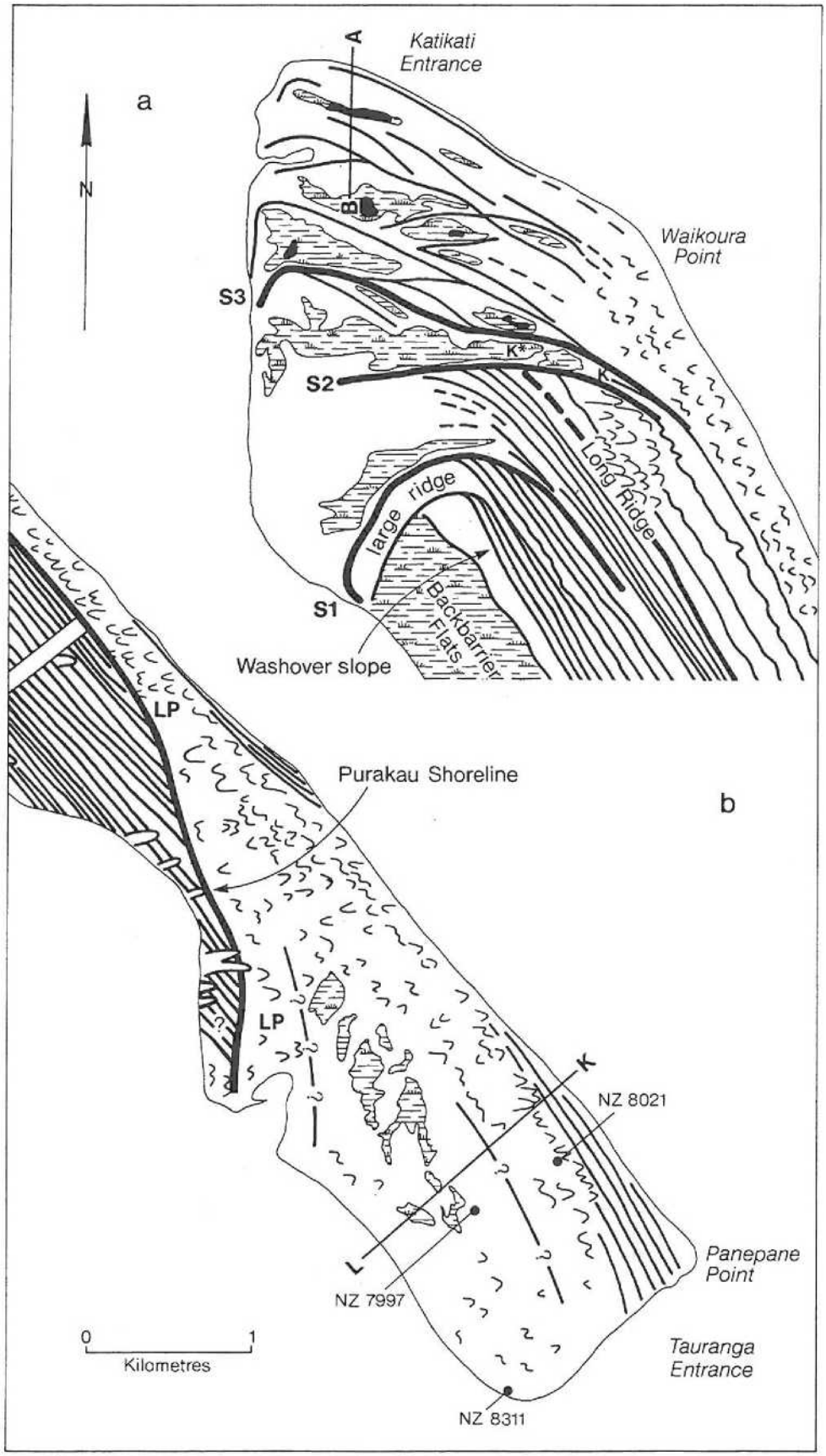


FIGURE 18. VERTICAL AERIAL PHOTOGRAPH OF RECURVED RIDGES AT THE NORTHWESTERN END OF THE ISLAND. PHOTOGRAPH COURTESY OF AIR MAPS (NZ) LTD.

Parallel relict foredunes are present near Panepane Point and in a small area about 4 km northwest of Panepane Point. There appear, however, to be low broad ridges (Fig. 17), separating depressions and wetlands. From the relict foredunes and the low, broad ridges we infer the growth of the Southeastern End of the island from the Purakau Shoreline to the present shoreline (Fig. 20).

The ages of shells from the coarse sand at c. 1.0m below present high water level are 701 ± 31 yr BP (NZ8021) and 2114 ± 46 yr BP (NZ7997) (Table 1). The older shells are from near the middle of the Southeastern End, the younger from near the ocean coast (Fig. 19b). The age of midden shells from the boat ramp corner of the Southeastern End is 751 ± 37 yr BP.

2.2.5 Contemporary foredune and beach

There is a regular foredune along much of the ocean shoreline. Its vegetation is described by Beadel (1989b). The foredune height above the seaward limit of

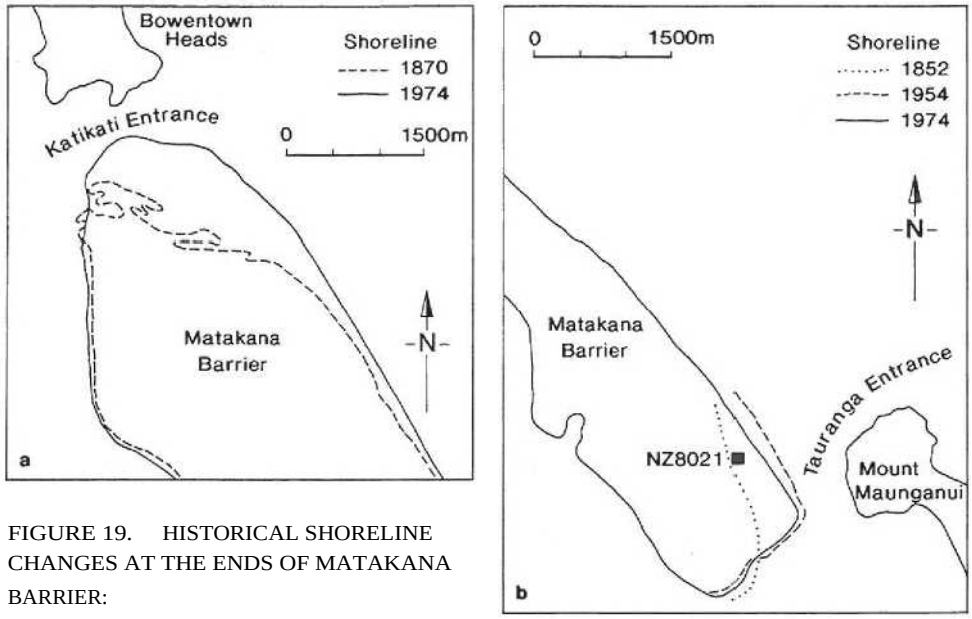


FIGURE 19. HISTORICAL SHORELINE CHANGES AT THE ENDS OF MATAKANA BARRIER:

a) THE NORTHWESTERN END OPPOSITE BOWENTOWN HEADS. DATA FOR 1870 SHORELINE FROM CADASTRAL MAP (SO 9385) AND 19-4 SHORELINE FROM TOPOGRAPHIC MAP NZMS 260 U13 1ST ED., 1979).

b) THE SOUTHEASTERN END OPPOSITE MT. MAUNGANUI. DATA FOR THE 1852, 1954 AND 1972 SHORELINES FROM HEALY (197.').

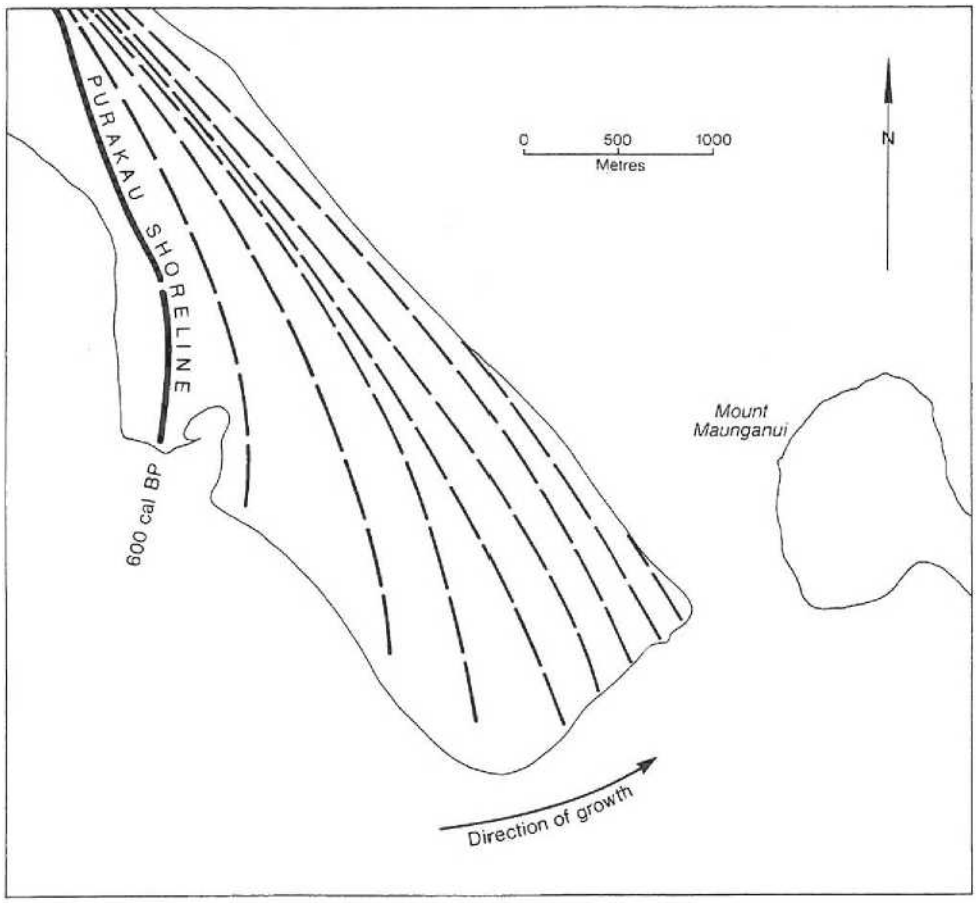


FIGURE 20. INFERRED GROWTH OF THE SOUTHEASTERN END.

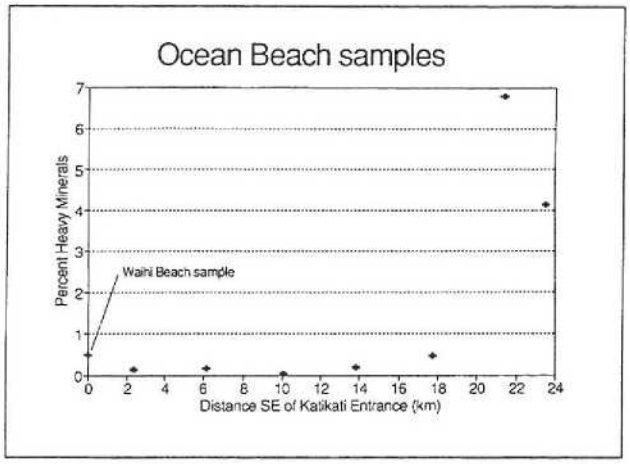


FIGURE 21. HEAVY MINERAL CONTENT OF OCEAN BEACH SAND SAMPLED AT THE MID-TIDE LEVEL IN 1993- WAIHI BEACH SAMPLE, TAKEN 8km NORTHWEST OF KATIKATI ENTRANCE SHOWN FOR COMPARISON,

vegetation varies from *c*. 1.7 m near the central part of the barrier to *c*. 4 m near the harbour entrances, and it is generally 5 m to 10 m wide. It is absent from c. 1.6 km to 3.7 km northwest of Panepane Point (Fig. 17), where the shoreline has eroded by more than 100 m since reaching its maximum seaward position in 1954 (Healy 1977). Shoreline erosion at the Katikati Entrance has removed the foredune and destroyed an area of Pinus radiata forest. Two or three additional ridges are present in a narrow strip behind much of the present ocean foredune. The additional ridges are lower and more closely spaced than ridges on the relict foredune plain, and are about the same height as the foredune. The small size of the foredune, where present, suggests that it is young.

Beach morphology around the barrier varies according to exposure. The ocean beach is wider and extends higher above mean sea level than beaches at the entrances and adjacent to the harbour. Dark seams of heavy minerals concentrated by storm waves sometimes occur on the upper part of the beach and are generally thicker, richer and more extensive than wind-blown heavy mineral seams in the foredune. When sampled in 1993, the heavy mineral content of mid-tide level sand was <1% in all samples except those near the Tauranga Entrance, where the sand contained up to 7% heavy minerals (Fig. 21).

Beach sand from near mid-tide level was collected twice, during January 1993 and August 1994, and foredune sand once during August 1994, along the entire ocean beach. Both sets of samples from Waikoura Point to a point c. 7 km from the Tauranga Entrance show uniform grain size (2.0-2.7 phi, 0.25-0.15 mm) and sorting almost identical to sand forming the relict foredunes on the main part of the barrier. Within 7 km of the Tauranga Entrance the beach sand coarsens markedly to c, 1.5 phi (0.35 mm) (Fig. 22a) and is more poorly sorted; foredune sand coarsens but its sorting shows little change (Fig. 22b).

2.2.6 Relict transgressive dunes

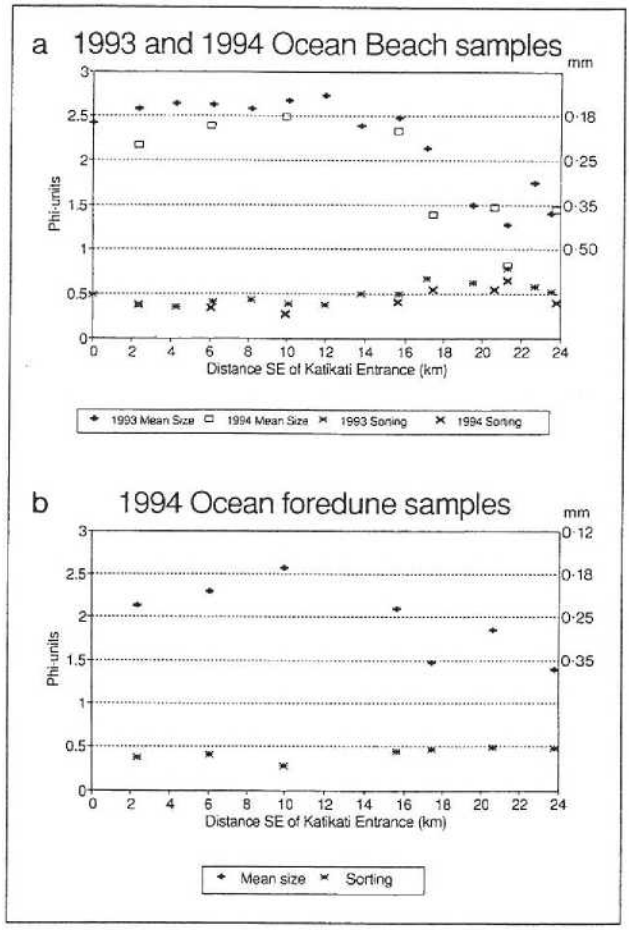
Relict transgressive dunes are common on Matakana Barrier. Blowout and parabolic dunes develop in response to disturbance of dune vegetation which exposes unconsolidated sand to wind erosion. Disturbance can include erosion by waves, increased wind, fire, tephra deposition, and damage by animals, including humans.

Once the vegetation is destabilised, a blowout dune may form as a lobe of sand aligned downwind- If the dune migrates further downwind it may evolve into a

FIGURE 22. MEAN SIZE AND SORTING OF BEACH AND FOREDUNE SAND. MEAN SIZE SHOWN IN PHI UNITS AND MILLIMETRES. SORTING SHOWN IN PHI UNITS ONLY. FOR LOCATION OF SAMPLING POINTS SEE APPENDIX 2.

a) OCEAN BEACH, JANUARY 1993 AND AUGUST 1994.

b) FOREDUNE SAND, AUGUST 1994.



parabolic dune with an advancing nose, a central deflation basin and two trailing arms aligned upwind. Sand is supplied to the nose by winds which are funnelled between the trailing arms.

Large parabolic dunes 2 km to 5 km northwest of the entrance to Blue Gum Bay (B, Fig. 23), and adjacent to Hunters Creek (E, Fig. 23), have mean directions of movement from 256° and 262° respectively. Blowouts and parabolic dunes are normally aligned with winds from a *geomorphically significant* wind resultant (Landsberg 1956). The geomorphically significant resultant for the harbour shore of Matakana Barrier (257°-259°) we calculate from winds at Waihi Beach (Harray 1977) and at Tauranga (Healy et al. 1977) using the method of Landsberg (1956) modified by Jennings (1957). The resultant agrees well with the alignment of the large parabolic dunes.

Not all dunes on the barrier, however, are aligned with the dominant wind directions; those which show no particular alignment are termed hummocky dunes.

The dunes on Matakana Barrier are described in three groups:

a) Blowout dunes and small parabolic dunes associated with relict foredunes;

b) Large parabolic dunes which have migrated across a number of relict foredunes;

c) Parabolic dunes in a narrow strip near the foredune along the ocean coast. This strip widens to include the southeastern end of the barrier, where hummocky dunes are present.

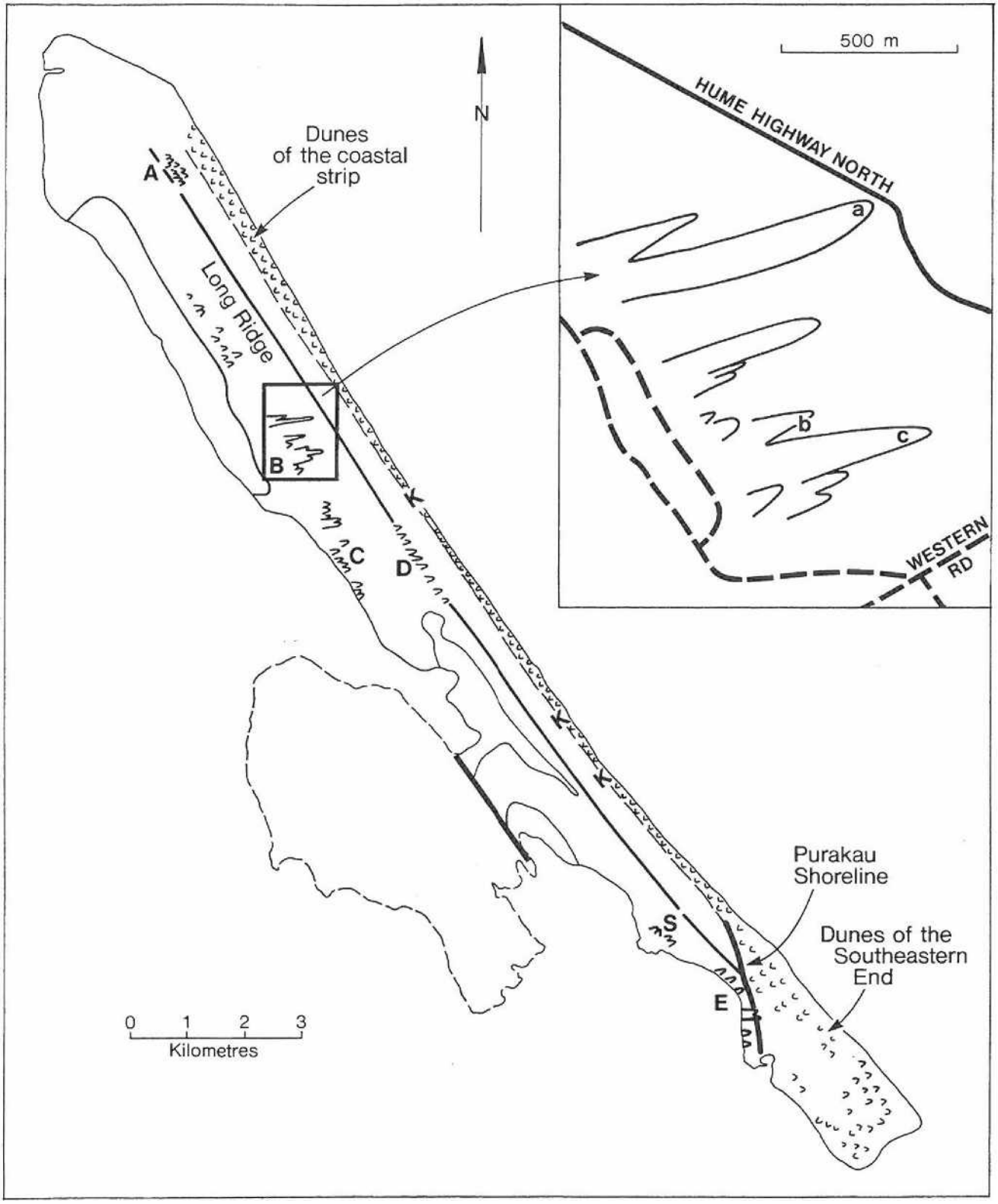


FIGURE 23. MATAKANA BARRIER SHOWING LOCATION OF LARGER TRANSGRESSIVE DUNES. LARGE PARABOLICS LABELLED A-E; S = STENT TEPHRA SITE NEAR THE MILL; K = LOCATIONS OF KAHAROA TEPHRA BENEATH PARABOLIC DUNES OF THE COASTAL STRIP.

INSET: ENLARGEMENT OF LARGE PARABOLIC DUNES AT B. LOCATIONS MENTIONED IN THE TEXT LABELLED a-c.