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Proposed Marine Farm Extension, Waitaria Bay, Kenepuru Sound: Benthic Survey, July 1999

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prepared for

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Blenheim

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Introduction

This report presents a biological description of benthic habitats and associated conspicuous macrobenthic communities from an area proposed as an extension to an existing marine farm located along Kaikoura Point, Kenepuru Sound (Figure 1).

The aim of this study was to provide ecological information on the proposed site and to identify features of significant biological value that could potentially be threatened by the establishment of a marine farm.

The "Guideline for Ecological Investigations of Proposed Marine Farm Areas" (DEPARTMENT OF CONSERVATION 1995) was used as a basis for survey design and ecological assessment.

Study area

The location of the existing oyster farm is in Waitara Bay, Kenepuru Sound (Figure 1). The proposal is for an extension of the existing farm to the east and west of the current boundaries (Figure 2). The area encompassed by the western extension is 0.96 ha and the eastern extension is for 6.2 ha (Figure 2). Position fixes were gained using the ships GPS. The surrounding terrestrial landscape above the shoreline is composed mainly of farmland pastures and commercial forestry (*Pinus* radiata). The foreground of the bay is gently sloping plateau land, leading high ranges further into the interior.

Methods

Field work was completed on the 30th July, 1999. The areas of the proposed extension to the existing marine farm and location of shore profiles were identified using the vessels radar and DGPS.

The guidelines for ecological investigations (Department of Conservation 1995) sets out the basic procedures to be followed when doing an ecological assessment. These are explained below.

Investigative survey

The aim of the investigative study was to provide a description of substratum and the distribution and/or abundance of conspicuous species or features of particular ecological interest in, and immediately adjacent to, a proposed extension to a marine farm area (Department of Conservation 1995). As per the 'Marine farm guidelines' (Department of Conservation 1995), a number of shore profiles were carried out. This involved conducting a total of five diver transects, four within the proposed marine farm extension to the east and south of the existing farm and one on the western farm boundary (Fig 2).

Ideally transects are run from the shore to a point beyond the seaward boundary. In this case, it was felt that this was not necessary as inshore species and interidal organisms would not be affected by the extension to the existing farm.

Each diver transect was designed to cover a distance greater than the width of the proposed extension. Each transect began and finished out side the proposed extension area. This meant the length of the transects varied between 200 m and 450 m. Along each transect, all conspicuous species present were recorded, and the habitat including bottom sediment and depth. All depths in this report are adjusted to chart datum.

Results

Shore profiles

The shore profiles show the general distribution sediment type and species across the sea bottom. Figures 3-7 display the bottom topography of each transect. For location of each transect, refer to Figure 2.

Figure 3 shows the depth profile of the most eastern of the transects in this survey. Bottom composition was silt and clays, and depth ranged from 5.0 m depth at the off-shore end of the transect to 3.5 m at the inner shore boundary.

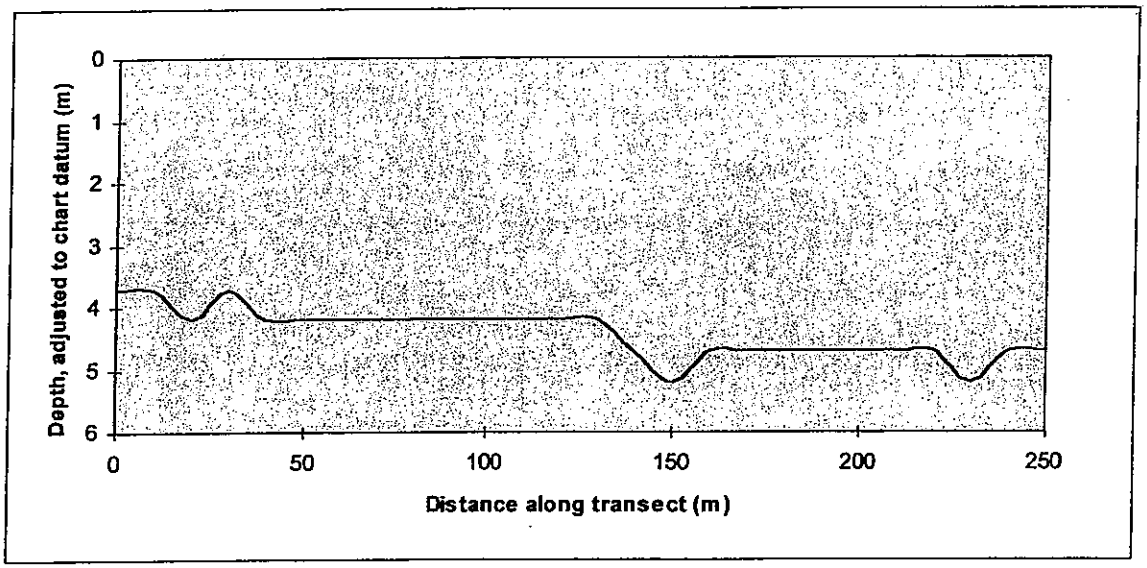

Figure 3. Shore profile of Dive 1, eastern extension area.

Figure 4 was the longest of all the five transects, penetrating some 450 m out into the bay. The bottom was composed of very fine silt and clay. The depth ranged between 3.0 m at the inner shore boundary to 5.0 m at the seaward end of the transect.

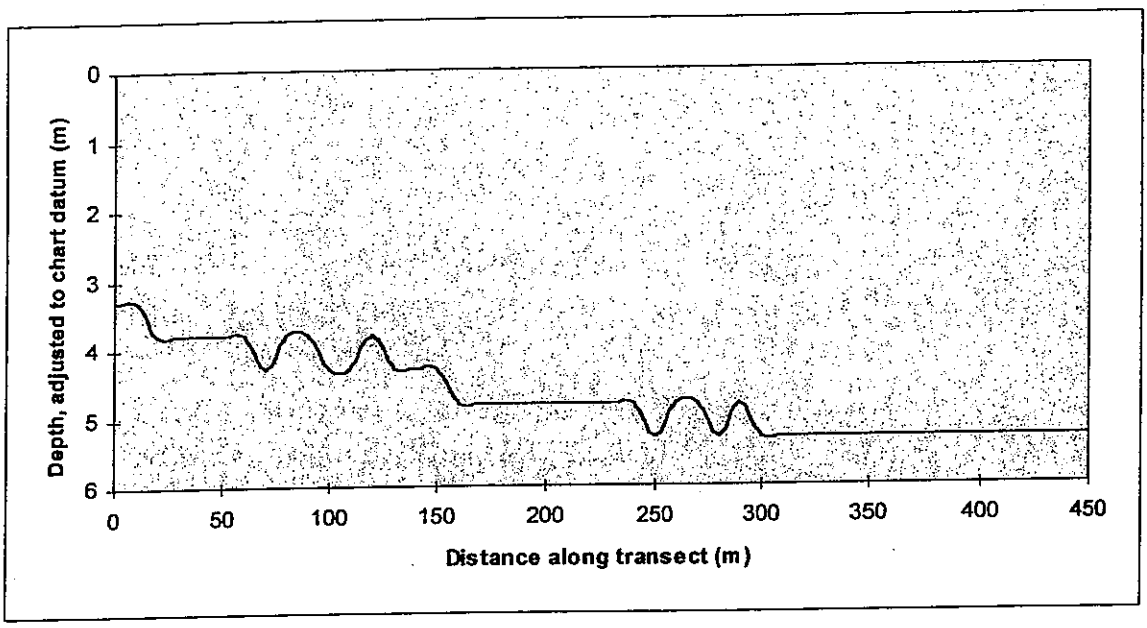

Figure 4. Shore profile of Dive 2, eastern extension area.

Figure 5 was located in the eastern extension area (Fig 2) and ranged in depth between 6.0 and 4.0 m. The bottom was composed of silt and clay.

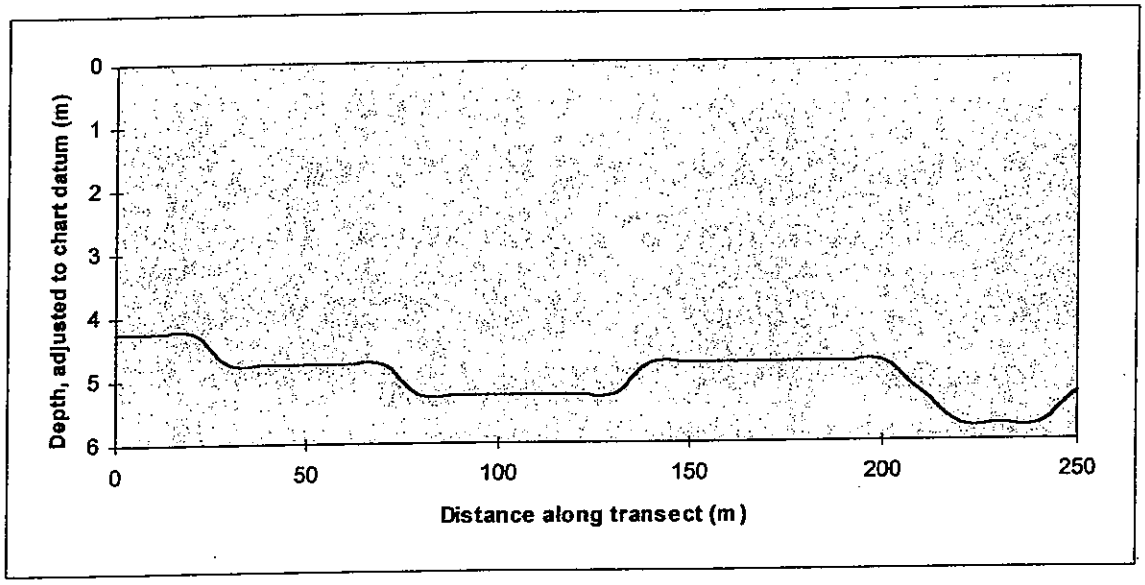

Figure 5. Shore profile of Dive 3, eastern extension area.

Figure 6 shows the results of Dive 4, the last transect carried out in the eastern extension area. It was 250 m long and depth ranged from 5.5 m at the seaward end of the transect to 3.5 m at the inner shore end of the transect. The bottom was composed of fine silt and clays.

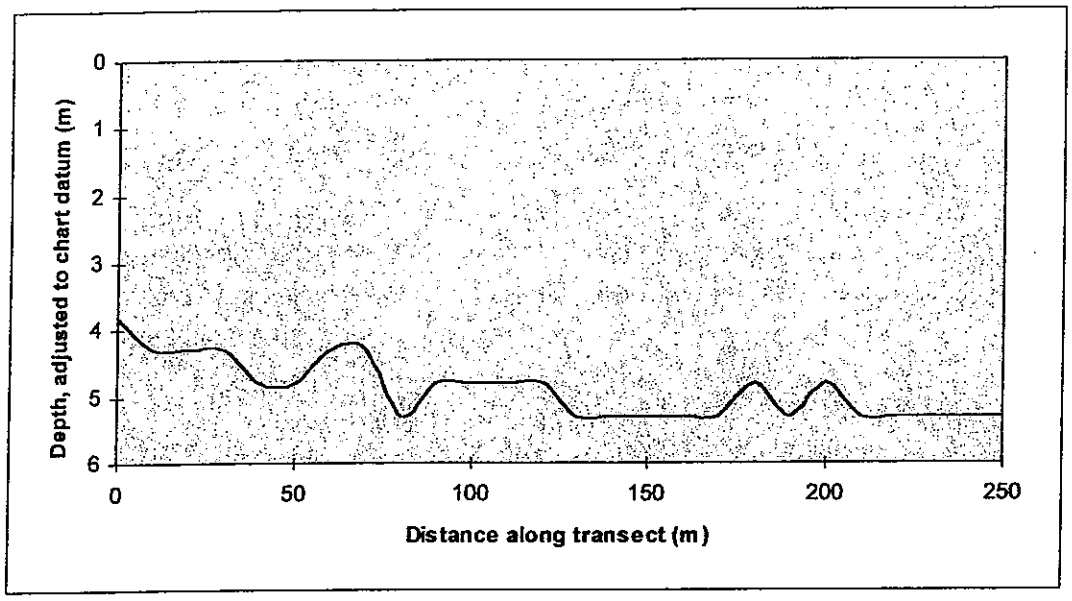

Figure 6. Shore profile of Dive 4, eastern extension area.

Figure 7 was the shortest of the five transects, being 200m long. Depth ranged between 1.5 m at the shoreward end of the transect, to around 5 m depth at the seaward end of the transect. The topography shows a gentle gradient along the transect except for two 'dips' at a distance of 110 m and 160 m. These dips appear to be no greater than 0.5 m. It is possible that these dips mark the boundary of an anchor block from an adjacent farm or a result of some natural scouring process.

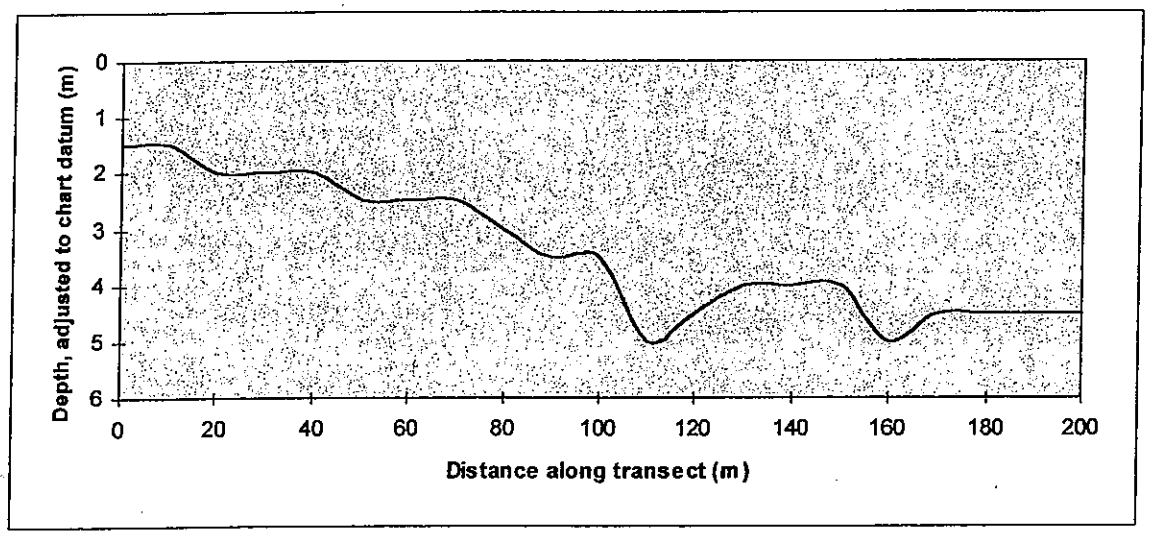

Figure 7. Shore profile of Dive 5, western extension area.

In summary, all the transects showed that the substratum in this region is dominated by fine silts and clays, No deviation in substrate was observed with respect to depth, distance from shore or location, ie. west versus east side of the existing marine farm.

Bottom topography is relatively gentle with occasional rise and falls which may be due to artificial structures or some unknown natural process.

Conspicuous species
All transects recorded very similar groups of species on each habitat. A total of 10 species were recorded (Table 1). The most wide spread organism along the transects was the cushion starfish. All the transects in the eastern extension area had a very sparsely distributed epibenthic community. Very little hard substrate was available for organisms attach to. The only substrate observed was the walls of the tube worm that exists in the fine sediments of the sea floor. These unidentified worms build a calcareous tube that stands about 10 cm above the sediment. The aperture of the tube is between 1 and 2 mm wide. The density of these tube worms are very low with only one or two individual observed per m^2. Attached to the tube of these worms were *Abroteia orbicularis* and *Hymenena variolosa*.

Green mussels were observed living together in clumps, but it is likely that these originated from one of the adjacent mussel farms. The small black mussel also had a clumped distribution along some transects but probably had a similar origin.

The only transect in the western extension area, had a higher diversity in the shallows, than any of the other transects. It had organisms such as sea squirts, fan worms, pacific oysters and one horse mussel. These organisms were observed outside the boundary or the proposed extensions.

Red algae		*Abroteia orbicularis*
		Hymenena variolosa
Chordata	Sea squirt	*Cnemidocarpa bicornuata*
Echinodermata	Cushion star	*Patiriella regularis*
Bivalve	Green lipped mussel	*Perna canaliculus*
	Horse mussel	*Atrina pectinata zelandica*
	Pacific oyster	*Crassostrea gigas*
	Little black mussel	*Xenostrobus pulex*
	Unknown tube worm	Fam: *Terebellidae*
	Fan worm	*Branchiomma serratibranchis*

Table 1. List of conspicuous species identified along transects

Horse Mussels (Atrina pectinata zelandica)
Live horse mussels were observed only along the one transect in the western extension area. Only two were observed and these were in the shallows, outside the proposed extension. Due to this and the low density observed, they were presumed not to be an issue and no further investigation was undertaken.

Lampshells
No lampshells (Brachiopoda) were observed on any of the transects.

Hydroids and Bryozoans
No large hydroid species or bryozoans were observed during the present study.

Tube worm mounds (Galeolaria hystrix)
No tube worm mounds were observed along any of the transects.

Discussion

Diversity was very low compared to other areas of the Marlborough Sounds with only 10 species being observed. The bottom type was continuos and the topography was gently sloping along all of the transects.

The area beneath the proposed extension was composed of fine silts and clay, cushion stars, and the occasional tube worm with some red algae attached to its tube. The species identified in this survey are common throughout the Marlborough Sounds region and have not been identified as 'ecologically significant' by the Department of Conservation.

Potential Impact of a bivalve farm
Impacts of mussel culture on soft bottom substratum have been reported as (Gillespie 1989, Watson 1995, Davidson 1998);

- increased levels of shell and fine sediment particles deposited onto the benthos (due to shell drop off, mussel harvesting, and float and warp cleaning)
- on a mud bottom, the diversity of species living on the surface most often increases (due to shell substratum providing additional habitat), while the diversity of species lining within the sediment most often decreases (due to deposition of finer sediment and chemical changes)
- the anoxic layer moves closer to the surface (due to the deposition of finer sediment and organic material originating from the mussel farm)
- an increase in sulphide and organic material, especially nitrogen which results in a increase in ammonium levels

The study site is located well within Kenepuru Sound and experiences low tidal currents and little wave action. As a result, any possible effects will be localised to areas beneath the farm or a few meters adjacent to it (Gillespie 1989).

Visibility was very low during the present study (<1 m) which indicates a high suspended sediment load. The species observed during the present study did not appear to be adversely affected by this sediment. It is likely then that the communities present are able to cope with high sediment loads and low sediment oxygen

concentrations which are said to be produced by mussel farms. Indeed, the fine silt sediment of the area beneath the proposed extensions are dominated by cushion stars which are mobile and would move if conditions were unfavourable. That they exist in these regions in large numbers suggest that having some many farms in close proximity are not adversely affecting them and therefore unlikely to be adversely affected by the granting of the application.

Marine farms have also been noted to increase abundances of animals in and on the seabed around mussel farms (Watson 1995). The mussel farm can provide hard substrata, and an enhanced source of food for natural predators such as starfish, crabs and fish (Watson 1995).

Other Issues

Increasing the size of the farm may increase the pressure on the bio-productivity of the area. However, the proposed extension will be used for oyster farming. Each individual mussel is capable of filter several litres of water per hour. Each line of a mussel farm can contain hundreds of mussels which can lead to a grand consumption of phytoplankton. Oysters on the other hand do not process as much water as mussels and their density per line is much less than green mussels. Therefore the increase in pressure on the phytoplankton is likely to be minimal compared to an increase in the size of an adjacent mussel farm.

The area of Kenepuru Sound devoted to aquaculture, compared to the area of the Sound that isn't, is very small. An increase in the existing oyster farm will have a minor effect on the levels of productivity in the Sound. Granting the application will not adversely affect existing biological communities with the local area or elsewhere in the Sound.

Conclusion

In conclusion, the proposed site is located in an area that is exposed to mild tidal currents and therefore there appears little threat to inshore communities. The community assemblages that currently exist in the vicinity of Waitara Bay are unlikely to be altered by the extension of the present farm.

References

Davidson, R.J. (1998). Preliminary report on ecological issues related to mussel harvesting activities. *Research, Survey and Monitoring report number 158, Wellington.*

Department of Conservation (1995). Guideline for ecological investigations of proposed marine farm areas. *Occasional Publication 25, Nelson/Marlborough Conservancy.*

Gillespie, P.A. (1989). The impact of long-line mussel culture on benthic habitat. *Report prepared for the Coastal and Marine Resources Directorate, Department of Conservation, Wellington.*

Watson, S. (1995). Wilson's Bay marine farm applications: Assessment of environmental effects. *Consultancy report SAN 300, NIWA, Hamilton.*

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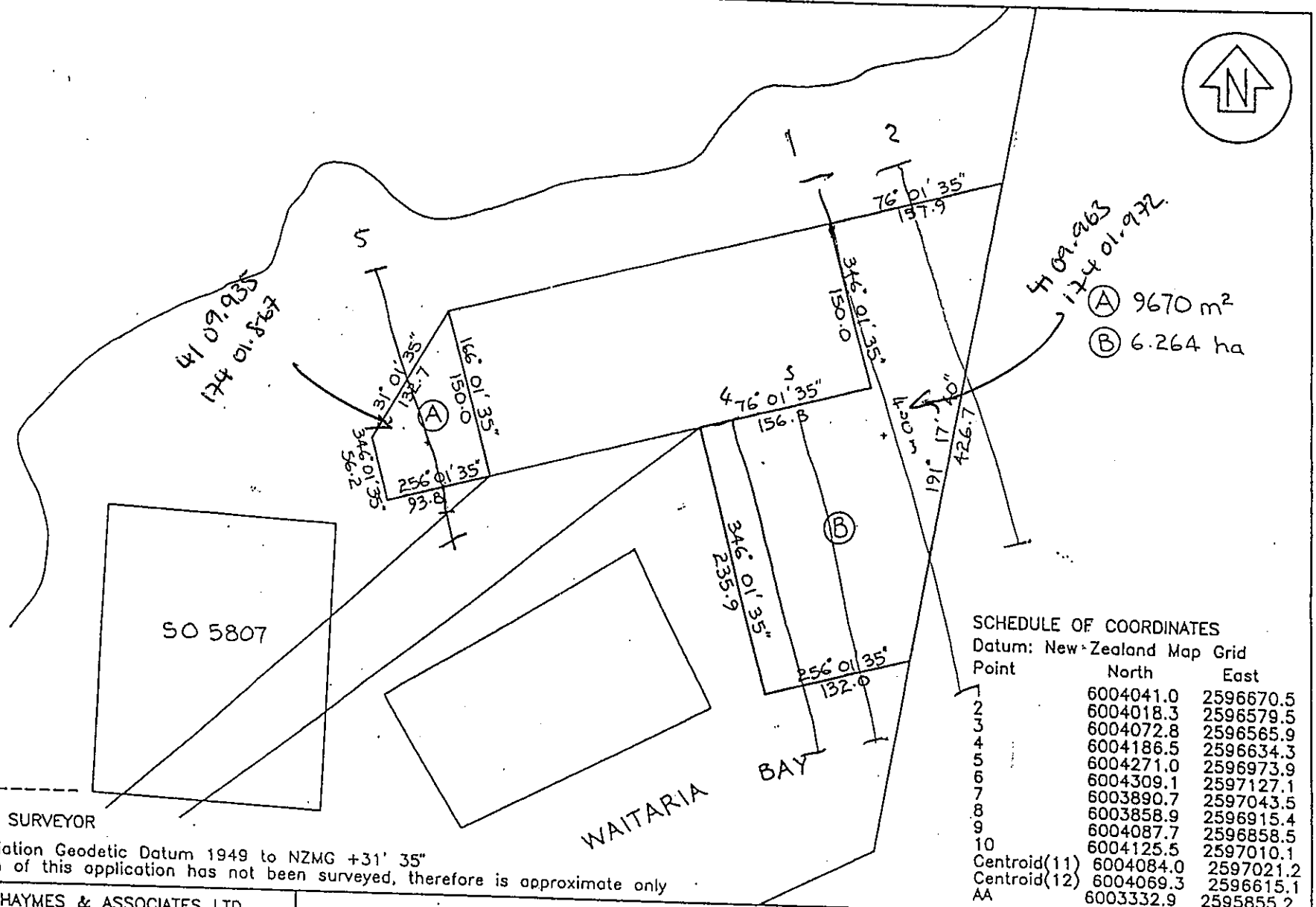

SCHEDULE OF COORDINATES
Datum: New Zealand Map Grid

Point	North	East
1	6004041.0	2596670.5
2	6004018.3	2596579.5
3	6004072.8	2596565.9
4	6004186.5	2596634.3
5	6004271.0	2596973.9
6	6004309.1	2597127.1
7	6003890.7	2597043.5
8	6003858.9	2596915.4
9	6004087.7	2596858.5
10	6004125.5	2597010.1
Centroid(11)	6004084.0	2597021.2
Centroid(12)	6004069.3	2596615.1
AA	6003332.9	2595855.2

A.J.HAWKE
REGISTERED SURVEYOR

Bearing variation Geodetic Datum 1949 to NZMG +31' 35"
The position of this application has not been surveyed, therefore is approximate only

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REGISTERED SURVEYORS
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PHONE (03)5787984–FAX (03)5787709

PLAN OF PROPOSED COASTAL PERMIT
Aotearoa Assets

SCALE 1:5000
DATE 29 JUL 1999
JOB REF.377

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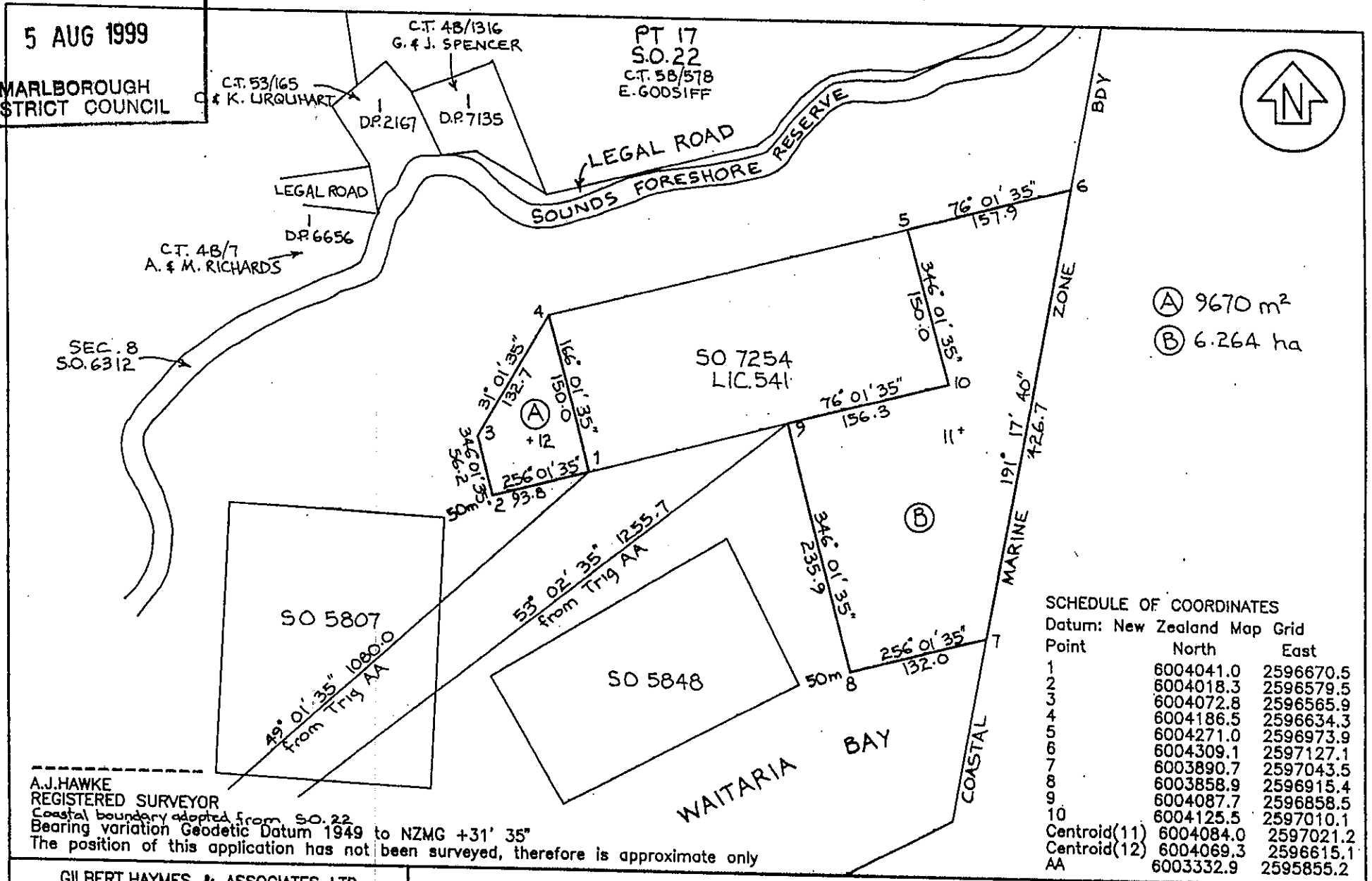

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Centroid(12)	6004069.3	2596615.1
AA	6003332.9	2595855.2

A.J. HAWKE
REGISTERED SURVEYOR
Coastal boundary adopted from S.O. 22
Bearing variation Geodetic Datum 1949 to NZMG +31' 35"
The position of this application has not been surveyed, therefore is approximate only

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