

## FUNDAMENTAL ELEMENTS OF A MULTIPURPOSE LAND INFORMATION SYSTEM

When a local government begins to seriously consider, or plan, the development of a GIS/LIS (Geographic Information System / Land Information System), with the goal of developing a multipurpose cadastre, there are certain fundamental elements that should be considered early in the process. While authors and publications vary in exactly how they describe these fundamental elements of a multipurpose cadastre, there is general agreement on what they are. The Urban and Regional Information Systems Association (URISA) and International Association of Assessing Officers (IAAO), in their joint publication, GIS Guidelines for Assessors, describe these four fundamental elements for a GIS-based cadastral mapping system as follows:

- **Geographic Control Data:** Geographic control describes the coordinate system and points on the coordinate system for all data in the GIS. The coordinate system is used to reference where things are located. For example, a county may establish geographic control on major road intersections and property subdivision boundary corners. These coordinates would then be used in the base map data and cadastral information.
- **Base Map Data:** Base map data are coordinates referenced to the geographic control for planimetric features that can be seen from an airplane. For example, rivers, lakes, streams, traveled ways, and railroad tracks may be included. The base map data would be coordinates for all these features.
- **Cadastral Data:** Cadastral data are the graphic information describing parcels. These data include property corners, boundaries, and parcels of land. Typically, property corners are coordinates for points on parcel boundaries and identifiers for the corners, which allow cadastral information to be tied to attribute information. Boundaries are lines between corners, line topology that describes who owns land on either side of the line, and an identifier for the line which allows it to be tied to attributes. In cadastral information, parcels of land are polygons (closed geometric figures) and an identifier for the polygon that relates the parcel to attribute information.
- **Attribute Data:** Attribute data are additional information about geographic control base map data, cadastral information, and other mapped features. For example, cadastral information contains lines with identifiers. Attribute data would have the line identifier and additional information about the line such as its bearing and distance as recorded in a deed. Attribute data are stored in a database.<sup>1</sup>

The National Research Council, in its publication, Procedures and Standards for a Multipurpose Cadastre, described the same fundamental elements or data needs, when they identified the components of a multipurpose cadastre as follows:

1. A spatial reference framework consisting of geodetic control points;
2. A series of current, accurate large-scale base maps;
3. A cadastral overlay that delineates all cadastral parcels and displays a unique identifying number for each of them; and
4. A series of compatible registers of interests in land parcels keyed to the parcel identifier numbers.<sup>2</sup>

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<sup>1</sup> Urban and Regional Information Systems Association and International Association of Assessing Officers, 1992: *GIS Guidelines for Assessors*, Washington, DC and Chicago, IL, 11-13 p.

<sup>2</sup> National Research Council, 1983: *Procedures and Standards for a Multipurpose Cadastre*, National Academy of Sciences, Washington, DC, 1 p.

Similar foundation elements are discussed in the Multipurpose Land Information Systems, The Guidebook, published by the Federal Geodetic Control Committee<sup>3</sup> and by the International Association of Assessing Officers in their Standard on Cadastral Maps and Parcel Identifiers.<sup>4</sup>

To assist local governments and others, in their consideration and development of these fundamental elements of a GIS/LIS based, multipurpose cadastre, the following background information and recommendations are provided for each of these fundamental elements.

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<sup>3</sup> Federal Geodetic Control Committee, January 1993: *Multipurpose Land Information Systems, The Guidebook*, "The Base Map", 12-3 p.

<sup>4</sup> International Association of Assessing Officers, January 1988: *Standard on Cadastral Maps and Parcel Identifiers*, Chicago, IL, 5 p.