GIS Applications in Hydrology and Hydraulics Questionnaire

March 21, 2008

The Subcommittee on Hydrology set up a workgroup to organize and publicize information on GIS applications in the fields of hydrology and hydraulics. This scope has been expanded to include related water quality, watershed management, and ecological sciences GIS applications. This work is intended to make information on GIS applications in hydrology and hydraulics more generally available. This questionnaire is designed to gather limited but key information about a particular GIS application in order for a potential user to decide if the application fits his/her computer system, data requirements, and physical system to be modeled.

These applications should be public domain and supported by user documentation. Availability on the web is not necessary if the application can be distributed on CD ROM or through e-mail requests. If a short abstract, fact sheet, or technical paper is available on the application, please attach a copy. **Please return questionnaires by May 15, 2008.**

Name of Application, date, version number:
eCoastal Program, May 2008

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Brief Description:

The eCoastal program provides a foundation for a data management plan designed to function as an enterprise GIS. It was developed to concentrate on the specific needs of the coastal engineer. eCoastal is an architecture developed by the U.S. Army Corps of Engineers that addresses spatial data standards, geodatabase structure, and custom coastal GIS applications.

One focus of an enterprise GIS is to allow access to data from users inside or outside an organization. Technology enables data to easily be accessible and distributable in a variety of formats. The eCoastal program offers support in understanding the available technologies, such as metadata clearinghouses or web mapping services, and provides additional guidance on system configuration to bring concepts to fruition. In the case of USACE organizations, eCoastal also provides system design and documentation that is compliant with all Army IT regulations.

In addition to the technology components, the eCoastal program is a compilation of lessons learned and recommendations for managing a variety of coastal related datasets in a geodatabase environment. eCoastal provides training to users on the default tools of ArcGIS and custom tools of the eCoastal toolbars to educate coastal engineers in data

analysis procedures performed in a GIS environment.

Platform/operating system:
Desktop –
- ArcGIS 9.2
- Spatial and 3D Analyst extensions are needed for some desktop applications

Web –
- ArcIMS
- ArcGIS Server
- Google Earth

Web-based or desk-top application?
The eCoastal program frequently surveys the coastal engineering community to determine what other technologies, models, and/or applications exist that engineers are integrating into their data analysis procedures. There are a number of custom applications that have been developed over the years. Applications that require little configuration can be downloaded from the eCoastal website. Literature is provided for other, more complex, applications that require additional configuration, such as database design, lookup tables, or web services. All of the setup is documented in the engineer manual.

Desktop
- **Data Viewer Toolbar:** The Data Viewer tools have been created to assist GIS users in data analysis and access to the geodatabase through the ArcGIS ArcMap interface. The ArcGIS Desktop applications are developed using ArcObjects. When you use an application, such as ArcMap, most of the time you are simply looking at or working with ArcObjects. The graphical user interface in each custom eCoastal application is developed using the same objects, such that in each application you will find the interface contains toolbars, menus, commands, and tools that have the same look and feel. The eCoastal Toolbox is distributed as an install package for the ArcGIS environment. Created in a modular design, users can choose which tools to load in their toolbar. In general, the tools provide a simple interface to common GIS tasks; such as locating data stored in the geodatabase, building attribute queries or designing a map layout.
  - Data Picker
  - Zoom to Layer (per definition query)
  - Find by Attribute
  - Create Map Layout
  - Sort Layers
  - Move Layers Up
  - Move Layers Down
  - Delete Multiple Fields
  - Add XY Coordinates

- Import Excel as Points
- Export to Text File
- Polygon Area
- Graphics to Features
- Generate Bounding Polygon
- Compare Tools (Remove duplicate features)
- Make PointZ Shape
- Make PolylineZ Shape

- **Survey Tools:** LiDAR data is an integral part of data analysis in coastal engineering. The Survey Toolbar enables coastal engineers to simplify the formatting process of LiDAR datasets. All tools available on this toolbar require a license to 3D and Spatial Analysis. Below is a list of tools available on the toolbar.
  - Profile Plot Generator
  - 3D Viewer
  - Depth Difference Calculator
  - Random Point Generator
  - Point to Surface Generator
  - Beach Profile Importer
  - Survey Loader/SAMS

- **Survey Analysis Management System (SAMS):** A primary use of hydrographic surveys supporting navigation operations and maintenance is to determine the quantity of material that has shoaled in a channel and is in need of dredging. These material quantity estimates are used for planning dredging operations and for computing payment volumes. One key aspect in this process is the issue of survey data management. This involves the handling, storing, formatting, and converting of raw ASCII data into useable GIS data layers where analytical methods and visualization techniques are ultimately employed for engineering purposes.

  The eCoastal Survey Analysis & Management System, hereinafter referred to as SAMS, is a system developed by the Mobile District Corps of Engineers that broadly functions as an enterprise GIS application designed to facilitate the collection, storage and retrieval of finished survey products from a GIS. eCoastal is a subset of the eGIS Enterprise concept being developed by the US Army Corps of Engineers that is a framework for developing GIS that manage the coastal environment.
  - Locate Selected Navigation Project Extents
  - Load Design Surface of Navigation Channel
  - Load Design Template (3D polyline) of Navigation Channel
  - View/Plot Survey Against Stationing
  - Compute Channel Volume
  - View Centerline Plot

- **SBAS-A:** The Regional Sediment Management GIS primarily establishes a regional sediment budget. A budget quantifies sediment erosion and accretion throughout the region. SBAS-A allows local (project-level) sediment budgets to be characterized regionally. Features of SBAS-A facilitate the creation and display of both local and regional sediment budgets. SBAS-A facilitates calculating and displaying local and regional sediment budgets including single and multiple inlets, estuaries, bays, and adjacent beaches.

Web
- ArcIMS page template
- RSM (Regional Sediment Management) Project Viewer
- Disposal/Dredge Area Viewer
- Ocean Disposal Area Manager

Data Requirements:

- Survey Tools: elevation data (grid, tin, XYZ point, profile data)
- Data to populate feeder databases: dredge/disposal events, project level information, etc.
- SBAS: sediment transport rates, dredge event records, disposal events records, survey data
- SAMS: 3D Navigation channel (SDS formatted), survey data

Data format and compatibility:
- An GIS formatted data

Will the application import and export data files ?
- Yes. A number of the applications convert a raw data input and format it properly for inclusion into an enterprise database.

Is the application flexible to couple with external programs and user created executables?
Most tools run within the ArcGIS environment, so any other extension can be coupled with the toolbars.

Also, the eCoastal program deploys instruction manuals to provide guidance to Districts on how to build the network architecture needed to broadcast Web Mapping Services. These open-source WMS can be consumed by a number of web and desktop applications.

Are system and user documentation available?   Are example applications available?
An engineer manual has been created to support the eCoastal program. The manual can be downloaded from the eCoastal website – http://eCoastal.usace.army.mil

Does the application require prior installation of ESRI software?   If so, which products?

Any of the custom desktop toolbars needs ESRI software.

Is there a user group or hotline-type support?
Users can submit a question or comment from the eCoastal website.

Please return the questionnaire to William Merkel at william.merkel@wdc.usda.gov. If there are questions or concerns please contact him at 301-504-3956. Thank you.