



The Connecticut Surveyor

July 2010

Volume Fifteen: Issue Six

CALS 2010 GOLF OUTING

Rob Orris, Superior Instrument
hosted the Beverage Cart



Jim Sheehy, Robert Dobmeier & Mike Turner



Paul Hallisey, Ken Buchanan, Bob Dahn & Dave Piette



President John Wagenblatt & Matt Peak, Waddell & Reed
who ran the "Hit the Green Contest" to benefit
the Scholarship Fund

The Impact of Land Surveying on our Nation's History - 224 Years of the Public Land Survey System

This year marks the 224th year of the Public Land Survey System. I have worked in the western United States for a long time, and I know firsthand where the development and conservation of natural resources have competing demands. The Department of the Interior (DOI) manages 500 million acres of surface lands, one-fifth of the land in the United States, as well as a 700 million-acre subsurface mineral estate. The Department's ability to accurately identify and establish - sometimes re-establish - monuments that document the legal boundaries between public and private lands is critical to our nation's economy and to the integrity of real estate transactions.

As the Director of the Bureau of Land Management (BLM), I'm honored to have the opportunity today to shine the spotlight on the Public Land Survey System and the historic Cadastral Survey Program.

The original thirteen states in our country were based upon division of lands that had been set by the King of England through the land grants. These grants had been established from London, where the information on the New World was sparse and inaccurate. Maps were almost nonexistent. After the Revolutionary War with England, the States wanted to resolve their boundaries. More importantly, the States wanted to establish the unclaimed lands of the West - "the Western Reserve" land west of the Appalachian Mountains as public land or "Public Domain lands" for the development of the country.

Controversy on how the lands were selected and the validity of the surveys had long laid the seeds for survey reform in America. The change came in the form of a new design for a rectangular survey system, or the Public Land Survey System. The continental Congress would debate and finalize this system in 1785. The system would be used for the disposal and sales of the non-original thirteen colony lands, or the Western Reserve Public Domain lands, of the newly formed United States. Most of you are aware of these events, but many people do not realize that the BLM's roots originated before the Constitution was ratified with the Land Ordinance Act of 1785. This act established the "Public Domain Lands" and the system of surveying that you are all familiar with today.

The debates that occurred before the passing of the Land Ordinance Act of 1785 are fascinating and colorful because many of the founding fathers of this country were directly involved with surveying. George Washington's career was based upon his surveying expertise and his association with Lord Fairfax. This early livelihood was extremely important and pivotal to the success of Washington's life. By surveying the raw and unsettled lands of the New World, many windows of opportunity were opened for Washington. Throughout history, land has always equated to power and wealth, and this was amplified in colonial America. Land ownership was the gauge of a person's status, power and wealth in 18th Century America. Only land-owners were allowed to vote, and the size of land ownership was definitely the mark of status. The value of land has only increased today. The status is still there, and the demand on the lands and its uses has only increased at an exponential rate.

Washington realized that to measure, or survey, the land would afford him a great advantage in the "currency" of the New World. His experience in surveying and mapping the lands also provided him with invaluable skills and knowledge during the Revolutionary War. Thomas Jefferson was keenly interested in surveying because his father was a surveyor. Also, Jefferson was appointed as a county surveyor and was influential in the new design of the Public Land Survey System. Roger Sherman, a surveyor from Connecticut, was the only person to sign all four documents establishing this country - "the Articles of Association," "the Declaration of Independence," "the Articles of Confederation" and "the Constitution." Of course, Abraham Lincoln was a

The Impact of Land Surveying on our Nation's History continued...

surveyor and used the income from surveying the homesteaded lands of Illinois to pay for his education to become a lawyer and eventually one of our Nation's greatest presidents.

Long before the Department of the Interior was established, surveyors were hard at work drawing the boundaries of this nation's new frontiers. The General Land Office (GLO) was created in 1812, as a separate bureau within the Department of Treasury. Most of the Public Domain land was surveyed with oversight by the GLO. These surveys were the first inventory of our nation's natural resources and were the basic tool for systematic development of both private and public lands. By 1910, the GLO employed over 1,400 people. The GLO became a part of the BLM in 1946. Portions of Alaska, Nevada and other western states continue to be surveyed for the very first time. However, the majority of our survey work is to modernize century-old surveys and boundaries with new surveys markers and modern GPS measurements.

The land laws enacted by Congress since 1785, are based upon the Public Land Survey System. Future laws will also be based upon this system. These laws include the management of minerals, water resources and wilderness; almost any activity performed by both the private and governmental sectors. Today, many of our Federal lands are noncontiguous, a patchwork of parcels that require certainty of location - surveys form the foundation of all land management work that the Interior performs in partnership with States, Tribes, counties, municipalities and the private sector.

The Western Governors' Association recognized the importance of cadastral survey information through a resolution that stated:

“...Western Governors urge BLM to complete, enhance, and maintain the Cadastral (system) ...in support of energy development, forest health restoration, wildland fire management, Homeland Security and First Responders.”

One of the chief tools that the BLM uses to accomplish its work is the Manual of Surveying Instructions (Manual)¹, the standard to which more than 300 government surveyors and 50,000 private surveyors adhere in conducting surveys. Not only Federal, State, county and local surveyors, but also attorneys, solicitors, and the title and real estate industries couldn't do their job without the Manual. The new Manual completed under the leadership of Don Buhler and Bob Dahl was officially released on September 24, 2009, at a ceremony at the Department of the Interior in conjunction with the National Society of Professional Surveyors and the American Congress of Surveying and Mapping. Working closely with the Solicitor's Office, the authors updated the Manual to be consistent with current legislation, judicial and administrative decisions, and current surveying practice. When the Manual was last issued in 1973, editors could not have foreseen the modern technology now commonly used in the surveying community. This time, we've tried our best to make the language “technology independent.” We also addressed how to survey in Alaska, which is done somewhat differently than in the lower 48.

The four areas of significant change in the new Manual include:

- 1) Updated content on water boundaries
- 2) Standard of evidence
- 3) Coordinates as collateral evidence
- 4) Mineral survey resurveys.

The Impact of Land Surveying on our Nation's History continued...

Americans can be confident that the 2009 edition of the Manual will see us into the future, regardless of what township we may be in.

Last year, the Secretary had the pleasure of recognizing in a brief ceremony 110 BLM cadastral surveyors for their expertise in professionally carrying on the rigors of the Public Land Survey System. This work could not have been done without the support of the private professional surveyors. Because of BLM's cadastral surveyors and the private professional surveying community, we enjoy the benefits of accurate survey and all that comes with that - across all jurisdictions and land tenures of our great country. As our population continues to grow, communities expand, and our country's remaining open spaces become more valued, your work as surveyors is even more essential.

Certainly, land surveyors facilitate effective management of some of America's greatest assets - its treasured landscapes and the rich resources found on and under the surface of Federal lands and beyond. For example, the Department depends on accurate legal descriptions in order to deliver a fair return to the American public for the commercial sale and production of the Nation's mineral estate and natural resources for that matter, we couldn't begin to confidently capture the wind and solar renewable energy resources found on Federal lands without knowing land boundaries and geographical features.

Our cadastral surveys provide the basic certainty that the renewable energy industry requires before they begin the long process and ultimately the huge investments in development of wind, solar and geothermal energy. This team effort will assist our country in breaking our dependence on foreign sources of energy. The Public Land Survey System, which was conceived by our country's founding fathers, will continue to be one of the key components of economic growth, which is based upon our country's vast land resources. We know the surveying sector is impacted by the recession. Our Cadastral Survey Program is involved with the American Recovery and Reinvestment Act for projects of nearly \$23 million, resulting in private contracting and job creation. The projects include improving the accuracy of our cadastral information, survey plat and records scanning, GIS work, records improvement and cadastral surveys for identification of abandoned mine lands reclamation projects.

In the last 225 years, surveying tools and techniques have changed. It's impossible to even imagine what the next 200 - even 20 - years will bring us. However, one thing is for sure, our cadastral surveyors and you will continue to execute and maintain this great system of land tenure and ownership. I'm confident that through the rich resources the Department and BLM manage - and with the assistance of surveyors, both BLM and private - the Department's role will continue to be monumental in securing a productive future for our Nation. I thank you for the service your provide.



1 The BLM's Surveying Manual of Instructions may be purchased by contacting the American Congress on Surveying & Mapping at www.acsm.net (eStore link).

Taken from the California Surveyor, Spring 2010

GPS NGPS Network Analysis and Adjustments

We present here an outline for GPS adjustment procedures to test whether we as a profession are following similar thought processes and a guide for those that haven't made up their minds yet.

Network analysis and adjustments can be defined generally as the process of validating the integrity of the measurements and constraining the measurements to known horizontal and vertical coordinates. This process is applicable to radial networks as well as complex interconnected arrays. The adjustments, horizontal and vertical, technically should be handled as separate processes when determining horizontal positions or orthometric heights (elevations). If both are required for a project then the process occurs in the following steps.

Step 1) Validate the internal consistency of the measurements and remove bad data.

Step 2) Fix a single position (Latitude, Longitude, Ellipsoid Height on a known valid control point) and analyze closures on other known points.

Step 3) Fix all acceptable control points to develop horizontal coordinates on all points in the survey.

Step 4) Fix a single height to develop heights and analyze closures on other known heights.

Step 5) Fix all acceptable heights to develop vertical coordinates on all points in the survey.

Step one is a minimally constrained adjustment used to validate the integrity and accuracy of the measured stand-alone vectors (baselines). Step two follows after removing unacceptable measurements. Step two is a minimally constrained adjustment fixing a known latitude, longitude and ellipsoid height (GPS coordinates) for the purpose of comparing the computed versus record positions (closures) at other known points. Step three is the constrained adjustment which fixes all the points determined to be acceptable in Step two and is used to develop adjusted three dimensional GPS coordinates. These adjusted coordinates (latitude, longitude and ellipsoid height) are the basis for applying a projection (i.e. State Plane or local) and computing grid coordinates.

If orthometric heights (elevations) are necessary then technically the adjustments should be processed separately and be free in the horizontal dimension. Step four fixes a single point for horizontal and a single point at a known orthometric height for the purpose of comparing the computed versus record heights (closures) at other known points. Step five fixes acceptable points in a vertically constrained adjustment to develop orthometric heights on all points in the network. The best results will be obtained if an NAVD88 height is used and includes a geoid model (i.e. Geoid03). Fixing a NAVD88 height and applying the geoid model results in pseudo-ellipsoid heights (pseudo meaning "as if") that may vary about 10 centimeters from the actual ellipsoid heights determined in Steps two and three. The resulting orthometric heights will only be as good as the geoid model and the measured ellipsoid height differences. The absolute accuracy can be better than 3 centimeters and the relative accuracy could approach 1 centimeter over a local area if diligent procedures are followed. There are some variations of these adjustments where tilts or rotations in the surfaces are solved to improve the overall fit with existing local control point positions and heights and will be discussed in a separate article.



Taken from the California Surveyor

The Surveyor as a FORENSIC Scientist

By Donald A. Wilson, LLS, PLS, RPF

Forensics is a household word these days, thanks to a number of television shows. Like anything else there are good and bad aspects to that. Television shows and movies compress real time into relatively few minutes and lead people to believe that investigations and the answers that result from them can be had in a brief span of time. Even worse, for the TV shows to retain their viewers, the episodes must pique the interest and, yes, be entertaining or fascinating. Crime solving on TV backed by the latest investigation techniques is fascinating - not least because science almost invariably puts the bad guys behind the bars, and relatively quickly.

The same expectations have spilled over to the court system. Juries have come to expect from professionals giving testimony the same highly specialized knowledge and reasoning as they see on television. In reality, forensic science is not only exacting but also time consuming and, often, painstakingly routine.

The court system is not the only one undergoing a change with the times. Forensics studies have become so intriguing of late that a number of schools have either created or expanded their curricula to accommodate the interest; many of them are, however, unable to meet the sudden high demand for forensic science education.

Sherlock Holmes was the first forensic criminologist known to the public, and much can be gleaned from Sir Arthur Conan Doyle's stories about his investigative methods. The reader is presented with a whole gamut of reasoning techniques. There is the "top-down" deductive reasoning which begins with a theory, develops a hypothesis, and endeavors to confirm or disprove the theory based on observed facts. The "bottom up" inductive reasoning, on the other hand, begins with specific observations and ends by developing general conclusions or theories that confirm a hypothesis. Sherlock Holmes often used "abductive reasoning," and so do today's forensic scientist, special unit detectives, and juries.

Abductive reasoning develops an inference to the best explanation, and it includes the generation, criticism, and possible acceptance of explanatory hypotheses. Sometimes called "the logic of Sherlock Holmes," abductive reasoning presents the investigator with subtle implications for evidence evaluation. A hypothesis is deemed acceptable only if it surpasses other explanations for the same data by a distinct margin, and, only if a thorough search has been conducted for other plausible explanations.

Some people may be turned away by gruesome crime scenes - blood spattered, corpses cut up to fit into freezer bags, or the most heart-wrenching of all, the violated bodies of children. That, admittedly, is what one gets to see early on but then come investigations that include such modern science as DNA testing and ballistics, and, most important, application of critical thinking to the problem at hand.

Land boundary investigations are no different from forensics in law enforcement - the owners expect surveyors to apply logic and exact science when surveying their properties. And where television has cold case files, for the surveyor there is probably no trail colder than an ancient land description or an early survey that must be retraced according to the rules of law. There are no shortcuts in boundary surveying; only, as in any criminal investigation, time-consuming, painstaking, exacting searching.

The Surveyor as a Forensic Scientist continued...

Forensics in surveying, in its strictest sense, is the application of science to questions which are of interest to local government, the courts, and, of course, to the individual land owners. The legal system places a tremendous amount of emphasis on land ownership, land rights and interests, land boundaries, and constitutional issues involving land. Local government needs to know what all these are when building roads and expanding utilities and other civic services.

Land records, as many surveyors will agree, are filled with inherent description problems that are inaccurate, misleading, and frustrating. For instance, a survey description may close mathematically and still describe the wrong parcel of land. Or, the description is difficult to read because of illegible handwriting, a stain that has obliterated the writing, and other challenges. Such descriptions require some sort of investigation and evaluation to make them usable.

Take for instance wooden evidence. Deteriorated, misidentified, sometimes salvaged only in fragments, wooden evidence can still be used to reestablish corner monuments once it has been analyzed by wood technologists. Same with metal markers buried underground, but the investigative tool here is the metal detector; the detectors currently on the market are so sophisticated that they can locate even the smallest parts of such markers. Photography is also doing its bit; there are more photographs available now than ever before, many on the Internet, and some through auction sites such as eBay. Railroad stations, dam and mill sites, streets, and rivers or lakes are easily identifiable on photographs and then related to the landscape. Then, if a surveyor needs to develop a chain of title in order to get back to the original description or fill gaps, the science of genealogy may be his or her first stop. Thanks to the Internet, it's much easier to track down relatives and determine family relationships and inheritances in order to complete a chain of ownership than it was just ten years ago! These are only a few examples of how modern technology and well tried surveying techniques are transforming surveying into "hot" forensic science. Let us not get carried away though. Forensics is only part any detective work, albeit important, and even though it usually "gets all the press."

As Sherlock said in the Study in Scarlet, "there is no branch of detective science which is so important and so much neglected as the art of tracing footsteps," ...and... "when you have eliminated the impossible, whatever remains, however improbable, must be the truth." Gil Grissom, the team leader in CSI: Crime Scene Investigation is sure "there is always a clue." Surveyors conducting boundary recovery would be the first to agree; and, they are acutely aware that inadequate or incomplete information can lead to false conclusions. Facts speak for themselves, evidence does not lie, and that's what the surveyor, much like a forensic scientist, is in pursuit of.

What we do or fail to do with this evidence speaks to our responsibilities as professionals.



Taken from the California Surveyor

CALS 2010 GOLF OUTING



1st Place Team Eric Seitz, Paul Archer, Alan Woodis & Bruce Woodis

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to the following Sponsors:**

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**Special thanks to Carmen Giuliano (left) for his help.
John Tocomis (2nd from right) won the 50/50 mulligan raffle.**

Thank you to A. Bowen Davies for his recent donation to the CALS Building Fund.

Classified

SEEKING POSITION:

1) Associate Member of CALS looking for full-time position. Hartford County. Eleven years experience. BS in Geography and AA in Mathematics. Skilled in AutoCAD Mapping, Eagle Point Coordinate Geometry, Trimble, Topcon, TDS, Sokkia total stations and data collectors; Leica and Trimble GPS. Excellent references. Contact the CALS office for a resume #101.

2) Professionally trained land surveyor with over 20 years experience. Diversified in all aspects of land surveying including but not limited to ALTA/ACSM Surveys, Property/Boundary Surveys, Zoning and Improvement Location Surveys, Topographic Surveys and Subdivision/Condominium maps. Proven leadership skills with a high level of organization and communication abilities. Able to consistently keep projects on target from a financial and time line perspective. I believe I would make a significant contribution to any firm. If your firm is looking for a dependable, results orientated professional with a solid performance track, I would be interested in speaking with you to discuss the value that my strengths and experience can bring to your search. Contact the CALS office for a resume #102.

3) Licensed Land Surveyor seeking a management position with responsibilities for marketing services for an engineering/surveying firm, developing business with new and existing clients and project management. Twenty-five years in land surveying applications of business development for new and existing clients; project management; supervision of field and office personnel and experience in all facets of land surveying projects, large and small. Contact the CALS office for resume and references #104.

4) Licensed Land Surveyor seeking employment. Extensive experience with title research, boundary surveys, topographic surveys, hydrographic surveys, construction and as-built surveys an existing conditions surveys for redesign, improvements and new design. Willing to work part time. Middlesex County. Contact the CALS office for resume and references #105.

POSITIONS AVAILABLE:

Fairfield County

Pereira Engineering, LLC is an established Civil/Environmental Engineering and Land Surveying firm located in Shelton, CT and we are looking to fill the following positions:

Survey Technician / CAD Operator: We are seeking a candidate with 0-2 years experience in Land Surveying or Civil Engineering. The qualified candidate MUST be highly proficient with AutoCAD and Autodesk Survey software. Candidate must also be highly-motivated and detail-oriented. Responsibilities will include downloading field survey data, preparation of CAD survey maps, and other office/field work all under the direct supervision of Senior Surveyor.

Survey Crew: We are also looking to bring on an additional survey crew. Qualified candidates must be experienced in boundary, ALTA/ACSM, topographic surveys, underground utility location, and construction stakeout. Experience with AutoCAD and Autodesk Survey software a real plus. Pereira Engineering offers a very competitive salary and benefits package including Major Medical Insurance, Retirement Plan, Life Insurance including Short-Term Disability and AD&D coverage, paid Vacation, Holidays, Sick Days, and Direct Deposit for payroll.

Please email resume and salary requirements to: joe@pereiraeng.com or fax to: (203) 944-9945.



Fellow Survey News

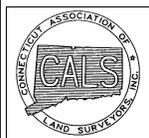
The following are some highlights from the Western Federation of Professional Surveyors (WFPS) Board of Directors Meeting, held earlier this year.

- The highlight of the Alaska Society of Professional Surveyors 2010 conference was a celebration of the 50th anniversary of their organization - *Congratulations and best wishes for another 50!*
- Arizona is looking to move to a four-year degree, with one opposition. They are looking into basing surveying licensure on specialties.
- The Hawaii Association of Land Surveyors awarded the Hawaii Surveyor of the Year for the first time.
- Qualification-based selection (QBS) law was passed in Idaho State Legislature. ISPLS has reviewed the possibility of separating from engineers on the State Board. They've decided to stay with the present system maybe adding more members.
- As of July 2010, a four-year degree in surveying is required in Nevada.
- Membership is down in most states, except for Utah, which showed an increase this year.
- The New Hampshire Land Surveyors Foundation Bylaws have been amended and are posted on the website under "About NHLISA".
- New links have been added to the NHLISA website for each of the Northeast Surveying Societies, including New York.

Taken from the NHLISA Newsletter June 2010



**Congratulations to Matt Peak
& his wife who recently
had a baby girl named Mia!**



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