

CCCLr Dune Erosion Model – User Guidance Document

Prepared by FSU-Beaches and Shores Resource Center, August 2010

Background

This document is intended to assist in running the CCCLr dune erosion model which is made available from the FDEP Bureau of Beaches and Coastal Systems (BBCS) through the FSU Beaches and Shores Resource Center (BSRC). The CCCL dune erosion model, also referred to as the Dean Erosion Model, was developed and has been used primarily for dune erosion simulation for a 100-year storm.

Reference documents for background and description of the CCCL model development are included with the model distribution files and are as follows:

- 1) Chiu, T.Y., Dean, R.G., "Methodology on Coastal Construction Control Line Establishment", Beaches and Shores Resource Center, June 2002.
<http://bcs.dep.state.fl.us/reports/method.pdf>
- 2) Wang, R., Manausa, M., "The CCCL Erosion Model", Beaches and Shores Resource Center, June 2006.
- 3) Walton, T.L., "FDEP Dune Erosion Modeling Historical Review with discussion of Models Under Review", Beaches and Shores Resource Center, April 2005.

The CCCLr dune erosion model is a revised version of the CCCL model which incorporated revised model calibration factors, also referred to as erosion factors, into the model. Specific description of development of the CCCLr model is contained in the reference by Wang and Manausa listed above as reference 2. The report by Wang and Manausa refers to the revised model as the Revised Dean Erosion Model (RDEM). For simplicity, this revised model is referred to as the "CCCLr" model by file name and common reference during its program execution and operation.

Below is discussion and information about running the CCCLr model and about model input specifically for running the model for the FDEP-BBCS. Procedures and model input described below are necessary and required in using the CCCLr model for 100-year storm erosion simulations. Required model input parameter values, as well as, example model input files, are included with the CCCLr model executable file and related files. Any alternate input values than those provided must be submitted with sufficient information to justify and support their use.

Vertical Datums

The FDEP-BBCS requires that all topographic survey data obtained and provided to the FDEP-BBCS be referenced to the NAVD88 vertical datum. It is noted, however, that the CCCL model and revised CCCLr version were developed and calibrated using topographic and hydrographic survey data referenced to the NGVD29 vertical datum.

Therefore, it is necessary that survey input data for running the CCCLr model be converted from NAVD88 to NGVD29. Following model execution, the model erosion profile output should be converted from NGVD29 back to the NAVD88 vertical datum.

When providing CCCLr model work to the FDEP-BBCS for review, submittals should include the model input and output profile tabulations and plots in both vertical datums, NAVD88 and NGVD29 (see Required Submittal Information further below) .

A datum conversion utility called 'CORPSCON' is available for data conversion and can be obtained through the following link:

<http://crunch.tec.army.mil/software/corpscon/corpscon.html>

Model Input

The CCCLr model executable file is accompanied by two project-specific input files that are read into the model during the model execution. These two project-specific files include a representative beach and offshore survey profile, and a storm tide hydrograph, both of which will be discussed further below. These two input files must be located within the same folder as the model executable file, CCCLr.exe. Another model input file read by the model during execution, efact5.dat, contains model calibration values which are maintained as the same values for all application of the CCCLr model.

Profile Survey Data:

One of the input files contains the topographic survey profile data in a very specific format as shown in the example survey data input file included with the model files provided. The example survey data input file is called 'COUNTY.IN'. The survey data file must be named 'COUNTY.IN' when used as input by the CCCLr model. The range ID at the beginning of line 2 of the file must read 'R-1', since there is only one profile read into the model in the COUNTY.IN file. The actual FDEP range location at or nearest to the profile data listed can be identified in the initial line of the file, shown as 'R-137' in the example file.

Care must be taken in compiling the survey profile data for the model. If the model is being run for a permit application, then upland survey data is being obtained from a topographic survey required for the permit. Since the property survey obtained for the permit application typically does not include offshore data, it is necessary to obtain offshore data for the model profile input file from the nearest FDEP range location.

The nearest offshore data should be the most recent data which has been checked and verified by FDEP-BBCS. The checked and verified data can be accessed from the FDEP-BBCS website at: <http://www.dep.state.fl.us/beaches/data/his-shore.htm> by clicking on the 'Profile Data' link. The prof839088 data set should be used. A detailed description of the survey data format can be found at the following BBCS website link: <ftp://ftp.dep.state.fl.us/pub/water/beaches/HSSD/ProfileData/PFORMAT.TXT>

The upland property survey required by the permit application should extend seaward to the 0.0 (ft., NAVD88) elevation. The merging of the offshore data should extend seaward from the point of the 0.0 elevation. The profile data taken from the upland survey should be obtained along the same profile azimuth angle as the offshore data being used. The upland profile data should also be obtained along a representative cross-sectional line which is lowest in elevation in order to obtain the most conservative erosion result from

the model. This is particularly important from the standpoint of using the model erosion results for any structural design purposes. All horizontal distances should be referenced from the intersection of the survey profile line with the coastal construction control line (CCCL) on the property. All distances should be referenced from the CCCL as the 0.0 point and measured positive seaward from the CCCL.

It is noted that files produced by the model during execution are the original profile data from the 'COUNTY.IN' file which is called "SURVEY.DAT" when produced with model output files, and the eroded profile output file produced during model execution called 'ERODED.DAT'. An output file is also produced called 'INITIAL.DAT' which is a smoothed version of the original survey data. Other output files are also included with the example files included with the model files provided. It is also noted again that the survey data should be converted from NAVD88 to NGVD29 for use in the 'COUNTY.IN' model input file.

Hydrographs:

The other project-specific file read into the model during model execution is the hydrograph file which must be named 'COUNTY.100'. An example file with that name is included with the provided CCCLr model files. The format of this file must be exactly as provided and shown in the example 'COUNTY.100' file. Digital copies of hydrograph files for each coastal county are included with the model files provided.

The specific hydrograph file appropriate for the location within a particular coastal county should be selected and prepared for use in the model. This should be done by isolating that single hydrograph file and appending the storm tide time series values after the file header lines in the 'COUNTY.100' file. An additional 'README' file is included with the model files which lists specific FDEP range locations for the county hydrograph files.

There are only a few items that should be edited in the 'COUNTY.100' hydrograph file each time it is prepared for a particular model run case. In addition to the first line which identifies the specific coastal county, line 3 should provide a specific 'A' value which is discussed further below. Line 7 listed as 'ICALC' relates to the 'A' value also and should be edited with a value of '0' if the A value listed on line 3 is to be used in the model, or with a value of '1' if the A value is considered to be 'variable' and is calculated by the model during model execution. More discussion on the A value is given below.

The last item in the file header in the hydrograph file 'COUNTY.100' to be edited should be the 100-year storm peak storm tide elevation which is listed on line 14. A listing of peak storm tide values and A values for each county is provided in the folder called 'AVAL_SS', which is included with the model files.

It is noted that running the CCCLr model related to permit application submittals to FDEP-BBCS for habitable structures requires an additional step to be performed. The additional step needed is to run the model using a "half hydrograph" in addition to running the model with the full hydrograph. That is, two versions of the hydrograph file should be set up and run with the CCCLr model.

The full hydrograph file should append the entire 36-hr storm tide time series for the project location as described above. The half hydrograph should include time series values only up through 18 hours, up to the point of the maximum storm tide elevation. Running the model with these two hydrographs will produce two erosion profiles. The erosion profile produced by the half hydrograph is needed for use in computing breaking wave crest elevations at peak storm tide in assessing underside elevations of lowest horizontal structural beams beneath lowest habitable floors. The erosion profile produced by the full hydrograph is needed for both structural design and construction-related siting issues.

A Values:

A specific listing of A values for each coastal county for use in running the CCCLr model is provided in the AVAL_SS folder included with the CCCLr model files. As stated previously, for locations where the A values are listed as 'variable', the model computes the A value during model execution. The appropriate edit to the 'ICALC' line in the hydrograph file to set ICALC to '1' is required for the variable A value cases.

Required Submittal Information:

The following items are required for all CCCLr model applications submitted to the FDEP-BBCS:

- 1) A copy of a topographic survey in conformance with the requirements of Section 62B-33.0081, Florida Administrative Code (FAC). The survey should clearly identify the location and azimuth bearing of the shore-normal line used to obtain the cross-sectional initial survey profile for the model application.
- 2) The initial survey data file and the eroded profile data file, both in the required file format described in the web link listed in the Profile Survey Data section above. Two sets of these profile data files are required, as described above, one set in NAVD88 and one set in NGVD29 vertical datums.
- 3) Two sets of hydrograph files in the required file format, as described above, one set for the full hydrograph, and one set for the half hydrograph.
- 4) Any other related information and work products in support of submittal of CCCLr model application work, particularly any alternate model input values than the values provided with the CCCLr model files..

Assistance Requests:

This document was prepared by Mark E. Leadon, P.E., on behalf of the FSU-BSRC to assist the FDEP-BBCS in CCCLr model applications, particularly for CCCL permit application-related use. Model files accompanying this document were compiled by Nhan T. Nguyen.

For any questions or problems in running the CCCLr model, please contact Dr. Robert Wang at srwang@fsu.edu or Mike Manausa at mmanausa@fsu.edu of the FSU-BSRC office. The phone number of the FSU-BSRC office at the time of this document preparation is 850-644-2847.