

12/84

ENVIRONMENT UNIT

ENVIRONMENT UNIT

DARWIN MARINA ESTATE

draft environmental impact statement
and planning study
volume three - june 1987



87/0055M

ENVIRONMENT UNIT

ADDRESS OF ISSUES RAISED
FROM THE
ADVERTISED 18 FEBRUARY 1987
PUBLIC SUBMISSION INVITATIONS TO
VOLUME II
CULLEN COVE MARINA
DRAFT ENVIRONMENTAL IMPACT STATEMENT

VOL. III DRAFT ENVIRONMENTAL IMPACT STATEMENT

JUNE 1987

87/0055

2.1 POPULATION - RESIDENTIAL PROFILE AND SOCIAL IMPACT ON LOCALITY

The projected residential component of the Darwin Marina Estate can be depicted in 4 categories.

- Individual or semi-detached waterfront houses
- Luxury strata title home units
- Condominiums
- Tourist hotel

For other social changes refer to 2.5.

HOUSING

The quality allotments provided within this development will determine the new permanent population which may be classified as mature age couples, senior business executives or retired citizens. These residents traditionally do not have a large proportion of school age children and in most cases do not maintain normal time tables in travel to and from business and would therefore not be conflicting with peak hour traffic flows. The expected vehicular movements are low and off peak. The projected traffic movements are covered in Figure 2.2.

LUXURY STRATA TITLE HOME UNITS

The market clearly identifies a need of business couples, well established people or retired citizens for these units. This type of living is not appealing or conducive to the traditional family life style and the impact on the established education system would be low.

Vehicular movement and emergency service needs for these residents would be similar to other medium density developments in Darwin and the projected vehicular movements are described in Figures 2.2 6, 7 and 8.

CONDOMINIUMS

The majority of these units are two and three bedroom with a mix of studio apartments and being suitable for couples or family accommodation of individual ownership, permanent rental apartments, or short term rental units. The projected stay would be approximately 7-10 days and cater for up-market holiday and touring guests. Traffic movement, and impact on domestic services (schools, hospitals, shopping etc.) will be minimal and again planning solutions have been adopted to cover natural emergency access to the buildings.

TOURIST HOTEL

The trading style of this resort hotel is expected to produce guests stays of 3-5 days with 35% of guests are expected to have a vehicle parked on the premises. An occupancy rate of 68-72% have been assumed for the calculation of guests traffic movements and these figures are shown in in Figure 2.2.6, 7 and 8.

OVERALL OBSERVATION

In general, the inhabitants of the total complex will have all day to day living needs serviced internally with only a limited requirement placed on local health and education systems. The road system will see a small increase in flow at peak hours with the majority of traffic taking place at non peak times.

Larrakeyah Primary School is within the immediate area and the residents of Larrakeyah and Darwin Marina Estate who are of a mature and senior age as outlined earlier are not expected to have a great demand on the primary school system. It may well be said that any contributing increase in school age children by the Marina's residents would be desirable to maintain an economic and efficient education centre.

MARINA'S PROJECTED POPULATION

	<u>No of units</u>	<u>Ratio</u>	<u>Total</u>
HOUSING LOTS	83	2.4	199
LUXURY HOME UNITS	70	2	140
CONDOMINIUMS:			
2 BED ROOM	100	2.2	220
SINGLE BED ROOM	55	1.4	77
HOTEL	182	1.6	291
TOTAL RESIDENTIAL POPULATION			927

2.2 VEHICULAR MOVEMENT PROJECTIONS

The Marina traffic study has been prepared from the predicted build-up of permanent residents and commercial users of the development. We have outlined the volume, frequency and direction of traffic that would emanate from the Marina. Requests of present traffic volume numbers and the capacity of the Smith Street round-a-bout are not available from either the Darwin City Council or Department of Transport and Works. Also unknown are the impacts that natural growth, the university and the casino project might have on traffic volumes. The number of traffic movements emanating out of Darwin Marina Estate can therefore be introduced into future and long term planning models once all these factors are known.

There is no immediate problem envisaged with the road system which is quite adequate for present flows and it is also understood that the present Smith Street round-a-bout is working under full capacity.

Very little permanent traffic changes can be expected until 24 months after commencement of construction when the first of the resident start to take up occupancy.

Studies of other marina developments show that at no stage does a sudden or dramatic traffic change occur. Numbers would not increase until 1989 with a progressive increase until April 1991 when the majority of the buildings have been completed.

All traffic from Darwin Marina Estate will be dispersed to varying destinations dependant on the business, shopping or leisure needs of the inhabitants. Figure 2.2.8 indicates these projections.

As the planned extension of Mitchell Street to service the Marina is no longer possible, due to use of buildings originally set for demolition by the University, the Smith Street round-a-bout is now proposed as the principle point of entry for all traffic.

The predominance of the Marina's traffic will flow along the Myilly Point Road to the tourist hotel, marina and commercial area with a lesser flow servicing the southern residential section of the development.

Traffic generated can be considered in two categories:-

- Southern residential confinement
- Northern commercial mix, ferry terminal and marina

2.2 1. Southern Component

The residents would gain access by a 7 metre wide carriageway to the Southern housing area connecting to Smith Streets and Gilruth Avenue. This road is of adequate width to cater for required standards of the predicted traffic movements.

To cover emergency situations, a crash barrier system connecting the Southern road link with Larrakeyah Road system would be constructed. This brick paved and landscaped public walkway for pedestrians general use would connect the roads. Kahlin park would also provide adequate egress from the site if it were required in an emergency.

2.2 2. Northern Commercial Mix, Ferry Terminal and Marina

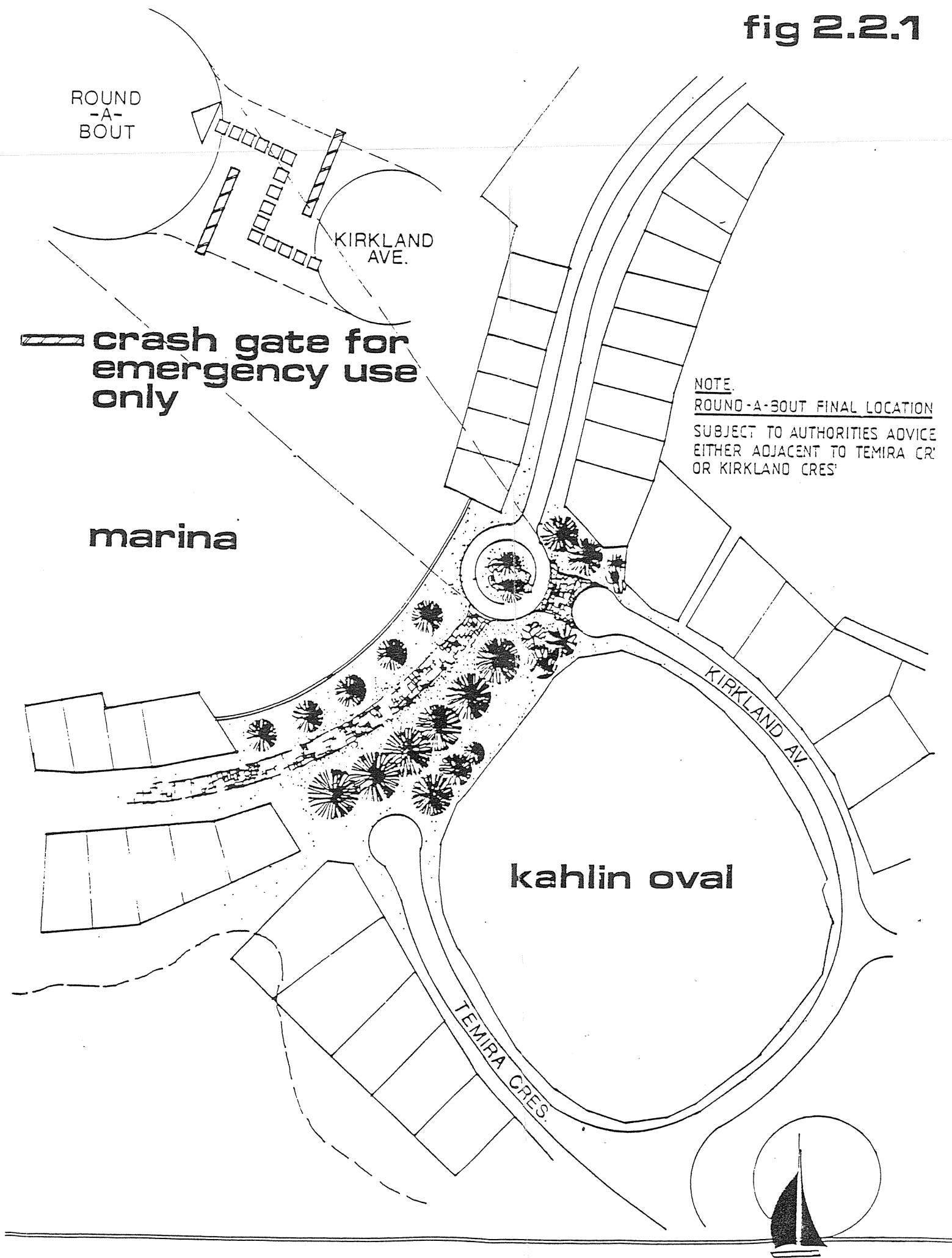
The road reserve and pavement width which connects the Commercial Marina Ferry Terminal and Hotel is of similar width as Mitchell Street West and will handle the expected traffic.

There is a diversity factor between the daytime activities of the Ferry Terminal to the after hours and night time peak operation of the hotel.

The 13 m carriageway to access the Marina will be constructed to the Standard requirements of the Department of Transport & Works. The peak loads for the Ferry Terminal would not coincide with normal commercial and commuter traffic. Hotels are finding a large user group that does not arrive in their own car. Corporate or holiday users would tend to utilize taxis. The Sheraton Hotel in Darwin did not consider on-site parking an essential facility and has shown that arrangements with the adjacent public parking station accommodates their guests habits and needs.

The condominiums have a number of accesses to the road system and these residential units will create a constant flow of traffic spread over the day. Studies at the Marrakai Centre of some 64 units and 10 visitor parking facilities with a single access on the main street (Smith Street) Darwin has not caused any significant traffic concern.

fig 2.2.1



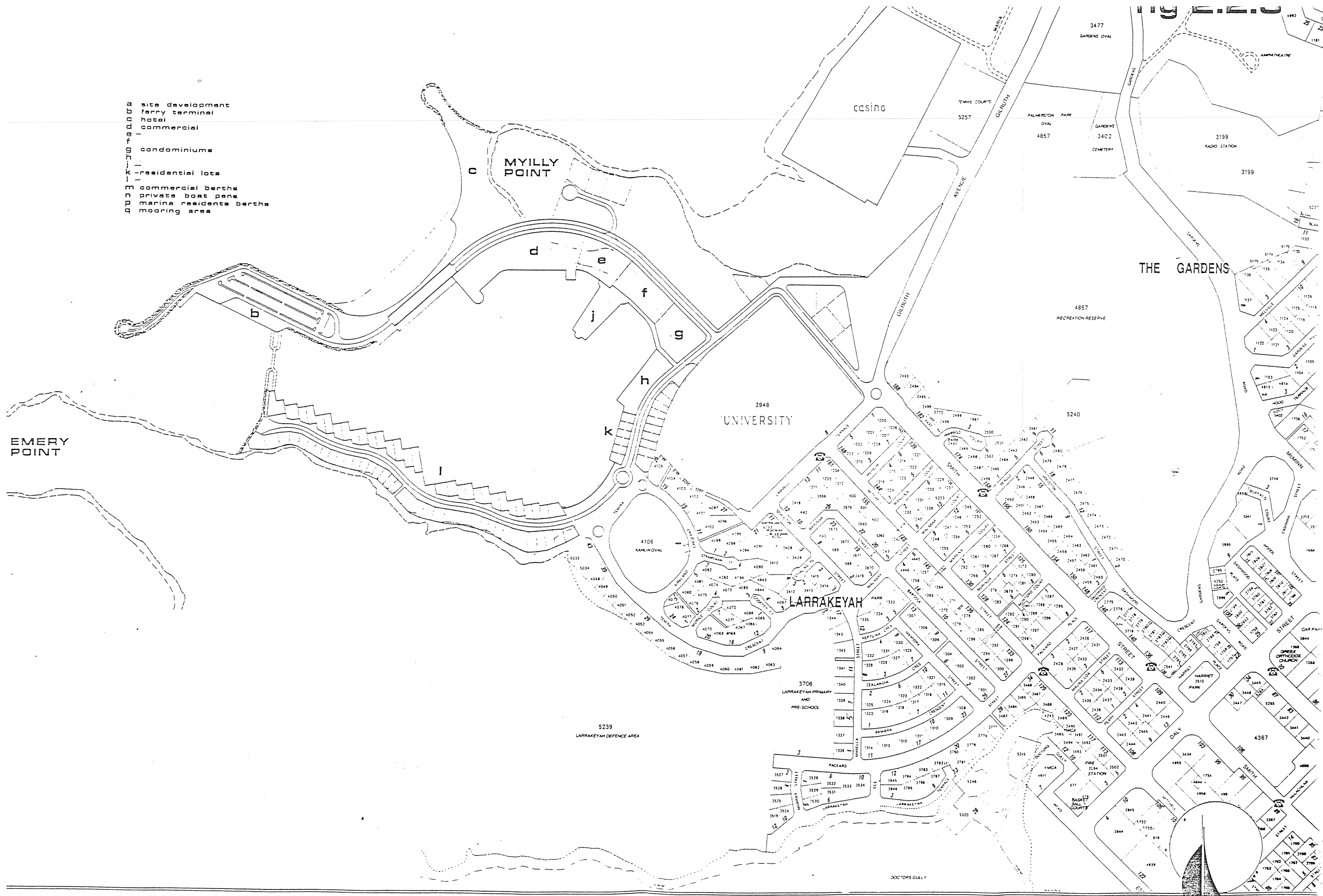
DARWIN MARINA ESTATE

VOS WOODHEAD PLANNING GROUP & WOODHEAD AUSTRALIA ARCHITECTS 17 LINDSAY STREET, DARWIN PO BOX 141 DARWIN NT

JUNE '97

PROJ. MAR-001

- a site development
- b ferry terminal
- c hotel
- d commercial
- e condominiums
- f residential lots
- g commercial berths
- h private boat pens
- i marina residents berths
- j mooring area



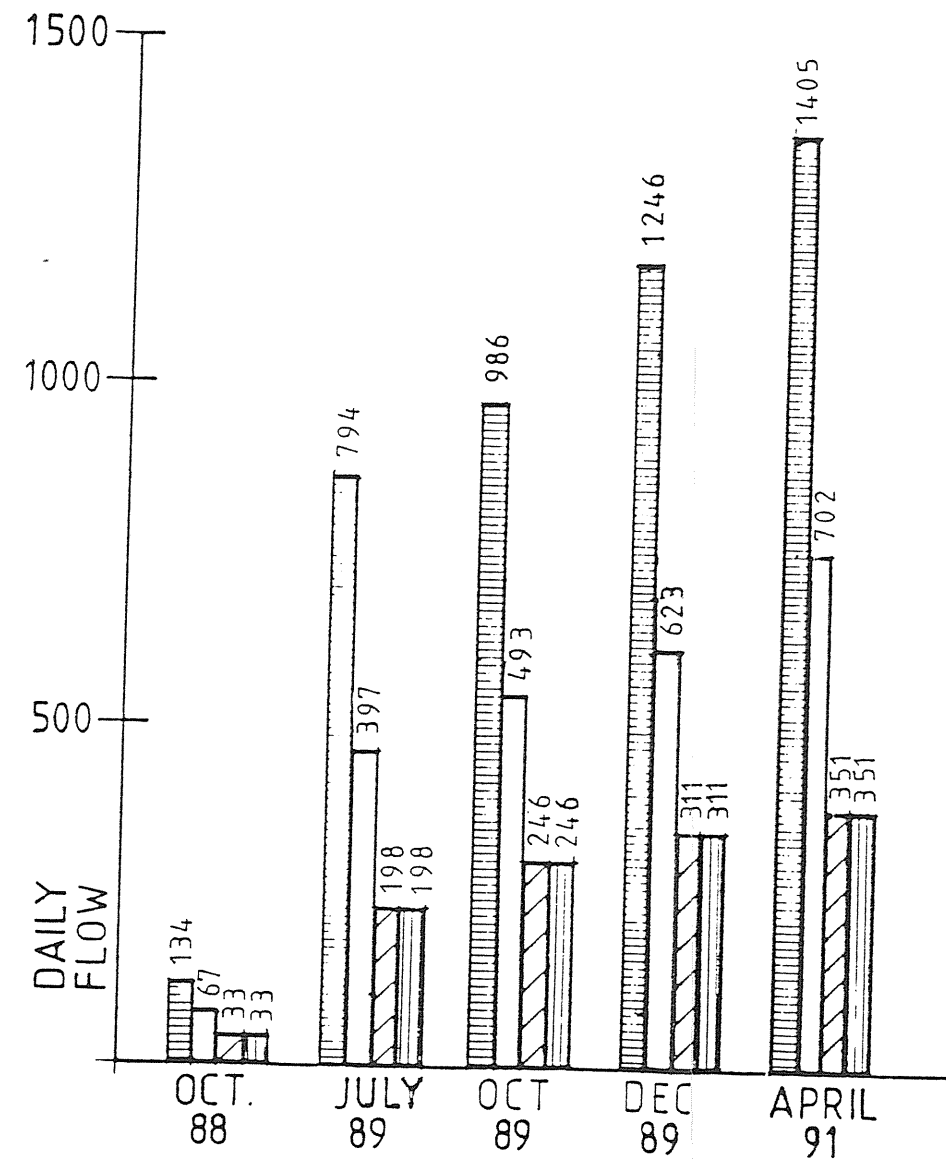
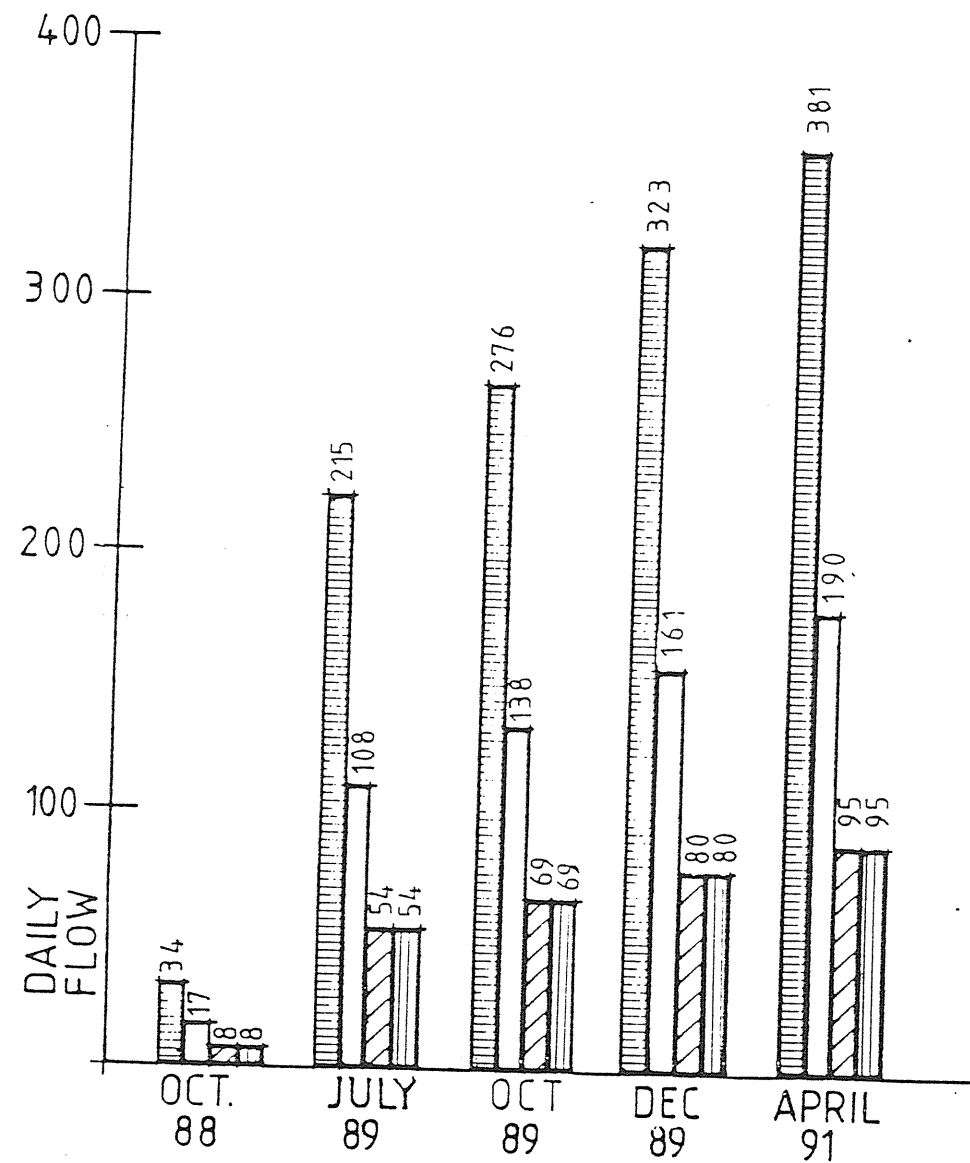
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fig 2.2.8

PROJECTED VEHICULAR FLOW FROM DARWIN MARINA EST. & SMITH STREET ROUND-A-BOUT

PEAK HOURS (MON.-FRI.)TOTAL FLOW (MON.-FRI.)



total vehicles
 south east on SMITH ST.

north on GILRUTH AV.
 south west on LAMBELL TER.

7m & 13m carriageway capacities

Table II Design flows of urban roads (based on Technical Memorandum 119/76 published by DOE)

Description	Urban motorway	All purpose road, no frontage access, no standing vehicles, negligible cross traffic	All purpose road, frontage development, side roads, pedestrian crossings, bus stops, waiting restrictions throughout day, loading restrictions at peak hours
Effective width of carriageway in metres (excluding refuges or central reservation)			
Carriageway with one lane in each direction:			
6.1	Peak hourly flow, veh/h, both directions of flow*	2000	1100
6.75			1400
7.3			1700
9			2200
10			2500
Undivided carriageways:			
2 lanes in each direction:			
12.3	Peak hourly flow, veh/h, one direction of flow	2550	1700
13.3			1900
14.6			2100
3 lanes in each direction:			
18			2700
Dual carriageways:			
2 lanes in each direction:			
6.75 x 2	Peak hourly flow, veh/h, one direction of flow	2950†	1800
7.3 x 2			
11 x 2			
3 lanes in each direction:			
11 x 2	5700	4800†	3550
One-way roads:			
6.1	Peak hourly flow, veh/h	2950	1800
6.75			2000
7.3			2200
9			2850
10			3250
11		4800	3550

* 60/40 directional split can be assumed

† Includes division by line of refuges as well as central reservation

fig 2.2.5

X

fig 2.2.7

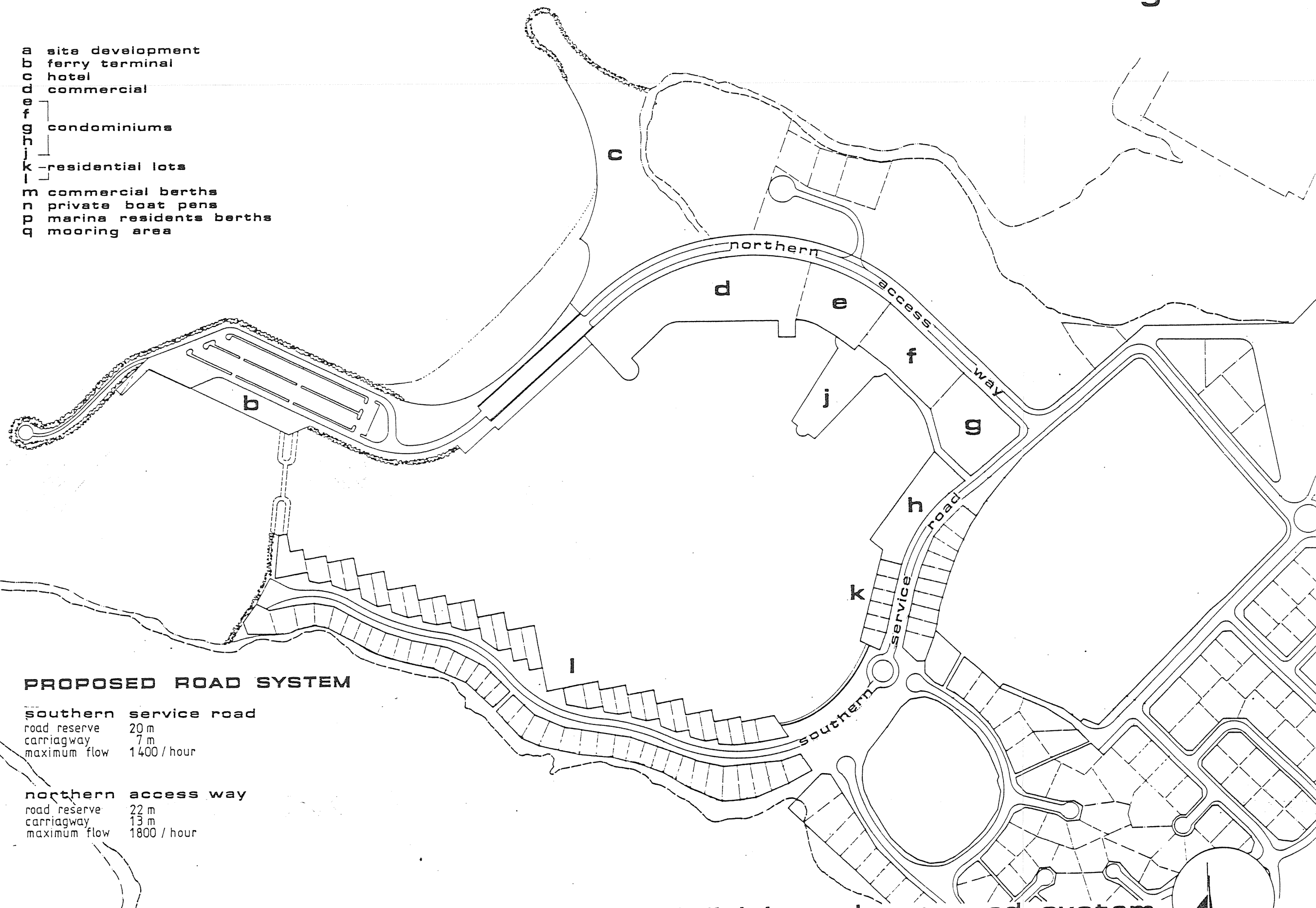
VEHICLE NUMBERS AND MOVEMENTS PER MARINA'S COMPONENT

		A	B	C	D	MONDAY-FRIDAY			WEEK-END		EST'D
						PEAK N/PEAK NIGHT			DAY- NIGHT		FLOW DATE
HOTEL	182 ROOMS	1	182)		60	15	45	30	60	45	Dec-89
	4800 m ² FOOD & BEV.	16/100	76)	64	76		30	76	30	76	
	32 STAFF	-	-)		32	32		32	32	32	
CONDOMINIUMS	100 TWIN B/R	2	200	100	50	15	35	35	50	30	50% OCT 89
	55 SINGLE B/R	2	110	27	14	4	10	10	-	-	50% APRIL 91
	15 STAFF	-	-	-	15	15	-	-	15	-	
LUXURY HOME UNITS	70	2	140	105	105	40	60	30	70	50	Oct-89
WATERFRONT HOUSING	83	2	166	166	125	40	70	40	83	60	50% JULY 89 50% APRIL 91
OFFICE AREA	3000 m2	2.5/1000	75	-	120	120	30	-	-	-	Jul-89
SHOPPING & RESTAURANT	3500 m2	6/100	245	-	160	45	200	150	160	160	Jul-89
MARINA PENS		1	120	-	72	4	40	10	80	20	Oct-88
SERVICE VEHICLES						-	40	-	5	-	
FERRY TERMINAL & PUBLIC BEACH	PER 1984 GOV PROPOSAL		300	300	-	30	50		250		Oct-88
TOURIST COACHES						1	6	3	6	4	
VISITORS						20	50	50	100	100	
TOTAL						381	666	466	941	577	

- (A) REGULATION ZONING RATIO
- (B) REGULATION PARKING BAYS
- (C) PLANNED PARKING BAYS
- (D) NUMBER OF VEHICLE PROJECTIONS

fig 2.2.4

- a site development
- b ferry terminal
- c hotel
- d commercial
- e } condominiums
- f }
- g }
- h }
- i } residential lots
- j }
- k }
- l }
- m commercial berths
- n private boat pens
- p marina residents berths
- q mooring area



PROPOSED ROAD SYSTEM

southern service road
road reserve 20 m
carriageway 7 m
maximum flow 1400 / hour

northern access way
road reserve 22 m
carriageway 13 m
maximum flow 1800 / hour

subdivision plan & road system

DARWIN MARINA ESTATE

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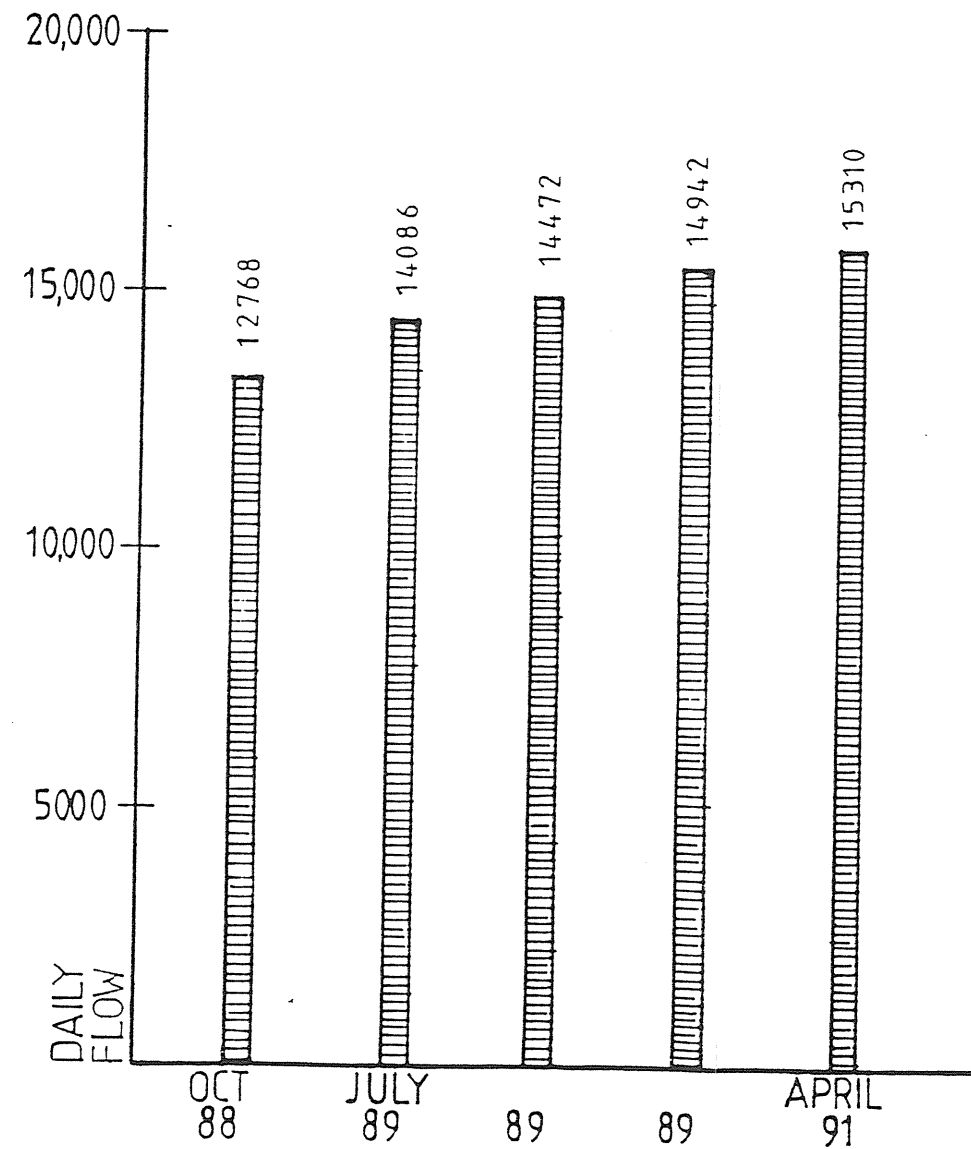
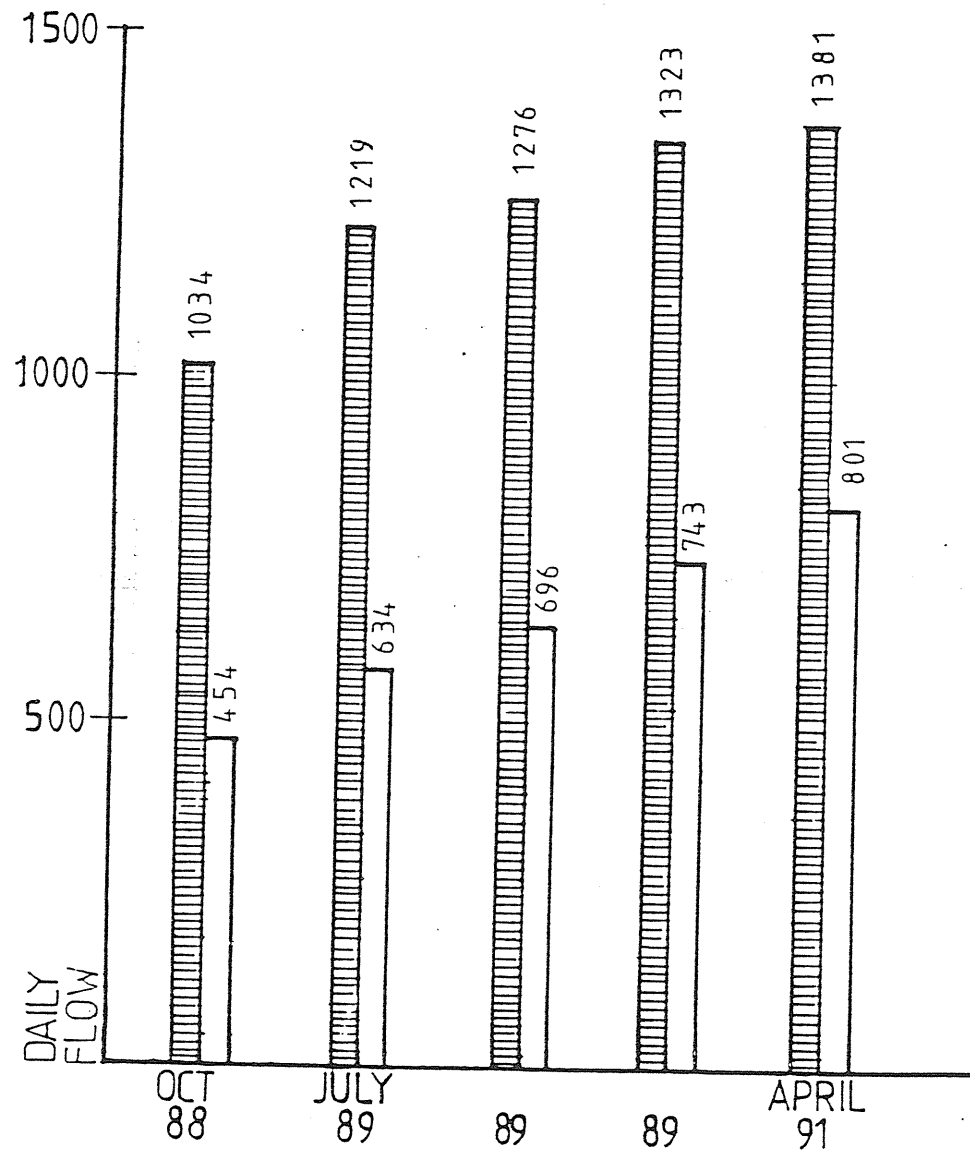
JUNE '87

PROJ No DAR-001

fig 2.2. 9.2

PROJECTED VEHICULAR FLOW FROM GILRUTH AV. AND SMITH ST. ROUND-A-BOUT

(BASED ON MARINA USE AND 130,000 POPULATION)



 PEAK HOUR IN DAILY
 PEAK HOUR OUT DAILY

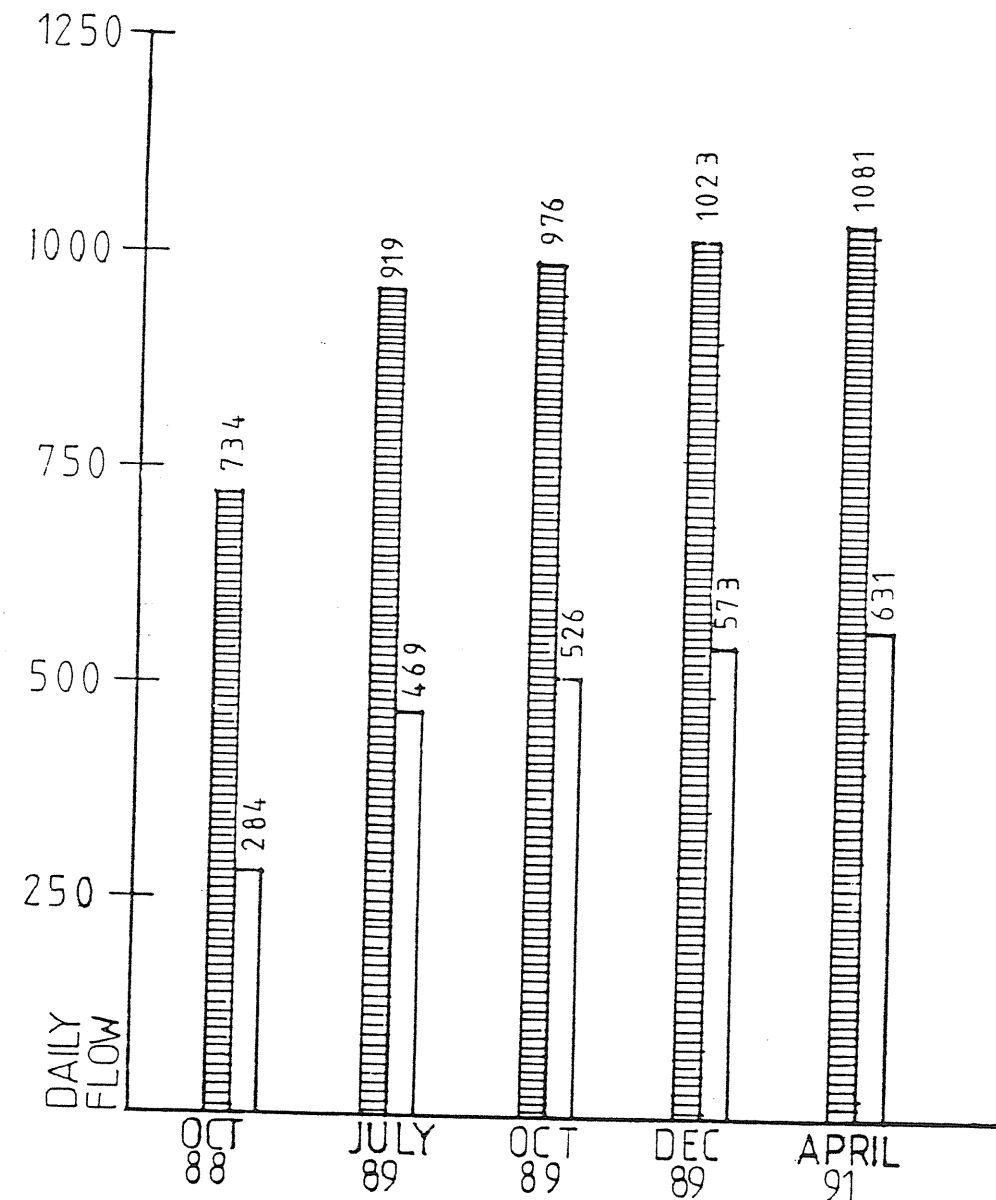
TOTAL DAILY TRAFFIC

ESTIMATED PUBLISHED FIGURES AS PER PLANNING DIVISION (ROADS) DEPARTMENT OF TRANSPORT & WORKS

fig 2.2. 9.1

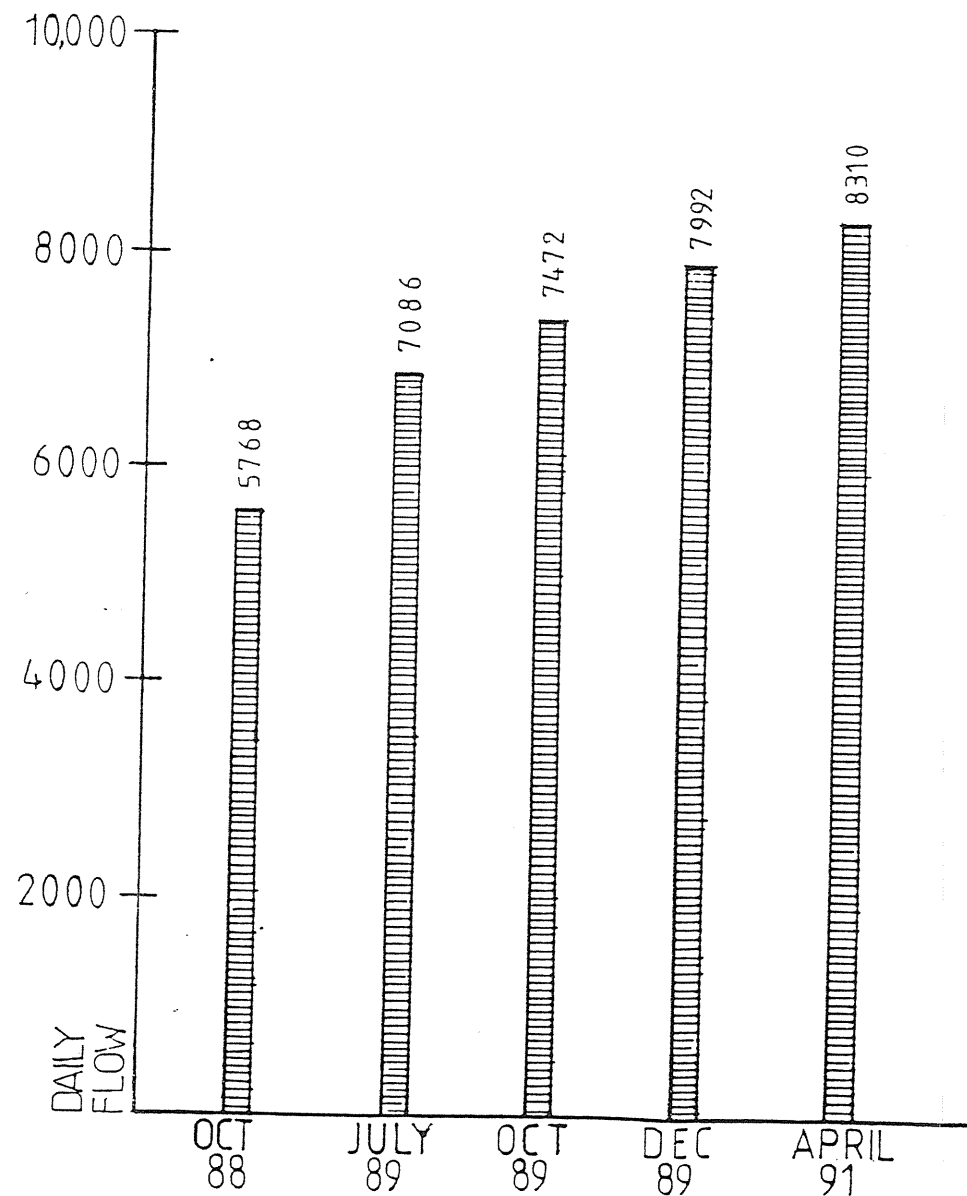
PROJECTED VEHICULAR FLOW FROM GILRUTH AV. AND SMITH ST. ROUND-A-BOUT

BASED ON MARINA USE AND 80,000 POPULATION



PEAK HOUR IN

PEAK HOUR OUT



TOTAL DAILY TRAFFIC

ESTIMATED PUBLISHED FIGURES AS PER PLANNING DIVISION (ROADS) DEPARTMENT OF TRANSPORT & WORKS

2.3 BOTANICAL STATEMENT

Figures 1.4 and 2.3 in the draft E.I.S. explain the existing landscape and species as well as the proposed landscape plan which had identified plant varieties. They have been provided at the scale to which the report has been produced and clearly indicate the areas of cliff face reclamation and seabed clearance and dredging. Research on behalf of the developers by Rolan Muench A.I.H. & A.I.L.A. of Woodhead Australia Landscape Architects has indicated plant life and vegetation to the region to be excavated is of a minor significance as similar growth is available in many like areas within the immediate close proximity. No rare species are in the effected area. Until detailed planning of all the components is completed a further and more detailed landscaping plan will not be prepared. This plan would be to the approval of the building and planning authorities.

The developers of Darwin Marina Estate have shown significant concern with their various projects undertaken in Darwin and Alice Springs. Similar concerns and standards will be followed in the development of Darwin Marina Estate

The ongoing maintenance would be as in all subdivisions the concern of the relevant owners.

In this case there would be three categories:-

1. Privately owned land which will be administered by the owner e.g. houses, Commercial Hotel.
2. Marina management group which will ensure that all foreshore areas used by the Marina will be suitably maintained.
3. Public areas such as the beach and the Ferry Terminal would be the responsibility of the Council.

2.4 PUBLIC RECREATIONAL SPACE

Recreational space has been significantly increased and improved. The complete water body, introduction of a deep water sailing club, a 350 metre long public beach usable at most tides and significant waterfront activity along the Marina shores has boosted the recreational space and utility of the area significantly. Most of the residents in the new Marina would concentrate their lifestyle and activities to the water.

The existing areas of Kahlin oval will be developed along the foreshore and improvements will enhance the existing residents amenity of the area.

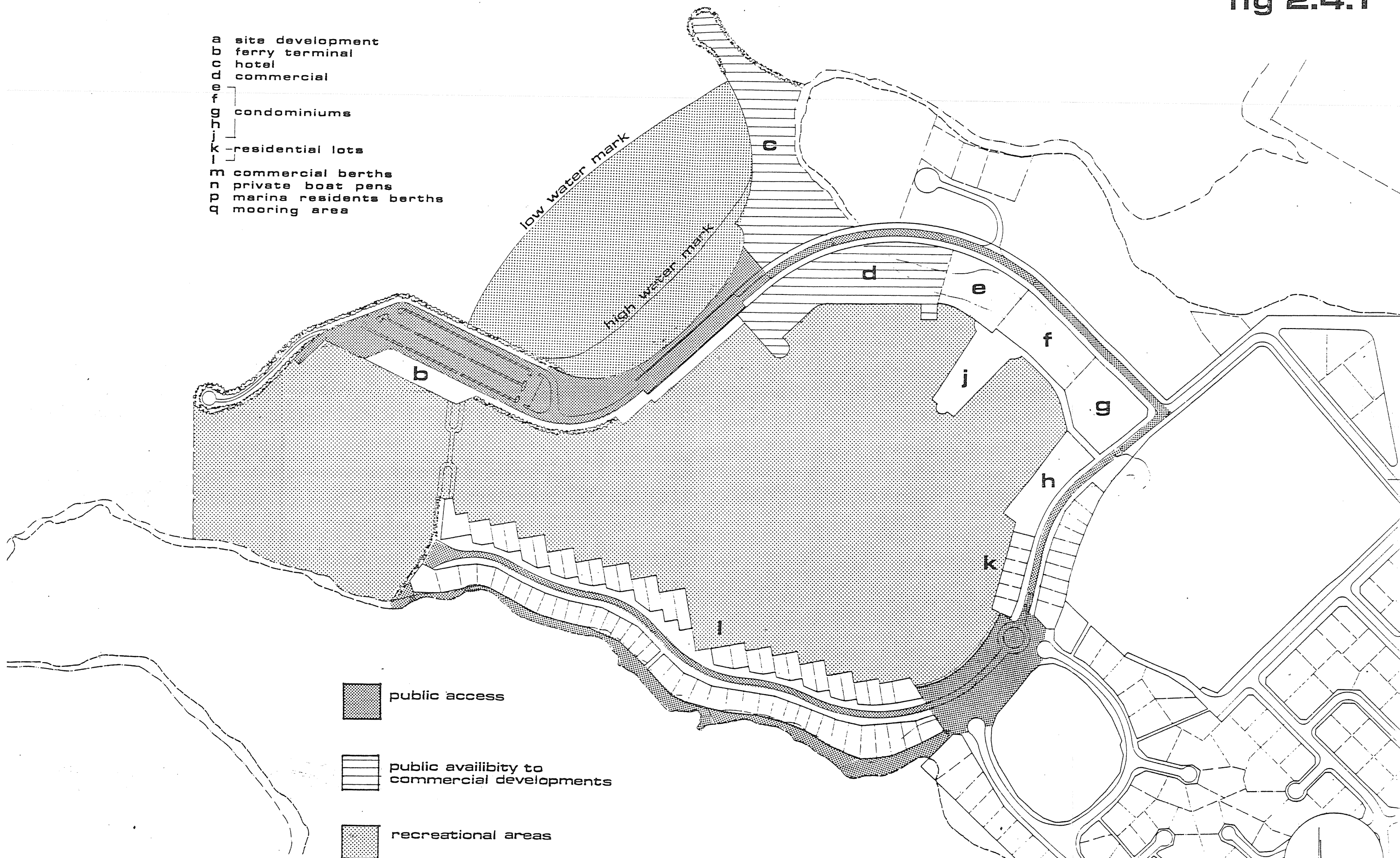
The development of Myilly Point park and the public beach both virtually non-existent would become available to be public.

The Marina residents would use the water as their principal recreational playground which is the main reason for their investment into the area.

A walkway behind the corridor of southern housing blocks from Kahlin oval to Emery Point will be open for public access. See Reference Figures 2.4.1, 2 and 3.

fig 2.4.1

- a site development
- b ferry terminal
- c hotel
- d commercial
- e condominiums
- f residential lots
- g commercial berths
- h private boat pens
- i marina residents berths
- j mooring area



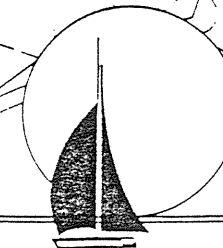
subdivision plan

DARWIN MARINA ESTATE

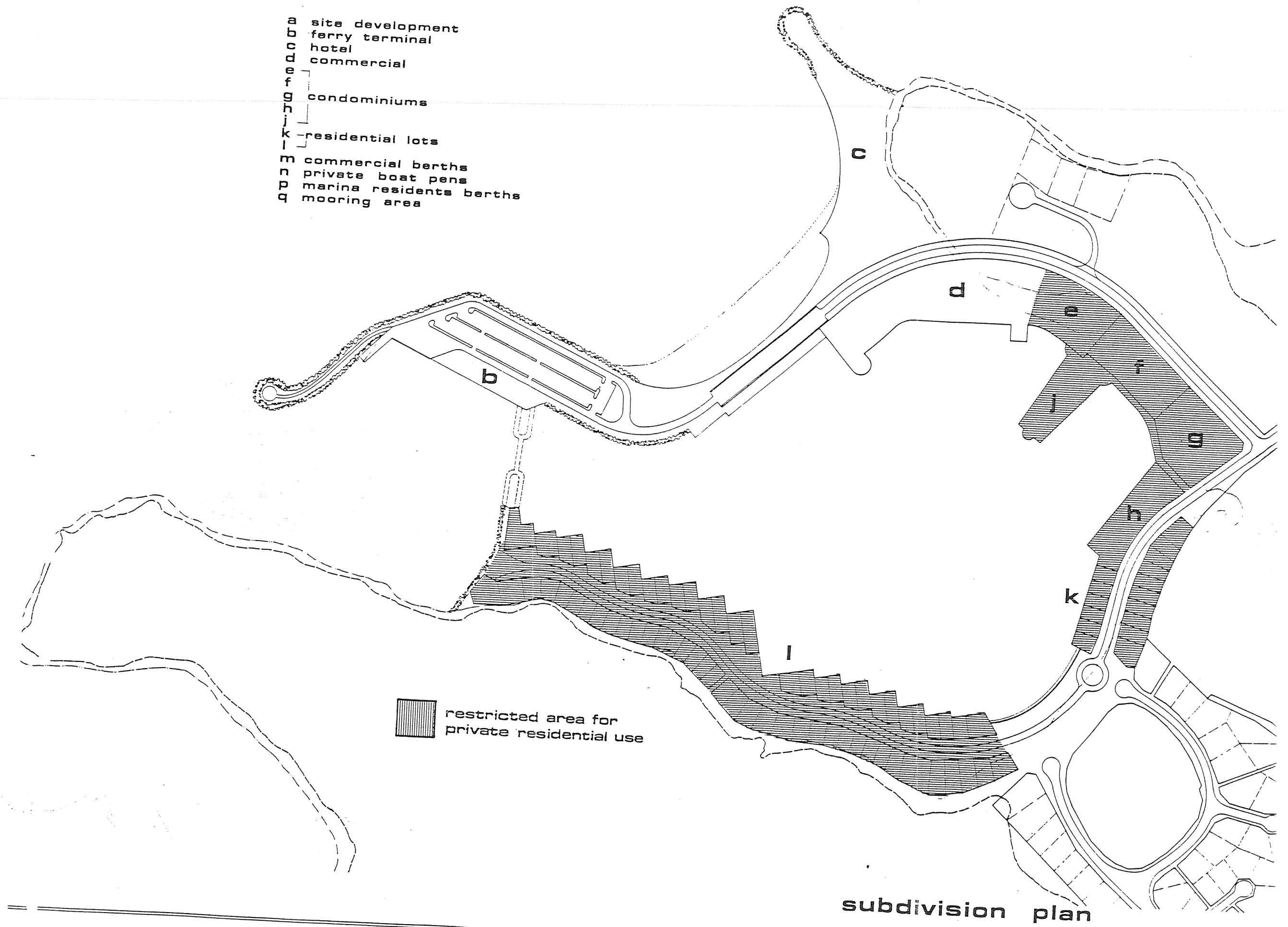
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JUNE 87

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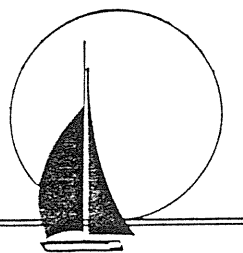
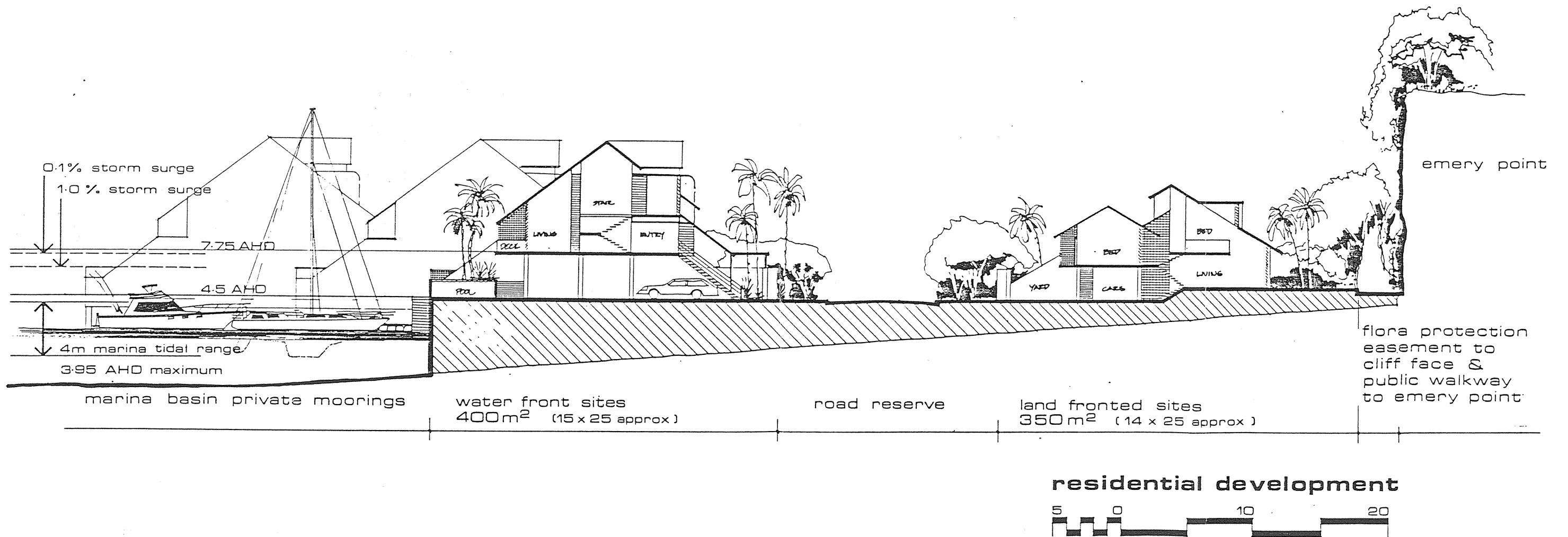


- a site development
- b ferry terminal
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- g }
- h }
- i } residential lots
- j }
- k }
- l }
- m commercial berths
- n private boat pens
- p marina residents berths
- q mooring area



subdivision plan

fig 2.4.3



2.5 CHANGES TO SOCIAL STRUCTURE

There is no doubt that there will be changes to the social structure of the area. The University and future Casino's developments will produce further differences.

However, studies have shown that Marinas and sensitively developed waterfront areas enhance the social amenity and desirability of the area. In cities such as Sydney where waterfront land is prominent, desirability to live within or adjacent to these areas are well known.

Cullen Bay is the only such site available in the immediate Darwin area offering these amenities. It should also be noted that the principal component of the development on the North side is public and commercial and will therefore provide access to the activities of the Marina and Harbour to Darwin's total population:

2.6 CONSTRUCTION PHASE NOISE AND DISRUPTION

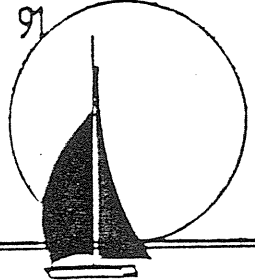
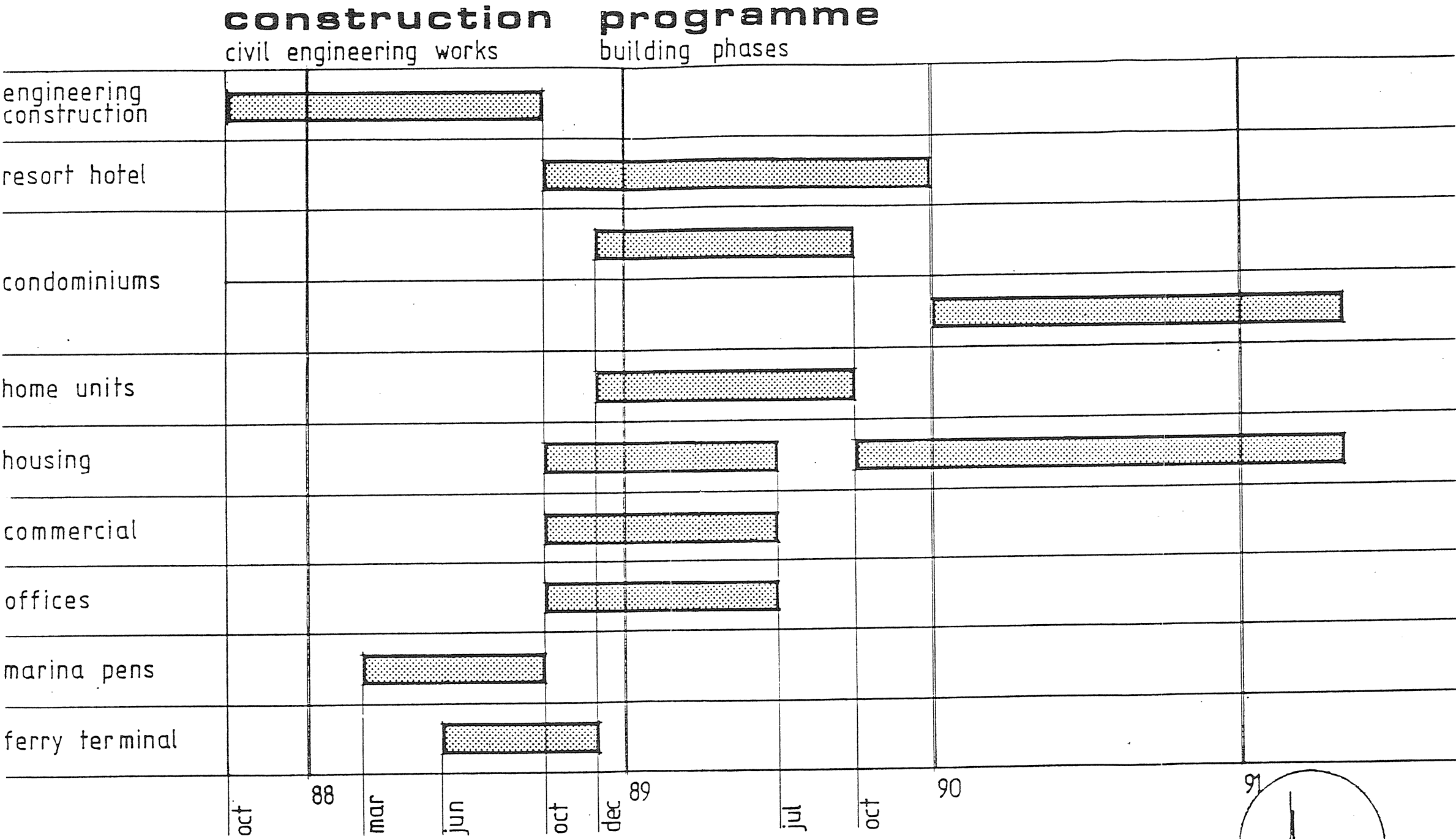
In order to minimize noise and dust population during construction strict standards will be set in accordance with regulations and acts. Specific times of machinery work, pile driving etc. will be established within the -construction documentation.

Darwin Marina Estate will be maintaining the standards established by statutory authorities and all claims of command for this responsibility should be handled through the developer.

To Control any inconvenience to nearby residents created by construction contractors an open door communication policy between the public and the developer will be adopted.

Refer to Figures 2.6.1 for details of construction programme and building phases.

fig 2.6.1

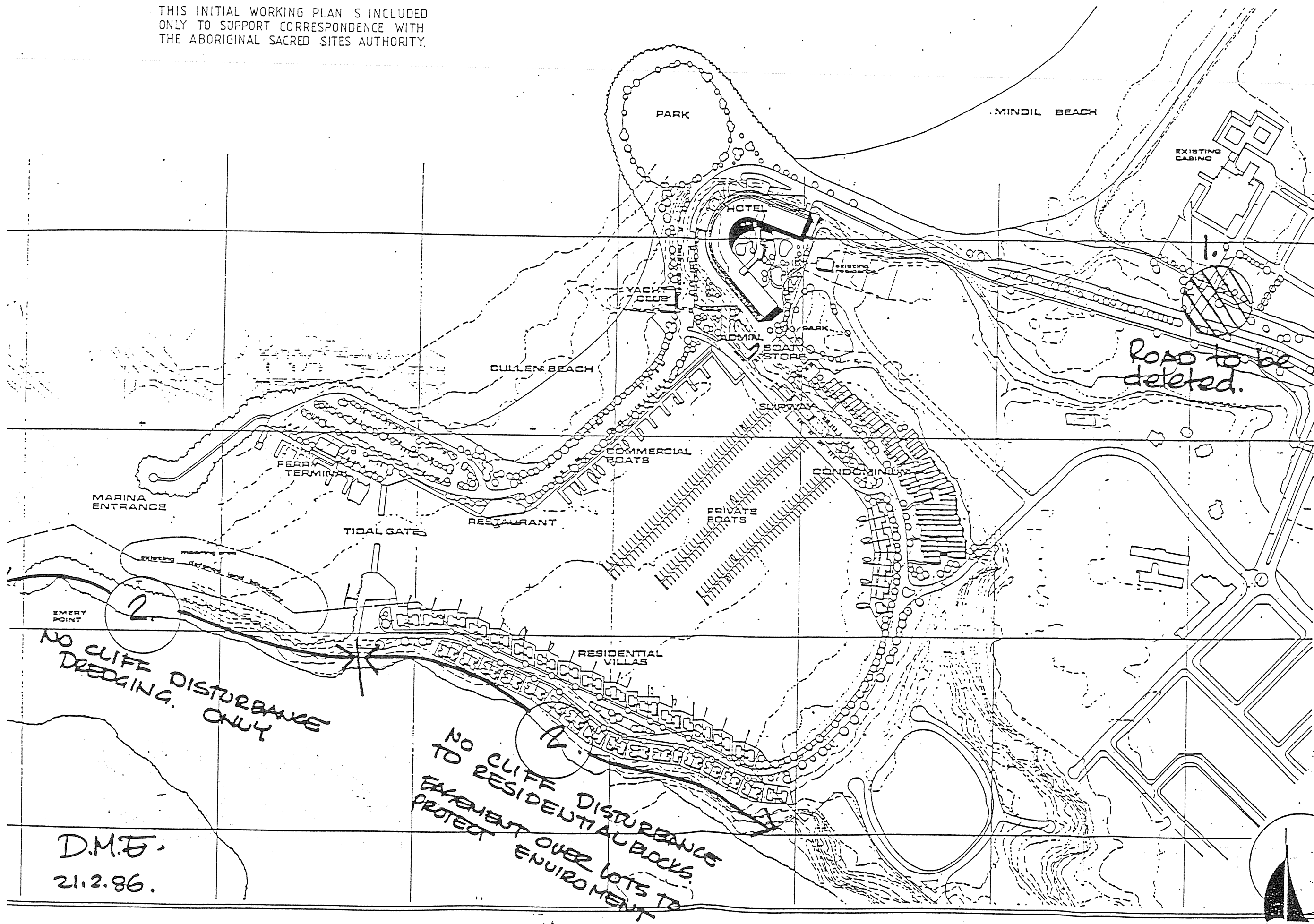


DARWIN MARINA ESTATE

VOS WOODHEAD PLANNING GROUP & WOODHEAD AUSTRALIA ARCHITECTS 17 LINOSAY STREET DARWIN P.O. BOX 1661, DARWIN, NT JUNE '97 PROJ No DAR-001

proposed land use

THIS INITIAL WORKING PLAN IS INCLUDED
ONLY TO SUPPORT CORRESPONDENCE WITH
THE ABORIGINAL SACRED SITES AUTHORITY.

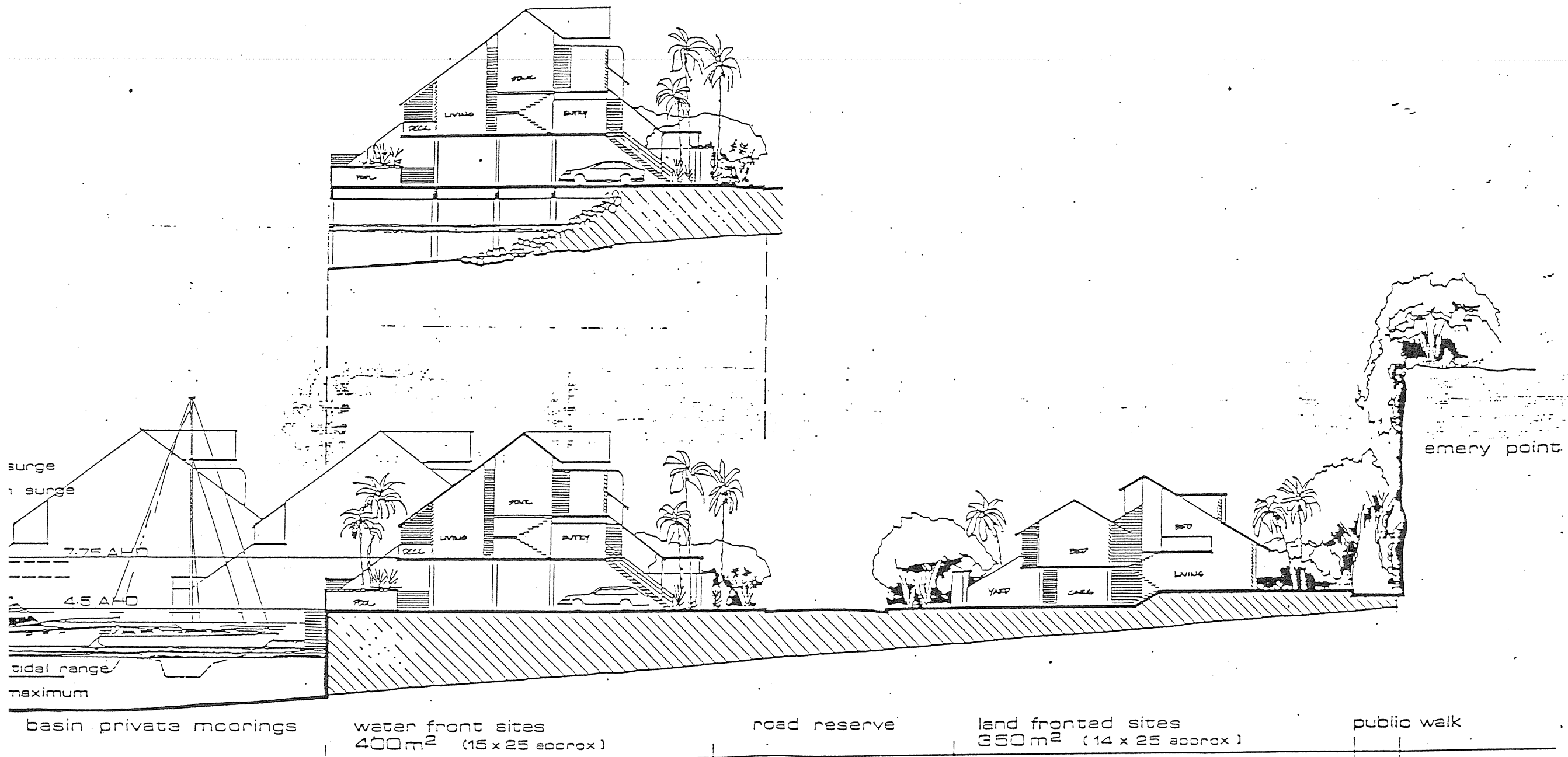


NO CLIFF DISTURBANCE
DREDGING ONLY

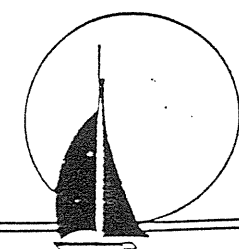
NO CLIFF DISTURBANCE
EXCEPT OVER LOTS TO
PROTECT ENVIRONMENT

D.M.F.
21.2.86.

DARWIN MARINA ESTATE



residential development



DARWIN MARINA ESTATE

3.1 MANAGEMENT OF MARINA COMPLEX

Section 2.5.9 Vol. 1 of the Draft E.I.S. sets out the management responsibilities of the Harbour Master.

The term Harbour Master will be changed to MARINA MASTER so there is no confusion with the Darwin Harbour Master. He and his staff would be employed and administer the Marina. This management team would be remunerated by the Corporate Management body funded by the residents, commercial participants and boat users.

The Body Corporate and Marina Master would control standards of operation and maintenance of the Marina complex and moorings with the exception of the public areas, Ferry Terminal and beach.

Articles of Association of the Body Corporate are being prepared to suit local conditions from samples gathered from other such developments and form the basis of the management maintenance responsibilities.

Levies on Land and Marina owners would pay all matters concerning central and marine related functions and will also be responsible for acting on behalf of the Darwin Marina Estate residents and users.

Local and statutory authorities would take a normal role regarding health and safety matters.

3.2 DREDGING EFFECTS - SANDBAR AND CULLEN BAY

The dredging of the sand bar will be conducted using a cutter suction dredge delivering sand direct to the new beach development by pipeline. At least some of that pipeline will be submerged to allow boating traffic to continue to use the channel on the shore side of the bar.

Given to the relatively coarse nature of the sandbar material, the turbidity caused by dredging is expected to be very small. Sand will be pumped direct to the beach where it will be temporarily banded to inhibit the loss of any fine material. Turbidity as a result of dredging will be monitored as part of the contractors responsibility to disallow public inconvenience or permanent damage and it should be significantly less than occurs naturally in Darwin harbour during the wet season.

The effectiveness of the sand bar as a barrier to cyclone wave attack is determined by its height and width. The material to be removed from the bar will be taken as a relatively thin slice from the seaward edge. The height of the bar will therefore be unaffected. The width of the bar remaining after dredging will still be approximately 1.5 times the wavelength of the cyclone waves. One wavelength is sufficient to cause the larger waves to break prior to reaching the development structures.

The new beach is to be placed by hydraulic means and so its initial relative density will be high. The beach will then be reshaped by mechanical means which will loosen the surface layer. With wave and tidal action that upper surface will quite quickly recompact.

There can be expected to be some redistribution of the beach as a result of wave action over the initial 12 months or so. An excess of fill will be placed on the beach in the first instance to allow for that natural reshaping. No replenishment is therefore expected to be required in the short term.

The public beach area would be vested in the local authority upon development completion for maintenance and control with any re-dredging needs being undertaken as per 3.5.

3.3 WATER QUALITY CRITERIA

Further to authorities recommendation, liaison between the developer and the Water Resources Group of the N.T. Water Authority has taken place. An initial 3 monthly sampling programme for the first year and subsequently 6 monthly samplings for required water valve standards will be established and documented as a part of the development lease agreement. Monitoring would be undertaken by the Darwin Marina Estate's Marina Master and analysis reporting by a commercial company such as Amdel-N.T. or a similar known and acceptable company recognized by the statutory authority.

? value

3.4 COST TO N.T. GOVERNMENT

Initial Head Works

The project is considered as a normal subdivision requiring services of roads, telephone, sewerage, water reticulation, and electricity all to be provided and in place by the completion time of the Marina civil works estimated by October 1988. The Developer would provide all internal services whilst the N.T. Government would provide services up to the boundary of the site. Cost of services would be met in the established manner with the various authorities collecting rates and charges etc.

Ongoing marina maintenance and service costs as proposed in 3.1 would be a condition of purchase by individual land and unit holders and subject to the joint management fund of the Marina's Body Corporate. Internal reticulation services would be considered to be vested in the various authorities on developments completion after an agreed defects liability period.

3.5. DREDGING RETURN PERIOD

The extent of maintenance dredging which will be required is difficult to estimate, an attempt has been made by analysis of the samples taken during the study period.

Based on the analysis undertaken and confirmed by the historical evidence of two similar harbours in Darwin it is possible to be reasonably confident that siltation and maintenance dredging will not be a significant operational or financial problem.

It is recommended that the situation be monitored for a period following construction.

A schedule to cover possible dredging return or silting up responsibilities should be discussed and incorporated within the development lease setting out say:

To year 2	100%	Developers/Body Corporate Fund
Year 2 to 4	80%	Developers/Body Corporate
	20%	government
Year 4 to 6	50%	Developers/Body Corporate
	50%	government
Year 6 to 8	25%	Developers/Body Corporate
	75%	government
Year 8 onwards	100%	government

3.6 CULLEN BAY MARINE FAUNA

On the proponents research into the seabed fauna it was shown to be tidal mud flats of little significance. The immediate area close to Darwin has many such mud flats and the reconstruction of Cullen Bay was felt not to be a loss to the ecology of the region. The fauna replacement type would be different as Cullen Bay will no longer be subject to complete tidal movement and drying up.

3.7 EFFECTS OF MANGROVE REMOVAL

In this instance the 1.3 Ha area involved compared with Darwin Harbour's 26,000 Ha renders the Cullen Bay mangroves' contribution to productivity, atmospheric gas exchange and fish habitat insignificant in the regional context : the further important mangrove function of shore line stabilizer will have no relevance to the developed shore line of the final marina. It should be mentioned that one positive benefit, noted by the Department of Health, will be a reduction in the number of biting midges in the bay environs.

Refer to E.I.S. Vol. 2 Figure 1.4 to show the size and location of mangrove cluster.

(= Fig 2.1 in Voss 87 doc)

3.8 BEACH REPLENISHMENT

The beach sand will be placed hydraulically and therefore will be well compacted at the time of placement. Apart from the surface which will have been re-worked there should be no "settling in" period required.

Beaches are by their nature dynamic. They can be expected to rotate during seasons as the predominant wave directions change and sand will move offshore during storms and then gradually back onshore during periods of mild wave climate.

Traditionally the extent of changes in beach alignment in Darwin has been small and dominated generally by cyclonic events. The new beach will be contained between headlands to accommodate the seasonal rotations. Material may be lost from the beach when severe storms take sand offshore into the influence of the strong tidal streams which can then remove it from the system.

The beach will be designed to minimize such loss although it would be imprudent to assume that beach replenishment will not be required from time to time. All the evidence available suggests that replenishment will be small but it is not possible to quantify it, at this stage.

It is recommended that beach profiles be monitored over a period of years and beach replenishment be covered by the maintenance fund discussed in Section 3.5.

3.9 NAVIGATION AIDS

The proponents acknowledge that the provision of navigation aids to enter the Marina are the responsibility of the proponent. This would include their installation and maintenance.

Advice will be sought from the Port Authority on the type and positioning of all navigation aids and the following may be required:

- Entry Lights
- Lead Light
- Electronic Navigation Aids

4.1 CONSTRUCTION EFFECTS

Sea level rise as a result of the greenhouse effect is still very much an unknown quantity. There are two conferences planned in early December 1987 at which sea level rise will be discussed. One is sponsored by the CSIRO to be held in Melbourne and the other sponsored by the Institution of Engineers in Launceston.

Following those two conferences the Institution of Engineers' National Committee on Coastal and Ocean Engineering will be preparing a position statement on the matter. One of the Directors of Riedel & Byrne is on that committee and will be involved in its preparation. The developers have addressed the phenomenon as it is known today and planning to this point is for road and building blocks only. It must be noted any proposed residential construction will be subject to building codes on the day of issue.

In the event if the potential greenhouse phenomenon does occur, the high range of Darwin's tide and significant build-up of finished levels to reclaimed ground would reduce the return period.

The present statement that the sea level may rise between 200 mm and 1500 mm is a very broad and generally an unqualified expression.

Sea levels have risen some 200 mm over the past century and the accelerated rise in level over the next 30 to 50 years appear optimistic and debatable.

At this stage it is expected that allowance for such a sea level rise can be accommodated by the development.

4.2 ENGINEERING/GEOLOGICAL STUDIES

A detailed site investigation programme enclosed has been prepared and this will be initiated once project approval has been given. The programme has been designed to identify the different types of material and establish their properties.

A large quantity of fill is required for this project. At this stage it has been assumed that all material to be dredged will be able to be accommodated within the development, although in some areas it will need to be mixed with good quality engineering fill.

The following are the initial assumptions on fill/excavation requirements.

Material	Origin	Fill Location	Quantity m3
Sand/Silt/Mud	Marina	Reclamation	350,000
	Outer Harbour	Reclamation	130,000
	Channel	Reclamation	40,000
Phyllite	Outer Harbour Channel	Reclamation	130,000
		Reclamation	100,000
Fill	Imported	Reclamation	180,000
		Beach Station	100,000
Impermeable Core	Imported	Beach Section	100,000

It is anticipated that the final design will be modified as required following the detailed Engineering and Geological studies to accommodate all excavated material in the project and to minimize the quantities of imported fill.

*accordance
with the
requirements*

Drilling and Sampling

We propose to sample the surface soils and underlying phyllite by drilling five boreholes from a support barge at the locations shown on Figure 1. The boreholes would be drilled to nominal depths of 10m (2) and 15m (3).

Undisturbed sampling of the surface soils in the boreholes would be carried out at approximate intervals of 1.5m. Coring of the underlying phyllite material would be carried out using reverse circulation techniques and a triple tube core barrel.

Coring of the phyllite may be restricted to locations and periods of low tide when the support barge is sitting directly on the sea bed as only minor movement of the drillrig during coring operations could cause significant problems.

Probing

Probing in combination with in situ vane shear testing and possible sampling would be carried out at up to twelve locations as shown on Figure 1. These investigations would either be carried out from the barge or from the exposed sea bed at low tide. Probing would be carried out to define the depth of the loose/soft surface sediments and would supplement the dynamic cone penetrometer probes performed during the preliminary investigation. In situ vane shear tests would provide field shear strengths of any cohesive materials present and supplementary sampling for disturbed and undisturbed samples may also be carried out.

LABORATORY TESTING

Laboratory testing on the range of materials likely to be sampled would comprise classification tests to confirm visual classifications, and strength and consolidation testing of the surface soils and underlying clays for evaluation of the engineering properties of these materials. In addition, unconfined compressive strength tests would be carried out on the phyllite material to determine strength characteristics and variability.

4.4 CONSTRUCTION PHASE - TURBIDITY LEVELS

Ref: 3.2 for Monitoring and Action. The fine material to be dredged from the outer harbour will result in increased turbidity. It is not expected to be significantly more severe than occurs naturally during the wet season.

The current measurement programme undertaken for this project indicates that for both ebb and flood tides there is a flow out of Cullen and Fannie Bay between the sand bar and Emery Point. This means that under most conditions any material in suspension will flow out into the main channel and away from Mindil and Vestey's Beaches and East Point Reef. Refer to the current measurement at location 6 (outer harbour location) on Figure 2.4 in Volume 2 of the E.I.S.

4.6 CONSTRUCTION PHASE DISRUPTION

Significant material will be moved in the first 6-8 months. If construction can start in late 1987 the wet season would keep dust down.

After 12 months of construction the major civil component will be over.

It is also worth reiterating that all heavy construction machinery will be fixed on site as there is no need to operate off site.

The civil construction inconvenience level is therefore not much greater than 12 months. Beyond that time normal building construction would prevail.

Also at that time it would be expected that the Marina basin is in operation as well as the first stage of the Ferry Terminal.

Refer 2.6 Development Phases for projected construction times and residential public relations policy.

5.1 ABORIGINAL EFFECTS

Discussion with Directors of the Sacred Sites Council and letters outlining these negotiations are enclosed and self-explanatory.

ENVIRONMENT UNIT

80/24

28th February, 1986

Secretary
Northern Territory Planning Authority
G.P.O. Box 1680
DARWIN N.T. 5794

Dear Madam,

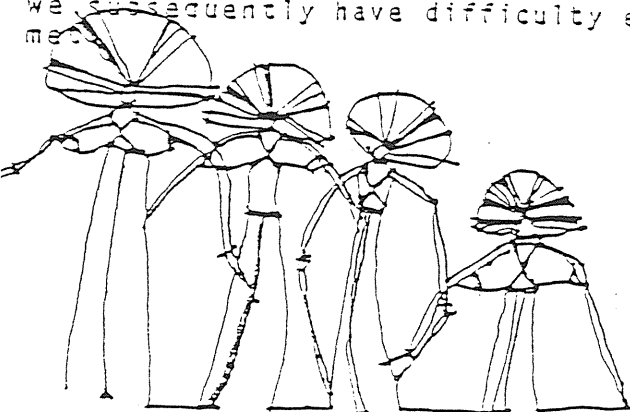
PROPOSED REZONING OF CULLEN BAY
HANS VOS PLANNING CONSULTANTS PTY LIMITED

Thank you for your letter of 27th February, 1986 inviting this Authority to be represented at a public hearing to be held at the Darwin City Council Chambers in Harry Chan Avenue at 9.30 am on 6th March, 1986.

I regret that I will not be able to attend this meeting as the timing conflicts with other commitments. Since writing to you with respect to my objections I have had the opportunity to discuss the proposed plans of Mr. Hans Vos in some detail with him.

I enclose for your information a letter received by this Authority from Mr. Vos relating to those discussions. I can advise that if the changes identified in Mr. Vos' letter are reflected by amendments to the Draft Planning Instruments 0232 and 0233 this Authority will have no objection to the proposed Marina and Condominium Development.

Until these matters are addressed and result in changes to the plans as currently before the Planning Authority however, our objections remain. It has been our experience in situations where developers have agreed to changes that unless those changes are actually recorded in the official documents of approval that we subsequently have difficulty ensuring that the commitments are met.



In this case it appears the applicant had failed to carry out the necessary preliminary investigations and negotiations prior to placing before the Planning Authority the applications for Draft Planning Instruments.

In the circumstances, therefore, I reiterate that this Authority would have no objection to the proposals once the amendments are effected in the draft plans and shown clearly as the actual applications made to the Planning Authority.

Yours faithfully,

A handwritten signature in dark ink, appearing to be 'R.W. Ellis', written in a cursive style.

R.W. ELLIS
Director

JCV:GB:8527

21st February, 1986

The Director,
Aboriginal Sacred Sites Authority,
G.P.O. Box 1890,
DARWIN. N.T. 5794

Attention: Mr. Bob Ellis

Dear Sir,

RE: DARWIN MARINA ESTATE

Further to our discussions of 21st February, 1986, I would like to confirm the following.

1. The island identified in the existing creek and stormwater outfall between the Casino and Myilly Point shows a roadway across that site on our development drawings.

The road link is now no longer required and will therefore be removed from any future documentation. It may be possible that a future pedestrian link is provided across the creek and if this occurs, we will consult with you to ensure that the location of such a road will not infringe on any sacred sites.

2. The area adjacent the Larrakeyah Military base will not be used or affected by the proposed development.

All the intended development will be on reclaimed land.

The face of the cliff will not be disturbed in any way either by removing of vegetation or mining of the face.

It is the Developer's intention to create an easement along the cliff face which will be endorsed on the subsequent titles of the land prohibiting such disturbances.

At the entrance to Larrakeyah point there will be some dredging of the sea bed to create a deeper harbour entrance. This again will not affect the cliff face and its vegetation.

I have enclosed a reduced copy of our drawing which identifies the areas raised in this letter.

I trust this is sufficient information for the Authority to consider its interests in this proposal.

Yours faithfully,

HANS VOS

6.1 GOVERNMENT RESPONSIBILITIES

An overview can be obtained from 3.1 and 3.4 in this response.

6.2 FUNDING AND COMPLETION OF PROJECT

The capital cost and risk is undertaken by the developers with Government outlay being on a progress payment/work related base. The funding method is to be the developer's prerogative.

6.3 ALTERNATIVE SITES

This matter has been previously addressed and it is understood that public and proponent acceptance is now in place for this site. The strength of demand and reaction from the people of Darwin regarding the quality of life style offered within the Marina development is such that all the residential blocks and a large percentage of boating facilities have commitment of purchases against them. The importance of this tourist facility adds a further range of services much needed to Darwin's infrastructure.

6.4 DRAINAGE OF KAHLIN OVAL

The proprietors will undertake to cover any standard local authority drainage requirements for Kahlin oval.

6.5 HOTEL REZONING

A formal application has been lodged with the respective authorities.