North Beach "Wash-a-Way" Dynamic Revetment Projects

These projects protect nearly 1000 acres of commercial cranberry farms from saltwater intrusion and reduces erosion that impacts nearby shellfish grounds. Erosion at "Washaway Beach" has been ongoing for decades, causing loss of dozens of homes and requiring relocation of state highway 105. The erosion now threatens the drainage infrastructure that protects the greater Grayland area from tidal flooding. If nothing is done soon, the tide gates will fail due to direct wave action against the gates, and the highway will then be at risk of flooding and failure. Then not only will thousands of acres of cranberry bogs become un-farmable, but dozens of miles of roads and highways will be flooded, along with hundreds of homes.
Pacific County Drainage District Number One is a Special Purpose Drainage District helping 63 farm families within the district. The cranberry industry in this district farms 816 acres of cranberries with an estimated value of $20-50 million. The land within the Pacific County Drainage District #1 is at an elevation below mean high water, with the highest point approximately six feet above mean sea level at the county line. North of this line the waters drain through the Grays Harbor Drainage District into the Elk River Estuary. This means that in the event of a tide gate failure or dike breach, much of the land within the district would be subject to flooding even on ordinary high tides. In the event of a storm surge the District could experience flooding to a depth of several feet, flooding the Grays Harbor Drainage District as well.

Project Areas & Projects:

- East Project Beach Reach (projects in currently in CPDS)

-High Dynamic Revetment Project	$ 30,000
-Dynamic Revetmemt	$112,000
-Buried Revetment	$153,000
	$295,000

- West Project Beach Reach

-High Dynamic Revetment	$ 60,000
-Dynamic Revetment South	$ 62,000
-Dynamic Revetment Center	$ 30,000
-Dynamic Revetment North	$ 36,000
	$188,000

West Project Beach Reach

East Project Beach Reach

Significant wave height	Peak Wave Period	$R_{u2\%} = C_r\sqrt{\frac{g}{2\pi}}T\sqrt{H_S}(\tan\theta)$. 2% exceedance of wave runup	$f_r = \frac{8}{\left(2.5\ln\left(30\frac{h_s}{k_s}\right)\right)^2}$ friction factor	$\tau_{BF} = f_{BF}\rho_w U_{max} R_u 2f \cot\theta$ Frictional Bed stress	$M_{R_u} = \frac{\rho_s f_{BF} U_{max} R_u 2f}{K_r\left(\frac{\rho_s - \rho_w}{\rho_w}\right) g \tan\theta}$ Critical mass for incipient motion	Volume of Critical mass for incipient motion	Median diameter of particle mass	
Hs (m, at toe)	**Tp (sec)**	**$R_{U2\%(m)}$ [Battjes 1974]**	**f_{BF}**	**τ_{BF} (Pa)**	**M_{ru} (kg)**	**V (m^3)**	**D_{50} (m)**	**D_{50} (in)**
1.40	20.00	1.69	0.04	1382.81	657.50	0.25	0.78	30.69
1.60	16.00	1.44	0.04	1561.25	542.97	0.20	0.73	28.80
1.70	14.30	1.33	0.04	1657.06	489.10	0.18	0.71	27.81
3.00	16.00	1.98	0.04	1918.45	1250.99	0.47	0.97	38.03
1.00	12.00	0.86	0.05	1498.75	183.25	0.07	0.51	20.05
0.50	12.00	0.61	0.06	1219.00	74.52	0.03	0.38	14.85
0.30	10.00	0.39	0.07	1144.17	29.14	0.01	0.28	10.86
0.10	7.00	0.16	0.11	1054.74	4.39	0.00	0.15	5.78

Constants			
g	9.81	m/s^2	gravitational acceleration
tan θ	0.033050847		beach slope
C_r	0.55		runup attenuation constant
h_{sb}	2.7432	m	still water level
H_{sb}	2.139696	m	Breaking significant wave height
U_{max}	6.921069987	m/s	maximum swash velocity
rho_s	2650	kg/m^3	density of quartz (sand/cobble)
rho_w	1030	kg/m^3	density of sea water
D_{50}	0.1524	m	median grain size
Kr	1		shape & packing coeficient

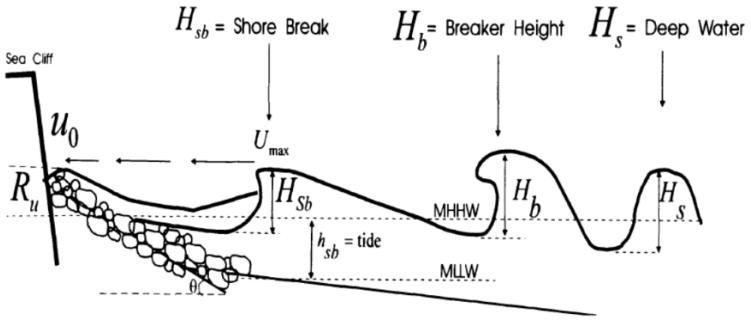

Figure 1. Schematic of the process of wave transformation from an initial off-shore wave height to the final run-up of swash on the beach face.

Lorang 2000