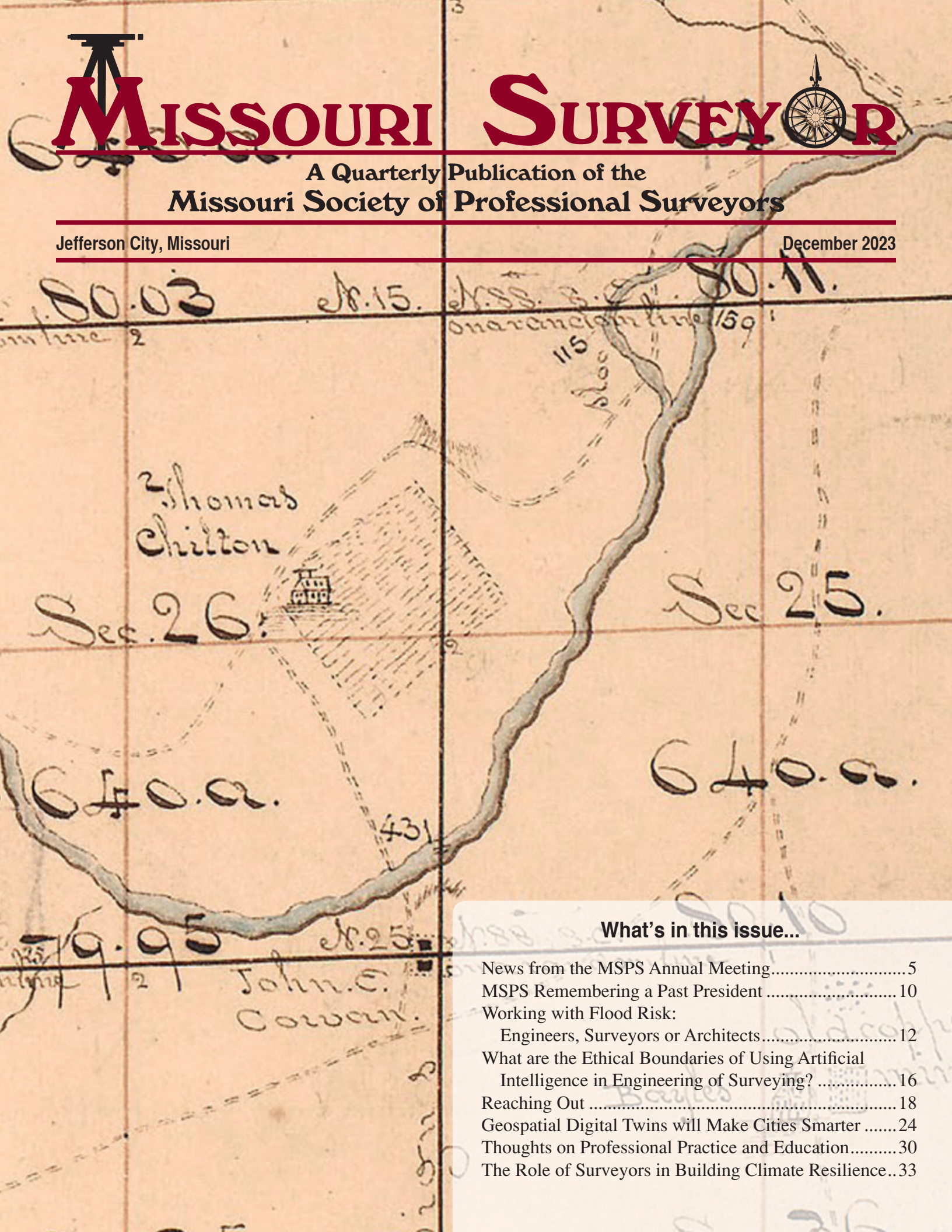


MISSOURI SURVEYOR

A Quarterly Publication of the
Missouri Society of Professional Surveyors

Jefferson City, Missouri

December 2023



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CALENDAR OF EVENTS

2024

February 14, 2024

Zoom Call, Board Meeting
Jefferson City, MO

March 13, 2024

USPLSS Webinar via zoom

May 1, 2024

Board Meeting
Lodge of Four Seasons, Lake Ozark, MO

May 2-3, 2024

46th Annual Spring Workshop
Lodge of Four Seasons, Lake Ozark, MO

July 6, 2024

Zoom Call, Board Meeting
MSPS Office, Jefferson City, MO

August 12-14, 2024

Review Course
Location TBD, Jefferson City, MO

October 3-5, 2024

67th Annual Meeting and Convention
Margaritaville Lake Resort
Osage Beach, MO

December 7, 2024

Zoom Call, Board Meeting
MSPS Office, Jefferson City, MO

Cover: In T29N R4W, between sections 25 and 26 in August of 1821, "Set a quarter section corner stone ... in the high corn [55 20] ... leave T. Chilton's field ... his houses are on the left."

Donald R. Martin, Editor



Notes from the Editor's Desk

Donald R. Martin



As I put the finishing touches on the December 2023 edition of *Missouri Surveyor* in late November, things are getting busy with the coming holidays and a new legislative season. Yes, there is always something to do.

This edition most importantly features news and images from the MSPS Annual Meeting at the end of September in Springfield. In our early pages be sure to check out a photo collage tribute to vendors and presenters at the meeting.

This is followed by reflections on our fellow members honored with awards, the installation of Bob Anderson as our new president, and recognitions of our newest PLS's and LSIT's. It looks like a lot happened over those three days!

Following the news from the Annual, we sadly publish the news of a MSPS past-president passing away. Craig Ruble of Salem left us far too soon this past August. A good man and fine surveyor, Mr. Ruble's contributions to our Society were countless. While we may no longer share lessons and laughs with Craig, his lore and legacy will enrich our memories forever. God bless you Craig.

Fresh on the heels of one Annual Meeting we include a reminder of the next. It is a "Save the Date" message on page 11. Mark your calendars for October 3rd through 5th in Osage Beach. After these opening pages of this edition, the articles begin!

I won't chironal details here – you will get those insights from your own thorough reading. You do read our articles don't you? We offer an interesting array of topics and subjects in this edition...a little something for everyone. FEMA news and flood management, the ethics of artificial intelligence, surveyors' outreach to young students, thoughts from our old friend Knud Hermansen, and reports on emerging opportunities for surveyors related to 3D modeling and climate change. Whew! – that is a lot!

Along the way don't ignore the ads. Please patronize these supporters of MSPS. And take special notice of an employment opportunity (Cochran Engineering is hiring!) and an early announcement from the Surveyors Historical Society about their September *Rendezvous* in neighboring Iowa.

Well, I best break-it-down and bunch-it-up. As I do so this November, I like most of you am giving thanks. Mine include thankfulness for being Editor of *Missouri Surveyor*. Thank you all for this wonderful opportunity and another good year. I'll get back with ya' in the next edition... 🇺🇸

Donald

THE MISSOURI SURVEYOR

Published quarterly by the
Missouri Society of
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	4 issues	1 issue
Full Page	650.00	200.00
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COPY DEADLINE

March Issue — February 1
June Issue — May 1
September Issue — August 1
December Issue — November 1

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The Missouri Surveyor is published quarterly by the Missouri Society of Professional Surveyors, to inform land surveyors and related professions, government officials, educational institutions, contractors, suppliers and associated businesses and industries about land surveying affairs. Articles or opinions appearing in this publication do not necessarily reflect the viewpoints of MSPS but are published as a service to its members, the general public and for the betterment of the surveying profession. No responsibility is assumed for errors, misquotes or deletions as to its contents. Articles may be reprinted with due credit given.

President's Message

Bob Anderson, PLS



I'm truly humbled to be given the opportunity to serve this Society as President. I look at the surveying community in the true meaning of the word. I don't know how people in other professions view their peers, but I can't imagine another profession holding their fellow professionals in higher regard than surveyors do each other. Many of us have experienced being in a social setting, and upon discovering another surveyor in our midst, there is an instant bond of kinship.

For those of you who know my lineage, you know I have some very large shoes to fill. My family started in the surveying profession in 1919 when my great-grandfather, James Pearl Anderson, started his first surveying job in the Kansas City area after serving in World War I. He then moved to Versailles to work on the Bagnell Dam. Following his work on Bagnell Dam, he moved back to Kansas City to work for Tuttle, Ayers, and Woodward. In 1946, with the blessing of his employer Colonel William Spann he ventured out and started Anderson Survey Company with his sons, Robert and Oliver, after they returned from World War II. Robert and Oliver went on to run Anderson Survey Company until their passings in 1965 and 1982, respectively. At that point, my father, James S. Anderson, assumed the mantle of operations. He has gone on to serve as president of our society and was the first surveyor to chair the Board for Professional Architects, Professional Engineers, Professional Land Surveyors and Professional Landscape Architects. Hopefully this apple didn't fall too far from the tree.

I am proud of my family's legacy in surveying but I am also proud to be a Missouri surveyor who is simply a peer among all Missouri surveyors. Particularly those in MSPS. It is my daily honor to be one among us all. To be a fellow member with you all in our fine association. I look forward to this coming year with all of the opportunities to work with you, and work for you. Together, let's continue the legacy of the Missouri Society of Professional Surveyors.

I will do my best to show our Society the reverence it deserves and always have an open ear for ideas of how to improve our profession and standing in the community at large.

Thank you again for the opportunity. Have a Merry Christmas and Happy Holidays. 🇺🇸

Bob

(continued on page 15)

Thank You, Exhibitors & Speakers!

66th Annual Meeting of MSPS

Exhibitors

Carlson Software
 GBA (George Butler Associates, Inc.)
 Geo-Tronics of Kentucky
 HubTack, Inc.
 Laser Specialists, Inc.
 Midwest Measurement
 MO Dept. of Agriculture-Land Survey Program
 Ozark Laser
 Seiler Instrument & Mfg. Co., Inc.

Seiler Geospatial
 Smart Drone, Inc.
 Southern Illinois University-Edwardsville
 State Technical College of Missouri
 Surveyors Historical Society
 Surveyors Materials
 Topcon Solutions Store
 Transit & Level Clinic



Speakers

Jim Copeland, PLS, MODOT
 Melvin Distler, PLS, MODOT
 David Doyle, Base 9 Geodetic Consult. Services
 Richard Elgin, PS, PE, Archer-Elgin Engi & Surv
 Scott Faenger, PLS, Land Survey Program
 Dennis J. Moulard, PLS, Witness Tree Consult.
 Jess Moss, PLS, Land Survey Program
 Matt Thomas, PLS, Premier Design Group
 Jacque Walters, Land Survey Program



News from the MSPS Annual Meeting

by Don Martin

During the 66th Annual Meeting of the Missouri Society of Professional Surveyors on September 29th in Springfield, the Award/Nominations Committee represented by President Ray Riggs presented honored members with the association's awards. The presentations went something like the following...

Jess Moss: Surveyor of the Year

"A member that gives freely of their time and efforts to our association and toward the betterment of the surveying profession," is honored as the MSPS Surveyor of the Year. Criteria for this honor call for knowledge, integrity and competency as qualifications.

This year we recognize a colleague who plays a uniquely active role in monitoring, maintaining and making the geospatial infrastructure of Missouri. He is a respected peer with 20 years of experience in our profession. Graduating from Missouri Science & Technology University in 2003, he took up the trade of surveying with the firm Cochran of Union which he followed with a tenure at Archer-Elgin of Rolla. He attained is license in 2008, all-the-while practicing in every facet of surveying. In 2015 our recipient joined the Missouri Land Survey Program, and by 2017 he became our state's Geodetic Coordinator. He serves that role ably has he has been called upon to lead in our ongoing transitions regarding coordinate systems, projections and datums.

Therefore, in recognition of contributions as:

- The steward of the MoGRS; past, present and future,
- Missouri's guide in improving the National Spatial Reference System,
- A lead developer of Low Distortion Projections
- The coordinator of Missouri participation in NGS programs,

We honor our 2023 MSPS Surveyor-of-the-Year:

Missouri PLS #2008016662, Jess Moss



(continued on next page)

News from the MSPS Annual Meeting *(continued)*

Mike Zahner: Robert E. Myers Service Award

The Robert E. Myers Service Award; our career achievement award. It honors a member with “more than 10 years of exemplary service and dedication to the surveying profession and in particular to the Society.”

We recognize a member and fellow surveyor who has made important contributions to our Society by serving in virtually every office we have! He joined surveying’s ranks four decades ago under the tutelage of one of our all-time greats. Upon the untimely death of his mentor, our recipient respectfully stepped in and continued the legacy of exemplary professionalism, surveying excellence and business acclaim that once belonged to his boss and friend Robert Pirrie. Our honoree has gone on to his own successes, serving clients throughout Missouri and Illinois as the President of his own firm. With all he has accomplished, it is the role of mentor he regards most importantly. Just as was once done for him, he now does for those in his charge at Zahner & Associates. This includes another generation of Zahners!

Held in high-esteem within our Society, and renowned for his long and continuing service to MSPS...

We honor him for being a leader in MSPS as:

- A Director and Officer
- MSPS President (2001)
- NSPS Governor for Missouri
- President of Zahner & Associates

The 2023 MSPS *Robert E. Myers Service Award* is therefore presented to:

Missouri PLS #2294, Mike Zahner



(continued on page 8)



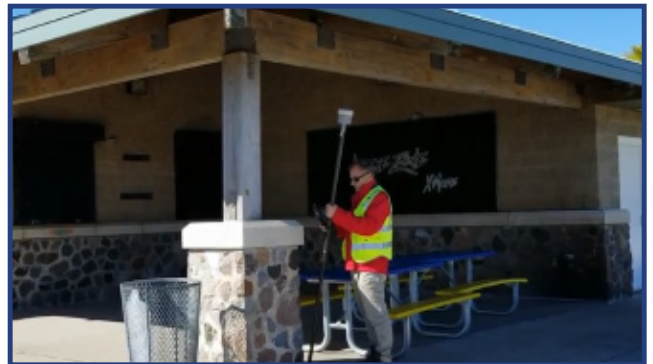
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News from the MSPS Annual Meeting *(continued)*

Legislative Award: Senator Karla Eslinger

In the Surveyor's Creed, the following is included –

“To do my utmost to raise the standards of the land surveying profession”

Our Society heeds this call in numerous ways. We draft standards, we educate our members on their applications, we teach them to our interns. We also work to address them in the law. Be they statutes or codes, our charge does require we turn to the political process on occasion. And when we do, we not only rely on our members being active and astute. We also call upon friends... those we and our fellow citizens have chosen to guide us in our law making. Today, we honor such a friend.

In 2022 and 2023, MSPS sought and worked for enhancements for the requirements to become a land surveyor and legislation needed for improvements to our geospatial systems. On those matters, both of these years, we were helped by our friend, Senator Karla Eslinger of Wasola, Missouri.

Senator Eslinger's District 33 includes Douglas, Howel, Ozark, Shannon, Stone, Taney and Texas counties. Prior to holding office, Senator Eslinger was an educator, having been an elementary school teacher, a principal, and a superintendent of schools in Ava and West Plains.

She has championed the causes of MSPS in the last two sessions, and it is with our greatest appreciation of her sponsorship we humbly offer our “thanks” by awarding our 2023 Legislative Award to:



Senator Karla Eslinger

Bob Anderson Installed as MSPS President

*Missouri Society of Professional Surveyors
By-Laws
Article II – Officers*

...to be elected by the voting membership at the Annual Meeting or by an email ballot prior to such meeting and to serve until their successors have been duly elected and assumed office.

As is customary and prescribed by MSPS By-Laws, the Annual Meeting marked an end to the service of Ray Riggs as President and the installation of Bob Anderson of Lee's Summit. Mr. Anderson is a fourth-generation Missouri surveyor and the son of former MSPS President Jim Anderson (1986).

Ray Riggs of West Plains will continue his service to MSPS as the Immediate Past President. Thank for a fine year as our leader Mr. Riggs and congratulations Mr. Anderson. Best wishes for success throughout your term.



(continued on page 15)

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In Memory of Craig Lee Ruble

Surveyor Craig Ruble of Salem, Missouri, departed this life August 27, 2023, from his home in the beautiful Ozarks.

Craig was born in Sedalia, Missouri on May 22, 1956, at Whitman Air Force Base, the oldest of five children. The family lived in several areas of southwest Missouri as his father was a lineman for the Rural Electric Association, finally settling in Salem, where Craig graduated from Salem High School.

He discovered surveying while working for the Bureau of Land Management and became a Professional Land Surveyor, eventually establishing Ruble Survey Company. He served on the Board of Directors of Missouri Society of Professional Surveyors, holding office from 1997 to 2005 when he was elected President. He was a member of the Missouri Association of County Surveyors and served as Dent County Surveyor.

Friends and family remember Craig for his tender heart and contagious smile. He'll be remembered for his love of beagles and wildlife, his rock and knife collections and his incredible sense of humor. He was a gifted storyteller, captivating an audience whether he was describing work on the federal lands and national forests of the Ozarks; changing the course of a river; or quirky mannerisms of relatives long gone. He delighted in hunting and camping on his property named Fishwater. His nieces and nephews were entertained as children by his musical instrument solos on guitar, banjo, fiddle, violin and the all-time favorite – his air trombone. He was a gentleman who made everything more fun.



Craig was preceded in death by his parents: Jack Ruble and Lela Jacobs. He is survived by his loving family including, stepdaughter: Deanna Nash of Salem, MO; siblings: Pamela Childress and husband Robert of Springfield, MO, Mark Ruble of North Little Rock, AR, Kim Gollhofer and husband Thomas of Salem, MO, and Amanda Wampler and husband Gene of Springfield, MO; grandchildren: Emily Brooks and husband Jake, and Savannah, Erin, Aubrey, and Eli Nash; as well as a host of nieces, nephews, cousins, other relatives, and dear friends. 🇺🇸

MSPS Remembering a Past President

PLS Craig Ruble of Salem was President of the Missouri Society of Professional Surveyors in 2005. He was a frequent instructor at MSPS meetings where he shared his enthusiasm and expertise for the retracement of original surveys. Craig was a master of surveying the Public Land Survey System and particularly adept at finding, recording and perpetuating its corners.

Imparting the lore and legacy of surveying were paramount concerns of Ruble. While he did a wonderful job in front of room of surveyors conducting a “class” on section break-downs or parenthetical corners (a favored topic), he was his happiest when sharing his skills at the annual Surveyors’ Rendezvous. Held in the forests of the Ozarks in the early winter of each year, he led the way as fellow surveyors gathered to follow him through branches and brush, over hills and down hollows, searching for stump-holes and corner stones.

The Society was proud to have Craig as a member and thankful for his service. We were honored to have him as a leader and will recall his memory with favor. He’s the one wearing the timber-cruiser’s vest, carrying a set of old field notes. 🇺🇸

67th Annual Meeting

of the

Missouri Society of Professional Surveyors

OCTOBER 3-5, 2024

MARGARITAVILLE LAKE RESORT
OSAGE BEACH, MISSOURI

Save the Date

PRELIMINARY PROGRAM

"Mapping Missouri"

Presentations on the early mapping of our state.

"Artificial Intelligence and the Surveyor"

How AI has already affected surveying and mapping practice and its future influence. Applying AI today and in the future.

"Shall I Buy a Drone?"

The spectrum of drones available, their capabilities, their pricing, their applications are huge. Is it time for the 4-person firm or the 20-person engineering/surveying firm to buy? If so, what is the cost, what is the application, how much training and will it make any money?

PLAT CONTEST

Enter your best work into the first MSPS Plat Contest. View the winning entrants' plats during the Annual Meeting.

**Details to Come*

Working with Flood Risk: Engineers, Surveyors or Architects

Federal Emergency Management Administration

Engineers, surveyors and architects play an important role in building mitigation solutions and providing data.

These resources are geared toward helping these professionals understand flood-related risks and technical tools available to them.

Know Your Risk

Get the necessary information to understand the mapped flood risk and zone(s) for your project area.

Find Your Flood Maps

Find existing flood maps through the FEMA Map Service Center (MSC).

For areas that already have digitally produced Flood Insurance Rate Map (FIRMs), the data will also be available in Geographic Information System format through the National Flood Hazard Layer (NFHL).



Letter of Map Changes (LOMC)

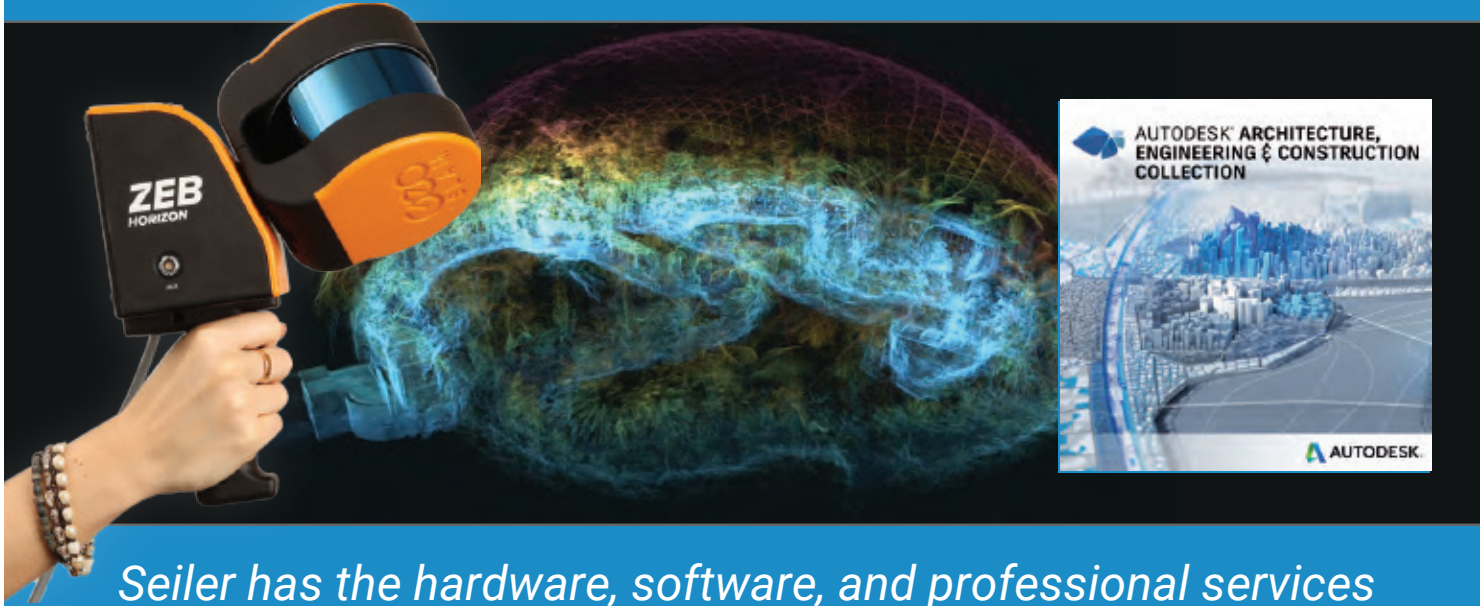
Keep in mind that LOMCs may have been processed in your project area after the effective date of the flood map. Recent Letters of Map Revision (LOMRs) will be included in the NFHL.

Order engineering back up information used to develop the flood hazard information shown on flood maps and LOMCs through the FEMA Engineering Library.

(continued on page 14)



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Working with Flood Risk: Engineers, Surveyors or Architects (continued)

Living with Levees

While FEMA maps flood hazards impacted by levee systems, FEMA does not build, own, or certify levees. The U.S. Army Corps of Engineers (USACE) is responsible for building and maintaining levees and for inspecting those structures to determine their level of maintenance.

States, communities, and private levee owners are responsible for maintaining and operating the levees they own according to specific design criteria.

Know Your Role

Make sure you understand your role as an engineer, surveyor or architect when performing flood risk or LOMC-related projects.



Cooperating Technical Partners (CTP) Program

With over 20,000 communities in the National Flood Insurance Program (NFIP), there is a significant challenge keeping flood hazard maps current.

The Cooperating Technical Partners Program is an innovative approach to creating partnerships between FEMA and participating NFIP communities, regional agencies, state agencies, tribes and universities that have the interest and capability to become more active participants in the FEMA flood hazard mapping program.

Take Action

Your project, if processed in accordance with the required FEMA, state and local requirements and standards, will help ensure that the flood map and FIS report and other flood risk products reflect the most up-to-date conditions.

Here are ways you can take action to make your project a success.

- Use the latest tools available from FEMA including Online LOMC or eLOMA processing and free specialized software for projects to update flood hazards, FIRMs and FIS reports
- FEMA provides guidance and standards for Risk MAP deliverables. Make sure your deliverables meet the necessary standards
- Make sure your project meets local permitting and building requirements. Contact the community officials where your project is located to confirm requirements which must be met. Be sure to correctly complete Elevation Certificate forms, which are required for certain LOMC requests and are used to verify compliance with building requirements
- Understand the NFIP regulations applicable to your project, read Technical Bulletins which provide guidance on NFIP building standards and adhere to NFIP and accepted industry building codes for flood-resistant design for construction projects
- Be informed of property protection measures that can be used to reduce flood risk. Advise your clients to build outside of the SFHA and/or encourage them to use these protection measures. More information is available through FEMA's Building Science resources
- Elevation Certificates must be prepared and certified by a Licensed Land Surveyor, Registered Professional Engineer, or architect who is authorized by Commonwealth, State, or local law to certify elevation information.

- Learn how to properly request a change or amendment to the FIRM. If physical changes to the floodplain have changed the flood hazard information shown on the effective FIRM, a revision must be requested. Make sure you understand the different types of Letter of Map Amendment and which applies to your project. This includes Conditional Letters of Map Revision for proposed projects located in the SFHA. The submittal requirements (including fees and forms) and process will vary based on the LOMC type. 🇲🇴

News from the MSPS Annual Meeting (continued)

New PLS's Recognized 🇲🇴



During the Annual Meeting, our new LSIT's were recognized. They are (l to r) Eann Bergman, Katelyn Jones, Amanda Kay Laughlin, Steven Niekamp, Waylon Sparkman, Garrett Spease, Landon Troesser, Justin Lee White, Jacob Mattson.



Missouri's newest PLS's were honored and recognized: (l to r) Eric Basinger, Adam Gerdes, Jeffery Jones, Craig Laneman, Christopher Rush. Congratulations and welcome to the profession!

What are the Ethical Boundaries of Using Artificial Intelligence in Engineering of Surveying?

by Ron Willey, Ph.D., P.E., August 2023, Licensure Exchange (NCEES)



I AM A CHEMICAL ENGINEERING PROFESSOR AND have been part of discussions that artificial intelligence (AI) is interfering with our ability to assess engineering student performance. Chat Generative Pre-Trained Transformer, or ChatGPT, is an artificial intelligence chatbot that enables users to refine and steer a conversation toward a desired length, format, style, and level of detail.

If students are turning to ChatGPT to generate answers, is this ethical?

Isn't this like using a calculator in place of a slide rule? Or using AutoCAD in place of drawing work on a drafting table? Calculators, spreadsheets, and AutoCAD are considered tools that make my work more efficient and accurate.

In my quest to find out if ChatGPT is a useful tool, I am finding that the answer is complex. Let's explore an example.

An example of ChatGPT

A few years back, I hired a local surveying firm, whose principal is a licensed surveyor in Massachusetts, for a property survey required for a building addition. I am now considering another building addition, but I would like to explore using other tools. I wanted to see if ChatGPT could provide a survey plot plan at a lower cost.

In early June 2023, I joined ChatGPT and asked it to create a survey plot plan for my property.

Below are the first two paragraphs of a response provided by ChatGPT.

I'm sorry, but as an AI text-based model, I don't have access to specific real-time data or the ability to generate visual content like survey plot plans. I can provide general information and guidance on survey plot plans, but for a specific location, I recommend reaching out to a professional land surveyor or consulting local authorities who can provide you with accurate and up-to-date information.

Land surveyors are trained professionals who specialize in measuring and mapping land boundaries. They have the expertise and tools necessary to create accurate survey plot plans based on the specific property you're interested in. They consider factors such as existing structures, boundaries, easements, and other relevant details.

For now, our professions—and therefore our ability to protect the public—appear to be safe from AI.

However, eventually, an artificial intelligence chatbot will find the Norfolk County Registry of Deeds, where my deed is recorded. It will find the plot plan on file. It will be able to piece together the history of the property, likely all the way back to 1623.


Is this an example of malpractice? My answer is no. This information exists. How it is brought out to the user/client does not matter, provided that it is in the public domain and is information and not design.

But let's say I hire AI surveyors, at one tenth the cost of my previous survey, and I receive a plot plan generated from a combination of registry information and satellite images. The building inspector is satisfied. Is this

malpractice? My answer is yes because the fieldwork is missing. So far, there is no substitute for the human element to go to the site and verify physical evidence.

There will always be a human element involved in design. A person must be held responsible and therefore must be qualified. One or two AI-generated tragedies will bring home the need for licensure and oversight.

You might suggest that we find a way to stop AI. Could professors stop the use of calculators in engineering classes and force students to use slide rules? The answer is no. How to legislate control and continue to protect the public will require understanding the ins and outs of AI and ensuring that the human element remains responsible.

Willey is a member of the Massachusetts board and a member of the 2022–23 NCEES Committee on Law Enforcement. 

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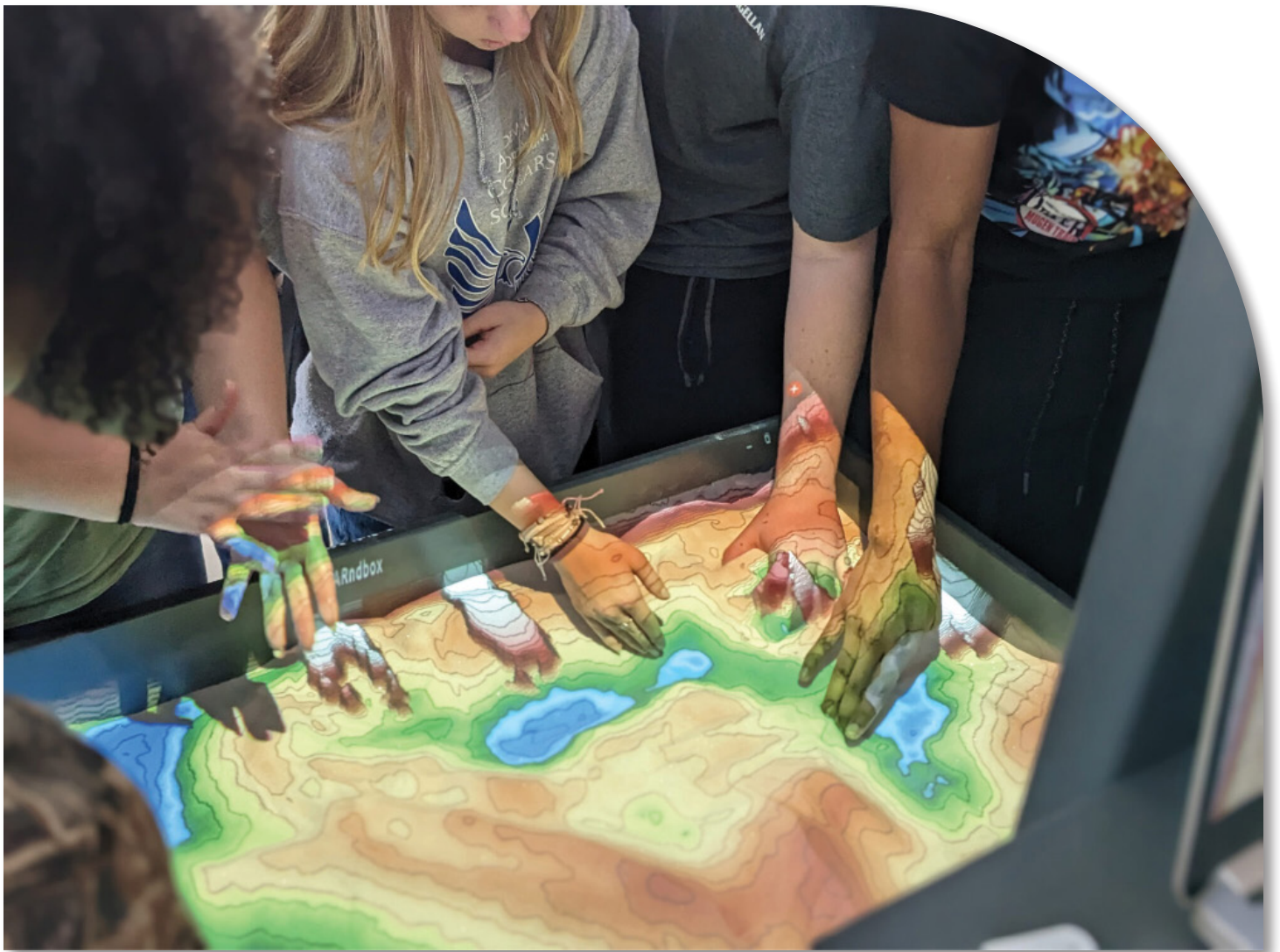
SOKKIA

Reaching Out

Using Technology and Outreach to Encourage Students to join the Profession.

by Brent Bass, PE, SIT and Melissa Padilla Cintron, SIT, June 10, 2023, American Surveyor

Amidst a global effort to inspire the next generation of young professionals to become land surveyors, mappers, and geospatial experts, DRMP is doing its part by investing in STEM education and proactively participating in community outreach.



High school students attending Construction Career Days at the Central Florida Fairgrounds in Orlando, Fla., got a hands-on experience with DRMP's Augmented Reality (AR) sandbox.

DRMP Geospatial Services Department Manager Brent Bass, PE, SIT, is reaching students through interactive, hands-on technology, while DRMP Survey Analyst Melissa Padilla Cintron, SIT, became a volunteer Brand Ambassador for Get Kids into Survey—a Manchester, England-based global initiative to attract students to the land surveying profession.

(continued on page 20)



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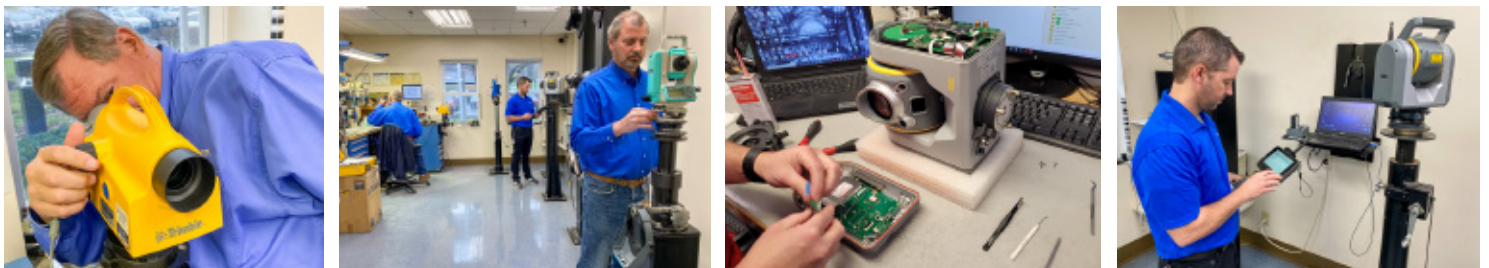
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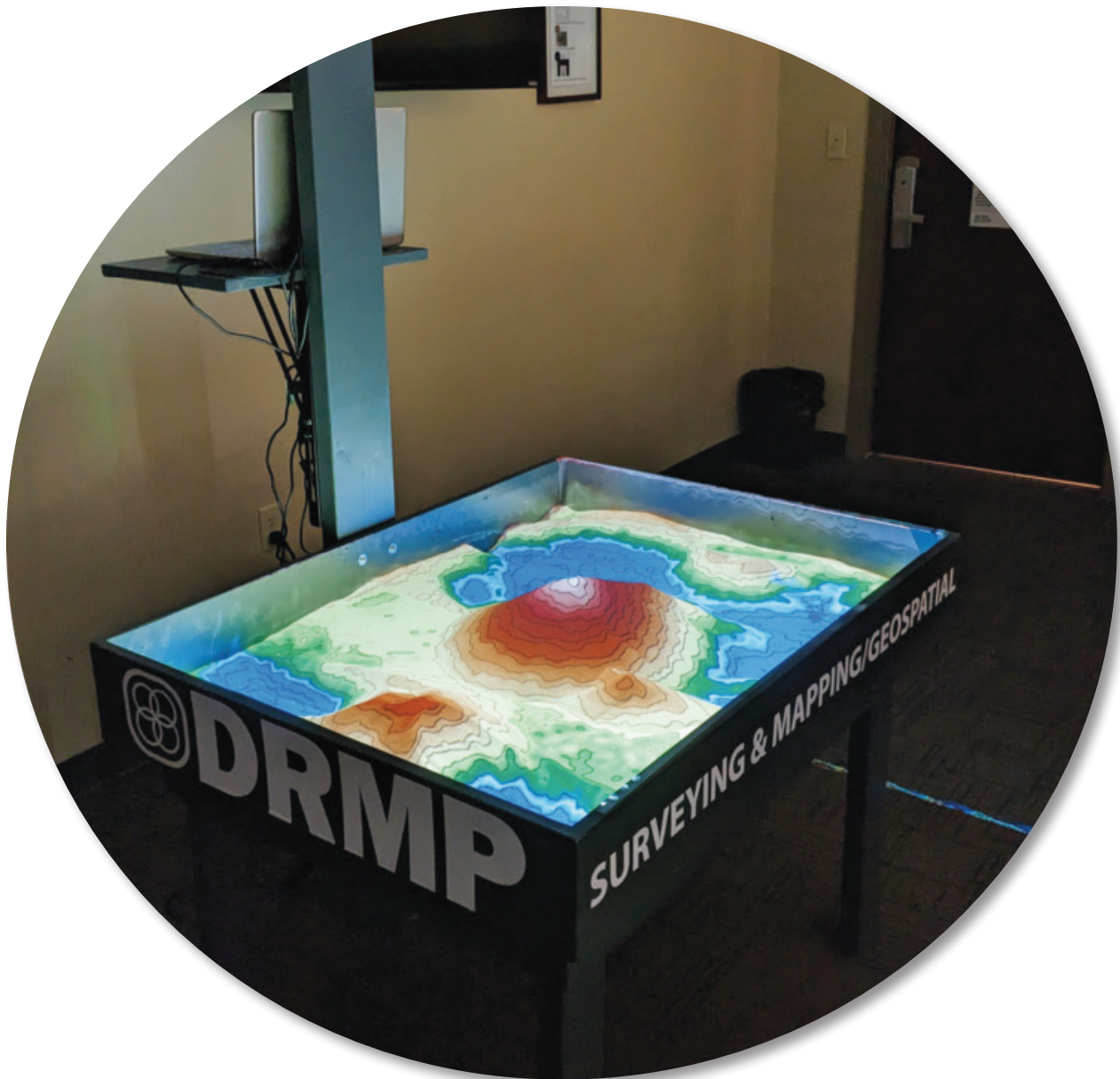
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Reaching Out *(continued)*

Bass Uses Augmented Reality Sandbox Workshop to Inspire Students

To spark interest in surveying, my team and I researched, developed, and built an Augmented Reality (AR) sandbox to teach students about the profession with the support of DRMP's Mapping/Geospatial Director.

I had the opportunity to recently introduce this workshop to 3,200 students who attended the annual Construction Career Days in Orlando, Fla. Our Survey presentation focused on surveying as a competitive job in our industry and how DRMP invests in its employees and technology. We explained our branch of surveying (LiDAR) and helped students understand what it is and how we do it.



DRMP's Augmented Reality (AR) sandbox allows users to create topography models by shaping real sand, which is then augmented in real-time by an elevation color map, topographic contour lines, and simulated water.

The sandbox is a 3D, interactive educational tool that allows users to create topography models by shaping real sand, which is then augmented in real-time by an elevation color map, topographic contour lines, and simulated water.

The primary purpose of DRMP's AR sandbox is to educate students and interns about surveying and mapping, as well as use it as a cross-training tool for DRMP employees. The plan is to use the AR sandbox for survey training, high school STEM nights/Career Days, and college intern recruitment.

The AR sandbox works by using a combination of a real sandbox, a Kinect 360 camera, sandbox visualization software, and a short throw projector. DRMP's AR sandbox used about one hundred pounds of special indoor sand that's free of silica and safe to use.

The AR sandbox uses the Kinect camera to check the depth changes of the sand. Every second it updates and refreshes the visualization on the computer. Then the latest changes are projected onto the sand creating the effect of changing contour lines.

Near the end of the presentation, we talked about the final product of a design survey, which is terrain models and contours. Then we had the students come over to the AR sandbox and manipulate the sand to see how contours work and how they can be affected if we change the terrain. The students seemed to really enjoy this part, and you could see their faces light up with excitement. You could almost see lightbulbs going off that they "get it" now. Some of the students had seen an AR sandbox before, but a majority had not. By having them move the "Earth" with their own hands really helps to explain what and why we do what we do.

Some of our survey staff have already used the sandbox to explain how we could locate ditches and swells better in the field to represent the terrain more accurately in their final models.

It has such a wow factor in educating that we wanted this to be something we use to teach and spark some interest in young people for surveying.

The idea of the AR sandbox was perfected by the University of California, Davis, in 2012, which helped create an open-source option for groups to build their own sandbox.

At some point we would like to test other software and possibly use the AR sandbox for subsurface utility education and LiDAR visualization.



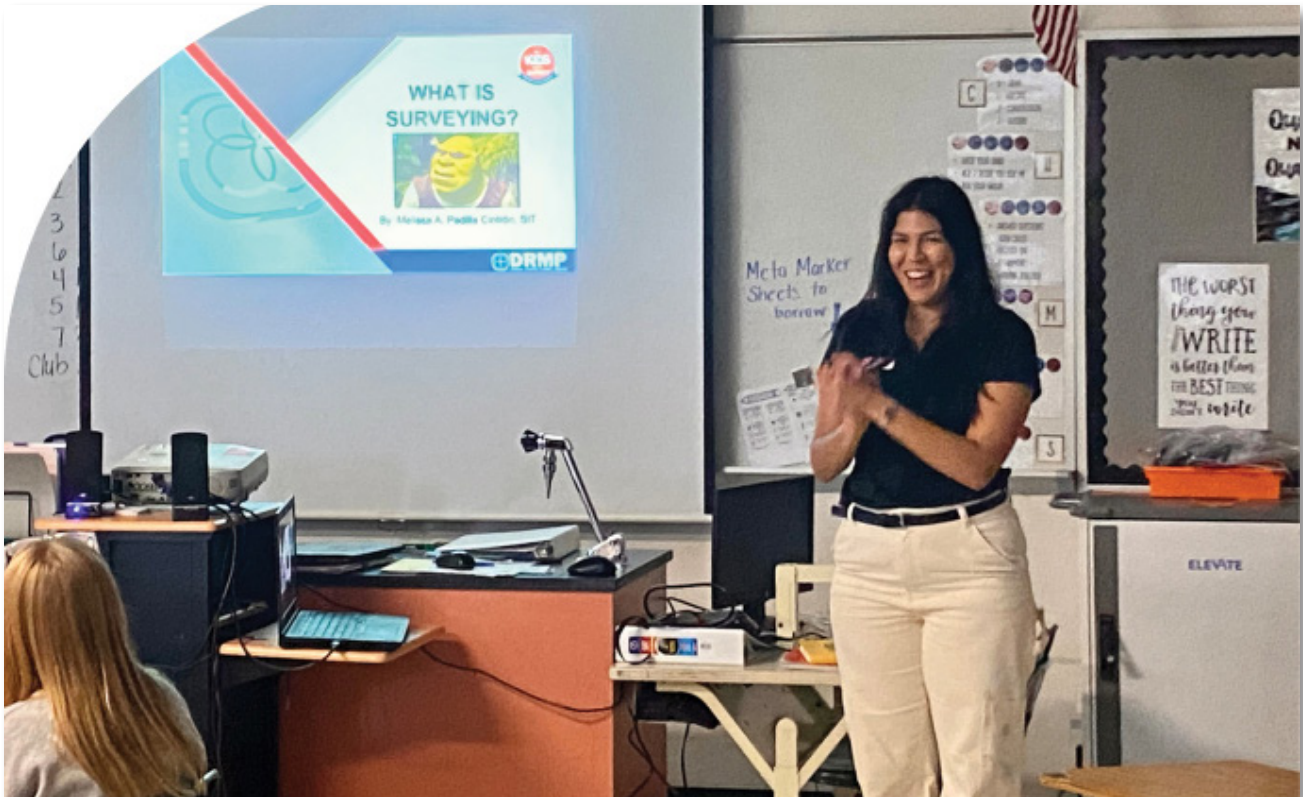
High school students explore DRMP's Augmented Reality (AR) sandbox at Construction Career Days in Orlando, Fla. The annual event introduces students to the surveying profession.

(continued on next page)

Reaching Out *(continued)*

Padilla Cintron Becomes Brand Ambassador for Get Kids into Survey

Get Kids into Survey launched in 2017 in response to a shortage of skilled young surveyors in the United Kingdom. The United States also is experiencing shortages as industry experts reach retirement age with no one to fill the void of training the next generation of land surveyors. Changes in education and licensing qualifications for surveyors have also created recruitment barriers.



Tampa, Fla., elementary school students learn about surveying during an interactive presentation taught by Melissa Padilla Cintron, SIT, a DRMP Survey Analyst and Brand Ambassador for Get Kids into Survey.

My goal is to help inspire students to consider the land surveying and mapping profession through interactive school presentations and resources, such as comic books and posters supplied by Get Kids into Survey.

I joined the organization as a brand ambassador in 2022 and represented DRMP and Get Kids into Survey at the Great American Teach-In in November of that same year. I conducted a surveying presentation at Liberty Middle School in Tampa, Fla., and brought a total station, data collector, and rod, into the classroom to demonstrate to students how surveying works.

I did a dynamic presentation combining hands-on experience using the posters the Get Kids into Survey provided and showed students different types of instruments and their function on a job site.

We also measured around the classroom the distance from one point to another to show students how surveying equipment works. They loved it. Some of them said they had seen us with our equipment on the side of the road, but they didn't understand what we do.

One female student said she wanted to be a surveyor in the future. I told her we needed more women in the industry because female surveyors are not common.

In March, we held a workshop at Construction Career Days in Tampa during National Surveyors Week. Along with bringing equipment for a demonstration, I reached out to a Geomatics Program Specialist from the University of Florida to attend the event with me to talk to students about the university's surveying program opportunities.

I think it's important we are getting involved with the community and using technology, such as the AR sandbox to explain our profession. I think we are impacting students and encouraging them to explore surveying as a career option.

The global and local efforts to close the gap in the shortage of surveying professionals are being taken seriously. Salaries have gone up in recent years to attract applicants, and projects like Get Kids into Survey have been organized internationally and locally to engage the next generation of young professionals.

DRMP will continue to look for opportunities to shine a spotlight on the importance of the profession through investment in technology, talent acquisition, STEM education, and community outreach. 🇺🇸



Brent Bass, PE, SIT, is Geospatial Services Department Manager in DRMP's Surveying and Mapping/Geospatial Department.

Melissa Padilla Cintron, SIT, is a Survey Analyst in DRMP's Surveying and Mapping/Geospatial Department.

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Geospatial Digital Twins will Make Cities Smarter

Building tomorrow's cities today

by Adina Gillespie, October 2, 2023, GIM Intentional

Thanks to the ability of digital twins to provide insights into the reality of present conditions and the impacts of future scenarios, they have the potential to revolutionize the planning and efficiency of urban environments. How? This article presents four scenarios demonstrating ways in which geospatial digital twins will make tomorrow's cities smarter.

From the evening news to real estate marketing, 3D virtual environments seem to be everywhere. People are now accustomed to 'flying' around any part of the world without leaving their armchair, or 'walking' from room to room in an architect's concept of a yet-to-be-built home. These 3D virtual scenes, often called digital twins, provide planners with insights into the reality of present conditions and the impacts of future scenarios. Their ability to do this now has the potential to revolutionize the planning and efficiency of urban environments, from modelling new construction plans to managing traffic flows and noise pollution.

It is estimated that the market for digital twin technologies will reach US\$73.5 billion by 2027, according to recent research by McKinsey. In most cases, these digital twins are made possible by integrating sensor technology and artificial intelligence (AI) technology. Airborne sensors quickly and cost-effectively collect accurate imagery and elevation data as core components of generating 3D environments. AI and machine learning algorithms can extract a variety of feature information to transform these geospatial datasets into immersive digital twins ready for visualization, modelling and simulation.

Constant feedback loop

One of the many recent developments is that a digital twin can be kept up to date with real-time data inputs within a constant feedback loop, capable of empowering action and decision-making. This innovation allows planners to understand the current state of physical environments, such as cities, at a greater depth than ever before, discover potential challenges and model ways to be more efficient.

Digital twins are deployed to analyze and determine how changes can make urban areas more livable, navigable and sustainable. The increasing affordability and accessibility of sensors for collecting 3D geospatial data likewise facilitates the democratization of digital twin technology. Not only can cities now afford them, but the datasets – as well as the modelling and simulation packages that leverage the 3D data – can also be obtained and utilized productively by the private sector for commercial purposes.

There are many advantages of using digital twins, but the most beneficial are undoubtedly those that involve modelling and simulating the future to discover the impacts of proposed changes to current conditions. Using hybrid airborne systems like the Leica CityMapper-2, which combines optical imaging and Lidar sensors for simultaneous image co-registration and data capture, it is now possible to generate digital twins with unprecedented accuracy.

Below are four scenarios demonstrating how digital twins will transform urban environments in the near future.



Traffic routes are analysed using digital twins to ensure large vehicles avoid collisions. (Image courtesy: Hexagon)

1. Vehicle clearance detection

As cities grow more crowded, managing traffic congestion becomes critical for mobility and commerce. By creating highly detailed virtual replicas of urban areas, planners can visualize the domino effects of disruptions: people are late for work, appointments are missed and product deliveries are delayed. For example, digital twins can model new truck-loading zones outside a busy shopping complex. Combined with real-time traffic data and AI, planners simulate patterns with the new zone in place to find potential choke points from large vehicles entering and exiting. Traffic engineers can use this live information to designate alternate routes for large commercial vehicles, reducing disruption.

Digital twins also enable the testing of dynamic solutions such as smart traffic signals. Traffic patterns are simulated under different signal-timing scenarios for the most optimal timing, maximizing flow at various times of day and during special events or holidays. During infrastructure projects, the impact of lane closures and detours is tested in the virtual city, and traffic departments prepare contingency plans knowing the exact effects of diversions.

Additionally, trucking companies can leverage the same digital twin simulation to train their drivers in advance of navigating the crowded downtowns of specific cities on their delivery routes, saving time and even minimizing vehicle emissions. In these ways, digital twins become a virtual laboratory for traffic planning innovation. Solutions are proven before real-world implementation that once required more costly and disruptive experimentation.



Noise from a tram is simulated as a moving volume bubble, with each layer portraying different decibel levels. (Image courtesy: Hexagon)

2. Noise pollution mapping

A realistic noise map may be the ultimate example of how digital twins have the potential for high-impact decision-making. In this simulation, the noise from an existing city tram has been modelled and represented as a volume bubble. Each layer of the bubble portrays loudness in decibels. As the tram moves through the city, so too does the noise bubble, showing precisely where and how much each volume level affects residential buildings, offices and restaurants.

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Geospatial Digital Twins will Make Cities Smarter *(continued)*

Potential renters or homebuyers can use this information in advance to determine if their new home will be uncomfortably loud each time a tram passes by. For a tram line in the planning stages, city transport planners could use the same simulation to identify the best routes to reduce noise impact, or to plan for noise abatement walls to shield homes, hospitals and schools from ongoing noise pollution.

3. Skyscraper construction planning

As urban centers experience rapid growth, high-rise tower blocks are proliferating in areas with limited available land for new construction. In one real-world example, the developer of a proposed high-rise building leveraged a digital twin to showcase the project to potential investors. The digital twin modelled how the planned tower would appear within the existing cityscape. By simulating the building at various heights, the developer demonstrated how additional stories and units would affect the living experience and potentially maximize revenue with penthouse-level rental rates and sales prices.

This model also enables extensive analysis by city zoning officials. By visualizing the planned tower in the context of neighboring structures, planners can determine potential impacts on sightlines from existing buildings that could warrant height restrictions as well as effects on parking space and congestion. The city planning department could also simulate the tower's solar reflection to assess increased heat sink impacts or measure the magnitude of new shadows cast over public parks.

With virtual models, the digital twin reduces speculation and helps assess the trade-offs associated with new developments. In this specific example, the digital twin ultimately provided a comprehensive means for all stakeholders to quantify the proposed project's effects before final approval. As this technology matures and becomes more commonplace, urban planning decisions and negotiations promise to become more informed, improving sustainability and efficiency.

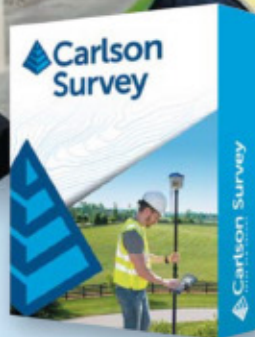


A digital twin used in planning the construction of a high-rise building. (Image courtesy: Hexagon)

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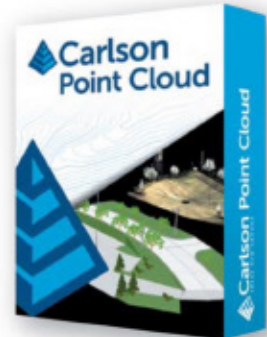
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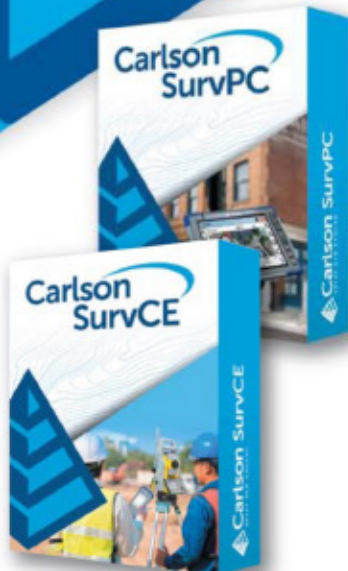
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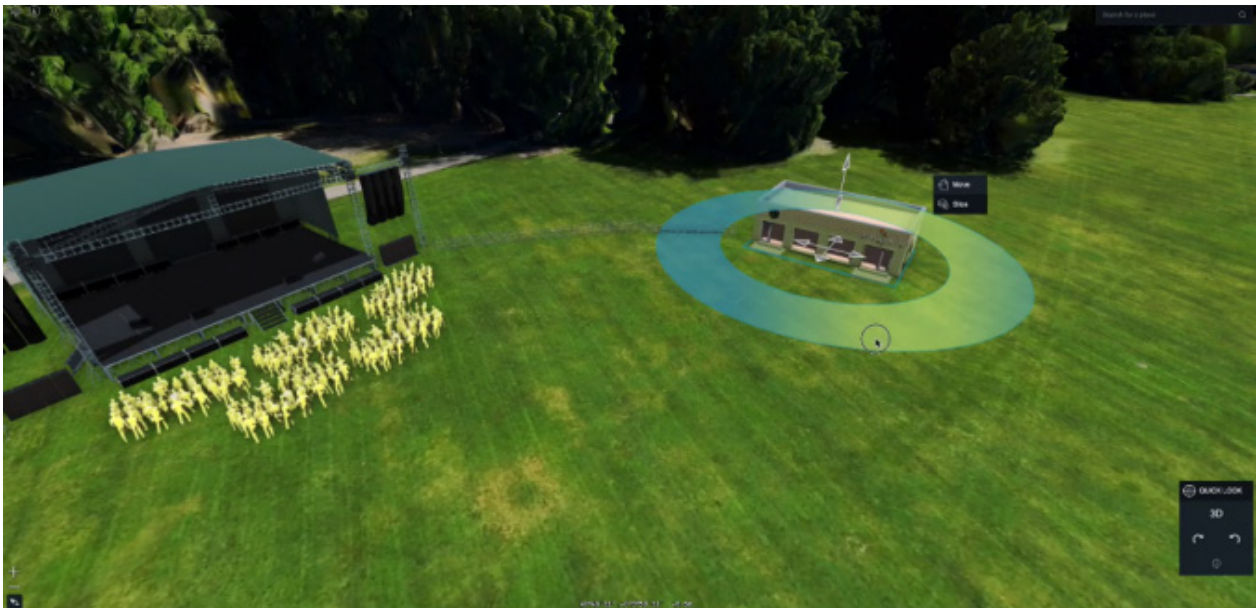
Geospatial Digital Twins will Make Cities Smarter *(continued)*

4. Event planning

Event planners can create stunningly detailed and accurate virtual models of venues with digital twins. Various stage placements and orientations are visualized to refine layouts and ticket sales plans for maximum attendance and revenue. Key factors can be modelled, such as sightlines and viewing angles to identify ideal seating areas with unobstructed views, and acoustics and lighting to refine the audience experience through optimized sound and lighting strategies.

Most importantly, public safety officials can test mapped exit routes to determine ideal emergency evacuation plans. Crowd movement and flows are simulated to identify potential bottlenecks, informing the placement of vendor booths and amenities to minimize congestion. Digital twins even assist in programming complex pyrotechnics or drone shows by evaluating firing lines, flight paths and no-fly zones to avoid obstructions. Precise mapping of streets, alleyways and walkways also supports plans for getting emergency vehicles in and attendees out as quickly as possible, if necessary.

With this ability to eliminate guesswork through information-rich simulation, digital twins enable events to be meticulously engineered, planned and optimized. Planners can drive revenue using data-driven insights that are simply not possible from traditional static planning diagrams or models.



A digital twin used to estimate and plan event capacity and layout. (Image courtesy: Hexagon)

Digital twins are the future of urban environments

The HxGN Content Program supports initiatives like these with its Metro HD data offering, including 3D mesh models of major cities. Captured with the Leica CityMapper-2, providing simultaneously co-registered imaging and Lidar data, the 3D mesh models generate highly accurate and detailed digital twins that make simulations like those described above a reality. By leveraging the potential of digital twins, planners can improve the safety, efficiency and habitability of urban centres around the world. 🇺🇸



Thanks to the Leica CityMapper-2, which combines optical imaging and Lidar sensors for simultaneous image co-registration and data capture, it is now possible to generate digital twins with unprecedented accuracy. (Image courtesy: Hexagon)

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Thoughts on Professional Practice and Education

Article 11: Common Practical Deficiencies in Student Education

by Knud E. Hermansen+ P.L.S., PE., PH.D., Esq.

This is the eleventh article I have prepared in the series of articles offering thoughts on professional practice and education. In this article I am going to explain what I believe to be common deficiencies in student education from the perspective of the professional practitioner.

I offer this perspective from teaching surveying for over thirty years in four different universities and practicing surveying for over fifty years.

Of course, I will acknowledge from the outset that individual students often suffer from one or more deficiencies in their knowledge despite the best efforts of the faculty. Also, there are programs that have unique deficiencies brought about by faculty deficiencies or program deficiencies. This article will focus on deficiencies found across the many survey programs found in the United States. I should also state there are individual programs that don't suffer from the deficiencies I will discuss because of the efforts of faculty in the program. I will exclude a discussion on one common deficiency that I have already written about – business and management knowledge.

The most common deficiency that will be the focus of this article is communication skills. Communication skills involve e-mails, reports, correspondence, public speaking, and CAD. Within each one of the methods of communication are numerous facets that could be explored.

I must acknowledge before continuing that this is the eleventh article I have written on practice and education. For those that have read my earlier articles, articles on my web site, or even read my fictional books, I am clearly not the source to expound on writing perfection. With my *mea culpa* on record, I continue.

The form of communication that a student has the most experience is often the area the student is most deficient. I am referring to e-mail and digital messages. It is discouraging to receive an e-mail from a senior or graduate that begins a formal e-mail with the salutation of 'hey' or fails to include an adequate subject line that a business needs to triage e-mails.

The typical student's experience with digital communication seems to be composed of continuous repetition of bad habits. The student and recent graduate have failed to shift their focus from e-mails, tweets, and twitters composing electronic messages that seems to be the center of their life to a business e-mail read by the employer or client. As an employee they should realize that continuous quips during working hours from friends and family are a frustrating distraction that is inappropriate to continue as an employee during working hours, in a business environment.

Unfortunately, surveying programs have not been able to improve the communication skills of students using university resources. Many universities lack courses that teach business communications. All universities abound in courses on poetry, fictional writing, grant writing, persuasive writing, or technical writing. The last course is more appropriate to an engineer reporting engineering test results. The technical writing course has little relevancy to a surveyor reporting on a boundary location. Writing courses taught by English faculty that have no experience in business and in many cases have never worked outside of a university environment, perhaps majored in literature, poetry, medieval writing, or such in graduate school, cannot be expected to teach the necessary writing and communication skills needed by surveying graduates practicing surveying.

The next deficiency of college graduates involving communicating is public speaking. Surveyors that have practiced for years know the value of public speaking. Public speaking courses offer a good start but fall short of educating the student on the public speaking a surveyor most often encounters. I need not elaborate what many of you reading this article experience when speaking at planning board meetings filled with a crowd opposed to a client's development, testifying as an expert witness, or coordinating a business meeting involving a multi-discipline project.

CAD is another deficiency often found in surveying and engineering students that has surprised me. Diagraming, platting, and plans should be one form of communication

that surveying students excel yet I often must resort to first threatening then later removing numerous points for a student's repeated failure to use a diagram that would immensely clarify their communications.

Having given my opinion, I now offer advice by suggesting surveying faculty take it upon themselves to instruct students on communication deficiencies that continue to exist after the student has taken numerous writing and speech courses. Request letters of transmittals with assignments. CAD should be taught sooner rather than later in the surveying program. I believe six credits of CAD to be a minimum for a surveying student. Require diagrams with every assignment that would benefit by inserting a diagram into an assignment response.

I would and probably should end this article at this point but for one more item I must mention. In reviewing the article, I see that I have failed to create much fodder for controversy. To write an article without generating some controversy is unimaginable. Allow me to do so now.

I have noticed one concerted university effort at teaching communication to students that I must admit I roll my eyes in mystification. There are so many avenues of guidance that can be given to improve communication that are ignored. So, I must ask, why is it necessary to encourage, on a formal sign-off, what pronoun the writer wishes to associate with themselves when it is otherwise obvious. For example, if a person signs off as "Nancy" why would I ever begin to think I should address 'Nancy' using some other pronoun than as a she or her? If a 'Harry' wishes to be addressed as a she/her pronoun, I almost get the point. Perhaps I am not sensitive enough to evolving social norms. I do know that if I could change social norms I would focus on tv newscasters that show the picture of a person clearly dressed in a Marine uniform and then in a display of gross incompetence and insensitivity to thousands of Marines refer to that person as a soldier.

† Other books and articles by Knud can be found at <https://umaine.edu/svt/faculty/hermansen-articles/>

Article 12: Life-Time Continuing Education Waiver with Academic Education

This is the twelfth article I have prepared in the series offering thoughts on professional practice and education. In this article I am going to reflect on formal education and continuing education requirements.

At the outset, I must point out the elephant in the room. I acknowledge that I hold a Ph.D. and a juris doctorate. I mention this since some will accuse me of self-serving when reading this article. I'm not going to surrender my degrees in order to appear unbiased. I was never known to shy from controversy in living my life or my writing. My contact information is on the web. Feel free to write and chastise me. Don't expect much self-reflection at my age. The sand in my life's hour glass is almost run out. At my age, changing course or my opinion is not likely to happen.

Let me get to the point of this article. Many states have adopted continuing education requirements for re-licensing. This article focuses on the disconnect between state continuing education regulations and academic education achievements.

In this article, I wish to focus on the fact that all states with continuing education requirements have decoupled the requirements for continuing education from academic education other than allow continuing education credit for an academic course taken in a renewal cycle. Specifically, states that require continuing education make no allowances for the achievement of formal academic education. By way of example, a state will require a certain number of professional development hours a year for all licensees regardless whether the licensee has no degree or a doctorate in the profession. This makes no practical sense, at least to me. Let me explain.

As a general rule, a one-credit academic course is worth fourteen professional development hours. A typical bachelor of science degree in the profession has at least 30 credit hours in focused professional course work. A master's degree in the profession has an additional 30 credit hours focused on professional course topics. Finally, a doctorate has another 60 credit hours above the master's degree focused on professional course topics. Therefore, a licensee with a master's degree has earned the equivalent of 420 professional development hours. A licensee with a master's and doctorate degree has earned the equivalent of 1,260 professional development hours. For a state that requires fifteen professional development hours a year, the licensee with a doctorate has achieved the equivalent of 84 years of continuing education. Unless the licensee stretches their formal academic education coursework over their lifetime, the licensee will only get to claim their formal academic education courses for perhaps two to three license renewals. Perhaps another renewal period can be claimed if the state allows some carryover of continuing education hours.

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Thoughts on Professional Practice and Education *(continued)*

Unless a licensee with a master's degree or doctorate develops amnesia or dementia, the licensee with formal academic degrees will retain a significant portion of the knowledge from their formal education throughout their professional career. Continuing education regulations should recognize this achievement and give life-time credit for academic education achievements.

I offer four reasons to permit academic education achievements to allow for life-time credit for continuing education.

First, if continuing education is meant to foster professional development, individuals with academic degrees, especially advanced academic degrees, have achieved professional development and knowledge well beyond the typical licensee.

Second, the licensee that has pursued and obtained academic degrees, especially advanced degrees, has shown a commitment for lifelong learning. The licensee will not likely put that commitment aside after completing the degree. The licensee will not need to be coerced to continue life-long learning.

Third, giving life-time credit for degree achievements will encourage licensees to have a focused approach toward meeting continuing education requirements. Completed academic courses that can be used toward a degree and also substitute for continuing education throughout a licensee's lifetime means that time and money spent on course work will save the licensee time and money later.

Finally, recognition of academic degrees for continuing education will encourage licensees to obtain degrees. States that have no degree requirements for licensure will encourage surveyors to obtain a degree by awarding life-time continuing education credit for a degree. All states can encourage licensees to obtain an advanced degree by permitting life-time credit for advanced academic education culminating in a degree.

I will add that many states already couple academic degrees with experience requirements. Those individuals seeking licensure with formal academic degrees often have to show less experience in order to obtain licensure.

Having given reasons for life-time continuing education credit for academic degrees, I now offer advice by suggesting regulations to be adopted using the same or similar wording as follows:

Licensees with at least thirty credit hours of surveying or related course work and a bachelor of science degree may waive half the continuing education requirements for renewal of licensure for every renewal period. (Note any bachelor of science degree with ABET accreditation in surveying, geomatics, or similar title will be presumed to meet the requirement of thirty credit hours.)

Licensees with a master of science degree along with forty-five credit hours in surveying or related course work may waive three-fourth of the continuing education requirements for renewal of licensure for each renewal period. (Undergraduate and graduate surveying or related course work is counted toward the forty-five credits.)

Licensees with a doctorate degree along with sixty credit hours in surveying or related course work may waive all continuing education requirements for renewal of licensure for each renewal period. (All undergraduate and graduate surveying or related course work is counted toward the sixty credits.)

I will close by suggesting that the appearance of a conflict of interest in advocating this recognition, is really not a conflict of interest if the reader delves into my life. Having lived to the age I find myself at, I recognize that I will be long dead before regulations are changed and there would be an easing in continuing education requirements that could affect me because of the degrees I have. 🇺🇸

† Other books and articles by Knud can be found at <https://umaine.edu/svt/faculty/hermansen-articles/>

The Role of Surveyors in Building Climate Resilience

Redesigning surveying to support a sustainable global future

by Roshni Sharma, Clarissa Augustinus, October 18, 2023, GIM International



New knowledge and tools are needed if surveyors are to fulfil their critical role along the path to achieving humanity's global climate goals related to land, water and the marine environment. Surveying systems must also be redesigned in several respects: shifting focus from data collection to analysis, integrating geospatial and climate data, designing for climate resilience and for infrastructure, and collaborative solutions.

By 2030, the world is projected to experience significant changes as a result of climate change. Coastal areas will face increasing threats from rising sea levels, leading to the erosion of shorelines and increased flooding during storms. Low-lying coastal cities and island nations are particularly vulnerable, displacing communities and threatening critical infrastructure. Hurricanes, droughts, heatwaves and wildfires will continue and accelerate in frequency, and lead to increased risks to human health and safety. The poor in the Global South will continue to experience the greatest impact, even though they contribute the least to the problem because of their tiny carbon footprints.

Changing weather patterns will disrupt agriculture systems, and crop yields will decrease due to shifting climate conditions, land degradation and desertification. Water scarcity will continue to increase. Biodiversity loss will accelerate. This will all impact on food security and will lead to increased human migration, both within countries and across borders. Surveying and geospatial professionals play a key role in understanding and mitigating these and other impacts of human-induced climate change.

Shifting focus: from data collection to analysis

The geospatial and surveying industry is undergoing a profound transformation, shifting from its traditional emphasis on data collection – which remains fundamental – to an additional new focus on data analysis. Analyzing geospatial data is crucial in unravelling the multifaceted impacts of climate change and land degradation. It enables the extraction of meaningful insights

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The Role of Surveyors in Building Climate Resilience *(continued)*

from trends, patterns and anomalies in the data, allowing for a deeper understanding of human-induced climate impacts on countries, regions, landscapes, ecosystems and communities, and facilitating data-driven decision-making.



As climate change impacts are felt, floods are becoming more common and more disastrous.

This industry shift signifies a broader recognition of the value of data analysis in climate resilience efforts. It empowers surveying professionals to both collect data and interpret it, ultimately contributing to more effective and evidence-based climate adaptation and mitigation measures. By morphing into specialized data analysts, surveyors will bring an indispensable skillset to the forefront of the fight against climate change.

Integrating geospatial and climate data for comprehensive analysis

Climate change operates on multiple scales and dimensions – at local, national, regional and the Earth system level. Analyzing geospatial data from a diverse array of sources is paramount in comprehending the multifaceted impacts of climate change. It is vital to assess land use changes, track temperature fluctuations, and monitor sea-level rise, changes in forest edges, global food production and unregulated large-scale acquisitions of land belonging to Indigenous peoples and local communities. Geospatial data, collected through satellite imagery, ground-based surveys and remote sensing technologies, provides a comprehensive view of these complex changes.

Scenario simulations, particularly digital twins, can revolutionize decision-making in climate resilience. These models are able to simulate various climate-related scenarios, providing insights into potential vulnerabilities and necessary adaptations. Digital twins enable proactive planning and management and can protect people and the planet from the escalating impacts of climate change.



In the last 12 months, increasingly catastrophic wildfires have occurred around the world.

Redesigning land and water systems for climate action

Climate change, land degradation and desertification are triggering a significant transformation in land use across the globe, redefining agricultural zones, urban planning and natural resource management. These shifts represent some of the most visible and pressing impacts of the changing climate. Geospatial data is a critical enabling factor in adapting to, mitigating and optimizing land use changes, including to enhance food and water security and to protect biodiversity and natural areas in a changing world.

Most natural capital (e.g. forests, grasslands, natural areas) is in the form of common property, which is generally held in some form of state or public land arrangement. Often these parcels are not documented in government land systems. Fit-for-purpose boundary demarcation is essential to manage the resources in these areas efficiently and to safeguard what climate scientists call 'protected areas', such as game parks and forests. Land administration systems as a whole need to be made fit for purpose, efficient and effective to enable the rapid implementation and rollout of security of tenure for the achievement of global climate goals. Without land tenure security, people will continue to 'mine' their resources rather than maintain them. Valuers would argue that establishing property rights and pricing nature's benefits correctly can be an effective approach to maintaining and restoring natural capital. Fit-for-purpose land valuation approaches that include natural capital need to be developed and scaled up.

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The Role of Surveyors in Building Climate Resilience *(continued)*

Ethical and legal dimensions

Geospatial data can contribute to smarter spatial planning to reduce the footprint of agriculture, limit urban sprawl and strengthen spatial planning targeting to protect biodiversity. The ethical and legal dimensions of urban planning take center stage, as governments grapple with issues like competition over land and property rights, management of informal settlements and flood management.

The shifting landscape of natural resource management necessitates tracking and monitoring, with geospatial data providing real-time insights into land use changes. It can support land governance and the protection of local communities' rights to land and natural resources. It is also vital to help governments protect natural areas such as forests from illegal logging, game parks from cattle incursions, and water towers from human activity. Geospatial data-driven natural resource management underpins ethical and responsible resource extraction and habitat preservation in accordance with the legal aspects of environmental regulations and international treaties.

Marine environments

Climate change is having a major impact on marine environments, fundamentally altering the delicate balance of life beneath the waves. Coastal ecosystems – from mangrove forests to coral reef – are under immense stress. Surveying and geospatial technologies are indispensable tools in monitoring and managing the changes. High-resolution mapping and remote sensing enable scientists and conservationists to track shoreline shifts, assess the health of coral reefs and safeguard marine resources. This also enables the monitoring and enforcement of marine regulations aimed at preserving biodiversity and critical habitats.

Resilient infrastructure

Climate change poses multifaceted challenges to critical infrastructure, spanning transportation, energy and water supply systems. Rising temperatures intensify wear and tear on roads and bridges, while extreme weather events disrupt transportation networks. Energy infrastructure faces increased demand due to climate-induced heatwaves, while water supply systems grapple with shifting precipitation patterns and the threat of prolonged droughts.

Surveying and geospatial expertise stands as a crucial pillar in crafting resilient infrastructure design and adaptation strategies. Surveyors play a pivotal role in collecting precise geospatial data, enabling informed decisions about climate-resilient infrastructure placements and designs. Geospatial insights are essential for identifying vulnerable areas and optimizing resource allocation for climate adaptation. Moreover, community engagement is pivotal in ensuring that infrastructure projects align with local needs, values and long-term sustainability goals, and surveyors often have a unique relationship with local communities.

Collaborative solutions

Successful collaborations between surveying professionals, climate scientists and policymakers have emerged as a potent force in addressing the multifaceted challenges of climate change. Surveying professionals provide essential geospatial data and analysis, offering a comprehensive understanding of climate impacts on land, water, marine and infrastructure environments. Climate scientists and environmental scientists bring their specialized knowledge, conducting research to predict and assess changes in the climate and human-induced environmental impacts. Policymakers translate this information into policies, actionable strategies, legislation and resource allocation to mitigate climate risks and avoid or limit degradation and restore the environment. Surveyors then make some of this happen on the ground.

The integration of geospatial and climate data serves as a cornerstone of evidence-based decision-making. Precise mapping, remote sensing and geographic information systems (GIS) enable stakeholders to visualize climate trends and vulnerabilities, facilitating targeted interventions. This data-driven approach enhances the capacity to adapt to climate change by identifying high-risk areas and optimizing resource allocation.

(continued on page 38)

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The Role of Surveyors in Building Climate Resilience *(continued)*

So what can you do?

In an era where our planet faces increasingly complex and unpredictable environmental challenges, surveying brings a vital technical foundation that underpins climate resilience strategies. Precise surveying and geospatial data reveal the changing land use and chart the path toward a more sustainable future. Integrating climate data and geospatial insights into surveying practices and work on the ground is not just a choice; it is an imperative. It is the synergy of these two disciplines that will help our industry maintain and build its relevance, and empower us to work with other sectors to create sustainable solutions.

In a world where climate change poses ever-increasing challenges, it is time for action. Join the movement to safeguard our planet, inform evidence-based decisions and chart a new course towards a sustainable and resilient future for generations to come. Join the FIG Climate Compass Task Force. 🇺🇸

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