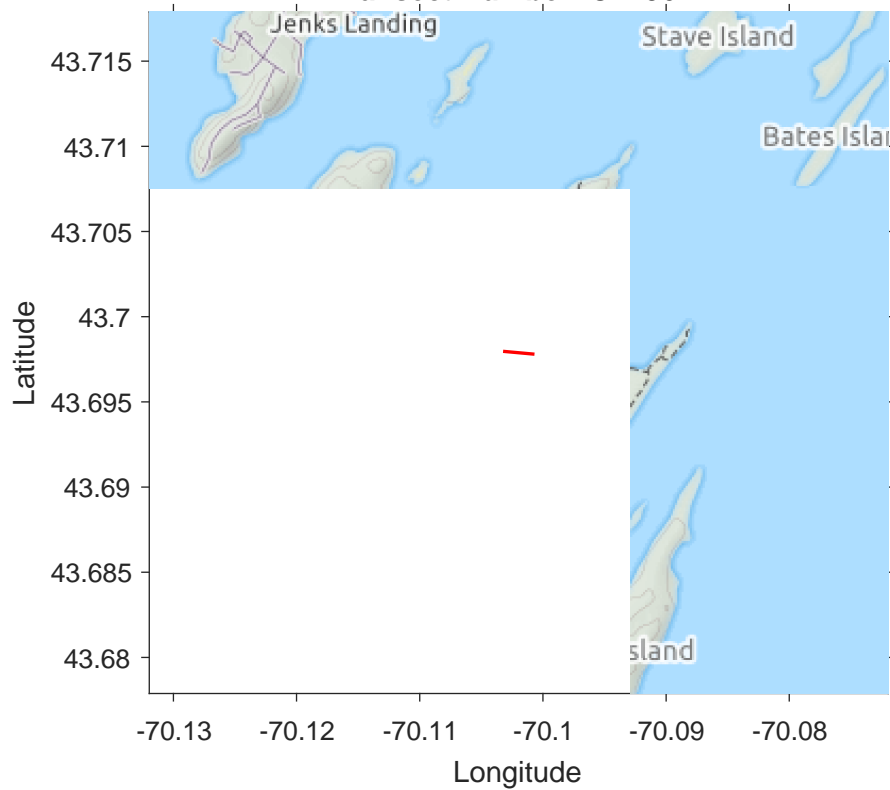
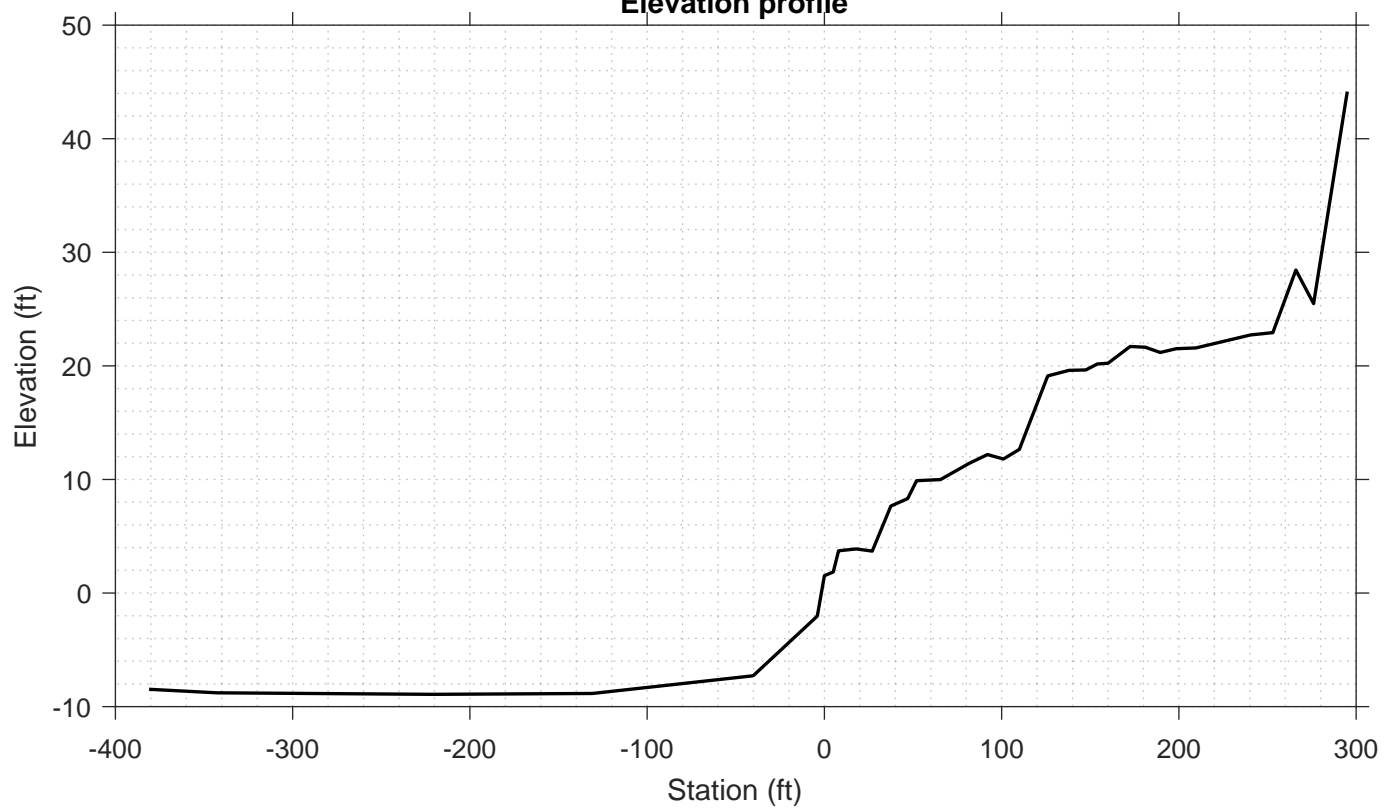


Transect Number: CM-96-1



Elevation profile



DATA LOG FOR TRANSECT ID: CM-96-1

PART 1: USER INPUT

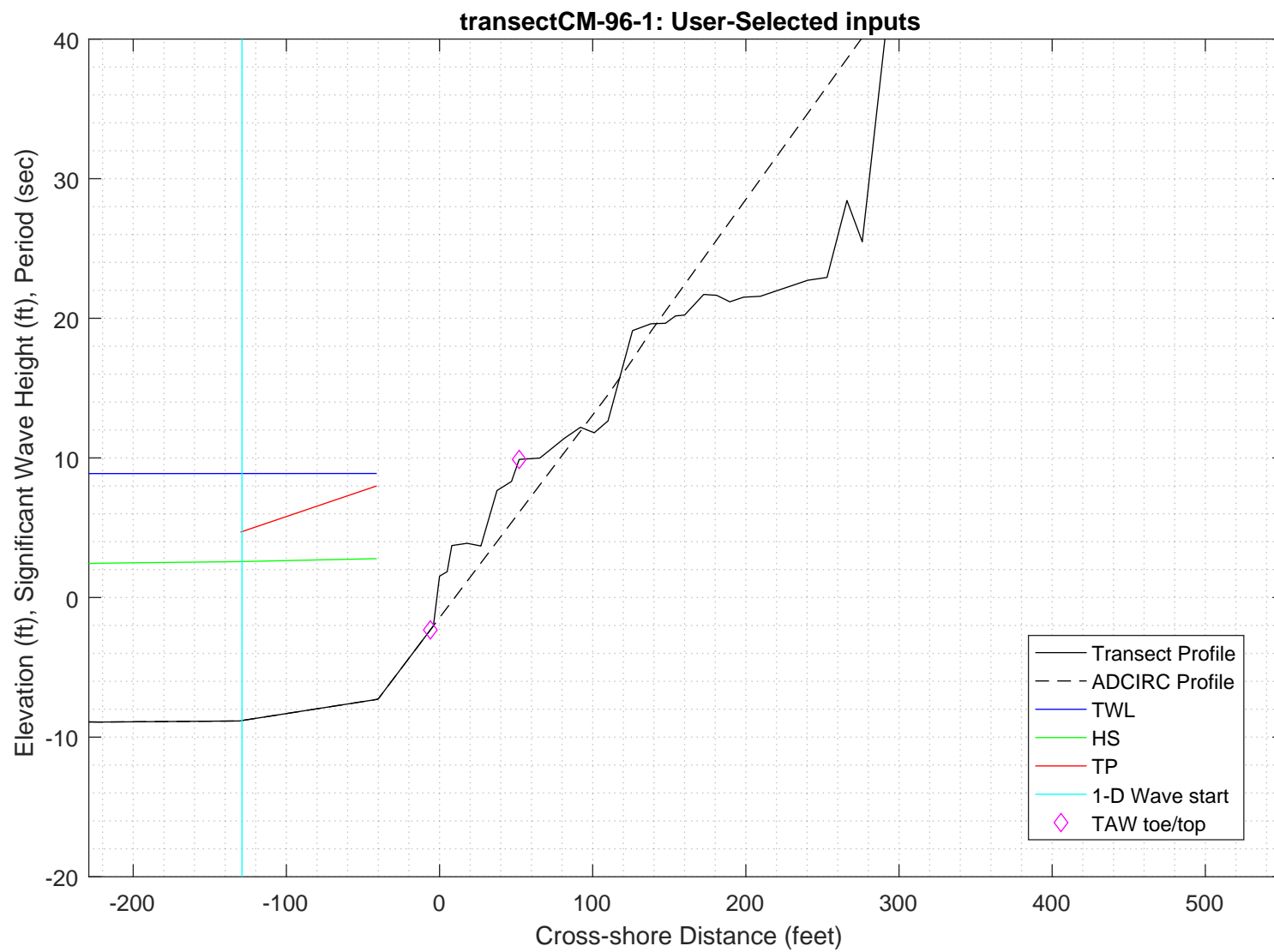
SWAN 1-D / WHAFIS input

station: -129 ft
LON: -70.1016 deg E
LAT: 43.6979 deg N
Bottom ELEV: -8.8091 ft-NAVD88
TWL: 8.8814 ft-NAVD88
HS: 2.5775 ft
TP: 4.7208 sec
Wave Direction bin: 180 deg CCW from East (90 deg sector)
Transect Direction: 176.1953 deg CCW from East

TAW/RUNUP input

toe sta: -6 ft
toe elev: -2.3185 ft-NAVD88
top sta: 52 ft
top elev: 9.8917 ft-NAVD88
Wave and water level conditions at toe to be calculated in SWAN 1-D

PART 1 COMPLETE



PART 2: SWAN 1-D

swan input grid name: 2_swan/gridfiles/CM-96-1zmeters_xmeters.grd
swan file name: 2_swan/swanfiles/CM-96-1.swn
swan output name: 2_swan/swanfiles/CM-96-1.dat

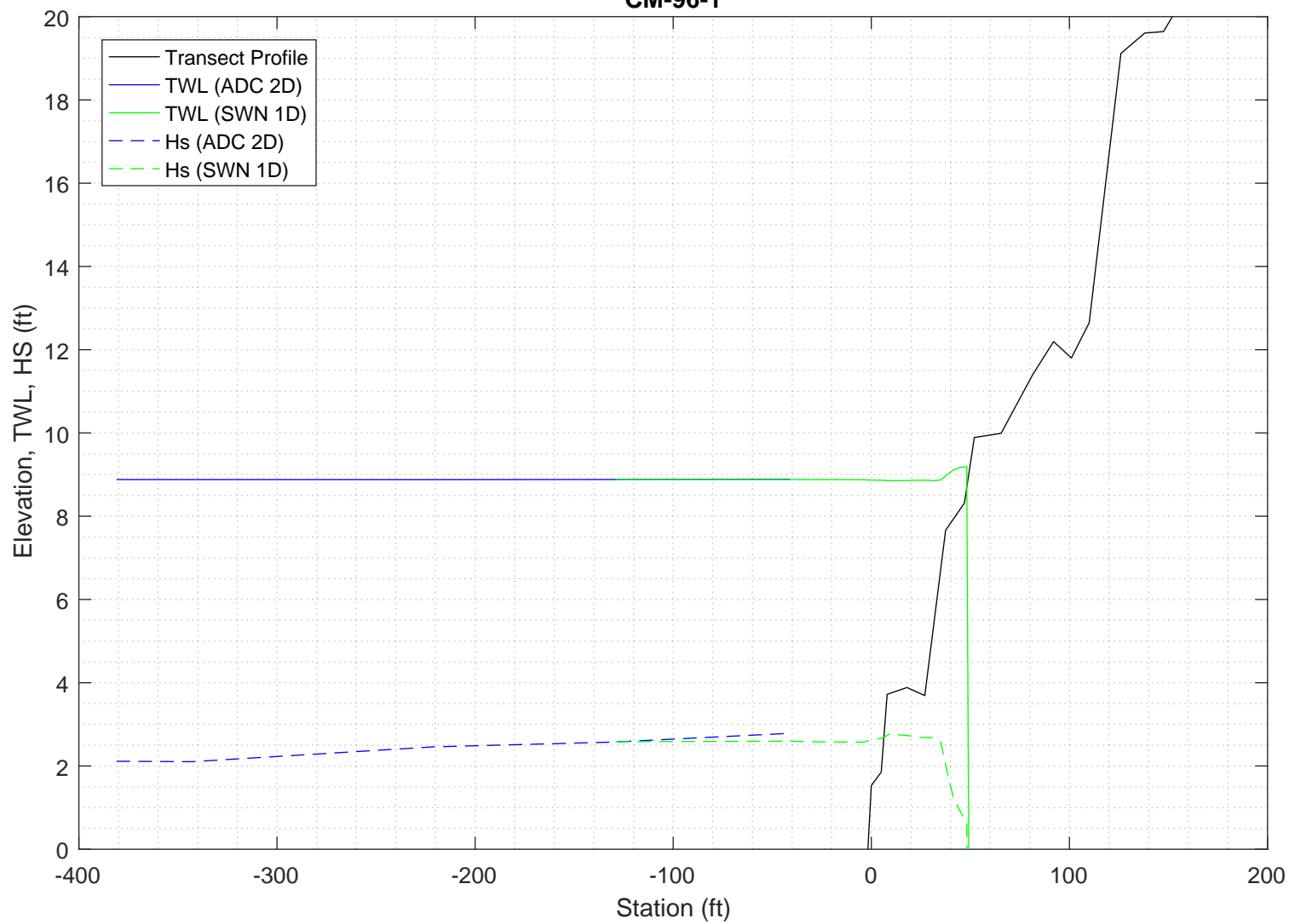
Boundary Conditions:
TWL- 2.7071 meters
HS- 0.78561 meters
PER- 4.7208 seconds

Batch File: 2_swan/swanfiles/runswan.dat

SWAN maximum additional wave setup: 0.31165 feet
SWAN output at toe:
SETUP- -0.0052132 feet
HS- 2.5766 feet
PER- 4.6414 seconds

PART 2 COMPLETE

2-D ADCIRC+SWAN and SWAN 1-D results, Transect:
CM-96-1



Execution started at 20200416.132456

```

-----
                        SWAN
SIMULATION OF WAVES IN NEAR SHORE AREAS
VERSION NUMBER 41.20A
-----

```

```

PROJECT '2018FemaAppeal' '1'
    '100-year Wind and Wave conditions'
! -- SET commands -----
SET DEPMIN=0.01 MAXMES=999 MAXERR=3 PWTAIL=4
SET LEVEL 0
SET CARTESIAN
! -- MODE commands -----
MODE STATIONARY ONED
!-- COORDINATES commands-----
COORDINATES CART
!
! -- computational (CGRID) grid commands -----
!
!                               xlenc=length of grid in meters
! mxc = number of mesh cells (one less than number of grid points)
!CGRID REGular [xpc] [ypc] [alpc] [xlenc] [ylenc] [mxc] [myc] &
!      [ CIRCle|SECTor[dir1] [dir2] ] [mdc] [flow] [fhigh] [msc]
CGRID REGULAR    0      0      0      55      0.  55      0      &
CIRCLE           36      0.03  0.8      30
Resolution in sigma-space: df/f = 0.1157
! -- READgrid ---- not used in 1-D mode -----
! -- INPgrid commands -----
!INPgrid BOTtom REGular [xpinp] [ypinp] [alpinp] [mxinp] [myinp] [dxinp] [dyinp]
!
INPGRID BOTTOM REGULAR    0      0      0      55      0      1      1
!READinp BOTtom [fac] 'fname1' [idla] [nhedf] [FREe|FORmat[form]|UNFormatted]
READ    BOTTOM    -1. '../gridfiles/CM-96-lzmmeters_xmmeters.grd'    1      0      FREE
!-----
! -- WIND [vel] [dir]
WIND      25.1  0
! -- BOUNd SHAPespec
BOUND SHAPE JONSWAP 3.3  PEAK DSPR POWER
! -- BOUNdspec
! BOU SIDE W CCW CON FILE 'swanspec.txt' 1
BOUN SIDE W CCW CONSTANT PAR    0.78561      4.7208      0  2
!-- BOUNdnest1 - optional for boundary from parent run
!-- BOUNdnest2
!-- BOUNdnest3
!-- INITIAL -- usest to specify initial values
!

```

```

!----- P H Y S I C S -----
!-- GEN1 [cf10] [cf20] [cf30] [cf40] [edmlpm] [cdrag] [umin] [cfpm]
!-- GEN2 [cf10] [cf20] [cf30] [cf40] [cf50] [cf60] [edmlpm] [cdrag] [umin] [cfpm]
      GEN3 KOMEN
!   whitecapping ( on by default)
!-- WCApping KOMen [cds2] [stpm] [powst] [delta] [powk]
      WCAP KOM
!   quadruplet wave interactions
!-- QUADrupl [iquad] [lambda] [Cn14] [Csh1] [Csh2]
! -- BREaking CONstant [alpha] [gamma]
      BREAK      CON      1.      0.73
!-- FRIction JONswap CONstant [cfjon]
      FRIC      JONSWAP CON      0.038
!-- TRIad [itriad] [trfac] [cutfr] [a] [b] [urcrit] [urslim]
! TRIAD      1      0.65      2.5      0.95 -0.75 0.2      0.01
      TRIAD
!-- VEGETation [height] [diamtr] [nstems] [drag]
!-- MUD [layer] [rhom] [viscm]
!- LIMiter [ursell] [qb] deactivates quadruplets with Ursell number exceeds ursell
!-- OBSTacle -- not in 1-D
!-- SETUP [supcor]
      SETUP      0
!
! ----- N U M E R I C S -----
!
!-- PROP can use BBST or GSE instead of default
! -- NUMeric -- lots of options
!   NUM ACCUR npnts=100. stat 30
      NUMeric STOPC
!
! -----O U T P U T -----
!
!OUTPut OPTIOns "comment' (TABLE [field]) (BLOck [ndec] [len]) (SPEC [ndec])
      OUTPUT OPTIONS '%' TABLE 16
      $BLOCK 9 1000 SPEC 8
!CURve 'sname' [xpl] [yp1] <[int] [xp] [yp] >
      CURVE 'curve' 0      0      55 55      0
!TABLE 'sname' < HEADER|NOHEAdER|INDEXed > 'fname' <output parameters> (output time)
      Table 'curve' HEADER 'CM-96-1.dat' XP YP HSIGN TPS RTP TMM10 DIR &
      DSPR DEPTH SETUP
!QUANTITY XP hexp=99999
!
!-----
COMPUTE STATIONARY
-----
COMPUTATIONAL PART OF SWAN
-----

```

```

One-dimensional mode of SWAN is activated
Gridresolution      : MXC          56 MYC          1
                   : MCGRD         57
                   : MSC           31 MDC           36
                   : MTC           1
                   : NSTATC         0 ITERMX        50
Propagation flags   : ITFRE         1 IREFR         1
Source term flags   : IBOT          1 ISURF         1
                   : IWCAP          1 IWIND          3
                   : ITRIAD         1 IQUAD          2
                   : IVEG           0 ITURBV         0
                   : IMUD           0
Spatial step        : DX            0.1000E+01 DY      0.1000E+01
Spectral bin        : df/f          0.1157E+00 DDIR     0.1000E+02
Physical constants  : GRAV          0.9810E+01 RHO      0.1025E+04
Wind input          : WSPEED        0.2510E+02 DIR      0.0000E+00
Tail parameters     : E(f)          0.4000E+01 E(k)      0.2500E+01
                   : A(f)          0.5000E+01 A(k)      0.3000E+01
Accuracy parameters : DREL          0.1000E-01 NPNTS     0.9950E+02
                   : DHABS         0.0000E+00 CURVAT    0.5000E-02
                   : GRWMX         0.1000E+00
Drying/flooding     : LEVEL         0.0000E+00 DEPMIN    0.1000E-01
The Cartesian convention for wind and wave directions is used
Scheme for geographic propagation is SORDUP
Scheme geogr. space : PROPSC         2 ICMAx         7
Scheme spectral space: CSS           0.5000E+00 CDD      0.5000E+00
Current is off
Quadruplets         : IQUAD         2
                   : LAMBDA        0.2500E+00 CNL4      0.3000E+08
                   : CSH1          0.5500E+01 CSH2      0.8330E+00
                   : CSH3          -0.1250E+01
Maximum Ursell nr for Snl4 : 0.1000E+02
Triads              : ITRIAD         1 TRFAC         0.8000E+00
                   : CUTFR          0.2500E+01 URCRI     0.2000E+00
Minimum Ursell nr for Snl3 : 0.1000E-01
JONSWAP ('73)       : GAMMA         0.3800E-01
Vegetation is off
Turbulence is off
Fluid mud is off
W-cap Komen ('84)   : EMPCOF (CDS2): 0.2360E-04
W-cap Komen ('84)   : APM (STPM)    : 0.3020E-02
W-cap Komen ('84)   : POWST         : 0.2000E+01
W-cap Komen ('84)   : DELTA         : 0.1000E+01
W-cap Komen ('84)   : POWK          : 0.1000E+01
Wind drag is fit
Snyder/Komen wind input
Battjes&Janssen ('78): ALPHA        0.1000E+01 GAMMA    0.7300E+00
Set-up              : SUPCOR         0.0000E+00
Diffraction is off
Janssen ('89,'90)   : ALPHA        0.1000E-01 KAPPA     0.4100E+00
Janssen ('89,'90)   : RHOA         0.1280E+01 RHOW      0.1025E+04

1st and 2nd gen. wind: CF10         0.1880E+03 CF20      0.5900E+00
                   : CF30         0.1200E+00 CF40      0.2500E+03
                   : CF50         0.2300E-02 CF60      -0.2230E+00
                   : CF70         0.0000E+00 CF80      -0.5600E+00
                   : RHOAW        0.1249E-02 EDMLEPM    0.3600E-02
                   : CDRAG        0.1230E-02 UMIN       0.1000E+01
                   : LIM_PM       0.1300E+00

```

First guess by 2nd generation model flags for first iteration:

```

ITER      1 GRWMX      0.1000E+23 ALFA      0.0000E+00
IWIND     2 IWCAP      0 IQUAD      0
ITRIAD    1 IBOT      1 ISURF      1
IVEG      0 ITURBV     0 IMUD      0

```

```

iteration   1; sweep 1
iteration   1; sweep 2
iteration   1; sweep 3
iteration   1; sweep 4
not possible to compute, first iteration

```

Options given by user are activated for proceeding calculation:

```

ITER      2 GRWMX      0.1000E+00 ALFA      0.0000E+00
IWIND     3 IWCAP      1 IQUAD      2
ITRIAD    1 IBOT      1 ISURF      1
IVEG      0 ITURBV     0 IMUD      0

```

```

iteration   2; sweep 1
iteration   2; sweep 2
iteration   2; sweep 3
iteration   2; sweep 4
accuracy OK in 36.37 % of wet grid points ( 99.50 % required)

iteration   3; sweep 1
iteration   3; sweep 2
iteration   3; sweep 3

```



```
iteration    3; sweep 4
accuracy OK in 1.82 % of wet grid points ( 99.50 % required)

iteration    4; sweep 1
iteration    4; sweep 2
iteration    4; sweep 3
iteration    4; sweep 4
accuracy OK in 36.37 % of wet grid points ( 99.50 % required)

iteration    5; sweep 1
iteration    5; sweep 2
iteration    5; sweep 3
iteration    5; sweep 4
accuracy OK in 92.73 % of wet grid points ( 99.50 % required)

iteration    6; sweep 1
iteration    6; sweep 2
iteration    6; sweep 3
iteration    6; sweep 4
accuracy OK in 92.73 % of wet grid points ( 99.50 % required)

iteration    7; sweep 1
iteration    7; sweep 2
iteration    7; sweep 3
iteration    7; sweep 4
accuracy OK in 96.37 % of wet grid points ( 99.50 % required)

iteration    8; sweep 1
iteration    8; sweep 2
iteration    8; sweep 3
iteration    8; sweep 4
accuracy OK in 96.37 % of wet grid points ( 99.50 % required)

iteration    9; sweep 1
iteration    9; sweep 2
iteration    9; sweep 3
iteration    9; sweep 4
accuracy OK in 96.37 % of wet grid points ( 99.50 % required)

iteration   10; sweep 1
iteration   10; sweep 2
iteration   10; sweep 3
iteration   10; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   11; sweep 1
iteration   11; sweep 2
iteration   11; sweep 3
iteration   11; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   12; sweep 1
iteration   12; sweep 2
iteration   12; sweep 3
iteration   12; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   13; sweep 1
iteration   13; sweep 2
iteration   13; sweep 3
iteration   13; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   14; sweep 1
iteration   14; sweep 2
iteration   14; sweep 3
iteration   14; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   15; sweep 1
iteration   15; sweep 2
iteration   15; sweep 3
iteration   15; sweep 4
accuracy OK in 96.37 % of wet grid points ( 99.50 % required)

iteration   16; sweep 1
iteration   16; sweep 2
iteration   16; sweep 3
iteration   16; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   17; sweep 1
iteration   17; sweep 2
iteration   17; sweep 3
iteration   17; sweep 4
accuracy OK in 98.19 % of wet grid points ( 99.50 % required)

iteration   18; sweep 1
iteration   18; sweep 2
iteration   18; sweep 3
```

iteration 18; sweep 4
accuracy OK in 100.00 % of wet grid points (99.50 % required)

STOP

Run: 1

Table:curve

SWAN version:41.20A

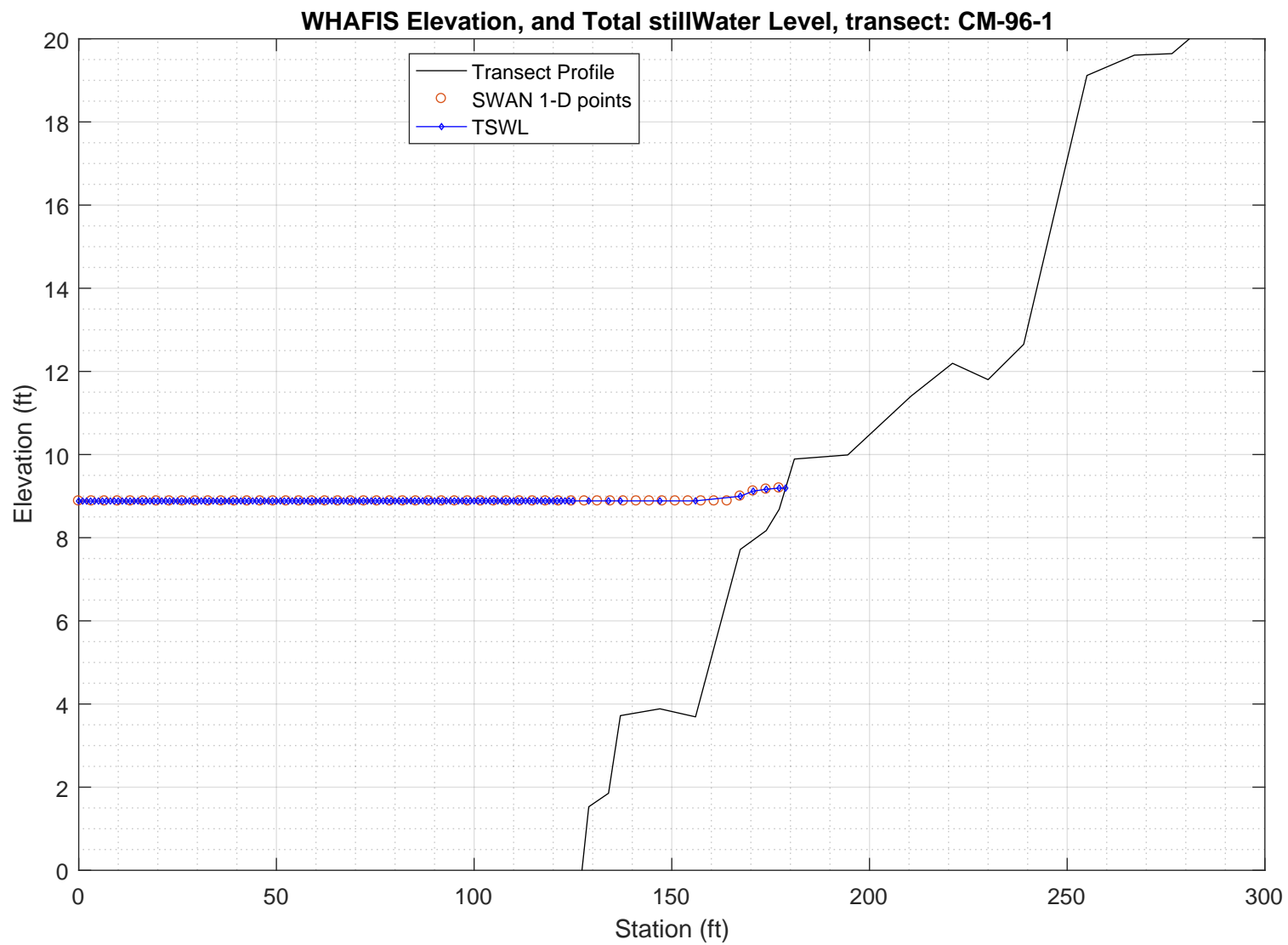
Xp [m]	Yp [m]	Hsig [m]	TPsmoo [sec]	RTpeak [sec]	Tm_10 [sec]	Dir [degr]	Dspr [degr]	Depth [m]	Setup [m]
0.	0.	0.78761	4.6361	4.6483	4.2574	0.000	31.5060	5.3900	0.000000
1.	0.	0.78771	4.6362	4.6483	4.2560	0.000	31.4556	5.3700	-0.000012
2.	0.	0.78782	4.6362	4.6483	4.2545	0.000	31.4055	5.3600	-0.000019
3.	0.	0.78788	4.6362	4.6483	4.2531	0.000	31.3449	5.3400	-0.000031
4.	0.	0.78797	4.6362	4.6483	4.2516	0.000	31.2918	5.3200	-0.000043
5.	0.	0.78809	4.6362	4.6483	4.2501	0.000	31.2414	5.3099	-0.000050
6.	0.	0.78816	4.6362	4.6483	4.2486	0.000	31.1819	5.2899	-0.000062
7.	0.	0.78822	4.6362	4.6483	4.2472	0.000	31.1227	5.2699	-0.000074
8.	0.	0.78833	4.6363	4.6483	4.2457	0.000	31.0783	5.2499	-0.000086
9.	0.	0.78847	4.6363	4.6483	4.2441	0.000	31.0380	5.2399	-0.000094
10.	0.	0.78856	4.6363	4.6483	4.2426	0.000	30.9910	5.2199	-0.000106
11.	0.	0.78869	4.6363	4.6483	4.2411	0.000	30.9498	5.1999	-0.000118
12.	0.	0.78884	4.6363	4.6483	4.2395	0.000	30.9113	5.1899	-0.000125
13.	0.	0.78895	4.6363	4.6483	4.2380	0.000	30.8652	5.1699	-0.000138
14.	0.	0.78905	4.6364	4.6483	4.2364	0.000	30.8165	5.1498	-0.000150
15.	0.	0.78918	4.6364	4.6483	4.2349	0.000	30.7752	5.1298	-0.000163
16.	0.	0.78935	4.6364	4.6483	4.2332	0.000	30.7362	5.1198	-0.000171
17.	0.	0.78947	4.6364	4.6483	4.2317	0.000	30.6900	5.0998	-0.000183
18.	0.	0.78963	4.6364	4.6483	4.2301	0.000	30.6497	5.0798	-0.000196
19.	0.	0.78981	4.6364	4.6483	4.2284	0.000	30.6113	5.0698	-0.000205
20.	0.	0.78995	4.6365	4.6483	4.2268	0.000	30.5653	5.0498	-0.000218
21.	0.	0.79007	4.6365	4.6483	4.2252	0.000	30.5167	5.0298	-0.000231
22.	0.	0.79025	4.6365	4.6483	4.2236	0.000	30.4754	5.0098	-0.000245
23.	0.	0.79044	4.6365	4.6483	4.2218	0.000	30.4366	4.9997	-0.000253
24.	0.	0.79060	4.6366	4.6483	4.2201	0.000	30.3903	4.9797	-0.000267
25.	0.	0.79079	4.6366	4.6483	4.2185	0.000	30.3496	4.9597	-0.000281
26.	0.	0.79095	4.6366	4.6483	4.2167	0.000	30.3026	4.9497	-0.000289
27.	0.	0.79061	4.6367	4.6483	4.2146	0.000	30.1519	4.9197	-0.000309
28.	0.	0.78968	4.6370	4.6483	4.2140	0.000	29.8711	4.7896	-0.000386
29.	0.	0.78860	4.6374	4.6483	4.2135	0.000	29.5239	4.6495	-0.000475
30.	0.	0.78761	4.6379	4.6483	4.2134	0.000	29.1494	4.4994	-0.000579
31.	0.	0.78674	4.6383	4.6483	4.2135	0.000	28.7709	4.3593	-0.000685
32.	0.	0.78606	4.6388	4.6483	4.2141	0.000	28.4096	4.2092	-0.000807
33.	0.	0.78551	4.6393	4.6483	4.2148	0.000	28.0477	4.0691	-0.000931
34.	0.	0.78519	4.6398	4.6483	4.2160	0.000	27.6720	3.9189	-0.001077
35.	0.	0.78499	4.6403	4.6483	4.2173	0.000	27.2826	3.7788	-0.001228
36.	0.	0.78508	4.6409	4.6483	4.2192	0.000	26.8760	3.6286	-0.001405

PART 3: WHAFIS

WHAFIS input: CM-96-1.dat

WHAFIS output: CM-96-1.out

PART 3 COMPLETE



WAVE HEIGHT COMPUTATIONS FOR FLOOD INSURANCE STUDIES (WHAFIS VERSION 4.0G, 08_2007)

Executed on: Thu Apr 16 13:27:11 2020

Input file: C:\FEMA-TransectAnalysis\LOMR-TransectAnalysis-Portland\3_whafis\whafis4\CM-96-1.dat

Output file: C:\FEMA-TransectAnalysis\LOMR-TransectAnalysis-Portland\3_whafis\whafis4\CM-96-1.out

header

THIS IS A 100-YEAR CASE
 THE FOLLOWING NON-DEFAULT WIND SPEEDS ARE BEING USED
 WINDIF 56.14 WINDOF 56.14 WINDVH 60.00

PART1 INPUT

IE	0.000	-8.809	1.000	1.000	8.881	4.124	4.721	56.140	0.017	0.000
OF	1.000	-8.792	0.000	8.881	0.000	0.000	0.000	0.000	0.017	0.000
OF	2.000	-8.775	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	3.000	-8.758	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	4.000	-8.740	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	5.000	-8.723	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	6.000	-8.706	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	7.000	-8.689	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	8.000	-8.672	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	9.000	-8.655	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	10.000	-8.637	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	11.000	-8.620	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	12.000	-8.603	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	13.000	-8.586	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	14.000	-8.569	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	15.000	-8.552	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	16.000	-8.534	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	17.000	-8.517	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	18.000	-8.500	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	19.000	-8.483	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	20.000	-8.466	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	21.000	-8.449	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	22.000	-8.431	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	23.000	-8.414	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	24.000	-8.397	0.000	8.882	0.000	0.000	0.000	0.000	0.017	0.000
OF	25.000	-8.380	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	26.000	-8.363	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	27.000	-8.346	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	28.000	-8.328	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	29.000	-8.311	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	30.000	-8.294	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	31.000	-8.277	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	32.000	-8.260	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	33.000	-8.243	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	34.000	-8.225	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	35.000	-8.208	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	36.000	-8.191	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	37.000	-8.174	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	38.000	-8.157	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	39.000	-8.139	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	40.000	-8.122	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	41.000	-8.105	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	42.000	-8.088	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	43.000	-8.071	0.000	8.883	0.000	0.000	0.000	0.000	0.017	0.000
OF	44.000	-8.054	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	45.000	-8.037	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	46.000	-8.019	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	47.000	-8.002	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	48.000	-7.985	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	49.000	-7.968	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	50.000	-7.951	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	51.000	-7.934	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	52.000	-7.916	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	53.000	-7.899	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	54.000	-7.882	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	55.000	-7.865	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	56.000	-7.848	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	57.000	-7.831	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	58.000	-7.813	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	59.000	-7.796	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	60.000	-7.779	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	61.000	-7.762	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	62.000	-7.745	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	63.000	-7.728	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	64.000	-7.710	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	65.000	-7.693	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	66.000	-7.676	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000
OF	67.000	-7.659	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	68.000	-7.642	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	69.000	-7.625	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	70.000	-7.608	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	71.000	-7.590	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	72.000	-7.573	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	73.000	-7.556	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	74.000	-7.539	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	75.000	-7.522	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	76.000	-7.504	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	77.000	-7.487	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	78.000	-7.470	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	79.000	-7.453	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	80.000	-7.436	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	81.000	-7.419	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	82.000	-7.402	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	83.000	-7.384	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	84.000	-7.367	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	85.000	-7.350	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	86.000	-7.333	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	87.000	-7.316	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000
OF	88.000	-7.299	0.000	8.885	0.000	0.000	0.000	0.000	0.030	0.000
OF	89.000	-7.256	0.000	8.885	0.000	0.000	0.000	0.000	0.094	0.000
OF	90.000	-7.111	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	91.000	-6.966	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	92.000	-6.821	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000

OF	93.000	-6.676	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	94.000	-6.530	0.000	8.885	0.000	0.000	0.000	0.000	0.146	0.000
OF	95.000	-6.385	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	96.000	-6.240	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	97.000	-6.094	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	98.000	-5.949	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	99.000	-5.804	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	100.000	-5.659	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	101.000	-5.514	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	102.000	-5.368	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	103.000	-5.223	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	104.000	-5.078	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	105.000	-4.933	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	106.000	-4.787	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	107.000	-4.642	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	108.000	-4.497	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	109.000	-4.352	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	110.000	-4.207	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	111.000	-4.061	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	112.000	-3.916	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	113.000	-3.771	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	114.000	-3.626	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	115.000	-3.480	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	116.000	-3.335	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	117.000	-3.190	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	118.000	-3.045	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	119.000	-2.899	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	120.000	-2.754	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	121.000	-2.609	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	122.000	-2.464	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	123.000	-2.319	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	124.000	-2.174	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
OF	125.000	-2.028	0.000	8.885	0.000	0.000	0.000	0.000	0.740	0.000
IF	129.000	1.529	0.000	8.885	0.000	0.000	0.000	0.000	0.431	0.000
IF	134.000	1.854	0.000	8.885	0.000	0.000	0.000	0.000	0.274	0.000
IF	137.000	3.720	0.000	8.885	0.000	0.000	0.000	0.000	0.156	0.000
IF	147.000	3.885	0.000	8.885	0.000	0.000	0.000	0.000	-0.002	0.000
IF	156.000	3.691	0.000	8.885	0.000	0.000	0.000	0.000	0.189	0.000
IF	167.300	7.718	0.000	8.997	0.000	0.000	0.000	0.000	0.291	0.000
IF	170.600	7.944	0.000	9.121	0.000	0.000	0.000	0.000	0.069	0.000
IF	173.900	8.171	0.000	9.165	0.000	0.000	0.000	0.000	0.112	0.000
IF	177.200	8.684	0.000	9.193	0.000	0.000	0.000	0.000	0.209	0.000
IF	178.800	9.193	0.000	9.193	0.000	0.000	0.000	0.000	0.318	0.000
ET	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	END	END	FETCH	SURGE	ELEV	SURGE	ELEV	INITIAL	INITIAL		BOTTOM	AVERAGE
IE	STATION	ELEVATION	LENGTH	10-YEAR	100-YEAR	100-YEAR	WAVE	HEIGHT	W. PERIOD		SLOPE	A-ZONES
	0.000	-8.809	1.000	1.000	1.000	8.881		4.124	4.721	56.140	0.017	0.000
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	1.000	-8.792	0.000	8.881	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	2.000	-8.775	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	3.000	-8.758	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	4.000	-8.740	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	5.000	-8.723	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	6.000	-8.706	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	7.000	-8.689	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	8.000	-8.672	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	9.000	-8.655	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	10.000	-8.637	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	11.000	-8.620	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	12.000	-8.603	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	13.000	-8.586	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	14.000	-8.569	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	15.000	-8.552	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	16.000	-8.534	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	17.000	-8.517	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE							BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR							SLOPE	A-ZONES
	18.000	-8.500	0.000	8.882	0.000	0.000	0.000	0.000	0.000	0.017	0.000	

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	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	53.000	-7.899	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	54.000	-7.882	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	55.000	-7.865	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	56.000	-7.848	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	57.000	-7.831	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	58.000	-7.813	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	59.000	-7.796	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	60.000	-7.779	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	61.000	-7.762	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	62.000	-7.745	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	63.000	-7.728	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	64.000	-7.710	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	65.000	-7.693	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	66.000	-7.676	0.000	8.884	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	67.000	-7.659	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	68.000	-7.642	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	69.000	-7.625	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	70.000	-7.608	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	71.000	-7.590	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	72.000	-7.573	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	73.000	-7.556	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	74.000	-7.539	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	75.000	-7.522	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	76.000	-7.504	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	77.000	-7.487	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	78.000	-7.470	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	79.000	-7.453	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	80.000	-7.436	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	81.000	-7.419	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	82.000	-7.402	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	83.000	-7.384	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	84.000	-7.367	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	85.000	-7.350	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR						SLOPE	A-ZONES
	86.000	-7.333	0.000	8.885	0.000	0.000	0.000	0.000	0.017	0.000	

	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 87.000	ELEVATION -7.316	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.017	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 88.000	ELEVATION -7.299	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.030	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 89.000	ELEVATION -7.256	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.094	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 90.000	ELEVATION -7.111	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 91.000	ELEVATION -6.966	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 92.000	ELEVATION -6.821	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 93.000	ELEVATION -6.676	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 94.000	ELEVATION -6.530	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.146	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 95.000	ELEVATION -6.385	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 96.000	ELEVATION -6.240	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 97.000	ELEVATION -6.094	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 98.000	ELEVATION -5.949	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 99.000	ELEVATION -5.804	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 100.000	ELEVATION -5.659	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 101.000	ELEVATION -5.514	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 102.000	ELEVATION -5.368	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 103.000	ELEVATION -5.223	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 104.000	ELEVATION -5.078	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 105.000	ELEVATION -4.933	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 106.000	ELEVATION -4.787	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 107.000	ELEVATION -4.642	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 108.000	ELEVATION -4.497	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 109.000	ELEVATION -4.352	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 110.000	ELEVATION -4.207	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 111.000	ELEVATION -4.061	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 112.000	ELEVATION -3.916	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 113.000	ELEVATION -3.771	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 114.000	ELEVATION -3.626	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 115.000	ELEVATION -3.480	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 116.000	ELEVATION -3.335	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 117.000	ELEVATION -3.190	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 118.000	ELEVATION -3.045	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 119.000	ELEVATION -2.899	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000
	END	END	NEW SURGE	NEW SURGE						BOTTOM	AVERAGE
OF	STATION 120.000	ELEVATION -2.754	10-YEAR 0.000	100-YEAR 8.885	0.000	0.000	0.000	0.000	0.000	SLOPE 0.145	A-ZONES 0.000

	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	121.000	-2.609	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	122.000	-2.464	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	123.000	-2.319	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	124.000	-2.174	0.000	8.885	0.000	0.000	0.000	0.000	0.145	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
OF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	125.000	-2.028	0.000	8.885	0.000	0.000	0.000	0.000	0.740	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	129.000	1.529	0.000	8.885	0.000	0.000	0.000	0.000	0.431	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	134.000	1.854	0.000	8.885	0.000	0.000	0.000	0.000	0.274	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	137.000	3.720	0.000	8.885	0.000	0.000	0.000	0.000	0.156	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	147.000	3.885	0.000	8.885	0.000	0.000	0.000	0.000	-0.002	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	156.000	3.691	0.000	8.885	0.000	0.000	0.000	0.000	0.189	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	167.300	7.718	0.000	8.997	0.000	0.000	0.000	0.000	0.291	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	170.600	7.944	0.000	9.121	0.000	0.000	0.000	0.000	0.069	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	173.900	8.171	0.000	9.165	0.000	0.000	0.000	0.000	0.112	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	177.200	8.684	0.000	9.193	0.000	0.000	0.000	0.000	0.209	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
IF	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
	178.800	9.193	0.000	9.193	0.000	0.000	0.000	0.000	0.318	0.000
-----END OF TRANSECT-----										

NOTE:

SURGE ELEVATION INCLUDES CONTRIBUTIONS FROM ASTRONOMICAL AND STORM TIDES.

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PART2: CONTROLLING WAVE HEIGHTS, SPECTRAL				PEAK WAVE PERIOD, AND WAVE CREST ELEVATIONS		
LOCATION		CONTROLLING	SPECTRAL PEAK	WAVE CREST		
		WAVE HEIGHT	WAVE PERIOD	ELEVATION		
IE	0.00	4.12	4.72	11.77		
OF	1.00	4.12	4.72	11.77		
OF	2.00	4.12	4.72	11.77		
OF	3.00	4.13	4.72	11.77		
OF	4.00	4.13	4.72	11.77		
OF	5.00	4.13	4.72	11.77		
OF	6.00	4.13	4.72	11.77		
OF	7.00	4.13	4.72	11.77		
OF	8.00	4.13	4.72	11.77		
OF	9.00	4.13	4.72	11.77		
OF	10.00	4.13	4.72	11.77		
OF	11.00	4.13	4.72	11.77		
OF	12.00	4.13	4.72	11.77		
OF	13.00	4.13	4.72	11.77		
OF	14.00	4.13	4.72	11.77		
OF	15.00	4.13	4.72	11.77		
OF	16.00	4.13	4.72	11.77		
OF	17.00	4.13	4.72	11.77		
OF	18.00	4.13	4.72	11.77		
OF	19.00	4.13	4.72	11.77		
OF	20.00	4.13	4.72	11.77		
OF	21.00	4.13	4.72	11.78		
OF	22.00	4.13	4.72	11.78		
OF	23.00	4.13	4.72	11.78		
OF	24.00	4.13	4.72	11.78		
OF	25.00	4.14	4.72	11.78		
OF	26.00	4.14	4.72	11.78		
OF	27.00	4.14	4.72	11.78		
OF	28.00	4.14	4.72	11.78		
OF	29.00	4.14	4.72	11.78		
OF	30.00	4.14	4.72	11.78		
OF	31.00	4.14	4.72	11.78		
OF	32.00	4.14	4.72	11.78		
OF	33.00	4.14	4.72	11.78		
OF	34.00	4.14	4.72	11.78		
OF	35.00	4.14	4.72	11.78		
OF	36.00	4.14	4.72	11.78		
OF	37.00	4.14	4.72	11.78		
OF	38.00	4.14	4.72	11.78		
OF	39.00	4.14	4.72	11.78		
OF	40.00	4.14	4.72	11.78		
OF	41.00	4.14	4.72	11.78		
OF	42.00	4.14	4.72	11.78		
OF	43.00	4.14	4.72	11.78		
OF	44.00	4.14	4.72	11.78		
OF	45.00	4.14	4.72	11.79		
OF	46.00	4.15	4.72	11.79		
OF	47.00	4.15	4.72	11.79		
OF	48.00	4.15	4.72	11.79		

OF	49.00	4.15	4.72	11.79
OF	50.00	4.15	4.72	11.79
OF	51.00	4.15	4.72	11.79
OF	52.00	4.15	4.72	11.79
OF	53.00	4.15	4.72	11.79
OF	54.00	4.15	4.72	11.79
OF	55.00	4.15	4.72	11.79
OF	56.00	4.15	4.72	11.79
OF	57.00	4.15	4.72	11.79
OF	58.00	4.15	4.72	11.79
OF	59.00	4.15	4.72	11.79
OF	60.00	4.15	4.72	11.79
OF	61.00	4.15	4.72	11.79
OF	62.00	4.15	4.72	11.79
OF	63.00	4.15	4.72	11.79
OF	64.00	4.15	4.72	11.79
OF	65.00	4.15	4.72	11.79
OF	66.00	4.16	4.72	11.79
OF	67.00	4.16	4.72	11.79
OF	68.00	4.16	4.72	11.79
OF	69.00	4.16	4.72	11.79
OF	70.00	4.16	4.72	11.80
OF	71.00	4.16	4.72	11.80
OF	72.00	4.16	4.72	11.80
OF	73.00	4.16	4.72	11.80
OF	74.00	4.16	4.72	11.80
OF	75.00	4.16	4.72	11.80
OF	76.00	4.16	4.72	11.80
OF	77.00	4.16	4.72	11.80
OF	78.00	4.16	4.72	11.80
OF	79.00	4.16	4.72	11.80
OF	80.00	4.16	4.72	11.80
OF	81.00	4.16	4.72	11.80
OF	82.00	4.16	4.72	11.80
OF	83.00	4.16	4.72	11.80
OF	84.00	4.16	4.72	11.80
OF	85.00	4.17	4.72	11.80
OF	86.00	4.17	4.72	11.80
OF	87.00	4.17	4.72	11.80
OF	88.00	4.17	4.72	11.80
OF	89.00	4.17	4.72	11.80
OF	90.00	4.17	4.72	11.80
OF	91.00	4.17	4.72	11.81
OF	92.00	4.18	4.72	11.81
OF	93.00	4.18	4.72	11.81
OF	94.00	4.18	4.72	11.81
OF	95.00	4.18	4.72	11.81
OF	96.00	4.19	4.72	11.82
OF	97.00	4.19	4.72	11.82
OF	98.00	4.19	4.72	11.82
OF	99.00	4.20	4.72	11.82
OF	100.00	4.20	4.73	11.83
OF	101.00	4.20	4.73	11.83
OF	102.00	4.21	4.73	11.83
OF	103.00	4.21	4.73	11.83
OF	104.00	4.22	4.73	11.84
OF	105.00	4.22	4.73	11.84
OF	106.00	4.23	4.73	11.84
OF	107.00	4.23	4.73	11.85
OF	108.00	4.24	4.73	11.85
OF	109.00	4.24	4.73	11.85
OF	110.00	4.25	4.73	11.86
OF	111.00	4.25	4.73	11.86
OF	112.00	4.26	4.73	11.87
OF	113.00	4.26	4.73	11.87
OF	114.00	4.27	4.73	11.87
OF	115.00	4.28	4.73	11.88
OF	116.00	4.28	4.73	11.88
OF	117.00	4.29	4.73	11.89
OF	118.00	4.30	4.73	11.89
OF	119.00	4.31	4.73	11.90
OF	120.00	4.31	4.73	11.90
OF	121.00	4.32	4.73	11.91
OF	122.00	4.33	4.73	11.92
OF	123.00	4.34	4.73	11.92
OF	124.00	4.35	4.73	11.93
OF	125.00	4.36	4.73	11.93
IF	129.00	4.59	4.73	12.09
IF	134.00	4.53	4.73	12.06
IF	137.00	3.76	4.73	11.52
IF	147.00	3.65	4.73	11.44
IF	156.00	3.62	4.73	11.42
IF	167.30	0.98	4.73	9.68
IF	170.60	0.90	4.73	9.75
IF	173.90	0.76	4.73	9.70
IF	177.20	0.39	4.73	9.47
IF	178.80	0.01	4.73	9.20

PART3 LOCATION OF AREAS ABOVE 100-YEAR SURGE
NO AREAS ABOVE 100-YEAR SURGE IN THIS TRANSECT

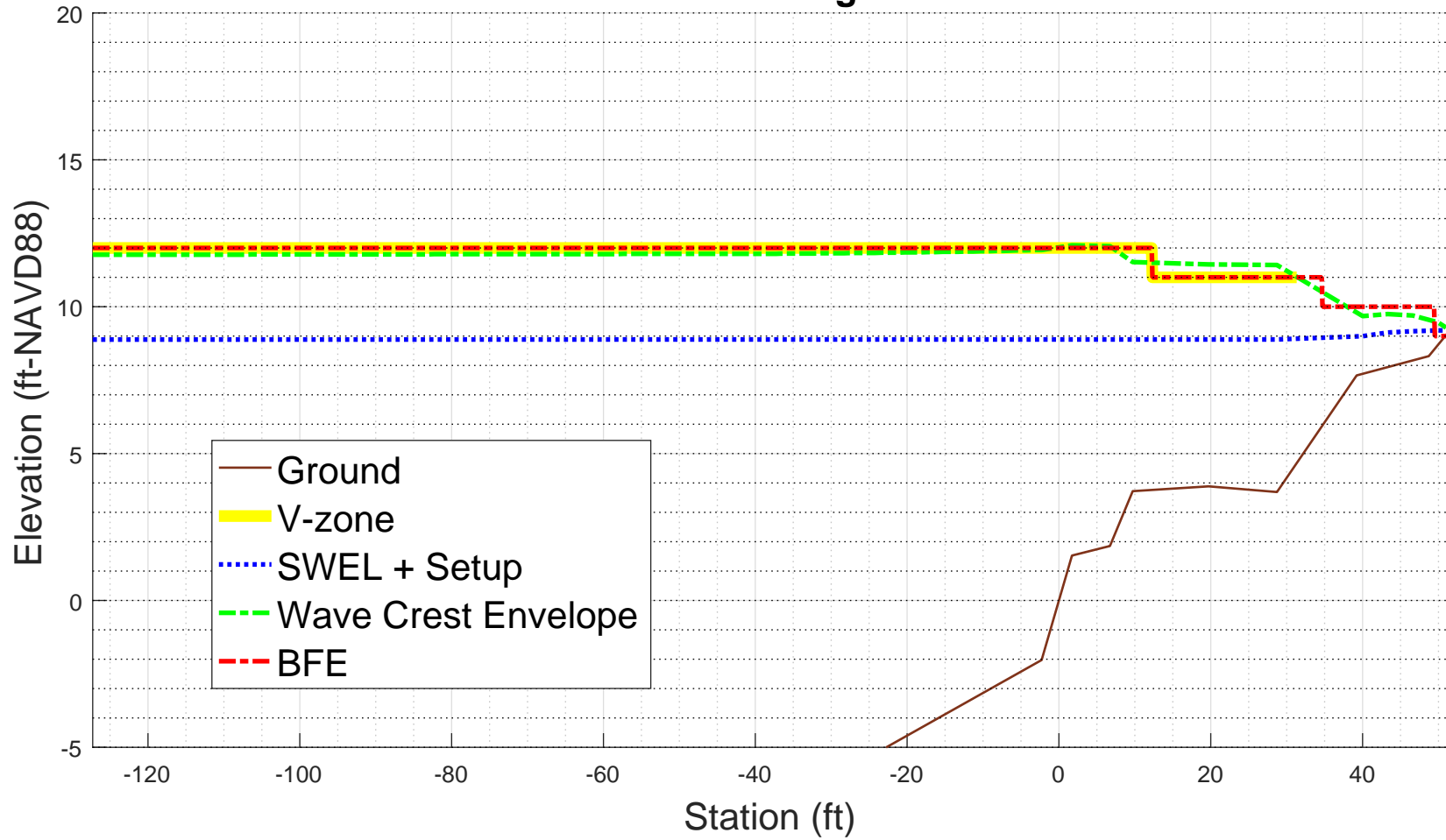
PART4 LOCATION OF SURGE CHANGES		
STATION	10-YEAR SURGE	100-YEAR SURGE
2.00	1.00	8.88
25.00	1.00	8.88
44.00	1.00	8.88
67.00	1.00	8.89
167.30	1.00	9.00
170.60	1.00	9.12
173.90	1.00	9.16
177.20	1.00	9.19

PART5 LOCATION OF V ZONES
STATION OF GUTTER LOCATION OF ZONE
158.67 WINDWARD

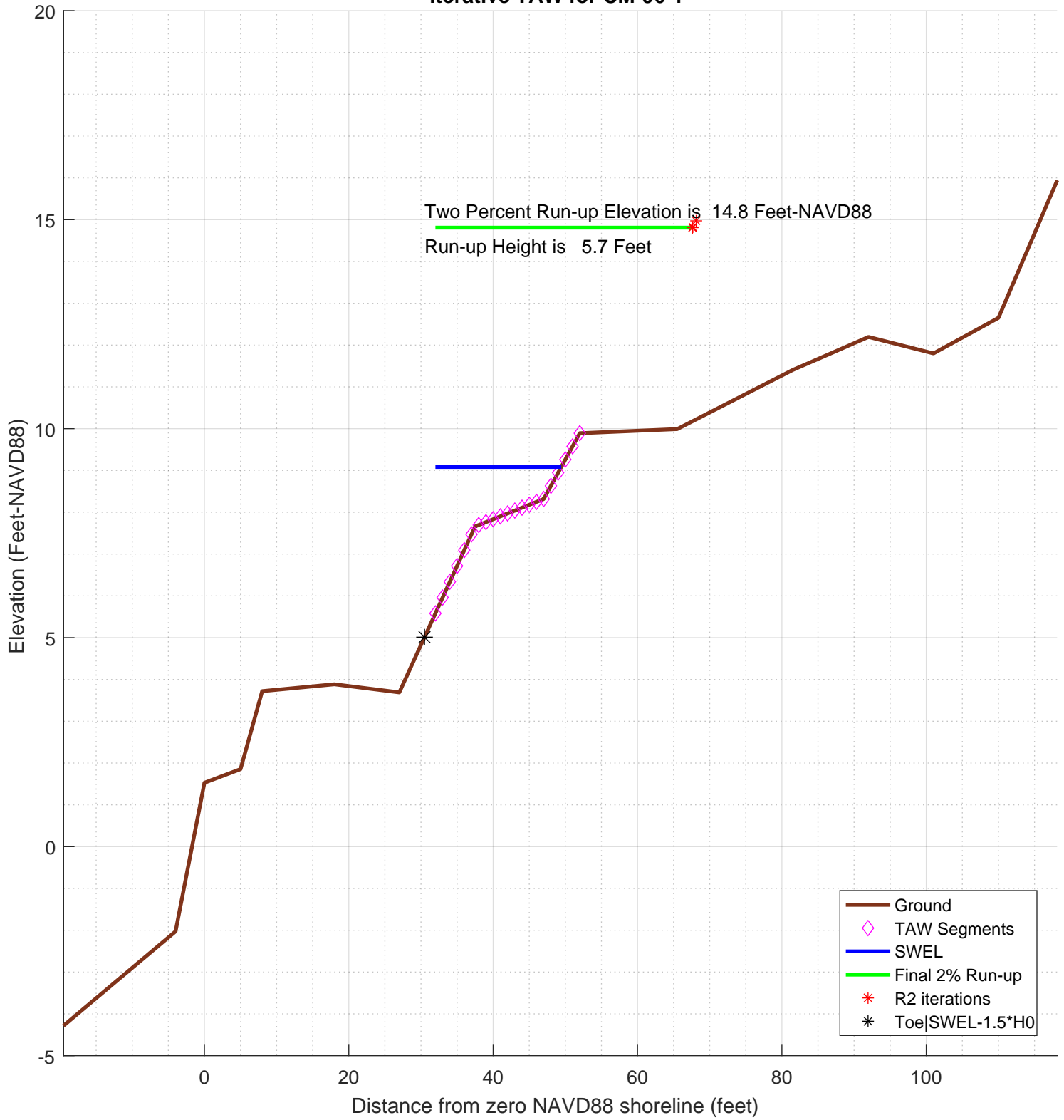
PART6 NUMBERED A ZONES AND V ZONES				
STATION OF GUTTER	ELEVATION	ZONE DESIGNATION		FHF
0.00	11.77			
		V22	EL=12	120
1.00	11.77			
		V22	EL=12	120
2.00	11.77			
		V22	EL=12	120
24.00	11.78			
		V22	EL=12	120
25.00	11.78			
		V22	EL=12	120
43.00	11.78			
		V22	EL=12	120
44.00	11.78			
		V22	EL=12	120
66.00	11.79			
		V22	EL=12	120
67.00	11.79			
		V22	EL=12	120
138.94	11.50			
		V22	EL=11	120
156.00	11.42			
		V22	EL=11	120
158.67	11.04			
		A18	EL=11	90
161.99	10.50			
		A18	EL=10	90
167.30	9.68			
		A18	EL=10	90
170.60	9.75			
		A18	EL=10	90
173.90	9.70			
		A18	EL=10	90
176.76	9.50			
		A18	EL= 9	90
177.20	9.47			
		A18	EL= 9	90
178.80	9.20			
ZONE TERMINATED AT END OF TRANSECT				
PART 7 POSTSCRIPT NOTES				
PS#	1	START(411230.068,4838905.6463)		
PS#	2	END(411114.2713,4838917.814)		

-1.000000e+00

CM-96-1
100-year WHAFIS Output
Zero Station: -70.10211560, 43.69789496
Onshore Dir: 174.0 deg CCW from E



Iterative TAW for CM-96-1



```

diary on          % begin recording

% FEMA appeal for The Town of Harpswell, Cumberland county, Maine
% TRANSECT ID: CM-96-1
% calculation by SJH, Ransom Consulting, Inc. 16-Apr-2020
% 100-year wave runup using TAW methodology
% including berm and weighted average with foreshore if necessary
%
% chk nld 20200220
%
% This script assumes that the incident wave conditions provided
% as input in the configuration section below are the
% appropriate values located at the end of the foreshore
% or toe of the slope on which the run-up is being calculated
% the script does not attempt to apply a depth limit or any other
% transformation to the incident wave conditions other than
% conversion of the peak wave period to the spectral mean wave
% as recommended in the references below
%
% references:
%
% Van der Meer, J.W., 2002. Technical Report Wave Run-up and
% Wave Overtopping at Dikes. TAW Technical Advisory Committee on
% Flood Defence, The Netherlands.
%
% FEMA. 2007, Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update
%
%
%-----
% CONFIG
%-----
fname='inpfiles/CM-96-1sta_ele_include.csv'; % file with station, elevation, include
% third column is 0 for excluded points
imgname='logfiles/CM-96-1-runup';
SWEL=8.8814; % 100-yr still water level including wave setup.
H0=2.5766; % significant wave height at toe of structure
Tp=4.6414; % peak period, 1/fma,
T0=Tp/1.1;

gamma_berm=1; % this may get changed automatically below
gamma_rough=0.8;
gamma_beta=1;
gamma_perm=1;

setupAtToe=-0.0052132;
maxSetup=0.31165; % only used in case of berm/shallow foreshore weighted average

plotTitle='Iterative TAW for CM-96-1'

plotTitle =

Iterative TAW for CM-96-1

% END CONFIG
%-----

SWEL=SWEL+setupAtToe

SWEL =

8.8761868

SWEL_fore=SWEL+maxSetup

SWEL_fore =

9.1878368

% FIND WAVELENGTH USING DEEPWATER DISPERSION RELATION
% using English units
L0=32.15/(2*pi)*T0^2

L0 =

91.0990261582998

% Find Hb (Munk, 1949)
%Hb=H0/(3.3*(H0/L0)^(1/3))
%Db=-Hb/.78+SWEL; % depth at breaking

% The toe elevation here is only used to determine the average
% structure slope, it is not used to depth limit the wave height.
% Any depth limiting or other modification of the wave height

```



```

% to make it consistent with TAW guidance should be performed
% prior to the input of the significant wave height given above.
Ztoe=SWEL-1.5*H0

Ztoe =

    5.0112868

% read the transect
[sta,dep,inc] = textread(fname,'%n%n%n%[^\\n]','delimiter',' ','headerlines',0);

% remove unselected points
k=find(inc==0);
sta(k)=[];
dep(k)=[];

sta_org=sta; % used for plotting purposes
dep_org=dep;

% initial guess at maximum run-up elevation to estimate slope
Z2=SWEL+1.5*H0

Z2 =

    12.7410868

% determine station at the max runup and -1.5*H0 (i.e. the toe)
top_sta=-999;
toe_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1))) % here is the intersection of z2 with profile
        top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
    end
    if ((Ztoe > dep(kk)) & (Ztoe <= dep(kk+1))) % here is the intersection of Ztoe with profile
        toe_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Ztoe)
    end
end
toe_sta =

    30.4922497474066

% check to make sure we got them, if not extend the end slopes outward
S=diff(dep)./diff(sta);
if toe_sta== -999
    dy=dep(1)-Ztoe;
    toe_sta=sta(1)-dy/S(1)
end
if top_sta== -999
    dy=Z2-dep(end);
    top_sta=sta(end)+dy/S(end)
end
top_sta =

    61.046687685142

% just so the reader can tell the values aren't -999 anymore
top_sta

top_sta =

    61.046687685142

toe_sta

toe_sta =

    30.4922497474066

% check for case where the toe of slope is below SWL-1.5*H0
% in this case interpolate setup from the setupAtToe(really setup as first station), and the max setup
% also un-include points seaward of SWL-1.5*H0
if Ztoe > dep(1)
    dd=SWEL_fore-dep;
    k=find(dd<0,1); % k is index of first land point
    staAtSWL=interp1(dep(k-1:k),sta(k-1:k),SWEL_fore);
    dsta=staAtSWL-sta(1);
    dsetup=maxSetup-setupAtToe;
    dsetdsta=dsetup/dsta;
    setup=setupAtToe+dsetdsta*(toe_sta-sta(1));
    sprintf('!!- Location of SWEL-1.5*H0 is %4.1f ft landward of toe of slope',dsta)
    sprintf('!!- Setup is interpolated between setup at toe of slope and max setup')

```

```

    sprintf('!!!-      setup is adjusted to %4.2f feet',setup)
    SWEL=SWEL-setupAtToe+setup;
    sprintf('!!!-      SWEL is adjusted to %4.2f feet',SWEL)
    k=find(dep < SWEL-1.5*H0)
    sta(k)=[];
    dep(k)=[];
else
    sprintf('!!!- The User has selected a starting point that is %4.2f feet above the elevation of SWEL-1.5H0\n',dep(1)
    sprintf('!!!- This may be reasonable for some cases. However the user may want to consider:\n')
    sprintf('!!!- 1) Selecting a starting point that is at or below %4.2f feet elevation, or\n', Ztoe)
    sprintf('!!!- 2) Reducing the incident wave height to a depth limited condition.\n')
end

ans =

-!!!- Location of SWEL-1.5*H0 is 55.8 ft landward of toe of slope

ans =

-!!!- Setup is interpolated between setup at toe of slope and max setup

ans =

-!!!-      setup is adjusted to 0.20 feet

ans =

-!!!-      SWEL is adjusted to 9.08 feet

k =

    1
    2
    3
    4
    5
    6
    7
    8
    9
   10
   11
   12
   13
   14
   15
   16
   17
   18
   19
   20
   21
   22
   23
   24
   25
   26
   27
   28
   29
   30
   31
   32
   33
   34
   35
   36
   37
   38

% now iterate converge on a runup elevation
tol=0.01; % convergence criteria
R2del=999;
R2_new=3*H0; %initial guess
R2=R2_new;
iter=0;
R2_all=[];
topStaAll=[];
Berm_Segs=[];
TAW_ALWAYS_VALID=1;
while(abs(R2del) > tol && iter <= 25)
    iter=iter+1;
    sprintf('!----- STARTING ITERATION %d -----!',iter)

```

```

% elevation of toe of slope
Ztoe
% station of toe slope (relative to 0-NAVD88 shoreline)
toe_sta
% station of top of slope/extent of 2% run-up
top_sta
% elevation of top of slope/extent of 2% run-up
Z2
% incident significant wave height
H0
% incident spectral peak wave period
Tp
% incident spectral mean wave period
T0

R2=R2_new
Z2=R2+SWEL
% determine slope for this iteration
top_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1))) % here is the intersection of z2 with profile
        top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
        break;
    end
end
if top_sta== -999
    dy=Z2-dep(end);
    top_sta=sta(end)+dy/S(end)
end

% get the length of the slope (not accounting for berm)
Lslope=top_sta-toe_sta

% loop over profile segments to determine berm factor
% re-calculate influence of depth of berm based on this run-up elevation
% check for berm, berm width, berm height
berm_width=0;
rdh_sum=0;
Berm_Segs=[];
Berm_Heights=[];
for kk=1:length(sta)-1
    ddep=dep(kk+1)-dep(kk);
    dsta=sta(kk+1)-sta(kk);
    s=ddep/dsta;
    if (s < 1/15) % count it as a berm if slope is flatter than 1:15 (see TAW manual)
        sprintf('Berm Factor Calculation: Iteration %d, Profile Segment: %d',iter,kk)
        berm_width=berm_width+dsta; % tally the width of all berm segments
        % compute the rdh for this segment and weight it by the segment length
        dh=SWEL-(dep(kk)+dep(kk+1))/2
        if dh < 0
            chi=R2;
        else
            chi=2* H0;
        end
        if (dh <= R2 & dh >=-2*H0)
            rdh=(0.5-0.5*cos(3.14159*dh/chi)) ;
        else
            rdh=1;
        end
        rdh_sum=rdh_sum + rdh * dsta
        Berm_Segs=[Berm_Segs, kk];
        Berm_Heights=[Berm_Heights, (dep(kk)+dep(kk+1))/2];
    end
    if dep(kk) >= Z2 % jump out of loop if we reached limit of run-up for this iteration
        break
    end
end
sprintf('!----- End Berm Factor Calculation, Iter: %d -----!',iter)
berm_width
rB=berm_width/Lslope
if (berm_width > 0)
    rdh_mean=rdh_sum/berm_width
else
    rdh_mean=1
end
gamma_berm=1- rB * (1-rdh_mean)
if gamma_berm > 1
    gamma_berm=1
end
if gamma_berm < 0.6
    gamma_berm =0.6
end
% Iribarren number
slope=(Z2-Ztoe)/(Lslope-berm_width)
Irb=(slope/(sqrt(H0/L0)))
% runup height
gamma_berm
gamma_perm
gamma_beta
gamma_rough

```

```

gamma=gamma_berm*gamma_perm*gamma_beta*gamma_rough

% check validity
TAW_VALID=1;
if (Irb*gamma_berm < 0.5 | Irb*gamma_berm > 10 )
    sprintf('!!! - - Iribaren number: %6.2f is outside the valid range (0.5-10), TAW NOT VALID - - !!!\n', Irb*gamma_berm)
    TAW_VALID=0;
else
    sprintf('!!! - - Iribaren number: %6.2f is in the valid range (0.5-10), TAW RECOMMENDED - - !!!\n', Irb*gamma_berm)
end
islope=1/slope;
if (slope < 1/8 | slope > 1)
    sprintf('!!! - - slope: 1:%3.1f V:H is outside the valid range (1:8 - 1:1), TAW NOT VALID - - !!!\n', islope)
    TAW_VALID=0;
else
    sprintf('!!! - - slope: 1:%3.1f V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!\n', islope)
end
if TAW_VALID == 0
    TAW_ALWAYS_VALID=0;
end

if (Irb*gamma_berm < 1.8)
    R2_new=gamma*H0*1.77*Irb
else
    R2_new=gamma*H0*(4.3-(1.6/sqrt(Irb)))
end

% check to see if we need to evaluate a shallow foreshore
if berm_width > 0.25 * L0;
    disp ('! Berm width is greater than 1/4 wave length')
    disp ('! Runup will be weighted average with foreshore calculation assuming depth limited wave height on berm')
    % do the foreshore calculation
    fore_H0=0.78*(SWEL_fore-min(Berm_Heights))
    % get upper slope
    fore_toe_sta=-999;
    fore_toe_dep=-999;
    for kk=length(dep)-1:-1:1
        ddep=dep(kk+1)-dep(kk);
        dsta=sta(kk+1)-sta(kk);
        s=ddep/dsta;
        if s < 1/15
            break
        end
        fore_toe_sta=sta(kk);
        fore_toe_dep=dep(kk);
        upper_slope=(Z2-fore_toe_dep)/(top_sta-fore_toe_sta)
    end
    fore_Irb=upper_slope/(sqrt(fore_H0/L0));
    fore_gamma=gamma_perm*gamma_beta*gamma_rough;
    if (fore_Irb < 1.8)
        fore_R2=fore_gamma*fore_H0*1.77*fore_Irb;
    else
        fore_R2=fore_gamma*fore_H0*(4.3-(1.6/sqrt(fore_Irb)));
    end
    if berm_width >= L0
        R2_new=fore_R2
        disp ('berm is wider than one wavelength, use full shallow foreshore solution');
    else
        w2=(berm_width-0.25*L0)/(0.75*L0)
        w1=1-w2
        R2_new=w2*fore_R2 + w1*R2_new
    end
end % end berm width check
% convergence criterion
R2del=abs(R2-R2_new)
R2_all(iter)=R2_new;
% get the new top station (for plot purposes)
Z2=R2_new+SWEL
top_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1))) % here is the intersection of z2 with profile
        top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
        break;
    end
end
if top_sta== -999
    dy=Z2-dep(end);
    top_sta=sta(end)+dy/S(end);
end
topStaAll(iter)=top_sta;

end
ans =
!----- STARTING ITERATION 1 -----!
Ztoe =
        5.0112868
toe_sta =
        30.4922497474066
top_sta =
        61.046687685142

```

```

Z2 =
    12.7410868
H0 =
    2.5766
Tp =
    4.6414
T0 =
    4.21945454545455
R2 =
    7.7298
Z2 =
    16.8133395082333
top_sta =
    73.9760748417528
Lslope =
    43.4838250943462
ans =
!----- End Berm Factor Calculation, Iter: 1 -----!
berm_width =
    0
rB =
    0
rdh_mean =
    1
gamma_berm =
    1
slope =
    0.271412477688579
Irb =
    1.61385003375967
gamma_berm =
    1
gamma_perm =
    1
gamma_beta =
    1
gamma_rough =
    0.8
gamma =
    0.8
ans =
!!! - - Iribaren number: 1.61 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:3.7 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
    5.88807633173098
R2del =
    1.84172366826902
Z2 =
    14.9716158399643
ans =
!----- STARTING ITERATION 2 -----!
Ztoe =
    5.0112868
toe_sta =
    30.4922497474066
top_sta =
    68.128609065771
Z2 =
    14.9716158399643
H0 =
    2.5766
Tp =
    4.6414
T0 =
    4.21945454545455
R2 =
    5.88807633173098
Z2 =
    14.9716158399643
top_sta =
    68.128609065771
Lslope =
    37.6363593183644
ans =
!----- End Berm Factor Calculation, Iter: 2 -----!
berm_width =
    0
rB =
    0
rdh_mean =
    1
gamma_berm =
    1
slope =
    0.264646454129909
Irb =
    1.57361847387867
gamma_berm =
    1

```

```

gamma_perm =
1
gamma_beta =
1
gamma_rough =
0.8
gamma =
0.8
ans =
!!! - - Iribaren number: 1.57 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:3.8 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
5.74129286947083
R2del =
0.146783462260157
Z2 =
14.8248323777041
ans =
!----- STARTING ITERATION 3 -----!
Ztoe =
5.0112868
toe_sta =
30.4922497474066
top_sta =
67.6625721206884
Z2 =
14.8248323777041
H0 =
2.5766
Tp =
4.6414
T0 =
4.21945454545455
R2 =
5.74129286947083
Z2 =
14.8248323777041
top_sta =
67.6625721206884
Lslope =
37.1703223732818
ans =
!----- End Berm Factor Calculation, Iter: 3 -----!
berm_width =
0
rB =
0
rdh_mean =
1
gamma_berm =
1
slope =
0.264015616522018
Irb =
1.56986744038359
gamma_berm =
1
gamma_perm =
1
gamma_beta =
1
gamma_rough =
0.8
gamma =
0.8
ans =
!!! - - Iribaren number: 1.57 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:3.8 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
5.72760735279958
R2del =
0.0136855166712468
Z2 =
14.8111468610329
ans =
!----- STARTING ITERATION 4 -----!
Ztoe =
5.0112868
toe_sta =
30.4922497474066
top_sta =
67.6191206563127
Z2 =
14.8111468610329
H0 =
2.5766
Tp =
4.6414

```

```

T0 =
    4.21945454545455
R2 =
    5.72760735279958
Z2 =
    14.8111468610329
top_sta =
    67.6191206563127
Lslope =
    37.1268709089061
ans =
!----- End Berm Factor Calculation, Iter: 4 -----!
berm_width =
    0
rB =
    0
rdh_mean =
    1
gamma_berm =
    1
slope =
    0.263955992549916
Irb =
    1.56951290933841
gamma_berm =
    1
gamma_perm =
    1
gamma_beta =
    1
gamma_rough =
    0.8
gamma =
    0.8
ans =
!!! - - Iribaren number: 1.57 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:3.8 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
    5.72631385847711
R2del =
    0.00129349432246606
Z2 =
    14.8098533667104
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
    14.8098533667104
diary off
-1.000000e+00

```

PART 5: RUNUP2

for transect: CM-96-1

Station locations shifted by: -1.72 feet from their
original location to set the shoreline to
elevation 0 for RUNUP2 input

RUNUP2 INPUT CONVERSIONS

for transect: CM-96-1

Incident significant wave height: 2.58 feet

Peak wave period: 4.72 seconds

Mean wave height: 1.61 feet

Local Depth below SWEL: 17.69 feet

Mean wave height deshoaled using Hunt approximation for
celerity assuming constant wave energy flux.

References: R.G. Dean and R.A. Dalrymple. 2000. Water

Wave Mechanics for Engineers and Scientists. World
Scientific Publishing Company, River Edge New Jersey

USACE (1985), Direct Methods for Calculating Wavelength, CETN-1-17
US Army Engineer Waterways Experiment Station Coastal Engineering
Research Center, Vicksburg, MS

also see Coastal Engineering Manual Part II-3
for discussion of shoaling coefficient

Depth, $D = 17.69$

Period, $T = 4.01$

Waveheight, $H = 1.61$

Deep water wavelength, L_0 (ft)

$L_0 = g \cdot T^2 / 2\pi$

$L_0 = 32.17 \cdot 4.01^2 / 6.28 = 82.45$

Deep water wave celerity, C_0 (ft/s)

$C_0 = L_0 / T$

$C_0 = 82.45 / 4.01 = 20.55$

Angular frequency, σ (rad/s)

$\sigma = 2\pi / T$

$\sigma = 6.28 / 4.01 = 1.57$

Hunts (1979) approximation for Celerity C_{1H} (ft/s) at Depth D (ft)

$y = \sigma \cdot \sigma \cdot D / g$

$y = 1.57 \cdot 1.57 \cdot 17.69 / 32.17 = 1.35$

$C_{1H} = \sqrt{g \cdot D / (y + 1 / (1 + 0.6522 \cdot y + 0.4622 \cdot y^2 + 0.0864 \cdot y^4 + 0.0675 \cdot y^5))}$

$C_{1H} = 18.57$

Shoaling Coefficient K_{sH}

$K_{sH} = \sqrt{C_0 / C_{1H}}$

$K_{sH} = \sqrt{20.55 / 18.57} = 1.05$

Deepwater Wave Height H_{0_H} (ft)

$H_{0_H} = H / K_{sH}$

$H_{0_H} = 1.61 / 1.05 = 1.53$

Deepwater mean wave height: 1.53 feet

END RUNUP2 CONVERSIONS

RUNUP2 RESULTS

for transect: CM-96-1

RUNUP2 SWEL:

8.90

8.90

8.90

8.90

8.90
8.90
8.90
8.90
8.90

RUNUP2 deepwater mean wave heights:

1.46
1.46
1.46
1.53
1.53
1.53
1.61
1.61
1.61

RUNUP2 mean wave periods:

3.81
4.01
4.21
3.81
4.01
4.21
3.81
4.01
4.21

RUNUP2 runup above SWEL:

2.06
2.21
2.37
2.06
2.22
2.37
2.07
2.21
2.38

RUNUP2 Mean runup height above SWEL: 2.22 feet

RUNUP2 2-percent runup height above SWEL: 4.88 feet

RUNUP2 2-percent runup elevation: 13.78 feet-NAVD88

RUNUP2 Messages:

No Messages

_____END RUNUP2 RESULTS_____

_____ACES BEACH RUNUP_____

Incident significant wave height: 2.58 feet

Significant wave height is mean wave height divided by 0.626

Reference: D.2.8.1.2.1 Atlantic and Gulf of Mexico G&S Feb. 2007

Deepwater significant wave height: 2.45 feet

Peak wave period: 4.72 seconds

Average beach Slope: 1:9.68 (H:V)

ACES IRREGULAR WAVE RUNUP ON BEACHES

Reference:

Leenknecht, David A., Andre Szuwaiski, and Ann Sherlock. 1992.

"Automated Coastal Engineering System Technical Reference",

Coastal Engineering Research Center, Department of the Army

Waterways Experiments Station, Corps of Eniggneers, 3909 Halls
Ferry Road, Vicksburg, Mississippi 39180-6199.

INPUTS:

Acceleration Due to Gravity,	g	=	32.174
Deepwater Significant Wave height,	Hs	=	2.45
Wave Period,	T	=	4.72
Beach Slope,	S	=	0.103

EQUATIONS:

Runup,	R	=	Hs * a * Irb^b
Iribarren,	Irb	=	S/sqrt(Hs/L0)
Wavelength,	L0	=	g * T^2 / 2 / pi

COEFFICIENTS:

(Mase, H. 1989, "Random Wave Runup Height on Gentle Slopes,"
j. Waterway, Port, Coastal and Ocean Engineering Division,
ASCE, Vol 115, No. 5, pp 649-661.)

	[Rmax, R2%, R-1/3, R-1/10, R-mean]
a =	[2.32, 1.86, 1.70, 1.38, 0.88]
b =	[0.77, 0.71, 0.71, 0.70, 0.69]

RESULTS:

RUNUP = [4.3, 3.6, 3.3, 2.6, 1.7]

ACES RUNUP CALCULATED USING 'Aces_Beach_Runup.m'

ACES Beach 2-percent runup height above SWEL: 3.56 feet

ACES Beach 2-percent runup elevation: 12.46 feet-NAVD88

ACES BEACH RUNUP is valid

_____END ACES BEACH RESULTS_____

PART 5 COMPLETE_____

FEMA
RUNUP2 transect: CM-96-1

sjh

job 2

1

3.00

-8.81	-127.3	0.8
-8.38	-102.3	0.8
-8.09	-85.3	0.8
-7.30	-39.3	0.8
-7.26	-38.3	0.8
-6.68	-34.3	0.8
-6.38	-32.3	0.8
-5.51	-26.3	0.8
-5.22	-24.3	0.8
-4.35	-18.3	0.8
-3.77	-14.3	0.8
-2.03	-2.3	0.8
1.53	1.7	0.8
1.85	6.7	0.8
3.72	9.7	0.8
3.88	19.7	0.8
3.88	28.7	0.8
7.66	39.2	0.8
8.32	48.7	0.8
1 9.89	53.7	0.8
8.9	1.46	3.81
8.9	1.46	4.01
8.9	1.46	4.21
8.9	1.53	3.81
8.9	1.53	4.01
8.9	1.53	4.21
8.9	1.61	3.81
8.9	1.61	4.01
8.9	1.61	4.21

CLIENT- FEMA
PROJECT-RUNUP2 transect: CM-96-1

** WAVE RUNUP-VERSION 2.0 **

ENGINEERED BY sjh

JOB job 2
RUN 1 PAGE 1

CROSS SECTION PROFILE

	LENGTH	ELEV.	SLOPE	ROUGHNESS
1	-127.3	-8.8		
2	-102.3	-8.4	.00	.80
3	-85.3	-8.1	58.62	.80
4	-39.3	-7.3	58.23	.80
5	-38.3	-7.3	25.00	.80
6	-34.3	-6.7	6.90	.80
7	-32.3	-6.4	6.67	.80
8	-26.3	-5.5	6.90	.80
9	-24.3	-5.2	6.90	.80
10	-18.3	-4.3	6.90	.80
11	-14.3	-3.8	6.90	.80
12	-2.3	-2.0	6.90	.80
13	1.7	1.5	1.12	.80
14	6.7	1.9	15.63	.80
15	9.7	3.7	1.60	.80
16	19.7	3.9	62.50	.80
17	28.7	3.9	FLAT	.80
18	39.2	7.7	2.78	.80
19	48.7	8.3	14.39	.80
20	53.7	9.9	3.18	.80
	LAST SLOPE	3.00	LAST ROUGHNESS	.80

CLIENT- FEMA
PROJECT-RUNUP2 transect: CM-96-1

** WAVE RUNUP-VERSION 2.0 **

ENGINEERED BY sjh

JOB job 2
RUN 1 PAGE 2

OUTPUT TABLE

INPUT PARAMETERS			RUNUP RESULTS			
-----			-----			
WATER LEVEL ABOVE DATUM (FT.)	DEEP WATER WAVE HEIGHT (FT.)	WAVE PERIOD (SEC.)	BREAKING SLOPE NUMBER	RUNUP SLOPE NUMBER	RUNUP ABOVE WATER LEVEL (FT.)	BREAKER DEPTH (FT.)
8.90	1.46	3.81	11	20	2.06	1.91
8.90	1.46	4.01	11	20	2.21	1.93
8.90	1.46	4.21	11	20	2.37	1.96
8.90	1.53	3.81	11	20	2.06	1.99
8.90	1.53	4.01	11	20	2.22	2.01
8.90	1.53	4.21	11	20	2.37	2.04
8.90	1.61	3.81	11	20	2.07	2.08
8.90	1.61	4.01	11	20	2.21	2.10
8.90	1.61	4.21	11	20	2.38	2.13

Runup2 2% runup elevation for Transect: CM-96-1

