```
diary on         % begin recording

% FEMA appeal for The Town of Harpswell, Cumberland county, Maine
% TRANSECT ID: CM-124
% calculation by SJH, Ransom Consulting, Inc. 20-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-124sta_ele_include.csv';   % file with station, elevation, include
                                    % third colunm is 0 for excluded points
imgname='logfiles/CM-124-runup';
SWEL=9.0068;  % 100-yr still water level including wave setup.
H0=4.0078;    % significant wave height at toe of structure
Tp=5.0362;    % peak period, 1/fma,
T0=Tp/1.1;

gamma_berm=0.93753;   % this may get changed automatically below
gamma_rough=0.8;
gamma_beta=1;
gamma_perm=1;

setupAtToe=-0.01648;
maxSetup=0.27738;   % only used in case of berm/shallow foreshore weighted average

plotTitle='Iterative TAW for CM-124'

plotTitle =

Iterative TAW for CM-124



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

SWEL=SWEL+setupAtToe

SWEL =

                   8.99032

SWEL_fore=SWEL+maxSetup

SWEL_fore =

                    9.2677



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

L0 =

          107.256019656912


% 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 =

                    2.97862


% 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 =

                   15.00202


% 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 =

          14.0074162679426


top_sta =

          75.7719774011299

% 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 =

          75.7719774011299

toe_sta

toe_sta =

          14.0074162679426




% 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 78.5 ft landward of toe of slope


ans =

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


ans =

-!!-       setup is adjusted to 0.18 feet


ans =

-!!-       SWEL is adjusted to 9.19 feet


k =

     1
     2
     3
     4
     5
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    55
```

```
% 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
```

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   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 =
                    2.97862
toe_sta =
           14.0074162679426
top_sta =
           75.7719774011299
Z2 =
                   15.00202
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
           4.57836363636364
R2 =
                    12.0234
Z2 =
           21.2084110080735
top_sta =
           142.187032741139
Lslope =
           128.179616473196
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 1
dh =
           5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 2
dh =
           5.90793600807348
rdh_sum =
           1.68529921251834
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 3
dh =
           5.85518600807348
rdh_sum =
           2.51651234959337
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 4
dh =
           5.80243600807348
rdh_sum =
           3.33991132389942
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 5
dh =
           5.74968600807348
rdh_sum =
           4.15535790775132
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 12
dh =
           3.71458600807348
rdh_sum =
           4.59802330632674
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 13
dh =
           3.65633600807348
rdh_sum =
           5.02936483654619
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 38
dh =
          -2.25383899192652
rdh_sum =
           5.11359008446356
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 39
dh =
          -2.31933899192652
rdh_sum =
           5.20262911248105
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 44
dh =
          -3.55743899192652
rdh_sum =
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```
          5.40352056658974
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          5.61052875058848
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 68
dh =
         -6.56881399192652
rdh_sum =
           6.1830553769251
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 69
dh =
         -6.61666399192652
rdh_sum =
           6.7617614132431
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 70
dh =
         -6.61711399192652
rdh_sum =
           7.3405255062519
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 71
dh =
         -6.57016399192652
rdh_sum =
           7.91322663326668
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 76
dh =
         -7.32236399192652
rdh_sum =
           8.58113002076043
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 77
dh =
         -7.37871399192652
rdh_sum =
           9.2559492991577
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 78
dh =
         -7.40946399192652
rdh_sum =
           9.93452666767695
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 79
dh =
         -7.41461399192652
rdh_sum =
           10.6137323194366
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 80
dh =
         -7.41976399192652
rdh_sum =
           11.2935659299397
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 81
dh =
         -7.42491399192652
rdh_sum =
           11.9740271735523
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 82
dh =
         -7.43006399192652
rdh_sum =
           12.655115723504
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 83
dh =
         -7.43521399192652
rdh_sum =
           13.3368312518885
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 84
dh =
         -7.46481399192652
rdh_sum =
           14.0221439691922
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 85
dh =
         -7.51886399192652
rdh_sum =
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```
          14.7139964487974
ans =
!------- End Berm Factor Calculation, Iter: 1 ---------!
berm_width =
    25
rB =
          0.195038811067341
rdh_mean =
          0.588559857951894
gamma_berm =
           0.91975320386956
slope =
          0.176680158651386
Irb =
          0.913998742198735
gamma_berm =
           0.91975320386956
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                        0.8
gamma =
          0.735802563095648
ans =
!!! - - Iribaren number:   0.84 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.7 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          4.77074497685901
R2del =
          7.25265502314099
Z2 =
          13.9557559849325
top_sta =
          66.0577090979284
ans =
!----------------- STARTING ITERATION 2 -----------------!
Ztoe =
                    2.97862
toe_sta =
          14.0074162679426
top_sta =
          66.0577090979284
Z2 =
          13.9557559849325
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          4.77074497685901
Z2 =
          13.9557559849325
top_sta =
          66.0577090979284
Lslope =
          52.0502928299858
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
     1
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
     2
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
     3
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
     4
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
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     5
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 12
dh =
         3.71458600807348
rdh_sum =
         5.44266539857542
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 13
dh =
         3.65633600807348
rdh_sum =
         5.87400692879487
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 38
dh =
        -2.25383899192652
rdh_sum =
         6.33075224587892
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 39
dh =
        -2.31933899192652
rdh_sum =
         6.80901652877687
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 44
dh =
        -3.55743899192652
rdh_sum =
         7.65773609552121
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 45
dh =
        -3.61553899192652
rdh_sum =
         8.51990634851971
ans =
!------- End Berm Factor Calculation, Iter: 2 ---------!
berm_width =
    11
rB =
         0.211334065610923
rdh_mean =
         0.774536940774519
gamma_berm =
         0.952351975048803
slope =
         0.267407008042439
Irb =
         1.38334531093653
gamma_berm =
         0.952351975048803
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                      0.8
gamma =
         0.761881580039042
ans =
!!! - - Iribaren number:   1.32 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 =
         7.47648357251724
R2del =
         2.70573859565823
Z2 =
         16.6614945805907
top_sta =
         100.715903433686
ans =
!----------------- STARTING ITERATION 3 -----------------!
Ztoe =
                   2.97862
toe_sta =
         14.0074162679426
top_sta =
         100.715903433686
Z2 =
         16.6614945805907
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
         4.57836363636364
R2 =
```

```
          7.47648357251724
Z2 =
          16.6614945805907
top_sta =
          100.715903433686
Lslope =
          86.7084871657431
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.23732663156932
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.45656775096638
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
           5.9186172970621
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.39284843086715
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 68
dh =
         -6.56881399192652
rdh_sum =
          7.35692028387383
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 69
dh =
         -6.61666399192652
rdh_sum =
          8.32464010409872
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 70
dh =
         -6.61711399192652
rdh_sum =
```

```
           9.2923933360374
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 71
dh =
         -6.57016399192652
rdh_sum =
           10.256570688621
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 76
dh =
         -7.32236399192652
rdh_sum =
           11.2555224897684
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 77
dh =
         -7.37871399192652
rdh_sum =
           12.2551005535862
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 78
dh =
         -7.40946399192652
rdh_sum =
           13.2549022635925
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 79
dh =
         -7.41461399192652
rdh_sum =
              14.2547332729
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 80
dh =
         -7.41976399192652
rdh_sum =
           15.2545912408303
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 81
dh =
         -7.42491399192652
rdh_sum =
           16.2544738265789
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 82
dh =
         -7.43006399192652
rdh_sum =
           17.254378689226
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 83
dh =
         -7.43521399192652
rdh_sum =
           18.2543034877474
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 84
dh =
         -7.46481399192652
rdh_sum =
           19.2542974701407
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 85
dh =
         -7.51886399192652
rdh_sum =
           20.2542182138319
ans =
!------- End Berm Factor Calculation, Iter: 3 ---------!
berm_width =
    25
rB =
         0.288322410148992
rdh_mean =
         0.810168728553277
gamma_berm =
         0.945267390294833
slope =
         0.221734079201129
Irb =
           1.14707090507153
gamma_berm =
         0.945267390294833
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
```

```
         0.756213912235867
ans =
!!! - - Iribaren number:   1.08 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.15338706735624
R2del =
          1.32309650516099
Z2 =
          15.3383980754297
top_sta =
          79.5739895528782
ans =
!----------------- STARTING ITERATION 4 -----------------!
Ztoe =
                    2.97862
toe_sta =
          14.0074162679426
top_sta =
          79.5739895528782
Z2 =
          15.3383980754297
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          6.15338706735624
Z2 =
          15.3383980754297
top_sta =
          79.5739895528782
Lslope =
          65.5665732849356
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32543585118557
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
```

```
          5.63688451650779
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.25837685704887
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.89420052285582
ans =
!------- End Berm Factor Calculation, Iter: 4 ---------!
berm_width =
    11
rB =
         0.167768413825697
rdh_mean =
         0.626745502077802
gamma_berm =
         0.937379684930286
slope =
         0.226508232629699
Irb =
          1.17176847305021
gamma_berm =
         0.937379684930286
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.749903747944229
ans =
!!! - - Iribaren number:   1.10 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
           6.2334235927585
R2del =
        0.0800365254022593
Z2 =
          15.418434600832
top_sta =
         80.4786274825549
ans =
!----------------- STARTING ITERATION 5 -----------------!
Ztoe =
                   2.97862
toe_sta =
         14.0074162679426
top_sta =
         80.4786274825549
Z2 =
          15.418434600832
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
         4.57836363636364
R2 =
           6.2334235927585
Z2 =
          15.418434600832
top_sta =
         80.4786274825549
Lslope =
         66.4712112146123
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 1
dh =
         5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 2
dh =
         5.90793600807348
rdh_sum =
         1.68529921251834
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 3
dh =
         5.85518600807348
rdh_sum =
```

```
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.31871335178303
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.62314327343593
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.23329290303733
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.85767452013856
ans =
!------- End Berm Factor Calculation, Iter: 5 ---------!
berm_width =
    11
rB =
         0.165485174694423
rdh_mean =
         0.623424956376232
gamma_berm =
         0.937682413120361
slope =
         0.224257129571295
Irb =
          1.16012310562669
gamma_berm =
         0.937682413120361
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                      0.8
gamma =
         0.750145930496289
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.17346714806519
R2del =
         0.059956444693313
Z2 =
          15.3584781561387
top_sta =
           79.800883120211
ans =
!----------------- STARTING ITERATION 6 -----------------!
Ztoe =
                   2.97862
toe_sta =
```

```
          14.0074162679426
top_sta =
           79.800883120211
Z2 =
          15.3584781561387
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
          4.57836363636364
R2 =
          6.17346714806519
Z2 =
          15.3584781561387
top_sta =
           79.800883120211
Lslope =
          65.7934668522684
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32372861885355
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.63339508814312
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.25202006380348
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
           6.8849521571759
ans =
!------- End Berm Factor Calculation, Iter: 6 ---------!
berm_width =
    11
rB =
```

```
         0.167189852218902
rdh_mean =
         0.625904741561446
gamma_berm =
         0.937455069025866
slope =
         0.225936756101173
Irb =
          1.16881212055282
gamma_berm =
         0.937455069025866
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.749964055220693
ans =
!!! - - Iribaren number:   1.10 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.21819679533891
R2del =
        0.0447296472737149
Z2 =
          15.4032078034124
top_sta =
           80.306476013707
ans =
!----------------- STARTING ITERATION 7 -----------------!
Ztoe =
                    2.97862
toe_sta =
          14.0074162679426
top_sta =
           80.306476013707
Z2 =
          15.4032078034124
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          6.21819679533891
Z2 =
          15.4032078034124
top_sta =
           80.306476013707
Lslope =
          66.2990597457644
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
```

```
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.31997549536028
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.62572339697241
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.23801322884716
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.86455451957334
ans =
!------- End Berm Factor Calculation, Iter: 7 ---------!
berm_width =
    11
rB =
          0.165914871827466
rdh_mean =
          0.624050410870303
gamma_berm =
          0.937624372105958
slope =
          0.224679910662749
Irb =
           1.16231022945975
gamma_berm =
          0.937624372105958
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                        0.8
gamma =
          0.750099497684766
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.18472283833895
R2del =
         0.0334739569999538
Z2 =
          15.3697338464124
top_sta =
          79.9280660611574
ans =
!----------------- STARTING ITERATION 8 -----------------!
Ztoe =
                    2.97862
toe_sta =
          14.0074162679426
top_sta =
          79.9280660611574
Z2 =
          15.3697338464124
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          6.18472283833895
Z2 =
          15.3697338464124
top_sta =
          79.9280660611574
Lslope =
```

```
          65.9206497932148
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32277774503648
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.63145150826817
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.24847554977824
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.87979292493756
ans =
!------- End Berm Factor Calculation, Iter: 8 ---------!
berm_width =
    11
rB =
         0.166867287177928
rdh_mean =
         0.625435720448869
gamma_berm =
         0.937497474797548
slope =
         0.225618485816664
Irb =
          1.16716565021942
gamma_berm =
         0.937497474797548
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
```

```
         0.749997979838038
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.20971829316299
R2del =
         0.024995454824043
Z2 =
          15.3947293012365
top_sta =
          80.2106195730523
ans =
!----------------- STARTING ITERATION 9 -----------------!
Ztoe =
                    2.97862
toe_sta =
          14.0074162679426
top_sta =
          80.2106195730523
Z2 =
          15.3947293012365
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          6.20971829316299
Z2 =
          15.3947293012365
top_sta =
          80.2106195730523
Lslope =
          66.2032033051097
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32068166453571
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
```

```
           5.6271669321714
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 44
dh =
          -3.55743899192652
rdh_sum =
           6.24065206866503
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 45
dh =
          -3.61553899192652
rdh_sum =
           6.86839939276392
ans =
!------- End Berm Factor Calculation, Iter: 9 ---------!
berm_width =
    11
rB =
          0.166155102031913
rdh_mean =
           0.62439994479672
gamma_berm =
          0.937592134504507
slope =
          0.224916464224228
Irb =
           1.16353396425433
gamma_berm =
          0.937592134504507
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                        0.8
gamma =
          0.750073707603605
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
           6.19102153664942
R2del =
         0.0186967565135712
Z2 =
           15.3760325447229
top_sta =
           79.9992377934792
ans =
!----------------- STARTING ITERATION 10 -----------------!
Ztoe =
                    2.97862
toe_sta =
           14.0074162679426
top_sta =
           79.9992377934792
Z2 =
           15.3760325447229
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
           4.57836363636364
R2 =
           6.19102153664942
Z2 =
           15.3760325447229
top_sta =
           79.9992377934792
Lslope =
           65.9918215255366
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 1
dh =
           5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 2
dh =
           5.90793600807348
rdh_sum =
           1.68529921251834
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 3
dh =
           5.85518600807348
rdh_sum =
```

```
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32224753464781
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.63036773692922
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.24649788064329
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.87691357840472
ans =
!------- End Berm Factor Calculation, Iter: 10 ---------!
berm_width =
    11
rB =
         0.166687321939483
rdh_mean =
         0.625173961673156
gamma_berm =
         0.937521251478112
slope =
         0.225441023788709
Irb =
          1.16624760672445
gamma_berm =
         0.937521251478112
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                      0.8
gamma =
         0.75001700118249
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.20499135561615
R2del =
        0.0139698189667223
Z2 =
          15.3900023636896
top_sta =
          80.1571776561857
ans =
!----------------- STARTING ITERATION 11 -----------------!
Ztoe =
                  2.97862
toe_sta =
```

```
          14.0074162679426
top_sta =
          80.1571776561857
Z2 =
          15.3900023636896
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
          4.57836363636364
R2 =
          6.20499135561615
Z2 =
          15.3900023636896
top_sta =
          80.1571776561857
Lslope =
          66.1497613882431
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32107642585591
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.62797388076203
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.24212654504153
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.87054734274568
ans =
!------- End Berm Factor Calculation, Iter: 11 ---------!
berm_width =
    11
rB =
```

```
         0.166289337544837
rdh_mean =
          0.62459521297688
gamma_berm =
         0.937574186654765
slope =
          0.22504870467736
Irb =
          1.16421806828024
gamma_berm =
         0.937574186654765
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.750059349323812
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.19454298901956
R2del =
        0.0104483665965871
Z2 =
           15.379553997093
top_sta =
          80.0390502780445
ans =
!----------------- STARTING ITERATION 12 -----------------!
Ztoe =
                    2.97862
toe_sta =
          14.0074162679426
top_sta =
          80.0390502780445
Z2 =
           15.379553997093
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          6.19454298901956
Z2 =
           15.379553997093
top_sta =
          80.0390502780445
Lslope =
          66.0316340101019
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
```

```
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32195169871213
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.62976302869064
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
           6.2453940367829
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.87530622910836
ans =
!------- End Berm Factor Calculation, Iter: 12 ---------!
berm_width =
    11
rB =
          0.16658682107302
rdh_mean =
         0.625027839009851
gamma_berm =
          0.93753457970977
slope =
         0.225341918701099
Irb =
          1.16573491799861
gamma_berm =
          0.93753457970977
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                        0.8
gamma =
         0.750027663767816
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.20235178223583
R2del =
       0.00780879321627204
Z2 =
          15.3873627903093
top_sta =
          80.1273351080759
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
          15.3873627903093
diary off
-1.000000e+00
-1.000000e+00
```