

U.S. Geological Survey Elevation-Hydrography Breakline Specifications

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The U.S. Geological Survey (USGS) is developing specifications for hydrographic breaklines in support of the integration of the National Hydrography and Watershed Boundary Datasets (NHD/WBD), and the data that support the 3D Elevation Program (3DEP). These programs contribute foundation data to The National Map and derived products such as the US Topo digital map series.

Breaklines are vector features that are used to enforce or maintain linear features on an elevation surface. They define terrain features that are difficult to capture with discrete point data, making them particularly valuable when used with lidar data. Traditional topographic breaklines include bridge and road edges, cliffs, and ridgelines. Breaklines defining hydrographic features can be used to impose different hydrologic treatments (flattening and enforcement) on digital elevation models. Thus, breaklines can allow the creation of different elevation surfaces tailored to meet individual users' expectations and needs.

In 2011, the USGS conducted the National Enhanced Elevation Assessment, a comprehensive survey of elevation data needs, projected benefits, and application business uses from Federal and state agencies. Numerous hydrologic applications were identified that would benefit from high resolution elevation data, including natural resources conservation, water supply and quality, river and stream resource management, coastal zone management, flood risk management and sea level rise and subsidence. All of these business uses identified by the survey include the need for hydrologic surfaces on which overland flow of surface waters can be accurately modeled.

The water sciences community, within and beyond the USGS, is dependent on both the elevation data and the NHD to satisfy their missions. Increasing numbers of users are creating local-resolution (potentially down to 1:2,400) streams data from lidar-derived digital elevation models (DEMs). Unfortunately, these data are not always made available for integration into the NHD.

With lidar as the predominant elevation data source, the 3DEP currently (2016) requires collection and delivery of the minimal set of hydrographic breaklines needed to hydro-flatten the topographic DEM to improve the cartographic appearance of larger water bodies. In defining Geographic Information Systems standards for those breaklines, expanding the specifications to include the hydrography necessary to create hydrologic DEMs and support other NHD applications was a natural extension. Moreover, those breaklines can provide a base for NHD updates, creation of local-resolution NHD, and improved integration of elevation and streams data. Having common collection specifications for all breakline data reduces integration costs and allows immediate cross-project use of the data.

Ideally, hydrographic breaklines would be collected as part of a lidar project, reducing life-cycle production costs while meeting numerous needs of both the 3DEP and NHD Program. The hydrographic breakline specifications will be published in the USGS NGP Lidar Base Specifications v2.0 report later this year (2016).