This paper presents a new numerical model for shoreline change which can be used to model the evolution of shorelines with large curvature. The model is based on a one-line formulation in terms of coordinates which follow the shape of the shoreline, instead of the more common approach where the two orthogonal horizontal directions are used. The volume error in the sediment continuity equation which is thereby introduced is removed through an iterative procedure. The model treats the shoreline changes by computing the sediment transport in a 2D coastal area model, and then integrating the sediment transport field across the coastal profile to obtain the longshore sediment transport variation along the shoreline. The model is used to compute the evolution of a shoreline with a 90° change in shoreline orientation; due to this drastic change in orientation a migrating shoreline spit develops in the model. The dimensions of the spits evolving in the model compare favorably to previous model results and to field observation of the Skaw Spit in the north of Denmark.