MARINE MANAGMENT SUPPORT
NINGALOO

NINGALOO MARINE PARK MONITORING PROGRAM:
RE-SURVEY OF MONITORING SITES IN BENTHIC COMMUNITIES IN AREAS OF HIGH HUMAN USAGE IN DECEMBER 2000

Data Report: MMS/NIN/NMP-30/2000

A collaborative project between the Marine Conservation Branch
and Exmouth District Office of CALM

Part funded by *Coasts and Clean Seas*

an initiative of the Natural Heritage Trust

Natural Heritage Trust
Helping Communities Helping Australia

Prepared by Tim Grubba and Carolyn Williams

December 2000

Marine Conservation Branch
Department of Conservation and Land Management
47 Henry St.
Fremantle, Western Australia, 6160

ACKNOWLEDGMENTS

Direction

Director, Nature Conservation Division, CALM - Keiran McNamara
Manager, Marine Conservation Branch (MCB), CALM - Dr. Chris Simpson

CALM Regional/District collaboration

Regional Manager, Pilbara Region, CALM - Chris Muller
District Manager, Exmouth District, CALM - Doug Myers
Marine Conservation Officer, Exmouth District, CALM - Carolyn Williams
Marine Reserves Officer, Exmouth District, CALM - Adam Meyer
Operations Officer, Exmouth District, CALM - Arvid Hogstrom
Portfolio Leader - Monitoring, MCB, CALM - Jennie Cary
Marine Conservation Officer, MCB, CALM – Timothy Grubba

Project Supervisor, MCB, CALM – Jennie Cary
Field Team Leaders, Exmouth District, CALM – Carolyn Williams and Adam Meyer

Funding / Resources

This project was partially funded by *Coasts and Clean Seas*, an initiative of the Natural Heritage Trust. Significant resources including personnel, equipment and logistical support were provided by the CALM Exmouth District office and MCB.

This report may be cited as:

Grubba T and Williams C (2000). Ningaloo Marine Park Monitoring Program: Re-survey of monitoring sites in benthic communities in areas of high human usage in December 2000. Data Report MMS/NIN/NMP-30/2000. (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished report.

Copies of this report may be obtained from:

Marine Conservation Branch
Department of Conservation and Land Management
47 Henry St.
Fremantle, Western Australia, 6160

Ph: (08) 9336 0100
Fx: (08) 94305408

SUMMARY

This data report presents the data collected during the re-survey in December 2000, of ten monitoring sites in benthic communities located in areas of high human usage in the northern region of Ningaloo Marine Park. The ten sites were established in 1999 as part of the Ningaloo Marine Park Monitoring Program (NMPMP). For each site, the habitat type, dominant species and visible impacts were described. Associated high quality video imagery that was acquired at the sites has been archived. The Department and the Marine Parks and Reserves Authority (MPRA) use this data to assess (audit) the status of the key ecological and social values of the NMP against pre-determined management targets. If targets are exceeded or adverse trends are identified then this triggers the Department and the MPRA to adapt NMP management strategies to ensure that human activities are ecologically sustainable.

The NMPMP is part funded by *Coasts and Clean Seas*, an initiative of the Natural Heritage Trust and CALM.

The NMPMP is coordinated by the Exmouth District Office and Marine Conservation Branch (MCB) of CALM.

Companion reports associated with this project are: Cary *et al*., (1999), Cary *et al*., (2000), Cary *et al*., (2000) and Grubba and Williams (2000).

CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1 INTRODUCTION

1.1 GENERAL

In 1998, *Coasts and Clean Seas*, an initiative of the Natural Heritage Trust provided $103,050 to the Department of Conservation and Land Management (CALM) to establish a long-term monitoring program in the Ningaloo Marine Park (NMP) (Figure 1). This was titled the *Ningaloo Marine Park Monitoring Program*, (NMPMP). The main aim of the NMPMP is to establish a network of long-term re-locatable monitoring sites to gather quantitative baseline data. The Department and the Marine Parks and Reserves Authority (MPRA) use this data to assess (audit) the status of the key ecological and social values of the NMP against pre-determined management targets. If targets are exceeded or adverse trends are identified then this triggers the Department and the MPRA to adapt NMP management strategies to ensure that human activities are ecologically sustainable.

This data report presents the data collected during the re-survey in December 2000, of ten monitoring sites in benthic communities located in areas of high human usage in the northern region of NMP. The ten sites were established in 1999 as part of the NMPMP. For each site, the habitat type, dominant species and visible impacts were described. Associated high quality video imagery that was acquired at the sites has been archived.

The December 2000 field survey was coordinated by the Exmouth District office of CALM (Contact: Doug Myers) in collaboration with the Marine Conservation Branch (MCB) of CALM (Project Supervisor: Jennie Cary).

1.2 BACKGROUND

The management of WA's marine conservation reserves is now based on an outcome-based "best practice" model of performance reporting in natural resource management (ANZECC, 1997). The "best practice" model facilitates the assessment (auditing) of management performance allowing for a more adaptive and effective management style. To facilitate the conversion to this new model, the Department is developing marine work plans (MWP) for each marine park as an interim bridging mechanism. The MWP for each marine park identifies all the ecological and social values, listing for each value:

- existing and potential uses and/or pressures,
- management objectives,
- strategies,
- performance measures/s,
- desired trends, and
- targets.

In addition, the MWP prioritises values and management strategies using a value/threat framework (Simpson *et. al,* 2002). Values identified as having the highest priority and being the most threatened by human impacts are classified as Key Performance Indicators (KPI). For each KPI there are established short-term and long-term targets, which can be audited. Lower priority values are classified using the scale: high, medium and low. Priority is given to monitoring programs that provide the quantitative baseline data necessary to identify trends and assess whether established management targets of KPIs are being met (i.e. auditing).

Monitoring programs generally comprise of one or more of the following components: (i) local scale impact or *compliance monitoring* that examines the effects of human activities in a localised area; (ii) temporally-constrained, broadscale *surveillance monitoring* to assess the response of key biological parameters to episodic regional physical and biological processes (eg the effect of storms and predators) and (iii) spatially-constrained, long-term monitoring of key biological parameters to determine the extent and cause of *natural variation* (eg seasonal and inter-annual variability) of key ecosystem attributes.

The NMPMP established a network of 52 monitoring sites in 1998 and 1999 along the back reef and lagoon areas of the NMP and proposed southern extension to collect baseline data on the benthic communities. Thirty sites are permanent 'transect' long-term monitoring sites. At each 'transect' site there are three 50m long straight transects, laid end to end, with a 10m gap between each. The start of the first transect and the end of the third transect are permanently marked using star pickets. 'Transect' sites are used to quantitatively sample benthic communities for surveillance and natural variation monitoring. Twenty-two sites are 'non-transect' sites. At each 'non-transect' site there is a sample area, which is not permanently marked. 'Non-transect' sites are used to qualitatively sample larger areas and are used for compliance monitoring. An additional 17 non-permanent 'transect' sites were added to the NMPMP network (bringing the total to 69 sites) that were established in Bills Bay in 1989 to monitor the impacts of the 1989 coral spawning which caused anoxia which resulted in mass coral mortality. At each of the 17 non-permanent 'transect' sites three 50m long transects are laid parallel to each other, with a 20m gap between each. Star pickets were not used to mark these sites.

Additional monitoring sites will be added to the NMPMP as required, to fill gaps identified in the networks. The NMPMP will also expand with the development and implementation of monitoring programs to collect baseline data on the other KPIs (Table 1).

Table 1. Key Performance Indicators (KPIs) for the Ningaloo Marine Park

Key Performance Indicator
• Water Quality
• Coral reef communities
• Whale sharks
• Loggerhead turtles
• Seascapes
• Coastal use
• Indigenous heritage

1.3 AIMS OF THE NMPMP

The main aim of the *NMPMP* is to establish a network of re-locatable long-term monitoring sites to monitor the status of key ecological and social values in the NMP and proposed southern extension.

- To establish a network of sites in representative undisturbed areas of the NMP to assess the effects of natural processes on KPIs.
- To establish a network of sites in areas of human activity/pressure in NMP to assess the impacts of human activities on KPIs.
- To determine the presence/absence and relative abundance (if appropriate) of key species at each monitoring site.
- To take still images and video footage of benthic communities at representative sites on an opportunistic basis to assist with future education programs.

1.4 OBJECTIVES OF THE DECEMBER 2000 SURVEY

The objectives of the December 2000 field survey were:

- To re-survey 10 monitoring sites established in 1999, in benthic communities in areas of high human usage in the northern region of the NMP in order to collect qualitative data on human impacts and coral community 'health'.

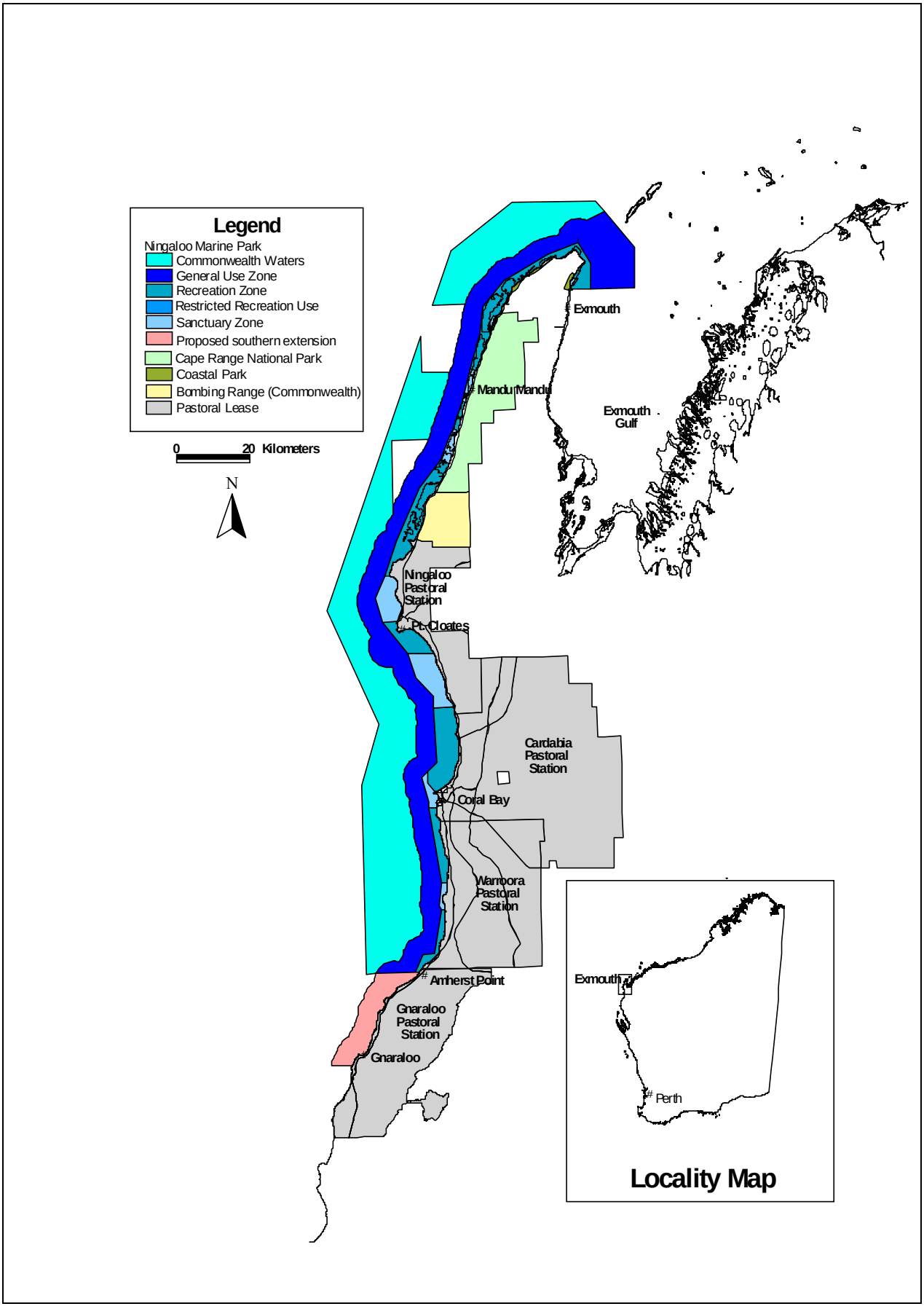


Figure 1. Location map of Ningaloo Marine Park and proposed southern extension

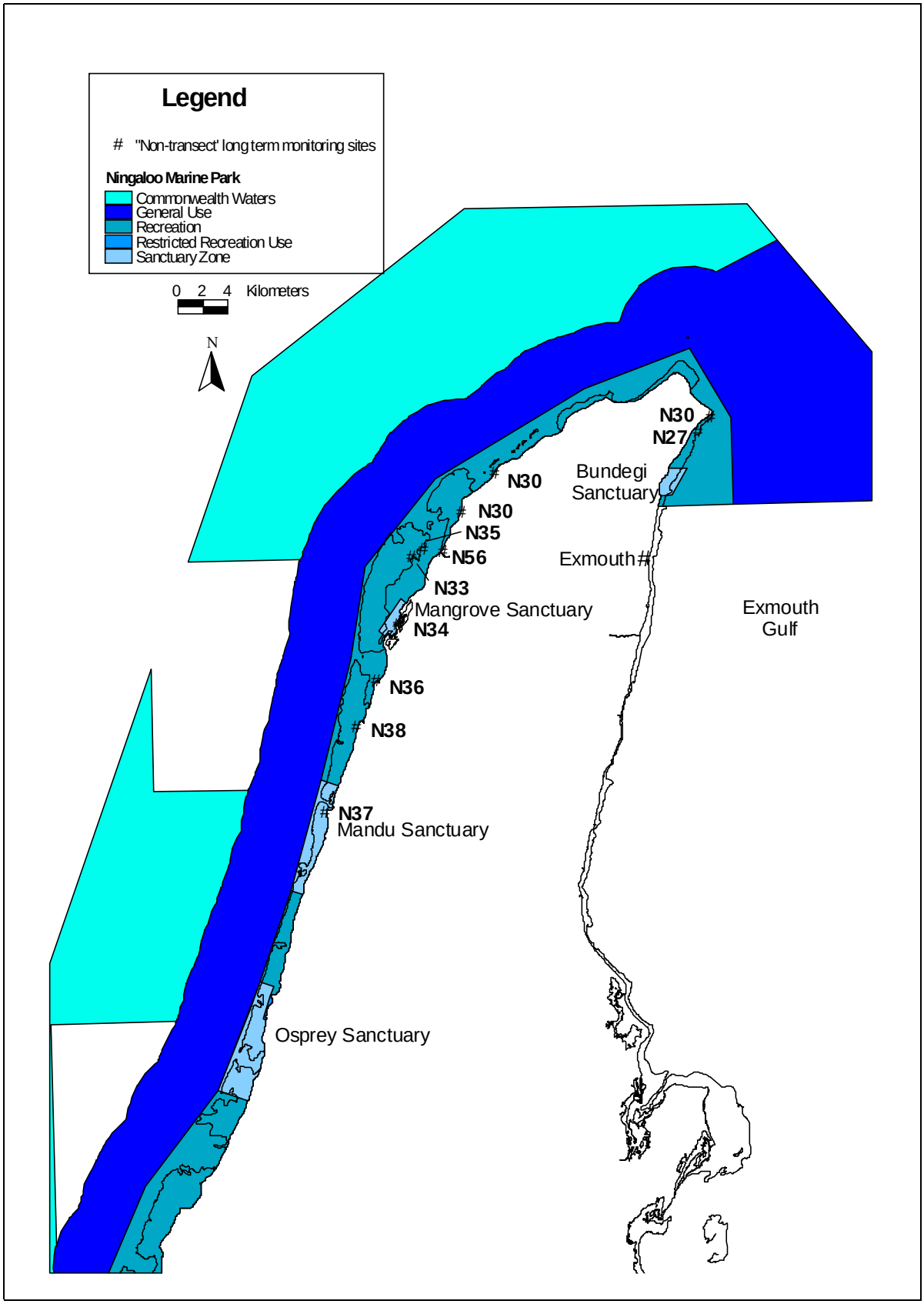


Figure 2. Location of the ten monitoring sites in benthic communities re-surveyed in December 2000 in the Ningaloo Marine Park. Sites were originally established in 1999 as part of the Ningaloo Marine Park Monitoring Program (Cary *et al.*, 2000).

2 METHODS

2.1 RE-SURVEY OF SITES IN AREAS OF HIGH HUMAN USAGE

A total of ten 'non-transect' monitoring sites in benthic communities in areas of high human usage in the northern region of the NMP were re-surveyed (Figure 2 and Table 2). Sites were re-located using the site description data recorded during site establishment in August 1999. This data includes site maps and site coordinates taken using differential global positioning system (DGPS) set to the datum WGS84 (Cary *et al.,* 2000).

At each site, the surrounding benthic habitat and any visible impacts were recorded using high quality digital video imagery. In addition, these data were qualitatively registered onto two data sheets, as follows:

1. *'Non-transect' monitoring site data sheet* - a site map which includes 'non-transect' site location, observed impacts on benthic habitats, types and abundance of litter and other features of interest; and
2. *Habitat data sheet* – habitat description, including dominant species, description of impacts, human activities, target species presence/absence of crayfish and *Drupella* abundance (referred to as either 'none' (no *Drupella* feeding scars), 'low' (≤ 5 *Drupella* feeding scars) or medium/high (> 6 *Drupella* feeding scars)).

2.2 WATER DEPTH CORRECTION

At each site it was determined whether the site was sub-tidal or inter-tidal by noting the average water depth at the time of sampling and using predicted water level for that same time (source: Department of Transport) to ascertain whether the site is exposed at low water throughout the fortnightly tidal cycle.

3 RESULTS

3.1 DATA SHEETS

See Appendix 1 for the respective pairs of data sheets completed for each monitoring site. See Table 1 for a summary of the information recorded at each site.

Table 2. Summary description of the monitoring sites re-surveyed in December 2000 as part of the NMPMP.

Site No	Site Name	Habitat	Depth (m) [1]	Depth (m) [2]	Intertidal or subtidal	Dominant coral	Litter present	*Panulirus* sp.	*Drupella*	*Drupella* feeding scars	Recent bleaching
N 27	Bundegi human usage	Back reef	2.5	1.35	Subtidal	Acroporidae. (Fungidae bleached)	✗	✗	✔	✔	✔
N30	Navy jetty - South	Limestone pavement/lagoon	5.0	3.96	Subtidal	Alcyoniidae	✔	✗	✗	✗	✗
N31	Jurabi - North/South	Limestone pavement/lagoon	2.0	1.05	Subtidal	-	✗	✗	✗	✗	✗
N56	Tantabiddi boat ramp	Lagoon	0.45	-0.42	Intertidal	-	✗	✗	✗	✗	✗
N35	Tantabiddi glass bottom boat	Lagoon	3.0	1.68	Subtidal	Acroporidae	✗	✗	✔	✗	✗
N33	Tantabiddi-snorkel	Lagoon	2.5	1.27	Subtidal	Poritidae	✔	✗	✔	✗	✗
N34	Mangrove Walk	Mangrove	land	land	Terrestrial	-	✔	✗	✗	✗	✗
N36	Mesa Camp	Limestone pavement/lagoon	3.0	1.93	Subtidal	-	✔	✗	✗	✗	✗
N38	Lakeside	Back reef	3.0	2.05	Subtidal	Poritidae	✔	✗	✗	✗	✗
N37	Turquoise Bay	Back reef	3.0	2.24	Subtidal	Acroporidae and Alcyoniidae	✔	✗	✔	✗	✗

Note: ✔ means present

[1] water depth (m) measured at site at the time of observation

[2] water depth (m) at lowest low water (ie chart datum)

4 DATA MANAGEMENT

4.1 REPORT

Hard copies of this report will be held at the following locations:

1. Marine Conservation Branch library, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6010. Ph. (08) 9366 0100, Fax (08) 9430 5408.
2. Woodvale Library, Science and Information Division, Ocean Reef Rd., Woodvale, Western Australia, 6026. Ph (08) 9306 1641.
3. Archives, Woodvale Library, Science and Information Division, Ocean Reef Rd., Woodvale, Western Australia, 6026. Ph. (08) 9405 5100, Fax. (08) 9306 1641.
4. Exmouth District, Department of Conservation and Land Management, 20 Nimitz St., Exmouth, Western Australia, 6707. Ph: (08) 9949 1676 Fax: (08) 9949 1580.
5. Pilbara Region, Department of Conservation and Land Management, Mardie Rd., Karratha, Western Australia, 6714. Ph: (08) 9143 1488 1676 Fax: (08) 9144 118.

The Marine Conservation Branch will hold digital copies of this report at the following directory pathways:

1. The Marine Conservation Branch Server:
   Shareddata on 'CALM-frem-1' [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_3000]
2. MCB Server full backup DAT tape:
   [T:\144-Marine Conservation Branch\Shared Data\Current_MCB_reports\MMS\mms_3000]
3. CD_ROM [mms_3000]
4. MCB homepage on the Department of Conservation and Land Management Intranet CALMweb: http://calmweb.calm.wa.gov.au/drb/ncd/mcb/rep_pdf/mms_reps/mms_2000/mmsrep00.htm#mms_3000

4.2 VIDEO RECORDS

Original digital videotapes of the sites monitoring during the December 2000 survey (Appendix 2) will be held as follows:

- Mini digital video (MDV) masters have been archived in HOLD08 at the Information Management Branch, Department of Conservation and Land Management, 17 Dick Perry Avenue, Kensington, Western Australia. Ph: (08) 9334 0392 Fax: (08) 9334 0466.
- MDV copies have been stored at the Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St, Fremantle, Western Australia. Ph: (08) 9336 0100 Fax (08) 9430 5408.

5 REFERENCES

ANZEC (1997). Best Practice in Performance Reporting in Natural Resource Management. Department of Natural Resources and Environment, Melbourne.

Cary J L, Grubba T L and Myers J (1999). Ningaloo Marine Park Monitoring Program: Benthic Monitoring sites established in 1998. Data Report: MMSP/NIN/NMP-18/98. (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished report.

Cary J L, Grubba T L, Mahendran M & Radford B (2000). Ningaloo Marine Park Monitoring Program: Benthic monitoring sites established in 1999. Data Report: MMS/NIN/NMP-21/2000 (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished report.

Cary J L and Grubba T L (2000). Ningaloo Marine Park Monitoring Program: Re-survey of monitoring sites in benthic communities in Bills Bay, impacted by the 1989 coral spawning event, in May 2000. MMS/NIN/NMP-24/2000 (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6151). Unpublished report.

Grubba T L and Williams C (2000). Re-survey of long-term monitoring sites established at high human usage sites in Ningaloo Marine Park in 1999. Field Program Report: MMS/NIN/NMP-28/2000 (Marine Conservation Branch, Department of Conservation and Land Management, 47 Henry St., Fremantle, Western Australia, 6160). Unpublished report
.

APPENDIX 1: DATA SHEETS – 'NON-TRANSECT' LONG-TERM MONITORING SITES

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N27	**Site Name**	Bundegi-human usage	**Date**	7/12/2000	**Recorder**	Williams
Vessel	Quintrex		**Time**	15:30	**Weather**	12 kn SW	
Sea	Calm		**Water depth (m)**	2-3	**Water visibility (m)**	7	

GPS Latitude	**GPS Longitude**	**Differential**			
-21.82760 S	114. 17966 E	**Yes**	☐	**No**	☒

Site location	Site located on back reef approximately 200-300m from the end of the Bundegi jetty

Habitat Description

Back reef – coral dominated by *Acropora* sp. (branching and digitate) with large areas of dead coral. Fungidae are common and occasional *Galaxea* sp., *Favia* sp. and *Platygyra* sp.

Dominant Species

Seagrass	Small amount of *Halophila* sp.
Macro-algae	*Caulerpa* sp
Coral	*Acropora* sp. (branching, digitate and dead) Fungiids (partially bleached)
Fish	*Amphiprion* sp. (clownfish), Pomacentridae (damsel fish), *Cromileptes altivelis* (Barramundi cod), *Hemiscyllium ocellatum* (Epaulette shark)
Invertebrates	Anemone, and sea stars

Other Features

Impact or Activity

Fungidae colonies partially bleached. No litter observed. No targeted reef fish sighted. No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. *Drupella* were common but few *Drupella* feeding scars visible.

Video reference	NMPMP/bvt/5-7/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

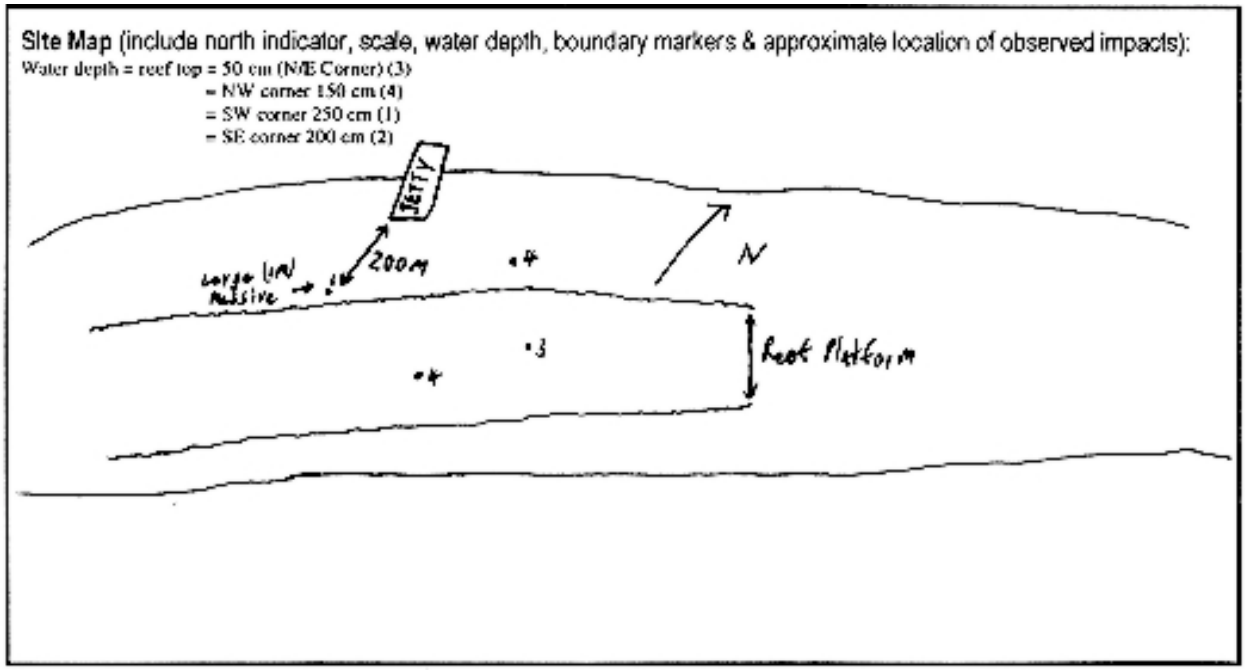
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				Field Survey		December 2000
Site No.	N27	Site Name	Bundegi–human usage	Date	7/12/2000	Observer	Williams

Co-ordinates of Boundary Markers			Observed Impacts
	DGPS Latitude	DGPS Longitude	
1	-21.82760 S	114.17966 E	Refer to Habitat data sheet
2	-21.82773 S	114.17993 E	
3	-21.82745 S	114.18007 E	
4	-21.82732 S	114.17981 E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	Tape no.	NMPMP/bvt/5-7/12/2000 /#1	Main Human Activity	snorkelling
Time coding for all video footage at site:		From:	0:14:27:00	To:	0:23:46:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes:

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N30	**Site Name**	Naval Jetty – South	**Date**	7/12/2000	**Recorder**	Williams
Vessel	Quintrex		**Time**	14:55-15:19	**Weather**	12 knots SW	
Sea	Calm		**Water depth (m)**	5	**Water visibility (m)**	10	

GPS Latitude	GPS Longitude	Differential			
-21.81783 S	114.18968 E	**Yes**	☐	**No**	☒

Site location	Site located just south of the Navy Pier at Pt. Murat inshore from southern dolphin, slightly north (closer to Pier) than shown on August 1999 site data sheet.

Habitat Description

Some limestone pavement with dominant large (3m diameter) limestone lumps covered mainly by soft corals and inverts. Surrounding habitat comprised of flat limestone pavement.

Dominant Species

Seagrass	-
Macro-algae	
Coral	*Sarcophyton* sp
Fish	Scaridae (parrotfish), *Zanclus cornutus* (Moorish Idol)
Invertebrates	*Tridacna* sp (clam) and *Holothuria atra* (sea cucumber)

Other Features

Impact or Activity

Litter included one large pipe (filmed). No targeted reef fish sighted. No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. No *Drupella* sighted.

Video reference	NMPMP/bvt/5-7/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

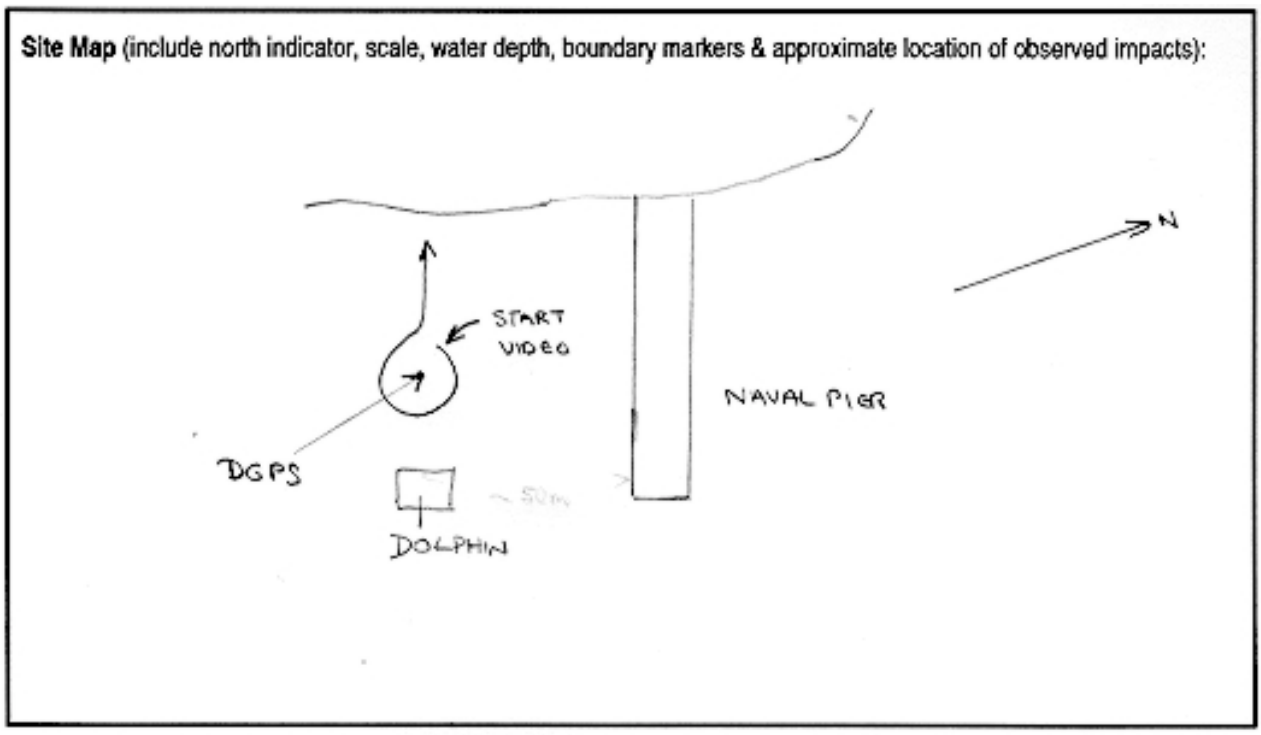
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N30	**Site Name**	Naval Jetty - South	**Date**	7/12/2000	**Observer**	Williams

	Co-ordinates of Boundary Markers		**Observed Impacts**
	DGPS Latitude	**DGPS Longitude**	
1	-21.81783 S	114.18968 E	Refer to *Habitat Data* sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	**Tape no.**	NMPMP/bvt/5-7/12/2000 /#1	**Main Human Activity**	Pier activities
Time coding for all video footage at site:		**From:**	0:09:42:15	**To:**	0:14:22:08

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes:

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N31	**Site Name**	Jurabi – South	**Date**	6/12/2000	**Recorder**	Williams
Vessel	N/A	**Time**	13:30	**Weather**	20 kts SW		
Sea	Choppy	**Water depth (m)**	2	**Water visibility (m)**	3		

GPS Latitude	GPS Longitude	Differential			
-21.88508 S	113.99338 E	**Yes**	☐	**No**	☒

Site location	Site located 50m offshore from Jurabi beach. Access to beach via a track 2.3km south of Lighthouse Caravan Park.

Habitat Description

Limestone pavement shoreline with thin covering of sand.

Dominant Species

Seagrass	
Macro-algae	*Padina* sp., *Halidmeda* sp.
Coral	
Fish	
Invertebrates	*Holothura atra* (Sea cucumber), Black sponge

Other Features

Site noted for large number of juvenile (2cm long) sea cucumbers on sand and adult *H. atra* on black sponge. No video was taken at this site.

Impact or Activity

No litter observed. No targeted reef fish sighted. No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. No *Drupella* sighted.

Video reference	NMPMP/bvt/ /#	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

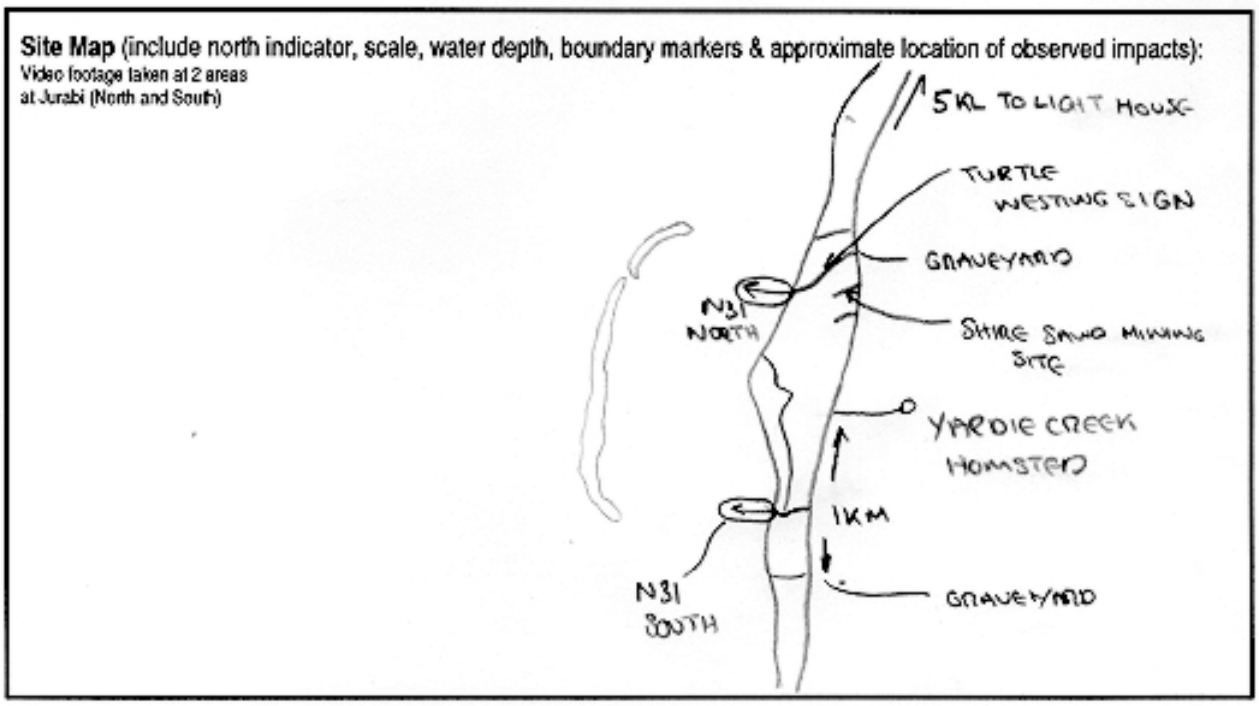
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N31	**Site Name**	Jurabi – South	**Date**	6/12/2000	**Observer**	Williams

Co-ordinates of Boundary Markers			**Observed Impacts**
	DGPS Latitude	**DGPS Longitude**	
1	-21.88508 S	113.99338 E	Refer to *Habitat Data* sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	**Tape no.**	NMPMP/bvt/ /#	**Main Human Activity**	
Time coding for all video footage at site:		**From:**	0:00:00:00	**To:**	0:00:00:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):
Video footage taken at 2 areas at Jurabi (North and South)



Notes: No video footage.

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N56	**Site Name**	Tantabiddi boat ramp	**Date**	6/12/2000	**Recorder**	Williams
Vessel	N/A		**Time**	12:30	**Weather**	25 knots SW	
Sea	N/A		**Water depth (m)**	0.45	**Water visibility (m)**	N/A	

GPS Latitude	**GPS Longitude**	**Differential**			
-21.91327 S	113.97742 E	**Yes**	☐	**No**	☒

Site location	Site located on intertidal reef north of the Tantabiddi boat ramp in front of Tantabiddi boat ramp toilet block.

Habitat Description

Intertidal reef with rich macro algae assemblage

Dominant Species

Seagrass	
Macro-algae	Some *Ulva* sp. – not extensive. Variety of red, green and brown algal species on beach at water mark
Coral	
Fish	
Invertebrates	Small gastropods and molluscs

Other Features

Impact or Activity

Possible nutrient enrichment from toilet block located about 50m from waters edge. No litter observed. No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. No *Drupella* sighted.

Video reference	NMPMP/bvt/5-7/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

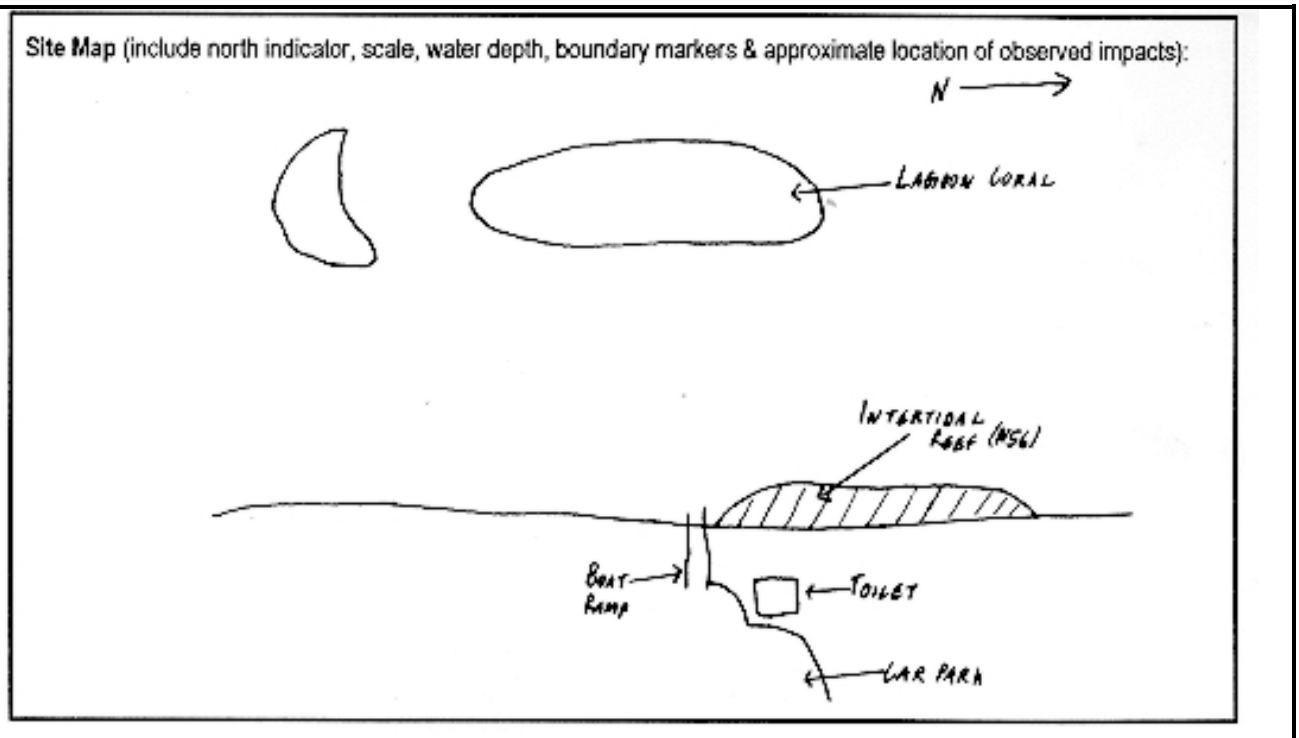
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N56	**Site Name**	Tantabiddi boat ramp	**Date**	6/12/2000	**Observer**	Williams

Co-ordinates of Boundary Markers			**Observed Impacts**
	DGPS Latitude	**DGPS Longitude**	
1	-21.91327 S	113.97742 E	Refer to *Habitat Data* sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	**Tape no.**	NMPMP/bvt/ 5-7/12/2000 /#1	**Main Human Activity**	Toilet block
Time coding for all video footage at site:		**From:**	0:00:00:00	**To:**	0:09:40:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes:

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N35	**Site Name**	Tantabiddi – glass bottom boat	**Date**	28/12/2000	**Recorder**	Meyer
Vessel	Quintrex		**Time**	12:15	**Weather**	12 kts SW	
Sea	calm		**Water depth (m)**	3	**Water visibility (m)**	5	

GPS Latitude	GPS Longitude	Differential			
-21.91017 S	113.96328 E	**Yes**	☐	**No**	☒

Site location	Site located in the lagoon area visited by the glass bottom boat tour.

Habitat Description

Lagoon – coral dominated by *Acropora* sp. (tabular and branching) with very little sand.

Dominant Species

Seagrass	
Macro-algae	
Coral	*Echinopora* sp, *Porities* sp. (large) *Acropora* sp.(digitate, tabular and branching)
Fish	Pomacentridae (damselfish), *Amphiprion* sp. (clown fish), Labridae (wrasse), *Epinephelus multinotatus* (Rankin cod), Scaridae (parrotfish)
Invertebrates	

Other Features

One juvenile *Chelonia mydas,* (Green turtle)

Impact or Activity

During 2000, a new glass bottom boat operator replaced the previous operator (Richard Wain). The new operator uses the same boat and route as the previous operator. There is no evidence of impacts due to the glass bottom boat and snorkelling. No litter observed. No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. *Drupella* abundance low with individuals sighted on *Porities* sp. and *Acropora* sp. No *Drupella* feeding scars sighted.

Video reference	NMPMP/bvt/28/12/2000 /#2	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

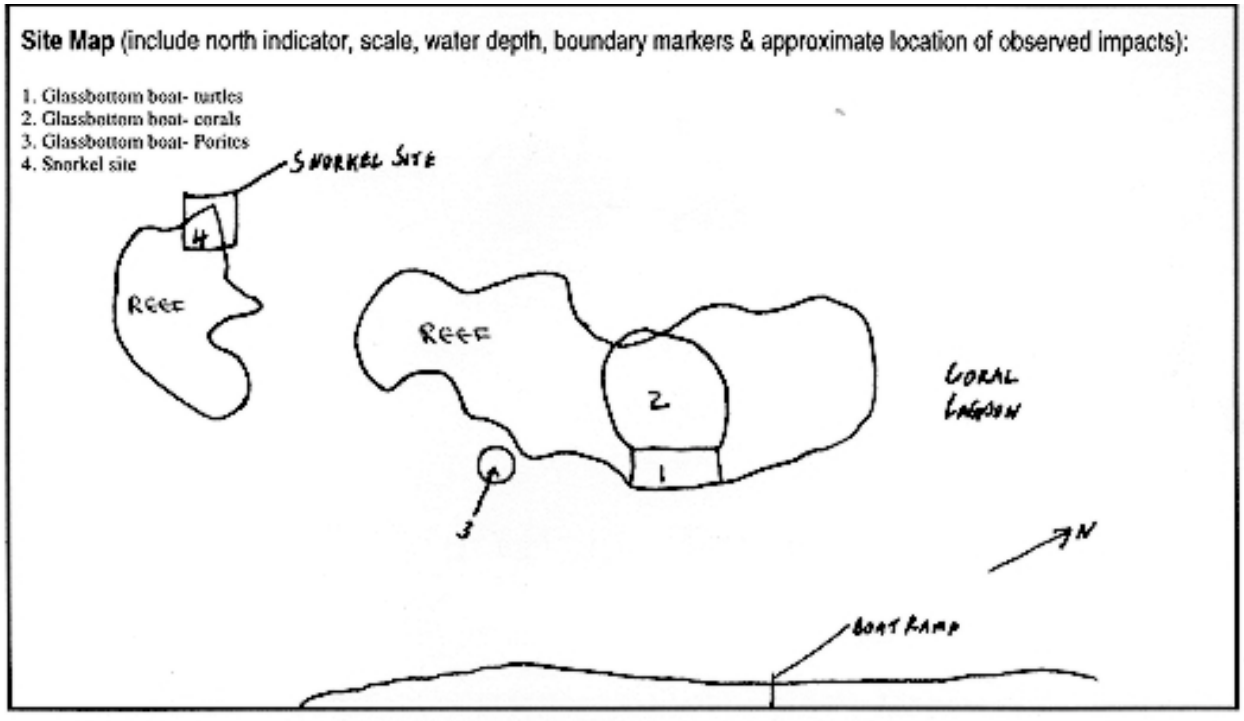
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N35	**Site Name**	Tantabiddi–glass bottom boat	**Date**	28/12/2000	**Observer**	Meyer

Co-ordinates of Boundary Markers			**Observed Impacts**
	DGPS Latitude	**DGPS Longitude**	
1	-21.91017 S	113.96328 E	Refer to *Habitat Data* sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Williams	**Tape no.**	NMPMP/bvt/28/12/2000 /#2	**Main Human Activity**	snorkelling
Time coding for all video footage at site:		**From:**	0:08:47:14	**To:**	0:14:01:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes: Very little sand so anchor vessel 50m away from site.

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N33	**Site Name**	Tantabiddi-snorkel	**Date**	28/12/2000	**Recorder**	Meyer
Vessel	Quintrex	**Time**	11:00	**Weather**	8 kts SW		
Sea	Calm	**Water depth (m)**	2-3	**Water visibility (m)**	8		

GPS Latitude	GPS Longitude	Differential			
-21.91522 S	113.9555 E	**Yes**	☐	**No**	☒

Site location	Site located adjacent to the Tantabiddi boat ramp at the glass bottom boat snorkelling site

Habitat Description

Lagoon – coral dominated by *Porites* sp. with limestone substrate. Very little sand on top of limestone.

Dominant Species

Seagrass	
Macro-algae	
Coral	*Porites* sp.,
Fish	Pomacentridae (damselfish), Pomacanthidae (angelfish), Chaetodontidae (butterflyfish),*Taeniura lymma* (blue spot ray), *Triaenodon obesus* (white tip reef shark), Scombridae (mackeral), *Caranx ignobilis* (giant trevally), Ostraciidae (boxfish), Syngnathidae (pipefish) and Plotosidae (catfish).
Invertebrates	*Holothuria nobilis* (x9), *Stichopus chloronotus* (Holothurian), urchins, sea stars, clams, and oysters.

Other Features

Nudibranchs and egg mass.
Most number of *H. nobilis* that Exmouth staff have seen.

Impact or Activity

Six pieces of old fishing line. No targeted reef fish or *Panulirus* sp. (rock lobster) sighted. *Drupella* abundance low (ie. 2) and no *Drupella* feeding scars visible. No *Acanthaster planci* (COTS) sighted.

Video reference	NMPMP/bvt/28/12/2000 /#2	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

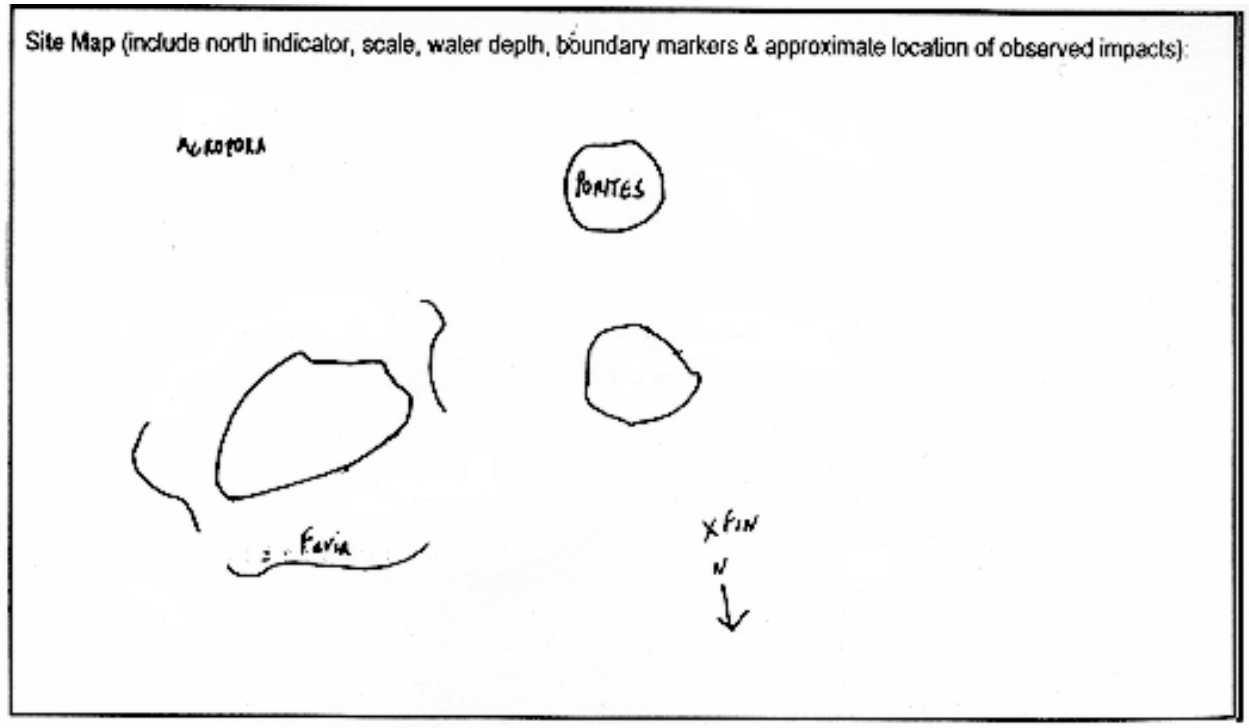
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				Field Survey		December 2000
Site No.	N33	Site Name	Tantabiddi-snorkel	Date	28/12/2000	Observer	Meyer

Co-ordinates of Boundary Markers			Observed Impacts
	DGPS Latitude	DGPS Longitude	
1	-21.91522 S	113.9555 E	Refer to *Habitat Data* sheet
2	-21.91537 S	113.9563 E	
3	-21.9158 S	113.95605 E	
4	-21.9156 S	113.95547 E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Williams	Tape no.	NMPMP/bvt/28/12/2000 /#2	Main Human Activity	snorkelling/fishing
Time coding for all video footage at site:		From:	0:00:15:01	To:	0:08:45:17

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes: Please ignore first 15 seconds of footage of coffee cup and Jo walking into the Office. Adam strikes again!

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N34	**Site Name**	Mangrove Walk	**Date**	5/12/2000	**Recorder**	Williams
Vessel	N/A		**Time**	15:20	**Weather**	25 knots SW	
Sea	N/A		**Water depth (m)**	N/A	**Water visibility (m)**	N/A	

GPS Latitude	**GPS Longitude**	**Differential**			
-21.9643 S	113.94298 E	**Yes**	☐	**No**	☒

Site location	Site located onshore and included the bird hide and adjacent mangroves. Follow walk tracks to beach and point.

Habitat Description

Mainly *Avicennia marina* and *Rhizophora stylosa* surrounded by samphire flats and buffel grass.

Dominant Species

Seagrass	
Macro-algae	
Coral	
Fish	
Invertebrates	

Other Features

Impact or Activity

Mangrove walk is used by bird watchers and reef walkers. Mangrove walk is also used by the annual Exmouth school Year 7 camp who visit the site with Exmouth CALM staff. When the site was visited, two people were bird watching, however no birds sighted. Litter included a beer can and various plastic bags. A cooked mud crab carapace (2 pieces) sighted. No damage to the mangroves observed (ie no broken branches)

Video reference	NMPMP/bvt/5-7/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

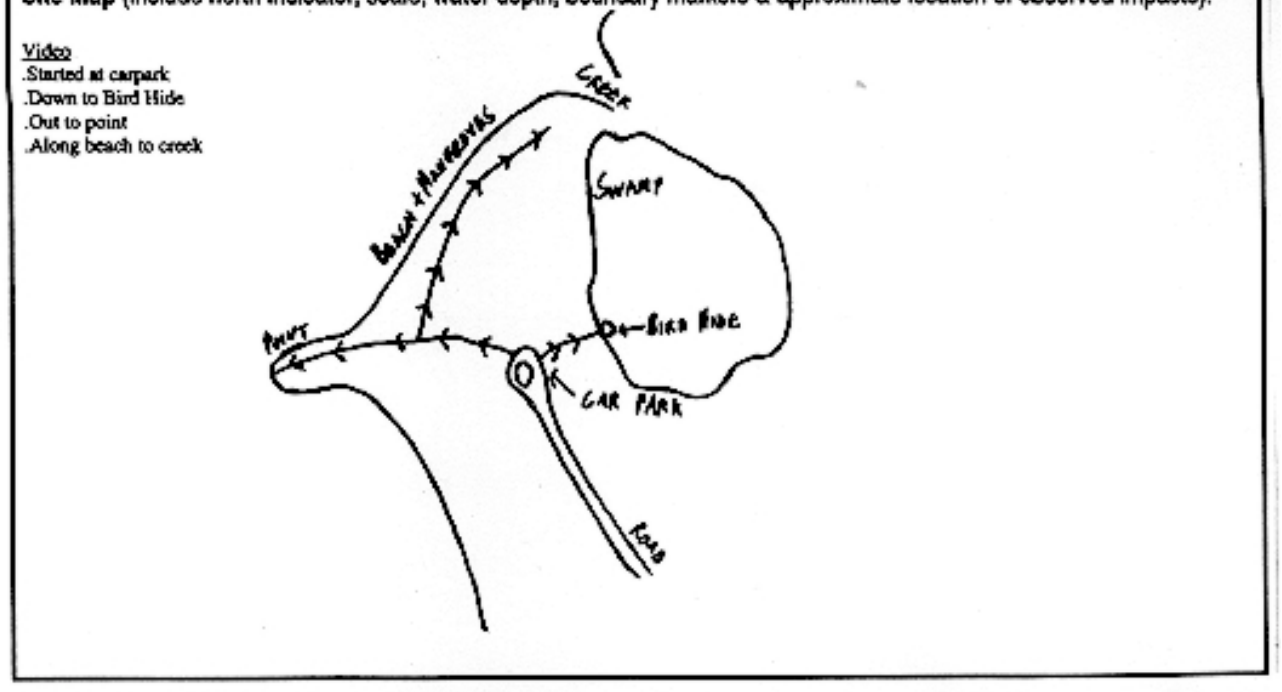
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				Field Survey		December 2000
Site No.	N34	Site Name	Mangrove Walk	Date	5/12/2000	Observer	Williams

	Co-ordinates of Boundary Markers		Observed Impacts
	DGPS Latitude	DGPS Longitude	
1	-21.9643 S	113.94298 E	Refer to *Habitat Data* sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	Tape no.	NMPMP/bvt/ 5-7/12/2000 /#1	Main Human Activity	bird watching
Time coding for all video footage at site:		From:	0:07:00:01	To:	0:11:11:23

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes: No birds at hide.

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N36	**Site Name**	Mesa	**Date**	5/12/2000	**Recorder**	Williams
Vessel	N/A	**Time**	14:15-14:41	**Weather**	20 knots SW		
Sea	Whitecaps	**Water depth (m)**	3	**Water visibility (m)**	3		

GPS Latitude	GPS Longitude	Differential			
-22.00572 S	113.92565 E	**Yes**	☐	**No**	☒

Site location	Site located 50m offshore from Mesa campsite. Around rock island

Habitat Description

Limestone pavement/ridge with some *Pocillopora* sp. and diverse assemblage of macro algae.

Dominant Species

Seagrass	*Halophila* sp.
Macro-algae	Diverse assemblage!
Coral	*Pocillopora* sp.
Fish	Pomacentridae (damselfish), Labridae (wrasse),*Chelmon* sp. (coralfish), Mugilidae (mullet), Acanthuridae (surgeonfish).
Invertebrates	*Cucita* sp. (Pin cushion starfish), Plumulariidae (Hydroids), and *Tridacna* sp. (giant clam)

Other Features

Apogonidae (cardinalfish) juveniles aggregating under overhang of ledge.

Impact or Activity

A recreational fisher using a rod and reel was observed fishing on the island. Litter sighted included one beer bottle and two lead sinkers. No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. No *Drupella* sighted.

Video reference	NMPMP/bvt/5-7/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N 36	**Site Name**	Mesa	**Date**	5/12/2000	**Observer**	Williams

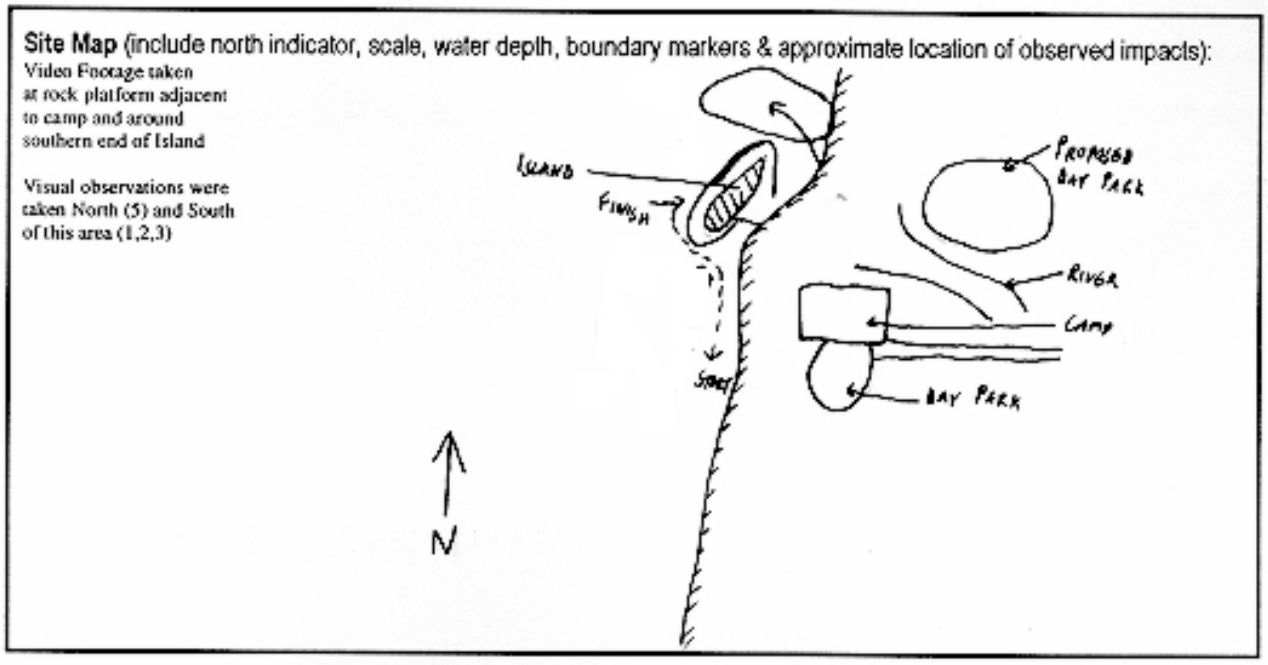
Co-ordinates of Boundary Markers			**Observed Impacts**
	DGPS Latitude	**DGPS Longitude**	
1	-22.00572 S	113.92565 E	Refer to *Habitat Data* sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	**Tape no.**	NMPMP/bvt/5-7/12/2000 /#1	**Main Human Activity**	fishing
Time coding for all video footage at site:		**From:**	0:04:45:00	**To:**	0:06:58:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):

Video Footage taken at rock platform adjacent to camp and around southern end of Island

Visual observations were taken North (3) and South of this area (1,2,3)



Notes: Battery four failed at end of filming. Change to battery six.

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N38	**Site Name**	Lakeside	**Date**	5/12/2000	**Recorder**	Williams
Vessel	N/A	**Time**	13:00-13:38	**Weather**	20 knots SW		
Sea	whitecaps	**Water depth (m)**	3	**Water visibility (m)**	6		

GPS Latitude	**GPS Longitude**	**Differential**			
-22.03925 S	113.90989 E	**Yes**	☐	**No**	☒

Site location	Site located in the lagoon adjacent to the Lakeside access ("Lakeside Bommies" in CALM *Dive and Snorkel sites in WA.*).

Habitat Description

Lagoon – corals include *Porites* sp. (bommies 0.5-4m) and some *Acopora* sp. (branching and tabular).

Dominant Species

Seagrass	
Macro-algae	Filamentous algae abundant
Coral	*Acropora* sp. (tabular and branching) and *Porities* sp.,
Fish	Lethrinidae (emperor) and Pomacentridae (damselfish)
Invertebrates	*Holothuria atra and Stichopus chloronotus* (Holothurians), urchins, *Tridacna* sp. (giant clam), sea star, and black sponge,

Other Features

Impact or Activity

Litter includes one beer can on the beach and one old car tyre with coral on it (filmed). No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted. No *Drupella* sighted. Large *Porites* sp. colony with 5% recent damage.

Video reference	NMPMP/bvt/5-7/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

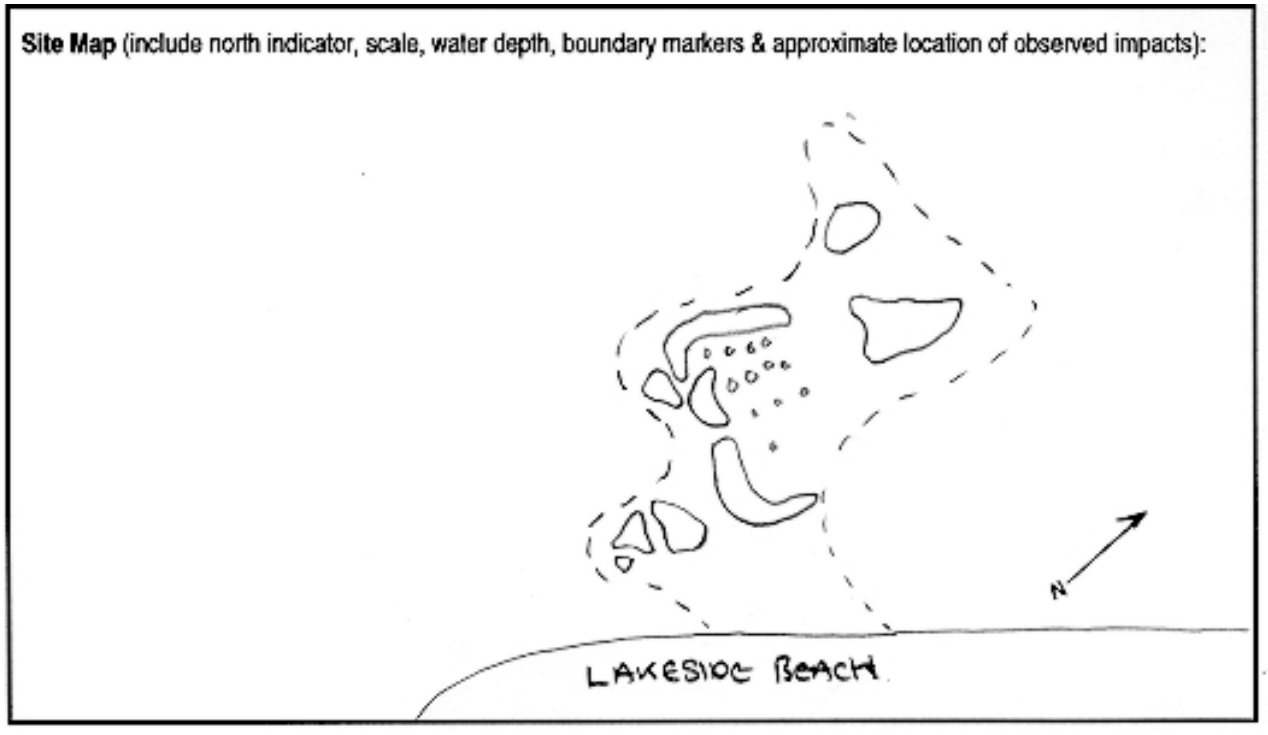
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N 38	**Site Name**	Lakeside	**Date**	5/12/2000	**Observer**	Williams

Co-ordinates of Boundary Markers			**Observed Impacts**
	DGPS Latitude	**DGPS Longitude**	
1	-22.03925 S	113.90989 E	Refer to *Habitat Data* sheet.
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	**Tape no.**	NMPMP/bvt/5-7/12/2000 /#1	**Main Human Activity**	snorkelling/fishing
Time coding for all video footage at site:		**From:**	0:01:07:00	**To:**	0:04:45:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes: Tape reset to 0:00:00:00 after N37 Turquoise Bay. Lakeside footage starts with dead mullet (0:00:00:00 – 0:01:06:00) then continues with u/water footage from 0:01:07:00 – 0:04:45:00).

HABITAT DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				**Field Survey**		December 2000
Site No.	N37	**Site Name**	Turquoise Bay	**Date**	5/12/2000	**Recorder**	Williams
Vessel	N/A		**Time**	11:00–11:49	**Weather**	18 kts SW	
Sea	Calm		**Water depth (m)**	3	**Water visibility (m)**	12	

GPS Latitude	GPS Longitude	Differential			
-22.10178 S	113.88422 E	**Yes**	☐	**No**	☒

Site location	Site located at Turquoise Bay (See "Turquoise Bay Drift snorkel" in CALM *Dive and Snorkel sites in WA.*

Habitat Description

Lagoon – sand patches with *Porite*s close to shore. *Acropora* sp. dominate further from shore with *Sinularia* sp. becoming common. **Strong current.**

Dominant Species

Seagrass	*Halophila* sp. sparse
Macro-algae	Filamentous brown or Blue-Green.
Coral	*Acropora* sp. (digitate and branching) and *Porities* sp.
Fish	Labridae (wrasse), Scaridae (parrotfish), Pomacentridae (damselfish), Balistidae(triggerfish), Lethrinidae (emperor), Pomacanthidae (angelfish) and Mullidae (goatfish)
Invertebrates	*Holothuria atra*, *Stichopus chloronotus* (holothurian), sea stars, octopus, *Tridacna* sp. (giant clam) and urchins

Other Features

Lots of filamentous weed.
One *Chelonia mydas* (green turtle) sighted in water. 1 turtle track (up and down) on beach at Point.

Impact or Activity

When the site was visited there were 30 people on beach and in the water. 10 cars + 2 buses in carpark. Some evidence of possible fin damage - small amount of broken hard coral. Litter includes one piece of broken glass encrusted with coralline algae and one piece of fishing line (filmed). No *Panulirus* sp. (rock lobster) sighted. No *Acanthaster planci* (COTS) sighted A few *Drupella* (uncommon) sighted and no *Drupella* feeding scars sighted.

Video reference	NMPMP/bvt/5-6/12/2000 /#1	**Aerial reference**	N/A
Slide reference	N/A	**Print reference**	N/A

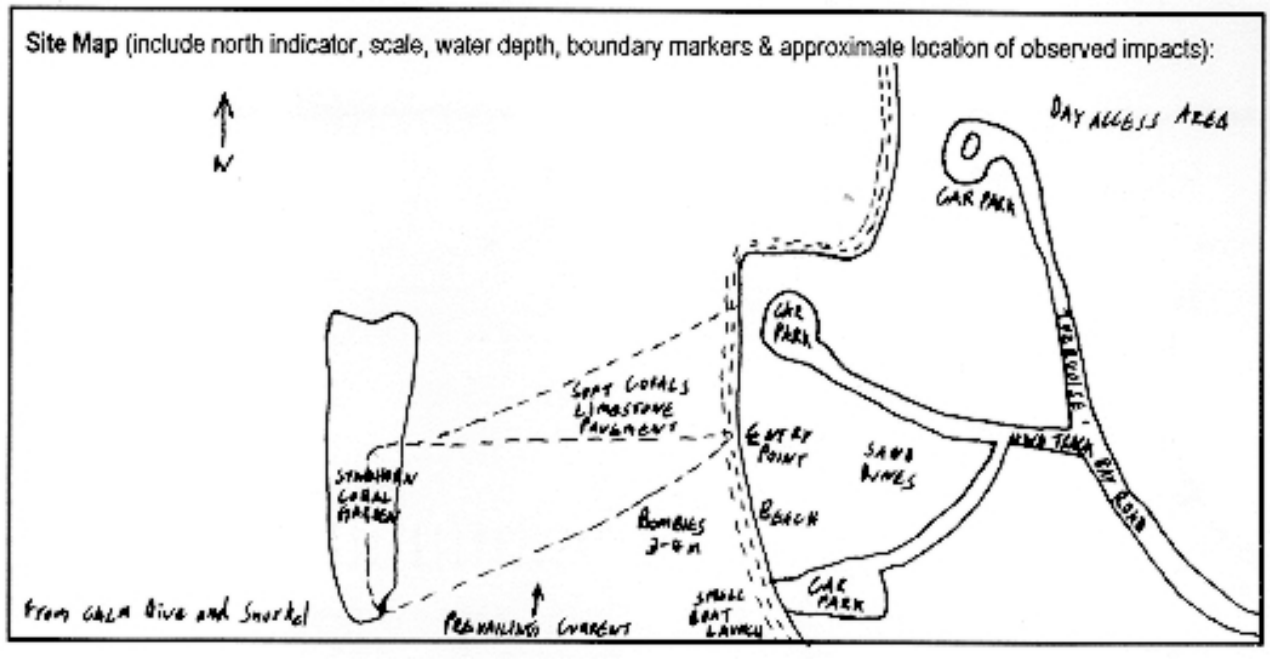
NON-TRANSECT MONITORING SITE DATA SHEET

Project	NINGALOO MARINE PARK MONITORING PROGRAM				Field Survey		December 2000
Site No.	N37	Site Name	Turquoise Bay	Date	5/12/2000	Observer	Williams

Co-ordinates of Boundary Markers			Observed Impacts
	DGPS Latitude	DGPS Longitude	
1	-22.10178 S	113.88422 E	Refer to Habitat data sheet
2	S	E	
3	S	E	
4	S	E	
5	N/A	N/A	
6	N/A	N/A	

Video operator	Hogstrom	Tape no.	NMPMP/bvt/5-7/12/2000 /#1	Main Human Activity	snorkelling
Time coding for all video footage at site:		From:	0:00:00:00	To:	0:04:03:00

Site Map (include north indicator, scale, water depth, boundary markers & approximate location of observed impacts):



Notes: Battery one failed after 4:03 sec. Changed to battery four.

APPENDIX 2: NMPMP 12/00 VIDEO TAPES

Tapes #	Programme	Description	Digital original	VHS copy	Digital copy
MMS/NIN/NMP/BVT 5-7/12/00 #1	Ningaloo Marine Park Monitoring Program	N27, N30, N56, N34, N36, N38, N37	Yes	Yes	Yes
MMS/NIN/NMP/BVT 28/12/00 #2	Ningaloo Marine Park Monitoring Program	N33, N35	Yes	Yes	Yes