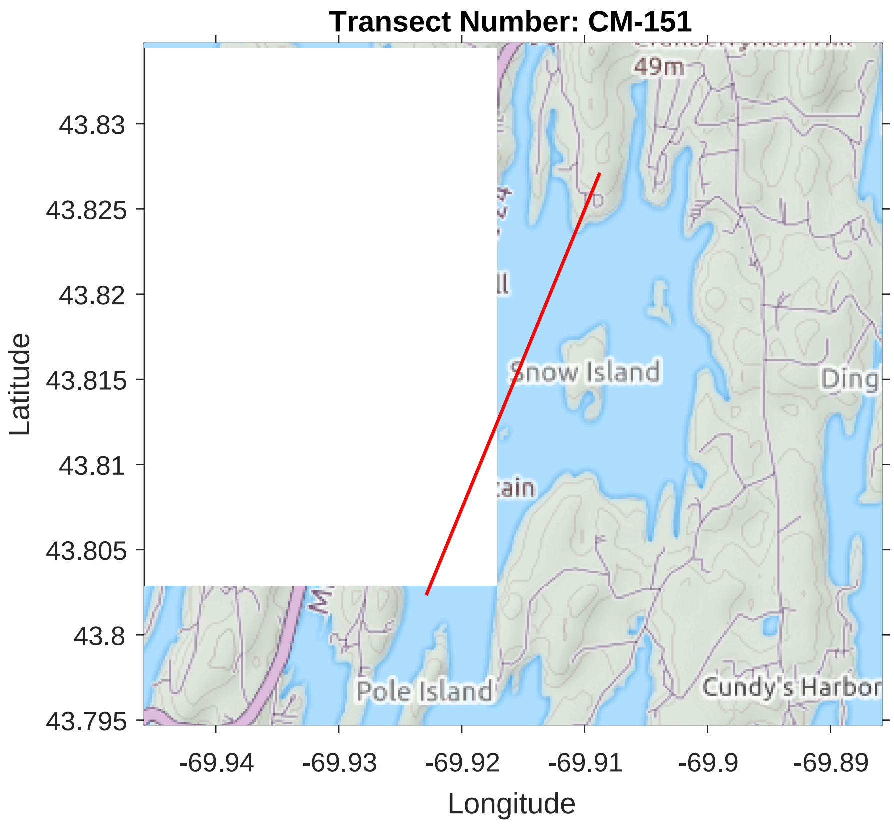
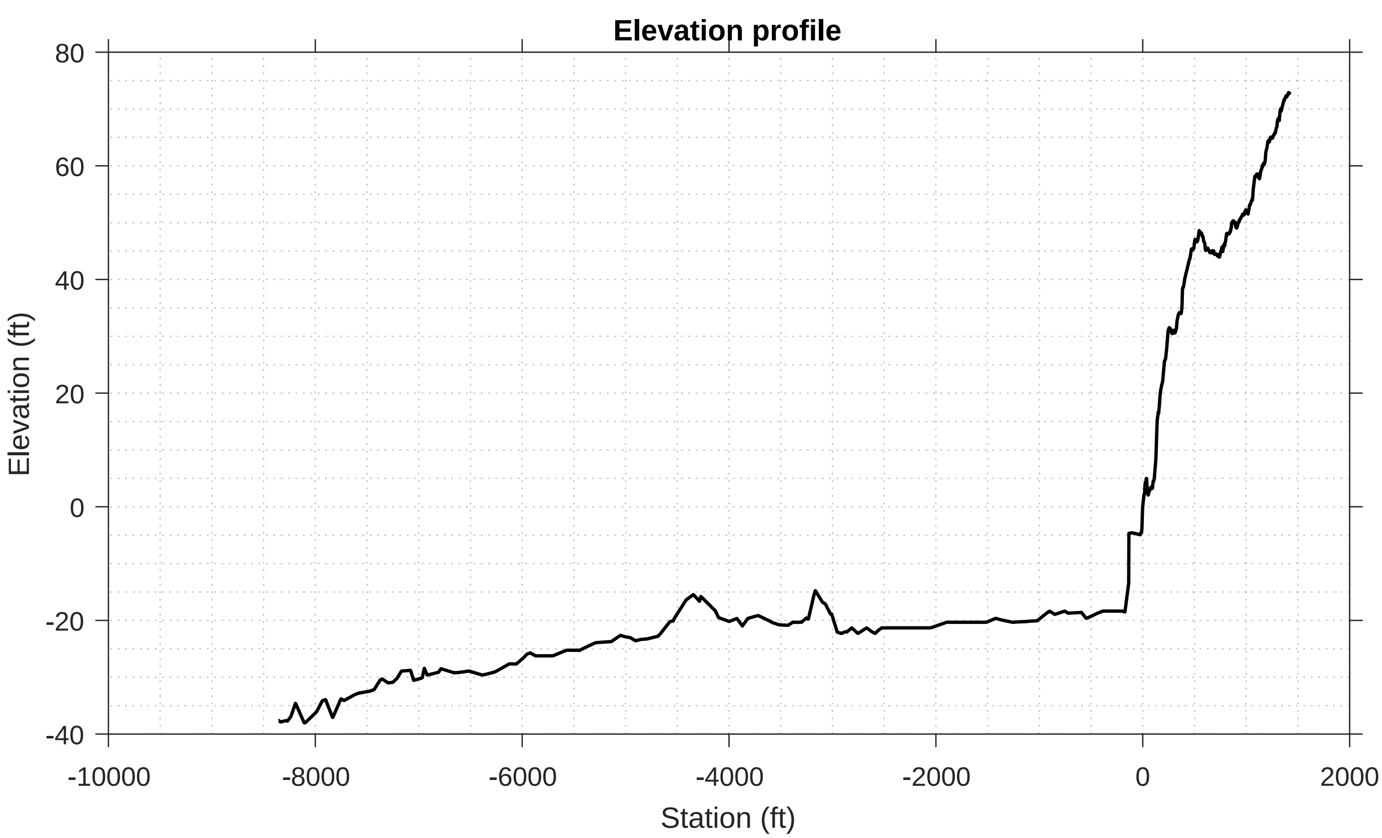


Transect Number: CM-151
49m
Snow Island
Ding
ain
Pole Island
Cundy's Harbor
43.83
43.825
43.82
43.815
43.81
43.805
43.8
43.795
Latitude
-69.94
-69.93
-69.92
-69.91
-69.9
-69.89
Longitude



Elevation profile
80
60
40
20
0
-20
-40
Elevation (ft)
-10000
-8000
-6000
-4000
-2000
0
2000
Station (ft)

DATA LOG FOR TRANSECT ID: CM-151

PART 1: USER INPUT

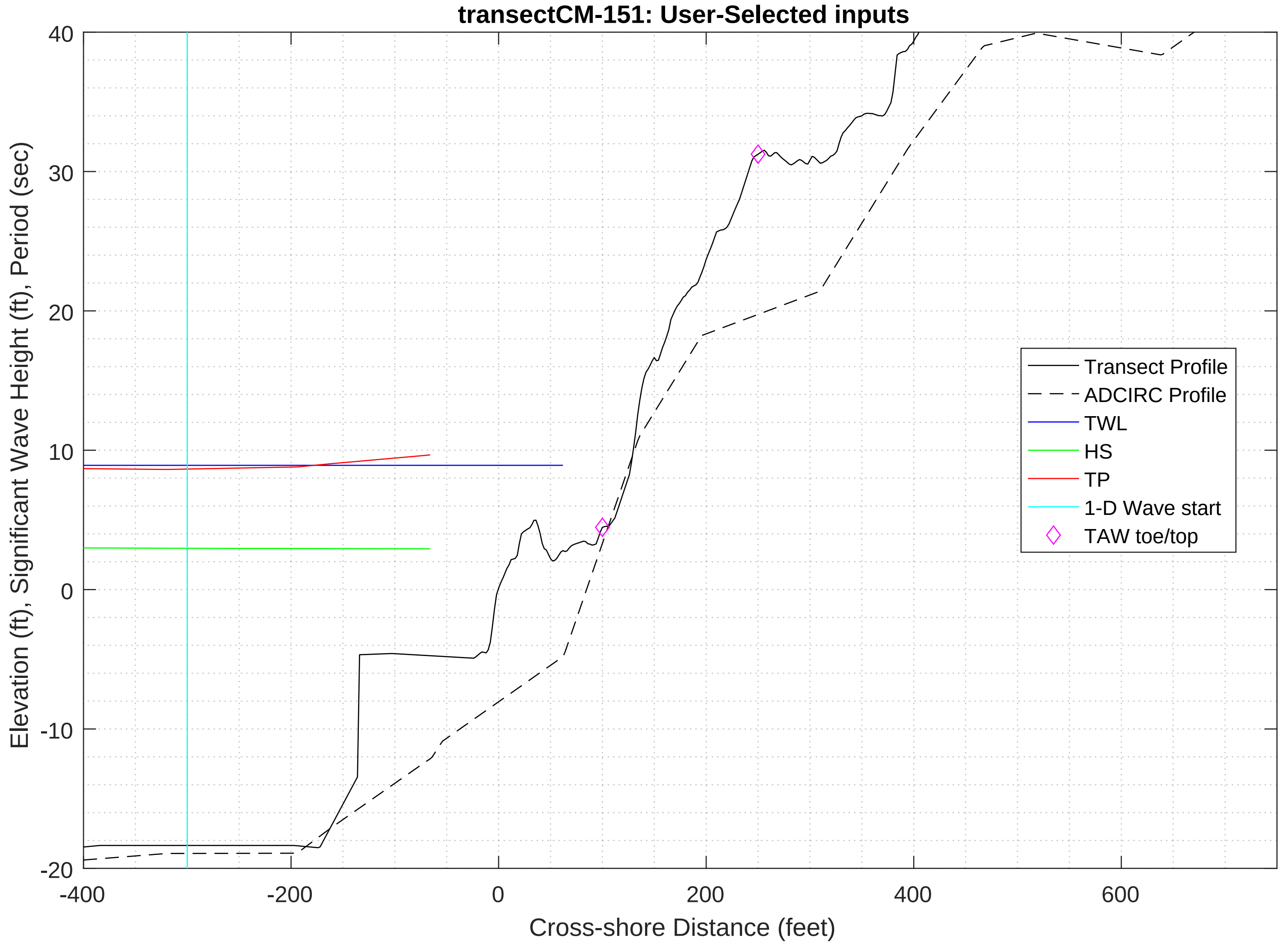
SWAN 1-D / WHAFIS input

```
station:     -300 ft
LON:         -69.9112 deg E
LAT:         43.8228 deg N
Bottom ELEV:        -18.3586 ft-NAVD88
TWL:         8.918 ft-NAVD88
HS:          2.9649 ft
TP:          8.6504 sec
Wave Direction bin: 45 deg CCW from East (90 deg sector)
Transect Direction:   60.3343 deg CCW from East
```

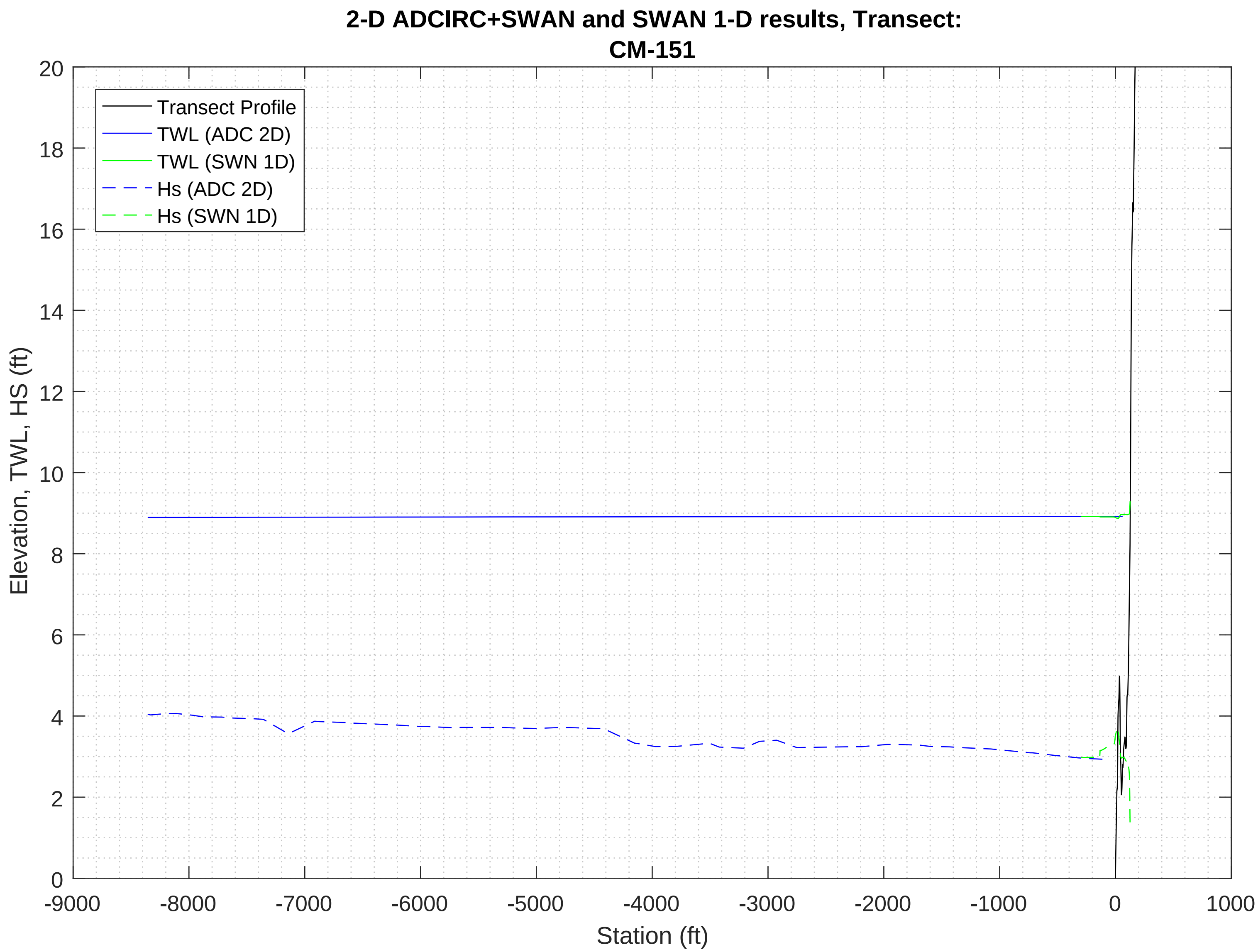
TAW/RUNUP input

```
toe sta:      100 ft
toe elev:     4.4674 ft-NAVD88
top sta:      250 ft
top elev:     31.2447 ft-NAVD88
*Wave and water level conditions at toe to be calculated in SWAN 1-D*
```

PART 1 COMPLETE


transectCM-151: User-Selected inputs
Elevation (ft), Significant Wave Height (ft), Period (sec)
Cross-shore Distance (feet)
40
30
20
10
0
-10
-20
-400
-200
0
200
400
600
Transect Profile
ADCIRC Profile
TWL
HS
TP
1-D Wave start
TAW toe/top

```
_______________________________________________________
PART 2: SWAN 1-D

swan input grid name: 2_swan/gridfiles/CM-151zmeters_xmeters.grd
swan file name:       2_swan/swanfiles/CM-151.swn
swan output name:     2_swan/swanfiles/CM-151.dat

Boundary Conditions:
    TWL- 2.7182 meters
    HS-  0.9037 meters
    PER- 8.6504 seconds

Batch File: 2_swan/swanfiles/runswan.dat

SWAN maximum additional wave setup: 0.3738 feet
SWAN output at toe:
    SETUP- 0.043986 feet
    HS-    2.9153 feet
    PER-   8.7643 seconds

PART 2 COMPLETE________________________________________
```



2-D ADCIRC+SWAN and SWAN 1-D results, Transect:
CM-151
Transect Profile
TWL (ADC 2D)
TWL (SWN 1D)
Hs (ADC 2D)
Hs (SWN 1D)
Elevation, TWL, HS (ft)
Station (ft)
20
18
16
14
12
10
8
6
4
2
0
-9000
-8000
-7000
-6000
-5000
-4000
-3000
-2000
-1000
0
1000

1

```
                    Execution started at 20200220.141950


                    ---------------------------------------
                                     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      130       0.   130     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      130   0      1       1

 !READinp BOTtom [fac]  'fname1'  [idla]  [nhedf]  [FREe|FORmat[form]|UNFormatted]

  READ    BOTTOM   -1. '../gridfiles/CM-151zmeters_xmeters.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   0.9037     8.6504     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] [edm1pm] [cdrag] [umin] [cfpm]
!-- GEN2 [cf10] [cf20] [cf30] [cf40] [cf50] [cf60] [edm1pm] [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' [xp1] [yp1] <[int]   [xp]   [yp] >
 CURVE 'curve' 0     0      130  130    0
!TABLe 'sname' < HEADer|NOHEADer|INDexed > 'fname' <output parameters> (output time)
 Table 'curve'   HEADER 'CM-151.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             131 MYC              1
                     : MCGRD           132
                     : 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 EDMLPM  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  71.00 % 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   0.77 % 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  70.23 % 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  78.63 % 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  99.24 % 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 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.	0.90668	8.6843	8.9638	7.7895	0.037	31.9663	8.3100	0.000004
1.	0.	0.90675	8.6843	8.9638	7.7889	0.037	31.9667	8.3100	0.000003
2.	0.	0.90681	8.6843	8.9638	7.7883	0.037	31.9671	8.3100	0.000003
3.	0.	0.90688	8.6842	8.9638	7.7877	0.037	31.9675	8.3100	0.000002
4.	0.	0.90694	8.6842	8.9638	7.7871	0.037	31.9679	8.3100	0.000002
5.	0.	0.90701	8.6842	8.9638	7.7864	0.037	31.9683	8.3100	0.000001
6.	0.	0.90708	8.6842	8.9638	7.7858	0.037	31.9688	8.3100	0.000001
7.	0.	0.90714	8.6842	8.9638	7.7852	0.037	31.9692	8.3100	0.000000
8.	0.	0.90721	8.6842	8.9638	7.7845	0.037	31.9697	8.3100	-0.000000
9.	0.	0.90728	8.6842	8.9638	7.7839	0.037	31.9701	8.3100	-0.000001
10.	0.	0.90735	8.6842	8.9638	7.7832	0.037	31.9706	8.3100	-0.000001
11.	0.	0.90742	8.6842	8.9638	7.7826	0.038	31.9710	8.3100	-0.000001
12.	0.	0.90748	8.6841	8.9638	7.7819	0.038	31.9715	8.3100	-0.000002
13.	0.	0.90755	8.6841	8.9638	7.7812	0.038	31.9720	8.3100	-0.000002
14.	0.	0.90762	8.6841	8.9638	7.7806	0.038	31.9725	8.3100	-0.000003
15.	0.	0.90769	8.6841	8.9638	7.7799	0.038	31.9730	8.3100	-0.000003
16.	0.	0.90776	8.6841	8.9638	7.7792	0.038	31.9735	8.3100	-0.000004
17.	0.	0.90783	8.6841	8.9638	7.7785	0.038	31.9740	8.3100	-0.000004
18.	0.	0.90790	8.6841	8.9638	7.7778	0.038	31.9746	8.3100	-0.000005
19.	0.	0.90798	8.6841	8.9638	7.7771	0.038	31.9751	8.3100	-0.000005
20.	0.	0.90805	8.6841	8.9638	7.7764	0.038	31.9757	8.3100	-0.000006
21.	0.	0.90812	8.6841	8.9638	7.7757	0.038	31.9762	8.3100	-0.000006
22.	0.	0.90819	8.6840	8.9638	7.7750	0.038	31.9768	8.3100	-0.000007
23.	0.	0.90827	8.6840	8.9638	7.7743	0.038	31.9774	8.3100	-0.000007
24.	0.	0.90834	8.6840	8.9638	7.7736	0.038	31.9780	8.3100	-0.000008
25.	0.	0.90841	8.6840	8.9638	7.7728	0.038	31.9786	8.3100	-0.000008
26.	0.	0.90849	8.6840	8.9638	7.7721	0.038	31.9792	8.3100	-0.000009
27.	0.	0.90856	8.6840	8.9638	7.7713	0.038	31.9798	8.3100	-0.000009
28.	0.	0.90864	8.6840	8.9638	7.7706	0.039	31.9804	8.3100	-0.000009
29.	0.	0.90871	8.6840	8.9638	7.7698	0.039	31.9810	8.3100	-0.000010
30.	0.	0.90879	8.6840	8.9638	7.7690	0.039	31.9813	8.3100	-0.000010
31.	0.	0.90894	8.6840	8.9638	7.7683	0.039	31.9963	8.3100	-0.000011
32.	0.	0.90909	8.6839	8.9638	7.7674	0.039	32.0298	8.3200	-0.000009
33.	0.	0.90919	8.6839	8.9638	7.7664	0.039	32.0536	8.3300	-0.000006
34.	0.	0.90940	8.6839	8.9638	7.7655	0.039	32.0751	8.3300	-0.000007
35.	0.	0.90961	8.6838	8.9638	7.7637	0.039	32.1086	8.3400	-0.000004
36.	0.	0.90980	8.6838	8.9638	7.7614	0.039	32.1296	8.3500	-0.000002
37.	0.	0.91011	8.6838	8.9638	7.7590	0.039	32.1482	8.3500	-0.000003
38.	0.	0.91018	8.6837	8.9638	7.7560	0.039	32.1409	8.3600	0.000000
39.	0.	0.90977	8.6837	8.9638	7.7529	0.039	31.9808	8.3400	-0.000006
40.	0.	0.90968	8.6841	8.9638	7.7518	0.039	31.6540	8.2100	-0.000049
41.	0.	0.90951	8.6846	8.9638	7.7507	0.039	31.2978	8.0699	-0.000096
42.	0.	0.90940	8.6850	8.9638	7.7496	0.039	30.9834	7.9299	-0.000143
43.	0.	0.90941	8.6855	8.9638	7.7486	0.039	30.6637	7.7898	-0.000194
44.	0.	0.90957	8.6859	8.9638	7.7475	0.039	30.3414	7.6498	-0.000247
45.	0.	0.90990	8.6864	8.9638	7.7460	0.039	30.0180	7.5097	-0.000304
46.	0.	0.91041	8.6869	8.9638	7.7443	0.039	29.6944	7.3696	-0.000365
47.	0.	0.91107	8.6874	8.9638	7.7426	0.039	29.3704	7.2296	-0.000430
48.	0.	0.91189	8.6879	8.9638	7.7409	0.039	29.0470	7.0895	-0.000498
49.	0.	0.91271	8.6884	8.9638	7.7390	0.039	28.7112	6.9494	-0.000570
50.	0.	0.90685	8.6891	8.9638	7.7351	0.038	26.6724	6.7593	-0.000686
51.	0.	0.96258	8.6998	8.9638	7.8248	0.034	23.9096	4.1367	-0.003309
52.	0.	0.95999	8.7003	8.9638	7.7983	0.034	23.1000	4.1367	-0.003306
53.	0.	0.95992	8.7009	8.9638	7.7720	0.033	22.8252	4.1367	-0.003307
54.	0.	0.96110	8.7016	8.9638	7.7460	0.033	22.7319	4.1267	-0.003329
55.	0.	0.96223	8.7021	8.9638	7.7198	0.033	22.7092	4.1267	-0.003333
56.	0.	0.96345	8.7027	8.9638	7.6938	0.034	22.7024	4.1267	-0.003337
57.	0.	0.96511	8.7032	8.9638	7.6682	0.034	22.7013	4.1166	-0.003361
58.	0.	0.96648	8.7037	8.9638	7.6420	0.034	22.7126	4.1166	-0.003366
59.	0.	0.96794	8.7042	8.9638	7.6153	0.035	22.7289	4.1166	-0.003372

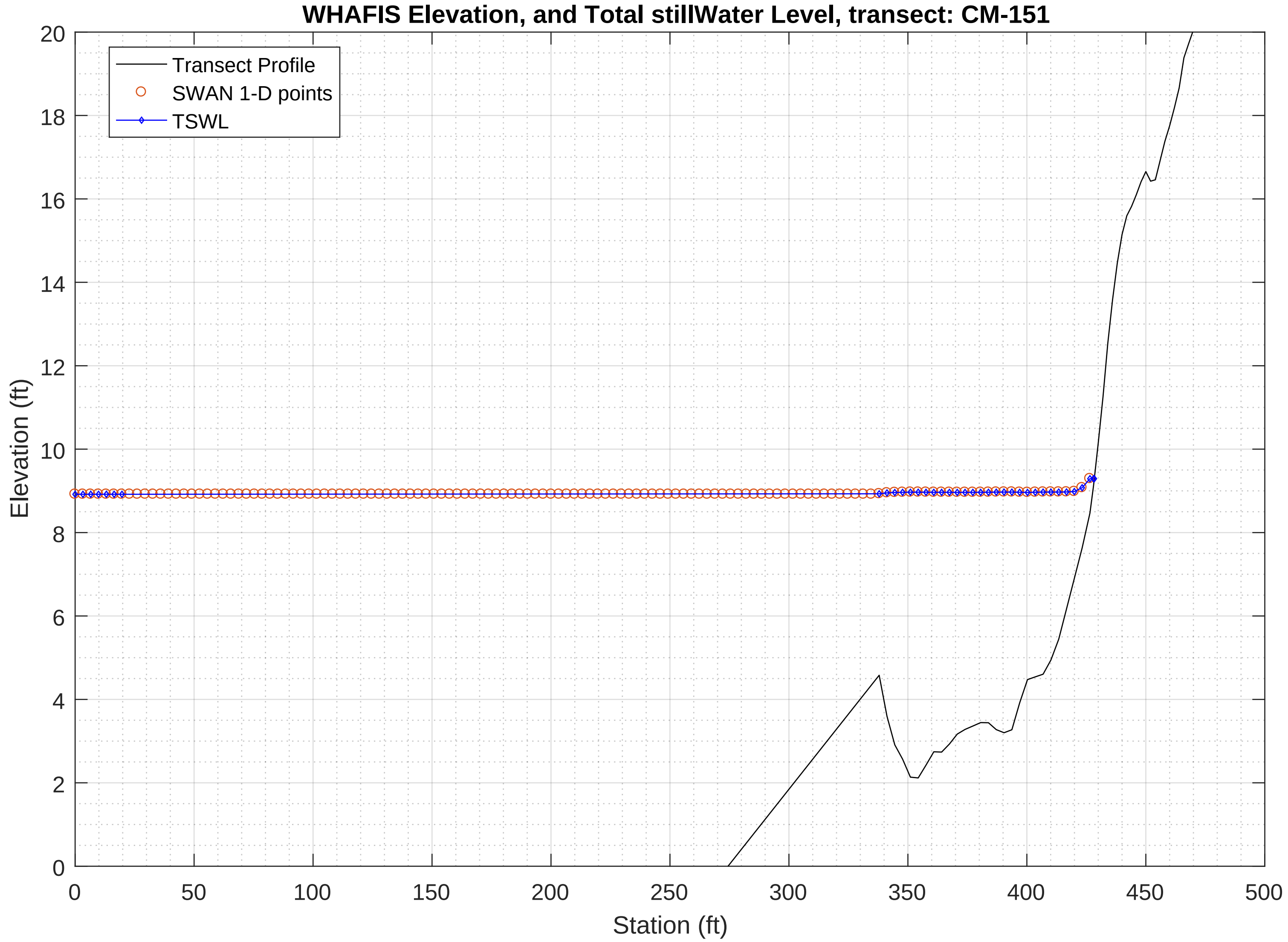
60.	0.	0.96948	8.7046	8.9638	7.5879	0.035	22.7490	4.1166	-0.003378
61.	0.	0.97113	8.7051	8.9638	7.5596	0.037	22.7737	4.1166	-0.003385
62.	0.	0.97298	8.7054	8.9638	7.5298	0.039	22.8184	4.1166	-0.003392
63.	0.	0.97461	8.7058	8.9638	7.4981	0.042	22.8739	4.1266	-0.003381
64.	0.	0.97677	8.7061	8.9638	7.4657	0.046	22.9373	4.1266	-0.003390
65.	0.	0.97866	8.7063	8.9638	7.4319	0.054	23.0139	4.1366	-0.003380
66.	0.	0.98062	8.7066	8.9638	7.4036	0.073	23.1083	4.1366	-0.003389
67.	0.	0.98214	8.7068	8.9638	7.3761	0.095	23.2232	4.1466	-0.003378
68.	0.	0.98413	8.7070	8.9638	7.3478	0.122	23.3447	4.1466	-0.003386
69.	0.	0.98591	8.7072	8.9638	7.3232	0.143	23.4823	4.1466	-0.003395
70.	0.	0.98737	8.7073	8.9638	7.2978	0.159	23.6409	4.1566	-0.003384
71.	0.	0.98932	8.7075	8.9638	7.2720	0.169	23.8190	4.1566	-0.003393
72.	0.	0.99081	8.7076	8.9638	7.2472	0.146	23.9776	4.1666	-0.003384
73.	0.	0.99248	8.7078	8.9638	7.2258	0.115	24.0990	4.1666	-0.003393
74.	0.	0.99349	8.7079	8.9638	7.2078	0.119	24.1887	4.1766	-0.003383
75.	0.	0.99468	8.7080	8.9638	7.1924	0.124	24.2559	4.1766	-0.003392
76.	0.	0.99583	8.7081	8.9638	7.1780	0.130	24.3246	4.1766	-0.003399
77.	0.	0.99657	8.7082	8.9638	7.1636	0.126	24.3861	4.1866	-0.003388
78.	0.	0.99767	8.7083	8.9638	7.1502	0.121	24.4480	4.1866	-0.003396
79.	0.	0.99840	8.7084	8.9638	7.1364	0.117	24.5052	4.1966	-0.003386
80.	0.	0.99942	8.7085	8.9638	7.1240	0.116	24.5564	4.1966	-0.003393
81.	0.	1.00011	8.7086	8.9638	7.1110	0.118	24.6032	4.2066	-0.003383
82.	0.	1.00108	8.7087	8.9638	7.0990	0.123	24.6353	4.2066	-0.003391
83.	0.	1.00207	8.7088	8.9638	7.0873	0.131	24.6710	4.2066	-0.003399
84.	0.	1.00258	8.7088	8.9638	7.0744	0.141	24.6706	4.2166	-0.003390
85.	0.	1.00484	8.7091	8.9638	7.0671	0.146	24.5905	4.1665	-0.003493
86.	0.	1.00750	8.7094	8.9638	7.0604	0.149	24.5056	4.1064	-0.003619
87.	0.	1.00886	8.7096	8.9638	7.0510	0.152	24.4617	4.0863	-0.003668
88.	0.	1.00929	8.7098	8.9638	7.0409	0.155	24.2896	4.0763	-0.003699
89.	0.	1.01531	8.7108	8.9638	7.0476	0.158	23.6297	3.8658	-0.004168
90.	0.	1.03885	8.7137	8.9638	7.0813	0.149	22.4964	3.2742	-0.005844
91.	0.	1.06568	8.7174	8.9638	7.0841	0.138	21.4759	2.7821	-0.007932
92.	0.	1.07994	8.7209	8.9638	7.0368	0.129	20.7730	2.5709	-0.009135
93.	0.	1.09231	8.7252	8.9638	6.9714	0.124	20.1631	2.3998	-0.010229
94.	0.	1.10466	8.7302	8.9638	6.8925	0.120	19.5336	2.2286	-0.011411
95.	0.	1.11550	8.7359	8.9638	6.8003	0.122	18.9380	2.0675	-0.012542
96.	0.	1.11372	8.7412	8.9638	6.6931	0.116	18.5068	2.0277	-0.012325
97.	0.	1.11355	8.7465	8.9638	6.6075	0.085	17.7374	1.9274	-0.012595
98.	0.	1.12878	8.7549	8.9638	6.5794	359.993	16.5287	1.5341	-0.015900
99.	0.	1.10611	8.7624	8.9638	6.4729	359.940	15.7225	1.4262	-0.013770
100.	0.	1.07468	8.7686	8.9638	6.3422	359.876	15.1701	1.3801	-0.009948
101.	0.	1.04711	8.7730	8.9638	6.2034	359.873	14.6971	1.3135	-0.006542
102.	0.	1.02655	8.7751	8.9638	6.0367	359.958	14.4777	1.1961	-0.003886
103.	0.	0.98026	8.7747	8.9638	5.8552	0.017	15.2688	1.3236	0.003646
104.	0.	0.93711	8.7733	8.9638	5.6800	0.050	16.6342	1.6302	0.010244
105.	0.	0.91762	8.7720	8.9638	5.5713	0.074	17.6448	1.8430	0.013043
106.	0.	0.91002	8.7712	8.9638	5.5109	0.098	18.3439	1.9542	0.014208
107.	0.	0.90337	8.7704	8.9638	5.4525	0.116	18.7474	2.0852	0.015202
108.	0.	0.90302	8.7701	8.9638	5.4337	0.135	18.7183	2.0853	0.015283
109.	0.	0.90631	8.7700	8.9638	5.4418	0.158	18.4734	1.9948	0.014801
110.	0.	0.90978	8.7699	8.9638	5.4540	0.185	18.2622	1.8942	0.014236
111.	0.	0.90769	8.7694	8.9638	5.4360	0.213	18.1677	1.8944	0.014410
112.	0.	0.90783	8.7691	8.9638	5.4334	0.245	17.9793	1.8442	0.014225
113.	0.	0.90892	8.7687	8.9638	5.4400	0.282	17.7645	1.7638	0.013833
114.	0.	0.90637	8.7682	8.9638	5.4305	0.324	17.6149	1.7339	0.013915
115.	0.	0.90334	8.7677	8.9638	5.4212	0.368	17.4925	1.7040	0.014039
116.	0.	0.89939	8.7671	8.9638	5.4087	0.418	17.4193	1.6843	0.014287
117.	0.	0.89436	8.7664	8.9638	5.3903	0.469	17.4910	1.6847	0.014738
118.	0.	0.88726	8.7657	8.9638	5.3552	0.521	17.6720	1.7356	0.015573
119.	0.	0.88272	8.7651	8.9638	5.3306	0.570	17.7454	1.7561	0.016052
120.	0.	0.88002	8.7647	8.9638	5.3186	0.613	17.4780	1.7362	0.016160
121.	0.	0.88710	8.7646	8.9638	5.3633	0.686	16.7777	1.5346	0.014587
122.	0.	0.88858	8.7643	8.9638	5.3948	0.801	16.1467	1.3634	0.013407
123.	0.	0.87432	8.7637	8.9638	5.3703	0.916	15.8290	1.3447	0.014675
124.	0.	0.85942	8.7632	8.9638	5.3465	1.017	15.4864	1.3260	0.015996
125.	0.	0.84949	8.7630	8.9638	5.3490	1.128	14.8855	1.2263	0.016282
126.	0.	0.83790	8.7635	8.9638	5.3632	1.254	13.9461	1.0763	0.016333

127.	0.	0.81671	8.7680	8.9638	5.4080	1.286	12.6260	0.8570	0.016951
128.	0.	0.78348	8.7726	8.9638	5.4189	1.161	11.1722	0.6300	0.019957
129.	0.	0.64665	8.7778	8.9638	5.6663	0.125	10.3548	0.4377	0.047735
130.	0.	0.38244	8.8505	8.9638	6.5737	357.855	11.7011	0.2539	0.113933

PART 3: WHAFIS

WHAFIS input: CM-151.dat
WHAFIS output: CM-151.out

PART 3 COMPLETE



WHAFIS Elevation, and Total stillWater Level, transect: CM-151
Transect Profile
SWAN 1-D points
TSWL
Elevation (ft)
Station (ft)
0
2
4
6
8
10
12
14
16
18
20
0
50
100
150
200
250
300
350
400
450
500

```
WAVE HEIGHT COMPUTATIONS FOR FLOOD INSURANCE STUDIES (WHAFIS VERSION 4.0G, 08_2007)
Executed on: Thu Feb 20 14:57:37 2020
Input file:  C:\FEMA-TransectAnalysis\LOMR-TransectAnalysis-Harpswell\3_whafis\whafis4\CM-151.dat
Output file: C:\FEMA-TransectAnalysis\LOMR-TransectAnalysis-Harpswell\3_whafis\whafis4\CM-151.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   -18.358     1.000     1.000     8.918     4.744     8.650    56.140     0.000     0.000
         OF      3.300   -18.358     0.000     8.918     0.000     0.000     0.000     0.000     0.000     0.000
         OF      6.600   -18.358     0.000     8.918     0.000     0.000     0.000     0.000     0.000     0.000
         OF      9.800   -18.358     0.000     8.918     0.000     0.000     0.000     0.000     0.000     0.000
         OF     13.100   -18.358     0.000     8.918     0.000     0.000     0.000     0.000     0.000     0.000
         OF     16.400   -18.358     0.000     8.918     0.000     0.000     0.000     0.000     0.000     0.000
         OF     19.700   -18.358     0.000     8.918     0.000     0.000     0.000     0.000     0.071     0.000
         IF    337.900     4.579     0.000     8.930     0.000     0.000     0.000     0.000     0.068     0.000
         IF    341.200     3.597     0.000     8.952     0.000     0.000     0.000     0.000    -0.253     0.000
         IF    344.500     2.911     0.000     8.961     0.000     0.000     0.000     0.000    -0.156     0.000
         IF    347.800     2.568     0.000     8.965     0.000     0.000     0.000     0.000    -0.119     0.000
         IF    351.000     2.136     0.000     8.968     0.000     0.000     0.000     0.000    -0.069     0.000
         IF    354.300     2.117     0.000     8.968     0.000     0.000     0.000     0.000     0.044     0.000
         IF    357.600     2.424     0.000     8.967     0.000     0.000     0.000     0.000     0.095     0.000
         IF    360.900     2.744     0.000     8.965     0.000     0.000     0.000     0.000     0.047     0.000
         IF    364.200     2.737     0.000     8.965     0.000     0.000     0.000     0.000     0.028     0.000
         IF    367.500     2.930     0.000     8.965     0.000     0.000     0.000     0.000     0.066     0.000
         IF    370.700     3.168     0.000     8.963     0.000     0.000     0.000     0.000     0.054     0.000
         IF    374.000     3.280     0.000     8.964     0.000     0.000     0.000     0.000     0.029     0.000
         IF    377.300     3.361     0.000     8.964     0.000     0.000     0.000     0.000     0.025     0.000
         IF    380.600     3.444     0.000     8.965     0.000     0.000     0.000     0.000     0.012     0.000
         IF    383.900     3.440     0.000     8.966     0.000     0.000     0.000     0.000    -0.026     0.000
         IF    387.100     3.275     0.000     8.969     0.000     0.000     0.000     0.000    -0.037     0.000
         IF    390.400     3.201     0.000     8.971     0.000     0.000     0.000     0.000    -0.001     0.000
         IF    393.700     3.272     0.000     8.971     0.000     0.000     0.000     0.000     0.109     0.000
         IF    397.000     3.918     0.000     8.966     0.000     0.000     0.000     0.000     0.182     0.000
         IF    400.300     4.475     0.000     8.962     0.000     0.000     0.000     0.000     0.096     0.000
         IF    403.500     4.540     0.000     8.966     0.000     0.000     0.000     0.000     0.020     0.000
         IF    406.800     4.604     0.000     8.970     0.000     0.000     0.000     0.000     0.061     0.000
         IF    410.100     4.944     0.000     8.971     0.000     0.000     0.000     0.000     0.127     0.000
         IF    413.400     5.443     0.000     8.972     0.000     0.000     0.000     0.000     0.186     0.000
         IF    416.700     6.170     0.000     8.974     0.000     0.000     0.000     0.000     0.224     0.000
         IF    419.900     6.900     0.000     8.983     0.000     0.000     0.000     0.000     0.225     0.000
         IF    423.200     7.630     0.000     9.075     0.000     0.000     0.000     0.000     0.237     0.000
         IF    426.500     8.468     0.000     9.292     0.000     0.000     0.000     0.000     0.309     0.000
         IF    428.000     9.114     0.000     9.292     0.000     0.000     0.000     0.000     0.458     0.000
         IF    428.300     9.292     0.000     9.292     0.000     0.000     0.000     0.000     0.591     0.000
         ET      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1
             END       END      FETCH SURGE ELEV SURGE ELEV    INITIAL    INITIAL             BOTTOM    AVERAGE
         STATION ELEVATION     LENGTH    10-YEAR  100-YEAR WAVE HEIGHT  W. PERIOD              SLOPE    A-ZONES
  IE       0.000   -18.358      1.000      1.000      8.918      4.744      8.650     56.140      0.000      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  OF       3.300   -18.358      0.000      8.918      0.000      0.000      0.000      0.000      0.000      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  OF       6.600   -18.358      0.000      8.918      0.000      0.000      0.000      0.000      0.000      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  OF       9.800   -18.358      0.000      8.918      0.000      0.000      0.000      0.000      0.000      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  OF      13.100   -18.358      0.000      8.918      0.000      0.000      0.000      0.000      0.000      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  OF      16.400   -18.358      0.000      8.918      0.000      0.000      0.000      0.000      0.000      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  OF      19.700   -18.358      0.000      8.918      0.000      0.000      0.000      0.000      0.071      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     337.900     4.579      0.000      8.930      0.000      0.000      0.000      0.000      0.068      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     341.200     3.597      0.000      8.952      0.000      0.000      0.000      0.000     -0.253      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     344.500     2.911      0.000      8.961      0.000      0.000      0.000      0.000     -0.156      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     347.800     2.568      0.000      8.965      0.000      0.000      0.000      0.000     -0.119      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     351.000     2.136      0.000      8.968      0.000      0.000      0.000      0.000     -0.069      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     354.300     2.117      0.000      8.968      0.000      0.000      0.000      0.000      0.044      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     357.600     2.424      0.000      8.967      0.000      0.000      0.000      0.000      0.095      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     360.900     2.744      0.000      8.965      0.000      0.000      0.000      0.000      0.047      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     364.200     2.737      0.000      8.965      0.000      0.000      0.000      0.000      0.028      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     367.500     2.930      0.000      8.965      0.000      0.000      0.000      0.000      0.066      0.000
             END       END NEW SURGE  NEW SURGE                                                BOTTOM    AVERAGE
         STATION ELEVATION   10-YEAR   100-YEAR                                                 SLOPE    A-ZONES
  IF     370.700     3.168      0.000      8.963      0.000      0.000      0.000      0.000      0.054      0.000
```

	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	374.000	3.280	0.000	8.964	0.000	0.000	0.000	0.000	0.029	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	377.300	3.361	0.000	8.964	0.000	0.000	0.000	0.000	0.025	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	380.600	3.444	0.000	8.965	0.000	0.000	0.000	0.000	0.012	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	383.900	3.440	0.000	8.966	0.000	0.000	0.000	0.000	-0.026	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	387.100	3.275	0.000	8.969	0.000	0.000	0.000	0.000	-0.037	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	390.400	3.201	0.000	8.971	0.000	0.000	0.000	0.000	-0.001	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	393.700	3.272	0.000	8.971	0.000	0.000	0.000	0.000	0.109	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	397.000	3.918	0.000	8.966	0.000	0.000	0.000	0.000	0.182	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	400.300	4.475	0.000	8.962	0.000	0.000	0.000	0.000	0.096	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	403.500	4.540	0.000	8.966	0.000	0.000	0.000	0.000	0.020	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	406.800	4.604	0.000	8.970	0.000	0.000	0.000	0.000	0.061	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	410.100	4.944	0.000	8.971	0.000	0.000	0.000	0.000	0.127	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	413.400	5.443	0.000	8.972	0.000	0.000	0.000	0.000	0.186	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	416.700	6.170	0.000	8.974	0.000	0.000	0.000	0.000	0.224	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	419.900	6.900	0.000	8.983	0.000	0.000	0.000	0.000	0.225	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	423.200	7.630	0.000	9.075	0.000	0.000	0.000	0.000	0.237	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	426.500	8.468	0.000	9.292	0.000	0.000	0.000	0.000	0.309	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	428.000	9.114	0.000	9.292	0.000	0.000	0.000	0.000	0.458	0.000
	END	END	NEW SURGE	NEW SURGE					BOTTOM	AVERAGE
	STATION	ELEVATION	10-YEAR	100-YEAR					SLOPE	A-ZONES
IF	428.300	9.292	0.000	9.292	0.000	0.000	0.000	0.000	0.591	0.000

--END OF TRANSECT--

NOTE:
SURGE ELEVATION INCLUDES CONTRIBUTIONS FROM ASTRONOMICAL AND STORM TIDES.

1

PART2: CONTROLLING WAVE HEIGHTS, SPECTRAL PEAK WAVE PERIOD, AND WAVE CREST ELEVATIONS

LOCATION		CONTROLLING WAVE HEIGHT	SPECTRAL PEAK WAVE PERIOD	WAVE CREST ELEVATION
IE	0.00	4.74	8.65	12.24
OF	3.30	4.75	8.65	12.24
OF	6.60	4.75	8.65	12.24
OF	9.80	4.75	8.65	12.24
OF	13.10	4.75	8.65	12.24
OF	16.40	4.75	8.65	12.24
OF	19.70	4.75	8.65	12.24
	146.98	5.30	8.65	12.63
	258.35	6.16	8.65	13.24
IF	337.90	3.33	8.65	11.26
IF	341.20	3.50	8.65	11.40
IF	344.50	3.61	8.65	11.48
IF	347.80	3.67	8.65	11.53
IF	351.00	3.68	8.65	11.55
IF	354.30	3.68	8.65	11.54
IF	357.60	3.69	8.65	11.55
IF	360.90	3.64	8.65	11.51
IF	364.20	3.64	8.65	11.51
IF	367.50	3.61	8.65	11.49
IF	370.70	3.57	8.65	11.47
IF	374.00	3.56	8.65	11.46
IF	377.30	3.55	8.65	11.45
IF	380.60	3.54	8.65	11.44
IF	383.90	3.54	8.65	11.45
IF	387.10	3.57	8.65	11.47
IF	390.40	3.58	8.65	11.48
IF	393.70	3.57	8.65	11.47
IF	397.00	3.48	8.65	11.40
IF	400.30	3.38	8.65	11.33
IF	403.50	3.37	8.65	11.33
IF	406.80	3.35	8.65	11.31
IF	410.10	3.09	8.65	11.13
IF	413.40	2.71	8.65	10.87
IF	416.70	2.16	8.65	10.49
IF	419.90	1.61	8.65	10.11
IF	423.20	1.12	8.65	9.86
IF	426.50	0.64	8.65	9.74

IF	428.00	0.14	8.65	9.39
IF	428.30	0.01	8.65	9.30

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
337.90	1.00	8.93
341.20	1.00	8.95
344.50	1.00	8.96
347.80	1.00	8.97
351.00	1.00	8.97
357.60	1.00	8.97
360.90	1.00	8.97
370.70	1.00	8.96
374.00	1.00	8.96
380.60	1.00	8.97
383.90	1.00	8.97
387.10	1.00	8.97
390.40	1.00	8.97
397.00	1.00	8.97
400.30	1.00	8.96
403.50	1.00	8.97
406.80	1.00	8.97
410.10	1.00	8.97
413.40	1.00	8.97
416.70	1.00	8.97
419.90	1.00	8.98
423.20	1.00	9.07
426.50	1.00	9.29

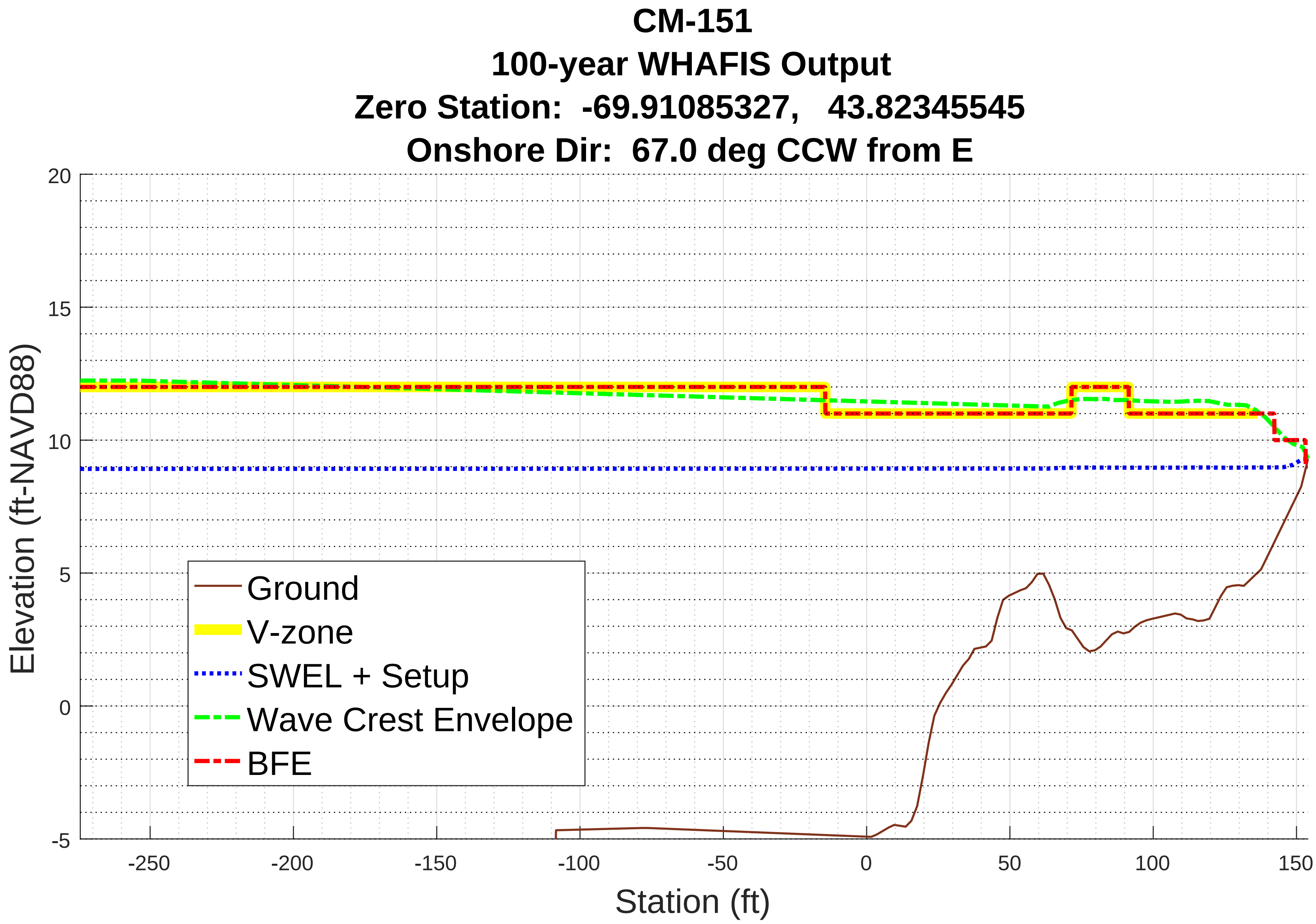
PART5 LOCATION OF V ZONES

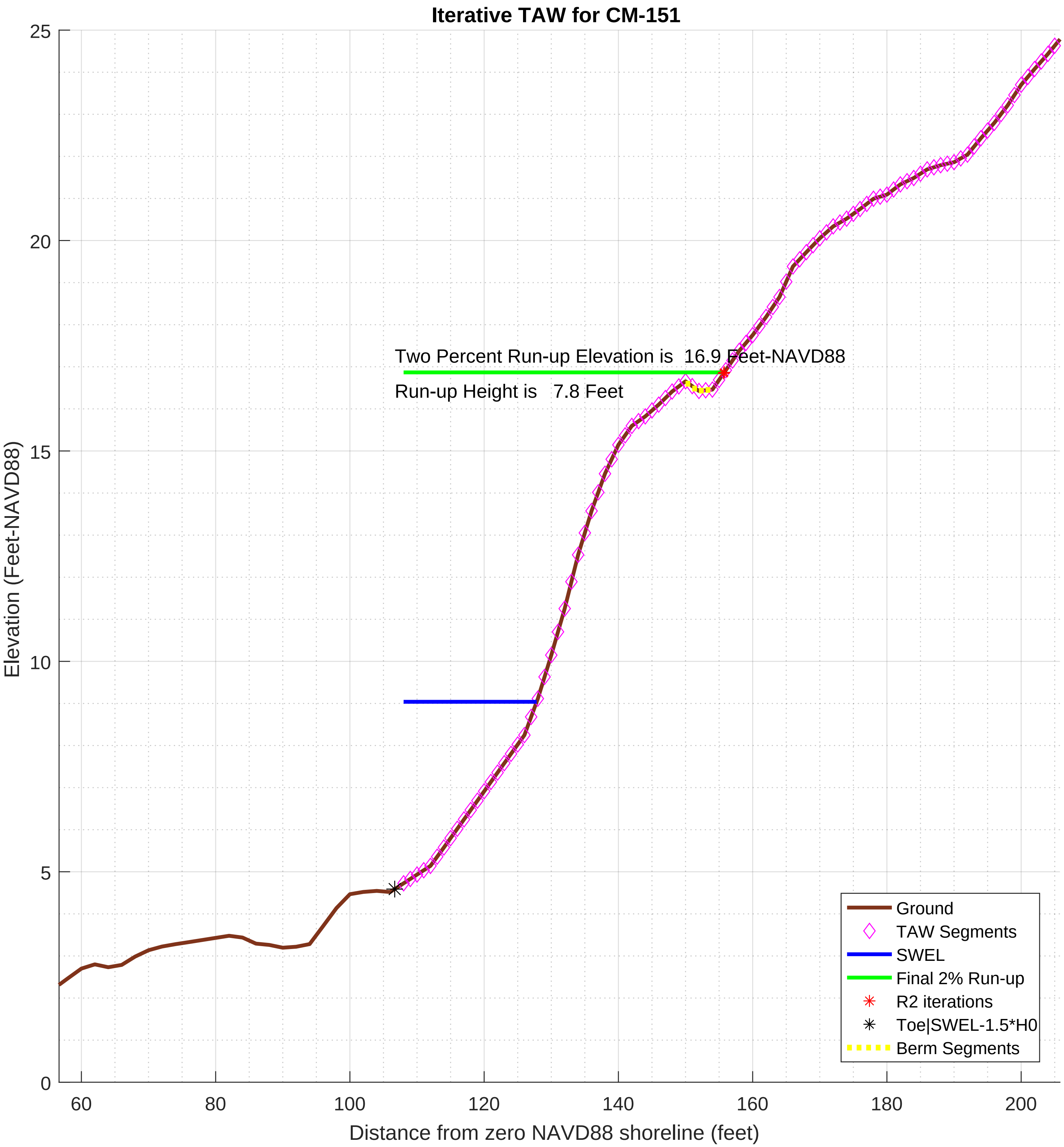
STATION OF GUTTER	LOCATION OF ZONE
410.89	WINDWARD

PART6 NUMBERED A ZONES AND V ZONES

STATION OF GUTTER	ELEVATION	ZONE DESIGNATION	FHF
0.00	12.24		
		V22 EL=12	120
19.70	12.24		
		V22 EL=12	120
104.24	12.50		
		V22 EL=13	120
288.17	12.50		
		V22 EL=12	120
328.40	11.50		
		V22 EL=11	120
337.90	11.26		
		V22 EL=11	120
341.20	11.40		
		V22 EL=11	120
344.50	11.48		
		V22 EL=11	120
345.61	11.50		
		V22 EL=12	120
347.80	11.53		
		V22 EL=12	120
351.00	11.55		
		V22 EL=12	120
354.30	11.54		
		V22 EL=12	120
357.60	11.55		
		V22 EL=12	120
360.90	11.51		
		V22 EL=12	120
366.39	11.50		
		V22 EL=11	120
367.50	11.49		
		V22 EL=11	120
370.70	11.47		
		V22 EL=11	120
374.00	11.46		
		V22 EL=11	120
377.30	11.45		
		V22 EL=11	120
380.60	11.44		
		V22 EL=11	120
383.90	11.45		
		V22 EL=11	120
387.10	11.47		
		V22 EL=11	120
390.40	11.48		
		V22 EL=11	120
393.70	11.47		
		V22 EL=11	120
397.00	11.40		
		V22 EL=11	120
400.30	11.33		
		V22 EL=11	120
403.50	11.33		
		V22 EL=11	120
406.80	11.31		
		V22 EL=11	120
410.10	11.13		
		V22 EL=11	120
410.89	11.07		
		A18 EL=11	90
413.40	10.87		
		A18 EL=11	90
416.59	10.50		
		A18 EL=10	90
416.70	10.49		
		A18 EL=10	90
419.90	10.11		
		A18 EL=10	90

```
                         423.20           9.86
                                                      A18  EL=10      90
                         426.50           9.74
                                                      A18  EL=10      90
                         427.53           9.50
                                                      A18  EL= 9      90
                         428.30           9.30
                              ZONE TERMINATED AT END OF TRANSECT
                              PART 7   POSTSCRIPT NOTES
           PS#  1   START(426724.0833,4852590.9082)
           PS#  2   END(426784.4463,4852732.7827)
-1.000000e+00
```


CM-151
100-year WHAFIS Output
Zero Station: -69.91085327, 43.82345545
Onshore Dir: 67.0 deg CCW from E
Elevation (ft-NAVD88)
Station (ft)
20
15
10
5
0
-5
-250
-200
-150
-100
-50
0
50
100
150
Ground
V-zone
SWEL + Setup
Wave Crest Envelope
BFE



Iterative TAW for CM-151
Two Percent Run-up Elevation is 16.9 Feet-NAVD88
Run-up Height is 7.8 Feet
Elevation (Feet-NAVD88)
Distance from zero NAVD88 shoreline (feet)
0
5
10
15
20
25
60
80
100
120
140
160
180
200
Ground
TAW Segments
SWEL
Final 2% Run-up
R2 iterations
Toe|SWEL-1.5*H0
Berm Segments

```
diary on         % begin recording

% FEMA appeal for The Town of Harpswell, Cumberland county, Maine
% TRANSECT ID: CM-151
% calculation by SJH, Ransom Consulting, Inc. 21-Feb-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-151sta_ele_include.csv';   % file with station, elevation, include
                                      % third colunm is 0 for excluded points
imgname='logfiles/CM-151-runup';
SWEL=8.918;  % 100-yr still water level including wave setup.
H0=2.9153;    % significant wave height at toe of structure
Tp=8.7643;    % 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=0.043986;
maxSetup=0.3738;   % only used in case of berm/shallow foreshore weighted average

plotTitle='Iterative TAW for CM-151'

plotTitle =

Iterative TAW for CM-151



% END CONFIG
%--------------------------------

SWEL=SWEL+setupAtToe

SWEL =

                  8.961986

SWEL_fore=SWEL+maxSetup

SWEL_fore =

                  9.335786



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

L0 =

          324.825569445064


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

Ztoe =

                  4.589036


% 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 =

                 13.334936


% 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 =

          106.674103431609


top_sta =

           135.54037381386

% 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

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

top_sta =

           135.54037381386

toe_sta

toe_sta =

          106.674103431609




% 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 28.4 ft landward of toe of slope


ans =

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


ans =

-!!-       setup is adjusted to 0.12 feet


ans =

-!!-       SWEL is adjusted to 9.04 feet


k =

     1
     2
     3
     4
     5
     6
     7
     8




% 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*gam
   TAW_VALID=0;
else
   sprintf('!!! - - Iribaren number: %6.2f is in the valid range (0.5-10), TAW RECOMMENDED - - !!!\n', Irb*gamma_
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 ber
       % 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 =
                  4.589036
toe_sta =
          106.674103431609
top_sta =
           135.54037381386
Z2 =
                 13.334936
H0 =
                    2.9153
Tp =
                    8.7643
T0 =
          7.96754545454545
R2 =
                    8.7459
Z2 =
           17.785316458269
top_sta =
          160.151002121616
Lslope =
          53.4768986900064
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 43
dh =
         -7.55828354173097
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 44
dh =
         -7.44348354173097
rdh_sum =
     2
```

```
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 45
dh =
        -7.39425854173097
rdh_sum =
     3
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 46
dh =
        -7.41060854173097
rdh_sum =
     4
ans =
!------- End Berm Factor Calculation, Iter: 1 ---------!
berm_width =
     4
rB =
       0.0747986532126162
rdh_mean =
     1
gamma_berm =
     1
slope =
        0.266715998934155
Irb =
         2.81535098626894
gamma_berm =
     1
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                      0.8
gamma =
                      0.8
ans =
!!! - - Iribaren number:   2.82 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 =
            7.80467211404
R2del =
        0.941227885959997
Z2 =
          16.844088572309
top_sta =
          155.67595471144
ans =
!----------------- STARTING ITERATION 2 -----------------!
Ztoe =
                 4.589036
toe_sta =
         106.674103431609
top_sta =
          155.67595471144
Z2 =
          16.844088572309
H0 =
                   2.9153
Tp =
                   8.7643
T0 =
         7.96754545454545
R2 =
            7.80467211404
Z2 =
          16.844088572309
top_sta =
          155.67595471144
Lslope =
         49.0018512798304
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 43
dh =
        -7.55828354173097
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 44
dh =
        -7.44348354173097
rdh_sum =
     2
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 45
dh =
        -7.39425854173097
rdh_sum =
     3
```

```
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 46
dh =
        -7.41060854173097
rdh_sum =
     4
ans =
!------- End Berm Factor Calculation, Iter: 2 ---------!
berm_width =
     4
rB =
       0.0816295689964358
rdh_mean =
     1
gamma_berm =
     1
slope =
        0.272323298348432
Irb =
         2.87453947139686
gamma_berm =
     1
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                      0.8
gamma =
                      0.8
ans =
!!! - - Iribaren number:   2.87 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 =
         7.82768753698293
R2del =
       0.0230154229429278
Z2 =
          16.867103995252
top_sta =
         155.775913117272
ans =
!----------------- STARTING ITERATION 3 -----------------!
Ztoe =
                 4.589036
toe_sta =
         106.674103431609
top_sta =
         155.775913117272
Z2 =
          16.867103995252
H0 =
                   2.9153
Tp =
                   8.7643
T0 =
         7.96754545454545
R2 =
         7.82768753698293
Z2 =
          16.867103995252
top_sta =
         155.775913117272
Lslope =
         49.1018096856629
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 43
dh =
        -7.55828354173097
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 44
dh =
        -7.44348354173097
rdh_sum =
     2
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 45
dh =
        -7.39425854173097
rdh_sum =
     3
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 46
dh =
        -7.41060854173097
rdh_sum =
     4
```

```
ans =
!------- End Berm Factor Calculation, Iter: 3 ---------!
berm_width =
     4
rB =
        0.0814633926042027
rdh_mean =
     1
gamma_berm =
     1
slope =
         0.272230051982924
Irb =
          2.87355519880673
gamma_berm =
     1
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
                       0.8
ans =
!!! - - Iribaren number:   2.87 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 =
          7.82731062690426
R2del =
      0.000376910078670356
Z2 =
          16.8667270851733
top_sta =
          155.774276157104
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
          16.8667270851733
diary off
diary on         % begin recording
% FEMA appeal for The Town of Harpswell, Cumberland county, Maine
% TRANSECT ID: CM-151
% calculation by SJH, Ransom Consulting, Inc. 21-Feb-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-151sta_ele_include.csv';   % file with station, elevation, include
                                      % third colunm is 0 for excluded points
imgname='logfiles/CM-151-runup';
SWEL=8.918;  % 100-yr still water level including wave setup.
H0=2.9153;    % significant wave height at toe of structure
Tp=8.7643;    % 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=0.043986;
maxSetup=0.3738;   % only used in case of berm/shallow foreshore weighted average
plotTitle='Iterative TAW for CM-151'
plotTitle =
Iterative TAW for CM-151
% END CONFIG
%------------------------------
```

```
SWEL=SWEL+setupAtToe
SWEL =
                  8.961986
SWEL_fore=SWEL+maxSetup
SWEL_fore =
                  9.335786
% FIND WAVELENGTH USING DEEPWATER DISPERSION RELATION
% using English units
L0=32.15/(2*pi)*T0^2
L0 =
          324.825569445064
% 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 consitent with TAW guidance should be performed
% prior to the input of the significant wave height given above.
Ztoe=SWEL-1.5*H0
Ztoe =
                  4.589036
% 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 =
                 13.334936
% 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 =
          106.674103431609
top_sta =
           135.54037381386
% 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
% just so the reader can tell the values aren't -999 anymore
top_sta
top_sta =
           135.54037381386
toe_sta
toe_sta =
          106.674103431609
% 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 28.4 ft landward of toe of slope
ans =
-!!- Setup is interpolated between setup at toe of slope and max setup
ans =
-!!-       setup is adjusted to 0.12 feet
ans =
-!!-       SWEL is adjusted to 9.04 feet
k =
     1
     2
     3
     4
     5
     6
     7
     8
% 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*gam
   TAW_VALID=0;
else
   sprintf('!!! - - Iribaren number: %6.2f is in the valid range (0.5-10), TAW RECOMMENDED - - !!!\n', Irb*gamma_
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 ber
   % 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 =
                  4.589036
toe_sta =
          106.674103431609
top_sta =
           135.54037381386
Z2 =
                 13.334936
H0 =
                    2.9153
Tp =
                    8.7643
T0 =
          7.96754545454545
R2 =
                    8.7459
Z2 =
           17.785316458269
top_sta =
          160.151002121616
Lslope =
          53.4768986900064
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 43
dh =
         -7.55828354173097
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 44
dh =
         -7.44348354173097
rdh_sum =
     2
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 45
dh =
         -7.39425854173097
rdh_sum =
     3
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 46
dh =
         -7.41060854173097
rdh_sum =
     4
ans =
!------- End Berm Factor Calculation, Iter: 1 ---------!
berm_width =
     4
rB =
        0.0747986532126162
rdh_mean =
     1
gamma_berm =
     1
slope =
         0.266715998934155
Irb =
          2.81535098626894
gamma_berm =
     1
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
```

```
                       0.8
ans =
!!! - - Iribaren number:   2.82 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 =
             7.80467211404
R2del =
         0.941227885959997
Z2 =
           16.844088572309
top_sta =
           155.67595471144
ans =
!----------------- STARTING ITERATION 2 -----------------!
Ztoe =
                  4.589036
toe_sta =
          106.674103431609
top_sta =
           155.67595471144
Z2 =
           16.844088572309
H0 =
                    2.9153
Tp =
                    8.7643
T0 =
          7.96754545454545
R2 =
             7.80467211404
Z2 =
           16.844088572309
top_sta =
           155.67595471144
Lslope =
          49.0018512798304
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 43
dh =
         -7.55828354173097
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 44
dh =
         -7.44348354173097
rdh_sum =
     2
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 45
dh =
         -7.39425854173097
rdh_sum =
     3
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 46
dh =
         -7.41060854173097
rdh_sum =
     4
ans =
!------- End Berm Factor Calculation, Iter: 2 ---------!
berm_width =
     4
rB =
        0.0816295689964358
rdh_mean =
     1
gamma_berm =
     1
slope =
         0.272323298348432
Irb =
          2.87453947139686
gamma_berm =
     1
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
                       0.8
ans =
!!! - - Iribaren number:   2.87 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 =
```

```
          7.82768753698293
R2del =
        0.0230154229429278
Z2 =
           16.867103995252
top_sta =
          155.775913117272
ans =
!----------------- STARTING ITERATION 3 -----------------!
Ztoe =
                  4.589036
toe_sta =
          106.674103431609
top_sta =
          155.775913117272
Z2 =
           16.867103995252
H0 =
                    2.9153
Tp =
                    8.7643
T0 =
          7.96754545454545
R2 =
          7.82768753698293
Z2 =
           16.867103995252
top_sta =
          155.775913117272
Lslope =
          49.1018096856629
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 43
dh =
         -7.55828354173097
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 44
dh =
         -7.44348354173097
rdh_sum =
     2
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 45
dh =
         -7.39425854173097
rdh_sum =
     3
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 46
dh =
         -7.41060854173097
rdh_sum =
     4
ans =
!------- End Berm Factor Calculation, Iter: 3 ---------!
berm_width =
     4
rB =
        0.0814633926042027
rdh_mean =
     1
gamma_berm =
     1
slope =
         0.272230051982924
Irb =
          2.87355519880673
gamma_berm =
     1
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
                       0.8
ans =
!!! - - Iribaren number:   2.87 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 =
          7.82731062690426
R2del =
      0.000376910078670356
Z2 =
          16.8667270851733
top_sta =
```

```
          155.774276157104
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
          16.8667270851733
diary off
-1.000000e+00
```

PART 5: RUNUP2

for transect: CM-151

Station locations shifted by: -0.46 feet from their original location to set the shoreline to elevation 0 for RUNUP2 input

RUNUP2 INPUT CONVERSIONS

for transect: CM-151

Incident significant wave height: 2.96 feet

Peak wave period: 8.65 seconds

Mean wave height: 1.86 feet

Local Depth below SWEL: 27.28 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 Jersy

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

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

```
    Depth, D = 27.28
    Period, T = 7.35
    Waveheight, H = 1.86
Deep water wavelength, L0 (ft)
    L0 = g*T*T/twopi
    L0 = 32.17*7.35*7.35/6.28 = 276.85
Deep water wave celerity, C0 (ft/s)
    C0 = L0/T
    C0 = 276.85/7.35 = 37.65
Angular frequency, sigma (rad/s)
    sigma = twopi/T
    sigma = 6.28/7.35 = 0.85
Hunts (1979) approximation for Celerity C1H (ft/s) at Depth D (ft)
    y = sigma.*sigma.*D./g
    y = 0.85*0.85*27.28/32.17 = 0.62
    C1H = sqrt( g.*D./(y+1./(1 + 0.6522.*y + 0.4622.*y.^2 + 0.0864.*y.^4 +0.0675.*y.^5)) )
    C1H = 26.56
Shoaling Coefficient KsH
    KsH = sqrt(C0/C1H)
    KsH = sqrt(37.65/26.56) = 1.19
Deepwater Wave Height H0_H (ft)
    H0_H = H/KsH
    H0_H = 1.86/1.19 = 1.56
```

Deepwater mean wave height: 1.56 feet

END RUNUP2 CONVERSIONS

RUNUP2 RESULTS

for transect: CM-151

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:
1.48
1.48
1.48
1.56
1.56
1.56
1.64
1.64
1.64

RUNUP2 mean wave periods:
6.99
7.35
7.72
6.99
7.35
7.72
6.99
7.35
7.72

RUNUP2 runup above SWEL:
4.36
4.41
4.49
4.61
4.58
4.67
4.78
4.83
4.90

RUNUP2 Mean runup height above SWEL: 4.63 feet

RUNUP2 2-percent runup height above SWEL: 10.18 feet

RUNUP2 2-percent runup elevation: 19.08 feet-NAVD88

RUNUP2 Messages:
Nonfatal Error, Check Output

______________END RUNUP2 RESULTS_______________________

________________ACES BEACH RUNUP_______________________

Incident significant wave height: 2.96 feet

Significant wave height deshoaled using Hunt equation

Deepwater significant wave height: 2.18 feet

Peak wave period: 8.65 seconds

Average beach Slope: 1:12.34 (H:V)

ACES RUNUP CALCULATED USING ’Aces_Beach_Runup.m’

ACES Beach 2-percent runup height above SWEL: 4.27 feet

ACES Beach 2-percent runup elevation: 13.17 feet-NAVD88

ACES BEACH RUNUP is valid

_____________END ACES BEACH RESULTS____________________

PART 5 COMPLETE____

```
  FEMA                                                         sjh            job 2
  RUNUP2 transect: CM-151                                                         1
14.0
  -18.36 -299.5 0.8
  -18.36 -171.5 0.8
  -13.44 -135.5 0.8
  -4.67 -133.5 0.8
  -4.59 -19.5  0.8
  -3.77 -7.5   0.8
  -0.37 -1.5   0.8
  4.97  34.5   0.8
  4.98  110.5  0.8
  8.25  126.5  0.8
  14.46 138.5  0.8
  20.34 172.5  0.8
  26.24 222.5  0.8
  30.76 244.5  0.8
  31.53 256.5  0.8
  31.53 326.5  0.8
  33.85 344.5  0.8
  34.18 372.5  0.8
  38.36 384.5  0.8
1 46.49 500.5  0.8
 8.9   1.48  6.99
 8.9   1.48  7.35
 8.9   1.48  7.72
 8.9   1.56  6.99
 8.9   1.56  7.35
 8.9   1.56  7.72
 8.9   1.64  6.99
 8.9   1.64  7.35
 8.9   1.64  7.72
```

****

CROSS SECTION PROFILE

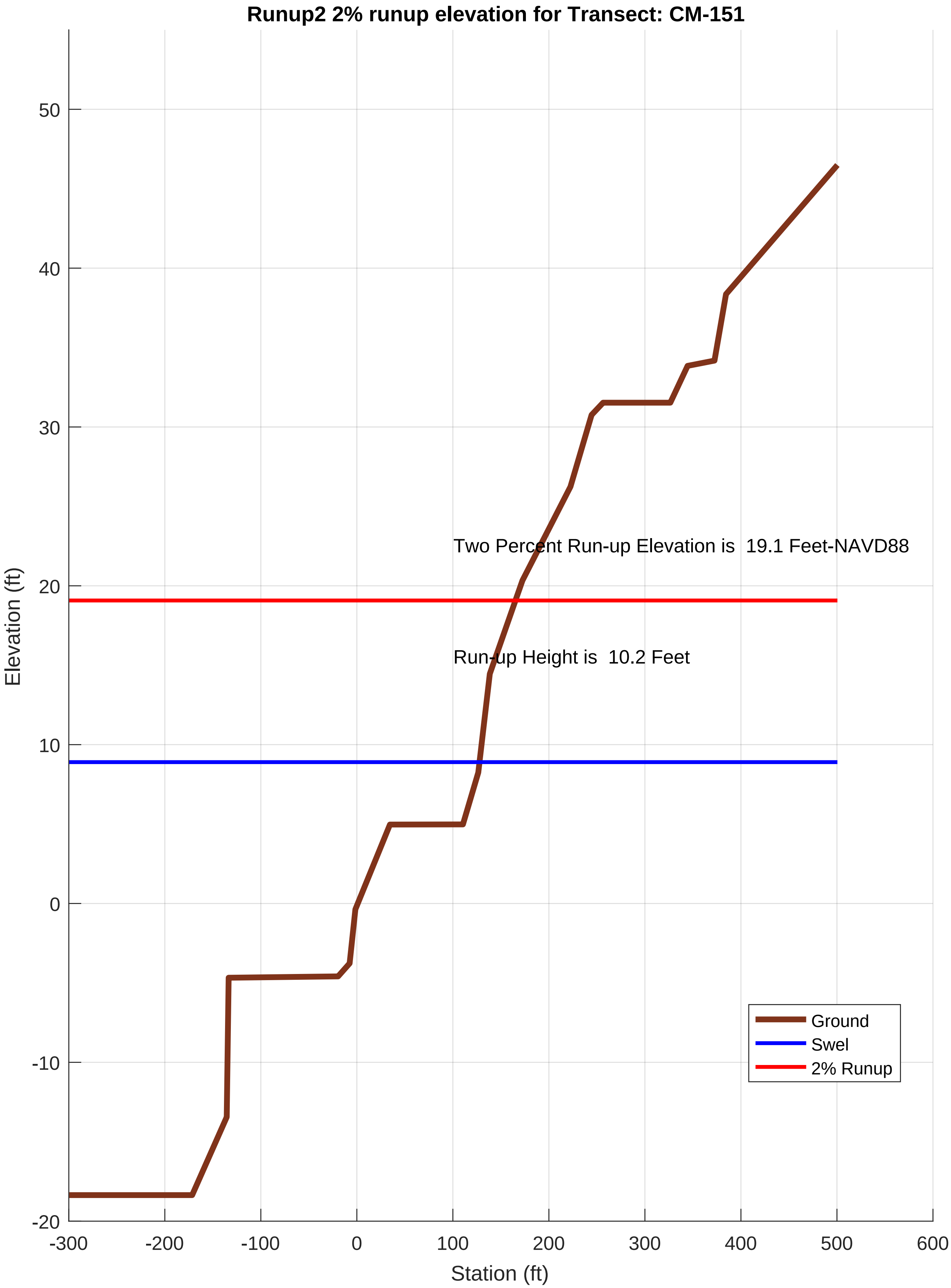
	LENGTH	ELEV.	SLOPE	ROUGHNESS
1	-299.0	-18.3		
			.00	.80
2	-171.0	-18.3		
			7.35	.80
3	-135.0	-13.4		
			.17	.80
4	-133.5	-4.7		
			FLAT	.80
5	-19.5	-4.6		
			14.63	.80
6	-7.5	-3.8		
			1.76	.80
7	-1.5	-.4		
			6.74	.80
8	34.5	5.0		
			FLAT	.80
9	110.5	5.0		
			4.89	.80
10	126.5	8.3		
			1.93	.80
11	138.5	14.5		
			5.78	.80
12	172.5	20.4		
			8.47	.80
13	222.5	26.3		
			4.87	.80
14	244.5	30.8		
			15.58	.80
15	256.5	31.5		
			FLAT	.80
16	326.5	31.5		
			7.76	.80
17	344.5	33.9		
			84.85	.80
18	372.5	34.2		
			2.87	.80
19	384.5	38.4		
			14.27	.80
20	500.5	46.5		

LAST SLOPE 14.00 LAST ROUGHNESS .80

****

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	1.48	6.99	9	10	4.36	2.36
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.48	7.35	9	10	4.41	2.41
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.48	7.72	9	10	4.49	2.46
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.56	6.99	9	10	4.61	2.45
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.56	7.35	9	10	4.58	2.51
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.56	7.72	9	10	4.67	2.56
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.64	6.99	9	10	4.78	2.55
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.64	7.35	9	10	4.83	2.61
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						
8.90	1.64	7.72	9	10	4.90	2.67
COMPOSITE SLOPE USED BUT WAVE MAY REFLECT, NOT BREAK						



Runup2 2% runup elevation for Transect: CM-151
Two Percent Run-up Elevation is 19.1 Feet-NAVD88
Run-up Height is 10.2 Feet
Elevation (ft)
Station (ft)
50
40
30
20
10
0
-10
-20
-300
-200
-100
0
100
200
300
400
500
600
Ground
Swel
2% Runup