

Welcome to the 10th Annual Survey Technical Workshop

March 20-22, 2007



**Sponsored by: the Office of Land Management
Minnesota Department of Transportation**

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2007 SURVEY TECHNICAL WORKSHOP

On behalf of the Minnesota Department of Transportation, Office of Land Management, we would like to welcome you to the 2007 Survey Technical Workshop. We are proud to say that 2007 marks the tenth year of this event!

As in the past, this workshop allows Mn/DOT employees and their partners the chance to review current practices, examine prospective trends, consider technical improvements and build relationships within the surveying community.

The workshop committee, made up of county employees, the private sector and Mn/DOT, has worked hard to compile session topics that are pertinent and interesting to those involved in survey operations throughout the state. The committee diligently reviewed last year's evaluation forms and made every attempt to improve the workshop based on the comments and suggestions made by the attendees.

Please take a few minutes to review the schedule, session descriptions, vendor summaries and speaker biographies in this booklet. As you already know, this year the workshop is scheduled for three days. We have decided that the two day format that had been used in the previous couple of years did not allow adequate time to cover the topics we wanted to offer and that our attendees had requested. The three day format will not only expand your educational opportunity, but it will give you a chance to attend some of the classes that will be repeated. As usual, we are offering concurrent sessions in order to provide information that impacts every survey professional.

For those of you submitting for Professional Development Hours with the *Board of Architecture, Engineering, Land Surveying, Landscaping Architecture, Geoscience and Interior Design*, please select those sessions that will meet your personal training needs and satisfy your defined licensing standard requirements. Workshop participants are responsible for submitting for Professional Development Hours with the board.

We would like to thank the presenters for their generosity in sharing their time and knowledge and for providing us all the opportunity to learn and ultimately improve the services we provide.

Special thanks go out to you, the participant. This workshop would not exist without your continued support and enthusiasm. We encourage your participation in each of the sessions. The evening will provide you with a more casual environment to consider and discuss the day's materials and events. Also, please plan to attend the social hour following the first day's sessions sponsored by the vendors.

Again, welcome! We hope you enjoy the workshop.



2007 SURVEY TECHNICAL WORKSHOP SCHEDULE

TUESDAY, MARCH 20, 2007

	WHITEBIRCH I	WHITEBIRCH II	PELICAN ROOM	HEARTLAND III & IV
10:00 AM	WORKSHOP REGISTRATION			
11:00 AM	WELCOME & OPENING REMARKS			
12:00 PM	LUNCH IN MINNESOTA I & II			
1:00 PM	<i>FGDC</i> <i>(Federal Geographic Data Committee)</i> Bob Ader			
2:30 PM	BREAK IN MINNESOTA I & II			
2:45 PM	<i>Work Zone Safety</i> Julie Bottolfson	<i>Control Systems, Datums & Standards</i> Roy Graff	<i>Trimble GNSS</i> Frontier Precision and Trimble Staff	
3:45 PM	<i>NSRS 2007/GEOID</i> David Zenk	<i>* Curves – Horizontal & Vertical</i> Roy Graff	<i>Trimble Open Forum – Q & A</i> Steve Richter	
4:45 PM	SESSIONS ADJOURN & SOCIAL HOUR BEGINS IN MINNESOTA I & II			
6:30 PM	DINNER IN MINNESOTA I & II			



Mn/DOT SURVEY SCHOOL CLASSES (in abbreviated form)



SOFTWARE AND EQUIPMENT DEMONSTRATIONS

* INDICATES A REPEAT SESSION



2007 SURVEY TECHNICAL WORKSHOP SCHEDULE

WEDNESDAY, MARCH 21, 2007

7:00 AM BREAKFAST IN MARINA DINING ROOM				
	WHITEBIRCH I	WHITEBIRCH II	PELICAN ROOM	HEARTLAND III & IV
8:00 AM	<i>*The Do's and Don'ts of Alignment Resolution</i> Brian Smith	<i>*Elevations & Leveling</i> David Zenk	<i>Bentley Power Survey</i> Ray Filipiak	<i>Round Photogrammetric Targets</i> Benard Obwocha
9:00 AM	<i>Ground Penetrating Radar</i> Lisa Hanni Jared Lampe	<i>GPS – What's New</i> David Zenk	<i>Bentley On-Site</i> Ray Filipiak	<i>*GPS Field Calibration For Trimble – When, Why & How!</i> Steve Richter
10:00 AM BREAK IN MINNESOTA I & II				
10:15 AM	<i>*Location Survey Requirements</i> Rick Bruss	<i>Land Corners: Records Research, Evidence Search & Restoration</i> Elliott Ruhland	<i>Leica Geosystems Technologies Part One</i> Dan Forsberg Chris Rotegard Greg Schneider	<i>Railroad Monitoring</i> Tom Harper
11:15 AM	<i>HDS Laser Scanning</i> Brad Canaday Gary Troge Dan Wik		<i>Leica Geosystems Technologies Part Two</i> Dan Forsberg Chris Rotegard Greg Schneider	<i>*Elevations & Leveling</i> David Zenk (REPEAT)
12:15 PM LUNCH IN MINNESOTA I & II				
1:15 PM	<i>OPUS</i> David Zenk	<i>Total Station Operations With Trimble Survey Controller</i> Steve Richter	<i>Carlson Software</i> David Pluym	<i>EVIDENCE: Recovering the PLS Corners and Ancient Boundaries</i> Gary Hopko
2:15 PM	<i>Mn/DOT's Golden Valley Machine Control</i> Jeremy Carlson Gregory Mullen David Torfin	<i>*GPS Field Calibration For Trimble – When, Why & How! (REPEAT)</i> Steve Richter	<i>Carlson Software Open Forum</i> David Pluym	
3:15 BREAK IN MINNESOTA I & II				
3:30 PM	<i>USGS National Geospatial Programs</i> Ron Wencil	<i>Concrete Staking Reports</i> Jon Mohrmann	<i>A Partial Inventory of the General Land Office Surveying Records for Mn</i> Rod Squires	<i>*Curves – Horizontal & Vertical</i> Roy Graff (REPEAT)
4:30 PM ADJOURN – DINNER AT 6:30 IN MN I & II				



2007 SURVEY TECHNICAL WORKSHOP SCHEDULE

THURSDAY, MARCH 22, 2007

7:00 AM BREAKFAST IN MARINA DINING ROOM				
	WHITEBIRCH I	WHITEBIRCH II	PELICAN ROOM	HEARTLAND III & IV
8:00 AM	<i>RTK Testing</i> Brad Canaday	<i>Construction Staking</i> Jeremy Carlson Michael Hetrick Gregory Mullen	<i>Leica Geosystems SmartPole</i> Dan Forsberg Chris Rotegard	* <i>Location Survey Requirements</i> Rick Bruss (REPEAT)
9:00 AM	<i>Trends in GIS</i> Dan Falbo		<i>Leica High-Definition Surveying (HDS Systems)</i> Greg Schneider	* <i>The Do's and Don'ts of Alignment Resolution</i> Brian Smith (REPEAT)
10:00 AM BREAK IN MINNESOTA I & II				
10:15 AM	<i>LIDAR Red River Basin Project – A Perspective on Elevation: National to Local</i> Ron Wencil			
11:15 AM				
12:15 PM ADJOURN				

 Mn/DOT SURVEY SCHOOL CLASSES (in abbreviated form)

 SOFTWARE AND EQUIPMENT DEMONSTRATIONS

* INDICATES A REPEAT SESSION

FOR YOUR INFORMATION:

In your folder you will find the following pertinent items regarding the workshop such as:

- **Workshop Program** – This booklet contains session descriptions, presenters' biographies and vendor outlines.
- **Quick Reference Guide** – This is for your convenience in finding sessions of interest.
- **Evaluation Form** – This form **MUST** be turned in at the end of the workshop. These evaluations are essential to ensure our ability to offer pertinent topics in the future. They also give us vital information about how certain topics were received and about the workshop presentations in general.
- **Name tag** – Please wear this nametag throughout the workshop. We want to know who you are! These nametags should be returned at the end of the workshop. A return box will be located on the registration table for your convenience.

***You Are Cordially Invited
To Attend The 2007
Survey Technical Workshop
Social Hour***

When: March 20 from 4:45 – 6:30 p.m.

Where: Minnesota I and II

What: Hors d'oeuvres and other
“refreshments” for your enjoyment!

This event is being sponsored by:

Bentley Systems, Incorporated

Carlson Software

CompassTools Incorporated

Frontier Precision/Trimble

Horizons, Incorporated

Leica Geosystems, Incorporated

Martinez Corporation

StrikeMaster Corporation

Ulteig Engineers, Incorporated

Utility Mapping Services, Incorporated



2007 SURVEY TECHNICAL WORKSHOP

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Session Descriptions and Speaker Biographies

WELCOME AND OPENING REMARKS

Richard Morey – Assistant Director, Mn/DOT Office of Land Management

Mr. Morey is a 27 year veteran of the Mn/DOT surveying community. He has served in Districts 9 and 5, later combined into the Metro District, as well as in the Central Office. Starting as a Highway Technician on a construction survey crew, Mr. Morey has progressed through the positions of Survey Crew Chief to District Surveyor, to his current position as Assistant Director in charge of the Office of Land Management Surveying and Mapping Section.

Mr. Morey has been the liaison to the Survey Field Users Group, Chair of the Mn/DOT Statewide Surveys Group's Policy and Practices Committee, Co-chair of the Contractor Staking Committee and is currently Chair of the Personnel and Training Committee. He is also a member of the Minnesota Society of Professional Surveyors, where he is chair of the Legislative Committee, also serving on the Education and Public Affairs Committees.

Mr. Morey has served as an instructor at the Mn/DOT Survey School. He has also been on the planning committee for past Survey Technical Workshops as well as a past presenter. Additionally, Mr. Morey has conducted a workshop on surveying for the Minnesota GIS/LIS Consortium and presented at MSPS Conferences. He holds a Master of Geographic Information Science from the University of Minnesota.

KEYNOTE SPEAKER - FGDC (Federal Geographic Data Committee)

Presented by: **Robert Ader**

This presentation will include a discussion of the viewpoints, strategies and efforts of the FGDC Subcommittee for Cadastral Data to integrate and share cadastral data across organizations. Efforts to support specific applications such as wildland fire, emergency management and energy development will be highlighted. In addition, the presentation will cover the Bureau of Land Management's efforts to provide geographic coordinate data for the Public Land Survey System and develop software to assist with making land records information more readily available through the National Integrated Lands System Project. Emphasis will be given to the overwhelming concept of a national cadastre and the need to work in partnership and collaboration across all organizations.

Robert Ader

Mr. Ader is a Geographer with the Bureau of Land Management, Lands and Realty Program. In 1978 he graduated with a Master's Degree in Geography (quantitative methods) from the University of South Carolina. Mr. Ader is the Chairperson of the FGDC Subcommittee for Cadastral Data. This subcommittee is working on the implementation of cadastral data content standards and the facilitation of data sharing through partnerships to support a host of applications. He also is the Workgroup Lead for the Subcommittee's Wildland Fire Initiative. Mr. Ader is the Cadastral Survey

Program User Representative to NILS and the recipient of the Federal 100 Award in 2005 which recognizes the top 100 federal employees in the nation. He was nominated for this award by states, counties and private industry.

Mr. Ader has over 20 years of experience with spatial data processing primarily with the Bureau of Land Management. Applications ranged from comprehensive resource management plans to energy development, use authorizations for public lands, wildland fire applications and resource protection. For the past ten years he has worked with BLM Cadastral Survey's digital boundary initiative or Geographic Coordinate Data Base. The goal of this program is to establish the foundation for a common set of quality cadastral information that is used across government and private industry to support economic development, maintain livable communities and provide community leaders with tools to manage both. In August of 2000 Mr. Ader was certified as a "friend" of cadastral surveyors.

Bentley On-Site

Presented by: **Ray Filipiak**

Bentley On-Site is a product that is composed of two applications: Administrator and Inspector/Stakeout/Data Collection. Together they allow the user to take intelligent electronic data from design, move it to a handheld device and use the data to perform stakeouts and inspections.

Today's session will focus on opening the project data by field personnel and performing inspections, collecting as built pay items and performing a structure stakeout. We will use two inspection methods: manually (hand entering the item location) and GPS (using a GPS simulator). We will then transfer the field collected information back to the administrator where it can be used to create custom reports and to visualize the field data.

Ray Filipiak

Mr. Filipiak has 35+ years experience in the DOT/Transportation field, 25 years of which were spent as a Roadway Designer/Surveyor for the Illinois DOT. For the past 10 years, he has been an Application Engineer/Civil Consultant with Bentley Systems, Inc. Mr. Filipiak's current responsibilities include product presentations, on-site consulting and training on the Bentley Foundation products, Bentley On-Site and the GEOPAK Product line.

Bentley Power Survey

Presented by: **Ray Filipiak** (*Biography Ref. Bentley On-Site*)

Power Survey provides survey professionals with an "all-in-one" solution for survey data management and drafting. It includes survey adjustment, digital terrain modeling, annotation and drafting tools.

This session will focus on taking a raw TDS file, reducing it and mapping it into a DGN file. We will complete some chain edits, detect for any crossing break lines and then build/display a DTM. Finally we will use plan production tools to complete the process of transforming our field collected data to a finished survey drawing.

Carlson Software

Presented by: **David Pluym**

This session will be a presentation of "Field to Finish" with Carlson Software and the new road design utilizing Carlson Software's new RoadNet feature.

David Pluym

Mr. Pluym is the Director of Midwest Sales for Carlson Software. He joined Carlson Software as a Technical Sales Specialist in 2003. Mr. Pluym has been in the Civil and Survey market since 1993, with experience in the practice of sales management, strategic planning, Government business planning and business acquisition. He is working to build a strong dealer/client base in the Midwestern states.

Carlson Software Open Forum

Presented by: **David Pluym** (*Biography Ref.* Carlson Software)

This will be a question and answer session on Carlson Software.

Concrete Staking Reports

Presented by: **Jon Mohrmann**

During this session you will learn how to create a Concrete Staking Report from GEOPAK pavement shape.

Jon Mohrmann

Mr. Mohrmann is a 22 year Mn/DOT employee having experience in inspection, hydraulics, survey and design. He is currently doing general GEOPAK support for District 4 (Detroit Lakes) and District 8 (Willmar). Mr. Mohrmann also performs statewide support for GEOPAK Site and Drainage and has been very involved with Modeling and Machine Control using GEOPAK since it's inception at Mn/DOT.

Construction Staking

Presented by: **Jeremy Carlson, Michael Hetrick and Gregory Mullen**

This session is intended to give an overview of the construction staking process and is geared more toward the "less experienced" surveyor as part of the Mn/DOT Survey School Classes. The topics covered will include construction limits, slope stakes, storm sewer, blue tops, paving hubs, curb hubs, bridge stakes and signs/lighting stakes. Each topic will briefly cover figuring notes and staking out.

Jeremy Carlson

Mr. Carlson is a Survey Crew Chief with Mn/DOT. He has been with Mn/DOT for seven years, all of them with the Golden Valley Survey Office. He is currently the Crew Chief on the Highway 169-Belle Plaine machine control project. Previous to being employed by Mn/DOT, Jeremy received his Associate of Arts Degree in Land Surveying and Civil Engineering Technology from St. Cloud Technical College.

Michael Hetrick

Mr. Hetrick is a Survey Crew Chief for Mn/DOT. He started his career in Surveys in April of 1996 as a Highway Technician stationed in Golden Valley (Metro District). Mr. Hetrick has worked his way up through the ranks and became a Crew Chief in June of 2004. Since then, he has worked on the Metro's first machine control projects (T.H. 101 & Riley Creek), several segments of T.H. 100, T.H. 62 (Crosstown) and many other smaller projects.

Gregory Mullen

Mr. Mullen is a Survey Crew Chief with Mn/DOT, working out of the Golden Valley Survey Office. He has been with Mn/DOT for eight years, all of which have been with the Golden Valley

Survey Office. He was a Crew Chief for the three and a half years before his currently assignment which is working on the Hanson Boulevard/T.H. 10 Interchange project in Coon Rapids.

Control Systems Datums & Standards

Presented by: **Roy Graff**

The instructor will discuss the basics of projections, datums, coordinate systems and adjustments. The instructor will demonstrate how to convert between coordinate systems and where to find more detailed information on the session topics.

Roy Graff, PLS

Mr. Graff is a Professional Land Surveyor, licensed to practice in Minnesota, and he holds a Bachelor of Science Degree in Computer Science from Mankato State University. He currently works for the Minnesota Department of Transportation in the Surveys Research and Support Unit of the Office of Land Management.

Curves – Horizontal & Vertical

Presented by: **Roy Graff** (*Biography Ref. Control Systems Datums & Standards*)

The instructor will discuss the geometry and mathematics of the horizontal circular curve and the vertical parabolic curve as they are used in surveying. The instructor will also demonstrate computations of the geometric elements of a circular curve, points and stationing along a circular curve, the basic elements of a vertical curve, elevations at any station along a vertical curve, high or low point of a vertical curve and the slope at any point on a vertical curve. The horizontal curve and vertical curve sections of the Mn/DOT Technical Manual will be included in the session handout.

The Do's and Don'ts of Alignment Resolution

Presented by: **Brian Smith**

What do you look for in the field to aid in the resolution of alignments when putting it together in the office? This session will piece together the field information and discuss how to deal with missing elements.

Brian Smith

Mr. Smith began his career with the Minnesota Department of Transportation in 1990 with the Mankato district in Surveys. He continues to work in Surveys in the Detroit Lakes District, working extensively with alignment resolution and land surveys.

Elevations & Leveling

Presented by: **David Zenk**

Use of GPS and traditional leveling techniques continue to be used alongside each other, sometimes on the same project. Understanding the relationships among the vertical height measuring systems is one of the keys to success.

David Zenk

Mr. Zenk is the National Geodetic Survey Advisor in Minnesota. He holds a Bachelor of Science Degree in Civil Engineering and Mechanical Engineering from the University of Minnesota and a Master's Degree in Land Surveying from Oregon State University. Mr. Zenk has served as adjunct faculty at the University of Minnesota and St. Cloud State University Geography Departments. He is licensed as a Registered Land Surveyor and Professional Engineer in the State of Minnesota.

Mr. Zenk has taught many seminars and other workshops to private industry, state, county and local government agencies. He is a past Chair of the Minnesota GIS/LIS Consortium. He is currently serving as Editor of the MSPS "Minnesota Surveyor" Magazine.

EVIDENCE: Recovering the PLS Corners and Ancient Boundaries

Presented by: **Gary Hopko**

In order to protect the property rights of all landowners, the PLS Corners and ancient boundaries must be properly recovered by considering all available evidence. The decision is based upon research, written evidence, testimony, field evidence, knowledge of ancient methods and equipment, nature lore and sound judgment. A shovel and soil probe are also extremely useful. This presentation will demonstrate how the proper application of all of the above factors will result in the most satisfying of all surveying experiences – getting it right!

Gary Hopko

In 1970 Mr. Hopko enrolled in the land surveying and civil technology curriculum at Dunwoody Institute. After graduation in 1972, he worked in the private sector until August of 1994 when he was appointed Douglas County Surveyor and served until his retirement in April of 2005. Although he developed a “passion for the PLS” and sometime misses those rewarding days in the field, retirement is still the best job he has ever had. He is currently an Honorary Member of MACS and a Life Member of MSPS.

GPS – What’s New

Presented by: **David Zenk** (*Biography Ref.* Elevations & Leveling)

During this session a brief background of the current GPS system will precede a preview of what the GPS system will include in the next few years. Augmenting navigational satellite systems will be discussed in the context of their impact on GPS.

GPS Field Calibration For Trimble – When, Why & How!

Presented by: **Steve Richter**

The proper procedures for performing a "good GPS calibration" will be discussed in this session. Performing both horizontal GPS calibrations and vertical GPS calibrations will be discussed. We will speak about the "rules of thumb" for these techniques when working with county coordinates as well as local coordinates.

Steve Richter

Mr. Richter has worked with Trimble products for over 12 years, specializing in GPS. He is a Trimble Certified Trainer and has trained over 250 professionals on the proper techniques for using GPS equipment. He currently resides in St. Cloud MN and is the Sales and Support Manager for Frontier Precision for their Northern Plains Offices.

Ground Penetrating Radar

Presented by: **Lisa Hanni & Jared Lampe**

Ground Penetrating Radar (GPR) is a geophysical non-invasive survey method which uses electromagnetic pulses to explore subsurface structures. It has been used for locating underground or subsurface structures and voids such as storage tanks, sewers, foundations, burial sites, pipelines, cables and internal steelwork in concrete.

When exploring for evidence of a public land survey corner that was set years earlier, a general search location is determined based upon notes and other physical evidence. Oftentimes, a large hole is dug which may or may not be productive. What if we were to consider if anything was still down there before we dug? As work on the roads becomes more dangerous with the increased speeds and traffic, this may be a tool to use before scheduling the backhoe.

Lisa Hanni

Ms. Hanni has worked in the Land Surveying and GIS disciplines since 1985. She has worked for private surveying and mapping firms in Maryland, Illinois and Minnesota. Ms. Hanni is a licensed Land Surveyor in the State of Minnesota and has been in County government since 1992. She is a member of numerous land surveying organizations and has published articles concerning the Public Land Survey and GIS in state and national magazines. Ms. Hanni is co-owner of an extensive antique surveying collection of instruments and books, and speaks regularly to groups concerning the Public Land Surveying System and legal descriptions. She is employed by Goodhue County as the County Surveyor, Land Use Management Director, and County Recorder. She has also been Interim County Administrator for Goodhue County.

Jared Lampe

Mr. Lampe is Vice President and co-owner of National GPR Service Inc. (NGPRS Inc.) He has worked in the Ground Penetrating Radar (GPR) field since 2002 and has extensive experience in operating and analyzing GPR data. Mr. Lampe has performed GPR investigations throughout the country in projects ranging from geological investigations, concrete slab imaging, cemetery, utility and underground storage tank locating and mapping. Mr. Lampe speaks regularly to groups concerning the applications and benefits of using GPR. NGPRS Inc. staff includes a Registered Professional Engineer, Registered Architect and Chief Geologist. NGPRS Inc. is a member of the Non Destructive Testing Society, Builders Exchange, Plumbing Heating Cooling Contractors Association and the Better Business Bureau.

HDS Laser Scanning

Presented by: **Brad Canaday, Gary Troge & Dan Wik**

Mn/DOT's latest surveying technology is the Leica HDS Laser Scanner. This presentation will cover the history of scanning at Mn/DOT, some of the projects that have been done, where we see its use, and a demonstration of the scanner.

Brad Canaday

Mr. Canaday is the Metro Surveys Manager for Mn/DOT's Metro Division Surveys Unit. He has over 33 years of surveying experience as a licensed land surveyor in both Minnesota and Wisconsin. He started his land surveying career in Wisconsin, working for several private land surveying firms and became a registered land surveyor in Wisconsin in 1978. Mr. Canaday started work for Mn/DOT in 1983, became registered in Minnesota in 1985, and has held various positions of increasing responsibility to his current position as Metro Surveys Manager. He was promoted to this position in September of 2006.

Gary Troge

Mr. Troge has been with the Survey Section of Mn/DOT since 1996. He has field experience in construction and location surveys and currently processes field data for Mn/DOT's Metro East Surveys.

Dan Wik

Mr. Wik has worked for Mn/DOT in the surveys section since May 1986. Twelve of those years were spent in the field doing both location and construction surveying. Mr. Wik is presently working in the office processing field data, coordinating the aerial photography and processing Static and RTK GPS data for Mn/DOT's Metro East District.

Land Corners: Records Research, Evidence Search & Restoration

Presented by: **Elliott Ruhland**

This presentation will cover the principles of record and field research for the restoration of the Public Land Survey System (PLSS) Corners in Minnesota. Examples drawn from the personal experience of the presenter will be used to illustrate the individual's role in this work, as well as the relationship between the PLSS, past records and current field and boundary conditions.

Elliott Ruhland

Mr. Ruhland is a Principal Land Surveyor and Supervisor of the Platting Unit in the Surveying and Mapping Section of Mn/DOT's Office of Land Management. He is a licensed Minnesota Land Surveyor and a licensed Civil Engineer. Mr. Ruhland received his Bachelor of Science Degree in Civil Engineering from Virginia Military Institute in 1977 and a Master of Science Degree in Civil Engineering from Iowa State University in 1980. He also acquired additional land surveying classes from St. Cloud University and Inver Hills Community College. Mr. Ruhland began practicing civil engineering in 1980 and since 1990 has been working for Mn/DOT in various right of way and land surveying positions. He is a member of the Capitol Area Land Surveyors Association (CALSA) and the Minnesota Society of Professional Surveyors (MSPS).

Leica Geosystems, Inc. Technologies – Part One

Presented by: **Dan Forsberg, Chris Rotegard & Greg Sneider**

This session will look at combining GPS, Total Station and High Definition Surveying (HDS) together to complete a survey job. Every site survey is different, as some are best suited for Total Stations, others for GPS and others for High-Definition Surveying. We will look at how these three technologies were combined utilizing Leica's new SmartPole and HDS solutions.

Chris Rotegard

Mr. Rotegard has been serving the surveying and engineering community for 26 years. He started his career at Brunson Instruments as a Service Technician. After 7 years he entered the Sales division with Sokkia Corporation working to the position of District Manager. After a brief time with Fieldworks he is employed by Leica Geosystems as a Direct Manufacture Representative. Mr. Rotegard is a certified Instructor in GPS, Robotics Technology as well as Data Collection.

Greg Schneider

Employed by the High Definition Surveying (HDS) Division of Leica Geosystems, Mr. Schneider has worked in the Surveying and Engineering Industry since 1982. Subsequently, his career has spanned many disciplines of these industries. In 2003 Mr. Schneider was hired as an HDS Applications Engineer (then Cyra Technologies) focusing on laser scanning hardware and software solutions. He is a certified HDS trainer and has provided project support services on over 200 laser scanning projects throughout the United States.

Leica Geosystems, Inc. Technologies – Part Two

Presented by: **Dan Forsberg** (*Biography Ref. Leica Geosystems, Inc. Tech. Part One*), **Chris Rotegard** (*Biography Ref. Leica Geosystems, Inc. Tech. Part One*) & **Greg Sneider** (*Biography Ref. Leica Geosystems, Inc. Tech. Part One*)

See description in Leica Geosystems, Inc. Technologies Part One. This session will be a continuation of Part One.

Leica Geosystems SmartPole (Product Demonstration)

Presented by: **Dan Forsberg** (*Biography Ref. Leica Geosystems, Inc. Tech. Part One*) & **Chris Rotegard** (*Biography Ref. Leica Geosystems, Inc. Tech. Part One*)

Leica SmartPole saves time in both the office and in the field. No longer is it necessary to first measure orientation points and only then detail points. Simply begin the survey and conduct the setup On-the-Fly whilst completing the survey. Once the TPS orientation and coordinates are known, all measured points are automatically updated. Learn this and more at this session.

Leica High-Definition Surveying (HDS Systems)

Presented by: **Greg Schneider** (*Biography Ref. Leica Geosystems, Inc. Tech. Part One*)

This session will look at combining GPS, Total Station and High Definition Surveying (HDS) together to complete a survey job. Every site survey is different. Some are best suited for Total stations, others for GPS and others for High-Definition Surveying. We will look at how these three technologies were combined utilizing Leica's new SmartPole and HDS solutions.

LIDAR Red River Basin Project - A Perspective on Elevation: National to Local

The USGS has historically provided elevation data in the United States in the form of topographic maps. However, topographic mapping has evolved from field surveying to aerial photogrammetry to advanced remote sensing technology. Today, elevation data involves all levels of government (Federal, State, regional, local), academia and the private sector. There are new data sources with different characteristics in unique data formats for various purposes and applications in multiple areas. This session will touch on some of the Elevation-related activities of potential interest at the national, regional and local level.

Ron Wencil

Mr. Wencil is the US Geological Survey (USGS) Geospatial Liaison in Minnesota. He works with federal, state, and local government agencies to assess geospatial data requirements and promotes cooperative efforts to meet the goals of the USGS National Geospatial Program Office. Mr. Wencil has been a Cartographer/Geographer in the Federal government for over 24 years in various positions and has been the Liaison in Minnesota for 11 years. He participates with the Governor's Council on Geographic Information and Metro GIS as well as other regional working groups. Mr. Wencil is also active in the American Society for Photogrammetry and Remote Sensing (ASPRS).

Location Survey Requirements

Presented by: **Rick Bruss**

The best construction project that is designed can only result from the most complete and accurate field survey data collected by the location survey crew. Likewise, the best r/w map or plat produced is possible because of the most thorough and accurate efforts in the field by the survey crew. This

session will discuss some “whats”, “wheres” and “hows” to finding and collecting the most complete, accurate and reliable survey data for every purpose.

Rick Bruss

Following graduation from Oregon State University, Mr. Bruss spent the next 10 years teaching school and logging in beautiful northwest Oregon. What began in 1989 as a temporary move back to Minnesota and securing a temporary job working for Mn/DOT as a seasonal laborer on a survey crew has evolved into an exciting career in surveying with Mn/DOT. Mr. Bruss has worked in the field on a survey crew as a technician, has written legal descriptions in Mn/DOT’s Central Office as an LSIT and has been supervising location survey crews in the Oakdale and Golden Valley Survey Offices as a Senior Land Surveyor. He has come to see how invaluable high quality location surveys are for every functional group that relies on survey information to produce a variety of products.

Mn/DOT’s Golden Valley Machine Control

Presented by: **Jeremy Carlson** (*Biography Ref.* Construction Staking), **Gregory Mullen** (*Biography Ref.* Construction Staking) & **David Torfin**

This session will cover the recent experiences of the Golden Valley Surveys Office with Machine Control. The topics covered will include the projects they handled, how the models were built, the types of equipment used, the accuracy of the equipment and the money/time benefits of machine control. The discussion will then be opened for questions and observations by the audience.

David Torfin

Mr. Torfin was employed with Gordon R. Coffin Co. Inc. (Land Surveyor & Planner) as a survey technician from June 1969 to June 1979. He began working for Mn/DOT’s West Metro Surveys in June 1979 as an entry level survey technician. In 1994, Mr. Torfin became a licensed Land Surveyor. He is currently the surveys supervisor for Mn/DOT’s Metro Surveys.

NSRS (National Spatial Reference System) 2007/GEOID

Presented by: **David Zenk** (*Biography Ref.* Elevations & Leveling)

The National Geodetic Survey released the NSRS2007 adjustment on February 10, 2007. This session will focus on the significant differences and similarities of this adjustment compared to former adjustments.

New hybrid and gravimetric geoid models will be generated in the next year (GEOID06 and USGG2006) for all U.S. regions including the conterminous United States. These models may adopt newer global gravity field models derived from the GRACE mission as well as improved terrain and gravity field information.

OPUS

Presented by: **David Zenk** (*Biography Ref.* Elevations & Leveling)

The National Geodetic Survey has implemented a free online service called OPUS, which allows users to submit a raw GPS file along with a few supplemental data, and receive, by email a position for the occupied point. The success of OPUS comes from the ease of use and the reliability of the results. In this session you will learn about current and future OPUS “flavors” and what to expect when you use OPUS.

A Partial Inventory of the General Land Office Surveying Records for Minnesota

Presented by: **Rod Squires**

The deputy surveyors, who subdivided the land surface of Minnesota during the last half of the nineteenth century, received instructions on how to carry out their work. These instructions are valuable to modern surveyors concerned with remonumenting or restoring lost government corners, conducting a boundary survey, creating a subdivision or a highway right-of-way or merely trying to understand a particular point or line. They contain information without which the modern surveyor may be unable to effectively interpret either the field notebooks or the plats that were compiled from the information in those notebooks. This presentation will present some preliminary findings of an on-going research project to make an inventory of such instructions, a project funded by Mn/DOT.

Rod Squires

Mr. Squires is an Associate Professor of Geography at the University of Minnesota. His interests focus on the evolution of landscapes with particular emphasis on land ownership. During the past 15 years he has written numerous articles for the Minnesota Surveyor, the official magazine of the Minnesota Society of Professional Surveyors (MSPS).

Railroad Monitoring

Presented by: **Tom Harper**

The BNSF Railway Company required real-time continuous monitoring of their tracks through Detroit Lakes during the 2006 construction season to measure any movement. Mn/DOT was lowering the ground water and driving sheet piling 14 feet from the main line track. About 1 ½ million tons of freight go over this section of track every week, so the BNSF was very interested in anything that might interrupt that flow. This presentation covers an overview of two different systems used for monitoring the track deflection, some of the problems faced during the observation period and solutions used in providing this monitoring.

Tom Harper

Mr. Harper is the Principal Land Surveyor for Minnesota Department of Transportation District 4 in Detroit Lakes. He graduated from Mankato State University in 1985 and began working for Mn/DOT in 1990 as a construction inspector. Mr. Harper worked on a survey crew in the winter initially and transferred to full time surveying in 1994. In 2001 he worked for the International Boundary Commission, responsible for maintaining the demarcation between the U.S and Canada while on a leave of absence from Mn/DOT. Mr. Harper has been the Principal Land Surveyor in Mn/DOT's Detroit Lakes since 2004.

Round Photogrammetric Targets

Presented by: **Benard Obwocha**

Photogrammetric Targets are ground control points required for mapping projects. The symmetry of a target is important for the production of best results. According to research, the symmetry of round targets makes it easier to locate the center of the target when viewing in stereo. Cross targets can introduce a bias in measuring the center of the target. This presentation will discuss these areas.

Benard Obwocha

Mr. Obwocha has a Bachelor of Science Degree from Kenya Polytechnic College and St. Cloud State University in Survey and Mapping. In 2006, he entered Mn/DOT's Grad Land Surveyor Trainee (G.L.S.T) Program. Mr. Obwocha is a Land Surveyor in Training (L.S.I.T). His surveying

experience prior to coming to Mn/DOT included working for Gibson Private Land Surveying Company in Kenya for 3 years. At Mn/DOT, Mr. Obwocha's experience includes; Geodetic Surveying, Descriptions, Platting, Right of Way and Mapping and Photogrammetry (2.5 years).

RTK Testing

Presented by: **Brad Canaday** (*Biography Ref.* HDS Laser Scanner)

Mn/DOT Metro Surveys did a series of tests with GPS RTK. During this session comparisons will be shown using different rovers and base stations, different parameters and conventional RTK vs. VRS.

Total Station Operations With Trimble Survey Controller

Presented by: **Steve Richter** (*Biography Ref.* GPS Field Calibration For Trimble–When, Why & How!)

This session will be focused on Trimble Survey Controller software and it's usage with Trimble Total Stations. Station elevation, measure codes, traversing, elevating the gun and robotics are just a few topics to be discussed and demonstrated.

Trends in GIS

Presented by: **Dan Falbo**

This session will focus on workflows and issues pertaining to the surveying community and the integration with GIS technology. The presentation will rely on anecdotal information from the Midwest and will include a discussion on emerging trends and best practices. The context will be the creation and maintenance of a multi-purpose cadastre.

Dan Falbo

Mr. Falbo has worked for ESRI of over 16 years. Currently he focuses on local government organizations in MN, ND, SD, and NE IL and assists in the creation of solutions to meet their business needs. Prior to ESRI, Mr. Falbo worked for the State of MN Land Management Information Center and the US Forest Service. He has a BA and MA from the University of MN.

Trimble GNSS

Presented by: **Frontier Precision and Trimble Staff**

What does GNSS stand for? What are these new signals and how are they being used in existing and new equipment? We will discuss these questions and more, including a demonstration on how these new signals work. GNSS is more than just new GPS signals.

Trimble Open Forum – Questions and Answers

Presented by: **Steve Richter** (*Biography Ref.* GPS Field Calibration For Trimble – When, Why & How!)

During this session you will have an opportunity to ask questions regarding Trimble Products and Services.

USGS National Geospatial Programs

Presented by: **Ron Wencil**

The USGS topographic mapping program has undergone a variety of changes as new technology, applications and the Internet have changed our view of geographic information. Digital geospatial

data sources and web mapping services have become the norm in government mapping activities. This session will highlight some of the Federal mapping activities within the USGS.

Work Zone Safety

Presented by: **Julie Bottolfson**

During this session you will learn how to effectively use PPE, lighting systems and other tools to stay safe while working on the roadways.

Julie Bottolfson

Ms. Bottolfson has worked in Mn/DOT's Metro District since January 1998. She started her career with Mn/DOT working in Oakdale as the East Metro Safety Administrator. Ten years prior to coming to Mn/DOT, Ms. Bottolfson managed the safety and workers compensation programs for several ConAgra companies with locations in 9 states. She is also a Paramedic and has been involved in Emergency Medical Services for over 20 years.

Final Thoughts & Closing

Presented by: **Rick Morey** (*Biography Ref. Welcome & Opening Remarks*)

VENDORS AND EXHIBITS

BENTLEY SYSTEMS, INCORPORATED

Bentley Systems, Incorporated provides software for the lifecycle of the world's infrastructure. The company's comprehensive portfolio for the civil, building, plant and geospatial vertical markets spans architecture, engineering, construction (AEC), and operations. Bentley supplies Mn/DOT's Computer Aided Design and Drafting systems MicroStation and GEOPAK Survey and Road Design software and is the leading provider of AEC software to the Engineering News-Record Design 500 and major owner-operators. www.bentley.com

CARLSON SOFTWARE

Founded in 1983, Carlson Software, Inc. is a leading provider of office and field software for land development markets, including land surveying, civil engineering, mining, construction, accident reconstruction and machine control. Carlson Software is headquartered in Maysville, KY, with offices in Atlanta and Boston. We continue to deliver the most complete suite of software solutions ever offered for these industries by a single company. Please take a moment to review this outstanding product line, which you may do so by going to www.carlsonsw.com. Please view our website and call if I can help your company reach its goals. David Pluym, Director of Government/Midwest sales can be reached at the new Midwest office, which is located in the Hazel Green/Kieler area of, WI. 877-435-2925, dpluym@carlsonsw.com. (cell: 563-580-5440)

COMPASSTOOLS INC.

CompassTools, Inc. is not only a Reseller of Trimble GPS Equipment and Data Collection Software, but a provider of complete GIS Field Data Collection Solutions. CompassTools has recently expanded to Minnesota, bringing nearly 14 years of experience helping find the perfect combination of hardware and software to fit our customers' GIS needs.

In addition to Trimble GPS, Ruggedized CE Data Collectors and Satellite Imagery, CompassTools offers many complete solutions for gathering data in the field, including Laser Mapping Systems for Stockpile Volume Inventories, GPS-Enabled Digital Cameras and Integrated GPS/Video Mapping Systems for Sign Inventory Applications. We have dedicated staff to provide full time Tech Support, Equipment Rentals and Certified Training for the products we offer. Please visit our website at: www.compasstoolsinc.com for more information about our products and services or call Del Stewart at: 612 331-4256.

FRONTIER PRECISION/TRIMBLE

Frontier Precision, Inc. was started in 1988. Mr. Dennis Kemmesat and Mr. Mike Althaus interests were awakened to the Trimble GPS in the early 90's. Since the 90's, Frontier Precision has become one of the top Trimble dealers throughout central United States and has four offices serving six different states. Frontier Precision, positioned to be a leader for years to come, has grown to be a leader in measurement and information technology representing such industry leaders as: Trimble, Nikon, and TDS. With Minnesota's first Trimble Certified Service Center, Toll Free Technical

Support, Trimble Certified Trainers, and 2 offices to serve you, we are setting a new standard for customer service. When it comes to positioning and measurement technology, we at Frontier Precision are excited and proud to be supporting the great state of Minnesota.

HISTORICAL SURVEYS

At this display you will have a opportunity to view some antique survey equipment, literature and relics. It is a great way to learn about the past and gain an understanding of what it was like to be a surveyor in the "old days."

HORIZONS, INC.

Horizons, Inc., has been involved in providing professional services in aerial imaging and design quality digital mapping services since 1968, and has six aircraft, camera equipped, with image motion compensation, gyro stabilized mounts and airborne GPS units. Horizons, Inc., has just recently updated two of it's aircraft to be equipped with Leica ALS 50 LIDAR (Light Detection and Ranging) systems, which in simple terms involves a laser profiler and allows Horizons, Inc. to collect up to 75,000 elevations per second along the flight path". We have two Aircraft equipped with LEICA's ADS 40 Digital Cameras.

Our mapping section is equipped with ten analytical stereo plotters, and three soft copy stereo work stations for design quality mapping, updates, and digital orthophotos. We have successfully completed projects for eleven DOT's across the Midwest and west.

Horizons Inc is celebrating its 37th year providing "state of the art" professional photogrammetric services to engineering professionals. We pride ourselves in providing the newest technologies available, such as LiDAR, Geosar, and Digital Aerial Photography. Our success is attributed to our strong commitment to clients and a focus on quality and timely delivery. For further information please visit our website at www.horizonsinc.com or feel free to contact Horizons, Inc., located here in Minnesota at 1-800-933-9869.

LEICA GEOSYSTEMS, INC.

Leica Geosystems' Surveying & Engineering Division provides solutions for positioning and data capture for Surveying, Civil Engineering, Construction and Mining industry segments. With its leading edge technologies included in Total Station, GPS, Leveling and Machine Automation it has established itself as a leading solutions provider in the spatial information industry.

The Surveying & Engineering Division is the largest division within Leica Geosystems, contributing more than 60% of the company's annual revenue. With close to 200 years of pioneering solutions to measure the world, Leica Geosystems products and services are trusted by professionals worldwide to help them capture, analyze, and present spatial information.

www.leica-geosystems.com

MARTINEZ CORPORATION

Martinez Corporation is a Geospatial Service Provider serving private and government clients throughout the United States. Serving clients out of Eagan, Minnesota and Austin, Texas, Martinez Corporation provides an array of services including: geospatial consulting, aerial / ground control planning, digital mapping, orthophoto and imaging production, CADD, GIS, high-definition scanning, 3D-visualization and modeling, aero-triangulation, high-precision digital scanning, design

surveys, right-of-way surveying (including boundary surveys, parcel plats, title and legal descriptions), as-built surveys and topographic surveys.

Martinez Corporation is highly experienced in providing services to various infrastructure clients including: Aviation: Airport Layout Plans, Obstruction Surveys, Spatial Information Systems Highway / Roadway / Bridges: Feasibility/Route Studies, Schematic Development Transit / Rail: Commuter, Light Rail, Freight Water: Water/ Wastewater, Watershed, Pipeline Municipal Planning/ Development: Urban Planning, Hike & Bike, Parks & Recreation

Martinez Corporation is a minority-owned business and is certified throughout the nation with various governmental agencies as Minority Business Enterprise (MBE) and/or Disadvantaged Business Enterprise (DBE). For more information about Martinez Corporation, please visit our website at: www.mtzcorp.com.

Mn/DOT – DETROIT LAKES (D4) EDMS DEMONSTRATION

Minnesota Department of Transportation District 4 has made most of their Certificates of Location of Government Corners and Section Breakdowns available over the internet. This hands-on display will show you how to access and download these Certificates of Location and Section Breakdowns.

MINNESOTA CORS NETWORK

The Office of Land Management will have on display a live demonstration of the Minnesota CORS/VRS Network. There will be qualified staff that will describe the current network and server configuration that supports the system and an explanation to new users on how to access the system for real time GPS corrections.

STRIKEMASTER CORPORATION

Strikemaster Corporation has been an industry leader in the ice fishing world for 60 years. We offer a variety of innovative products from our 2-stroke, electric and the new 4-stroke powerheads. We are committed to problem solving with innovation ideas. During this workshop, we will be introducing the Contractor/Surveyor Drill. This is an innovative idea to a time consuming manual labor proves. Randy Havel is the owner of Strikemaster and continues to lead in the commitment. Mike Katchmark is the operations manager and works with a quality staff on new product development. For more information about Strikemaster Corp. please visit our website at: www.strikemaster.com.

ULTEIG ENGINEERS, INC.

Ulteig Engineers, Inc. delivers comprehensive engineering, planning and surveying solutions to clients across the region and the nation. Since our founding in 1944, Ulteig has grown to include a staff of over 300 professionals representing a full range of disciplines. We provide services to the following market sectors: aviation, building and site services, energy, land surveying and right-of-way, municipal, transportation and water/wastewater. Ulteig Engineers has locations in Minneapolis and Detroit Lakes, MN, Fargo and Bismarck, ND, and Sioux Falls, SD. For more information about Ulteig Engineers and the services we offer, visit our website at www.ulteig.com.

UTILITY MAPPING SERVICES

Utility Mapping Services, Inc. (UMS) is a highly specialized, emerging small business focused on subsurface utility engineering (SUE). The firm's principals, Philip J. Meis, P.E. (MT, ID, SD, UT,

CO, WY, and TX) and Nicholas Josten both hold M.S. degrees in geophysical engineering from the Colorado School of Mines and are specialized in shallow, high resolution geophysical mapping techniques. Thomas Tschida, an engineering specialist with 28 years of surveying and construction experience with the Minnesota Department of Transportation brings us to seventy cumulative years of national experience in the areas of civil/transportation engineering and construction management, geophysical surveying, land survey, mapping and database management.

UMS is experienced with performing utility designating, locating and coordination services in a timely manner for large design and design-build projects. Our ongoing SUE work for heavily traveled urban projects, stands as testament of our ability to meet demanding schedules while adhering to the required standard of care.

For more information contact Thomas J. Tschida, Utility Mapping Services Inc., 3302 Southway Drive, Suite 101, St. Cloud, Minnesota 56301. Office: 320-258-5052. Cell: 320-247-3189 or E-mail: ttschida@umsi.us or website: <http://www.umsi.us>

MEAL MENUS DURING WORKSHOP

Tuesday, March 20:

Lunch: "Italian Buffet"

Dinner: "Fawcett Grand Buffet"

(Baron of Beef, Honey Glazed Ham and Baked Salmon)

Wednesday, March 21:

Breakfast: "Buffet Style" (Marina Dining Room)

Lunch: "All American Buffet"

(Grilled Hamburgers, Marinated Chicken Breast, Veggie Burgers)

Dinner: "Deluxe Dinner Buffet"

(Barbeque Loin Back Ribs, Roasted Herb Chicken & Cheese Stuffed Shells in Bolognese or Marinara)

Thursday, March 22:

Breakfast: "Buffet Style" (Marina Dining Room)

***WE HAVE INCLUDED SOME WEBSITE
ADDRESSES FOR YOUR INFORMATION***

Minnesota Department of Transportation, Office of Land Management –
Geodetics/GIS/CORS - <http://www.olmweb.dot.state.mn.us/>

The Minnesota Secretary of State - <http://www.sos.state.mn.us/>

Minnesota Association of County Surveyors - <http://www.macsinfo.us/>

Minnesota Society of Professional Surveyors - <http://www.mnsurveyor.com/>

The Minnesota State Legislature - <http://www.leg.state.mn.us/>

National Highway Institute - <http://www.nhi.fhwa.dot.gov/>

International Right Of Way Association – <http://www.irwaonline.org/>

Federal Highway Administration – <http://www.fhwa.dot.gov/>

Maps In Our Lives - <http://www.acsm.net/mapsinourlives.pdf>

Mn/DOT's Geodetic Unit Homepage -

[http://www.olmweb.dot.state.mn.us/Inside LM/Geodetic Home/geodetic home.html](http://www.olmweb.dot.state.mn.us/Inside_LM/Geodetic_Home/geodetic_home.html)

COVER PHOTOS:

The historical, 1905 photo on the cover of this booklet is of a survey crew from Hallock, Minnesota and was taken by E. A. Nelson. This photo is courtesy of the Minnesota Historical Society.

The color photo on the cover is of Mn/DOT's Oakdale Survey Crew. Many thanks to them for their "fantastic posing" as they replicated the 1905 photo! From left to right in the back row are: Fufa Roro, Gordy Meade, Amy Genin, Lucas Erickson, Mike Sjodin, Ambrose Shepherd, Terry Baumgard, Rod Clark, Chris Rehnberg, Adam Olson, Steve Dewing and Greg Placzek. Kneeling left to right are: Billy Adams, Martha Willand, Tim Wood, Chia Xiong and Albert Planten.

***THANK YOU FOR SUPPORTING
THE MINNESOTA DEPARTMENT
OF TRANSPORTATION'S
2007 SURVEY TECHNICAL
WORKSHOP***



WORKSHOP NOTES



WORKSHOP NOTES