Coming to Terms with the Model Law: The Search for a Definition of Surveying in New Mexico

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ABSTRACT: The Model Law is prompting many states to revisit their definition of surveying in determining whether the Model Law's current structure should be adopted. New Mexico's State Surveying Society, New Mexico Professional Surveyors (NMPS), is attempting to update New Mexico's current surveying definition to be reflective of the dynamics of a profession impacted by technological advances. Part of this process is the development of a position paper evaluating existing and proposed legislation from a cross section of other states and an analysis of how well the current proposed Model Law satisfies the need for a new definition. This article presents a brief overview of the process and a sampling of the notes gathered for the position paper.

Background

"Surveying is what surveyors do," David King (Albuquerque area land surveyor)

As our esteemed colleague's tongue in cheek response to our question "what is surveying?" suggests, arriving at a definition should be a fairly straightforward and simple undertaking. Figure out what surveyors do and write a definition covering these activities. Simple enough. Every state to various degrees has already done so. These definitions are codified in existing state statutes. While the definitions vary greatly from state to state, their intent is to protect the public by describing what constitutes the profession of surveying and what qualifications are necessary for an individual to practice in the profession. Why then the necessity to reexamine these existing definitions?

Current technological advances are changing the nature and scope of surveying dramatically. Gone are the days when surveyors could practice their craft secure in the knowledge that what they did in the execution of their duties was their sole domain alone. With the advent of GPS receivers, GIS software, and the ever increasing demand for spatial information, surveyors today find themselves as one of many players in the arena of land information specialties or, the now often referred to as geomatics. Whether surveying is a part of geomatics or geomatics is a part of surveying lies at the heart of the issue. The need to redefine the role of modern-day surveyors vis-à-vis the geomatics disciplines necessitates a review of what properly constitutes the surveying profession and what activities must be conducted under the practitioner's professional oversight.

In the spring of 1996, the Model Law became an increasingly hot topic of conversation among members of the New Mexico Professional Surveyors (NMPS), our state's professional surveying society. In February 2000, Jim Plasker, Chair of the multi-organization Task Force on the NCEES Model Law for Surveying, presented the results of the ongoing task force deliberations on the Model Law in two sessions at the NMPS Annual Conference in Albuquerque, New Mexico. By all accounts, the initial reaction was generally mixed. Those in support of the Model Law as originally proposed saw it as an opportunity to add some accountability and structure to a run-away situation where anybody with the price of a GPS receiver or rudimentary knowledge of a GIS software could hang out their shingle as some sort of land information specialist. The concern was that these individuals routinely crossed the line into boundary matters. The 1995 Model Law was seen as a positive step in addressing this perceived problem.

Those opposing further modification of the Model Law generally cited their dislike of the (perceived) tiered structure incorporated in the recommendations in the 1997 Task Force Report. They believed those recommendations would create a subset of surveying and would serve only to further erode the profession. At a time when the role of the surveyor in the public's mind is somewhat confused already, creating tiers

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within the profession was thought to only further muddy the waters and that the distinction between the different levels would quickly become blurred. The one thing that almost all involved in the discussion agreed on, however, was the need for a new definition to reflect the changing dynamics of the profession and its relationship to related areas of land information science. The "tiered" structure outlined by the task force was rejected by NCEES in their subsequent deliberations and is not currently under consideration. This notwithstanding, many of the other task force recommendations have been adopted and are contained in the 1999 version of the Model Law.

New Mexico statutes defining surveying and the requirements for licensing of surveyors (as well as engineering and the licensing of engineers) are created with "sunset" provisions. In 1995, the New Mexico statutes took a dramatic turn in requiring a board-approved 4-year surveying degree for licensure as a surveyor. In 2000, the statutes incorporated minor revisions regarding surveying. The next review and opportunity for major changes in the surveying statutes will come in the 2004 and 2005 state legislative sessions.

To that end, the New Mexico PS Board of Directors charged the Policy Committee with the task of preparing a position paper that would develop a new definition for the practice of surveying. This effort is expected to culminate in a recommendation to be presented to the state's Board of Licensure for Engineers and Surveyors for adoption. Ideally, this would ultimately manifest itself in legislation amending our Engineering and Surveying Practice Act. The problem was where to begin? With so much being written on the issue and with so many different proposals being advanced, where should the Policy Committee start in its deliberations? That is where the position paper on modern-day surveying came in. An element of this position paper would be an overview of what other states had done or were in the process of doing. It was hoped that researching the various laws and proposals would help crystallize and simplify the writing process. State findings could then be compared with the proposed Model Law to see if it satisfies the desired elements of a new definition of surveying.

Current Definitions of Surveying

The process of gathering data for a position paper began by obtaining information representing various points of view on what a surveyor does. Among the first to be opinion-polled were people who had already given a good deal of thought to the elements that constitute the profession of surveying. Dr. Ben Buckner was one of these people A quick search of the Internet located the following Buckner reflections on the value of being a surveyor:

1. Full understanding of the inexactness, uncertainty, and variable nature of measurement leads to humility since it teaches that one can never be sure of results. It is this very humility that, more than anything, creates the professional attitude needed to constantly seek new evidence, and consequently a higher probability of approaching the truth or proving something with confidence.
2. The surveyor is primarily an analyst. As an analyst of both measurement data and boundary location evidence (including geometric and other mathematical relationships), the surveyor is in a position to develop a keen sensitivity to the importance of finding and applying the truth.
3. A surveyor, when practicing according to the true nature of surveying, is ever seeking the truth, whether in measurement or in boundary location. Consequently, learning and applying the measurement science and the legal and other principles of boundary retracement develops character.
4. The art and science of surveying is a mirror of life itself.

Fair enough. What surveyors do is seek the truth, whether in measurement or in boundary location. Does the Model Law work towards this admirable goal? If so, how? If not, why not? Do other geomatics disciplines also seek the truth of measurements? Do they need to? What truths, if any, are they attempting to reveal? We went back to Dr. Buckner for more, this time for an actual definition in the traditional sense:

ELEMENTARY DEFINITION OF SURVEYING
(as paraphrased in most texts)

The art, science, and technology of detecting the relative position of points at, above, or below the surface of the earth; or establishing such points.

BROADER DEFINITION
(according to its true nature and scope)

Surveying Measurement: The art, science, and technology of gathering and analyzing measurement data related to the land and other land-related surfaces and spaces, to include designing and devising the measurement specifications and standards to accomplish these measurements with the desired precision and accuracy and error control and adjustment, including the use of all instrumentation applicable to such measurements, said

measurements typically being, but not limited to distances, heights, angles, directions, positions, areas, volumes, and other measurements associated with these quantities.

Professional Surveying: The application of knowledge of the science of surveying measurement, the legal principles of boundary location, the laws related to boundaries and land use, the applicable mathematical and computational theories and principles, the natural and other forces which affect positional accuracy, the land planning and development concepts pertinent to subdivision of land and property surveys, land record and land tenure concepts, geodetic and other earth-related sciences to the analysis, design, and execution of surveying and mapping projects and the design of land mapping and information systems.

If we accept this as the legitimate definition of what surveyors do, how does the Model Law satisfy this interpretation? An examination of a cross-section of state laws and proposed legislation reveals some common trends but also two extremes, with North Carolina being at one end and Illinois on the other. North Carolina's approach seems to be one of all inclusiveness with a series of exclusions:

A literal reading of the definition of surveying in the state's General Statutes 89C includes any graphical representation of any physical or cultural feature on the surface of the Earth, within the Earth, or in the air above the Earth. All media and data storage, either in hard copy or electronic form, is included in this definition of surveying. After presenting a list of common-sense exclusions, the state's G.S. 89C conclude with this somewhat ominous statement:

> Items that must be prepared under the supervision of a professional land surveyor include, but are not limited to, the following:
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> All maps and geo-referenced databases of any man-made or topographic feature by either terrestrial surveying methods, photogrammetric or GPS locations. This includes all base maps and data bases prepared by any person, firm, or government agency where that data is available to the public unless specifically exempted in the list above or by General Statue.

The items discussed herein are intended to include all maps, plats, orthophotographs, rectified photographs, planimetric maps and other documents, including geo-referenced databases that impact the health, safety, and welfare of the public.

Various laws prohibit the preparation of certain geo-referenced databases and maps and/or the possession of these maps or data basses. Any person preparing any prohibited map or database may be subject to disciplinary action of the North Carolina Board of Examiners.

We have visions of the spatial police raiding boiler room mapping operations.

New Mexico's current definition resembles definitions at the other end of the spectrum, exemplified by Illinois, California, Florida, Texas, and South Carolina. The Illinois Professional Land Surveyor Act of 1989, for instance, provides a definition of surveying (in short form) which, while not taking technological advances into consideration, still serves as an important definition of the profession:

> The determination and physical protraction of land boundaries, together with the attendant preparation of legal (title) descriptions and plats which bear witness for posterity and become part of the public record to chronicle the acts and wishes of landowners.

South Carolina has opted for a tier approach similar to the original Model Law Format.

> *Practice of TIER A land surveying* means providing professional services including, but not limited to, consultation investigation, testimony evaluation, expert technical testimony, planning, mapping, assembling, and interpreting reliable scientific measurements and information relative to the location, size, shape, or physical features of the earth, the space above the earth, or part of the earth, and utilization and development of these facts and interpretation into an orderly survey map, site plan, report, description, or project.
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> The practice of TIER A land surveying consists of three separate disciplines: land boundary surveying, photogrammetry, and geographic information systems/land information systems (GIS/LIS). A land surveyor may be licensed in one or more of the disciplines, and practice is restricted to only the discipline or disciplines for which the land surveyor is licensed.
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> *Practice of TIER B land surveying* includes all rights and privileges of the TIER A land boundary surveying discipline defined in Section 40-22-20(23)(a). In addition to these rights and privileges, TIER B land surveying includes, for subdivisions, preparing and furnishing sub-

division plans for sedimentation and erosion control and storm drainage systems, if the systems do not require the structural design of system components and are restricted to the use, where relevant, of any standards prescribed by local, state, or federal authorities.

From Florida:

"Practice of surveying and mapping" means, among other things, any professional service or work, the adequate performance of which involves the application of special knowledge of the principles of mathematics, the related physical and applied sciences, and the relevant requirements of law for adequate evidence of the act of measuring, locating, establishing, or reestablishing lines, angles, elevations, natural and manmade features in the air, on the surface and immediate subsurface of the earth, within underground workings, and on the beds or surface of bodies of water, for the purpose of determining, establishing, describing, displaying, or interpreting the facts of size, shape, topography, tidal datum planes, legal or geodetic location or relocation, and orientation of improved or unimproved real property and appurtenances thereto, including acreage and condominiums.

The practice of surveying and mapping also includes, but is not limited to, photogrammetric control; the monumentation and remonumentation of property boundaries and subdivisions; the measurement of and preparation of plans showing existing improvements after construction; the layout of proposed improvements; the preparation of descriptions for use in legal instruments of conveyance of real property and property rights; the preparation of subdivision planning maps and record plats, as provided for in chapter 177; the determination of, but not the design of, grades and elevations of roads and land in connection with subdivisions or divisions of land; and the creation and perpetuation of alignments related to maps, record plats, field note records, reports, property descriptions, and plans and drawings that represent them.

From a Texas draft proposal:

Activities that must be accomplished under the direct supervisory control (responsible charge) of a Professional Surveyor or Land Surveyor include, but are not limited to, the following:

1. Maps and geo-referenced databases defining legal boundaries, the location of man-made objects, or topography by either terrestrial surveying methods, photogrammetric or GPS locations. This includes maps and geo-referenced databases prepared by any person, firm, or government agency where that data is provided to the public as a survey product, unless specifically exempted in Section B below.

A list of exclusions then follows similar to North Carolina's.

We now come to the question that is central to the issue, "Is surveying one discipline of many within the scope of geomatics or is geomatics a term for certain types of surveying?" It seems that most definitions are from educational institutions outside the United Sates.

From the School of Geomatics Engineering, University of New South Wales:

Geomatics is concerned with the measurement, representation, analysis, management, retrieval and display of spatial data concerning both the Earths physical features and the built environment. The principal disciplines embraced by Geomatics include the mapping sciences, land management, geographic information systems, environmental visualization, geodesy, photogrammetry, remote sensing and surveying.

From the University of New Brunswick:

Geomatics is the modern scientific term referring to the integrated approach of measurement, analysis, management, storage and display of the descriptions and location of Earth-based data, often termed spatial data. These data come from many sources, including earth-orbiting satellites, air and sea-borne sensors and ground based instruments. It is processed and manipulated with state-of-the-art information technology using computer software and hardware. It has applications in all disciplines which depend on spatial data, including environmental studies, planning, engineering, navigation, geology and geophysics, oceanography, land development and land ownership and tourism. It is

thus fundamental to all the geo-science disciplines that use spatially related data.

The issues for New Mexico surveyors to resolve then are:

1) What is surveying?
2) What parts of surveying should be licensed for public protection?
3) How do we update and remain current in our statute description of surveying?

The NCEES Model Law for Surveying

How, then, do the 1999 version of the NCEES Model Law for Surveying and the 2000 version of the GIS/LIS Addendum figure into the solution? Do they define surveying in a broad sense, as does Buckner? Yes. Do they recognize that other geomatics disciplines and activities fall under the broad definition of surveying? We believe so. Do they suggest that all forms of surveying require licensing? No.

The Model Law embraces a broader concept of surveying than traditional state laws. Broader national law is needed to help us deal with the ever-changing technology of surveying, which forces us into new methods of surveying practice. Gone are the days when surveyors relied primarily on National Geodetic Survey (NGS) control monuments or local coordinate networks. GIS and LIS require more and more data to be captured in state plane or other geodetic networks. Local government and private control networks are being created and used as a basis for not only GIS/LIS, but also more and more for mapping and boundary surveys. Many of these networks do not agree spatially with one another. The growing reliance on such networks forces us to consider that public protection is needed.

Photogrammetry, the strange child of surveying, requires specialized knowledge and skills that fall under the broader definition of surveying, but does not embrace the traditional concepts of boundary surveying. Most photogrammetry experts are required to gain knowledge and skills in boundary surveying or civil engineering in order to practice under either a surveying or an engineering license. Neither boundary surveying not civil engineering knowledge and skills are essential for public protection of the practice of photogrammetric surveying.

The NCEES Model Law on Surveying broadens and clarifies the recognized definitions of the practice of surveying while not fully encompassing the definition of geomatics. Under Section 2 (Definitions), Article "b" (Professional Surveyor or Land Surveyor), Section 5 (Practice of Surveying or Land Surveying), the Law separates the definition of surveying into two distinct areas. Subsections "a" through "d" describe non-boundary surveying activities. Subsections "e" through "h" describe boundary surveying activities. In contrast, most (if not all) current state definitions of surveying refer to both boundary and non-boundary surveying (e.g., topographical mapping). This would preclude that surveying can be divided into non-boundary and boundary practice.

The ACSM Board of Directors, on December 6, 2000, endorsed the GIS/LIS Addendum and went on record as supporting the concept of "branched" licensing for surveying. Under branched licensing, those wishing to specialize in areas of non-boundary surveying would no longer have to gain the knowledge and skills to become a boundary surveyor. This adds yet another twist to the New Mexico Professional Surveyors' search for a definition of surveying. Are we ready to embrace branched licensing on top of a broader definition of surveying?

Conclusions

The surveying profession is undergoing dramatic changes. These changes are being driven by two major factors—technological hardware and software advances and the demand for spatial information by an ever-increasing number of land information users. The situation is market driven to a degree never before experienced. Surveyors as professionals must keep pace with this rapidly changing environment. They will not be able to by writing themselves into the law and become the "gatekeepers" of digital data. They will do so by establishing the legitimate need for the analytical skills and abilities that surveyors will bring to a GIS project.

Additionally, continuing advanced education of surveyors is of utmost importance. Requirements for licensure that fail to demand from the surveying candidate the skills and abilities for land information sciences will force the profession to the periphery of the market and permanently consign it to a subservient position in the geomatics matrix.

The New Mexico Professional Surveyors recognize, as stated in the 2000 GIS/LSI Addendum, that the tools used for surveying must be separated from the definition of surveying. A hammer that is used to crack pecans would not fall under a definition of carpentry. We also recognize that the definition of surveying should serve to protect the public, not the surveying profession. We will grapple with the issues and hope to have a consensus by the time the surveying statutes are reviewed and reissued in 2005.

LITERATURE

Buckner, Ben. *What is a Professional Surveyor*? http://www.ucls.org/cedu/sac.htm (September 2000).