



1. Project Name: Hilo Deep Draft Harbor

2. Date of Inspection: May 2, 2005

3. Inspection Personnel:

<u>Name</u>	<u>Agency/Office</u>	<u>Telephone No.</u>
Dan Meyers	COE	438-8875
Geoffrey Lee	COE	438-8864

4. Findings/Conclusions:

a. Performed the inspection of the Hilo DDH's breakwater. We met with Mr. Ian Bernie, Harbor Master, DOT-Harbors, prior to the inspection. No new work has been conducted in the harbor area which affect the Federal Project. Low tide condition early in the morning progressing to windier conditions by late morning. The following are deficiencies noted during the inspection:





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b. The splash apron is in a deteriorated state since the squatters have removed many of the stones. The painted reach markers are deteriorating or are gone in many instances. They should be repainted.

c. The following is a list of items to monitor:

<u>STATION</u> (P) = Picture in Report	<u>RIB #</u>	<u>SEPARATION (in)</u>	<u>REMARKS</u>	<u>TRIBAR #</u>
0+00			START REACH 1 ROOT	
0+50 to 0+70 (P)			Tree & Bushes on side slope, harbor-side (HS) / crest, many small stones washed up @ crest	
0+60 to 1+00			Uneven side slope, ocean-side (OS)	
1+00 to 3+50			No splash apron, looks peeled off, HS	
2+60			START REACH 2A TRUNK	
3+00			Split armor stone (AS), HS	
3+50 (P)			START REACH 2B TRUNK	
5+00			START REACH 2C TRUNK	
6+00			Change in side slope, OS	
8+00 (P)			Crest w/ 2 split AS. Settling 1/2H:1V	
9+25			Exposed underlayer (UL), HS.	
			3 AS at toe dislodged. Settling at crest.	
10+00			HS, Cracked armor stone	
10+50			OS, Split armor stone at hinge	
10+75 (P)			Dislodged AS, OS	
10+95			START REACH 2D TRUNK	
11+15 (Px2)	4	1	OS, Monitor tribar movement	727,927,780
11+25 (P)	5\6	3-6	OS, Tribar Separation, Spalling at chamfer	744,740,140
11+35 (P)	7\8	3	OS, sideslope steepening, Spalling at chamfer	851
11+45	9\10	7	Spalling at chamfer, no joint material	
11+55 (P)	12	1		735
11+65 (P)	14	3		782
11+75 (P)	15\16	2,3	Steepening of OS Sideslope	762,748,847
11+90	17	3	Air survey marker	832
11+96	18			
12+12	20	2		838
12+24	21\22	2	Nothing in joint	852\796

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12+25	26	4		858
12+68	27\28	7		752
12+80	30\31	2@5		761\775
12+92	32	3	Settling at bottom	953
12+98	33	4	Settling at bottom	792
13+04	34	12	Settling at bottom	738
13+10 (P)	35	24	Shank break	982
13+16	36	3	Settled and lateral movement	811
13+22	37	4		968
13+28	38	5,6		968,825
13+40	39\40	4		839
13+52	42	4	Spalling at chamfer	770
13+64	43\44	4		981
13+70	45		Spalling bottom of rib cap & chamfer. (Jt)	
			Monitor nearest joint-no filler.	
13+76	46		Spalling at chamfer	
13+88	48		Spalling at chamfer	
13+94	49	12	Air survey marker, mid slope.	643
			Steepening, UL exposed.	
14+06	51\52	2		756
14+18	53	1		583
14+30	55	3		866
14+36	56	12	Spalling at chamfer.	970
	57		Monitor nearest joint-no filler.	
14+60	59\60		Spalling at chamfer.	
14+75			START REACH 2E TRUNK	
14+78	63	2	1st bend in rib cap	402
14+84 (P)	64		Shank break. New shank break.	513,543
14+90	65	3		516
15+02	67	4		938
15+08	68\69	7		935
15+26	70\71	4	Spalling at chamfer	919
15+30 (P)	71		Tribar settling and movement	
15+32	72		Air survey marker. Monitor loss of UL. Settling.	
		No tribar @ cap, OS	Able to see water below cap	

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15+38	73\74	12	Begin settled area. Monitor nearest joint	906,920
15+50	75	2		868
15+56	76\77	5,12	End settling. Monitor tribar-tilted	905
15+74	79	12		884
15+80	80	6	Bottom corner sheared off	887
15+98 (P)	83	7,2	Old air survey marker. 856 is separated	856\889,598
			7" on one side, 18" on other side.	
			Nearest 598 shank break at WL.	
16+16	86	12		400
16+22	87	12		414
16+34	89	5		952
16+40	90	3	Gap/void between	392
16+46	91\92	1	Gap/void between (hole).	404
			? Broken tribar, HS. UL exposed.	
16+58	93	6		403
16+64	94	1		925
16+70	95	1	"Cambra", brass bolt, 2d bend, Loss of joint material	925
			Spalling at chamfer	
16+76	96	2,4		941\955
16+82	97\98		Spalling at chamfer	
17+00	100	2		997\987
17+05	102	3	Spalling	940
17+24	103\104	3		972
17+30	105	5		945
17+36	106	3		939
17+40 (P)	107\109		3 x shank break (jt location)	unk\317\287
17+42	110	3		957
17+78	113	4		328
17+84	114	2		328\956
17+90	115\116	1		251
17+96	116		Air marker survey	
18+02	117	5		942
18+08	118	3		943
18+14	119	3	Loss of joint material	396
18+20	120	8	Spalling at chamfer	227
18+26	121	5		214

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18+32	122	5		225
18+38	123	6		410
18+44	124	10		213
18+50	125	12		213
18+70	127	1		228
18+72	128	1		329
18+74	129	5,1		198\184
18+80	130	1		184
18+86	131	3	Loss of joint material	169
18+92	132	2	WL 2 chipped flukes	263
18+98	133	1	Settling 1H:2V	264
19+10	134\135	1		327
19+16	136	3		156
19+52	142	2		212
19+52 (P)	142		Shank break 7 ribs from end - 71 sliding. Broken tribar.	64
19+58	143	2	Double layer at WL, Loss of joint material	71
19+64	144	1		66
19+70	145	4		62
19+76	146	4		62
19+82	147	6		58
19+90	149	6	Rib cap end. Air survey marker.	255
19+91			START REACH 2F TRUNK	
21+90			Air survey marker	
22+90			Fractured crest stone	
23+90			Air survey marker. 50' reach. Settling, OS.	
24+90			End reach.	
25+00 (P)			START REACH 2G TRUNK, monitor hinge separation, OS.	
25+30 (P)			Slight separation at crest hinge, OS.	
			Monitor possible sliding.	
25+90			Air marker survey	
27+00 (P)			OS, hinge settling	
27+90			Air marker survey	
28+00 (P)			OS, Sideslope steepening/settling	
28+65 (P)			Depression on crest, 5' diameter, hinge settling w/ UL exposed.	
28+80		PS GONE this	Perched stone (PS), void at crest, UL exposed	

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		inspection		
			Note: perched stone is gone.	
29+50			Monitor possible loss of crest elevation	
29+90			Air survey marker. End reach, 30+00	
30+00			START REACH 2H TRUNK	
30+75		Gone	Rocker on crest 2' dia.	
31+90			Air survey marker	
33+90			Air survey marker	
34+10 (P)			60' reach with settling at crest opposite green can	
34+90			End reach, 35+00	
35+00			START REACH 2I TRUNK	
35+75			3'x4' void, UL exposed at crest	
35+90 (P)			Perched rock gone. 3'x4' void at crest	
36+00			Air survey marker	
36+50 (P)		4' x 2'	6' deep void at crest	
36+75			Air Cross	
37+10 (P)			Bridging of AS. Monitor slight crest settlement of side slope (sliding), OS	
38+00			Air survey marker	
38+40 (P)			Settling @ crest, void, UL missing	
40+00			START REACH 2J TRUNK	
40+00			Air survey marker, end reach	
40+60			Bridging and settling at crest, shifting & bulge, OS, noted FY01 Inspection	
42+00			Air survey marker	
42+50 (P)		HS	Possible dislodged stone at WL Not noted during this inspection. Continue to monitor.	
44+10			2'x3' void at crest. Many 10-50 LB stones between AS for 100' Slight settling at crest, bridging of AS, HS High energy area?	
45+00			START REACH 2K TRUNK	
45+80			Bridging of crest stone.	
47+00			Split AS on crest.	

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49+10 (P)			Split AS on crest	
49+50 (P)			OS, Cracked AS at hinge	
50+00		Marker	START REACH 2L TRUNK	
50+00			End reach	
50+70			Bridging of crest stone.	
52+50			Bridging of crest stone and settling	
52+75 (P)			Perched stone on crest 3' diameter	
54+00			Fractured AS at crest	
54+50 (P)		5'L x 3'W x 5'D	OS, separation of armor stones at hinge causing void	
54+75 (P)			OS, 1 AS w/ 2 splits at hinge	
55+00			START REACH 2M TRUNK	
55+25 (P)			OS, AS settling and separating at hinge	
56+00 (P)			OS, 4' void depth, UL settling at hinge	
57+00			2' separation at slope/crest hinge	
Several small			1 st 100' side slope looks steeper	
UL perched			High energy area, limu on crest	
OS hinge			Frequent overtopping	
			Monitor crest settlement	
59+00 (P)		5'D x 2'W x 6'L	Void - End reach. 2d big bend in breakwater	
59+30			Bridging and settling at crest	
60+00			START REACH 2N TRUNK	
60+00			Large cavity (10'x5') due to bridging	
			Little contact at crest.	
60+90 (P)		2' x 4' x 4'	Void @ crest	
61+50 (P)			1'x3' perched stone on crest	
65+00			START REACH 2O TRUNK	
65+00 (P)			Slight settling on slope side	
			Area of wave focusing	
66+00			End reach	
66+35			2' void on crest, exposed UL	
68+00 (P)			Tombstone - flat AS flipped up	
68+45			2' void at PC of bend	
69+00			OS, Monitor settling at hinge	
69+95			3'x4' void 10' deep down to waterline.	
			Loose AS, HS	
			PC etched into stone at 70+00	

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70+00			START REACH 2P TRUNK	
70+50			Brass disk - unknown inscription.	
			20'x10' depression, OS, monitor	
71+00			Air survey marker	
71+10 (P)			3'x5' void, OS	
72+00 (P)			End reach. Slight settling at crest hinge, OS	
73+35 (P)			Slight settling at crest and bulge, HS	
73+40			Slight settling at crest and bulge, HS	
74+40 (P)			3 fractured stones at crest.	
			Not found '98 inspection.	
75+00			START REACH 2Q TRUNK	
75+20			Separation at slope-crest hinge. UL exposed	
75+85 (P)			1 small crest stone fractured. 3x	
77+00			End reach	
77+30 (P)			Bridging at crest	
77+80 (P)			Cracked AS on Center Line of crest	
80+00			START REACH 2R TRUNK	
81+20 (P)			Voids at crest	
81+40			Void at crest	
81+50			Air survey marker adjacent red can	
82+00			End reach	
82+75			Possible dislodged AS at WL	
83+00-84+00			Poor key and fit of crest stones.	
			Not interlocked/touching adjacent stones	
84+30 (P)		5'L x 3'W x 8'D	Crest separation of several armor stones w/ UL exposed causing void	
85+00			START REACH 2S TRUNK	
85+00 to 92+00 (Px3)			Bridging of crest stones. Settling of hinge at various locations	
87+00			End reach, Settling hinge	
87+80 (P)			OS, Crest w/ void down to WL, UL exposed	
90+00			START REACH 2T TRUNK, Settling at hinge w/separation	
91+25 (P)			Fractured stone at crest, Settling hinge	
92+00			End reach, Settling hinge	
92+75			Settling hinge approx. end	
92+20 (P)			Voids (chinker present at other areas gone)	
			Fractured crest stone, no interlock, bridging	

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			AS protruding from slide slope, HS	
92+20-93+70 (P)			Noticeable 1' -2' recession at WL-150 LF	
92+90 (P)			OS, void from crest to WL	
93+00 (P)			OS, void from crest to WL	
93+90 (P)			2'x3'x10' void near crest, OS	
94+36			NOS disk "7741B 1976"	
95+00			START REACH 2U TRUNK	
95+36			NOS disk "7741A 1976"	
?			NOS disk "7741C 1976"	
100+00			START REACH 3 HEAD	
100+05			Settling, missing AS at WL, HS	
100+25 (P)			Settling, 1' gap between AS (WL to crest)	
100+35			Perched stone on crest not found FY01	
?			NOS disk "7741D 1976"	
			Monitor head closely for future changes	
			Profile appears to have changed (lost AS)	
			since last inspection	
100+55 (P)			Void	
100+65 (P×3)			END REACH 3 HEAD	



- a. Sta. 0+50 - Sta. 0+70, Armor Stones dislodged from hinge resting on sideslope.



- b. Sta. 0+50 - 0+70, remove vegetation.



c. Sta. 2+60, interior sideslope deteriorating.



d. Sta. 3+50, Overview



e. Sta. 4+00, harborside (HS) failure of sideslope.



f. Sta. 8+15, OS, void at hinge.



g. Sta. 10+05, 2ea. Voids on crest.



h. Sta. 10+75, OS, Monitor dislocated armor stone resting on the sideslope.



i. Sta. 11+15, OS 1" separation (tribar #927)



j. Sta. 11+15, OS, Monitor tribar movement.



k. Sta. 11+25, OS, 3-6" separation (tribar #740 and #744), Rib # 5.



l. Sta. 11+35, OS, 3" separation (tribar #851). Rib # 10, Sideslope steepening.



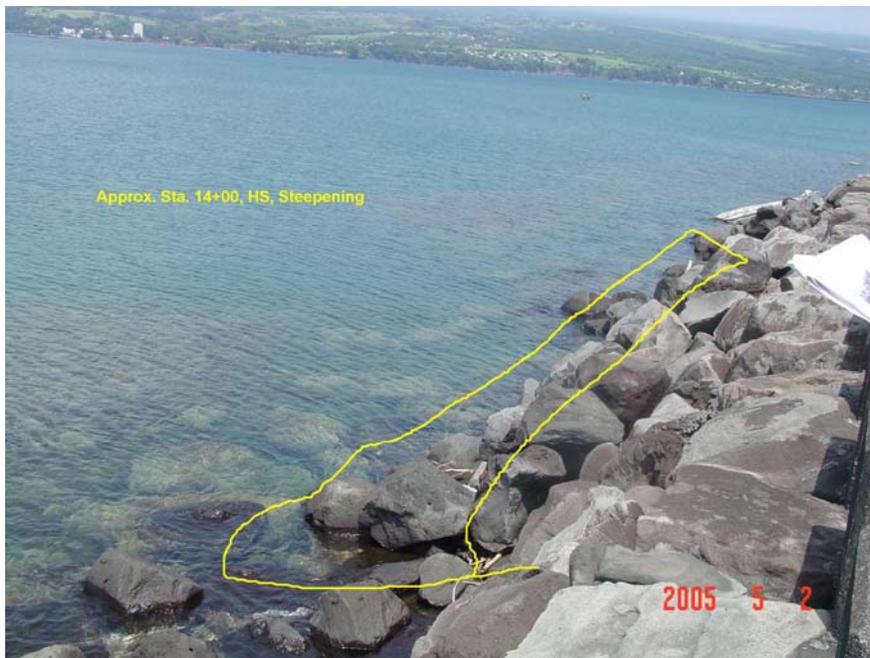
m. Sta. 11+55, OS, 1" separation (tribar #735).



n. Sta. 11+75, OS, Monitor tribar movement.



o. Sta. 13+10, OS, Broken Tribar # 982



p. Sta. 14+00, HS, sideslope steepening, peeling off see previous report.



q. Sta. 14+84, OS, Shank Break..



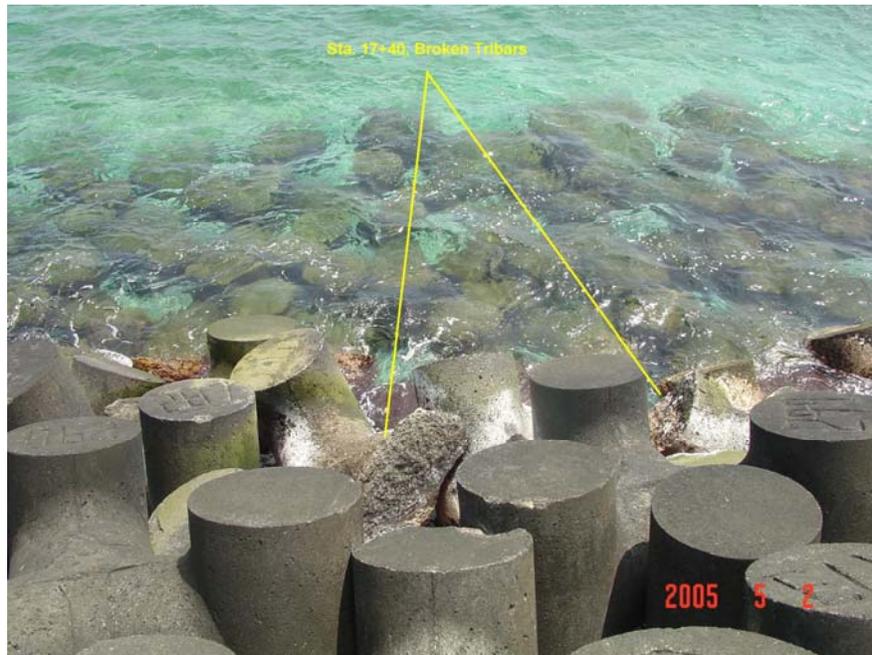
r. Sta.15+30 to 15+56, OS, Monitor tribar movement, settling.



s. Sta. 15+32, OS, Dislodged armor stone, no obvious void.



t. Sta.15+98, OS, Monitor shank break at water line.



u. Sta. 17+40, OS, Broken Tribars # 317 / 287 / ?



v. Sta. 18+56, OS, settling under tribar at ribcap.



w. Sta. 19+52, OS, Broken Tribars # 64



x. Sta. 21+90, Crest, partial air survey marker.



y. Sta. 22+80, HS, missing hinge armor stone.



z. Sta. 22+90, OS, Split armor stone.



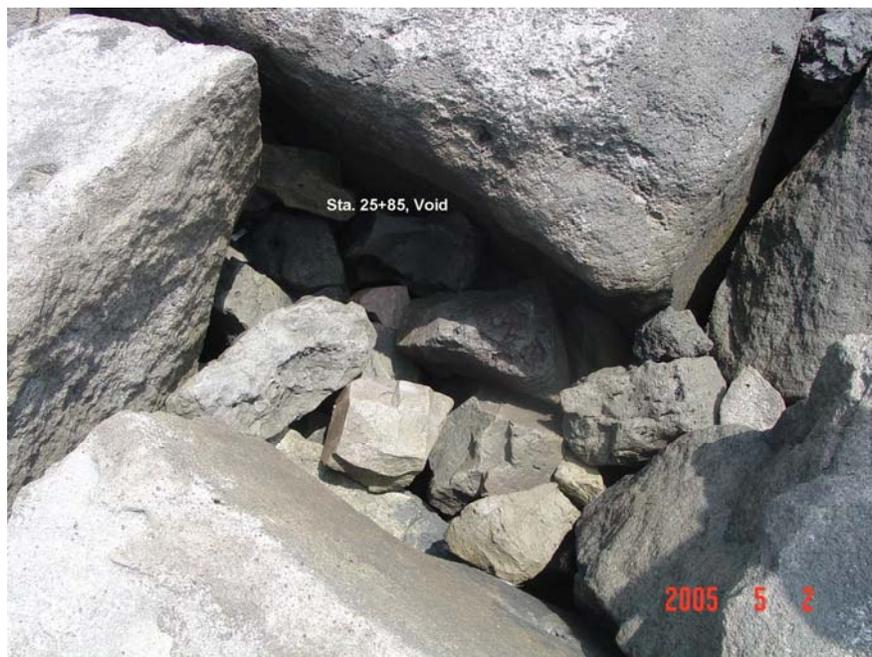
aa. Sta. 23+90, OS, Monitor hinge separation.



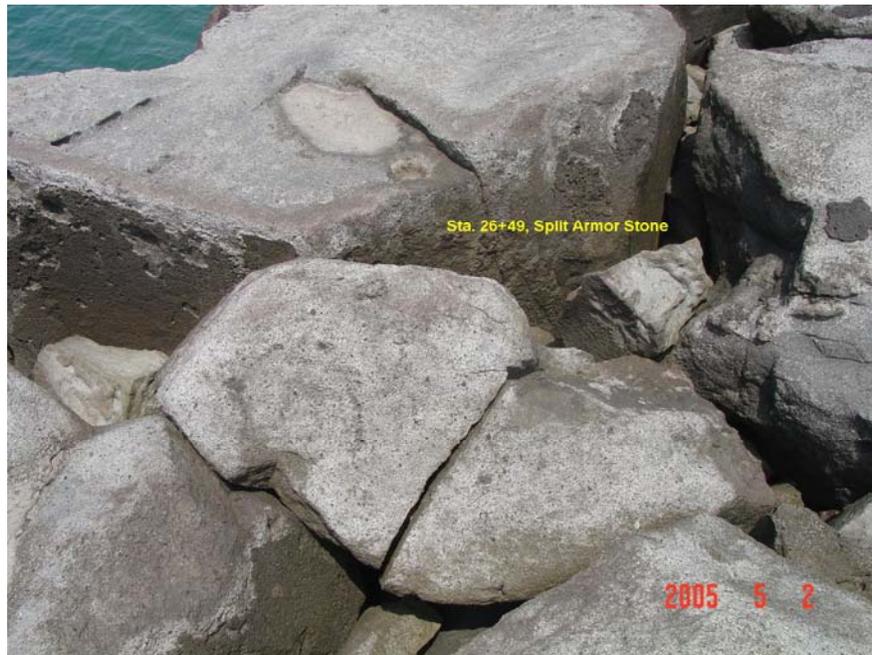
bb. Sta. 25+00, OS, Monitor hinge separation.



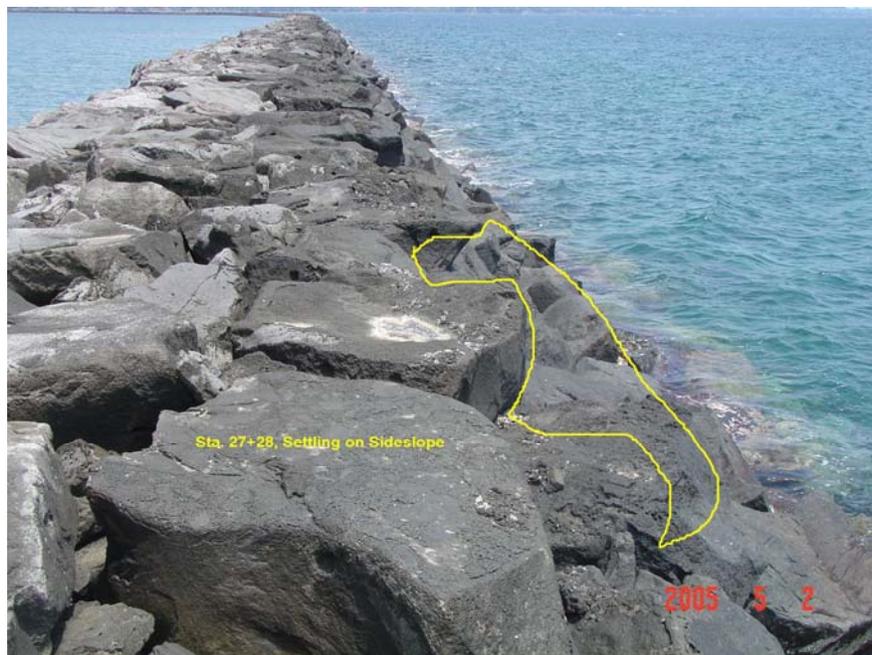
cc. Sta. 25+30, OS, Monitor hinge settling.



dd. Sta. 25+85, Small void at crest.



ee. Sta. 26+49, HS, split armor stone at hinge.



ff. Sta. 27+28, OS, sideslope settling.



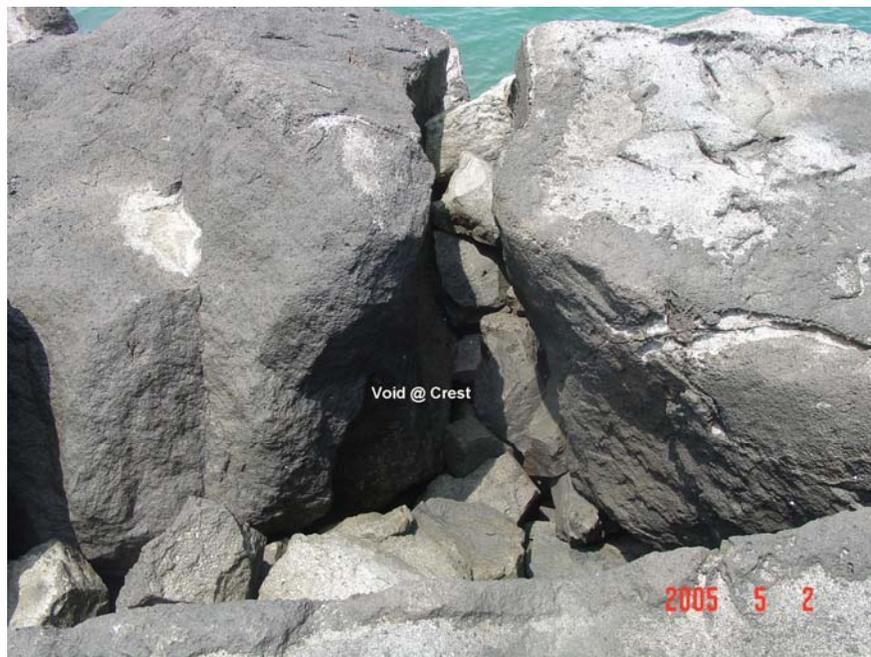
gg. Sta. 28+54, crest settling.



hh. Sta. 28+78, OS, settling at hinge.



ii. Sta. 29+38, Depression on crest.



jj. Sta. 32+25, void on crest.



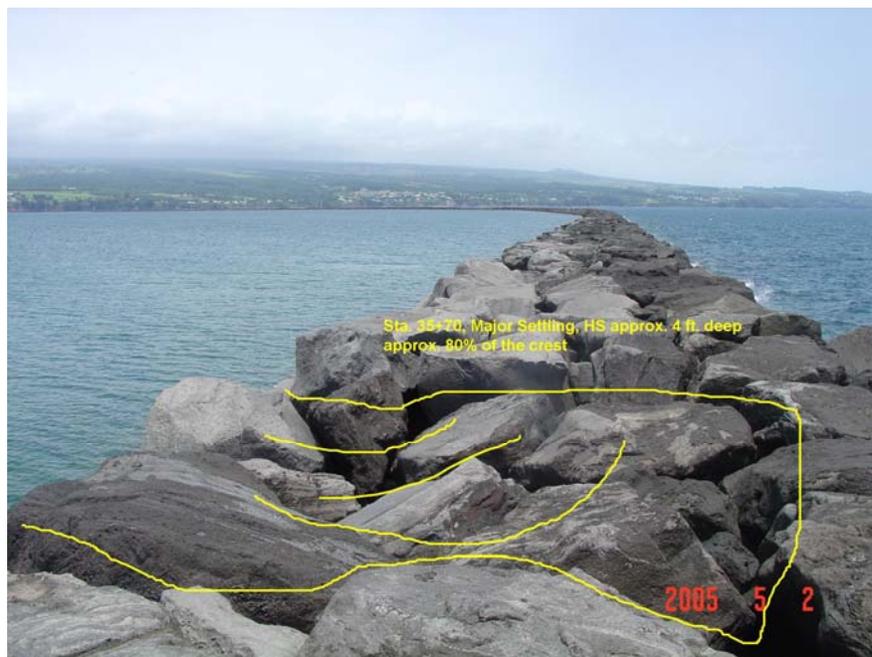
kk. Sta. 33+66, Void on crest.



ll. Sta. 35+00, Overview.



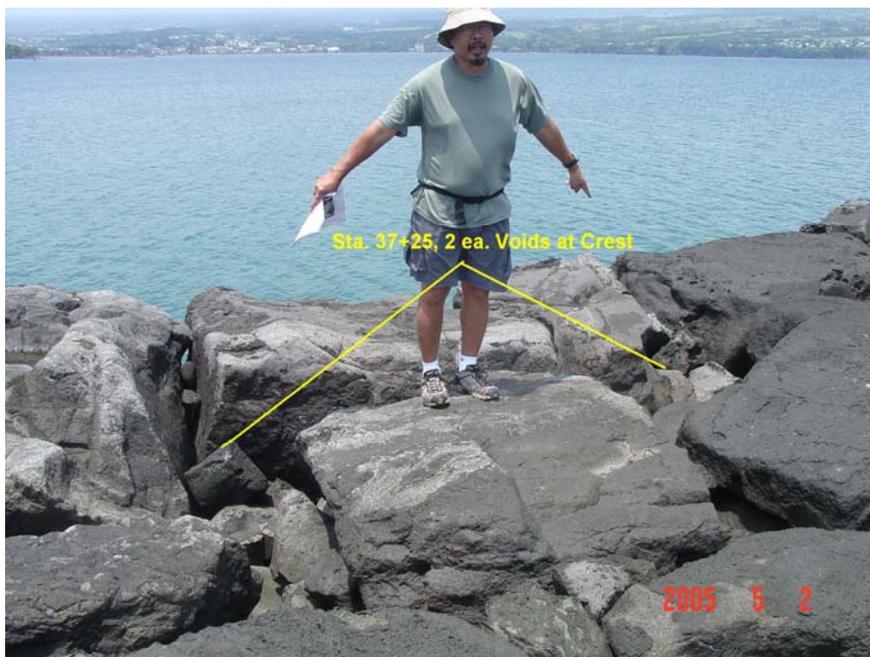
mm. Sta. 35+84, 3' x 4', void at crest.



nn. Sta. 36+10, (not Sta. 35+70), HS, Major settling of approx. 90% of crest.



oo. Sta. 37+25, OS, bridging armor stone.



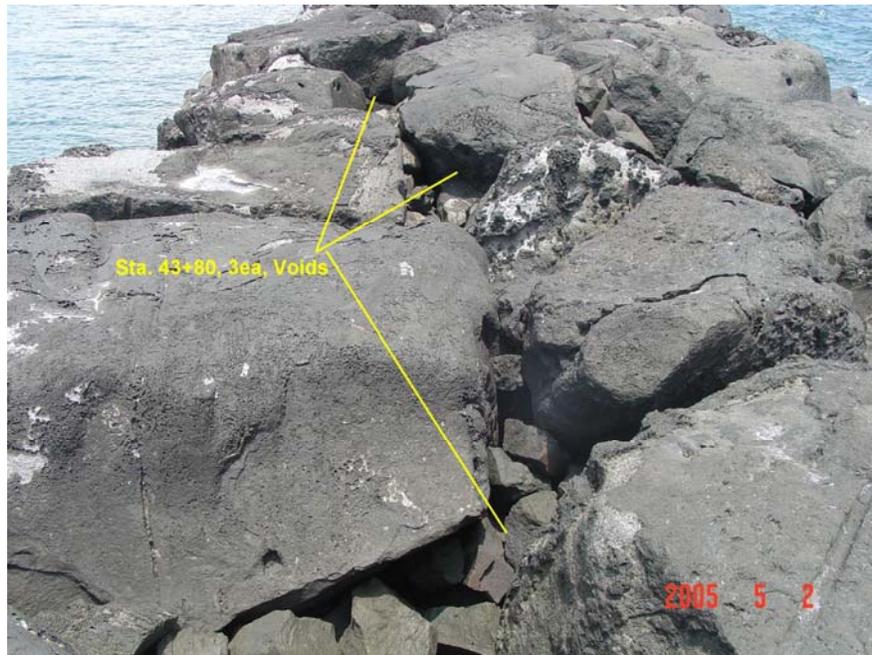
pp. Sta. Sta. 37+25, settling at crest w/2 ea. Voids.



qq. Sta. 38+85, 2ea. perched armor stones.



rr. Sta. 40+55, OS, bridging and settling.



ss. Sta. 43+80, Crest, 3 ea. Voids.



tt. Sta. 48+29, crest , split armor stone.



uu. Sta. 48+29, Split armor stone.



vv. Sta. 52+60, OS, bridging.



ww. Sta. 52+75 to 52+95, perched armor stone and separation. Small rocks are being forced on the crest by wave action and settling between armor stones causing voids size to increase.



xx. Sta. 54+00, fractured armor stone on crest.



yy. Sta. 54+30, fractured armor stone on crest.



zz. Sta. 55+25, OS, hinge separation.



aaa. Sta. 57+00, OS, perched armor stones, several smaller perched stones on sideslope.



bbb. Sta. 57+35, void at crest, CL of OS, 4' deep 3' wide 4' deep.



ccc. Sta. 57+00, HS, Overview.



ddd. Sta. 57+58, CL Crest, 2' separation.



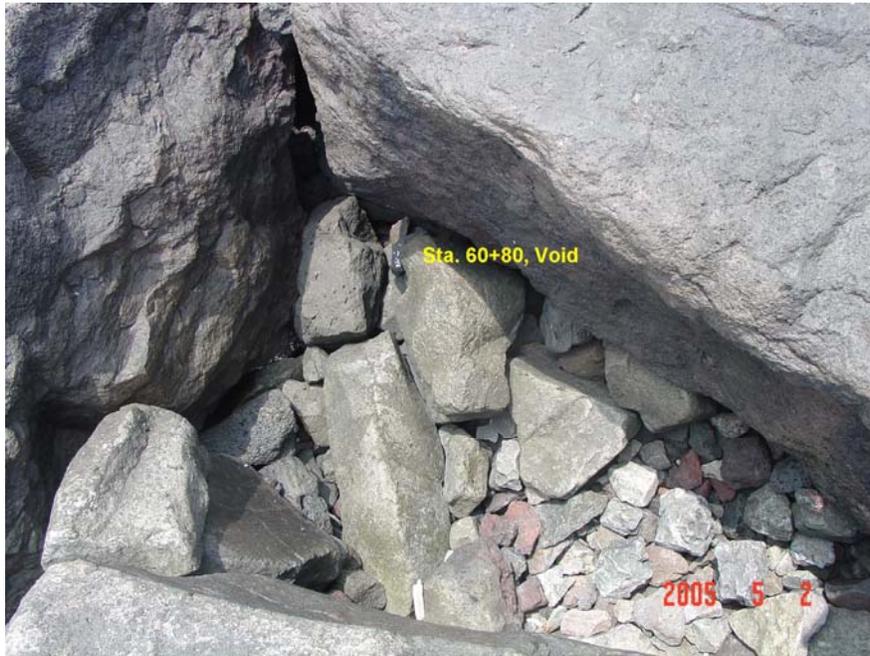
Sta. 59+40, HS, Settling at Hinge



eee. Sta. 59+40, HS, hinge settling.



fff. Sta. 59+82, CL crest, settling.



ggg. Sta. 60+80, HS of crest, void.



hhh. Sta. 62+00, perched armor stone, no obvious void.



iii. Sta. 62+63, OS, hinge settling & sideslope bowing.



jjj. Sta. 65+00, OS, bridging and settling.



kkk. Sta. 65+90, crest, cracked armor stone.



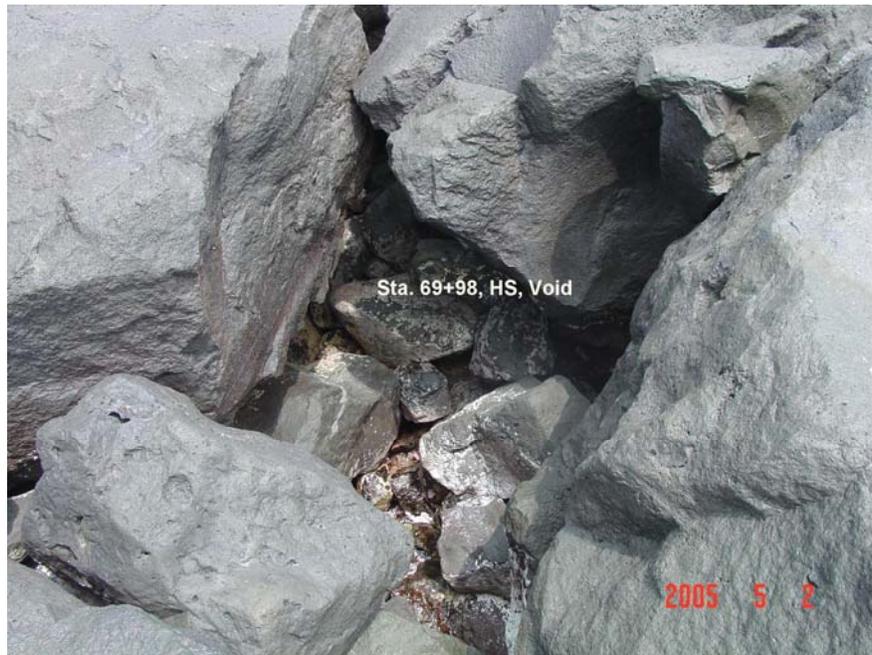
lll. Sta. 66+35, OS crest, 2' void w/ UL exposed.



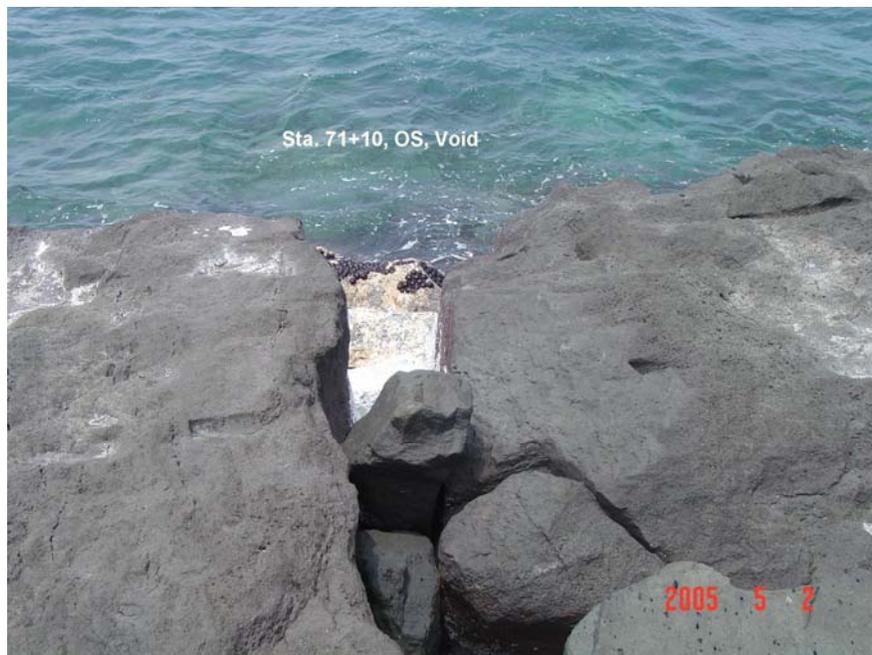
mmm. Sta. 67+19, OS, 2'Wx3'Lx4'D, void at hinge.



nnn. Sta. 68+00, Perched armor stone resting on crest, "Tombstone".



ooo. Sta. 69+98, HS of crest, 3'L x 4'W x 10'D void.



ppp. Sta. 71+10, OS, 3' x 5' void at hinge.



qqq. Sta. 72+00, OS, settling and void.



rrr. Sta. 73+00 to Sta. 73+64, HS, Buldge and settling.



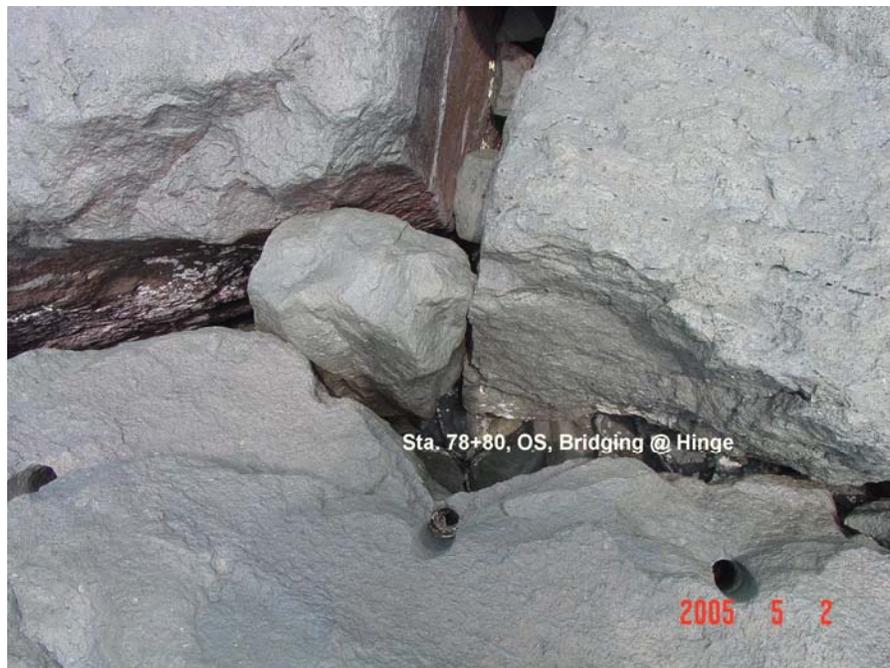
sss. Sta. 74+40, Crest, 1 fractured armor stone (3x).



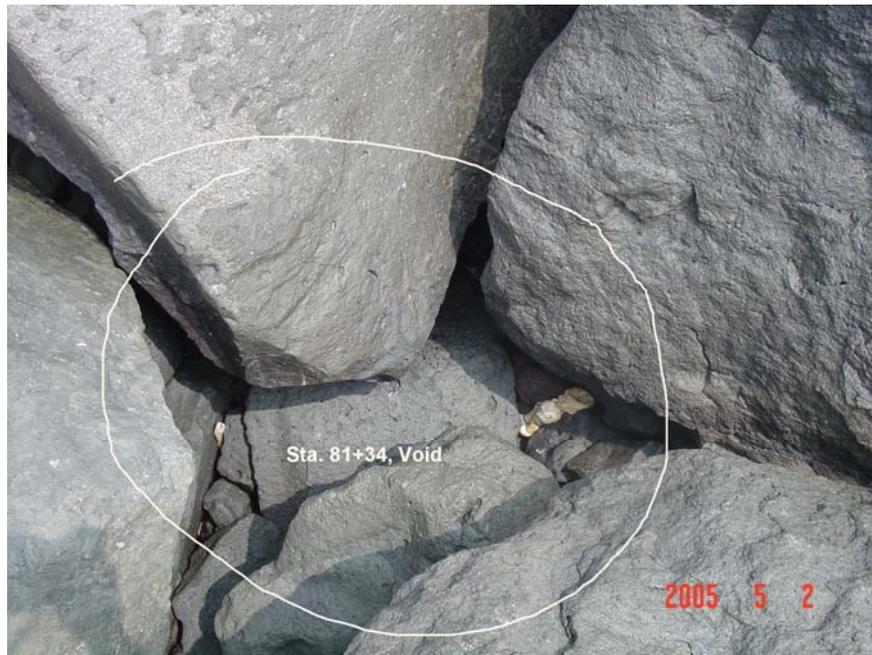
ttt. Sta. 75+85, Crest, 1 fractured armor stone (3x).



uuu. Sta. 77+15, OS, settling.



vvv. Sta. 78+80, OS, bridging at hinge.



www. Sta. 81+34, OS, void.



xxx. Sta. 90+00, OS, crest settling and gap.



yyy. Sta. 92+20. Overview.



zzz. Sta. 95+78. OS, perched armor stone.



aaaa. Sta. 100+65, OS, void at hinge.



bbbb. Sta. 100+65, Overview of head @ 45 deg HS.



cccc. Sta. 100+65, Overview at head @ 0 deg.



dddd. Sta. 100+65, Overview of head @ 45 deg OS.

5. Conclusion:



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There were new deficiencies noted during this inspection. The most significant were voids in the crest to the water line or near the water line at Sta. 54+50, Sta. 84+30, and Sta. 87+80.

Sideslope failure at Sta. 14+00, HS, noted on previous post storm report has not changes. The overall condition of the breakwater is FAIR, however the functionality is GOOD.

Suggestion to add semi-permanent brass survey monuments at every 500' with **station** numbers on them after the end of the concrete rib section would be helpful when doing future inspections.

Signed: _____
Dan Meyers, CEPOH-EC-T

Signed: _____
Jim Pennaz P.E., Ch, CEPOH-EC-T



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HILO HARBOR, HAWAII, HAWAII

CONDITION OF IMPROVEMENT 30 SEPTEMBER 1993

PREVIOUS PROJECTS: Authorized by the River and Harbor Acts of 2 March 1907, 25 July 1912 and 3 March 1925.

EXISTING PROJECT: Modification authorized by the Water Resources Development Act of 1986 (PL 99-662), 17 November 1986, provides for deepening the entrance channel from 35 feet to 39 feet and deepening the turning basin from 35 feet to 38 feet.

PROGRESS OF WORK

Completed and Under Maintenance: Work authorized by the Acts of 1907, 1912 and 1925 was completed in 1930. Emergency breakwater repair was completed in 1968. Other breakwater repairs were completed in 1973, 1975 and 1981. Last maintenance dredging was completed in April 1990; total material dredged was 80,000 cubic yards.

Work Remaining: None. Preconstruction engineering and design on modification authorized in 1986 and initiated in FY 1990, was terminated in July 1991. Project was determined to be economically unjustifiable. Project placed in deferred category in FY 1992.

COST OF CONSTRUCTION:

	<u>New Work</u>	<u>Maintenance</u>	<u>Total</u>
<u>Completed Works:</u>			
United States Funds	<u>\$5,423,440</u>	<u>\$4,089,631</u>	<u>\$9,513,071</u>
Total Costs	\$5,423,440	\$4,089,631	\$9,513,071
<u>Uncompleted Works:</u>			
United States Funds	\$4,570,000		\$4,570,000
Contributed Funds Required	<u>1,530,000</u>		<u>1,530,000</u>
Total Estimated Costs (1990)	\$6,100,000		\$6,100,000

RANGE OF TIDES: The range of tide between mean lower low water and mean higher high water is 2.4 feet. The extreme range is 5.4 feet.