

## **HORIZONS ONE PLAN SUBMISSION**

1. My full name is **Michael John Shepherd**. I am a geomorphologist.

### **2. My qualifications and experience include:**

B.A. Honours degree, 1965, and doctorate, 1970, in coastal geomorphology from the University of Sydney.

Lecturer and senior lecturer in geomorphology at Massey University from 1973 until I retired in 2006. Honorary teaching fellow at the University of Western Australia 1990. Honorary Research Associate, Massey University 2006-present. Coastal Systems Ltd. associate 2006-present.

Honorary Life Member of the New Zealand Geographical Society. Member of the New Zealand Geological Society.

I have published many papers in scientific journals, mainly dealing with coastal landforms in the Manawatu area but also other landforms such as Mt. Ruapehu glacial landforms. I have also co-authored chapters in several books such as 'Landforms of New Zealand' (chapter on Manawatu landforms) and 'The New Zealand Coast'.

### **4. Scope of evidence**

My statement is concerned with the identification of outstanding landscapes.

### **5. The definition of geomorphology**

Geomorphology may be defined as the scientific study of landforms, as component parts of landscapes, and the processes that shape them. It involves analysis of the interacting roles of geology, climate, and vegetation together with surface and near-surface processes such as weathering and erosion.

Although landforms are the prime component of landscapes, their significance is often overlooked by agencies such as the Department of Conservation that tend to focus upon

biological aspects when evaluating the natural attributes of an area. Perhaps it is for this reason that the Forest Parks are the only parts of the local ranges included as significant landscapes under Schedule F.

## **6. Introduction**

The proposed One Plan, particularly if recommended changes suggested by council officers are adopted, will provide a major advance. As a geomorphologist I am especially concerned with landscapes and, in particular, landforms. I was not happy with the original wording of the proposed One Plan that appeared to provide little if any protection to outstanding landscapes and landforms that were not included in Schedule F. The proposed changes to Objective 7-2a alleviate some of my concerns but, as noted in Ms Gordon's Planning Evidence and Recommendations Report, there is no specific policy to protect outstanding landscapes not included in Schedule F and 'this is a policy gap that needs to be addressed'. I fully endorse her recommendation (p70) that an additional policy (7-7d) be included to protect regionally outstanding landscapes not included in Schedule F. I suspect that there may be many landscapes, of various sizes, not included in Schedule F that could be considered outstanding. Examples of two such landscapes are included below.

## **7. The Puketoi Range**

This range lies within the Horizons region but because it is isolated from the main centres is little known. A recent resource consent application to develop a wind farm on this range was declined by the environmental commissioners partly on the grounds that the range is an outstanding natural feature, a point even stated by Genesis Energy's landscape architect in his written evidence.

The landforms of the range may be considered at three scales. At the largest scale, the Puketoi Range is a textbook example of an asymmetrical landform termed a *cuesta*, that consists of a steep, *scarp slope* and a more gentle and extensive *dip slope*. To develop, it required the uplift and tilting of extensive and regionally coherent limestone beds that form a more resistant cap-rock above softer underlying material. The plate tectonic setting of the southern North Island ensures that rapid uplift by processes of folding and faulting is affecting the region. Because of its scale and distinctiveness, I consider the Puketoi Range to be the best example of a *cuesta* in the North Island, and possibly in New Zealand.

At the mid-scale, *karst* landforms dominate within the range at the ground level. Karst is a term that refers to the unusual landforms that develop upon limestone rocks owing to their solubility in rain and runoff water. They include caves and underground drainage, dry valleys (lacking streams), that dominate the dip slope, and circular enclosed depressions termed *dolines*. Also present are large elongate depressions termed *bogaz*, which to my knowledge have not previously been described in New Zealand.

Finally, distinctive smaller scale landforms caused by the dissolution of surface rock outcrops of limestone rock are prevalent throughout the range.

There can be no doubt that the Puketoi Range is a regionally outstanding landscape, possibly one of national significance, but it is not included in Schedule F.



**Fig. 1.** The Puketoi Range looking south, showing the steep scarp slope and gentle dip slope with dry valleys.



Fig.2. A Puketoi Range dry valley with dolines (circular depressions that drain underground).



**Figs. 3 and 4.** Elongate bogaz depressions (left). PT17 cave (right). Puketoi Range

## 8. The Manawatu dune field (sand country)

I have carried out research into the nature and evolution of the Manawatu dune field over the past 35 years, and published my findings in a number of scientific journals and chapters in books. The dune field is part of New Zealand's largest dune field, that stretches from Paekakariki almost to Wanganui but reaches its greatest extent in the Manawatu area. Although the dunes are coastal landforms that have migrated up to 18 km inland from the coastline, only the youngest dunes, in a strip immediately adjacent to the coastline, are included in Schedule F. The older inland dunes and sand plains are largely farmed but the landforms are very well-preserved, forming a highly distinctive landscape of dune hillocks and associated sand plains and lakes. This is a textbook example of a parabolic dune field with dunes that have migrated inland in at least three distinct phases during the past 6500 years. Although forming an outstanding landscape, and of considerable scientific value, as far as I am aware the dune field is offered little protection by the existing legislation. This has not been a problem in the past, except where the small coastal settlements are located; indeed, the dune landforms remain largely unmodified and are more visible, distinct and accessible under a pasture cover than they would have been when originally forested. However, modern large-scale dairy farming is likely to involve the removal of dunes in order to flatten the landscape to accommodate mobile irrigation systems. If such activities were to expand greatly the significant landscape values of the dune field would be greatly compromised.



**Fig. 5.** Dunes encroaching inland near Himatangi.



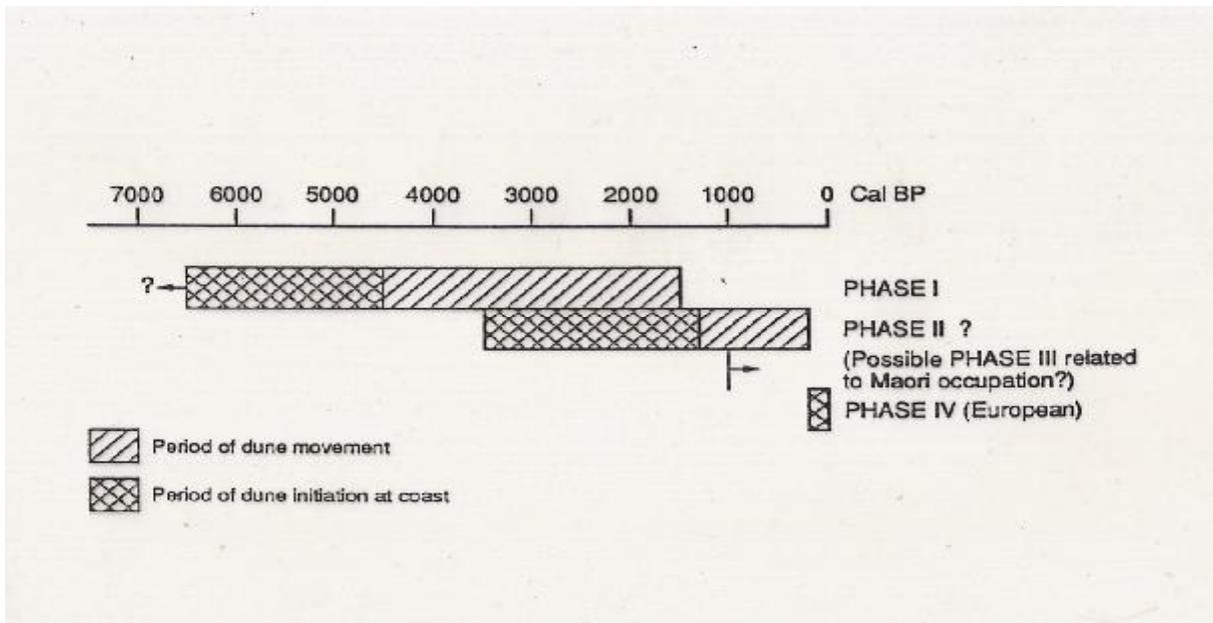
**Fig. 6.** Older dunes



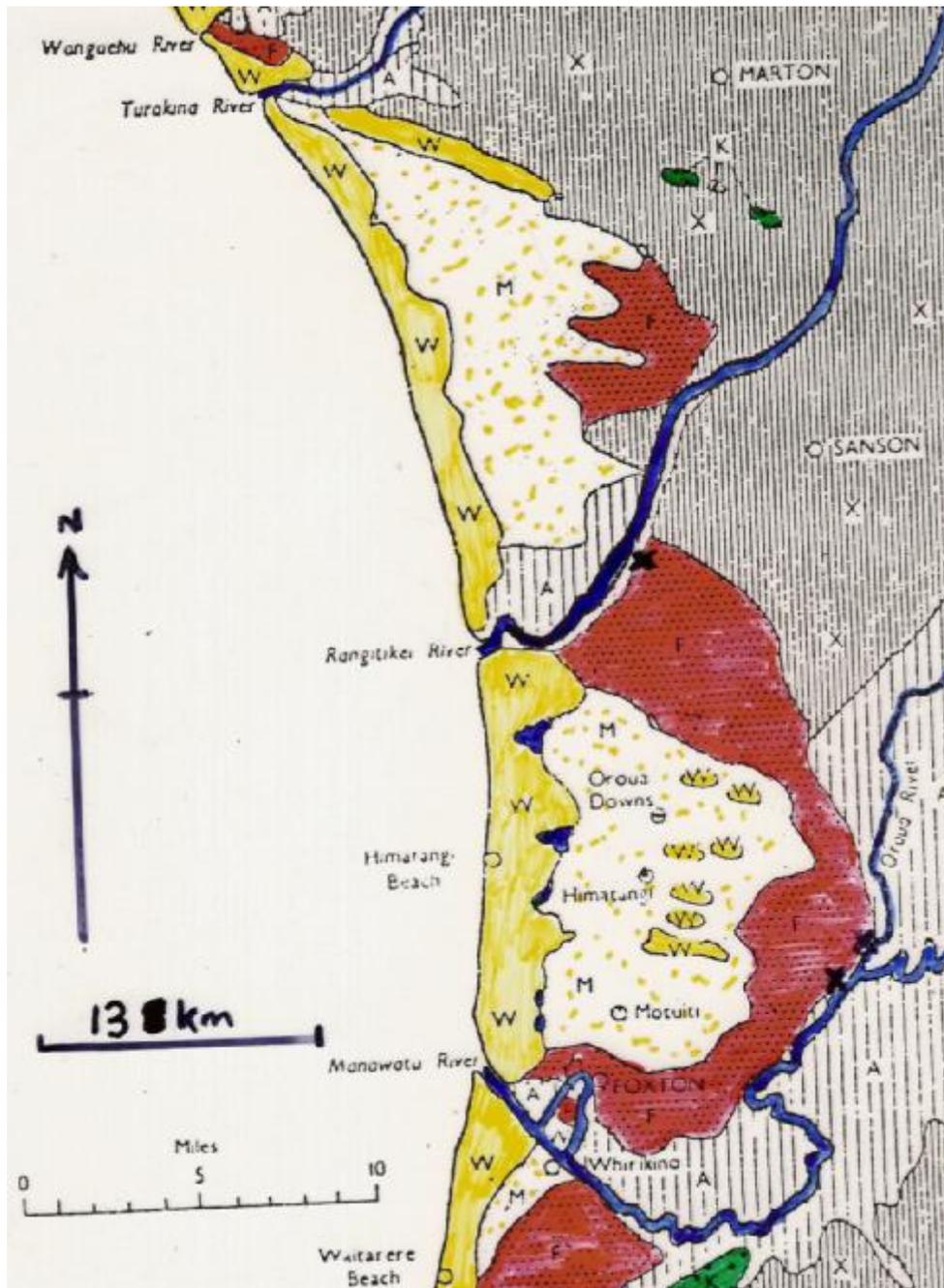
**Fig. 7.** Older dunes



**Fig. 8.** Ground view of older dunes



**Fig. 9.** The Manawatu dune field. Age of phases in years (Muckersie and Shepherd, 1995).

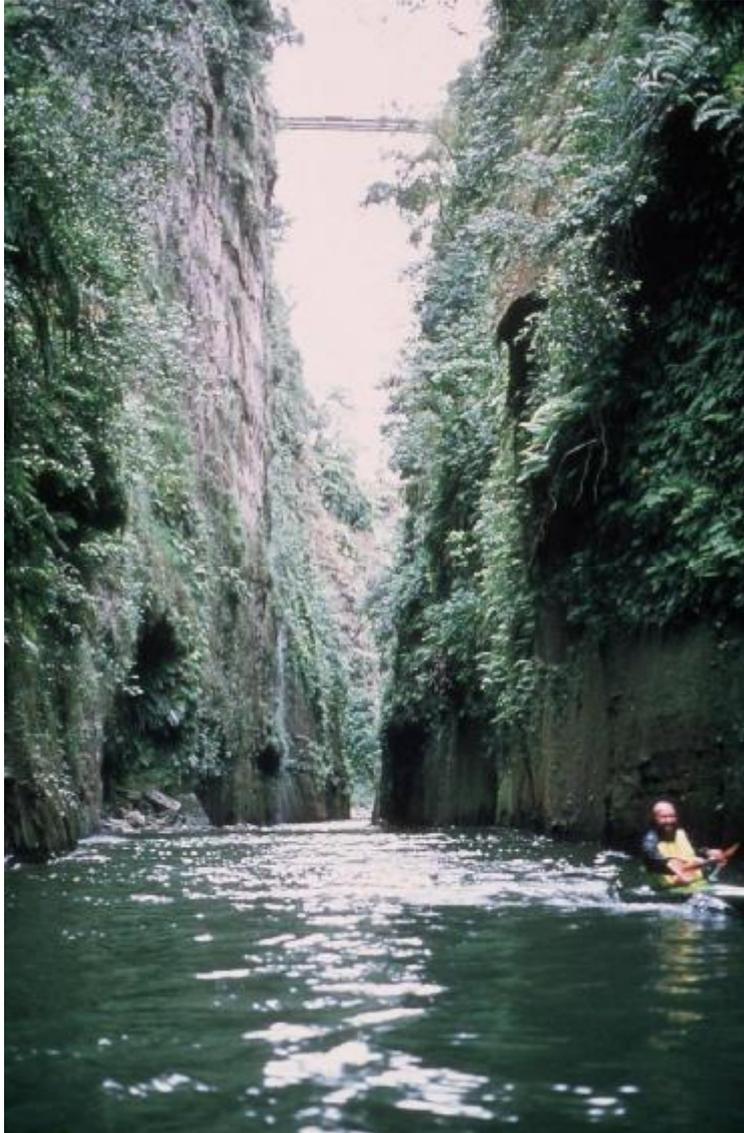


**Fig. 10.** Map showing location of Phase I (red), Phase 2 (stippled) and Phases 3 and 4 (solid yellow) (Cowie, 1963)

### 9. Smaller-scale landforms.

There are examples of medium to smaller-scale landforms in the area covered by Horizons that are highly significant, even at the global scale. These include the Manawatu Anticlines and features along the Wellington fault-line bordering the eastern flanks of the Tararua and Ruahine ranges. Others are of regional significance, such as the Moawhango Gorge (pictured)

and the limestone caves at Piripiri (Pohangina Valley). I am unsure whether the proposed policies can offer such outstanding natural features any protection.



**Fig. 11.** Canoeing in the Moawhango Gorge (tributary of the Rangitikei River near Taihape).



**Fig. 12.** Canoeing in the Moawhango Gorge.

### **10. Cumulative effect of Wind Farms**

Lastly I am pleased to see that there is finally some recognition of the cumulative effect of wind farms along the ranges between Wharite and Shannon. The ranges are our most distinct landforms and form the dominant skyline for much of the region. I was disappointed that the majestic sweep of the southern Ruahine range between the park boundary near Wharite and the Te Apiti Wind Farm, and parts of the Tararua Range, especially near the Turitea catchment, were not included with the areas classed as outstanding landscapes under Schedule F.

