GEODETIC TECHNOLOGIES ENABLING INNOVATION PART 1: FEDERAL GOVERNMENT

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In support of discussions regarding the use of coordinates in cadastral surveying, we provide an overview of federal government activities in geodesy and review issues related to geodetic coordinates and the compatibility of data, in particular spatial and temporal consistency. The Canadian Geodetic Survey is the Government of Canada's lead agency in geodesy, and is the principal agency responsible for establishing the reference frames or datums used in determining geodetic coordinates in Canada. A summary of issues relating to epoch propagation addresses concerns specific to the use of precise geodetic coordinate systems today.

En appui aux discussions concernant l'utilisation de coordonnées dans l'arpentage cadastral, nous donnons un aperçu des activités du gouvernement fédéral en géodésie et nous examinons les problèmes reliés aux coordonnées géodésiques et à la compatibilité des données, plus particulièrement la cohérence spatiale et temporelle. La Division des levés géodésiques du Canada est l'organisme chef de file du gouvernement canadien en géodésie et le principal organisme responsable d'établir les cadres et systèmes de référence utilisés pour déterminer les coordonnées géodésiques au Canada. Un résumé des problèmes reliés à la propagation dans le temps examine les préoccupations propres à l'utilisation de systèmes de coordonnées géodésiques précises aujourd'hui.

1. Introduction

Focusing on the extent that the cadastre should rely on coordinates raises the question of whether we adequately understand the nature of the coordinates themselves.

In *The Use and Value of a Geodetic Reference System*, *Epstein and Duchesneau* [1984] identify the fundamental benefit of geodesy to be "universal compatibility" of geospatial data. Universal compatibility is defined as an attribute which allows spatial information products to be "related to each other across all sites with a high degree of accuracy." Figure 1 illustrates a series of geospatial data sets aligned with vertical arrows representing coordinates. An ideal reference frame would have no spatial distortion (relative positions of points across an area are fully consistent) and geospatial data obtained at different times (for any purpose) would be perfectly aligned.

Coordinates define positions with respect to some reference frame, which is a practical realization of a reference system (being a set of definitions and conventions). Since reference frames are real-world realizations, they are imperfect. Imperfections in a given reference frame (i.e., distortions) introduce errors; however, today these types of errors are very small and usually considered to be negligible. More significant are differences between reference frames, and for this reason it is essential to carefully document version information about the reference frame and epoch.

Of greater interest is the accuracy of the coordinates that can be obtained by a surveyor in the field and how consistent these coordinates are spatially (i.e., how consistent coordinates are in an area—how much distortion exists) and temporarily (how consistent coordinates obtained in current studies are

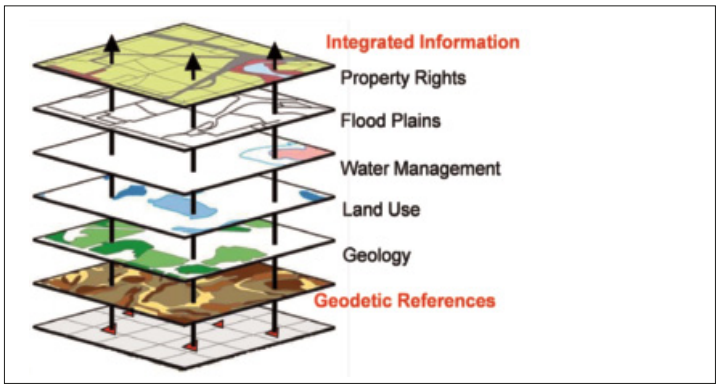

Figure 1: Universal compatibility of data.

dx.doi.org/10.5623/cig2016-304