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17/ENG03/044

CVE 302

BASIC HYDROLOGY

## **GEOGRAPHICAL INFORMATION SOFTWARE (GIS)**

A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. GIS is more than just software. People and methods are combined with geospatial software and tools, to enable spatial analysis, manage large datasets, and display information in a map/graphical form. The central function of a geographic information system is to provide a visual representation of data. It is estimated that 80% of the data we consider has a geospatial element of some form. GIS provides a means for that data to be stored in a database and then represented visually in a mapped format. Some examples of GIS software include QGIS, SAGA-GIS, ArcGIS, etc.

### **Types of Geographical Information Software (GIS) Data;**

GIS data can be separated into two categories: spatially referenced data which is represented by vector and raster forms (including imagery) and attribute tables which is represented in tabular format. Within the spatial referenced data group, the GIS data can be further classified into two different types: vector and raster. Most GIS software applications mainly focus on the usage and manipulation of vector geodatabases with added components to work with raster-based geodatabases.

### **APPLICATION OF GIS SOFTWARE IN HYDROLOGY**

Water professionals need to be able to manage surface and groundwater resources over the scale of an entire watershed. Within any given watershed, there may be thousands of groundwater monitoring wells, numerous stream reaches with gages, as well as snow measurements and weather stations. The effects of land cover, vegetation, soil type, topography, geology, water quality, and other factors must be considered in order to make sound management decisions. The data are available from a variety of public agencies, but often in

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different coordinate systems, at different scales, and from different time periods.

A GIS is a system of computer software, hardware, and data, combined with qualified people to assist with manipulation, analysis, and presentation of information that is tied to a spatial location. A GIS can be thought of as a “smart map” that has features that are associated with information typically derived from a database, which is simply a table of information. The critical element is the association of information with a location on the map. A key advantage of GIS is its ability to integrate, manage, and analyze large volumes of data, particularly over very large areas. GIS enables data to be integrated and viewed on the scale of an entire watershed, allowing a holistic approach to water resources management. These same integration capabilities also make GIS useful for local-scale analyses, where many diverse types of data must be considered.

### **PROCEDURE FOR UTILIZATION OF HYDROLOGICAL GIS;**

- a. Identifying a suitable project.
- b. Purchase or download of GIS software.
- c. Accumulation of GIS data for processing.
- d. Integrating the data acquired.
- e. Personnel training on operating the GIS software.
- f. Using the GIS for operations such as data management, data retrieval, data modelling, spatial analysis and data presentation

### **EXAMPLES OF GIS TOOLS**

#### **1. The Buffer Tool**

Buffers are proximity functions. When you use this geoprocessing tool, it creates a polygon at a set distance surrounding the features.

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## **2. The Merge Tool**

The merge geoprocessing tool combines data sets that are the same data type (points, lines or polygons). When you run the merge tool, the resulting data will be merged into one.

## **3. The Intersect Tool**

The Intersect Tool performs a geometric overlap. All features that overlap in all layers will be part of the output feature class – attributes preserved.

## **4. The Union Tool**

Some say the Union tool should come with a bottle of antacid. The union tool gets a bad reputation because it creates a lot of features. The Union Tool maintains all input features boundaries and attributes in the output feature class.

## **5. The Dissolve Tool**

The Dissolve Tool unifies boundaries based on common attribute values. In other words, dissolve merges neighboring boundaries if the neighbors have the same attributes.