THE REPUBLIC OF FIJI

MINISTRY OF AGRICULTURE, RURAL AND MARITIME DEVELOPMENT AND NATIONAL DISASTER MANAGEMENT

THE PROJECT FOR THE PLANNING OF THE NADI RIVER FLOOD CONTROL STRUCTURES

VOLUMEⅢ DATA BOOK

PART Ⅰ: DATA BOOK (1)

JULY 2016

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

YACHIYO ENGINEERING CO., LTD.
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16-091

THE REPUBLIC OF FIJI
THE PROJECT FOR THE PLANNING OF
THE NADI RIVER FLOOD CONTROL STRUCTURES

COMPOSITION OF FINAL REPORT

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THE PROJECT FOR THE PLANNING OF THE NADI RIVER FLOOD CONTROL STRUCTURES

FINAL REPORT

VOLUMEⅢ DATA BOOK

Contents

PARTⅠ: DATA BOOK (1)

PARTⅡ: DATA BOOK (2)

Data Book-1

Flooding list near Nadi River Basin between 1870 and 2014

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
1871	Mar	20-21	TC	・Entire Fiji Group affected. Centre over Western Fiji. 380mm rain at Delanasau, Bua, for 24 hrs ended 5 p.m. 20th (Holmes, 1877). ・Ba River: several labourers on McIntosh's cotton plantation drowned (Yeo & Blong, 2010; FTs). ・Nadi: houses carried away in river (Yeo, 1998).				
1879	Dec	11	TC	・Entire Fiji Group affected especially Northwestern Fiji. ・General: storm surge recorded at Nadi flats, Sabeto, Ba, Nanunu; one European drowned at Sabeto attributable to storm tide (Yeo, 1998; FTs). ・Lautoka: town flooded (Blong, 1994).				
1886	Jan	4-5	TC	・Ba: river rose considerably, but no damage reported at Rarawai Mill (Yeo, 1998).				
1912	Jan	28-29	TC	・Ba: flood peak estimated at 4.72m below the 1931 peak at Rarawai rail bridge on the 29th (Yeo, 1998).				
1918	Feb	7	TC	・General: storm surge swept West Coast with considerable damage to houses but no loss of life (SMH, 9/3/1918).				
1927	Feb	9	N/A	・General: storm surge swept West Coast with considerable damage to houses but no loss of life (SMH, 9/3/1918). ・Ba: flood peak estimated at 3.51m below the 1931 peak at Rarawai rail bridge; Navisa Creek rose 30ft (9.1m) (Yeo, 1998; CSR). ・Nadi: flood (CSR).				
1931	Feb-Mar	Feb2-Mar2	TC	・TC hit Labasa, Western Viti Levu and Southern Lomaiviti Group. ・General: Fiji's worst natural disaster with at least 225 fatalities during the hurricane, mostly from record flooding on the night of Saturday 21st February (Yeo & Blong, 2010); a second, lesser flood peak was recorded at Ba on 25th Feb (CSR); major floods (not as high as on 21st-22nd Feb) were experienced in eastern Viti Levu on 1st-2nd Mar, when the hurricane passed to the north of Penang in a south-easterly direction (FNA, 1931). ・Nadi: floods reportedly the highest and severest ever experienced in Nadi to that date; 5 ft (1.5m) deep in Nadi town, in some instances up to 9 ft deep (2.7m); Nadi River rose 35 ft above normal level; 3 people drowned (FNA; FTs; FNA, 1931); floods reportedly reached tramway tracks in Namaka (Robert Kennedy, pers. comm.).		225		
1932	Feb	5-6	N/A	・General: heavy flooding in all the main rivers (source unknown).				
1933	Mar	27	N/A	・Nadi: township flooded but no serious damage (FNA).				
1938	Feb	27	TC	・General: moderate flooding in the West (D'Aubert, 1994)				
1938	Dec	22	TC	・TC hit West to Southwest of Viti Levu. 36½ inches (927mm) rain recorded at Nadarivatu Timber Mill for 24 hours ended 22nd (CSR). ・General: main roads blocked by landslides and washouts in Western Viti Levu (D'Aubert, 1994).				

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
1939	Jan	21	TC	・TC passed over Viti Levu, then moved to Western Viti Levu on 21st. Centre passed over Kadavu. ・General: damage to roads and bridges across the country due to flooding (D'Aubert, 1994). ・Nadi: flood 4 ft (1.2m) deep in shops and houses (FTs).				
1944	Jan	9	TC	・TC crossed Viti Levu from west to east just south of Nadi				
1944	Mar	20	TC	・TC passed 50 miles west of Lautoka from west of Wallis Is.				
1946	Jan	30	TC	・TC hit western and southern Fiji Group.				
1948	Jan-Feb	Jan31-Feb4	TC	・TC hit Rotuma, Western Viti Levu and Kadavu. ・General: Viti Levu rivers in high flood (Kerr, 1976; D'Aubert, 1994).				
1954	Jan	15-19	TC	・TC hit northwest of Fiji. ・General: some flood damage on Viti Levu (FMS, 1997a).				
1955	Mar	8	N/A	・General: flooding extended from Rakiraki to Korotogo via western Viti Levu (PIM, 1955). ・Nadi: Flood reportedly the worst for 23 years; shops flooded (PIM, 1955).				
1956	Jan	30-31	N/A	・Minor. Approached Fiji from northwest passed western Fiji; Vatukoula had 664mm rain on 30th (24 hours) (FNA). ・Nadi: highest flood since 1938-39; higher than 1955 flood; heavy loss of merchandise (FTs).		3		
1956	Mar	6	N/A	・Minor to moderate. South-western and South-eastern Viti Levu and Kadavu. General: severe flooding on Viti Levu (FMS, 1997a). ・Nadi: flooded (FNA).				
1964	Mar	22	Storm	・Storm hit west of Nadi. ・Nadi: flood peak 6.72m a.m.s.l. (PWD, 2000); 18 ft (5.5m) in main street on night of 21st (FTs); temporary bridge over Nadi River destroyed (FNA, 1966).				
1964	Dec	18-22	TC	・Storm hit west of Nadi.				
1965	Feb	9-12	TC	・General: severe flooding on the main islands caused heavy stock and crop losses and claimed 11 lives (Kerr, 1976; D'Aubert, 1994). ・Nadi: higher than Oct 1972 flood (Harris, 1972); regarded as the highest flood on record at the time and much higher than Mar 1964 flood (FTs); severe damage to shops; Narewa village severely damaged (FTs).		11		
1972	Oct	24-25	TC Bebe	・Whole of Fiji was affected. ・General: storm surge recorded near Natunuku on Ba coast (Yeo, 1998). ・Lautoka: flooding in Vitogo and Namoli, 2-4 ft (0.6-1.2m) deep in places (Blong, 1994). ・Nadi: flood peak 1.37m deep at ANZ bank on 24th, somewhat lower than the Feb 1965 flood (Harris, 1972); 8 ft (2.4m) in town (Blong, 1994); about 500 houses damaged (source unknown). ・Sabeto River: severe flood, Nadele flooded, village moved to Korobebe (Yeo, 1998).				
1973	Mar	2-6	N/A	・General: five flood fatalities – two in Rewa area, two in Ba area, one in Nadi area (FTs). ・Nadi: about 2½ ft water (0.8m) in business district, flooding shops; low-lying approaches to Nadi bridge under 3 ft water (0.9m), closing road to traffic; one man drowned attempting to cross Mulomulo River on 5th (FTs).		5		

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
1974	Jan	10-12	N/A	・General: flooding in Western Division closed many roads (FTs). ・Nadi-Sigatoka: bridge at Tunalia under 2 ft (0.6m) floodwater on 12th (FTs).				
1974	Feb	25-26	N/A	・General: flooding in western division especially Ba. ・Lautoka: floods swept away about 300 ft (~90m) of 12 inch (0.3m) cast iron pipe from the Varaqi water intake on 26th; river level in gorge about 75 ft (20+ m) above normal (FTs). ・Nadi: approach to Nadi bridge from Lautoka under 3 ft (0.9m) of water (FTs). ・Sabeto: roads flooded (FTs).				
1974	Mar	12-14	N/A	・Nadi: serious flooding on 14th, about 5 ft (1.5m) deep at old bus station; Queens Road closed on Navo Flats and near Namotomoto village on Lautoka side (FTs). ・Nadi-Sigatoka: Semo bridge under 2 ft+ (0.6m +) water on night of 13th (FTs).				
1974	Apr	24-26	N/A	・Lautoka: near fatality when girl slipped and fell into drain, rescued by passer-by (FTs). ・Nadi: near fatality when villager attempted to cross Nadi River; approach to Nadi bridge on Lautoka side washed away (FTs).				
1975	Nov	17-20	N/A	・Nadi: bus station flooded on 17th (FTs).				
1982	Jan	23-31	Storm Hettie	・Storm hit Mamanucas and Western Viti Levu. ・General: extensive flooding in Northern, Western and Central parts of Viti Levu and Vanua Levu (FMS, 1983). ・Nadi: flood peak 5.86m a.m.s.l. (PWD, 2000); 4 ft (1.2m) water at Nadi bus station (Blong, 1994); one flood fatality (FTs).		1		
1983	Feb-Mar	Feb28-Mar2	TC Oscar	・TC hit Viti Levu, Yasawas, Lomaiviti, Southern Lau and Kadavu. ・General: heaviest flood damage in western and southwestern Viti Levu (source unknown). ・General: 2m storm surge reported near Vuda, Nadi and southwest coast of Viti Levu, with some reports suggesting 3-4m at Momi and Beqa Island (FMS, 1984; Blong, 1994). ・General: overall damage for the country (including flood) amounted to approximately (1998)F$148 million (World Bank, 2000). ・Nadi: flood peak 6.61m a.m.s.l. on 2nd (PWD, 2000); 12 ft (3.7m) of water in the market (Blong, 1994); Nadi Council estimated their damages to exceed $300,000 (FTs).				approximately (1998)F$148 million (World Bank, 2000).
1984	Mar	16-18	Gale Cyril	・General: significant flooding in Northern and Western Vanua Levu and Viti Levu (source unknown). ・Nadi: small storm surge observed in Nadi Bay with sea level estimated to have been 0.3m above normal on 16th (FMS, 1985a); flood peak 5.62m a.m.s.l. in Nadi town on 18th (PWD, 2000); 1m of floodwater at the Nadi bus station (Blong, 1994).				
1985	Jan	17	TC Eric	・TC hit Yasawas, Mamanucas, whole of Viti Levu and Southern Lau. ・General: crop and livestock losses in Western Viti Levu (FMS, 1997a). ・General: overall damage for the country (including flood) amounted to approximately (1998)F$64 million for the country (World Bank, 2000). ・Nadi: flood peak 4.56m a.m.s.l. (PWD, 2000).		23	150,000	39,712,636

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
1985	Jan	19	TC Nigel	・TC hit Southern Yasawas, Mamanucas, Northern half of Viti Levu, and Lomaiviti and Southern Lau. ・General: storm surge recorded in Western Fiji (FMS, 1997a); storm surge recorded near Natunuku on Ba coast (Yeo, 1998). ・Lautoka: localised flooding (Blong, 1994). ・Nadi: flood peak 4.74m a.m.s.l. (PWD, 2000).				
1985	Mar	5-7	TC Gavin	・TC hit Western and Southwestern parts of Viti Levu. ・General: serious flooding in the Ba, Nadi, Sigatoka and Rewa valleys (FMS, 1986a, 1997). ・Nadi: floods (Blong, 1994).		7		
1985	Mar	16-17	TC Hina	・TC hit Yasawas, Mamanuca, Viti Levu and parts of the Lomaiviti Group ・General: widespread flooding about northern and western parts of Viti Levu, the Mamanucas, Kadavu and Vatulele; several river crossings about interior of Nadi and Sigatoka washed away including Draiba bridge; about 1m storm surge reported along Viti Levu's Southwest coastline on the 16th, especially between Vuda and Momi Bay (FMS, 1985b). ・Nadi: flood peak 5.38m a.m.s.l. in Nadi town on 17th (PWD, 2000); 1-2 metres of flood water in Nadi town (Blong, 1994).		3	6,000	
1986	Apr	10-11	TC Martin	・TC hit Northern Lau, Taveuni, Vanuabalavu and northern two-thirds of Vanua Levu. The flooding on Viti Levu cannot be attributed to the cyclone which had a very distinct identity (FMS, 1986b). ・Lautoka: surrounding areas in Drasa, Vitogo, Natabua, Velo Velo, Vaivai, Saweni and Lomolomo (3-4m deep in houses) flooded; city not flooded; Namoli Creek flooded (FS). ・Nadi: flood peak 6.53m a.m.s.l. on 11th (PWD, 2000); town completely cut off (FS); water 1.5m deep at southern end of town (Blong, 1994); heavy losses to shops (FS).			5,600	
1986	Dec	N/A	TC Rajah	・Damage to crops, sugar, roads, bridges, power & telecom in Vanua Levu, Taveuni & Lau		1	3,000	14,000,000
1989	Feb	9-15	TD	・Tropical Depression developed just to the Southwest of Fiji on the 6th , later moved slowly eastward. ・General: nine flood-related deaths reported (FMS, 1990a). ・Nadi: waist deep water at the bus station on 13th (Blong, 1994).		9		
1989	May	28-30	TD	・Tropical Depression to the far west of Fiji. Associated broad cloud band persisted over Fiji from the 27th to the 31st. ・General: from the 28th low lying areas of Northern and Western Viti Levu were flooded (FMS, 1990a). ・Nadi: knee deep water at bus station on 30th (Blong, 1994).				
1990	May	21-22	TC Rae	・Most of the Fiji Group affected. Torrential rain fell over most parts of the country. ・General: major flooding of Nadi and Ba towns (FMS, 1990b); three lives lost due to drowning in flooded rivers, minor damage to crops and vegetation (FMS, 1996a); closure of roads and bridges all over the country (FMS, 1997a). ・Lautoka: shallow flooding in Vitogo Parade (Blong, 1994). ・Nadi: flood peak 5.93m a.m.s.l. (PWD, 2000); PWD's reported timing of flood peak on 29th suspect (Yeo, 2010).		3		26,200,000

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
1990	Nov	27-28	TC Sina	・TC hit Southern Fiji. ・General: overall damage for the country (including flood) amounted to approximately (1998) F$33 million (World Bank, 2000); most damage seems to have been caused by wind, since no major flooding (FMS, 1992; Yeo, 2010); coastal erosion reported on west and south coasts of Viti Levu due to storm surge (Holden, 1992).				approximately F$33million (World Bank, 2000)
1992	Dec	10-11	TC Joni	・TC hit Yasawas, Mamanucas, Southwestern Viti Levu and Kadavu. ・General: flooding of rivers in Viti Levu, especially the Rewa Delta; significant loss of livestock due to flooding (FMS, 1997a); overall damage for the country (including flood) amounted to approximately (1998) F$2 million (World Bank, 2000).				1,600,000
1993	Jan	3	TC Kina	・TC hit Yasawas, Northern and Eastern Viti Levu, Southern Vanua Levu, Lomaiviti and Southern Lau. ・General: prolonged heavy rain with a combination of factors including high tide and heavy seas blocked mouths of major rivers resulting in extensive flooding (FMS, 1996a). ・General: overall damage for the country (including flood) amounted to approximately (1998) F$188 million (World Bank, 2000); almost complete loss of crop in the Sigatoka, Navua and Nausori areas, major loss of livestock (FMS, 1997a). ・General: nine flood fatalities (Yeo, 2010). ・Nadi: no significant flooding (Terry & Raj, 1999).		23	28,000	approximately F$188million (World Bank, 2000)
1993	Feb	17	Gale Oli	・Gale hit Yasawas, Mamanucas, Southern Viti Levu, Kadavu and Ono-ILau. ・General: some damages to bridges in the Ba and Sigatoka areas (FMS, 1997a). ・Nadi: Qeleloa bridge closed to all traffic (FTs).				
1995	Mar	13-19	N/A	・Second trough of the month affected Fiji from 13th to 19th, initially moving south across the Group then moving north on 16th. ・Nadi: floods (15th or later) damaged over 250 tonnes of cane (FMS, 1996b).				
1997	Jan-Feb	Jan19-Feb2	TC Evan and Freda	・TCs and several other low pressure systems dominated Fiji's weather. ・General: traffic disruption and schools closed in the Western Division; several low bridges and roads under water with an Irish crossing in Nadi washed away; crushing at the Labasa and Lautoka Mills temporarily suspended (FMS 1998). ・Lautoka: 'freak' floods on night of 29th Jan, damage worth more than $150K in Namoli industrial area (FTs).				
1997	Mar	8	TC Gavin	・TC hit Yasawas, Mamanuca, Western Viti Levu. ・General: northern coast of Vanua Levu badly affected by storm surge, with sea walls breached in 10 places (Terry & Raj, 1999); storm surge recorded near Natunuku on Ba coast (Yeo, 1998); storm surge at Namara village on Wava island in Yasawas (FSP). ・General: overall damage for the country (including flood) amounted to approximately (1998)F$35 million (World Bank, 2000). ・Lautoka: flooding at Viseisei village (FSP). ・Nadi: flood peak 6.66m a.m.s.l. (PWD, 2000).		25	3,500	18,300,000
1998	Nov	11-13	TC	・The third and most significant trough of the month developed to the west of Fiji on 11th and moved slowly eastwards. Associated cloud bands and moist notherly winds produced widespread heavy rain with occasional squally thunderstorms for the next few days.				

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
				・General: flash flooding in some areas, especially in Western Division (FMS, 1999a).				
1999	Jan	18-19	TC Dani, SPCZ	・A third trough for the month this time a westward moving system approached the Lau Group on 16th. By 17th, the trough lay over the Lau Group and extended northwards to Rotuma. The trough continued to move westwards on 18th with the SPCZ over Rotuma also drifting south. This low-pressure system produced heavy rain across most of Vanua Levu and the Lomaiviti Group. ・On the night of 18th, the trough drifted onto Viti Levu and stalled for nearly 12 hours causing a strong convergence of winds and vigorous thunderstorm activity over the area. This resulted in very heavy rain overnight and during most of the following day over northwestern Viti Levu. The trough moved to the west of Fiji on 21st. ・General: Government estimated agricultural, infrastructural and utilities losses at about $10 million (Yeo, 2000); 6 flood fatalities (Yeo, 2010); $F8 million allocated by the Government in relief funding (source unknown). ・Lautoka: bridge over Vitogo River carried away (FTs). ・Nadi: flood peak 7.30m a.m.s.l. at Nadi bridge and 7.25m a.m.s.l. in town (LWRMD, 1999 cf. PWD, 2000); about 80% shops damaged while 50% lost nearly all stock (FTs); damage in Nadi town estimated at $12 million to the business sector and $2 million to private vehicles (FTs).		12	2,000	2,000,000
2000	Mar	2	LP	・Slow moving trough of low-pressure lay over the Group from 1st. Western Viti Levu and Northern Vanua Levu received significant rainfall on 1st. From midday on 2nd, the trough underwent rapid intensification close to western Viti Levu. ・Nadi: vehicle washed away by raging flood (FMS, 2000d).				
2000	Mar	17	LP	・Second trough of the month developed to the northwest of Fiji on 15th and extended over the country. The trough remained over the Group from 16th to 18th causing showers about the main islands, Yasawa and Lau Groups. ・General: flooding in the Western Division (FMS, 2000d). ・Nadi: a man drowned in a flash flood (FMS, 2000d).		1		
2000	May	2-4	LP	・A low pressure system developed along a trough over the Lomaiviti Group which drifted northwestward initially then curved southwest between 2nd and 3rd. ・General: flooding in the northern and western areas of Viti Levu in the first week of the month resulting in damages to infrastructure (FMS, 2000f). ・Lautoka: flash flooding on 2nd and 4th (FTs). ・Nadi: flash flooding on 4th (FTs).				
2000	Dec	7-12	TD	・Tropical Depression passed over the Group from the Northwest. ・General: flooding in the Western and Eastern Divisions. ・Lautoka: Natabua Flats flooded (FTs). ・Nadi: Qeleloa bridge under 0.9m of water on 7th; no major flooding at Nadi town (FTs).		4	5,600	

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
2001	Feb	19	LP	・A trough of low pressure approached Fiji from the northeast. ・Nadi: Flooding in the Narewa area. A child drowned while trying to cross a flooded river.		1		
2001	Feb-Mar	Feb28-Mar1	TC Paula	・TC approached Fiji from the west while moving in a southeasterly direction. An associated trough affected the Group and significant rainfall was received on 1st and 2nd. ・Nadi: Qeleloa River flooded. ・Sabeto River and low-lying areas between Lautoka and Nadi flooded on 28th.		1		800,000
2001	Oct	21-23	LP	・Trough of low pressure moved onto Viti Levu from the west ahead of an eastward moving frontal system located just south of New Caledonia. ・Nadi: Qeleloa bridge under approx. six feet (1.8m) of water on evening of 22nd. Nadi bus station flooded.				
2002	Feb	23-24	TD	・A weak tropical depression developed west of the Yasawa Group on 23rd. The system initially moved slowly westwards then turned south-eastwards later in the day while slowly deepening. Heavy rain affected western Viti Levu and the Yasawa Group on 23rd and 24th. ・General: Some bridges in Nadi, Lautoka, Ba, Tavua and Ra under water. Extensive damage to crops in these areas and in other parts of the Western Division.				
2002	Mar	7-11	SPCZ	・On 7th, the monsoon trough moved north towards the Fiji Islands bringing the SPCZ onto the Group. Heavy rainfall received for the next four days. ・Nadi: Qeleloa River flooded.				
2003	Jan	14	TC Ami	・Tropical Cyclone Flood & Landslide in the whole of Northern Division		19		22,089,200
2003	Mar	13-14	TC Eseta	・Rain accompanying a depression to the northwest of Fiji received from 9th in the western parts of the Group. By 11th the depression had intensified into TC Eseta. It passed south of Ono-i-Lau on 13th. Strong and gusty winds and rain continued until 14th. ・General: Numerous reports of flooding and crop damage in the Western Division. ・Nadi: Qeleloa bridge under 1.5m of water on 13th.				
2004	Feb	6-14	TD	・A weak trough developed over the Group resulting in heavy rain initially being received about the interior and western parts of the main islands. Rain continued about the eastern and western parts of the Group for the next few days. On 10th an active trough to the north of the Group drifted south and brought further rain on 11th. A depression formed along this trough west of Nadi on 12th, which later moved southwards. Heavy rain received until 15th. ・Lautoka: Reports of flooding in Navula, Toge and Saru. ・Nadi: Qeleloa River flooded.				
2004	April	7-8	TD	・A tropical depression developed along a southward moving trough about 220km northwest of Labasa. The depression intensified rapidly as it approached Vanua Levu and passed over the Vanua Levu coastline early on 7th. The depression was accompanied by heavy rain, which resulted in flooding parts of Vanua Levu. This depression continued to move rapidly southeast and was southeast of the Lau Group by midnight on 7th. A second depression formed along the above-mentioned trough 280km northnorthwest of Nadi. On 8th at 1.30p.m, the depression reached the Viti Levu coastline near Rakiraki and moved rapidly across Viti Levu. This depression cleared the Group on 9th at midday.		12		11,585,392

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
				・General: Flooding in parts of Vanua Levu and northern and eastern Viti Levu. Several millions of dollars of damage reported in the Central and northern parts of the Western Division. Probably 12 flood fatalities (Fiji Government Online, 2004; Yeo, 2010).				
2005	April	18-20	N/A	・On 15th a monsoonal trough intensified and moved northwards over Fiji. Heavy rain continued until 20th. ・General: Flooding in the Western, Northern and Central Divisions. Schools and roads closed around the country. A total of about 47 roads around the country closed or partially washed away. ・Nadi: Qeleloa bridge under 3m of water. Newly built Qeleloa bridge partially washed away. Residents of Qeleloa, Togo, Togomasi, Vuniyasi and Dratabu stranded. Nadi bus station and surrounding areas flooded. Nadi hospital and Andrews Road junction under 3 ft (0.9m) of water on 20th.				
2005	Oct	26-30	N/A	・On 22nd a weak cold front drifted west away from Fiji. Around this time a trough with associated active cloud and rain bands moved towards the Group from the north. By 26th, the cold front, which had become almost stationary to the west moved back onto the Group to merge with the trough. Widespread rainfall, heavy at times and accompanied by squally thunderstorms recorded in places. Rainfall continued until the end of the month, though mostly over the northern half of Fiji as the system responsible moved northwards.				
2006	Jan	28-29	TC Jim, SPCZ	・A combination of an active monsoonal trough associated with TC Jim to the far west of Fiji and a strong SPCZ produced substantial rain over the country from the 24th to 31st. Torrential rain received on the 28th in north and northwest Viti Levu. ・General: Flooding in the northwestern parts of the Western Division on 28th and 29th. Parts of Ba Town, Lautoka and Rakiraki flooded. ・Lautoka: Flooding at Vunato village at 2 a.m. Sun 29th. Reports of flooding along Sukanaivalu Road.		4	1,049	FJD 26,952.26
2006	Feb	4	TC Jim, SPCZ	・TC Jim drifted south into Fiji's area of responsibility on 1st. Associated westerlies with the SPCZ to the west of Fiji brought rain over most parts of the Group during the first week of the month. The SPCZ drifted over Vanua Levu on 4th.		1		
2007	Feb	4-12	TD	・At the beginning of the month a tropical depression moving southwest was identified north of Rotuma. Almost simultaneously an associated trough of low pressure with extensive cloud and rain east of Fiji moved towards the Group. The depression later passed over Vanua Levu and the Lau Group on 4th. The trough lingered in a weaker state across the northern parts of the Group for the next few days then re-intensified and drifted south on 8th. Widespread heavy rain received until 13th. ・General: Extensive flooding reported in northern Vanua Levu on 4th and in the Western Division on 12th. ・Nadi River: flood peak at Nadi town reported as 6.2m a.m.s.l., with significant flooding on Monday 12th. Roads on both ends of town under 5 ft (1.5m) of water. Some houses in Namotomoto village completely submerged.		0		FJD 2,985,989.00

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
2007	Mar	9-14	LP	・A trough to the south of Fiji moved back over the southern parts of the Group and continued further north. Heavy rainfall received in the northern and western parts of Fiji. ・Nadi: A man went missing while swimming in the flooded Nadi River.		3		FJD 695,327.00
2007	Mar	20-25	LP	・On 20th, a trough of low pressure moved onto the Group and became stationary for a week. Widespread heavy rain with heavy falls recorded during this period. On 22nd a depression was identified to the northwest of Fiji while moving toward the Group. The depression was closest to the Group on 24th and 25th. Strong and gusty winds experienced in the Northern and Western Divisions. ・Nadi: Bus stand under 4 ft (1.2m) floodwater at peak. Ratu Nemani Memorial School flooded (FTs).				
2007	Apr	4-5	TC Cliff	・A tropical disturbance located to the northwest of Fiji moved towards the country along a slow moving trough of low pressure on 1st. The disturbance intensified into TC Cliff on 4th, when it was just east of Udu Point. TC Cliff later tracked southeast through the Lau Group. ・General: Significant flooding in parts of Viti Levu and Vanua Levu. ・Nadi: One fatality when woman tried to cross flooded Logi Irish crossing at Nawaicoba at 8 p.m. on 3rd.		1		
2008	Jan	3	TD	・A deep tropical depression located far to the west of Fiji extended a trough onto the Group. Heavy rain received across most of the country. ・General: Substantial flooding reported in northwestern Viti Levu, especially Rakiraki and Nadi. ・Lautoka: Drasa Dam bridge under 5 ft (1.5m) water. Drasa and Vaivai bridges closed.		1		
2008	Jan	28-30	TD, TC Gene	・General: Flooding experienced across most of Viti Levu, especially Tavua, Rakiraki and Sigatoka. Preliminary wind and flood damage estimated to be $29 million. Three out of six fatalities from TC Gene may be attributed to flood – two drowned while swimming in flooded areas and one was unable to get to hospital to receive medical care (Yeo, 2010). Agricultural crops and infrastructure severely affected. Monasavu Road bridge swept away.				FJD 43,532,149.70 (Estimation)
2008	Feb	25	SPCZ	・The SPCZ merged with a frontal system over Fiji. ・General: Severe flooding in northwestern Viti Levu.				
2009	Jan	7-14	SPCZ, TD	・A vigorous monsoonal trough and SPCZ hovered over Fiji from 7th to 14th. Rainfall was intense and persistent during this time, especially in the Western and Northern Divisions. There was a short respite in the weather as the trough moved over northern parts of Fiji on 11th and 12th. However conditions deteriorated again as the trough drifted south on 13th and 14th. ・A tropical depression (TD) located to the west of the Group closed upon Fiji on 8th with torrential rain and flooding on the night of 8th. Many sites received 200-300mm rain for 24hrs ended 9 a.m. 9th (284mm at Rarawai Mill in Ba, 281mm at Nadi Airport, 241mm at Penang Mill in Rakiraki) (FMS, 2009). Note that 928mm was recorded at Tikituru gauge high on the divide between the Sigatoka and Navua catchments (920m a.m.s.l.) for 24hrs on 9th (midnight to midnight) (Turner, 2009). ・The trough associated with the first TD neared the Fiji Group on 10th, causing continuous heavy rain over Viti Levu with extensive flooding. Highest 24hr rain recorded was 493mm at Koronubu Sector Office (and 386mm at Monasavu Dam) (FMS, 2009).		11	146,725	FJD 112,990,000

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
				・A second TD approached Fiji from the west on 12th, with widespread heavy rain. Highest 24hr rain recorded was 378mm at Nabouwalu, Bua (and 321mm at Udu point). This produced the third major flooding for the period (FMS, 2009). ・From 15th to 17th, the trough and SPCZ hovered over the northern parts of Fiji. Several centres recorded heavy rainfall during this time (FMS, 2009). ・New 5-day rainfall records were set at Rarawai Mill, Nadi Airport and Nacocolevu (Sigatoka) (FMS, 2009). ・General: Repeated severe flooding occurred in parts of Viti Levu and Vanua Levu. Severe flooding in Western Division in areas close to major rivers between Rakiraki and Sigatoka. Long duration of flooding damaged sugarcane. ・General: 7 flood fatalities plus 4 in landslides. The locations of the flood fatalities were: 1) near Rarawai Mill, Ba, 2) Wailoa River, Monasavu, 3) Johnson Road, Lautoka, 4) Tubu village, Wainibuka River, 5) Nawaka village, Nadi, 6) Nasivi River, Vatukoula, 7) Labasa (NDMO). ・General: Gov't estimated preliminary losses of F$113 million, excluding most losses to households and business centres (Ambroz, 2009). Later estimated at F$175 million (FTs, 25/12/2009). Losses in the sugar belt especially Rarawai and Lautoka Mill areas estimated at about F$24 million, including $13.4 million to growers (incl. a loss in cane output of about $8.0 million) and $7.5 million to the Fiji Sugar Corporation (Lal et al., 2009). Total losses much higher if commercial and private sector damage is included (see Ba and Nadi entries). More than 11,000 people forced to evacuate their homes. School facilities and homes in many parts of the Western Division without water and electricity for several days. Bridges used to transport sugarcane were washed away and mills flooded. ・Nadi: Flooding here could be the highest on record. Flood peak estimated at 1.2m over floor at Jack's of Fiji despite raised floor. Note this compares to about 0.4m over Jack's floor in Jan 1999 flood (business interview by S. Yeo; level based on recollections), which was recorded as 7.25m a.m.s.l. in town, meaning that the Jan 2009 flood would have a peak of about 8.05m a.m.s.l. in town (note no surveyed data available at time report prepared). Nadi town, Nadi back road and Sabeto bridge closed due to flooding. Waimalika and Lomaimalika roads in Namaka also closed due to flooding. Damage in the greater Nadi region estimated at F$244 million, about 5% of GDP (households F$14.5 million; business F$229.5 million of which 37% direct damage from lost assets and 32% indirect damage from business interruption) (Holland, 2009). Flooding at Nawakalevu and Nawijikuma settlements, outside Nawaka, in early hours of Fri 9th. Severe damage at Narewa village when flooded on nights of Sat 10th and Mon 12th (FS). HART homes at Navakai flooded at least up to picture frames (FTs). Nadi water supply badly disrupted (FTs).				
2009	Jan	28-29	TC Hettie	・TC Hettie developed on 28th while located to the southeast of Fiji. A trough extended over the Group. ・General: Severe flooding reported in the interior and southeastern parts of Viti Levu and in the Eastern Division on Jan 28th-29th.				

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
2009	Dec	14-15	TC Mick	・TC affected Fiji from 13th-15th. The cyclone passed over the Yasawa and Mamanuca Groups before reaching the Viti Levu coastline on the afternoon of 14th. After passing directly over Viti Levu, TC Mick took a gradual eastward path across the central and southern parts of Fiji. ・General: Low-lying areas on Viti Levu flooded especially the deltas of Ba, Nadi, Navua and Rewa. Sigatoka Valley severely affected. Crops severely affected. Wind and flood damage estimated at $39 Million ・General: Two flood fatalities while crossing river, one in Lawaki River, Tailevu, one in Nasivikoso, Ba.	440	3	148,947	31,025,851.61
2010	Mar	1-12	TC Tomas	・Nothern & Eastern parts of Fiji's are affected.		2		FJD
2012	Jan	23-25	TD,SPCZ	・The 2012 floods began on the 21st of January and ended on the 12th of February after a trough of low pressure causing heavy rain was experienced over the Western parts of the Fiji. At the height of the flood a total of 64 evacuation centre's were active, accommodating 4,561 people. ・Damages were also caused to infrastructure, agricultural sector and public utilities. Nadi, Lautoka, Ba, Tavua and Rakiraki were the worst affected districts where damage concentrated. The total population of those districts, and who were, in some way affected by the floods, is 178,153. ・The National Disaster Management Office deemed it necessary to activate the National Emergency Operation Centre (NEOC) in Suva and Western Division Emergency Operation Centre (DEOC) based at the Officer of the Commissioner Western Division on Saturday 21 January, 2012. The declaration by Cabinet was announced on the following Tuesday, by which date, District Emergency Operations Centre (EOC) in Nadi, Ba, Tavua and Rakiraki were in full operation.		5	178,153	FJD 85,020,000.00 (Initial
2012	Mar-Apr	Mar29-Apr2	TD,SPCZ	・Heavy rainfalls resulting from a series of tropical depressions swept through the Fiji Islands during the later parts of March 2012 and early April 2012 causing significant and widespread flooding throughout the Western Division on the island of Veti Levu. ・Extreme rainfalls resulted in unprecedented flood levels being observed throughout the region, in particular the Nadi basin, where a recently installed network of rainfall and water level monitoring stations recorded both the extent and duration of the events. ・Since Thursday 29 March, a tropical depression has caused extensive flooding in Fiji, particularly in the Western Division. In some places, more than 300mm of rain fell in less than 24 hours. The initial downpour caused flash flooding in the Western District of Viti Levu which is still recovering from the January/February 2012 floods. The rain had continued over Friday, 30 March to Sunday, 1 April, which further worsened the flooding from Rakiraki to Sigatoka. The weekend rains also resulted in flooding of outlying areas of Suva. On the afternoon of Monday, 2 April it was confirmed that a tropical depression had formed into a cyclone 600km South West of Fiji, 'Cyclone Daphne'. Cyclone Daphne did not make landfall in Fiji but brought extra rain and strong winds to the affected areas.				

Year	Month	Date	Disaster[1)]	Flood Description and Areas Affected	Total House Lost	Number of Deaths	Human Affected Population	Estimated Damaged
					(Nos)	(Person)	(Person)	(USD)
				・The Western Division is the worst affected, particularly the main towns of Sigatoka, Nadi, Lautoka, Tavua, Ba and Rakiraki, all of which have been flooded in some places up to two meters of water. Water and electricity supplies are disrupted in the Western Division, affecting approximately 150,000 people. The extent of damage to houses, schools and infrastructure is currently unknown as access to communities is difficult. The Water Authority Fiji (WAF) reports that in Ba, Tavua, Rakiraki and Sigatoka, all pumping stations are out of operation and there is no inflow into treatment plants. In some areas of Nadi and Lautoka it is expected there will be no supply of water due to low pressure. The hospital and airport have reserved supplies. ・Four people have died and there are currently three young boys missing at sea. Fiji's only international airport has been closed to incoming passengers since Friday, 29 March but is open to passengers needing to leave Fiji.				
2012	Dec	17	TC Evan	・On 17th December 2012 TC Evan had reached its peak intensity with wind speeds of 210 km/h (130 mph), equivalent to a category 4 cyclone, near the North West coast of Vanua Levu. The following day (18th December) the Regional Specialised Meteorological Centre (RSMC) in Nadi reported that TC Evan had weakened into a category 3 TC and was located near the west coast of Viti Levu. ・The cyclone left widespread destruction in its path – but luckily no deaths or major injuries to persons. Dwellings and their contents were damaged or destroyed, infrastructure was damaged and crops ruined. The livelihoods of many of those affected were significantly compromised and economic activity disrupted. The impact of Evan compounded the damage experienced by some of the same communities and businesses in the wake of the Western Floods of January and March 2012. ・TC Evan was one of three significant weather events that affected Fiji in 2012, the other two being the severe flooding in the areas of Ra, Tavua, Ba, Lautoka, Nadi, Nadroga, Sigatoka, and Rewa in January 2012 and again in March 2012 the same areas were affected again but with greater intensity. The Government of Fiji estimated that damage from the 2012 floods was at approximately F$71 million. This suggests that Fiji experienced damage of F$146 million in 2012 alone.				108,467,187
2014	Jan	29-31	SPCZ	・2014 年1 月洪水は移動性の南太平洋収束帯（SPCZ）によってもたらされたもので、1 月29 日から31 日の未明にかけて雨が降り続いた。この時期は大潮（31 日18時41 分が大潮）と重なり、30 日の17 時47 分が満潮だったため、被害の拡大が懸念されたが、SPCZ が比較的早く南下したため、ナンディ町では外水による氾濫には至らなかった。				

Source:「Summarry of Major Disaster in Fiji 1985-March2010: NDMO」及び「Flooding in the Fiji islands between 1840 and 2009: Simon MCGREE, Stephhen w. YEO and Swastika DEVI」を元に調査団にて作成
1) TC:Tropical Cyclone, TD:Tropical Dipression, LP:Low Pressure, SPCZ:South Pacfic Convergence Zone

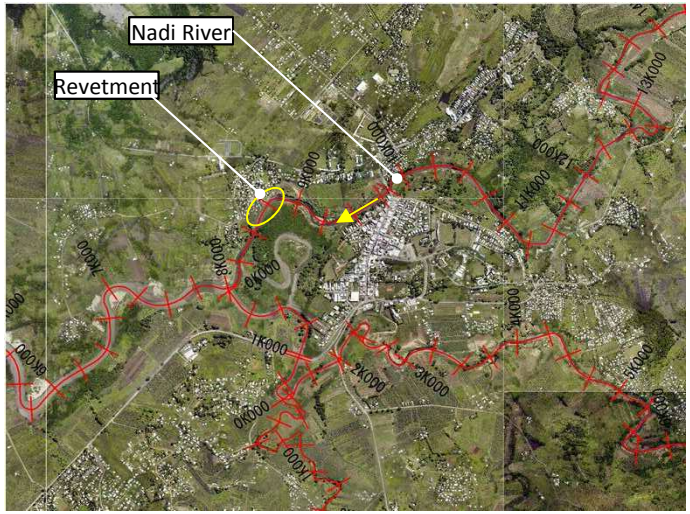
Data Book-2

Inventory of river structures

Inventory of river structures (1)

Structure	Revetment
Location	Narewa Village
River	Nadi River
Section	8k750 right bank side
Profile	
Type	Gabion
Length	Approx.200m
Height	h=5m
Completion year	2009
Administrator	LWRM
Operating rules, etc.	—
Hinterland	Village
Remarks	

Location



Standard Cross Section

No materials

Photo

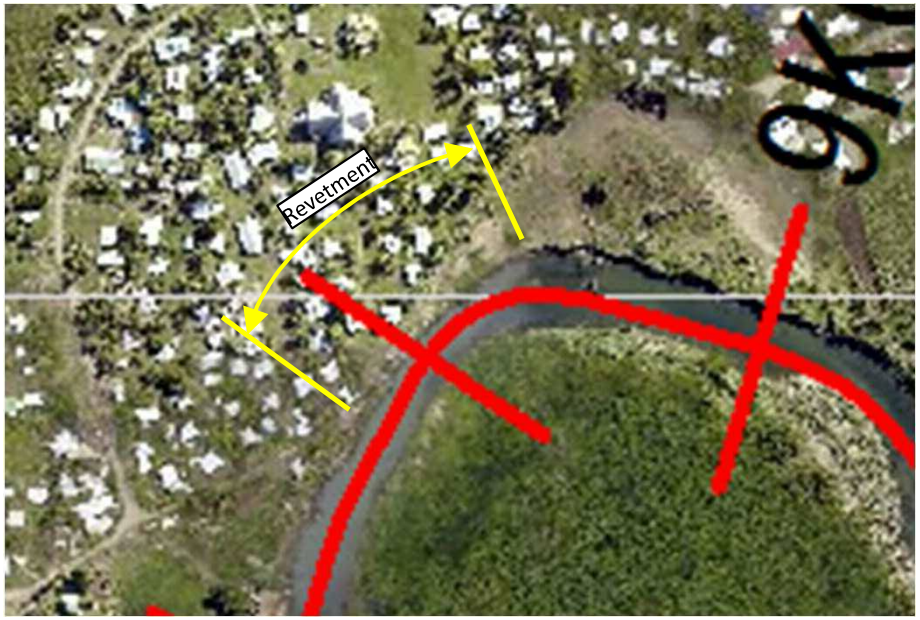
After construction in 2009

Situation in 2014

Situation in 2014

Situation in 2014

Plan



Damaged situation

No materials

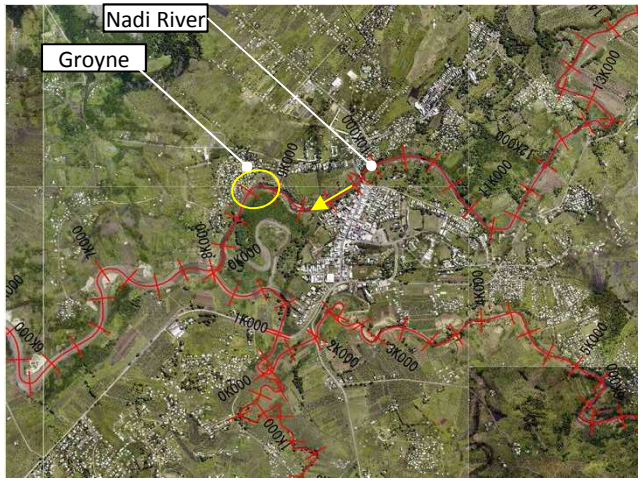
Repair history, inspection history

No materials

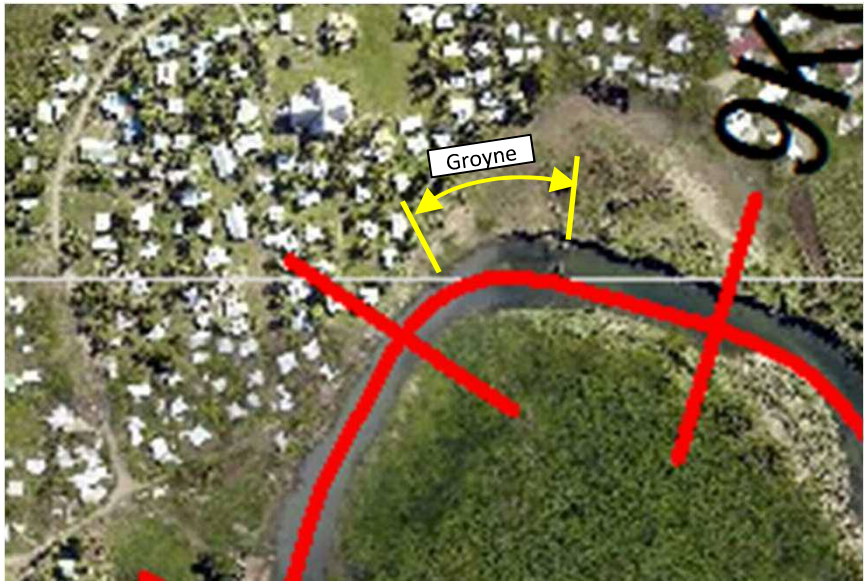
Inventory of river structures (2)

Structure	Groyne
Location	Narewa Village付近
River	Nadi River
Section	8k750 right bank side
Profile	
Type	Gabion
Length	—
Height	L=3m
Completion year	—
Administrator	LWRM
Operating rules, etc.	—
Hinterland	Village
Remarks	

Location



Plan



Standard Cross Section

No materials

Photo

Situation in 2014

Situation in 2014

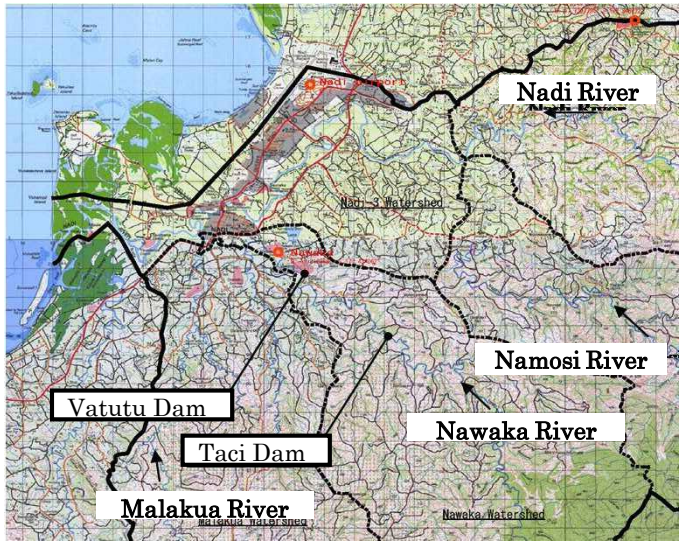
Situation in 2014

Damaged situation	Repair history, inspection history
No materials	No materials

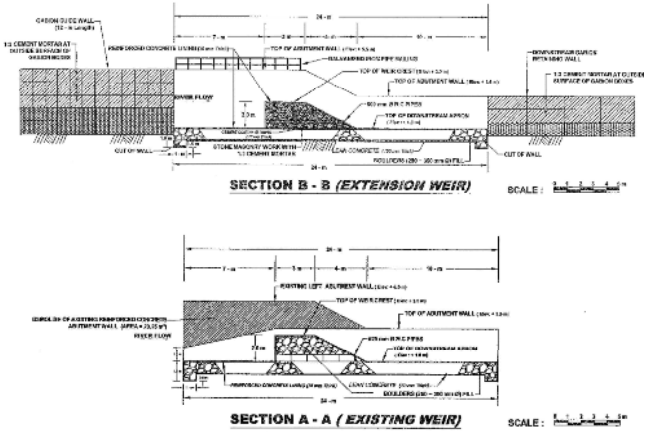
Inventory of river structures (3)

Structure	Vatutu Dam ／Retention Dam
Location	Nawaka River
River	Nawaka River
Section	6k200
Profile	
Type	Masonry+Concrete Coping
Width	B=35m
Size	W=24m, H=2.0m
Completion year	2009
Administrator	LWRM
Operating rules, etc.	—
Hinterland	Village
Remarks	

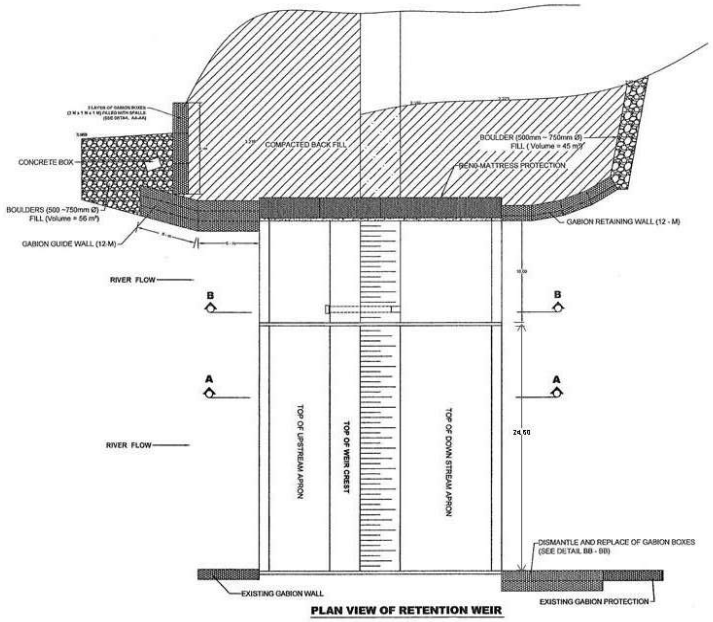
Location



Standard Cross Section



Plan



Photo

Photo in 2014

Photo in 2014

Photo in 2014

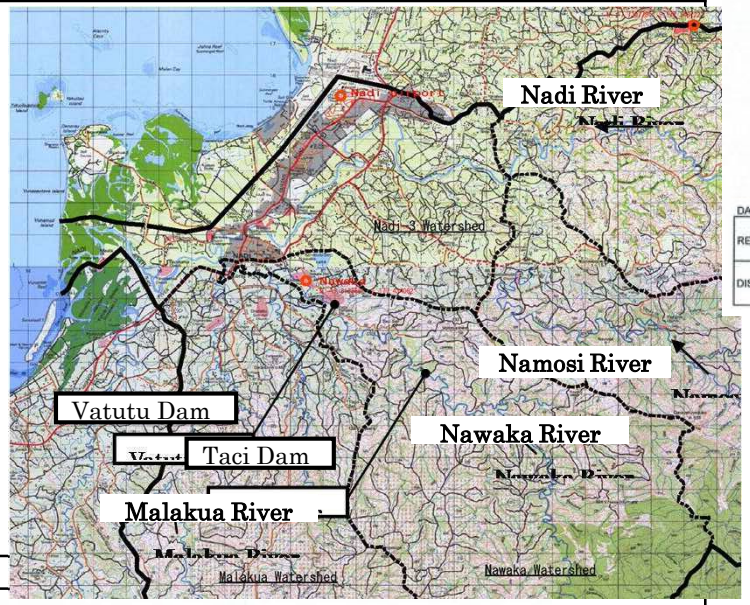
Photo in March 2012

Damaged situation	Repair history, inspection history
・Damaged by 2012 flood	・Repaired after 2012 flood

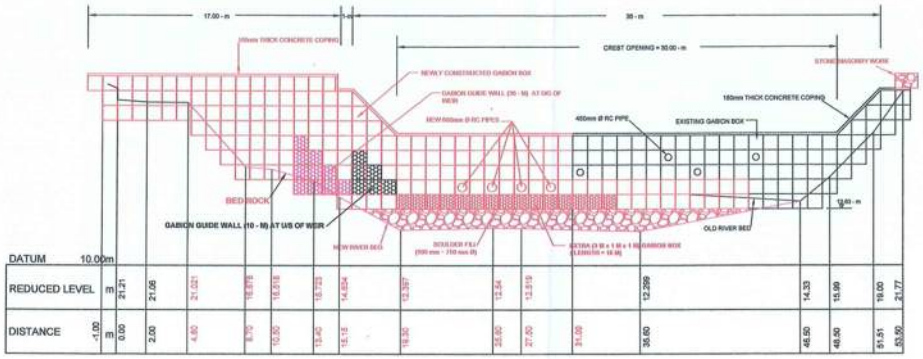
Inventory of river structures (4)

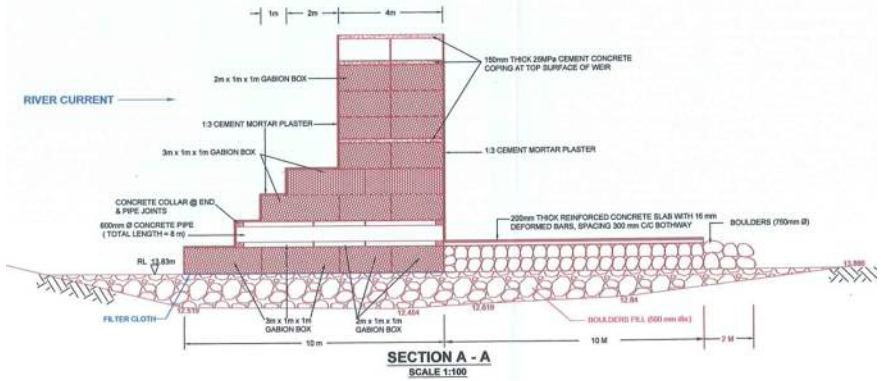
Structure	Taci Dam ／Retention Dam
Location	Nawaka River
River	Nawaka River
Section	11k500
Profile	
Type	Reinforced Concrete
Width	B=33m
Size	W=10m, H=6.0m
Completion year	2010
Administrator	LWRM
Operating rules, etc.	—
Hinterland	Village
Remarks	

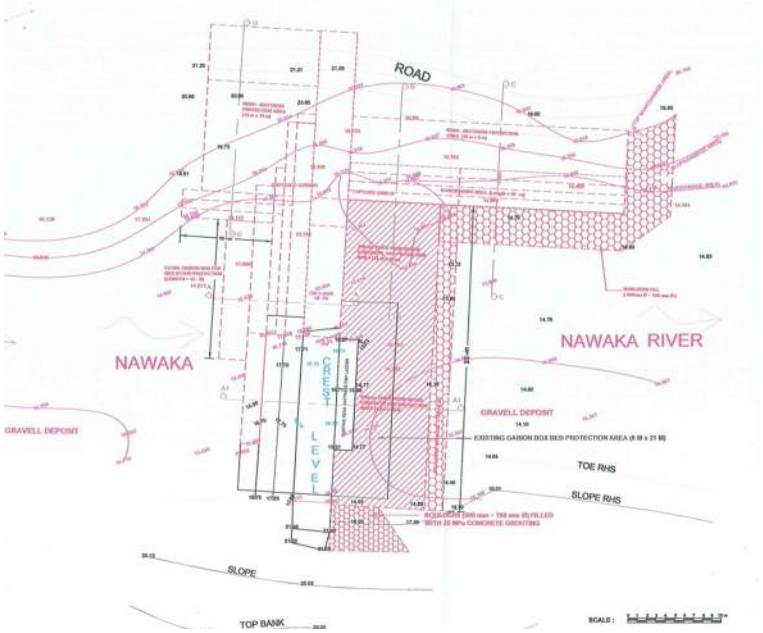
位置図



Standard Cross Section







Photo

Photo in 2014

Photo in 2014

Photo in 2015

Photo after 2012 flood

Damaged situation

・Damaged by 2012 flood

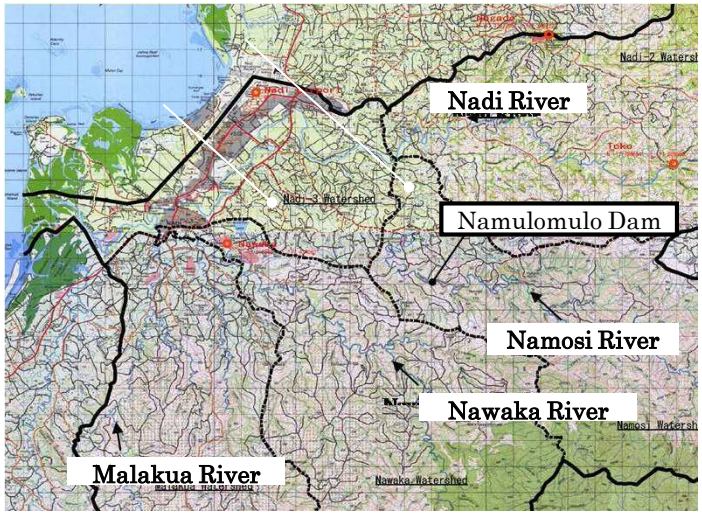
Repair history, inspection history

・Repaired after 2012 flood

Inventory of river structures (5)

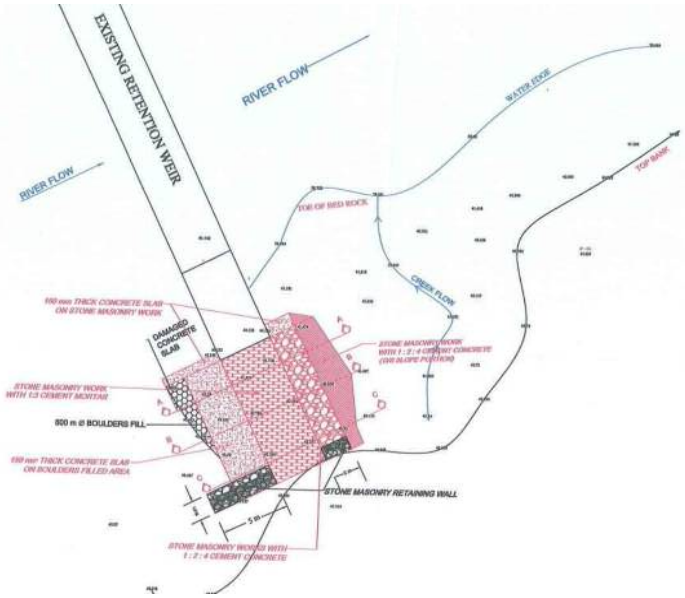
Structure	Namulomulo Dam ／Retention Dam
Location	Namosi River
River	Namosi River
Section	11k500
Profile	
Type	Gabion+Concrete Coping
Width	B=35m
Size	W=5m, H=5.0m
Completion year	2006
Administrator	LWRM
Operating rules, etc.	—
Hinterland	Village
Remarks	

Location



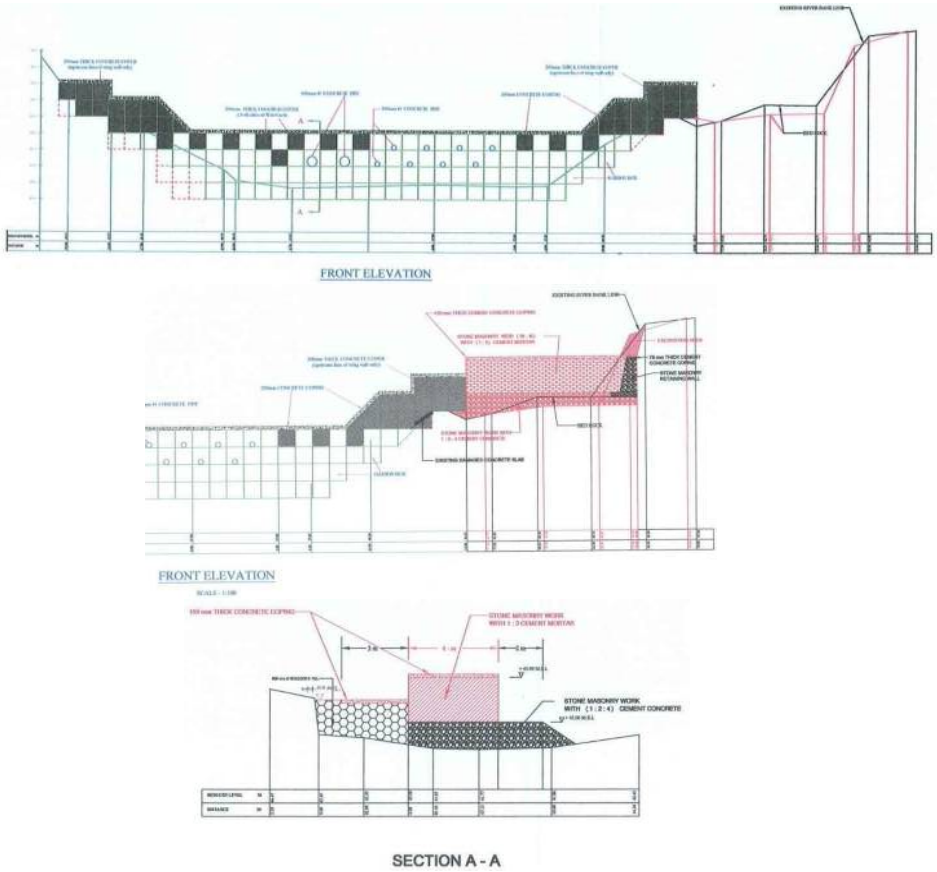
Plan

Drawing for recovery works in March 2012



Standard Cross Section

Drawings for recovery works in March 2012



Photo

Photo after completion

Photo after 2012 flood

Damaged situation

・Damaged by 2012 flood

Repair history, inspection history

・Repaired after 2012 flood

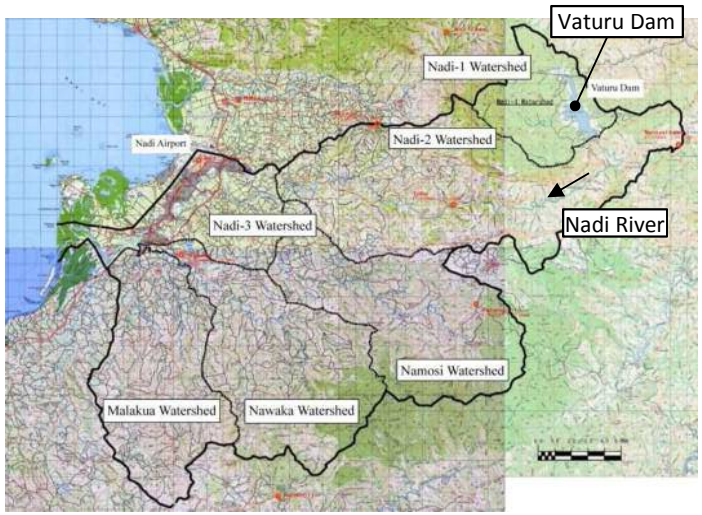
Inventory of river structures (6)

Structure	Vaturu Dam
Location	Nadi River
River	Nadi River
Section	60km
Completion year	1982年
Administrator	WAF

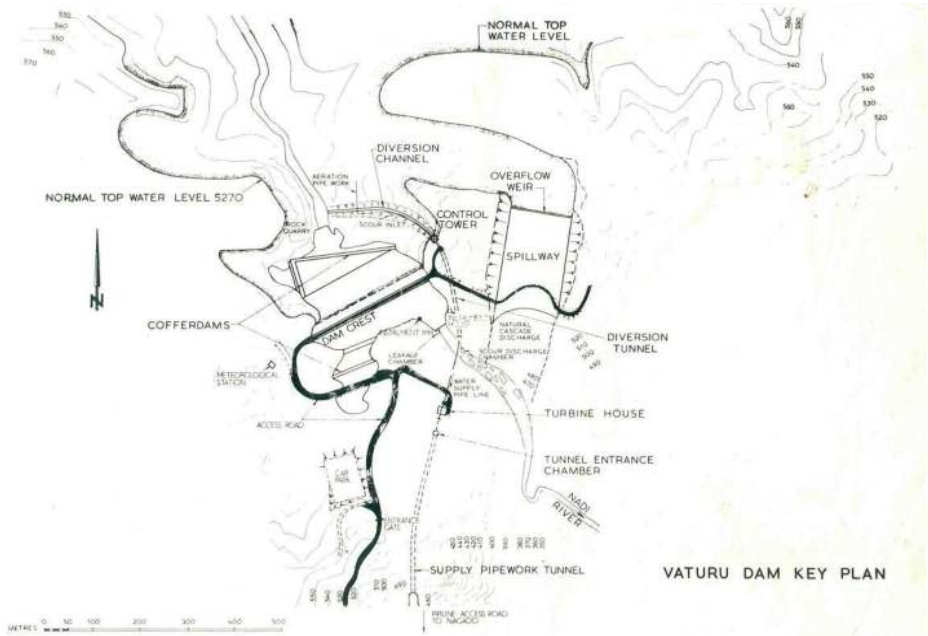
Profile

Purpose	Drinking Water
Catchment area	38.6km2
Full water surface area	1.6km2(160ha)
Maximum operating water level	527.0m
Minimum operational water level	510.0m
Effective storage Volume	27,000,000m3
Type	Center core type rockfill
Dam crest height	532.0m
Dam crest length	300m
Maximum dike height	56m
Dam crest width	10m
Slope gradient	Upstream 1:3.0 Dpwnstream 1:2.0
Dike Volume	1,050,000m3
Spillway	Overflow Dike B=100m
Day production water	90,000m3
Current supply water volume	18,000m3
Aqueduct	φ600mm×26km

Location



Plan



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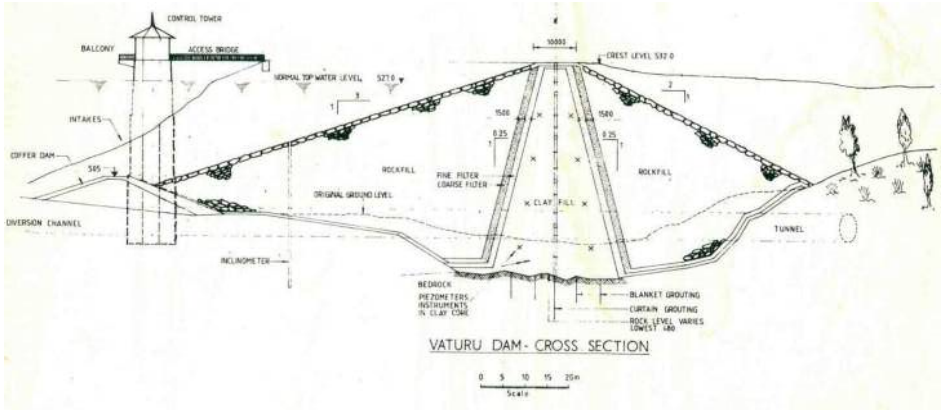


Photo

Photo in 2015

Photo in 2015

Photo in 2015

Photo in 2015

Damaged situation

No materials

Repair history, inspection history

No materials

Data Book-3

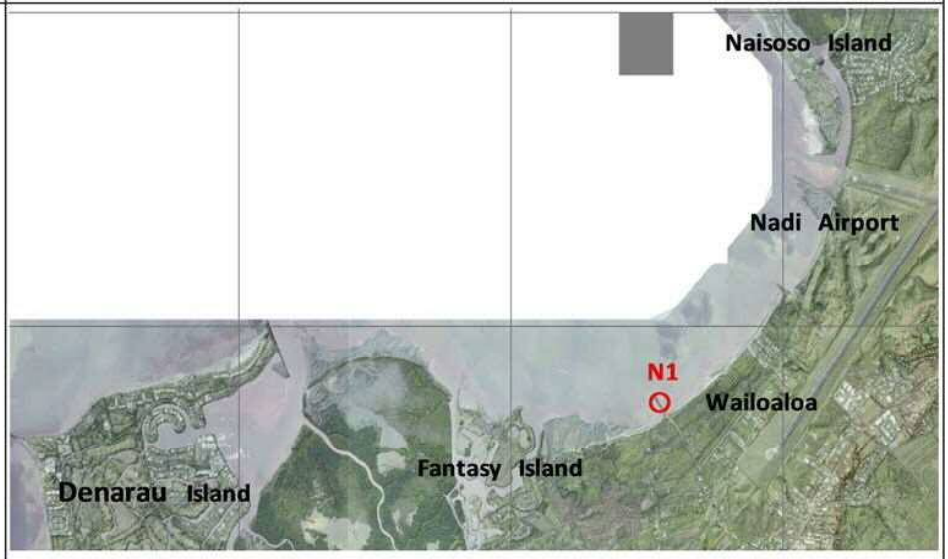
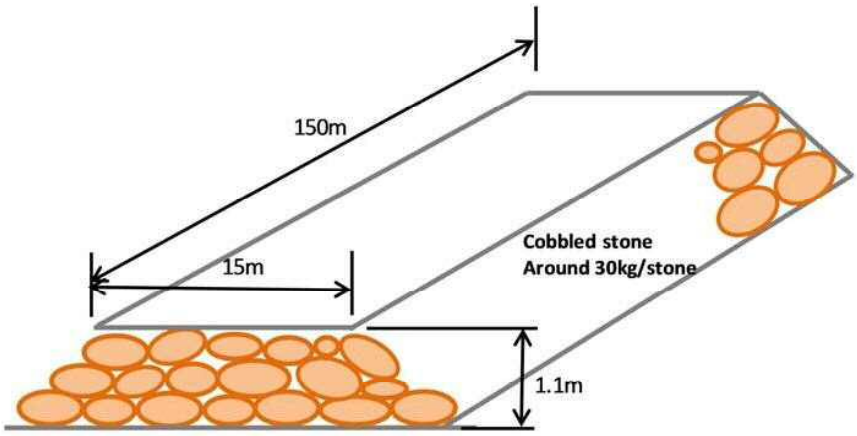
Inventory of seacoast structures (Jetty)

1. Location of Jetty

Map of jetty survey

2. Inventory of Seacoast Structures (Jetty)

Inventory of seacoast structures (Jetty) is organized in the following pages. “Right side” and “Left side” on the inventory indicate that the right side and left side from the viewpoint of upstream to downstream.

No.	N1-1							
Location	Wailoaloa			Place	Rock Jetty			
Date	01 / Feb / 2015, 06 / Feb / 2015			Time	10:50 11:30	Converted Tidal level	+0.8 +1.2	MSL+1.15
Latitude / Longitude GPS	Start	S:17.7676		UTM Coordinate	Start	X:544293.168		
		E:177.4179				Y:8035472.669		
	End	S:17.7687			End	X:544385.929		
		E:177.4187				Y:8035302.997		
Length	150.0m	Width	15.0m	Height (m)	1) 3.7	2) 2.6	3) 3.69	4) Equip. H 0.85
Abstract	Angle: 305 degree, Height: +1.15m Rock Jetty with cobbled stones (15 ~ 30cm diameter) Right side is covered with brown coarse sand, which seems to be poured sand from Naisoso Left side is covered with black fine sand, which seems to be from the Nadi Bay							
Location Map								
Diagram								

No.	N1-2		
Location	Wailoaloa	Place	Rock Jetty

Picture

Picture-1 N1 Full view (Tip to base)

Picture-2 Cobbled stones (φ15 ~ 30cm)

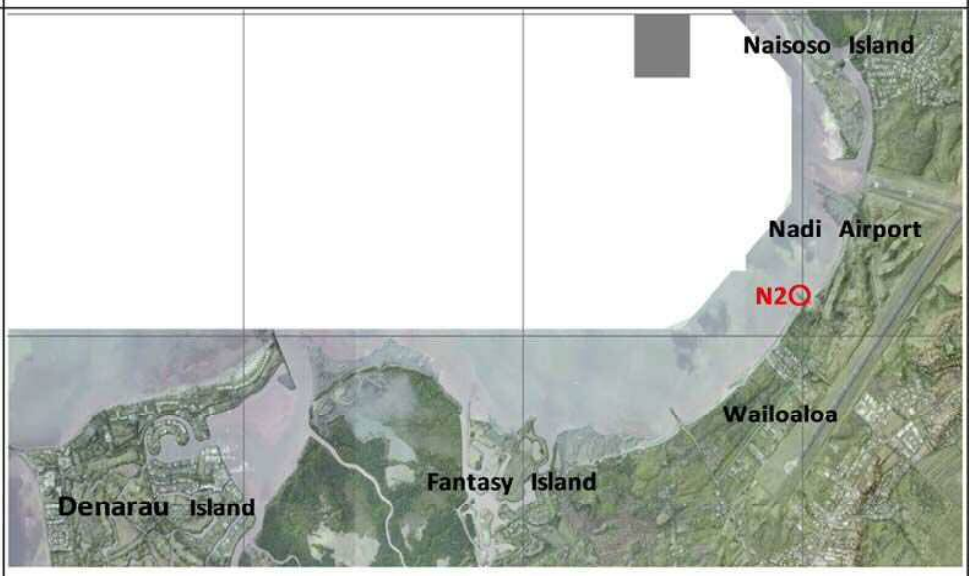
Picture-3 N1 Full view (Base to Tip)

Picture-4 Right side, Coarse sand with sea shells @ 2, 3cm depth from the surface

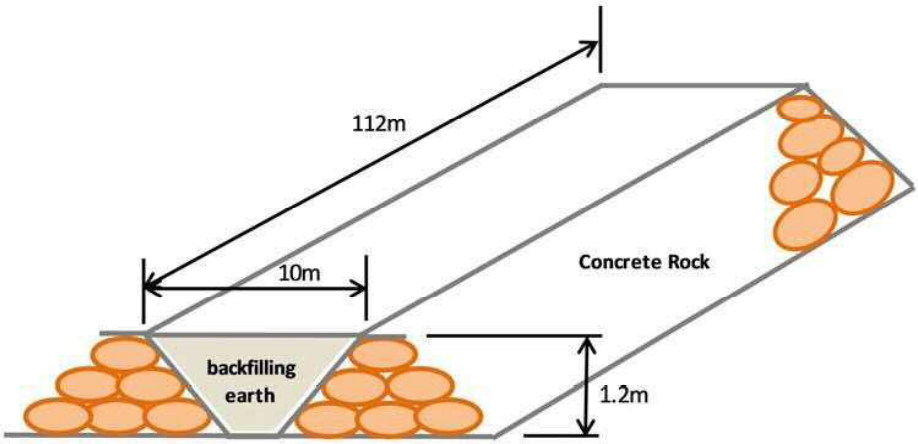
Picture-5 Left side, Fine sand @ 2, 3cm depth from the surface

No.	N2-1							
Location	Wailoaloa			Place	Turtle Airways			
Date	30-Jan-15			Time	17:30	Converted Tidal level	+1.6	MSL+1.15
Latitude / Longitude GPS	Start	S:17.7614		UTM Coordinate	Start	X:545624.507		
		E:177.4304				Y:8037278.212		
	End	S:17.7608			End	X:544293.168		
		E:177.4296				Y:8036231.748		
Length	112m	Width	10.0m	Height (m)	1) 1.2 from sea level	2)	3)	4)
Abstract	Angle: 217 degree, Height: +1.65m Variety size of concrete rocks are used as a foundation of jetty and earth is used for embankment. Right side: No beach, Left side: Beach with fine black sand towards Rock Jetty							

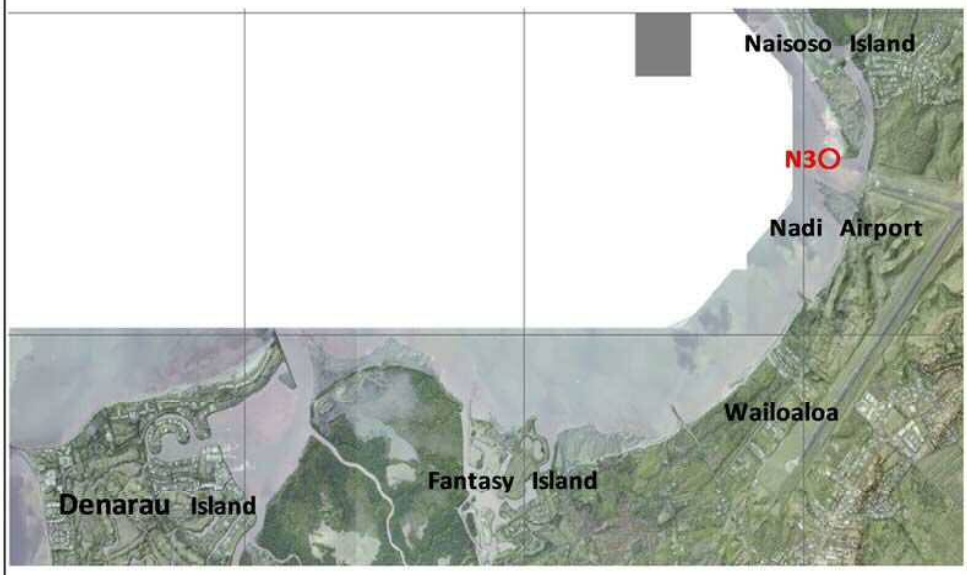
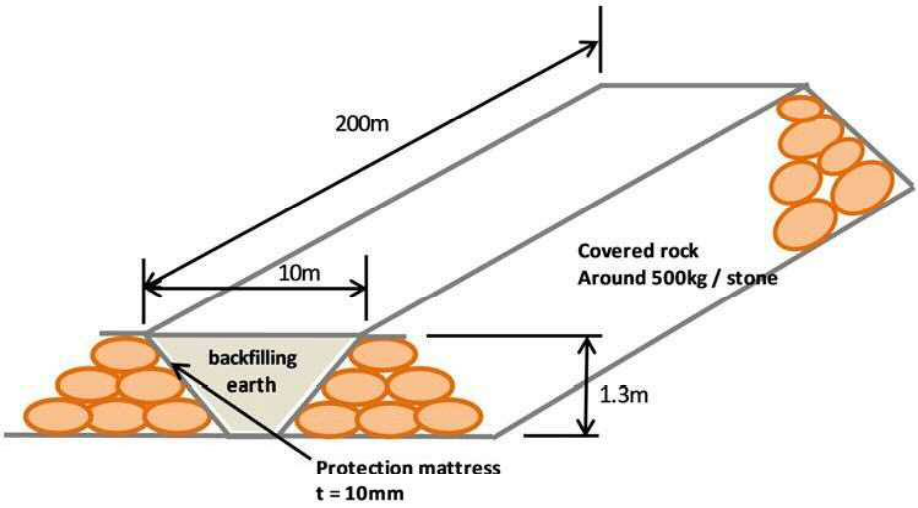
Location Map



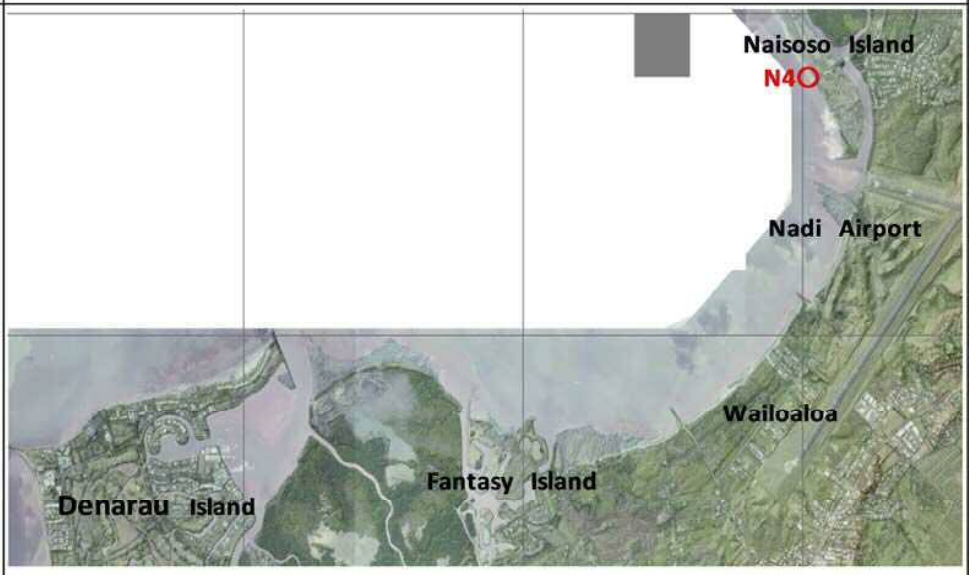
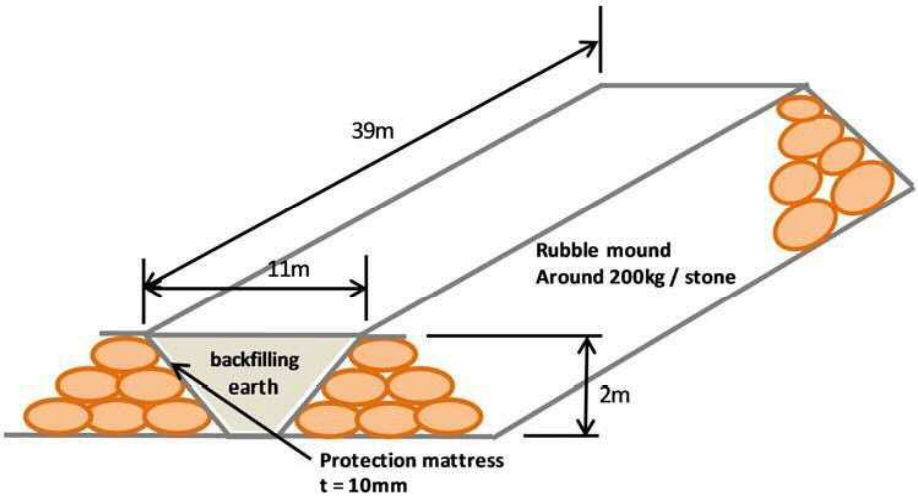
Diagram



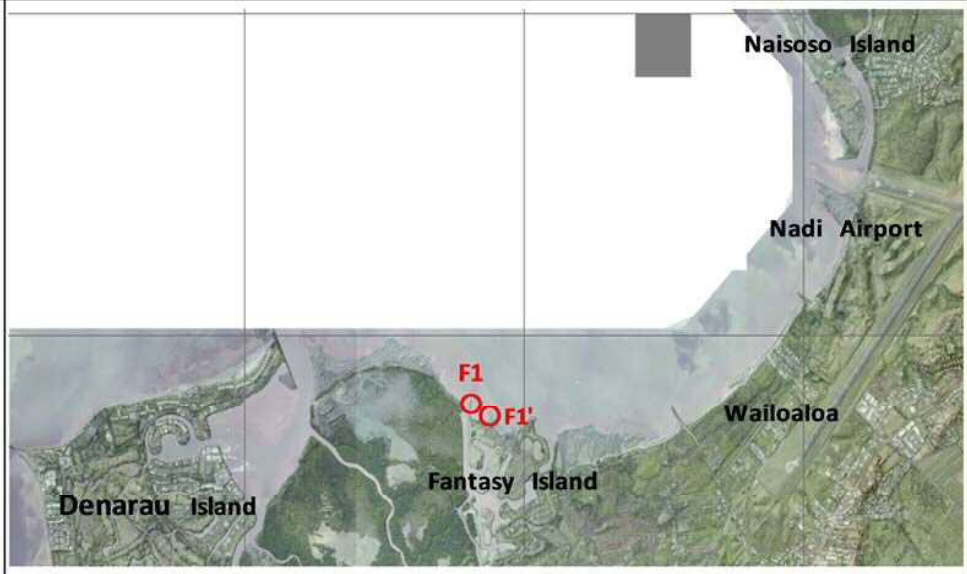
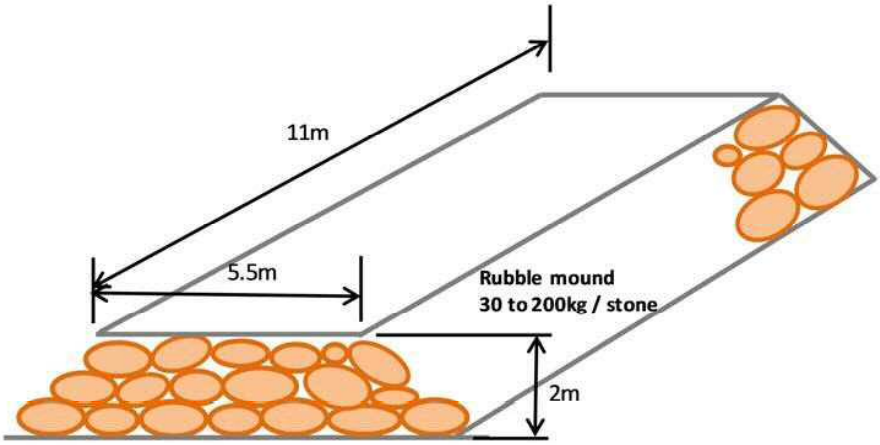
No.	N2-2		
Location	Wailoaloa	Place	Turtle Airways
Picture			
	Picture-1 N2 Full view (Tip to base)		
			
	Picture-2 Right side	Picture-3 Left side	
			
	Right side: No sedimentation	Picture-5 Left side: Fine sand	

No.	N3-1							
Location	Naisoso			Place	Naisoso Resort (Expansion Work 2nd phase)			
Date	30 / Jan / 2015, 9 / Feb / 2015			Time	16:00 15:00	Converted Tidal level	+1.8 +0.9	MSL+1.15
Latitude / Longitude GPS	Start	S: 17.7495		UTM Coordinate	Start	X:545901.379		
		E:177.4330				Y:8037474.327		
	End	S:17.7513			End	X:545884.991		
		E:177.4328				Y:8037274.586		
Length	200.0m	Width	10.0m	Height (m)	1) 2.23	2) 0.95	3)	4) Equip. H 0.85
Abstract	Angle: 237 degree, Height: +1.0m River mouth of the confluence of the Sabeto River covered mangrove Simple and solid jetty: Both sides are covered with stones and backfilled with the sand on the protection mattress (t = 10mm)							
Location Map								
Diagram								

No.	N3-2		
Location	Naisoso	Place	Naisoso Resort (Expansion Work 2nd phase)
Picture			
	Picture-1 N3 Full view (Right side to tip)		
			
	Picture-2 Right side	Picture-3 Left side	
			
	Picture-4 Right side, Coarse sand with sea shells	Left side: No sedimentation	

No.	N4-1							
Location	Naisoso			Place	Naisoso Resort (Expansion Work 1st phase)			
Date	9-Feb-15			Time	14:30	Converted Tidal level	+1.0	MSL+1.15
Latitude / Longitude GPS	Start	S:17.7459		UTM Coordinate	Start	X:545702.646		
		E:177.4311				Y:8037874.322		
	End	S:17.7461			End	X:545660.189		
		E:177.4307				Y:8037852.292		
Length	39.0m	Width	11.0m	Height (m)	1) 1.00	2) 2.90	3) 3.10	4) Equip. H 0.85
Abstract	Angle: 207 degree, Height: +1.85m This jetty is used as a monument. Sedimentaion is enlarging on left side and it is approximately 18m larger than right side.							
Location Map								
Diagram								

No.	N4-2		
Location	Naisoso	Place	Naisoso Resort (Expansion Work 1st phase)
Picture			
	Picture-1 N4 Full view (Tip to base)		
			
	Picture-2 Right side	Picture-3 Left side	
			
	Picture-4 Right side, Coarse sand (poured sand from the upstream of the Sabeto River)	Picture-5 Left side: Fine sand with silt	

No.	F1-1							
Location	Flood gate			Place	Fantasy Island			
Date	6-Feb-15			Time	10:30	Converted Tidal level	+1.4	MSL+1.15
Latitude / Longitude GPS	Start	S: 17.7679		UTM Coordinate	Start	X:542633.587		
		E:177.4022				Y:8035447.130		
	End	S: 17.7672			End	X:542676.154		
		E:177.4026				Y:8035524.484		
Length	11.0m	Width	5.5m	Height (m)	1) 2.97	2) 1.00	3)	4) Equip. H 0.85
Abstract	Angle: 54 degree, Height: 2.3m Rubble mound style jetty, This jetty is 4m lower than F1' Both jetties are cape-style and contribute to form the inshore between two jetties							
Location Map								
Diagram								

No.	F1-2		
Location	Flood gate	Place	Fantasy Island

Picture

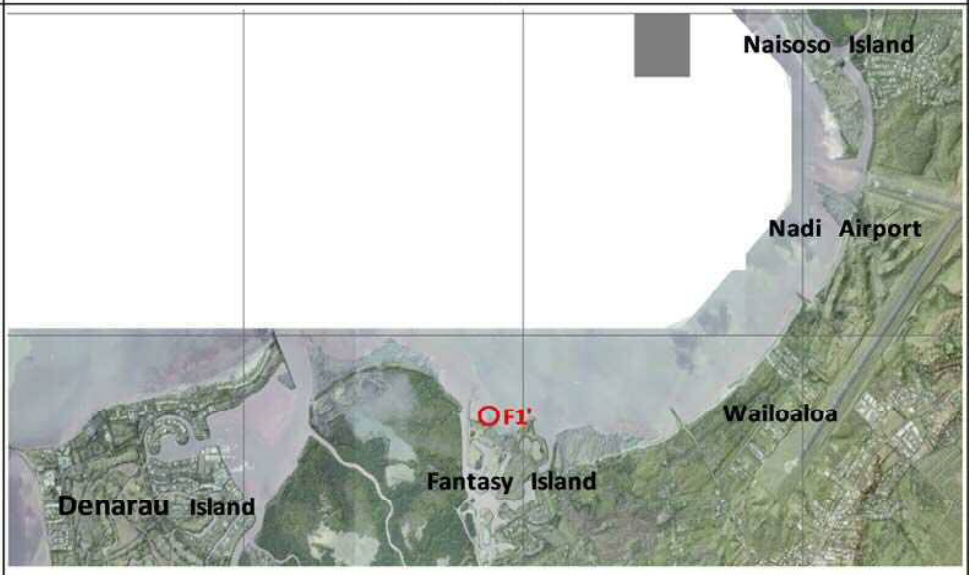
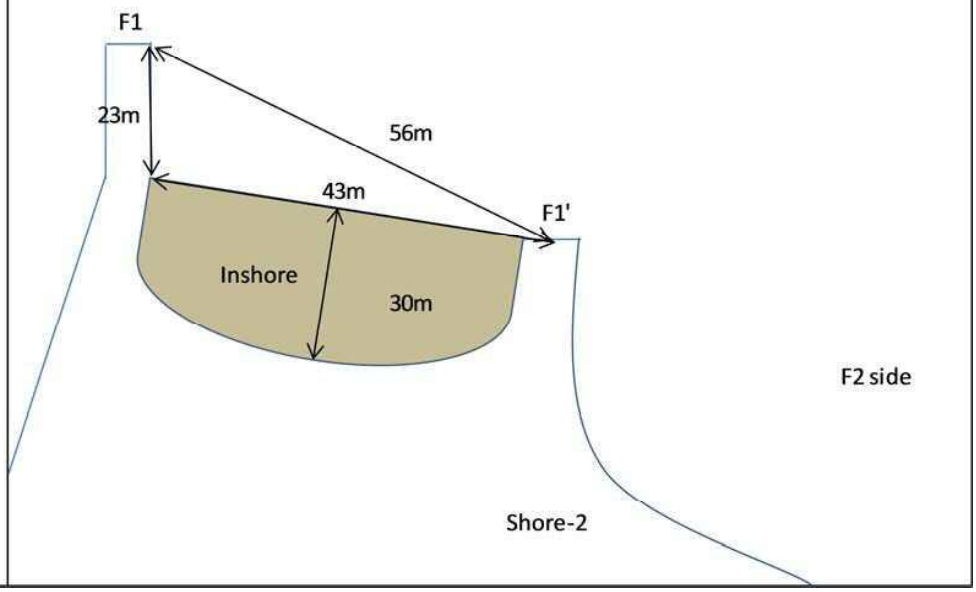
Picture-1 F1 Full view (F1' to F1)

Picture-2 Right side: Rubble mound, Inshore is in the back

Picture-3 Left side: Rubble mound

Picture-4 Inshore is under development

Picture-5 Mangrove on the opposite shore

No.	F1'-1							
Location	Flood gate			Place	Fantasy Island			
Date	6-Feb-15			Time	10:55	Converted Tidal level	+1.4	MSL+1.15
Latitude / Longitude GPS	Start	S:		UTM Coordinate	Start	X:		
		E:				Y:		
	End	S:17.7675			End	X:542707.884		
		E:177.4029				Y:8035491.225		
Length		Width		Height (m)	1)	2)	3)	4)
Abstract	Angle: -, Height: 6.3m Form of F1 to F1' is like a cape. It has an inshore (width 43m, length 30m). There is large shore on Far side of F1' Rubble mound can be found on the boundary of flood gate							
Location Map								
Diagram								

No.	F1'-2		
Location	Flood gate	Place	Fantasy Island

Picture

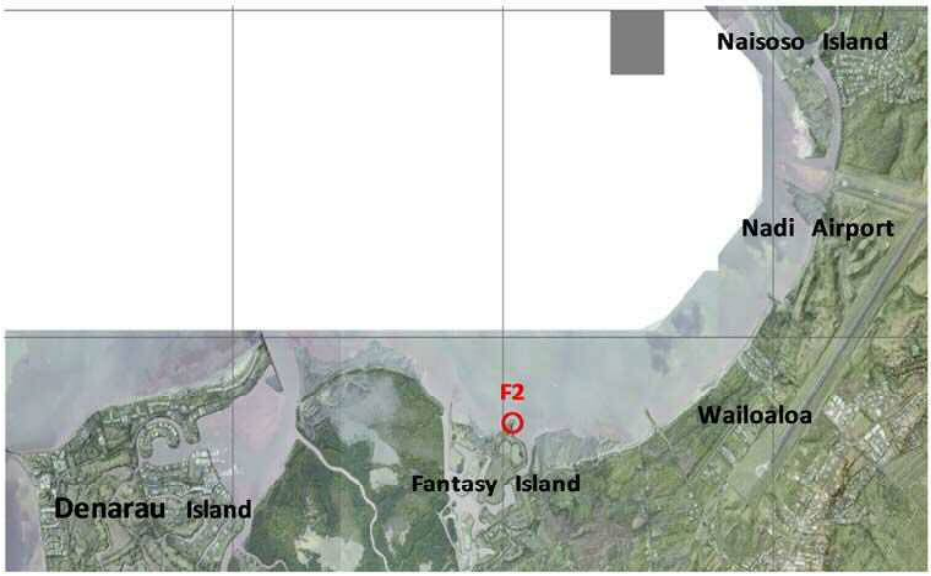
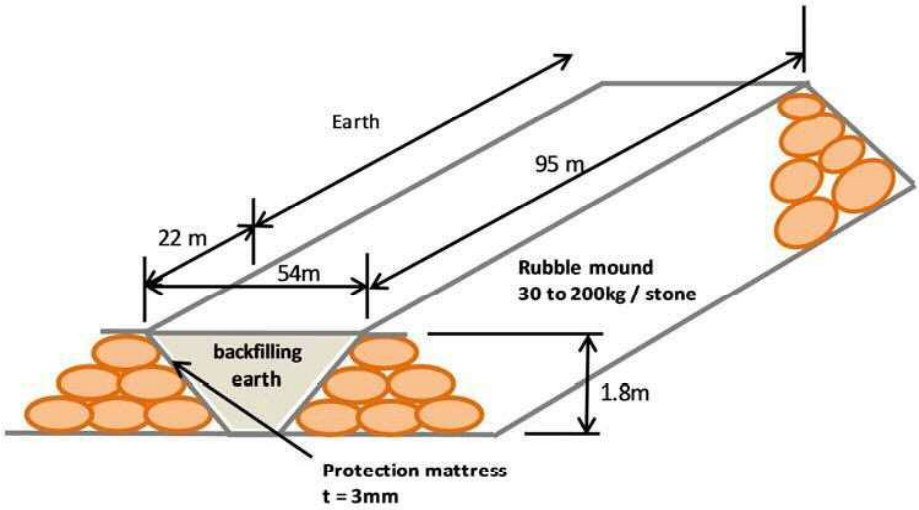
Picture-1 F1' Full view (Tip to base)

Picture-2 Jetty from the tip of F1'

Picture-3 Inshore (Between F1 and F1')

Picture-4 View from the shore-2 to F1'

Picture-5 Left side: Coarse sand at shore-2

No.	F2-1							
Location	Flood gate			Place	Fantasy Island			
Date	6-Mar-15			Time	12:00	Converted Tidal level	+0.5	MSL+1.15
Latitude / Longitude GPS	Start	S:17.7699		UTM Coordinate	Start	X:543078.373		
		E:177.4064				Y:8035226.808		
	End	S:17.7696			End	X:543022.528		
		E:177.4059				Y:8035253.755		
Length	95.0m	Width	54.0m	Height (m)	1) 2.10	2) 2.30	3)	4)
Abstract	Angle: 154 degree, Height: 2.2m This jetty is located the opposite side of shore-2. It is composed of rubble mound, protection mattress and backfilling sand. This jetty is used as a road.							
Location Map								
Diagram								

No.	F2-2		
Location	Flood gate	Place	Fantasy Island

Picture

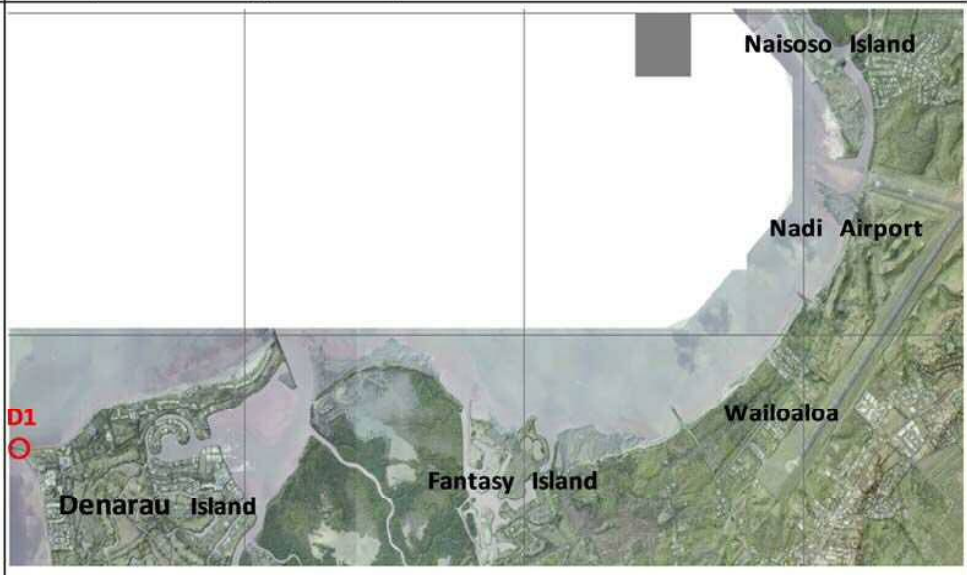
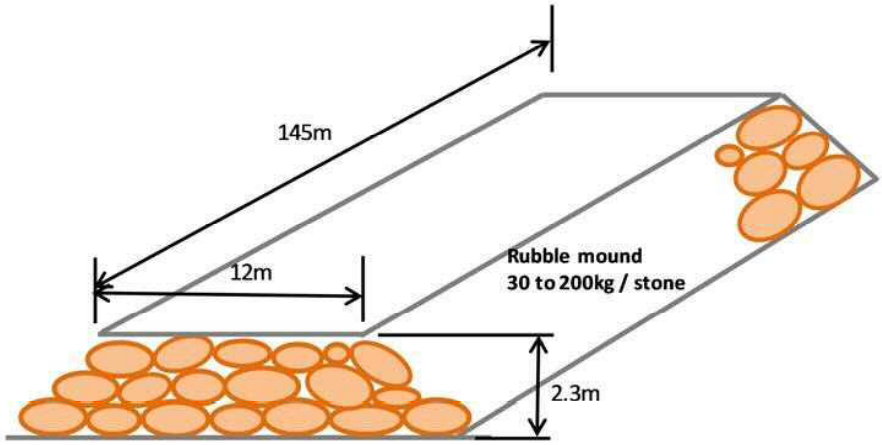
Picture-1 F2 Full view (Base to tip)

Picture-2 Right side (Tip to base)

Picture-3 Left side (Tip to base)

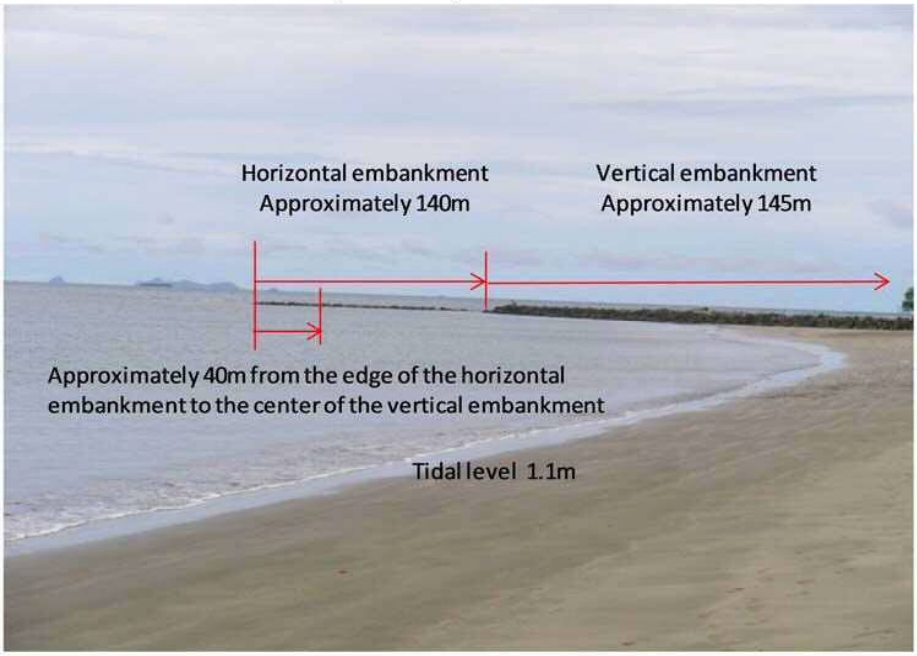
Picture-4 Right side (Tip)

Picture-5 Left side (Middle part to tip)

No.	D1-1							
Location	Deranau			Place	Sheraton Hotel			
Date	5-Feb-15			Time	11:10	Converted Tidal level	+1.1	MSL+1.15
Latitude / Longitude GPS	Start	S:17.771		UTM Coordinate	Start	X:538424.638		
		E:177.3625				Y:8035112.731		
	End	S:17.7713			End	X:538562.374		
		E:177.3638				Y:8035079.274		
Length	145.0m	Width	12.0m	Height (m)	1) 3.70	2) 1.50	3) 3.80	4) Equip. H 0.85
Abstract	Angle: 346 degree, Height: 2.25m T-shape jetty (145m length vertical embankment and 140m length, 2m width and 1.5m height horizontal embankment 25m away from the vertical embankment). Water depth of surrounding part is not deep.							
Location Map								
Diagram								

No.	D1-2		
Location	Deranau	Place	Sheraton Hotel

Picture



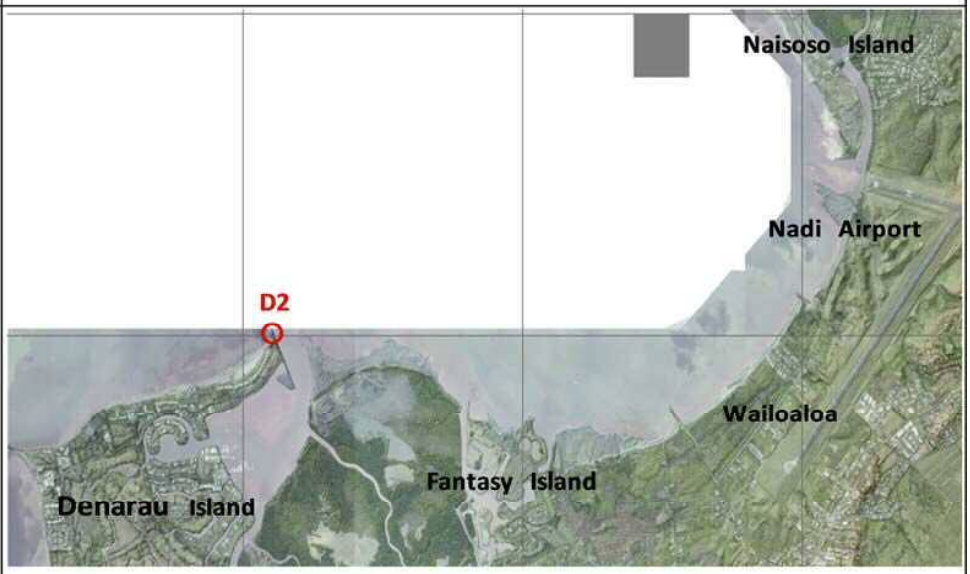
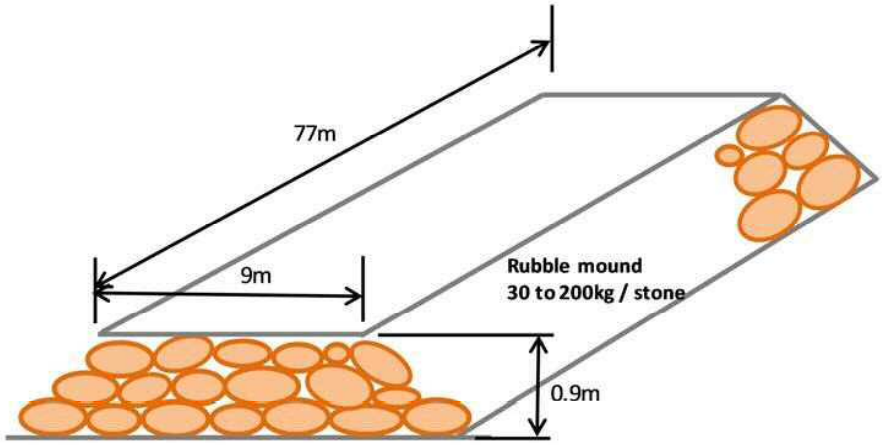
Picture-1 D1 Full view (Tip to base)

Picture-2 Right side: Rubble mound

Picture-3 Left side: Beach

Picture-4 View from the vertical embankment towards the horizontal embankment

Picture-5 Left side: Coarse and fine sand

No.	D2-1							
Location	Deranau			Place	Peninsula Hotel			
Date	5-Feb-15			Time	9:30	Converted Tidal level	+1.5	MSL+1.15
Latitude / Longitude GPS	Start	S:17.7623		UTM Coordinate	Start	X:540809.378		
		E:177.3850				Y:8036006.419		
	End	S:17.7630			End	X:540832.66		
		E:177.3852				Y:8035993.023		
Length	77.0m	Width	9.0m	Height (m)	1) 3.05	2) 2.10	3) 0.80	4) Equip. H 0.85
Abstract	Angle: 330 degree, Height: 1.35m Rubble mound style jetty							
Location Map								
Diagram								

No.	D2-2		
Location	Deranau	Place	Peninsula Hotel

Picture

Picture-1 D2 Full view (Base to tip)

Picture-2 Right side

Picture-3 Left side: Full view from left side

Picture-4 Right side

Picture-5 Left side