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A Study of Alternative Sites for Equestrian/ Hobby Farm Development in the Karratha Area

B. Kok

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Disclaimer

The contents of this report were based on the best available information at the time of publication. It is based in part on various assumptions and predictions. Conditions may change over time and conclusions should be interpreted in the light of the latest information available.

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1. Introduction

This report has been prepared in response to a request from the Shire of Roebourne to assess the land use capabilities for equestrian/hobby farm development in the Karratha area.

The report comprises five parts; a brief review of the areas climate, discussion of the geological soil units and vegetation, water supply, alternative areas of development and recommendations.

2. Climate

Karratha has a hot arid sub—tropical climate. The average annual rainfall is 315 mm and the average evaporation rate is about 2500 mm (Bureau of Meteorology - Annual Evaporation Map). Most of the rain occurs in the summer months (January to March) and is of monsoonal origin. Winter rains also occur and usually peak in May/June. The rainfall is highly seasonal and extremely variable with most rains occurring as one or two falls during the summer cyclones.

3. Geological Units and Vegetation

The geology of the proposed development is essentially a thin quaternary cover mainly comprising alluvium and colluvium and coastal limestone dunes overlying steeply dipping Archaean volcanic rocks. For the purpose of this report the relevant geological units will be referred to as follows.

Qpc Brown cracking clay (gilgai) overlying bedrock (and/or calcrete)

Qps Red, brown, stony medium textured colluvial soils overlying calcrete or bedrock

Qa Alluvial deposits along creeklines.

Qp Calcareous coastal dunes (Barnett et al)

The two units (Qpc) and (Qps) are variates of the colluvial — alluvial silty sand which covers most of the coastal plain. The (Qpc) unit is mainly a silty clay which develops areas of “gilgai” (crabholes). These Qpc soils are self mulching, which under undisturbed conditions protects them from water loss and the concentration of salts at the surface. Self mulching is a property of soil containing high amounts of active clays. When the top layer of soil dries after being wetted it forms a very crumbly dusty surface. This forms a vapour barrier and prevents the evaporation of water from the ground. Thus the soil provides its own surface mulch which, as well as conserving water, prevents the upward movement of salts to the top layer. Disturbance of vegetation and compaction of the surface layer destroys the self—mulch and aids the mobilization of sub—soil salts to the surface (George, 1978).

Near the coast the Qpc unit is almost treeless with neverfail grass (*Eragrostis setifolia*) predominating on the plains while wandarrie grass (*Eriachne spp*) tends to favour the depressions and drainage lines. Pockets of snakewood (*Acacia xiphophylla*) and other *Acacia spp* occur further inland (Kok, 1983).

The (Qps) unit is mainly a clayey silt with variable proportions of sand and gravel. The unit is usually covered with soft spinifex (*Triodia pungens*), ribbon grass (*Chrysopogon fallax*), and an upper storey of Kanji (*Acacia pyritolia*).

Both (Qpc) and (Qps) units have a surface veneer of gravel pebbles where the clay silt and sand have been removed by sheet flooding and wind action.

The (Qa) units are narrow alluvial deposits confined to the creek systems. The units may be associated with coolibah, (*Eucalyptus coolabah*) and riverine

wattle (*Acacia coriacea*) and a variable layer of other *Acacia spp*. Buffel grass (*Cenchrus ciliaris*), ribbon grass (*Chrysopogon fallax*) and soft spinifex (*Triodia pungens*) make up the ground storey.

The (Qp) unit consists of calcareous coastal dunes. On the seaward slope of the

foredune the grass (*Whiteochloa airoides*) usually dominates and is gradually replaced by soft spinifex (*Triodia pungens*) landwards. The introduced species buffel grass (*Cenchrus ciliaris*) and kapok bush (*Aerva javanica*) may replace the native species in disturbed situations. Stunted specimens of riverine wattle (*Acacia coriacea*) may also be found on the coastal dunes. (Craig, 1983).

3.1 Soil Salinity

Extensive sampling (George et al, 1978) showed that there is a marked correlation between soil type and salinity. The clayey (Qpc) units are highly saline and salinities above 0.6% Cl are common. (Salinities above .09% to .12% C1⁻ are detrimental to normal garden plants).

The silty (Qps) soils which are more readily leached are thus non—saline at the surface but increase in salt content with depth and proximity to the ground water table.

The river alluvium was not sampled during the 1978 investigation as the units are not very large. However, a sample taken during July 1984, indicated a non—saline surface layer, increasing in salinity at a depth of 60 cm (Appendix Table 1).

3.2 Alkalinity

The soils in the Karratha area are alkaline to highly alkaline with pH's often in excess of 9.0 (George et al., 1978). Highly alkaline conditions can indicate conditions which predispose the soil to low permeability. Nutritional unavailability may also cause plant nutritional problems.

4. Water Supply

The limited information available about the ground water resources around Karratha suggests that the supplies will be adequate for limited livestock watering only. Any high water users would need to be mains supplied. However, good quality water from the Harding Dam will only be available intermittently, thus the poor quality Millstream supply will impose severe limitations on any horticultural activity in the area.

5. Alternative Areas for Development

5.1 Location A (See attached map)

This area was previously zoned as a potential golf course and is well situated in relation to existing water supplies.

The soils in this location are mainly clayey (Qpc) soils with small pockets of silty (Qps) soils in the southern corner, a narrow belt of alluvium (Qa) occurs along Gwen Creek.

The development of Location A for equestrian or agricultural purposes is rejected on the basis that the predominating saline clayey soil type (Qpc) is totally unsuitable for this type of development. The area should be retained as previously zoned (golf course) to protect the aesthetic features of the approach to Karratha.

5.2 Location B

This area is situated east of the sewerage treatment site and is an extension of the saline gilgai soil type found at location A.

The development and disturbance of these (Qpc) soils should be avoided. Disturbance of the vegetation and compaction of the surface layer destroys the self mulching property of these soils and aids the mobilization of subsoil salts to the surface.

5.3 Location C and D

These two locations are considered together as they occur on very shallow soils. Location C is situated on the pipeline road to the sewerage treatment plant. The soils in this location are very thin with rocky outcrops. Bard spinifex, (*Triodia spp*) tends to dominate on this soil type which has very limited potential for development.

Regal Well (location D) has already been partly developed for equestrian purposes. However, this site has very little potential for further development as the alluvial sediments which are dominated by buffel grass (*Cenchrus ciliaris*) are very narrow and limited in extent. The area east of Regal Well consists of shallow soils which support Spinifex (*Triodia spp*) and bloodwood (*Eucalyptus dichromophloia*).

Regal Well is very saline, containing 19,030 mg/L total soluble salts.

5.4 Location E

This area is situated between the water pipeline and the east—west range of hills, north east of Regal Well.

The area has not been stocked since the development of Karratha commenced in 1969 and is a good example of a degraded clayey (Qpc) soil. Development on these soils should be avoided (See Location B).

5.5 Location F

Lease No 35776 to the west of the present Golf course has been vested in the Shire for rental purposes since 1978. The lease is 25.6 ha in extent and is confined to the frontal dune formation (Qp).

The King Bay Horse and Pony Club have developed the lease in accordance with the original development plan supplied to the Shire. Horse stalls, lunging ring and an adjoining paddock have been constructed in an exposed position along the frontal dune.

In the paddock adjoining the main complex native grasses have been completely replaced by the introduced species kapok bush (*Verve javanica*), indicating a disturbed situation.

These frontal dunes are very fragile and prone to wind erosion if the vegetative cover is removed. Further development and/or use of these frontal dunes for recreational purposes should be discouraged.

5.6 Location G (Seven Mile Creek)

Location G is situated along Seven Mile Creek and is the area originally set aside as a possible equestrian/hobby farm area. A small area in the vicinity of 13 mile well has partly been developed for equestrian purposes.

The main soil unit in this location is an alluvium sediment (Qa) which varies in width along the creek system from 50 to 300 meters. The vegetation is dominated by buffel grass (*Cenchrus ciliaris*), ribbon grass (*Chrysopogon fallax*) and a top storey of coolibah, (*Eucalyptus Coolabah*) and riverine wattle (*Acacia coracle*).

The Buffel grass (*Cenchrus ciliaris*) on these alluvial sediments has the ability to respond rapidly after even very light showers of rain. However, a continuous grazing pattern can be very detrimental to the grass sward. Trees being ring barked and trees actually dying where horses have had continuous access to the creek system is also evident. Further development in the area will have to be strictly controlled to protect the aesthetic features of Seven Mile Creek.

A narrow strip of high ground in the present development, west and south of 13 Mile Well comprises both clayey (Qpc) and silty (Qps) soils. Horse stalls, feed sheds and unloading facilities have been constructed on the transition zone between these two units. A narrow belt of the silty (Qps) soils occurs on the western side of the Seven Mile Creek south of 13 Mile Well, this (Qps) less saline (<0.01% C1⁻) than the (Qpc) soil samples north of 13 miles bore (0.32% C1⁻). (See appendix 1).

The water quality at 13 Mile Well is marginal for horses. Tests carried out in 1978 indicated a total soluble salts level of 12,260 mg/l. In 1984 the level recorded was 2356 mg/l total soluble salts. This indicates that the total soluble salts level could possibly increase with increased use.

6. Recommendations

The following recommendations are made:

- A. Equestrian/hobby farm development should be restricted to alluvial sediments and silty (Qps) soils south of 13 Mile Well on Seven Mile creek.
- B. Drilling to test soil depths and soil and groundwater salt levels should be conducted before a firm decision to develop this site is made.
- C. Mines Department to ascertain suitability of and safe drawing capacity of underwater supplies along Seven Mile Creek.
- D. A detailed management plan for the protection and management of the creek system should be drawn up. Such a management plan should include adequate measures to restrict uncontrolled access to the creek system.
- E. Because of the high water demands in the Karratha climate, poor water quality and the likelihood of high water tables developing under intensive irrigation, commercial horticulture will require careful management. Subsoil drainage would be essential for the long term survival of a horticultural enterprise and should be considered in any economic analysis.

Appendix

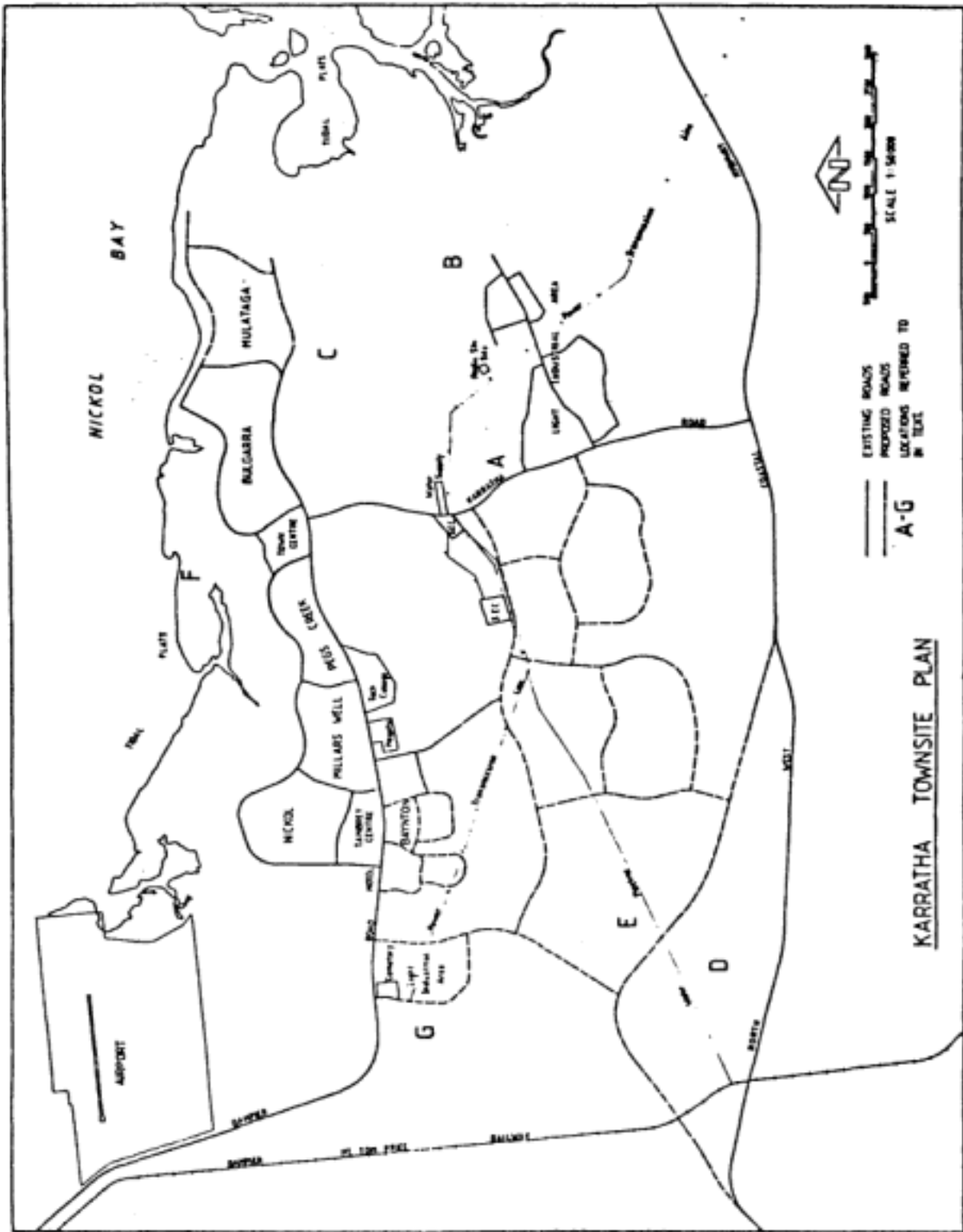
TABLE 1

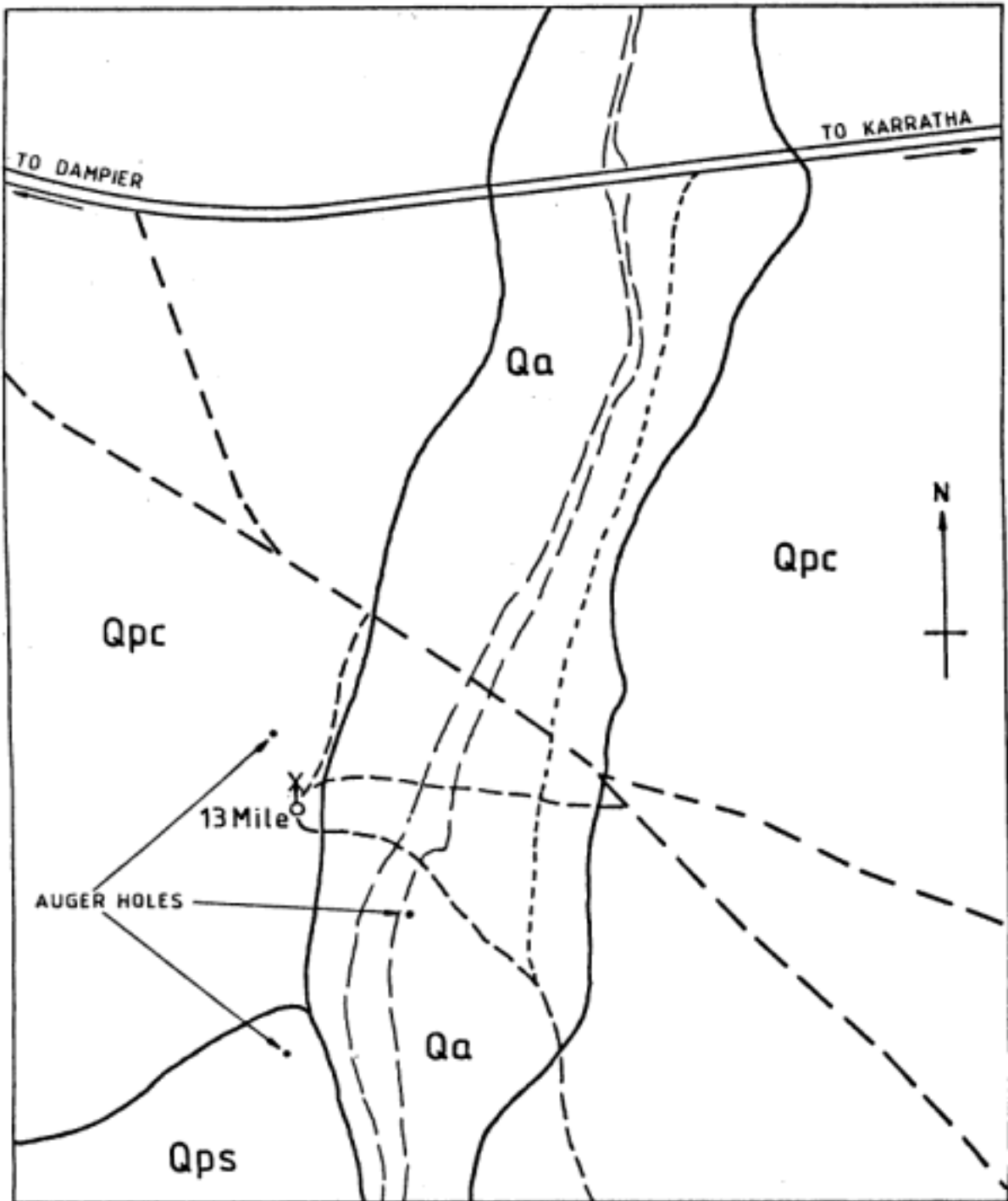
Salinity profiles at Karratha sampled July, 1984

Creek line Alluvium (Qa)		
Depth cm	PH (1:5H ₂ O)	%C1 ⁻ (by conductivity)
Surface	6.5	0.01
2 – 10	7.0	0.01
10 – 20	8.2	0.02
20 – 30	8.6	0.02
30 – 40	7.5	0.01
40 – 60	8.0	0.07
Seven Mile Creek (Qpc) Soil		
Surface	8.6	0.20
2 – 10	8.8	0.51
10 – 20	9.0	0.85
20 – 30	8.9	1.53
30 – 40	8.6	1.28
40 – 60	8.8	1.37
Seven Mile Creek (Qps) Soil		
Surface	8.0	<.01
2 – 10	8.6	0.02
10 – 20	8.6	0.03
20 – 30	8.9	0.22
30 – 40	8.9	0.25
40 – 50	9.0	0.23
50 – 60	8.9	0.30

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HAND AUGER SITES —13 MILE WELL, KARRATHA
SCALE 1:5000
(AREA G KARRATHA TOWNSITE PLAN)