Synopsis: Arc Hydro for Groundwater
GIS in Water Resources, Fall 2012

The *Arc Hydro Groundwater* data model is a geographic data model for groundwater and hydrogeology. At the core of Arc Hydro Groundwater is the *Framework* component, which consists of the most common features across surface water and groundwater systems. These features include wells, aquifers, rivers, waterbodies, locations of dams and monitoring points, and watersheds. Just like in Arc Hydro, *HydroIDs* are used to tie features together in *relationships*. For example, wells will use their *AquiferID* field to store the HydroID of the aquifer they penetrate.

Also included is a time series component, which includes four categories of temporal data: time series, attribute series, rasters series, and feature series. A *time series* indexes a data value by time, location, and a description of the variable that a value represents. The location links to a geospatial feature such as a monitoring point, while the description links to a row in the *VariableDefinition* table. An *attribute series* is like a time series, except that instead a given row representing a single data value, it represents several values at the same instance in time, where the values are stored in different fields with the name of the field indicating the related record in the VariableDefinition table. This is a more efficient structure for storing water quality grab samples where numerous parameters are measured from the same sample, or for simulation model results where numerous parameters are calculated at each time step.

A *raster series* is a collection of rasters indexed by time. Raster series could represent maps of precipitation of water level in an aquifer. A *feature series* is a set of features indexed by time. A feature series could represent the track of a particle in a groundwater system, the path of a hurricane, or the area inundated by a flood over time. A different feature (e.g., different flood polygon) is recorded at each time step, and the features use a common *GroupID* to tie them to the same phenomenon or entity.

Beyond these core elements, Arc Hydro Groundwater includes components specific to hydrogeology. The *Geology* component stores point, line, and polygon features related to geologic maps such as faults and outcrops, which are often closely tied to aquifers and other groundwater features. The *Borehole Data* component stores information about the geologic units and materials that wells penetrate, as well as 3D representations of wells. The *HydroStratigraphy* component includes several feature classes for representing hydrogeologic units, or geologic layers related to hydrogeology. These hydrogeologic units can be represented as 2D areas, 3D volumes, 2D or 3D cross sections, as well as raster datasets. All of these representations in HydroStratigraphy help us to visualize the complex 3D volumes beneath our feet. Finally, the *Simulation* component stores 2D and 3D representations of simulation model elements, such as the block centered finite difference grid used in MODFLOW.

The Arc Hydro Groundwater data model is supported by the *Arc Hydro Groundwater Tools*. The tools enable you to create or import data into the feature classes and tables of Arc Hydro, quickly plot graphs, and manage how the data are visualized in ArcMap and ArcScene.

For more information, see http://resources.arcgis.com/content/hydro/groundwater/about