

PROFESSIONAL LAND SURVEYORS OF WYOMING



80 80	sident • Sonja "Suzie" Sparks, PLS	PAUL A. REID PAUL A. REID NSPS Final POINT MONUMENT PHOTO BY MIKE FLAIM
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PRESIDENT'S MESSAGE



Greetings PLSW members and affiliates.

Ah, the end of another cool, wet spring and the promise of a green summer. It's great to be busy! Hopefully you are all prioritizing summer projects and trying to work in last minute requests. During the May Board of Directors meeting, 6 new applications for membership were approved. Welcome new members! The by -laws committee is working on edits and corrections to that document. We are looking forward to reviewing it later this year. The West Chapter is working on details for the publication of Dr. Stoughton's writings. May 31, several members attended the celebration of life and establishment of a control point in honor of Paul Reid. Read more about that later in this issue.

Thank you, publication committee for continuing to do a great job and to the chapters for bringing unique and interesting stories to the survey community. Periodically check the PLSW website for new information. If a county has corner/ land records available on line and we are not linked to their site, let us know. Your comments and suggestions about the site are always welcome.

As you go about your work, keep in mind the scholarship money that is available to Wyoming survey students – perhaps someone who works for you is eligible.

Have a prosperous summer. Don't forget to nurture your soul and spend time with family and friends. Life is too short for regrets!

Cheers!

Suzie Sparks, PLS President, Professional Land Surveyors of Wyoming

ANNOUNCEMENTS

CONGRATULATIONS!

•The members of the Professional Land Surveyors of Wyoming would like to recognize the achievement of the following new Wyoming registrants:

Andrew McGuire Pinedale, WY SI 168

• Professional Land Surveyors of Wyoming are looking for member volunteers for the position of State Secretary and/or Treasurer. Interested parties please contact Cevin Imus (307) 682-1661

• THE 2009 MANUAL OF SURVEY INSTRUCTION is now available online through the BLM website at http://www.blm.gov/pgdata/content/wo/en/ prog/more/cadastralsurvey/2009_edition.html. It can also be accessed directly at plsw.org on the "References" page.





MHS are seeking graduates from the University of Wyoming Land Surveying program that are looking for work in the Kansas City Metro area.

Company Description:

McAfee Henderson Solutions, Inc., a Kansas City Metro based civil engineering, land surveying, and construction observation firm, is seeking motivated individuals to join our organization. MHS provides professional services on a wide range of projects for our municipal and private clients.

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Provide office coordination duties of all land survey activities necessary for successful delivery of MHS projects. Job functions will include all major phases of land surveying including ALTA surveys, boundary surveys, platting, topographic surveys and design basemap production, construction layout, asbuilt surveys, and project documentation at the municipal, state, and federal levels.

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McAfee Henderson Solutions Inc. is an EOE.

Geodetic Surveying: Part VII

The Activities of the Ordnance Survey of England from 1800 to about 1845

Herbert W. Stoughton, PhD, PELS, CP

Introduction

Major William Mudge

William Mudge (1 December 1762 - 17 April 1820) attended the Military Academy at Woolwich. In 1779, he received his commission, and was immediately assigned to Lord Cornwallis's army in South Carolina (American Revolution). Upon his return from the war, he was assigned to the Tower of London, where he studied mathematics which earned him recommendations and an appointment to serve under Colonel Edward Williams. Although Mudge would command the Ordnance Survey until his death, he would accept and jointly hold two additional appointments. In 1808, he was appointed Lieutenant-Governor of the Military Academy at Woolwich. In 1810, the East India Company established its own academy at Addiscombe, and the student officers assigned to the East India Company were transferred from other institutions. Colonel Mudge was appointed superintendent, but did not relinquish any of his previous assignments. In 1819, Mudge was promoted Major-General.

Approximately three years after Mudge assumed the directorship of the Ordnance Survey, a very young lieutenant was appointed to his staff. Thomas Frederick Colby was born in 1784, and received his military commission on 21 December 1801. Colby's father, Thomas Colby, had been a officer in the Royal Marines, and his mother Cordellia, was the sister of General Hadden. In January 1802, Mudge wrote to the Master-General: "I find him (Lieut. Colby) on examination, well grounded in the rudiments of mathematics and in other respects perfectly calculated to be employed in this business. I beg to point out to your lordship the expediency of Lieutenant Colby being attached to me with some degree of permanency, and to request you will assign him to my orders on that principle." On 12 January 1802, the letter of appointment was issued.

In 1809, Mudge assigned most of the daily operations to Lieut. Colby, but retained the reigns when it came to interactions with the Chiefs of the Board of Ordnance. Colby had actual superintendence of personnel and daily operations. Records show that before Mudge received his additional assignments Mudge and Colby had enjoyed an excellent professional and

personal relationship. Therefore, when Col. Mudge was appointed superintendent of Addiscombe, he unofficially passed the reigns of most of the daily operations to Colby. It would only be after Mudge's death that Isaac Dalby wrote a letter describing the Williams - Mudge - Dalby era (1791 - 1798). In this letter Dalby stated that Williams did little survey work and did not contribute to the survey computations. Mudge and Dalby actually did the work. Since Mudge had experienced the "shadow leader" relationship, he spent the early years with Colby nurturing and educating Colby about the duties and responsibilities for operating the Great Trigonometrical Survey. When Mudge transitioned his efforts to his two other appointments, he had a tried and tested subordinate capable to take over the administrative and management of the Ordnance Survey. In a letter dated 9 September 1813, Col. Mudge wrote to Colby: "...you should immediately read the review of Major Lambton's Papers in the Asiatic Searches, giving an account of his Trigonometrical Operations *in India.*" He continued: *"it is undoubtedly done by* Playfair, who had us in his eye all the way through, and has ended his critique with the strongest compliment that could have been paid to the Surveyors in this country...".

In 1803, Lieut. Colby suffered an accident which could have ended his career. He was performing a tour of inspection on a survey in Cornwall when the accident occurred. Major Mudge described the incident. "...in the act of placing an over loaded pistol on the ground, was severely wounded from its going off unexpectedly: his left hand grasped the barrel and was so violently injured that amputation was necessary: it accordingly was taken off just above the wrist the same evening. The loss of his hand was not the only misfortune to be deplored, as his skull received a violent blow, producing a fracture in his forehead... The brain, it seems remains free of any injury; nor is any future evil apprehended beyond a scar." Colby did not accept his handicap as career ending. He continued his field surveying career by adapting. Most observing procedures require two hands to operate theodolites and surveying tapes. For the next two decades, Colby would be on the "short list" of observers of the primary Ordnance Surveys for triangulation and astronomy. A very remarkable feat.

July 2015



After 1810 and until 1819, Colby and James Gardner, either together or individually, executed the triangulation and astronomical observations in Scotland. The gentlemen measured a base line at Belhelvie near Aberdeen. In later analysis by Col. Alexander Ross Clarke, the baseline measured with Ramsden's two 100-foot and one 50-foot tapes, had a verified discrepancy of 1:110,000

General Mudge died on 17 April 1820, but Colby was not appointed his successor until 10 July 1820. In 1824, a Select Committee of the House of Commons (under Mr. Spring Rice) was appointed to consider the question of a Survey and Valuation of Ireland (identical to the 1-inch mapping of Great Britain). Captain Colby testified that the triangulation of Great Britain was nearly completed. He further stated that the mapping of England and Wales was nearly two-thirds complete, but that Scotland had not been initiated. The Select Committee employed the term Ordnance Survey. This usage appears to supersede the term "Great Trigonometrical Survey". At the time Colby testified, there were ten assigned officers, who had been reassigned from other duties after the Battle of Waterloo and the Peace of 1815.

Colonel Thomas Frederick Colby and the Survey of Ireland

In 1825, most of the officers and men were transferred to Ireland to initiate the trigonometrical and mapping surveys. This organization is now known as the Ordnance Survey of Ireland. Although the major compliment of the officers and staff departed, the offices at the Tower of London remained staffed by Captain Richard Mudge (son of General Mudge) and a handful of map engravers and cartographers. In October 1841, the survey offices located in the Tower of London "were burnt", and in 1842 the headquarters offices were removed to Southampton, where they remain today.

One of Colby's primary assistants was Robert Dawson. Dawson was born in 1776. At the age of 18 he was employed as a draughtsman under the Board of Ordnance. When the Corps of Royal Military Surveyors and Draughtsman was formed in 1802, one of the first appointees was Dawson. One of his primary assignments was instructing young Engineers in sketching and surveying. Col. Mudge assigned Dawson and Stanley as the

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Lines & Points

PAUL A REID July 15, 1945 - November 8, 2014

On May 31, a Celebration of Life was held for Paul Reid at the Kiwanis Community Shelter in Cheyenne. Paul's family organized the celebration, and there was a fantastic turn-out of people from all over the country. Friends and family joined in sharing stories and reminiscing about the person that contributed so much to the surveying profession and to life in general.



As part of the Celebration, the Western Federation of Professional Surveyors, (WestFed or WFPS), contributed by purchasing a "Final Point" cap in honor of Paul. The cap is a commemorative offered by the NSPS Foundation where of the funds used to purchase the marker \$25 goes into the NSPS Foundation and \$50 goes into the Berntsen/NSPS Scholarship Funds. The cap markings contain the Latitude and Longitude where the monument was placed, Paul's name, LS number, National Society of Professional Surveyors Foundation and Final Point. The quarterly WestFed meeting was held in Denver the day before, so 13 of the WestFed delegates were able to attend the Celebration in Cheyenne. Paul was the Wyoming delegate to WestFed for many years, and proudly served in that position as chairman of the bylaws and scholarship committees.

A dedication ceremony was held at the monument prior to the family celebration. Hosted by WFPS chairman Richard Heirerin of Alaska, many of Paul's cohorts, accomplices and comrads were able to speak and tell stories of the times they spent with Paul, and share many of the good times they had. A commemorative paperweight with the same markings as the actual cap was presented to Paul's wife Connie by the Southeast Chapter of PLSW. The Southeast Chapter also decided to include the monument into the City of Cheyenne Control Network, so it was set on a #6 rebar "driven to refusal" with a concrete collar. Paul had installed or replaced several of the monuments in the network, and this one, named "Paul Reid" replaced the former monument named Baseball. The ultimate plan is to Blue Book the monument and prepare a corner record for it in Paul's honor.

Special thanks to Paul's family for organizing such a wonderful celebration, with good food, good drink, and a lot of friends to share the gathering with. Also, thanks to the members of the Southeast Chapter of PLSW who contributed to making the event possible: Jack Studley for all his coordination and physical





labor installing the monument, Dennis Dawson for observing the monument position, (even though he's not done, yet), and all the others who contributed their ideas and efforts to make it a wonderful event.

It was a very enjoyable time seeing Paul's friends and family, some of whom travelled a long way to be able to attend the ceremonies. To hear the stories, and share some of the wonderful contributions this man made during his lifetime. Paul, you will be missed.

In the words of Larry Perry, "adios, Pablo. Vaya con dios!"

Respectfully, Mark Corbridge

July 2015

















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instructors. After the College at Addiscombe was established in 1810, Mudge entrusted the field instruction in surveying and drawing for the East India cadets to Dawson. Robert Dawson's professional map draughting and cartographic highly professional, sketching were and considered some of the finest examples produced in the first three decades of the nineteenth century. Dawson also introduced students to drawing contour maps (before 1830). Contouring was used before 1793. The military adopted contouring where "relative command of ground is of great importance". Sir Thomas Larcom credited Dawson with introducing the term "contouring" sometime around 1800. Dawson died in 1860.

Colonel Colby was appointed director by the Duke of Wellington. His initial pay was 1£7s 8¹/₂d per day (about 500 £ per annum). He remained the director of the organization until his retirement in 1846. Prior to moving to Ireland (1825), Colby was regularly in the field accompanying his field teams and participating in the same field accommodations (food and sleep conditions). In one incident it is reported he traveled from London to Huntley by mail coach, sitting atop the coach incurring the adverse weather conditions. When in camp, he accepted the conditions presented -"slept in his clothes on a bundle of tent linings". In one excursion he took Lieut. Robe and a small party of men on a "station hunt" (survey station reconnaissance) on a 22 day, 513 mile trek afoot. Immediately thereafter, he led a second trek over 586 miles.

In the winter of 1824 - 25, Colby presented Lieut. J.E. Portlock with the details of constructing a compensating bar apparatus for measuring geodetic base lines in Ireland. This instrument became the "Colby Apparatus" and was employed in India, Great Britain, Cape of Good Hope, and Ireland. In 1828, Colby married the second daughter of Archibald Boyd, of Londonderry (at age 44). The couple had four sons and two daughters. Until his retirement, Colby was in charge of the two survey organizations but spent most of his efforts until the original six-inch map series was complete in Ireland. Around 1842, the triangulation of Scotland was reinitiated and the mapping program commenced. Colby then returned to Scotland and led the field teams until his retirement.

In 1846, Colonel Colby retired. The year marked the formal completion of the six-inch maps of Ireland (1 : 10,560). Colby voluntarily

retired believing that after 44 years he deserved "a rest". He was a Fellow of the Royal Society; original member of the Royal Astronomical Society; assisted in the formation of the Royal Geographical Society; Fellow of the Geological Society; Honorary Member of the Institution of Civil Engineers; and received an L.L.D. from the University of Aberdeen. Except for the promotion to Major-General just before his retirement, Colby never received any of the "royal honors" from the various governments he served. His circle of friends included (army) Burgoyne and Everest; (sailors): Beaufort; (science): Fairday, Airy, Kater, Herschel, Baily, Sheepshanks, Barlow; and Robert Stevenson (engineer of light houses). There is little doubt in this writer's mind that George Biddell Airy's "The Earth" received critical review by Colby. G.B. Airy, Astronomer Royal, had a reputation of sometimes being a difficult person with whom to deal. Even Airy himself so states in his autobiography. From the time of Airy's graduation from Cambridge University, Colby and Airy would regularly communicate on a number of different commissions and committees. There is no indication that there was anything but cordial meetings and relations.

Under Colby's tenure a number of competent young engineers were trained and educated. The first cited herein is Joseph Ellison Portlock, graduate of the Royal Military Academy and commissioned in 1813. In 1814, he participated in the siege of Fort Erie, Canada, in the War of 1812. For most of that time he was the only engineer in the trenches. For his efforts he was commended in General Orders. In 1824, he was posted to the Ordnance Survey and then to Ireland. Portlock observed most of the main triangulation stations in Ireland and completed the Great Triangulation in 1832. He then directed the minor triangulation and height determinations throughout the island. In 1837, Portlock formed a geological and statistical office within the Ordnance Survey of Ireland. This office later became the basis for the Geological Survey. In 1843, he departed the organization and held a series of appointments at which he was very successful.

Colonel Colby had a knack for identifying promising young officers. One of these was Sir Thomas Aiskew Larcom (1801 - 1879). A graduate of the Royal Military Academy, he was commissioned a 2nd Lieut. in 1820. In 1824, he joined the Ordnance Survey and was posted to Mountjoy in Ireland. Mountjoy is located in

(Continued on Page 17)





Congress passed the Pacific Wagon Road Act that authorized the funding for surveying, engineering and construction of what was the largest federally funded road project west of the Mississippi at the time. The goal was to shorten the overall length of the Emigrant Trail then in use to California and Oregon. In addition to 50 miles of alkali desert and expensive ferry crossings on the Green River, there were problems in Utah at the time, and that route was to be avoided. "Lander's Cut-Off" ("cut-off" being a nickname for "shortcut" at the time) of the route, at approximately 229 miles in length, cut 60 miles and approximately one week of travel time.

Lander, as Chief Engineer for the project, under directions of the Department of the Interior, was instructed to begin the project in 1857. He left Independence, Missouri, on June 15, 1857, and arrived at South Pass on July 15. They began the trip with 27 mules, two horses, two wagons, and the usual provisions of bacon, beans, coffee, sugar, and flour. Together with his initial crew, they covered roughly 34 miles a day.

Lander broke his crew down into two-man teams. Each team was assigned a different area to reconnoiter and survey with the idea of providing



a quicker route to Oregon and California than the current route. They were looking for terrain that wasn't too difficult for ox-bound wagons with plenty of water, grass, and timber along the way.

Lander and his teams were able to complete the preliminary surveys during the summer and early fall. Lander returned to Washington, D.C., later that fall to flesh out his preliminary report and await construction on the road the following year.

Most of the surveys were conducted using a compass and an odometer wagon. The compasses were most likely surveyor's compasses with vernier sights. The odometer was a geared assembly designed to count the revolutions of a wagon wheel, which was calibrated to return distance. The odometer wagon, or cart, was small, weighed about 80 pounds, and was pulled by a horse or mule.

The surveys for the Lander Road were conducted before the General Land Office (GLO) had conducted their sectionalized land surveys, so the road survey was not tied to any known corners. Topographical features were noted where they crossed the survey centerline, but were not shown in any great detail. The field books of the surveys still survive, but are difficult to read.

Odometer Cart. Note odometer just above hub of wheel.

Surveyor's Compass

Note: These are not images of the actual instruments used during the survey. They are typical of instruments of the time.

Photos courtesy of Topographical Engineer Department – United States Corps of Engineers 7 July WSX between Green River for Ditterroot Creek. Jarvey nife 232 105 0,19 I 105 350 374 0,76 3022 437 $\mathcal{E}\mathcal{E}$ 0,16 4832 460 23 ۵,۵6 2512 540 0.32 80 285 % sig 3,22 3082 625 63 272 715 36 3,08 291 907 0.60 283 1069 0.36 2853 1312 5.48 0,68 207 1372 55 ¢, 15 312 1621 0.78 305% 1624 0,77 215 172 . 0,47 312 2362 79,69 3312 2474 317: 2672 2.02 0.55 270: 29.00 228. 0,62 ીજોવ્ય 218 2978 2/ 0.12 3054 3350 270 1,02 with pland 3315 11.5 0.46 2852 3602 87 0,24 ~ !! ~ 3913 311 0,86 2.5.0 4235 322 0.89 261: 450% 2/2 0.72 DEg. Ber 4635 125 0,55 27.82 4745 47.89 44 0.12 13,18 miles,

During 1857, William M.F. Magraw was the Superintendent of the South Pass Wagon Road Survey, with Lander, as the Chief Engineer, as Magraw's "No. 2" guy. Magraw was an alcoholic with all the attendant problems that are associated with that affliction. Lander was fairly diplomatic and was able to accomplish his work without too many problems with Magraw. But there had been several incidents during this time period concerning Magraw that came to the attention of his superiors in Washington. As a result, Magraw was relieved of the Superintendent's position, which was then given to Lander.

Lander and his staff spent the months of February and March 1858 scoping out the summer's work. Leaving Washington, they arrived at South Pass on June 14, 1858. At this time, Lander had a crew and staff of about fifty-one people. They immediately went into action. A block house was erected to store supplies. Lander sent some of his crew for additional supplies that had been stockpiled at various locations the previous year. Lander started work on the road with his remaining men. The first section of the road went fairly easily from South Pass to Piney Canyon.

Work then became more difficult when they reached the Wyoming Range, requiring timber cutting. On the south fork of Piney Creek in the Piney Canyon, they built a crude building as a resupply point for the work crews. They called the building "Fort Snyder" after James Snyder, one of Lander's crewmen. At this point, about 47 new crew members arrived from Salt Lake City to work on the road. By August 10th, there were about 100 men on site. They continued westerly, leaving Snyder Basin, until they reached a pass they named "Thompson Pass" in honor of Lander's boss back in Washington. At 8,700+ feet, this will be somewhat difficult terrain for the emigrant wagon trains. Heading southerly for a couple miles, they reach LaBarge Creek and an open valley that runs northwest. They follow this valley for about six miles, then westerly through a small pass on Commissary Ridge. They named this pass "Wagner Pass" in honor of William H. Wagner, the crew's topographer, engineer, and physician. Also, a peak about four miles northwest, was named "Wagner Peak." They head southerly along the Hobble Creek drainage for a couple miles, then turn northerly up a Hobble Creek drainage for about a mile and a half, reaching an elevation of 9,000+ feet. Although this will be difficult on the wagon trains, as it is the highest point on the trail, it is relatively short in length. From here, they head southwesterly along the Poker Fork Creek drainage (Smith's Fork). They eventually turn northwesterly and tie in with the current U.S. Hwy 89. They continue in this direction, eventually paralleling the Salt River until they reach Stump Creek where they head west into Idaho, and their eventual terminus for Lander's Cutoff Road at Soda Springs, Idaho.

A copy of a page of field notes prepared

on July 7, 1858. Even though the road

was surveyed preliminarily by Lander (or

his crew), it was surveyed again during

construction in 1858.

Lines & Points



On August 21, Lander feels comfortable leaving the project in the hands of his assistant, J.C. Campell, and heads to Salt Lake City for a little R and R. While there, he pays his respects to exgovernor, Brigham Young. Even though tensions were still high between the U.S. Government and Utah, Young thanks Lander for hiring men from Utah to work on the project, recognizing it as a public utility and a boost to the economy.

By the time Lander returns to the project, it is essentially complete and it is time to think about shutting the operation down for the season. During the 229.46 mile project, they had excavated 62,310 c.y. of earth, removed one mile of rock, cleared 11 miles of willows, and 23 miles of heavy pine. The cost of the expedition was \$40,260.77. Lander and some of his staff head back to Washington in the late fall.

Lander's lengthy report of January 20, 1859 included his "Emigrants Guide." These guides were common at the time for other routes. They typically gave a few narrative comments followed by a tabular list of topographical features and miles between the features. Lander was quite proud of his guide and had 5,000 copies printed. They were available at many government offices back east, and at Gilbert's Store on South Pass, the starting point of Lander's Cutoff.

Though Lander's Cutoff Road was essentially constructed, he returned during the summer of 1859 to complete other sections of the Pacific Wagon Road, and to patch a few areas of the cutoff that were damaged during the winter, or needed a additional work. Though not officially open during construction, there are some documents that state emigrants were using the road in the summer of '58. In the first official year of use (1859), Lander estimated 13,000 emigrants used the road. Some estimates put the total usage, during the busy years between 1859-1869, between 300,000 and 500,000 emigrants, although these numbers seem high. One author puts the number closer to 100,000. A local historian thinks 50,000 is a more accurate number. In any event, an exact number is impossible to determine because there were no official tallies kept. And even though a covered wagon was seen using the trail in 1912, its use was greatly reduced by 1869 when the transcontinental railroad was completed.

The Lander Road (Trail) has been retraced over the years, primarily by the BLM, Forest Service, and public interest groups. In many places, there are square concrete posts that mark the route. These used to have brass medallions affixed, but so many were being stolen that the BLM removed all the remaining medallions. The concrete posts are still in place. Much of the trail exists on federal lands, but a fair portion traverses private lands. Some of it has been obliterated by construction, but not as much as might be expected. In addition to the concrete monuments, several memorials have been placed along the route in commemoration.

Frederick W. Lander was born in Salem, Massachusetts on December 17, 1821. His family was fairly well-off, and he was educated at Governor Dummer Academy, Phillips Academy, and Andover and Norwich Military Academy. He took up the profession of civil engineering as an army officer. Before work on the Lander Road survey, he was engaged by the U.S. government surveying various routes for the proposed transcontinental railroad. Lander was believed to be at least 6'2" tall and weighed more than 200 pounds. An acknowledged top-rate surveyor and engineer of railroads and wagon roads, Lander was also a soldier and explorer, was fearless, a perfectionist, handsome, vigorous, hot-tempered, a published fiction writer and poet, and was a popular speaker with the wellheeled set in high society. Though not averse to self-promotion, Lander's name is not so well known as say, John C. Fremont. Though perhaps it should be. It could be argued that Lander had more worthy accomplishments, of public benefit, than did Fremont.

After completing his duties on the Lander Road, he served in the Union Army during the Civil War. Brigadier General Lander became ill with a "congestive chill" in February, 1862. He died on March 2, 1862 from what is now believed to be pneumonia. His funeral was attended by President Lincoln and 40,000 others. He was 41 years old.

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8. PinedaleOnline.com

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(Continued from Page 10)

Phoenix Park, Dublin, and became the center of scientific education. Larcom served on many committees and commissions, attempting to increase his knowledge of Ireland. In 1846, the original six-inch mapping program was completed, and Larcom left the organization. Following his resignation, Larcom held many offices in Ireland, including Under-Secretary for Ireland (1853 -1868). Larcom never relinquished his interest in scientific matters. He wrote hundreds of bound notebooks, including three books on contouring and one book on differential leveling. After retirement he was created a baronet and an Irish Privy Councilor.

The Determination of Elevations

By the end of 1770, the wye level was an essential surveying instrument used in canal construction. The level tube (vial) was rigorously attached to the telescope which sat in a pair of wyes (Y's). In 1830, William Gravatt improved the design by permanently affixing the telescope/vial assembly to the wyes. The first definitive textbook on leveling was authored by William Simms. It went through several editions, and was last published in the first decade of the twentieth century. Therefore, the



art and science of differential leveling (also called spirit leveling) was well known and understood.

The Ordnance Survey of Ireland executed the first differential leveling survey in 1837 to connect large lakes in northern Ireland to the sea. William Whewell, headed a committee of the British Association, in this endeavor and substantiated that the differences in elevation determined by differential leveling produced accuracies better than achieved by vertical angle observations. In 1839, differential leveling was adopted in Ireland, and completed in 1843. The "zero for the vertical datum adopted was the "low water spring tide, observed at Poolbeg Lighthouse, in Dublin Bay, on 8 April 1837". This datum later was compared



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to mean sea level. It was discovered that mean sea level was higher by eight (8) feet.

George Biddell Airy, Astronomer Royal, had authored a paper on tides earlier. Therefore, Colby consulted with Airy and devised a plan to define a vertical datum. The result of the consultation was to observe tide observations at 22 sites around Ireland in June, July, and August 1842. The procedure was to observe the tide pole (tide gauge) reading every five minutes for one complete tide day. The results confirmed the opinion that "mean sea level" would form the best vertical datum. The campaign in Ireland and the subsequent tidal observations at Victoria Dock, Liverpool in 1844 launched an in depth study on tides. William Whewell authored thirteen papers (called Series) on the tide which were published in the Philosophical Transactions.

To define the vertical datum for Great Britain, the observations were made at Victoria Dock, Liverpool. Near the mean heights of high and low water (tide), observations were made at five minute intervals for nearly an hour between 7 and 16 March 1844. This was known as the Old Liverpool Datum. It would be used for eighty years. Between 1 May 1915 and 30 April 1921 an automatic tide gauge at Newlyn, Cornwall, became the new datum based on the mean of the hourly readings.

In 1840, the geodetic leveling of Great Britain was initiated, and was completed in 1860.



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Responsible Chapter	First Call Date	Last Call Date	Publication Date		
West Chapter	THANK YOU!! (SEE ""	THE LANDER TRAIL" IN THIS ISSU	е)		
Central Chapter	September 1	September 15	October 1, 2015		
South Central Chapter	December 1	December 15, 2015	January 1, 2016		
Southeast Chapter	March 1	March 15	April 1, 2016		

Common Research Mistakes Surveyors Make

Forward Search

by Knud E. Hermansen † P.L.S., P.E., Ph.D., Esq.

In a previous article I stated that surveyors often make five common mistakes in researching the records. In the first article I discussed mistakes made in determining senior title. The second of five common mistakes often made by surveyors when researching the records is the failure to perform a forward search.

Many surveyors perform a record research back in time but fail to perform a search forward in time. As a consequence, the surveyor will often miss recorded out-conveyances from a parcel. The surveyor will also fail to find other recorded documents (e.g., boundary agreement) related to the boundary of the parcel being researched.

Assume a research of the records has disclosed that Randy owned a residential lot from 4 June 1932 to 16 August 1974. On 13 June 1950, Randy conveyed a five-foot strip of his residential property to his neighbor, by a properly executed deed. The neighbor built a fence along the new boundary on 2 May 1954 (thereby providing notice).

On 16 August 1974, Randy conveyed the residential lot to Bill. The deed from Randy to Bill used the original description and did not mention the five-foot strip conveyed to the neighbor twenty-four years previously.



On 23 August 1989 the executrix (personal representative) of the neighbor's estate discovered that the deed for the five-foot strip from Randy to the decedent had never been recorded. The executrix recorded the deed for the five-foot strip on 23 August 1989. Although the deed was executed in 1950, the deed was indexed in the indices covering the 1989 time period when the deed was finally recorded.

If a surveyor fails to perform a forward search, the surveyor will not discover the recorded deed conveying the five-foot strip of land to the neighbor. The surveyor, with Bill as a client, would believe the fence was encroaching on Bill's property.

What this example illustrates is that a complete record search entails using the name of a previous owner and searching every grantor index from the time the property was conveyed to a predecessor in title up to the present time. This procedure is known as a forward search. Unless a forward search is performed, the surveyor will not discover some conveyances that were made, properly indexed, and are effective against the title to real estate.

Bringing to light a surveyor's failure to perform a forward search will not necessarily convince surveyors to undertake the tedious and time consuming research necessary to overcome this limitation. Yet, the failure to perform this task could expose the surveyor to liability. At the very least, the surveyor should inform the client that these deficiencies in the research exist at the completion of services. Should the client want to compensate the surveyor for the time to perform a thorough search, these limitations can be overcome. † Knud is a professor in the surveying engineering technology program at the University of Maine. He offers consulting services in the area of boundary litigation, title, easements, land development, and alternate dispute resolution.





Proving that surveyors are a resourceful bunch, pictured is a "monument" that was found at the center quarter of a section that was being resurveyed last summer in northwestern Nebraska by Ryan Lorenzen, BLM Cadastral Surveyor. The survey was being conducted for the U.S. Forest Service in the National Grasslands approximately ten miles north of Crawford, Nebraska. The monument, described by Ryan as "an iron axle, 1 in. diam., firmly set, projecting 11 ins. above the ground, with a four post wheel hub, $5\frac{1}{2}$ ins. diam. on the top" was accepted as a careful and faithful establishment of the corner position. Because of its location in a "badland" area, where the ground was "hard as concrete", the monument was stamped as shown, rather than replaced with a standard BLM post.



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