# RE-SURVEY OF FONGAFALE BEACH PROFILES FUNAFUTI, TUVALU

5-6 May 1998

Phil Woodward SOPAC Secretariat

July 1998

SOPAC Preliminary Report 95

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# SUMMARY

In May 1998 a re-survey of twelve of the nineteen beach profiles along the lagoon side of Fongafale was carried out at the request of the Government of Tuvalu as part of the 1998 approved Coastal Unit work program item 3.6: Climate change and Coastal Erosion studies. The profiles were last surveyed in January 1994 during a Beach Monitoring Seminar (SOPAC Training Report 62) and BS 1-4,15, 17-20 were last surveyed during a brief stop over in February 1995 (SOPAC Preliminary Report 78).

# **ACKNOWLEDGEMENTS**

Funds to permit Phil Woodward to travel were provided by the Australian Government.

### INTRODUCTION

In January 1994 an in-country beach monitoring seminar was held at the Vaiaku Lagi Hotel (SOPAC Training Report 62) for representatives of various departments in Tuvalu concerned with the coastline. Nineteen of twenty one beach profiles previously established along the lagoon of Fongafale were re-established and surveyed to MSL height. In January 1994 during a brief stop over, profiles BS 1-4, 15, and 17-20 were re-surveyed. At the seminar a general recommendation that SOPAC continue to assist the Government of Tuvalu with the monitoring was agreed to.

# PERSONNEL INVOLVED

Phillip Woodward Marilyn Woodward Faatasi Malalonga Sumeo K. Silu Tolue Niu SOPAC, Cartographer Accompanying spouse, Field Assistant. Survey Department PWD Marine Park Conservation Ranger

# **RESULTS**

Data collected from the twelve profiles resurveyed are presented in Appendix 1, along with comparison graphs with data of June 1987, January 1994 and February 1995 and a location map.

**Profile BS 1: Near Survey Office.** There is no significant change to the profile. Rubble and concrete blocks have been added to the coastline.

**Profile BS 2: Vaiaku Lagi Hotel jetty.** There is no significant change to the profile. The base station had been disturbed and was replaced for the 1998 survey. The base station needs to be fixed permanently or will be lost.

**Profile BS 3:** Met Officer's house. A significant change to the profile has occurred due to a large amount of rubble and concrete blocks being added to the coastline. The blocks are as high as the VD on the septic tank block.

#### Profile BS 4: Near Henry's house

BS 4 is sited on the shoreline in the central Vaiaku area near Henry Naisali's house. It is 15.4m from the SW corner and 11.8m from the NW corner of an adjoining house. During the past 2 surveys in January 1994 and February 1995 a considerable pile of coconut husks and fronds were moved to locate the BS. In May 1998 there was a 1.3m deep box of coconut husks over the general BS site. The profile wasn't re-surveyed in May 1998.

**Profile BS 5:** Between Hardboard houses. There appears to be significant change to the profile between 6 and 20m horizontal. The beach face is covered with sand to the reef flat.

**Profile BS 6: Tausoa Maneaba.** The profiles of January 1994 and May 1998 show the foreshore protection work carried out to protect the Maneaba. The pile of sand at 5m has flattened a little, otherwise the profiles are very similar.

**Profile BS 7:** Primary School. In January 1994 concrete blocks and rubble had been added to the shoreline to protect the school building. The classroom nearest the shoreline is no longer in use and is in disrepair. The profile indicates a lowering and spreading of the concrete blocks.

# Profile BS 8: Hospital

BS 8 was located near the beach crest in the Hospital grounds, Vaiaku. BS 8 was sited 11.09m from the NW corner of the hospital patio on the second wing from the North and in line with the northern wall. BS 8 was last surveyed in January 1994. This survey showed the changes to the beach between 5-10m where concrete cubes were added as shore protection. Since that date a 6.2m extension to the wing has been added and some back filling towards the beach. Considerable digging failed to local the concrete BS.

**Profile BS 9: Co-operative Store.** There is significant change to the profile across the top of the beach. From 2 to 10m horizontal the beach rock is exposed. The loose coral rubble has been eroded away.

#### Profile BS 10: On road near UF107

BS 10 was located on a beach ridge by the road north of the Tuvalu Co-operative Warehouse opposite some borrow pit infilling, 4.5m from the trig point UF107 at a bearing 213 magnetic. The profile was last surveyed in January 1994. UF107 had been disturbed during removal of coral rubble from the road and the area of BS 10 could be under 1m of coral rubble. (see photo).

## Profile BS 11: Catholic Church

BS 11 was sited on an outcrop of beach rock bearing 205 magnetic from the SW corner of the Catholic Church. BS 11 was last surveyed in January 1994. There is considerable disturbance along the coast and over the beach rock. Any remains of BS 11 could not be found.

#### Profile BS 12: Poultry Shed

BS 12 was located at the top of the beach 5.31m from the NW corner and in line with the Northern side of the Department of Agriculture poultry shed near Fisheries. BS 12 was last surveyed and replaced in January 1994. Since that time a new large workshop has been erected beside the poultry shed and any remains of BS 12 were not found. (see photo).

#### Profile BS 14: Peter McQuarrie's house

BS 14 was in line with the fence to the south of Peter McQuarrie's house. It was 13.65m at 94 magnetic to the SW corner of the house and 17.4m from the NW corner of the house to the south. BS 14 was last surveyed in January 1994. No remains of the concrete BS were found in May 1998.

**Profile BS 15: Monument.** The profiles are similar with a small movement of surface coral rubble away from the 2-6m horizontal zone on the beach face.

#### Profile BS 16:

This BS disappeared soon after its establishment in 1987 and has not been resurveyed since.

**Profile BS 17: Tony's house**. The profiles are similar with a small movement of surface coral rubble away from the 6-10m horizontal zone on the beach face.

# Profile BS 18: Magazine

BS 18 was located on the beach ridge, lagoon side of the road, opposite the explosives magazine south of Tony's house. BS 18 was 27.6m bearing 316.5 magnetic from the NW corner of the magazine. BS 18 was last surveyed in January 1995 and a note of the dense vegetation was made. There was no indication of the BS on the beach ridge which was covered with coral rubble and the vegetation at the magazine made relocation practically impossible.

Profile BS 19: Building foundation. There is no significant change in the profile.

Profile BS 20: Bent coconut tree. There is no significant change in the profile.

**Profile LS12: Engineer's house.** The only change is landwards from 0m horizontal caused by the placing of concrete blocks and rubble.

#### Recommendation

It is recommended the missing or moved base stations be replaced, adjusted to MSL height and the profiles continue to be monitored.

SOPAC continues to encourage the monitoring of the beach profiles and will assist the Government of Tuvalu as required.

### REFERENCES

SOPAC Training Report 62: Howorth, R., Woodward, P. Tuvalu in country seminar on beach monitoring 24 – 28 January 1994.

SOPAC Preliminary Report 78: Woodward, P., Re-survey of Funafuti beach profiles, Tuvalu, 30 January –1 February 1995.

# **SCHEDULE**

Monday 4<sup>th</sup> May Tuesday 5<sup>th</sup> May Wednesday 6<sup>th</sup> May Thursday 7<sup>th</sup> May Friday 8<sup>th</sup> May

Arrive from Tarawa Survey Survey Report / photos Depart for Nadi

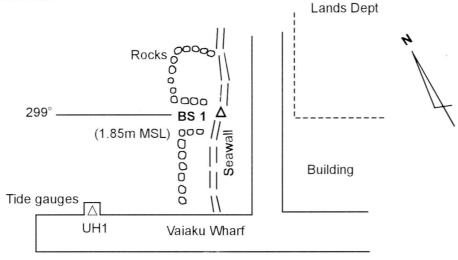
# **APPENDIX 1: Beach Profile Data**

LOCATION:

BS 1 is sited on the seawall directly across the road from the Lands

Department, Vaiaku

#### **SURVEYED MAY 1998**

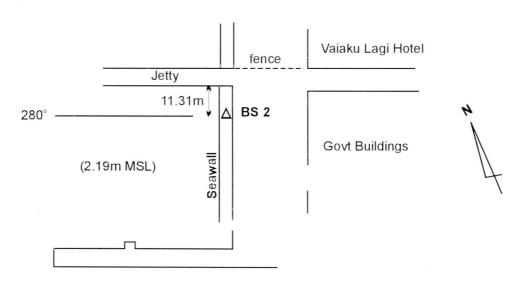


## PROFILE: BS 2

LOCATION:

BS 2 is located on top of the seawall, opposite the Government Offices in Vaiaku. BS 2 is 11.31m south of the small jetty between the Government

Offices and the new Vaiaku Hotel.



Fongafale BS: 1

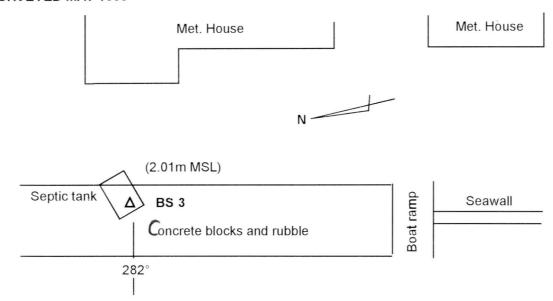
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LOCATION:

BS 3 is sited in a ceramic pipe filled with cement on the concrete sump block in the backyard of the former Meterological staff residence, adjacent to the original Vaiaku Lagi Hotel.

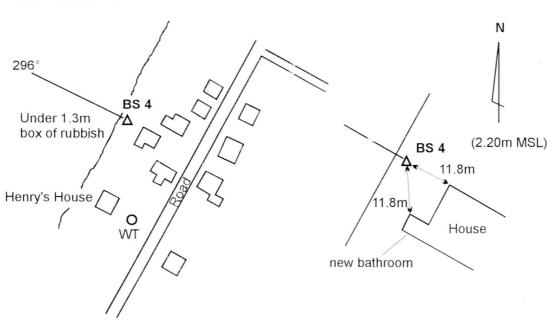
#### **SURVEYED MAY 1998**



# PROFILE: BS 4

LOCATION:

BS 4 is sited on the shoreline in the central Vaiaku area near Henry Naisali's house. It is 11.8m from the NW corner of a new bathroom and 11.8m from the NW corner of the house

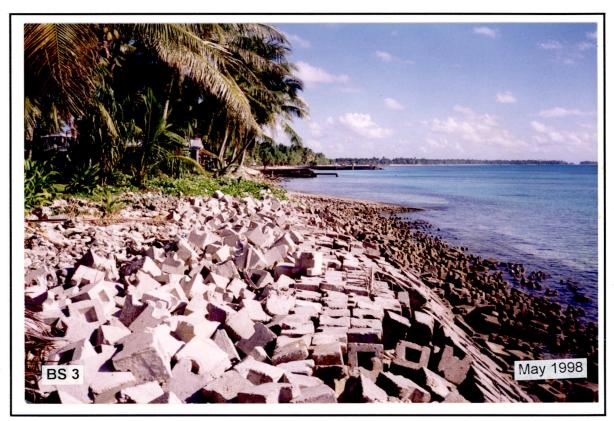


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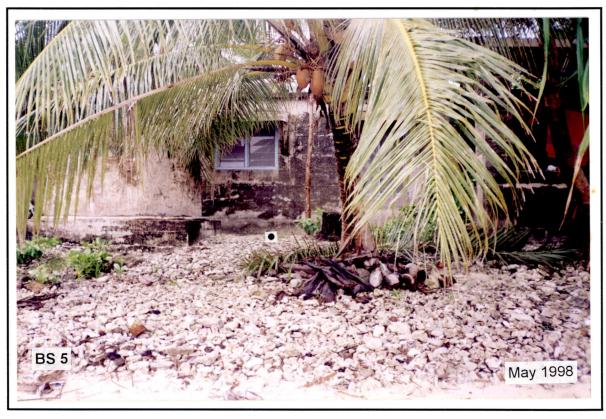
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FUNAFUTI BS 3: Concrete blocks and rubble added to the lagoon shoreline infront of the Met Officers house, Vaiaku.

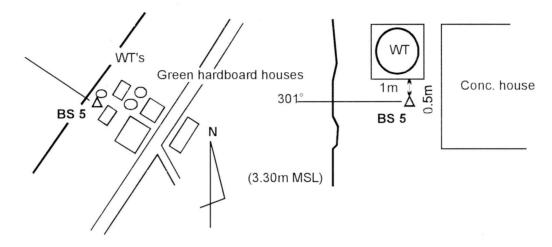


FUNAFUTI BS 5: Between the hardboard house, Vaiaku. The BS was located 1m from the base of the water tank.

LOCATION:

BS 5 is sited in the Vaiaku village approx 200m south of BS 6.. Access is between 2 green hardboard houses.BS 5 is near the shoreline behind a newer concrete house. and 1m from the concrete base of a new water tank.

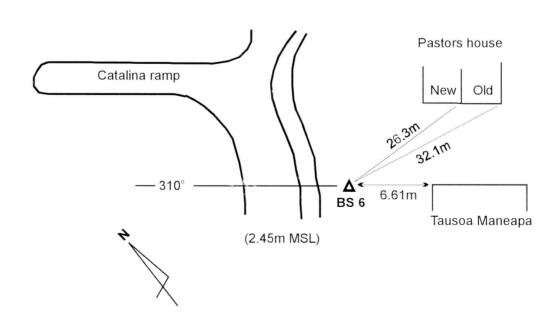
#### **SURVEYED MAY 1998**



PROFILE: BS 6

LOCATION:

BS 6 is sited 6.61m from the NW corner of the Tausoa Maneapa adjacent to the Tuvalu Churcvh, Vaiaku. BS 6 is 32.10m to the SE corner of the pastors house. The profile is in line with the northern wall of the Maneapa.



Fongafale BS: 5

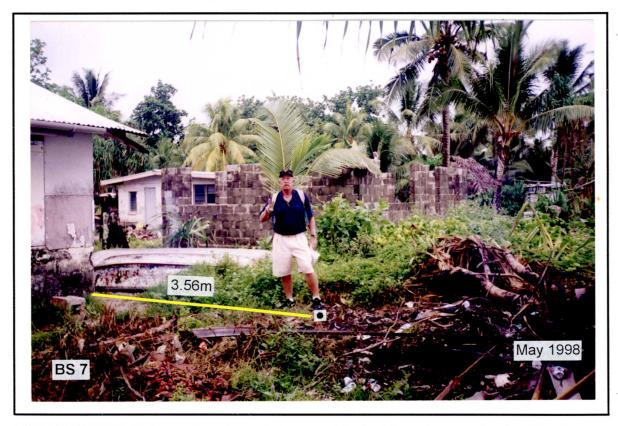
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Fongafale BS: 6

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72		-1.14							
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FUNAFUTI BS 6: BS 6 is 6.61m from the corner of the wall. It is usually buried.



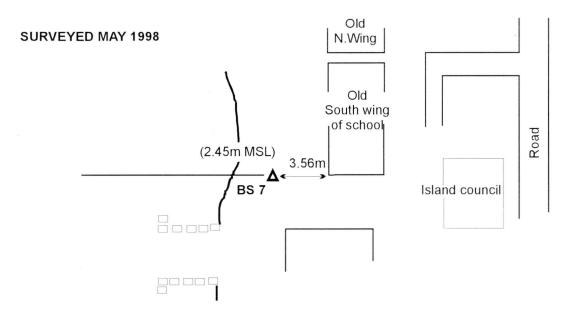
FUNAFUTI BS 7: Between the disused clasroom block at the primary school, 3.56m from the SW corner.

Fongafale BS: 6

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LOCATION:

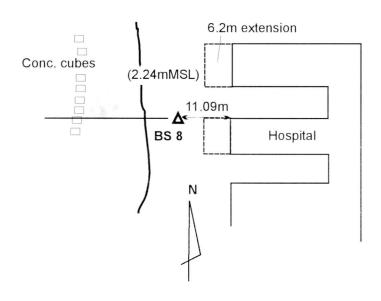
BS 7 is on the beach at the southern end of the Vaiaku Primary School. BS 7 is 3.56m from the SW corner of the schools southern wing and in line with the southern wall of the building



# PROFILE: BS 8

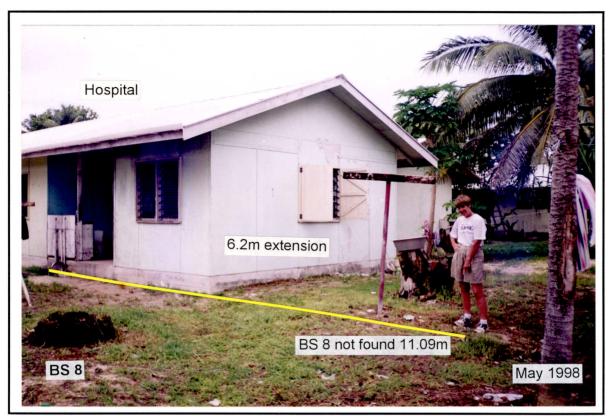
LOCATION:

BS 8 is near the beach crest in the Hospital grounds, Vaiaku. BS 8 is sited 11.09m from the NW corner of the hospital patio on the second wing from the North and is in line with the northern wall.

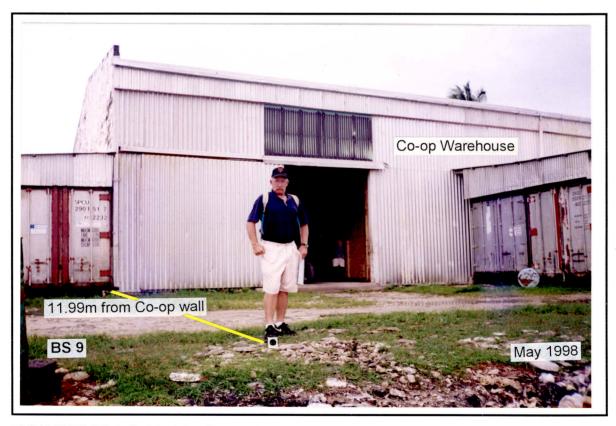


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cation:	Location: Primary School	loot						
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20	-0.0 <del>4</del>	-0.31	-0.29					
22	-0.15	-0.37	-0.37					
24	-0.29	-0.39	-0.43			BS 7		78-unf
26	-0.17	-0.68	-0.58					Jan-94
28	-1.03	-0.90	-0.91					May-98
30	-1.39	-1.25	-1.37		Annual Control of the			
32		±.7	-1.42		<b> </b>			
发		-1.21	-1.28	Hgi				
36		-0.68	-0.87					
38		-1.05	-1.14	-1.08	- (	- (		- 8
40	-1.14	-0.95	-1.09	7-	n	æ	13	23
42		-0.95	-0.79			Horizontal (m)	<u>-</u>	
45		-0.71	-0.60					
20	-0.72	-0.75	-0.99					
			and the same function of the same (before the printers of					

Location : Hospital Horizontal Jun-87 0 2.25 2 1.73 4 1.60 6 1.10 8 0.80 10 0.60 11 0.60	pital un-87	3									
30777	78-un	10									
0000		Jan-94									
	2.25	2.09									
7 7 0 0 0 0	1.73	2.14					BS 8				78-nuL
	09.	1.57						٠			Jan-94
0000	1.10	2.10	8								
	08.	1.79									
60.	09.0	1.08	) ti	1	V	/					
	141	0.57									
	7.18	0.4							AND	THE THE RESERVOIS PROPERTY OF THE PROPERTY OF	(Canada Canada C
1	90.0	0.11	-1.8		- (	- 5	- 1		8	- 8	
7	0.20	-0.10	0	_	o.	0	51		25	<b>9</b> 7	OS.
<u>۲</u>	0.32	-0.27					Horizontal (m)	tal (m)			
7	0.45	-0.39									
۲	0.55	-0.46									
۲	-0.61	-0.53									
<b>ٻ</b>	0.62	-0.60									
		-0.62									
		-0.64									
		-0.64									
		-0.71									
		-0.68									
Υ	-0.61	-0.60									
		-0.65									
		-0.73									
		-0.76									
		-0.43									
7	-0.52	-0.32									
7	0.52	-0.46									



FUNAFUTI BS 8: BS 8 was not found in its reported position. Clean up after the addition of a 6.2m extions to the hopsital wards may have displaced it.

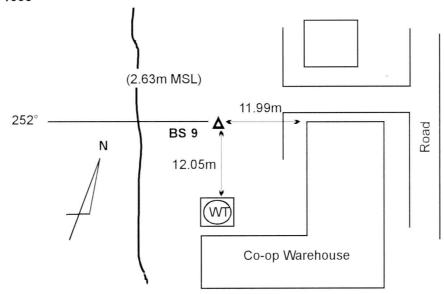


FUNAFUTI BS 9: Behind the Co-op Warehouse 11.99m from the NW corner.

LOCATION:

BS 9 is 10.99m from the NW corner of the Co-op Warehouse in line with the north facing wall and 12.05m from the WT base to the south.

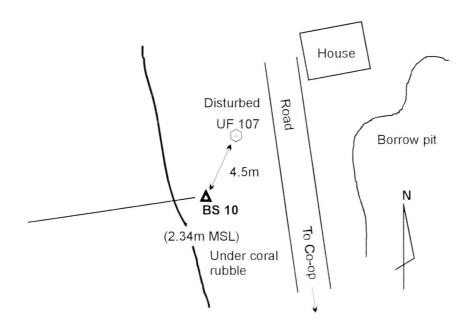
#### **SURVEYED MAY 1998**



# PROFILE: BS 10

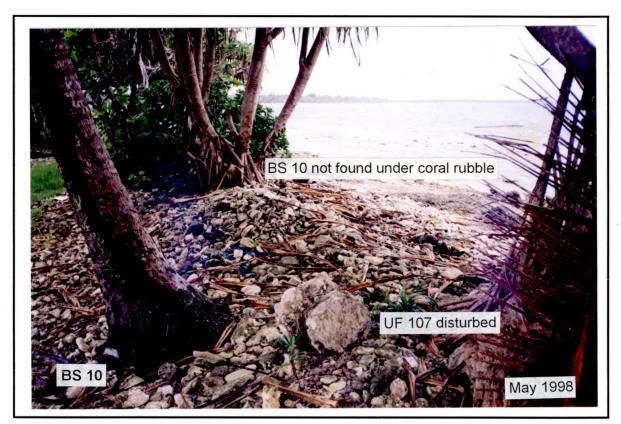
LOCATION:

On the road north of the Tuvalu Co-op Warehouse, BS 10 is on a beach ridge by the road opposite some borrow pit infilling, 4.5m from the trig point UF 107 at a bearing of 213° magnetic

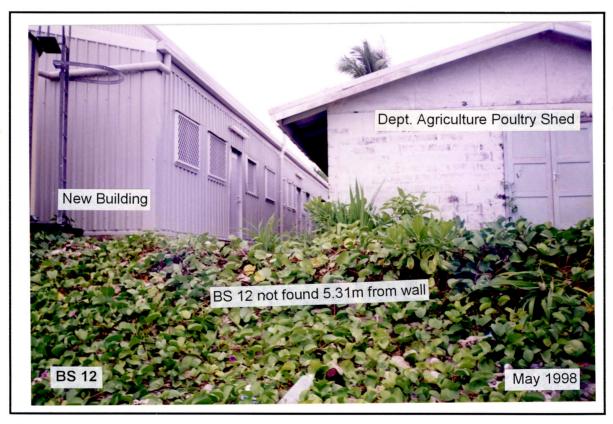


Vie Store   Vie Store   Vie Store   Vie Store   Vie Store   Jan-94   May-88   2.56   2.63   2.63   2.63   2.63   2.63   2.63   2.63   2.63   2.63   2.63   2.64   2.55   2.16   1.77   1.76   1.53   1.77   1.76   1.53   1.77   0.73   0.49   0.51   0.00	Base Station: 9	ation: 9			Date: 6.5.98	Time: 10.15am	Height: 2.63m				
2.57 2.63 2.63 2.63 2.63 2.63 2.63 2.63 2.63	Location: (	Co-operativ	e Store								
2.69 2.57 2.63 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.69 2.63 2.60 2.60 2.70 0.77 0.77 0.77 0.77 0.77 0.77 0.77 0	Horizontal	Jun-87	Jan-94	May-98							
2.63 2.63 2.63 2.63 2.63 2.63 2.65 2.63 2.65 2.65 2.65 2.65 2.65 2.65 2.65 2.65	φ		2.59	2.57							
2.63 2.63 2.63 2.63 2.63 2.63 2.64 2.63 2.65 2.65 2.65 2.65 2.65 2.65 2.65 2.65	4		2.63	2.63			BS 8			78-unf	
2.63 2.61 2.63 (m) 3.00 (m) 2.69 2.69 2.63 (m) 2.69 2.69 2.63 (m) 2.69 2.69 2.63 (m) 2.69 2.69 2.63 (m) 2.23 2.39 1.77 (m) 2.00 1.39 1.42 1.24 1.00 (m) 0.00 0.082 0.84 0.051 0.07 0.051 0.07 0.051 0.07 0.051 0.00 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.00 0	-5		2.62	2.63							
2.69 2.59 2.63 (m) 200 2.56 2.55 2.16 for 100 1.79 1.77 Height 100 0.80 0.82 0.84 1.42 1.24 -0.05 0.80 0.82 0.84 1.42 1.24 -0.00 0.80 0.82 0.84 1.42 1.24 -0.00 0.80 0.82 0.84 1.42 1.24 -0.00 0.00 0.00 0.00 0.00 1.40 m) 3.00 1.40 1.00 1.00 1.00 1.00 1.00 1.00 1	0	2.63	2.61	2.63	90%					May-98	
2.56 2.55 2.16 (2.50) 1.77 100 1.78 1.76 1.53 1.00 1.80 0.82 0.84 0.84 0.51 0.07 0.77 0.73 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.0	2	2.69	2.59	2.63	8 8						
2.23 2.39 1.77 igh 1.00 1.79 1.76 1.53 igh 1.00 1.39 1.42 1.24 1.39 1.42 1.24 1.39 1.42 1.24 1.39 1.42 1.24 1.39 1.42 1.24 1.39 1.42 1.24 1.30 0.82 0.84 1.30 0.77 0.73 1.00 0.07 0.73 1.00 0.07 0.07 1.00 0.00 0.01 1.00 0.00 0.00 1.00 0.00 0	4	2.56	2.55	2.16	8 8	7	1				
1.79 1.76 1.53 H 1.00 1.30 1.42 1.24 0.80 0.82 0.84 0.71 0.77 0.73 0.50 0.49 0.51 0.01 0.01 0.01 0.05 0.06 0.09 0.05 0.06 0.09 0.01 0.00 0.01 0.05 0.06 0.09 0.01 0.00 0.01 0.01 0.00 0.01 0.01 0.00 0.01 0.02 0.03 0.04 0.032 0.032 0.032 0.032	9	2.23	2.39	1.77	3 8						
1.39	ω	1.79	1.76	1.53	0.00						7
0.80 0.82 0.84	10	1.39	1.42	1.24	-1.00		- 3	- 2	- 2		[ ;
0.57  0.77  0.73	12	0.80	0.82	0.84	φ		4	9 24 29	\$	ec.	‡
0.50 0.49 0.51 0.27 0.28 0.11 0.11 0.11 0.00 -0.01 0.005 -0.02 -0.02 0.03 -0.04 -0.03 0.04 -0.05 0.08 -0.06 -0.09 0.13 -0.15 0.013 -0.12 0.013 -0.12 0.02 -0.26 0.03 -0.03 0.04 -0.26 0.05 -0.05 0.05 -0.05 0.07 -0.05	14	0.71	0.77	0.73			Horizoi	ntal (m)			
0.27 0.28  0.11 0.11 0.11  -0.05 -0.05 -0.02  -0.03 -0.04 -0.14  -0.05 -0.06 -0.09  -0.18 -0.15 -0.15  -0.13 -0.15  -0.14 -0.15  -0.13 -0.15  -0.14 -0.26  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.13 -0.15  -0.24 -0.26  -0.32 -0.30	16	0.50	0.49	0.51							
0.11 0.11 0.11  -0.01 0.00 -0.01  -0.05 -0.05 -0.05  -0.03 -0.04 -0.14	18	0.27	0.27	0.28							_
-0.01 0.00 -0.01 -0.05 -0.05 -0.02 -0.03 -0.04 -0.14 mm 3.00 -0.18 -0.20 -0.53 htt 2.00 -0.13 -0.15 Heigg 1.00 -0.13 -0.15 Heigg 1.00 -0.14 -0.15 Heigg 1.00 -0.15 -0.15 Heigg 1.00 -0.25 -0.25 Heigg 1.00 -0.25 -0.2	20	0.11	0.11	0.11			BS 8			Jun-87	
-0.05 -0.05 -0.02	22	-0.01	0.00	-0.01						Jan-94	
-0.03 -0.04 -0.14 (m) 2.00 -0.05 -0.06 -0.09 (m) 2.00 -0.18 -0.05	24	-0.05	-0.05	-0.02							_
-0.05 -0.06 -0.09	56	-0.03	-0.0 <del>4</del>	-0.14							
-0.18 -0.20 -0.53 ign 1.00 -0.44 -0.54 ieig 1.00 -0.44 -0.554 ieig 1.00 -6 -1	78	-0.05	-0.06	-0.09							
-0.44 -0.54 Fig. 1.000	30	-0.18	-0.20	-0.53	<b>6</b>						
-0.13 -0.15 -0.15 -0.15 -0.15 -0.13 -0.15 -0.13 -0.15 -0.13 -0.13 -0.12 -0.13 -0.12 -0.24 -0.26 -0.32 -0.32 -0.35 -0.25	32		-0.44	-0.54	0						1
-0.13 -0.15	8		-0.13	-0.15	9.0			- 0	- 7	- 4	1
-0.18 -0.13 -0.13 -0.18 -0.19 -0.12 -0.24 -0.26 -0.31 -0.31 -0.32 -0.30	36		-0.13	-0.15	ρ	<del>.</del>	4	D.	<u>‡</u>	<u> </u>	
-0.18 -0.19 -0.13 -0.32 -0.30 -0.25	38		-0.12	-0.13			Horizor	ntal (m)			
-0.13 -0.24 -0.31 -0.32 -0.33 -0.25	40	-0.18	-0.19	-0.12							
-0.24 -0.33 -0.32 -0.25 -0.25	42		-0.13	-0.17							
-0.32 -0.33 -0.32 -0.30 -0.22 -0.25	4		-0.24	-0.26							
-0.32	46		-0.31								
-0.32	48		-0.33								
-0.22	20	-0.32	-0.30								
1	09	-0.22	-0.25							Д	

משמ פו	base station: 10			Dale.	_	E E		neignt. 2.34m	<b>E</b>			
cation:	Location: On road near UF 107	ar UF 107										
<b>Horizontal</b>	Jun-87	Jan-94										
φ		1.91						,				
4	2.03	2.05						<b>BS 10</b>				78-unf —
-5	2.05	2.13										
0	2.34	2.34										
7	1.86	2.14										
4	1.60	1.63	6.0   <b>3</b>		The state of the s		(BBressen)			-		
စ	1.41	1.22			- (		- :					
œ	1.03	0.97		4	œ.		16	:	8 .		36	94
10	0.76	0.75						Horizontal (m)	(m)			
12	0.33	0.34										
4	-0.06	0.11										
16	-0.24	-0.11										
18	-0.19	-0.22										
20	-0.24	-0.26										
22	-0.27	-0.31										
24	-0.26	-0.35										
56	-0.24	-0.26										
28	-0.26	-0.41										
30	-0.29	-0.34 46.04										
32		-0.29										
34		-0.28										
36	-0.34	-0.29										
38		-0.31										
40	-0.50	-0.35										
45		-0.35										
20		-0.43										



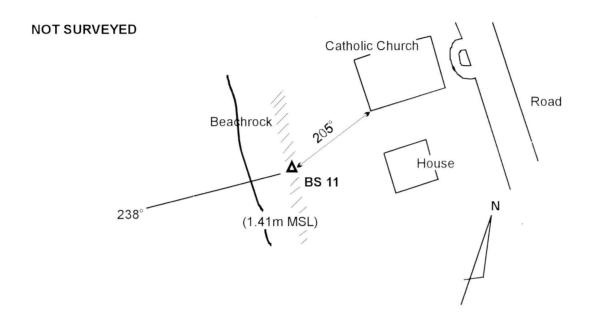
FUNAFUTI BS 10: BS 10 was not found in its reported position. Coral rubble graded from the road has covered it. UF 107 has been disturbed and is lying in the rubble.



FUNAFUTI BS 12: BS 12 was not found in its reported position. Clean up after the construction of the new building may have disturbed it.

LOCATION:

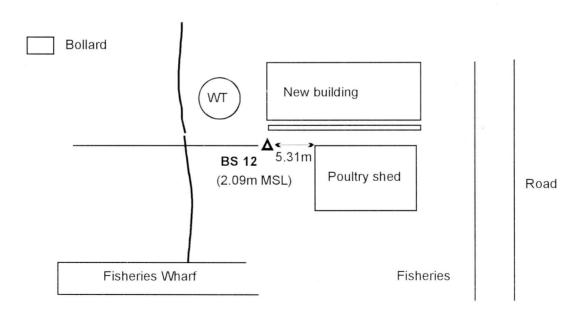
BS 11 is sited on an upper outcrop of beach rock bearing 205° magnetic from the SW corner of the Catholic Church.



# PROFILE: BS 12

LOCATION:

BS 12 is located at the top of the beach 5.31m from the NW corner and in line with the northern side of the Dept of Agriculture poultry shed near Fisheries. BS 12 was replaced in Jan 1994.



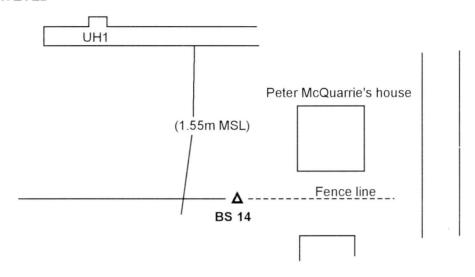
				78-unf	Jan-94				1		•	,																				۵
				+	-				,		20																					
											4																					
.41m								1		-	30	Horizontal (m)	()																			
Height: 1.41m				BS 11								Horizo																				
									-		20																					
Time:								Millian Co.			10																					
Date:						2.00 ┐	1.00	0.00	-1.00	-2.00	0																					
								14l																								
	urch	Jan-94	1.41	0.74	0.59	0.35	0.11	-0.24	-0.35	-0.36	-0.36	-0.45	-0.44	-0.46	-0.45	-0.46	-0.46	-0.45	-0.48	-0.50	-0.49	-0.50	-0.54	-0.70	-0.89	-1.26	-1.39	-1.62	-1.39			
Base Station: 11	Location: Catholic Church	Jun-87	1.41	0.78	0.50	0.40	0.11	-0.31	-0.37	-0.35	-0.40	-0.47	-0.46	-0.46	-0.45	-0.46	-0.47	-0.50					-0.58									
Base St	Location: (	Horizontal	0	2	4	9	ω	10	12	14	16	18	20	22	24	26	28	30	32	8	36	38	40	42	4	46	48	20	55			

				10	77	4	]		1																						
				Jul-85	Jun-87	4 Jan-94				-	46																				2
				-		1			-																						
									-	-	36																				
									1	-	26	(E	<b>)</b>																		
Ē				12					-			Horizontal (m)	2																		
Height: 2.11m				<b>BS 12</b>				#	1		•	Ī																			
He.							1		ř		16																				
							1																								
Time:										-	9																				
F							<b>#</b>																								
						8	88	88	9.7	38	4																				
Date:									gie ∠.∠.																						
		Jan-94	5.09	2.14	2.08	<u>4</u>	1.42	0.98	0.75	0.50	-0.17	-0.18	-0.55	-0.80	-0.93	-1.09	-1.16	-1.31	-1.28	-0.85	-0.81	-0.92	-0.95	-1.08	-1.20	-1.86					
		Jun-87			2.38	2.35	2.07	1.76	1.45	1.13	0.85		0.58	0.15	-0.11	-0.16	-0.27	-0.50	-0.61	-0.90	-0.62	-0.45	-0.42	-0.45	-0.50						
ion: 12	ultry Shed	Jul-85			2.38	2.20	1.74	1.18	96.0	0.74	0.31	0.14	-0.22	-0.22	-0.32																
Base Station: 12	Location: Poultry Shed	Horizontal	4	-2	0	2	4	မ	æ	10	12	14	16	18	20	22	24	26	28	30	32	8	36	38	40	20					

LOCATION:

BS 14 is in line with the fence to the south of Peter McQuarrie's house. BS 14 is 13.65m @ 94° magnetic to the SW corner of Peter's house and 17.4m from the NW corner of the house to the south.

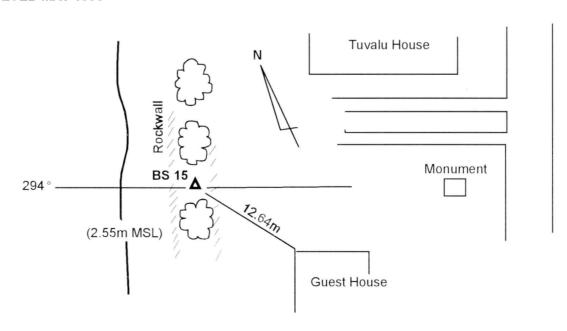
#### **NOT SURVEYED**



# PROFILE: BS 15

LOCATION:

BS 15 uses an old concrete marker by the fence line between the guest house and Tuvalu House. BS 15 lies 12.64m @ 310 degrees from the NW corner of the guest house and 22.58m to the NW corner of the monument.



da d	arie's house Jan-94		
Horizontal Jun-87 -2 1.51 0 1.55 2 1.55 4 0.96 6 0.45 8 0.16 10 -0.17 11 -0.44 14 -0.80 18 -0.97 22 -1.40 24 -1.59 26 28 -2.30 33 34 36 38	Jan-94		
	4 66		
	1		
	 	BS 14	Jun-87
	1.30	T	Jan-94
	1.16	2.00 ]	
	1.09	1.00 L	
	0.30	- 00:0	
	-0.15	-1.00 - 1	
	-0.45	He -2:00	•
	-0.78		- 9
	-0.97	95 97 81 8 7-	84
	-1.16	Horizontal (m)	
	-1.40		
	-1.46		
	-1.54 42.1-		
	-1.72		
	-2.05		
	-2.35		
	-2.47		
	-2.50		
	-2.56		
	-2.50		
-1.65	-1.65		
45	-1.46		
50 -1.92	-1.70		
			۵

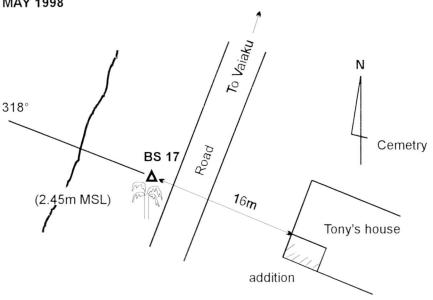
sase or	Base Station: 15				Date: 5.5.98	Ime:	Time: 11.11am	Height: 2.55m	25m			
ocation: N	ocation: Monument											
Horizontal	Jun-87	Jan-94	Jan-95	May-98								
-10		2.01	1.90	2.01				,				
ထု		1.97	1.89	1.97				BS 15			Jun-87	
φ		1.94	1.93	1.95	4.							
4		1.92	1.91	1.94	0						Jan-95	
-5		1.93	1.96	1.96							May-98	
0	2.29	2.30	2.32	2.55	) ti							
7	2.04	1.94	2.11	1.73					1		Transfer of the second	Managagaa
4	1.36	1.52	1.56	1.22								
9	0.82	1.07	0.99	0.86	<b>4</b> .	- 0	- 4	- 6	- 6	- 4	- 6	[ 8
œ	0.46	09.0	0.56	0.54	OL-	0	2	8	9	9	6	8
9	-0.02	0.18	0.27	0.25				Horizontal (m)	ıtal (m)			
12	-0.11	-0.09	0.02	-0.10								
14	-0.22	-0.29	-0.30	-0.37								
16	-0.45	-0.54	-0.43	-0.36				BS 15			78-unf	_
18		-0.56	-0.61	-0.55							Jan-94	_
20	-0.67	-0.69	-0.81	-0.57							Jan-95	
22	-0.87	-0.85	-0.89	-0.66							May-98	m
24	-0.95	-0.91	-1.02	-0.98								ſ
26	-1.28	-1.14	-1.21	-1.21						The state of the s		
28	-1.32	-1.61	-1.64	-1.60	<b>9Н</b>					1	The state of the s	Ī
30	-2.20	-1.84	-1.98	-1.89	2.00	- 0		- 0	- 5	- 6		3
32		-1.93	-2.05	-1.86	7-	0		0	2	0	N	o
34		-1.93	-2.08					Horizontal (m)	ıtal (m)			
36		-1.97	-2.09									
38		-1.89	-2.07									
40		-1.93	-2.08									
42		-1.98	-2.19									
44		-1.61	-1.75									
46	-1.75	-1.62	-1.74									
48		-1.53	-1.80									
20	-1.68	-1.63	-1.82									
09	-1 44	-136	-1.66								2	

LOCATION:

BS 17 is sited south of the airstrip on the lagoon side of the road opposite

Tony's house in the cemetry area.

#### **SURVEYED MAY 1998**



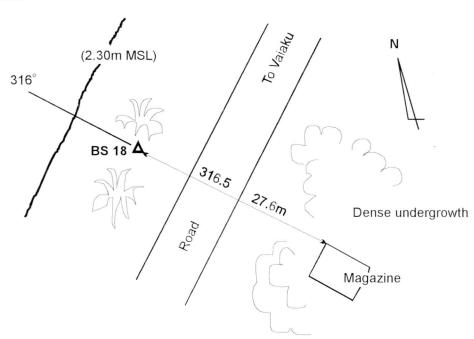
### PROFILE: BS 18

LOCATION:

BS 18 is located on the beach ridge, lagoon side of the road, opposite the explosives

magazine to the South of Tony's house. BS 18 is 27.6m @ 316.5 degrees from the

NW corner of the magazine. (Very overgrown Jan 1995)

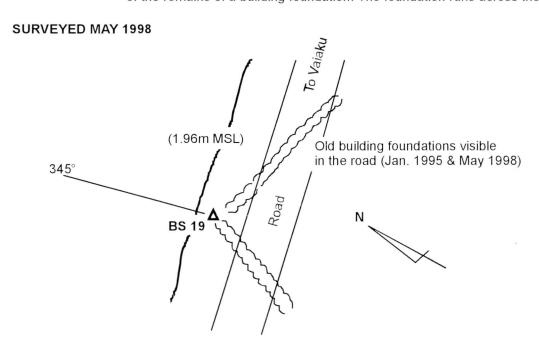


	Dase Station. 17			Date: 5.5.98		Time: 10.40am	Height: 2.45m	.45m						
ocation:	Location: Tony's house	ø												
Horizontal	Jun-87	Jan-94	Jan-95	May-98										
0		2.45	2.41	2.45								L		Γ
2		2.30	2.34	2.51				<b>BS 17</b>	7			•	Jun-87	
4		2.14	2.18	2.09										_
9	2.27	1.81	1.73	1.55	00 %	,							Jan-95	10
ω	1.47	1.26	1.03	1.11									May-98	80
10	1.16	0.74	0.69	0.76			1							
12	0.65	0.40	0.47	0.47	hgi 0.0	-0		İ	-					
14	0.27	0.29	0.30	0.26		- 0								
16	0.17	0.20	0.18	0.14		- 4		- 8	- 2	- 6	30	5	- 46	[
48	0.01	0.05	-0.02	0.07		OL	5	8	6	ક	ဂ္ဂ	5	<del>0</del>	2
20	-0.09	-0.05	-0.06	-0.04				Hori	Horizontal (m)	Ē				
22	-0.17	-0.06	-0.14	-0.11										
24	-0.20	-0.27	-0.21	-0.19					,			L		Г
56	-0.31	-0.19	-0.30	-0.21				BS 17	7			1	Jun-87	
28	-0.30	-0.31	-0.39	-0.18								1	Jan-94	500-0
90	-0.34	-0.33	-0.41	-0.35	3 00	0						<u> </u>		
32	-0.45	-0.42	-0.51	-0.45			1						May-98	~
怒	-0.53	-0.46	-0.61	-0.52		· ·			1					
98	-0.59	-0.54	-0.70	-0.40	1 <b>6</b> i							-		
38	-0.67	-0.81	-0.79	-0.58		<b>D C</b>								
40	-0.67	-0.75	-0.81	-0.56	3.	- 0	- u	a	ç	- 5	- 5	ā	ά	5
42	-0.88	-0.74	-0.76	-0.61		٧		o ;	2	<u> </u>	<u>t</u>	2	2	ĭ
4	-0.92		-0.77	-0.61				Hor	Horizontal (m)	î				
46	-0.77		-0.76	-0.58										
48	-0.94		-0.78	-0.75										
20		-0.60	-0.80	-0.57										
								1						
													2	

ase or	Base Station: 18				Date:	IIIIe.	•:	neignt. z.sum	E			
cation:	Location: Magazine											
Horizontal	Jun-87	Jan-94	Jan-95									
ထု	1.94	1.83	1.79					:				
4		2.02	2.02					BS 18			nr -	- Jun-87
-5	2.05	2.06	2.04								еГ —■—	- Jan-94
0	2.30	2.25	2.29		_ c						et –	Jan-95
2	2.01	1.85	1.79		00	\$						
4	1.43	1.28	1.23	<b>14</b> 1	, 8 8	J. Company of the Com						
9	0.71	0.67	0.70		, , R 8		40000		The State of the S			
æ	0.44	0.32	0.32		2 8							
10	0.01	-0.03	0.04		φ	4 14	24	8	4	54	64 74	_
12	-0.24	-0.25	-0.21					Horizontal (m)				
4	-0.47	-0.47	-0.49					110112011101				
16	-0.63	-0.65	-0.66									
18		-0.67	-0.73									
20	-0.77	-0.75	-0.78									
22	-0.80	-0.86	-0.85									
24	-0.85	-0.81	-0.83									
28	-0.78	-0.80	-0.88									
28	-0.82	-0.81	-0.87					-				
99	-0.80	-0.81	-0.88									
32		-0.79	-0.91									
8		-0.87	-0.93									
38		-0.82	-0.95									
38		-0.85	-1.01									
40	-0.90	-0.88	-1.07									
42		-0.94	-1.07									
4		-1.06	-1.15									
46		-0.93	-1.24									
48		-1.00	-1.17									
20	-1.15	-0.97	-1.22									
90	-1.08	-0.75	-1.27									
70		-1.15	-1.28									
80		86.0-	-141								4	

LOCATION:

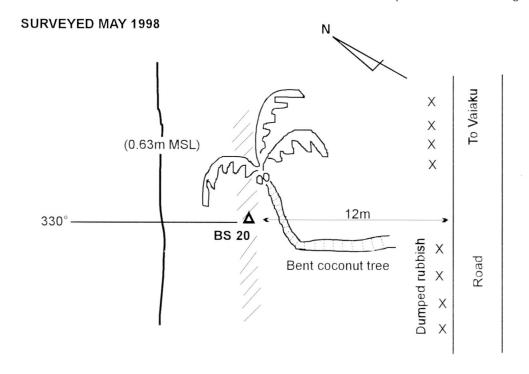
BS 19 is located south of BS 18 on the lagoon side of the road on the SW corner of the remains of a building foundation. The foundation runs across the road.



PROFILE: BS 20

LOCATION:

BS 20 is south of BS 19 and located on the beachrock on the lagoon side below a bent coconut tree 12m from the road. The profile bears 330 degrees.

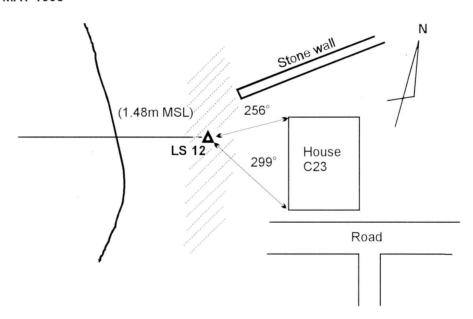


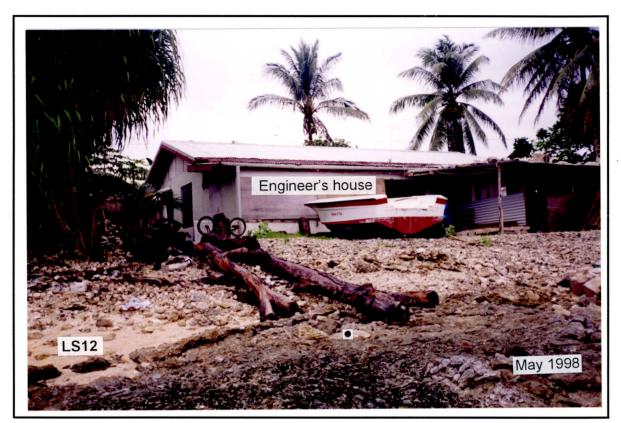
									—	7	_ 2	2										***	٦ ج	3						
				Jun-87	Jan-94	Jan-95	May-98			The state of the s	46	5				Jun-87	Jan-94	Jan-95	•─- May-98				ξ.							
				T	Persona	<u> </u>	1			The second second second	Ş	€				Manage of the Control						and the state of t	4	2						
										Ī	30	S										Sections of the section of the secti	- 77	<u>1</u>						
										-	5	3	Œ)								()	Annion and the Control of the Contro	- 5	7	Œ)					
1.96m				_						1	4	27	ontal								4	Overlandson, and	- 5	2	ontal	-				-
Height: 1.96m				<b>BS 19</b>						Comment of the Commen	5	8	Horizontal (m)			<b>BS 19</b>							α		Horizontal (m)					
am										The same of the sa	4	Ω											- «	0						
Time: 9.48am											5	2							,				-	٠						
							•	7			- 4	n							Performance on the Park	1			·	٧						
5.5.98						8	3 8	8 8	3 8	0.0	5. 3.	>						2 50	2.8	8 5	0.50	0.00	 	>						
Date: 5.5.98									lgi										(w											
		May-98	1.96	2.00	1.77	1.56	1.00	0.70	0.60	0.19	0.01	0.09	0.02	0.08	-0.22	-0.28	-0.46	-0.54	-0.55	-0.57	-0.59	-0.63	-0.66	-0.77	-0.66	-0.67				
		Jan-95	1.96	1.91	1.62	1.25	0.87	0.55	0.35	0.40	0.20	0.17	0.02	-0.04	-0.19	-0.29	-0.47	-0.59	-0.60	-0.64	-0.61	-0.65	-0.71	-0.84	-0.75	-0.78				
	ndation	Jan-94	1.96	1.85		1.49	0.88	0.51	0.29	0.13	-0.07	-0.13	-0.03	-0.16	-0.24	-0.36	-0.20	-0.52	-0.57	-0.55	-0.58	-0.60	-0.63	-0.65	-0.64	-0.73				
tion: 19	ulding four	Jun-87	1.96	1.61		1.46	96.0	0.62	0.50	0.42	0.19	0.15	0.12	0.08	-0.21	-0.26	-0.46	-0.52	-0.55					-0.79	-0.63	-0.68				
Base Station: 19	Location: Building foundation	Horizontal	0	2	က	4	9	80	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	45	20				

				In-87	Jan-94	Jan-95	May-98			-		8				787	Jan-94	Jan-95	May-98											d
				Jun-87	<b>e</b> L -	eL -	Ž		-			5				78-unf	Jar	Jar	Ma			0 0	4	<u>o</u>						7
									1		- 8	8											- 2	=						
.63m												17 91	Horizontal (m)										- 0	D	Horizontal (m)					
Height: 0.63m				<b>BS</b> 20							- 7	Ξ	Horizo			<b>BS</b> 20					,				Horizo					
00am											- 0	٥											-	_						
Time: 9.00am	×											4												†						
.98						5	2 2	8	- 0	9 9		ņ						5	8 8	- 00	- 8	8 8	2	ņ						
Date: 5.5.98									1 <b>9h</b>										<b>(W</b>			<b>9Н</b>								
		May-98	1.83	1.43	1.02	0.67	0.56	0.63	0.26	0.00	-0.72	-0.62	-0.74	-0.97	-1.03	-1.03	-1.09	-1.18	-1.57	-1.87	-2.41	-2.63	-2.82							
		Jan-95	2.05	1.56	1.12	0.69	0.55	0.55	0.21	-0.06	-0.54	-0.66	-0.73	-0.94	-1.09	-1.09	-1.14	-1.25	-1.77	-1.94									-	
		Jan-94	1.94	1.51	0.98	0.69	0.56	0.53	0.22	-0.04 40.04	-0.51	-0.64	-0.69	-0.97	<u>-</u> .	-1.08	-1.26	-1.76	-1.73	-2.05	-2.08	-2.30	-2.97	-4.17						
Base Station: 20	Sent tree	Jun-87	1.63	1.37	1.05	0.62	0.46	0.63	-0.38				-0.83					-1.22					-2.37							
Base St	Location: Bent tree	Horizontal	6-	ထု	မှ	4	-5	0	2	4	9	80	10	12	14	16	18	20	22	24	26	28	30	40						

LOCATION:

LS 12 is located on the beachrock almost in line with the old village stone wall in north Vaiaku, adjacent the house C23. LS 12 bears 256° magnetic from NW corner of C23 and 299° from the SW corner





FUNAFUTI LS12: The concrete BS is still in position.

Base Sta	Base Station: LS12	12		Date: 6.5.98	Time: 10.35am	n Height: 1.48m	3m			- State
Location: E	Location: Engineer's house	esnou								
Horizontal	Jul-85	Jan-94	May-98							
-10		2.35					:			
ထု	2.37	2.36	2.59			BS LS12	S12		Jul-85	2
φ	2.30	2.13	2.56				184		Jan-94	4
4	1.76	1.62	1.86	3.00					May-98	86
-5	4.	1.38	1.39	(w						
0	1.48	1.48	1.48	3 5			3			
2	1.25	1.25	1.25	3 8	<i>‡</i>					
4	0.81	0.80	0.78	9H					A STATE OF THE PERSON NAMED OF THE PERSON NAME	Principal district
9	0.68	0.68	0.69	-1.00		- 4	6	000	4	[
œ	0.45	0.37	0.44	2	•		8	8	<del>}</del>	8
10	0.25	0.27	0.25			Ą	Horizontal (m)			
12	0.17	0.18	0.15							
14	0.36	0.10	0.12							
16	0.14	0.10	0.13			BS LS12	S12		Jul-85	85
18	0.08	0.10	0.05						Jan-94	-94
20	0.08	0.07	0.03	300					May-98	86-/
22	0.09	0.07	90.0	(w	4					
24	0.07	0.09	0.07	) tr 2.00						
56	0.05	90.0	0.01	lgi 1.00						
28	0.01	0.04	0.01	6						
8	0.03	0.05	0.02	9.0	- 6	c	- 1	- 5	- 11	
32		0.07	0.05	ρ	?		- :	7	=	
श्र		0.05	0.00			Į.	Horizontal (m)			•
98		0.03	0.03							
88		0.00	0.01							
40		-0.04	-0.10							
45		-0.11	-0.16							
20		-0.18	-0.24						-	
									*	
									۵	