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The California Surveyor

FALL 1995 The Voice of the Land Surveyors of California NO. 110

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The California Surveyor

is the quarterly publication of the California Land Surveyors Association, Inc. and is published as a service to the land surveying profession of California. It is mailed to all Licensed Land Surveyors in the State of California as well as to all members of California Land Surveyors Association, Inc. *The California Surveyor* is an open forum for all surveyors, with an editorial policy predicated on the preamble to the Articles of Incorporation of the California Land Surveyors Association, Inc. and its stated aims and objectives, which read:

"Recognizing that the true merit of a profession is determined by the value of its services to society, the 'California Land Surveyors Association' does hereby dedicate itself to the promotion and protection of the profession of land surveying as a social and economic influence vital to the welfare of society, community, and state."

"The purpose of this organization is to promote the common good and welfare of its members in their activities in the profession of land surveying, to promote and maintain the highest possible standards of professional ethics and practices, to promote professional uniformity, to promote public faith and dependence in the Land Surveyors and their work."

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EDITORIAL MATERIAL
All articles, reports, letters, and contributions are accepted and will be considered for publication regardless of the author's affiliation with the California Land Surveyors Association, Inc. Contributions submitted on floppy diskette medium is encouraged. For compatibility, disks should be 5.25 or 3.5 inch, MSDOS (IBM compatible) format. We can accept ASCII text files or word processor files from the following programs: WordPerfect, Microsoft Word.

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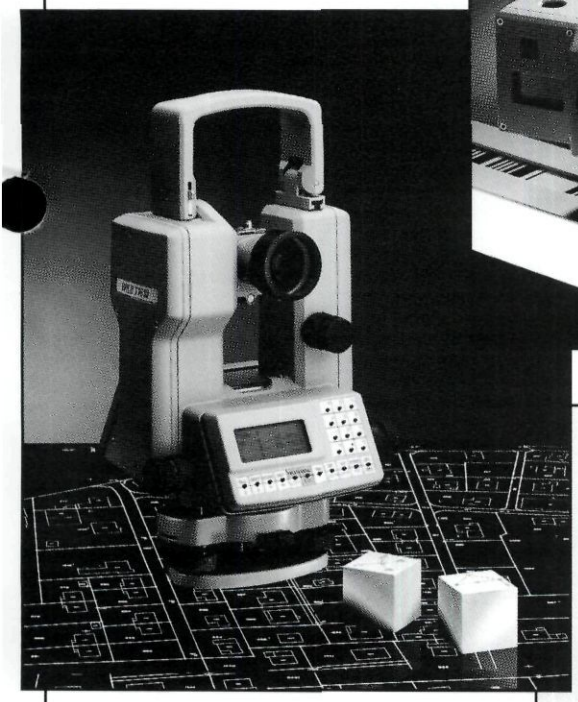

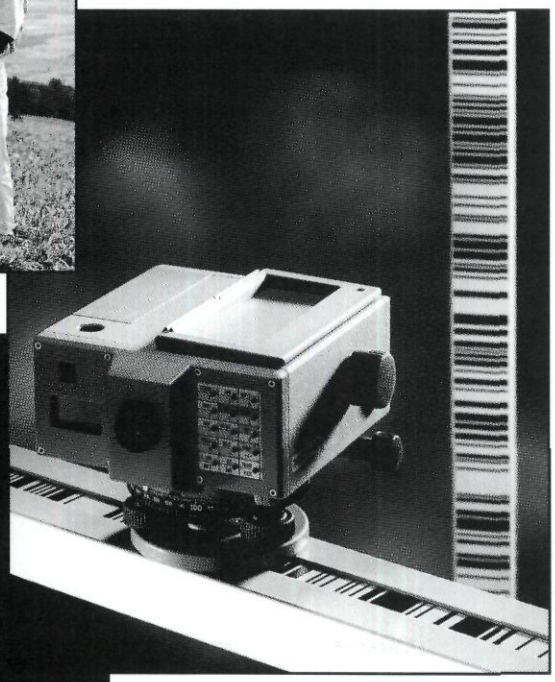

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FROM THE EDITOR

IMAGE OVER SUBSTANCE

By Tom Mastin, PLS

I **WAS READING** another Surveying Association's magazine the other day and on the cover was a picture of a young girl wearing the typical surveying belt and vest. Obviously the daughter of a surveyor who submitted the picture because it was "cute." I got to thinking about this a few hours later (it takes me a while to have things sink in). Is this the image that we want to project for our profession? I have read numerous articles about the professional image that we as land surveyors must project. I have slowly been convinced that we need to project that "professional image"; that business suit type image, where our client can't distinguish us from their attorney without a business card. I have heard of surveyors taking this to the extreme (i.e., a three piece suit while they are out doing field work). That's more than an image, it's an obsession. However, I have come to believe that out in the field we can project a professional image by our dress and mannerisms.

Now those of you who have worked with me or know me, know that even though I say I believe we need to project this professional image, I have never been one that was in the running for a GQ cover. I am in this discussion using the primary theorem of teaching "Do as I say, not as I do," or its corollary, "the correct way is the opposite of my way." I believe that those just coming into the profession are stuck with promoting this "professional image." In that vein, I think all four year surveying programs should require their students to dress in appropriate attire when they attend class, or at least the instructors.

Let me get back on track now. My original concern was-should the surveying profession be promoting an image that shows a young girl decked out in survey gear helping her parents surveying. Are we demeaning the experience and education necessary to become a professional land surveyor when we show a child out surveying? This hits close to home with me, as I have two young daughters who are often curious about exactly what their parents do after we drop them off at school.

> "Do as I say, not as I do," ...
>
> or
>
> ..."the correct way is the opposite of my way."

My problem was the more I thought about this image the more I liked it. I believe that we really have more than one image that we as a profession must project. We must show our clients and potential clients that surveying is not solely a technical trade but is mostly a profession. We must also educate the public in general what we as land surveyors do and lastly we must inform children who are on their way to making career choices about the profession of land surveying. So which one of these objectives are achieved by a cover of a young girl out surveying with her parents?

Glad you asked. It doesn't fit any of them. What objective that achieves is reminding those of us in the land surveying profession why we may have gotten into this profession and that we should enjoy the choice we made. We often forget that the group who understands our profession the least is our own profession. Few of us got into land surveying because we saw it as a way to become the next Bill Gates. Most of us got into this profession because we thought we would enjoy this type of work. As so many people looking to get a start in surveying say, "I saw some surveyors out along the road and I thought that would be fun work." Let's admit it, although we are too professional now to enjoy our work, most of us got into surveying because it looked like a fun way to make a few bucks. Many of us also get an enormous amount of satisfaction in the work that we do as land surveyors. We have a feeling of productivity and of problem solving on an on-going basis.

Okay, one more time, I will try to get back on track again. Although the cover did not convey a professional image of land surveying, it did project a warm feeling. I'm sure that not too many covers of The California CPA show an accountants child having fun helping her parents work on a ledger. We should promote land surveying as an enjoyable experience. Hey, we aren't dentists, we can't promote the big money in land surveying, but we sure can promote the low suicide rate.

I know that some of you, if anyone is reading this, are thinking about all those anxieties involved in the surveying profession. All professions, except lawn mowers, have stressful side effects. I don't think that it is wrong to highlight the positive. I have taken my oldest daughter out surveying a few times so that she can have some sense of what surveying is. (She is pictured on this cover, unless the publisher wasn't kidding about that nepotism clause.) We both enjoy the experience and we both learn a little from it. I don't think that I am trying to push her into the surveying profession (like I could actually push her into something) as much as I am trying to show her that work can be enjoyable and satisfying.

My conclusion, after many sleepless nights (or maybe it was just a half hour of TV surfing) thinking about the cover, was the image of a young girl out helping her parents surveying was possibly one of the best images we could be using to promote the land surveying profession except that it does not convey the professional nature of the business. Although this is a major shortcoming it does not diminish the effectiveness of the cover.

What must we do to promote the professional nature of the business? Again another good question from a group that rarely even opens up this magazine. The answer to that is as easy as it is complicated. We must eliminate the image of land surveyors being out in the field. Ask anyone in the public what they think land surveyors do and they will think of someone out in the field somehow. As an interesting side note; the word field comes from the latin words "fie eldo" which means "center of street." Personally, this is the image I had when I was a young pup, and it is an aspect of surveying that I enjoyed for years. However, it so permeates the image of land surveying that people do not think you can be a surveyor unless you are out in the field. When people think of surveyors out in the "Field" they are not thinking of someone making professional type decisions. Obviously, many times in the field we are making those types of decisions, but again we are talking image. I see civil engineers out on construction sites all the time, working (admittedly, they are usually getting in everyones way) yet the public does not have that image of civil engineers. The public sees CEs as people huddled around a drawing with their slide rulers out; that's a professional. Interestingly, CEs used to be seen as people out on the job sites making sure structures were being built right. Their profession, in the early '60s decided that they needed a more "professional" image and started to promote CEs as "Office People." The nature of their work didn't change, just the image. This is the decision that the land surveying profession as a whole must make. Do we continually want the image of us as field technicians or do we willing to sell the soul of the profession for a better image?

So, as I go slowly to press, I leave this thought with the youth of our profession. Image isn't everything, it's the only thing, *except for integrity.* ⊕

LETTERS TO THE EDITOR

SCHOLARSHIP AWARDED

The California Land Surveyor's Association, San Diego Chapter, is pleased to announce that they have awarded their Curtis M. Brown Scholarship to $1,000.00 ($500) each) to two California State University, Fresno, seniors, Eric S. Cantrell and Lillian Lee-Seay.

The Curtis M. Brown Memorial Scholarship fund was established in 1989 in honor of the Chapter's long-time member, the late Curtis M. Brown, a well known surveyor and author. The scholarship is intended to aid and award a student enrolled in a four-year institution, or in a community college with the intent to attend a four year institution, majoring in surveying or surveying engineering. The Scholarship Committee reviews not only the academic and financial status of the applicants, but considers the applicants' activities and involvement in the surveying profession. This year's Committee decided to divide the award between two highly-qualified applicants.

Eric S. Cantrell, a senior at California State University Fresno, is working this summer as a party chief in San Diego. While at school in Fresno, he is active in student chapters of CLSA, ASPRS and SPSA. In 1994, Eric led a crew in a fellow student's senior project using G.P.S. in Death Valley, Mount Whitney and White Mountain. The project was very successful, and a cover article appeared in the surveying magazine P.O.B. Eric just received his License as a Land Surveyor in the Sate of California. He plans to return to San Diego after graduation in 1996, and he looks forward to continuing his involvement in the Surveying Community.

Lillian Lee-Seay, also a senior at CSU Fresno, is currently Vice President of the Surveying and Photogrammetry Student Association, and was last year's Chairperson of the Annual Fresno Surveying Conference. Besides her extensive involvement in school activities and maintaining a 3.3 GPA, Lillian works part-time for the California Department of Forestry in the Geographic Information System office, developing and implementing a GIS system to evaluate and analyze the cumulative effects of timber harvest in California.

The San Diego Chapter is proud to be able to support the efforts of these enthusiastic students of the surveying profession.

Beth A. Swersie, Education Committee,
San Diego Chapter C.L.S.A.

LS REQUIREMENTS REVISITED

This letter is written in response to your editorial in the Summer 1995 issue. I am not aware of any western state other than Nevada requiring mandatory professional development.

If the Board wanted to do something really useful and effective, they would require LS candidates to appear before an LS panel, in addition to the current application and references, to be considered for admission to the LS exam; as is done in Colorado.

W.D. Goodwin, PLS

HISTORICAL SURVEY RECORDS

I noticed your request for historical California Survey notes, and even though this deed is from New York, and was written a couple of hundred years before California was even a state, I though it may be of some interest to you.

My Mother's maiden name is Underhill, and she belongs to a society that traced their family tree back to the year 1253. This is the story of one of my grandfathers who came to New England about the 1630's. The article gives more details, but the deed is for a plot of land given to him by a group of indian tribes that he was associated with. Captain John, was the "John Wayne" of the 1630's. There is mention of a monument to him to be placed on Long Island. There is one now which was dedicated by President Teddy Roosevelt. The other page shows Captain John with the men the he led in the indian wars in New England. He is credited with the organization of the National Guard and was honored by having a postage stamp created in is honor.

Perhaps you know of a group in New York that is similar to yours, who may also find some interest in these papers.

Eugene Sage

[Editor's Note: The following is a reprint of the deed to John Underhill that Mr. Sage refers to. It is an interesting view of land transfers in the 1600s.]

INDIAN DEED OF FEBRUARY 20th 1667.

Killenworth this 20th (of) febrewary 1667 wee the Injon proprietors on manenecok whos names are hereunto (su)bscribed do by these presants Ackowledg to have giv(e)n and frely granted and made over unto John (u)ndrelll senior of the plaase Aforesaid in ye Rioll patronage and protecktion of his hines Jeames duke of york: a sarten trackt of land Containing aa hundred and fifty acors more or les ly(ing be)tewne Corne (Cri)k and ye mark tre bounded by us suthardl (ly thence r)anging with ye lot of nathan burchall as lai(d o)ot by hemsted men with a small nouke of medoe lying betwene oke nek medowes and racoune s(wom)p bounded wesward with three Rocks lying in y(e said)d medow with all preveliges of Commoneg for (tim)ber and grasesing fishing fouling hunting with all benefits of mineralls Acording to law for him ye siad John his ayers ssuksesors ar Asinges pesable to posses or inioye for ever fre from all molestaion

from us our ayres sucksesors adminestrators and Asines and do by thes presants Ingabe to make good ye promeses to him ye said John his (ayres & A)sines Aforesaid Ag(ainst) all pleyes or pretens(es) whatsumever we haveing Reserved full satesfackt(io)n from him ye siad John for all ye priveleges and benifits as before menshoned as wittness our hands day and date Above written and in ye nintenyth yeare of ye Kings Raine sined seled and delivered in ye preans of us.

Recorded in ye Office at New Yorke the 13 day of March 1667/8.

WHEN TO FILE A RECORD OF SURVEY

The laws and rules which mandate the filing of record of survey maps and corner records are found in the Professional Land Surveyors Act (Chapter 15, Sections 8700 through 8806 of the Business and Professions Code) and Board Rules, Sections 400 to 471 of the California Code of Regulations. Section 8762 states the requirements for determining when a record of survey shall be filed. A record of survey may be filed for any survey at the discretion of the surveyor upon the completion of a survey. A record of survey must be filed under certain conditions. The interpretation of when the filing is discretionary or when it is mandatory is the issue which many surveyors encounter and have trouble understanding. Many choose to ignore the requirement due to cost, difficult and/or time-consuming county surveyor checking procedures or other related matters. Allowing cost or time constraints to dictate a surveyor's professional conduct or to fail to practice in conformance with the laws, rules and regulations of the State of California leads to a complaint being filed against the surveyor with the Board, with the possibility of disciplinary action.

Section 8762 (see opposite page) states that after making a survey in conformity with the practice of land surveying, the surveyor or civil engineer may or shall file a record of survey with the county surveyor in the county in which the survey was made.

The key issue to be considered is not whether monuments are set during the making of a survey of a parcel described by deed or other instrument of title, but whether the survey discloses one or more of the elements outlined in Section 8762 which are not shown on a recorded subdivision map, official map, record of survey, or map or survey record maintained by the Bureau of Land Management of the United States. A record of survey is an integral part of any survey performed and is generally the only document which a client receives from a surveyor which shows and delineates the land boundary or property lines and related information which comprises the results of the survey performed by the surveyor. It is in the best interest of the public and the profession for records of survey to be filed in accordance with section 8762.

Professional Land Surveyors Act
Business and Professions Code Section 8762.
Records of Survey

After making a survey in conformity with the practice of land surveying, the surveyor or civil engineer may file

with the county surveyor in the county in which the survey was made, a record of the survey.

After making a survey in conformity with the practice of land surveying, the licensed land surveyor or registered civil engineer shall file with the county surveyor in the county in which the survey was made a record of the survey relating to land boundaries or property lines, if the survey discloses any of the following:

(a) Material evidence or physical change, which in whole or in part does not appear on any subdivision map, official map, or record of survey previously recorded or filed in the office of the county recorder or county surveying department, or map or survey record maintained by the Bureau of Land Management of the United States.

(b) A material discrepancy with the information contained in any subdivision map, official map, or record of survey previously recorded or filed in the office of the county recorder or the county surveying department, or any map or survey record maintained by the Bureau of Land Management of the United States. For purposes of this subdivision, a "material discrepancy" is limited to a material discrepancy in the position of points or lines, or in dimensions.

(c) Evidence that, by reasonable analysis, might result in materially alternate positions of lines or points, shown on any subdivision map, official map, or record of survey previously recorded or filed in the office of the county recorder or the county surveying department, or any map or survey record maintained by the Bureau of Land Management of the United States.

(d) The establishment of one or more points or lines not shown on any subdivision map, official map, or record of survey, the positions of which are not ascertainable from an inspection of the subdivision map, official map, or record of survey without trigonometric cal-culations.

(e) The points or lines set during a survey of any parcel described in any deed or other instrument of title recorded in the county recorder's office are not shown on any subdivision map, official map, or record of survey.

The record of survey required to be filed pursuant to this section shall be filed within 90 days after the setting of boundary monuments during the performance of a survey or within 90 days after completion of a survey, whichever occurs first.

If the 90-day time limit contained in this section cannot be complied with for reasons beyond the control of the licensed land surveyor or registered civil engineer, the 90-day time period shall be extended until such time as the reasons for delay are eliminated. If the licensed land surveyor or registered civil engineer cannot comply with the 90-day time limit, he or she shall, prior to the expiration of the 90-day time limit, provide the county surveyor with a letter stating that he or she is unable to comply. The letter shall provide an estimate of the date for completion of the record of survey, the reasons for the delay, and a general statement as to the location of the survey, including the assessor's parcel number or numbers.

The licensed land surveyor or registered civil engineer shall not initially be required to provide specific details of the survey. However, if other surveys at the same location are performed by others which may affect or be affected by the survey, the licensed land surveyor or registered civil engineer shall then provide information requested by the county surveyor without unreasonable delay.

Any record of survey filed with the county surveyor shall, after being examined by him or her, be filed with the county recorder.

[Amended, Chapter 26, Statutes of 1994] ⊕

HPGN AND HPGN-D STATEWIDE DATA FILE AVAILABLE

CLSA HAS COMPILED an electronic data file of all the High Precision Geodetic Network (HPGN) and HPGN-Densification station data (descriptions, coordinates, etc.) in California. This information was extracted from the August, 1995 NGS CD-ROM. It includes all data submitted to NGS through the Northridge earthquake survey. The data set is available from CLSA at $20.00 per disk, plus handling. The data set is available on one disk in a "zipped" format. Call the Central Office at 707/578-6016 to order. The program "Seeker," also available through CLSA, will read and search by location for stations in this data file. ⊕

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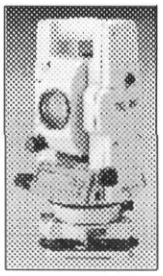

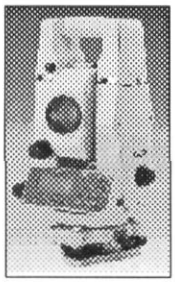

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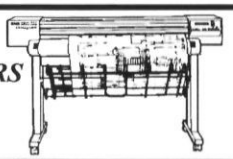

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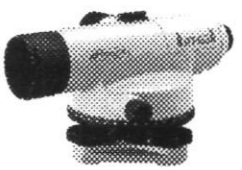

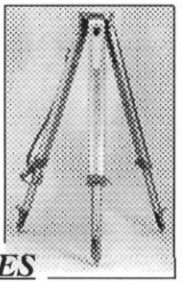

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GIS EDUCATIONAL PLAN

By Wil Finfrock, PLS

THERE IS A repetitious observation among a growing number of land surveyors, that even as technology eliminates a once customary field of practice, it has failed to create a proportionate number of new opportunities for the practicing land surveyor. This in spite of the fact that these same technologies have spawned a great deal of seemingly apropos industry, most notably among those industries, G.I.S.

The causes of this situation are manifold but the focus of this proposal is a singular, but in my humble opinion, an essential element to a general solution. The crux is this: Land surveyors have not educated themselves, positioned themselves, or ingratiated themselves, into the Geographic Information community. We are not involved in Geographic Information Systems as a profession because we have stood at a distance and asserted an untested "right" to an inattentive audience. That audience does not know what we do, what we know, or what we think. And not surprising, we know little about them.

As I see it, the solution is three-fold: One is to pursue a political agenda to defend the legitimate professional domain of land surveying. On this count, I believe C.L.S.A. is doing an excellent job. The second is to pursue a policy of increased Geographic Information education within the profession, and that this education be of a very practical, hands-on nature. Three is to establish an administrative position to coordinate with other GIS organizations and create a focal point for industry and agency alike. Whatever we do within our organization will be in vain unless we network into the GIS community and represent ourselves as the professional resource we believe ourselves to be. Until they know, what it is we know, all of our knowledge and legal privilege will not improve our position within this community. Land surveyors must become recognized members of the GIS community, and to attain that citizenship, we must participate in the established organizations. And here I want to emphasize the role of participation, as opposed to confrontation. Our own legislative history will bear out the truth in this point.

A Little History

About a year and a half ago, Kurt Hoehn, then president, approached me and asked if I would be interested in relieving Howard Brunner at his post at the reorganizing California GIS Task Force (soon to emerge as the independent California Geographic Information Association). It sounded like an interesting job with lousy pay. I'm a surveyor; I took it.

In the course of representing C.L.S.A. at the CGIA, I found myself occasionally pressed to explain why a surveyor's expertise would be desirable on a GIS team, and the answers were not always easy to come by . . . not because they aren't there, but because I had never thought my position through to those particular extremes. And once having an answer in hand, the obvious corollary question arose: If that is so, why aren't there more surveyor's in GIS. It was a very good exercise, and I should take this opportunity to thank those who threw me into that lion's den.

My conclusions led me to a few glaring deficiencies within the profession, the most prominent of which is that we don't know the language and we don't drive the software. The good news is this: It is easy to fix . . . if we are willing to make the effort and spend the time.

You may recall two and a half years ago, Jack Dangemond, CEO of Environmental Systems Research Institute (a.k.a. ESRI) was the keynote speaker in San Diego at the annual C.L.S.A. conference. For those that don't know, ESRI is the moral equivalent of IBM in the world of GIS. As keynote speaker, Mr. Dangermond urged surveyor's to become more involved in the technology of GIS, but I think a great deal fell on deaf ears for want of a viable vehicle to the promised land.

On the strength of the office granted me by C.L.S.A., and parlaying the credibility of the CGIA, I drafted Mr. Dangermond a proposal, suggesting a strategy whereby the surveying community could become more acquainted with his product. To make a long story shorter, Mr Dangermond and his excellent staff are good to the intent of their word. ESRI has agreed to facilitate our GIS education program by providing software through the office of the newly established C.L.S.A. GIS Liaison (see sidebar ESRI provides Educational Grants to C.L.S.A.)

Method

To achieve these aims, I propose the formation of an advisory position to the California Land Surveyors Association

Board of Directors; a Geographic Information System Liaison. The Liaison would be responsible to:

- Seek out information and alliances beneficial to land surveyors in the domain of Geographic Information System technology
- Report the status of the information to the Board and the Officers.
- Establish and manage a means for distribution of the information to the general membership

To begin, the Liaison should participate in GIS conferences across the country, if necessary and join other pertinent organizations as well as subscribe and digest pertinent journals. Further, we should seek to establish GIS Development Groups within each of the local chapters where they don't exist. A strategic alliance within the GIS industry should be sought out to support these groups with hardware, software and training. Each of these groups should seek to establish a public service demonstration GIS installation, in a public place to promote and advertise the logical nexus between land surveys and land information systems (a.k.a. GIS) and to better acquaint ourselves with the technology while building credentials to be the participants in this new technology that we wish to be. ⊕

ESRI PROVIDES EDUCATIONAL GRANTS TO C.L.S.A.

GIS Liaison Position Created

AT THE JULY MEETING, adopting a proposal from the Advanced Technologies Committee, the Board of C.L.S.A. voted to create a new Board Advisory Position, a Geographic Information System Liaison. The purpose of this position is to create an organizational nexus, a focal point for information both inside and outside the corporate body of C.L.S.A.

The GIS Liaison position is charged with responsibility to seek out information and alliances beneficial to Land Surveyors in the domain of Geographic Information System technology; to establish and manage a means of distributing that information to the general membership of C.L.S.A.; and to report the status of these responsibilities to the Officer's of the Board of C.L.S.A.

A Proposal To The Local Chapters

The focal point having been created at the State level, the task remains to organize at the local level. The challenge of advancing our knowledge of GIS technologies as a group is now on the local chapter: the vision is to create local GIS Development Committees across the state. The Chair of each of those committees will report to the GIS liaison on the activities of the local Development Committee and the GIS Liaison will in turn report their findings to the Chairs, as well as the Board. Once established, this network will be the distribution conduit through which pertinent information and educational materials travel to advance the status and position of Land Surveyors in the realm of GIS.

A prototype GIS Development Group was established earlier this year in the Central Coast Chapter. Its stated goals were to explore the feasibility of establishing cooperative ties to industry in hopes of developing a mutually beneficial program for educating Land Surveyors and showcasing GIS technology. Their on-going effort is to acquire hardware and software, to educate themselves in the use of this equipment, to build a functional prototype for demonstration purposes, and to seek a public venue in which to display their final product.

ESRI provides Educational Grants

The fruits of the initial inquiries of that group were extraordinary: Jack Dangermond, CEO of Environmental Systems Research Institute (a.k.a. ESRI), responded to our inquiry with remarkable generosity. ESRI is prepared to provide, through the GIS Liaison, for educational purposes, a copy of their latest version of ARCVIEW to establish GIS Development Groups. This latest version will directly read AutoCAD dwg files, allowing us to use a familiar platform to transition our existing knowledge base into a new arena.

To acquire a copy for your local chapter, establish your local GIS Development Group, have the Chair make application to the GIS Liaison through the C.L.S.A. Central Office, and C.L.S.A. will see that you receive a copy of ARCVIEW for your education group. Discussions are underway regarding the possibility for training seminars around the state; more news on that as it develops. In the interim, there are excellent after-market publications on the subject of ARCVIEW and other excellent products of ESRI.

Please be sure to put Mr. Jack Dangermond on your Christmas card list.

If you have any questions regarding this program, please feel free to contact me, Will Finfrock, GIS Liaison, through the C.L.S.A. Central Office or directly by E-mail at WWFIN@aol.com. ⊕

THE FUTURE OF BOUNDARIES (ALTAS, METRICATION, LEAST SQUARES, AND COORDINATES)

Part II

By Michael A. Duffy, PLS

[Editor's note: this article is based on Mr. Duffy's talk at California State University, Fresno Surveying Conference on January 27, 1995.]

Least Squares

WITH THE ADVENT OF GPS, it may be time for the surveying community to review some of the procedures currently legislated and practiced, that could be refined or improved, based on such technology. With boundary surveys as a backdrop, I want to discuss some uses of least squares adjustments in relationship to cadastral monuments.

Since the advent of the U.S. Public Rectangular Lands System in 1785, the procedures for replacing lost corners has remained unchanged. This system was set up to allow for simple mathematical calculations, which were necessary for the era they were performed in. Examples of these calculations include the double proportionate measurement and the grant boundary method. In the time period between the publication of the last Manual of Surveying Instructions 1973 and today, we have seen the rise of EDM, digital theodolite, GPS, field calculators, and personal computers. What we have not seen is a re-evaluation of our survey methods and procedures.

With the advances in accessibility of personal computers and the advent of the least squares adjustment method, the time appears right to re-evaluate the adjustment procedures for boundary surveys as a whole. One area of consideration would be the restoration of lost corners within the public land system. Least Squares adjustments, if legislated through the BLM, as the adjustment of choice, would allow the surveyor to use all the evidence available to re-position a corner. Advantages of Least Squares over traditional adjustment methods used in restoration of lost cadastral corners include:

- Calculates mathematical search area radius for all lost corners prior to search.
- Uses record directions, distances, ties, and topo calls in restoring corners.
- Provides statistical information on original surveys and their possible errors.
- Allows weighting of all public and private survey records in repositioning corners.

- Allows for easy use of state plane coordinates, zones, units of measurements.
- Reduces chance of mathematical errors, due to human blunders.
- Consolidates all adjustments into one, including: single & double proportions, compass rule, transformations, etc.
- Provides statistical reporting and mathematical assurances admissible in court.
- Provides graphical presentations of measured survey lines and error ellipses.
- Allows for fast readjustment, if additional original monuments or record data are found, during any stage of survey.

State Plane Coordinates

Another area, boundary surveys could be improved through legislation, is allowing cadastral corners to be re-established by state plane coordinates, if such a coordinate exists of the public record, rather than either double proportion or least squares adjustments. California has already legislated the CCS83 datum for state plane coordinates and has established a state-wide High Precision Geodetic Network (HPGN) to monitor the use of such coordinates. This would necessitate the creation of a state-wide program to begin establishing, verifying, and documenting state plane coordinates on all existing cadastral corners. Also, State Plane Coordinates could be mandated by state and local agencies for all cadastral corners shown on any record map and included in this state-wide cadastral database.

Another positive step would be to begin including state plane coordinates on critical calls, such as basis of bearings for all new legal descriptions. This would be a slow, on-going process covering decades, eventually creating direct ties between property corners and the larger cadastral grid. The end product, resulting from this transformation process, would be a common basis of bearings for every deed and map within the State of California on grid north, not astronomic north.

Conclusions

Many of the issues, I have brought up in this paper, would require a great deal of legislation and administrative changes within the surveying community. Some of these changes, such as new procedures for restoration of lost corners, would need to take place at the **federal** level through completion of a revised and updated *Manual of Surveying Instructions 1973*. The comments in this area are broad and quite radical, but I believe them necessary to keep up with the changes experienced in the profession over the last 25 years.

Other action necessary at the **national** level is the need to revise the 1992 ALTA/ACSM standards to include positional accuracy standards, not just angle, distance, and closure requirements. Statements encouraging

static and fast-static GPS measurements need to be included in this nation-wide standard.

Action at the **state** level will require some new thinking. With the reduction of forces at the federal level for nearly all surveying support, a shift in responsibilities is in order. The federal government can no longer support horizontal and vertical geodetic control at anywhere near the levels they have in the past. Nor do they have the staff to accept all the data being created by both the private and public surveying communities nationwide. It appears safe to say, they will continue experiencing a downsizing in personnel and budget in survey organizations, such as the BLM, USGS, and NGS. Early indications, from the Senate's "Contract with America," outline major cuts or outright elimination in federal support of these groups.

This conscience effort to shift federal budgeted programs to the states, combined with the information explosion resulting from GIS and GPS, requires a state-based solution. I believe, the time has come to resurrect a state office that would carry the title "**State Surveyor General**." Other states, like Colorado, have done this very thing. Actually, a total of 14 states currently have such a position. California had such a position until 1928. This new office would take on many, if not all of the issues listed in this paper, plus many more.

As early as 1858, California saw a need to have a central authority to reside over state-wide, parcel-based data. The State Surveyor General required all County Surveyors to forward survey information pertaining to topography, mineral lands, legal parcels, road locations, city and county boundaries, agricultural lands, state lands, etc. to his office for use by state legislators. This could be done today in a standard electronic format for GIS compiling and distribution.

The duties of such a position would include, but would not be limited to:

- Prepare and promote state-wide legislation for items, such as metrication standards, state plane coordinates requirements for survey mapping and legal descriptions, and monument preservation funding.
- Prepare recommendations for changes to national standards documents, such as the *Manual of Surveying Instructions, ALTA/ACSM Land Title Survey Standards,* and *FGCC.*
- Standards relating to horizontal and vertical control.
- Prepare guidelines to standardize state-wide review procedures established within the Subdivision Map Act and Land Surveyors Act for survey mapping.
- Create, maintain, and regulate a state-wide CCS83 database for all geodetic and cadastral monuments, *including the HPGN and CORS* control networks.
- Create, maintain, and regulate a state-wide vertical control database for NAVD88.
- Create, maintain, and regulate a state-wide GIS program for all survey-based parcel information.
- Regulate licensing, fees, and disciplinary actions for professional surveyors.
- Promoting and funding this idea would require reiterating the fact that survey control is directly tied to maintaining a safe and efficient infrastructure in California. Fire, flood, and earthquakes can be sighted as disasters, which require survey solutions and a central figure to implement these solutions. State disaster preparedness funds could also be a source of funding. Funding of this office could also come from something similar to the monumentation preservation fund by additional record documentation fees.

Many of the job functions listed above have fallen on the shoulders of Caltrans because of their expertise and lack of any other existing state-wide survey group. Also, the fact that numerous local organizations continue to spring up in California to tackle general and specific survey issues, lends credence to the need for an overseeing body that can act as a political, technical, and informational hub of these activities. Some of these local groups include:

League of California Surveying Organizations (LCSO)

California Continuous Operating Reference Station Committee (CCC)

California Geodetic Control Committee (CGCC)

Southern California GPS Users Group

County Engineers Association of California (CEAC)

Consulting Engineers and Land Surveyors of California (CELSOC)

California Land Surveyors Association (CLSA)

California Geographic Information Association (CGIA).

These groups usually have the professional and technical knowledge to solve current survey problems, but lack the political clout to accomplish many of their goals. **A State Surveyor** General office would help consolidate and strengthen the valiant efforts of these groups and act as a bridge between where the federal government's involvement leaves off in surveying support for California and what the future survey needs really are for the State. ⊕

NEEDLES AND PINS

By George R. Dunbar, PLS

PINS

FOR THE MODERN DAY surveyor to retrace the footsteps of the old timers who were surveying using a Gunter's chain and a compass, it is necessary to understand their procedures.

In the measurement of lines, in the west, either the Gunter's chain (66 feet long comprised of 100 links of 0.66 feet each) or as specified in the "Oregon Manual of Instructions" which covered all surveys in the west, a "Two Pole Chain" was used. The latter is simply one half of a Gunter's chain, (33 feet long comprised of 50 links of 0.66 feet each).

The "Two Pole chain" was used due to the extremities of terrain, and the method of measurement. The Surveyor normally set up at a place of beginning, taking a line of sight and sending a flag man ahead (possibly accompanied by an axeman). These two went as far as they could go and still see back to the Surveyor, oftentimes a half mile or more. There they erected a forward sight, "a flag". This usually consisted of the trunk of a sapling or small tree, de-barked and possibly marked by pieces of cloth. The chainmen, accompanied by axemen then began their measurements. The rear chainman sighting the "flag" and placing the head chainman on line. If going downhill the head chainman normally held his end of the chain at an estimated level position, or as high as he could hold, and dropped a chaining pin to mark the spot. Moving ahead the rear chainman repeated the procedure, and picked up the dropped pin and placed it on a ring on his belt. Some of the more careful and precise chainmen, rather than simply holding the chain as high as possible, "broke chain", at a point estimated as level, the rear chainman proceeded to this point, while the head chainman retaining a grip on the point where he broke chain, proceeded ahead the remainder of the chain length. This occasionally resulted in a mis-tally, because the rear chainman forgot the use of a pin in marking the "broken chain." After proceeding along the line a total of 10 chains, the chainmen exchanged pins, and marked their results in a "peg book," which would later be turned over to the surveyor for entry into his field notes, along with any notations concerning terrain and/or blazed line trees. Since often the chainmen were illiterate or semi-illiterate, mistakes were made. The modern surveyor re-tracing the notes of an old timer that do not close, or match terrain calls, should first look for errors of one link, 10 links (how often have you seen a chain with missing marking tags), one half chain if a two pole chain was in use, or one chain. The last 3 of these errors usually resulted from an error in the tally, whereas a mistake of from 1 to 9 links, was often the result of inability to count.

Whenever I was retracing a metes and bounds survey of very early origin, that did not close, the first effort I made was to look for the above enumerated errors. Eight times out of ten I found that mis-tallies were at the root of the problem, and when these blunders were located, the survey usually came together very well.

I have never seen expounded, in any textbook on boundary surveying, what I choose to call the "Theory of Blunders" (i.e., **NEVER** prorate a blunder, rather, **ALWAYS, ALWAYS**, place a blunder where the blunder occurred). (If you can locate it with any degree of certainty).

Having outlined the procedure of chaining, and recognizing that the line in these early surveys was often "eyeballed", by the chainmen, not by the surveyor, it becomes apparent for one reason why line trees often do not line up EXACTLY when retraced using a modern transit or theodolite.

However these line trees, when recovered, **ARE ORIGINAL MONUMENTS**,. just the same as original corners are, and should be treated as "High and Holy Objects". The Surveyor should report the vagaries of what is described in the deed as a straight line, while honoring the placement of these original monuments

NEEDLES

The earliest surveys were accomplished using a Surveyor's Compass and Jacob's Staff.

Later surveys were accomplished with compasses accompanied by a telescope and cross hairs mounted on a tripod. In my former firm we still have a "Cyclotomic" Surveyor's Compass that I often used. It's needle was remarkably accurate. The modern surveyor, when re-tracing a compass survey, should, himself, first make a reconnaissance survey, using a compass. Oftentimes this will locate areas of "local attraction" which may have existed when the original survey was performed.

My most remarkable survey of this type occurred above the town of Pescadero in San Mateo County. A surveyor had made a survey and filed a Parcel Map that ignored all of the prior deed calls to fences and terrain. Research enabled me to begin my retacement in an area of an old "Spanish style picket fence", mostly rotted off at the ground with the pickets lying helter skelter about. Careful excavation, however, uncovered the butts of these pickets, which gave me a line to project back to the highway and the site of a former timber bridge recited in the deed (the present bridge was a concrete bridge dating back to the '20s) County field notes for this

bridge gave ties to the old timber bridge, and again, careful excavation resulted in locating the mudsill abutment of the old bridge, still intact. Absolutely no doubt about where I was. **HOWEVER**, compass bearings on the two ends of the same line resulted in bearings that differed by 7 degrees. From the southern terminus of the line looking North the magnetic bearing was N 26½°E, from the northern terminus of the line looking south the magnetic bearing was S 19½°W. All of the subsequent courses agree with the magnetic bearings. A modern day surveyor beginning at the locus of the old bridge and running north by angles would have a 7° "boot" at the northern terminus of the first course, which would get worse the farther you went. To make matters worse, after two courses where 100 year old lines of possession were discernible, if you looked and dug, the evidence petered out due to extreme flooding in the area in the 1950s. Sedimentary deposits were over 10 feet deep and the creek bank had moved, in places by over 100 feet. Subsequent investigations in the town newspaper morgue recited meteor showers and strikes in the 1870s. I was able to pinpoint a mass with powerful magnetic influence near the line in question, however it is under the existing paved road where I could not excavate to investigate. It is my firm belief that this is the site of a meteor of unknown size, or a lost wheel barrow or bull dozer.

In the 1850s and later, it was the practice of good surveyors in an area to go out at least once a year and determine the meridian by Polaris (usually at elongation), as this ,is a simple thing to do without the requirement of accurate time. The following day they would then set off the declination for the particular area using the determined meridian. Surveyors who were not quite as precise or careful simply took someone's word for it and set their declination that way.

I have retraced a number of surveys by a surveyor (name unknown) who probably came to California from Ohio, Michigan, or another of the midwestern states where magnetic declination is 0° or very near to 0° and did not set off declination (in our area this is about 16¾°, depending on the year). If you ignore this gentleman's bearings, but employ his angles, you will find he did marvelously precise work for his time.

To get back to "Needles," when these surveyors ran a line even employing a telescope and crosshairs, it was the practice to simply pick up the instrument and go to the other side of any tree they encountered, re-setup and continue. In doing so their bearing for any segment of line is very good but may be stair-stepped as much as a foot or so. Sometimes you will find this "stair-stepping" to be a compensating error (i.e., one step to the right, one step to the left). At other times you may find the error to be accumulative (i.e., one step to the right, one step to the right, etc.) which may result in an error in bearings of feet when the two ends are connected to locate the entire line.

It is always advisable to check the magnetic bearing both forward and back, since occasionally you may find, like my Pescadero survey, local attraction of a very specific nature. If you are checking magnetic bearings along a road or street, a parked car is a prime example. One thing not always thought of is pens and mechanical pencils in the shirt pocket or eyeglasses with steel frames. You are carrying your "local attraction" with you. I read an article once about a retracement that simply would not go together until the surveyor noted a sketch in the original notes that showed the surveyor with a pistol holstered at his side. The modern surveyor tried the same thing an Lo! and Behold! the survey came together like a charm.

I would advise all surveyors who are doing retracement work to either keep an old Engineer's transit with Compass on the truck or purchase a Surveyor's Compass and Jacob Staff or at the very least carry a Brunton Compass or a similar "Forester's Compass."

Checking the Magnetic Bearing of the first and last courses of a lengthy survey is also a good way to locate large errors. Back when all my surveying was done with an Engineer's Transit, I turned the needle loose on every course, just to check that I had not mis-calculated the angle or turned the wrong angle. Of course I never made a mistake, but to paraphrase Daniel Boone, I was confused for a few courses now and then. ⊕

THE IMPERIAL VALLEY PRECISE NETWORK SURVEY PROJECT

A CORRIDOR OF COOPERATION IN SOUTHERN CALIFORNIA

By Tony Nothdurft, PLS; Bob Estes, PLS; Harrison Barton, PLS;
David Royer, and Christy C. Hunter, RG

IMPERIAL COUNTY like other counties in California has been moving in the direction of employing an advanced system of surveying and mapping technologies. These technologies, known as the Global Positioning System (GPS) and the Geographic Information System (GIS) are gaining acceptance around the world by professional surveyors. The County Surveyor, realizing the benefits to Imperial County, communicated to the local surveying community, in both the private and public sector, a desire to support this new technology. The response was positive.

Apparently, the timing was right and a new level of cooperation was born within the County's surveying community; in April of 1994, a GPS Monumentation Committee was formed. The committee's purpose was to look at the status of geodetic control in the County. Among the participants of the committee were representatives of the California Department of Transportation (CALTRANS) who expressed early on an interest in this project. Other participants included members of the surveying departments of Imperial County, Imperial Irrigation District (IID), cities of Calexico, El Centro, Imperial and Brawley, and local private firms, TESCO Engineering and Surveying, Lyon Engineering, T.B. Jones Engineering and Surveying, and South Valley Engineering Inc. along with interest from other entities such as California Division of Oil and Gas, and the U.S. Bureau of Land Management.

The Committee determined that although there is existing National Geodetic Survey (NGS) horizontal control through the region, the spacing is too great to be used conveniently in most local surveys. Therefore a need for a continuous single horizontal control base was identified. The target area chosen for the network is a 8 km wide corridor that extends north from the Mexican border at Calexico for 36.8 km to Brawley, and encompasses most of the developing and metropolitan areas of Imperial County. This Imperial Valley Precise Network (IVPN), a base network of geodetic control, would be used to tie in all subsequent surveys, thus controlling the compatibility of all subsequent survey data that would be incorporated into a regional GIS. A GPS Monumentation Subcommittee was formed to plan the project, determine accuracy standards, spacing and assign tasks. The subcommittee was made up of representatives from CALTRANS, Imperial County, IID, and TESCO.

The subcommittee recommended the IVPN should have a four kilometer spacing, thus requiring approximately 70 stations. This would allow enough inter-visible stations near developed areas to facilitate the use of conventional instruments for network densification or subsequent surveys. The control net would be established on the 1991.35 epoch of the NAD83 datum and published locally at the county. In addition the GPS survey should meet first order accuracy standards, however first order specifications would not always be met regarding station spacing, monumentation and ties to all adjacent existing stations.

Once the plan was outlined the timetable and fieldwork strategy for the project was devised. CALTRANS provided the equipment and some personnel who assisted in the training sessions, data collection and data processing. The other committee participants provided additional resources for station recovery, mark setting and project documentation. As was also decided by the GPS subcommittee, the Imperial County Surveyor coordinated these efforts, created corner record cards for each station and would maintain the records for public distribution and use. TESCO volunteered to prepare and record a Record Of Survey (ROS) map.

From Reconnaissance To A Final Network

On July 14, 1994, the first phase began with instructions and training for station reconnaissance and recovery. This included instructions for; performing obstruction surveys to determine site suitability for GPS, setting new monuments as required at the appropriate spacing, making ties to North American Vertical Datum 1988 (NAVD88) vertical control and preparing monument tie records.

Reconnaissance, station recovery, mark setting, and station descriptions took place from the beginning of August to the end of September. Each participant was assigned a different portion of the geodetic control area.

Many of the participants and other surveyors in the community had no or limited experience in a GPS survey and so education was an important step. On August 18, 1994, a GPS and Geodetic Control orientation presentation was conducted for all those in the community who were interested. The presentation, made by Tony Nothdurft, PLS, Computer Systems Supervisor of CALTRANS, covered Stand-

ards, Specifications, Accuracies, Datums, Basic principles of GPS, GPS Measuring techniques, a sample GPS control project, and an overview of the IVPN.

During the preliminary planning of the project, research into the National Geodetic Reference System (NGRS) and Caltrans records revealed two recent surveys and monumentation suitable for use in this project: An B order (1:1,000,000 or 1 ppm) HPGN GPS survey conducted in 1993 and adjusted onto the 1991.35 epoch adjustment, and a first order (1:100,000 or 10 ppm) GPS survey in 1989 and updated to the High Precision Geodetic Network (HPGN) adjustment 1991.35 epoch and published by the National Geodetic Survey (NGS) in 1993. The subcommittee decided to hold the B order stations to control this GPS survey and to accept the 1989 stations into the base network without remeasuring to all stations but only to a representative sampling to determine the relative fit between the surveys. This determination was based on the probable need for periodic resurveys of the base network due to the amount of crustal motion that takes place in the valley.

After the reconnaissance work was completed the network configuration was developed. The plan essentially called for 74 stations established with; existing control, new control established by a GPS survey and control set by traditional methods. (At the request of some of the members of the committee, Caltrans agreed to upgrade their project control outside the network area. This updated project control traverse would be adjusted to ties to the GPS survey and would make 11 third order stations available as a supplement to the base network.)

The final network essentially remained true to this plan and is composed of a total of 74 stations of the following:

- 35 stations observed in a first order GPS survey;
- 30 existing first order 1989 GPS stations;
- 2 second order stations with recompleted coordinates through conventional; ties to this GPS survey;
- 7 eccentric marks (some replaced lost marks, some were existing marks suitable for GPS).

Observations were also made on 8 vertical control marks (NAVD88), 4 of which were held in the final 3-D adjustment.

The results of this survey were processed in December of 1994. As of this writing the ROS is in final stages of completion and the Control Station Recovery Cards and coordinate values are on file with the County Surveyor. The relative accuracies of the stations included in the GPS survey were well within first order standards at plus or minus 10 mm. The existing first order stations now show a relative accuracy of plus or minus 10 mm to 30 mm which is understandable as this is a known area of crustal movement. Mixing the existing control with the new showed closures as great as 50 mm over 3.2 km (1:64,374 or 15.5 PPM). Subsidence and crustal motion is prevalent in this area therefore the network will need to be resurveyed periodically as the ground moves a significant amount and deteriorates the integrity of the established coordinate values.

GPS Survey

In October, after 6 months of preliminary work, the GPS survey finally got underway. Three days of two hour GPS observation sessions, three per day, were initially completed on days of year 291, 292 and 293 (October 18, 19, 20). After preliminary baseline processing another two hour session was observed on day 307 using four receivers to fill in a gap in the baseline network.

A total of eight Trimble Navigation Ltd. 4000SSE Dual frequency GPS receivers with L1/L2 geodetic antennas were used during the three-day period. Of these eight, four receivers were borrowed from Caltrans Geometronics, Sacramento and were equipped with P code on L1 and L2 frequencies. The remaining four were from Caltrans District 11, San Diego with P code installed on L2 only. Eight observers, two each from the County of Imperial Survey Department, Imperial Irrigation District, TESCO, and Lyon Engineering operated the GPS receivers.

Traditional Survey Methods

A Caltrans second order traverse was tied to this GPS survey and two stations were recomputed onto this network adjustment from the traverse data.

Seven Eccentric stations were established for stations that were either destroyed or found to be unsuitable for GPS. Four stations were destroyed and either a Reference Mark or an accessory to the monument was selected as its replacement and computed onto this adjustment from record measurements. Three new eccentric marks were set and established using standard procedures for establishing eccentric marks as documented by the NGS.

Post Survey Data Processing

A total of 258 GPS vector baselines were processed using Trimble Navigation Ltd. GPSurvey single baseline processing software version 1.20. The final network adjustment used a total of 76 baselines, the rest were disabled as trivial baselines.

All least squares adjustments were computed with Geolab 2 version 2.4d for windows. One station with values on NAD83 1991.35 HPGN and NAVD88 were held fixed. The root-mean-square (RMS) of the residuals was 2.4 mm with a maximum of 9 mm. Internally the average station confidence region (error ellipse) was 9 mm horizontal and 15 mm vertical. The average relative station confidence region was 6 mm horizontal and 12 mm vertical and an average 1.4 PPM with a maximum 7.62 PPM due to a short line. This meets expectations for first order GPS control surveys.

All B order stations were within allowable accuracies and were suitable to hold in the final 3-D adjustment. Nine B order horizontal stations on NAD83 1991.35 HPGN and four vertical stations on NAVD88 were constrained to, and the NGS "Geoid 93" geoid height model was used in this adjustment. The average relative station confidence region was 5 mm horizontal and 10 mm vertical and an average 1.2 PPM with a maximum 7.33 PPM over an .814 km distance. The improvement in the computed confidence regions from the minimally constrained adjustment is due to closer distances between constraints, less divergence. Comparisons made from ties to published stations showed differences as great as 120 mm on second order stations, throwing out one first order station as it was apparent that it had been subjected to local movement. These comparisons were at the outside limits of the expected differences for first order control work.

Crustal Motion Modeling

Imperial County is located in an unstable area with respect to both regional crustal movement and local fault creep. Therefore any secular movement was modeled using the Horizontal Time Dependent Positioning Program (HTDPP) version 1.6 distributed by the NGS. The model estimates movement across the San Andreas Fault relative to the continental plate.

Concern over the relative difference encountered when comparing existing stations to this GPS survey prompted an attempt to model the secular motions of this region and thereby minimize those differences. The procedure for doing this was to update the B order stations coordinate values adjusted to 1991.35 epoch to today, 1994.8, then use those updated values to constrain the adjustment of the baseline vectors measured today in this survey. The coordinate values for the entire survey were then computed back on to the 1991.35 epoch for the final results.

Final 3-D Constrained Least Squares Adjustment

Due to minimal relative movement and the distance between B order control stations, the statistics for the final 3-D adjustment were essentially the same as those of the preliminary constrained 3-D adjustment. The variance factor showed a slight improvement which indicates that the updated B order control values better represent today's measurements. Coordinate values at the innermost stations changed to a magnitude of 35 mm from the preliminary adjusted values. Comparisons to the existing stations showed differences as great as 50 mm for first order and over 100 mm for second order therefore it was determined to upgrade the second order stations and revise the existing first order stations to first order per this survey.

Conclusion

The HTDPP model is too coarse to improve the positions at this range in this area. Three independent GPS sessions were observed in the project on day 345 to acquire direct connections between new and existing stations in the areas with the most change. They showed up to a 50 mm difference from record to measured and usually fell in the 20 mm to 30 mm range as expected. In conclusion, first order accuracies were attained within the GPS survey and one can expect plus or minus 10 mm accuracy between these stations and as much as 50 mm when connecting this survey with an existing station. Existing stations should now be accurate within 20 mm relative to each other due to secular crustal movement. This indicates a need to periodically remeasure the network as relationship between stations changes significantly. In retrospect, the network may have been made to fit better locally by making more ties to the existing monumentation and constraining to their published values as well as to the B order marks, or by obtaining the original vector data for the 1989 survey, rectifying it to today's vectors using the HTDP model and adjusting both surveys simultaneously. This was not deemed necessary due to the nature of the area.

Cooperation from the surveying community of Imperial County and the various public agencies carried this project

through to its successful completion. It was hoped that by bringing together these knowledgeable individuals and groups a long-term consortium would be formed. Such a cooperative approach is thought to be the best way to deal with the next step, that of helping Imperial County to become a part of the GIS age. It is hoped that this type of cooperation will continue toward that goal.

Acknowledgments

The efforts of the following individuals are recognized as being instrumental to the success of this project and they are to be commended for their interest and cooperation:

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Christy C. Hunter, RG

Here's Some Important Information About CLSA

The goal of the California Land Surveyors Association is to promote and enhance the profession of surveying, to promote the common good and welfare of its members, to promote and maintain the highest possible standards of professional ethics and practice, and to elevate the public's understanding of our profession. CLSA represents all land surveyors, whether they are employees or proprietors, whether in the public or the private sector.

Representation

■ LOCAL: Your local chapter represents you in local issues. Through your chapter representative to the State Board of Directors, the individual member can direct the course CLSA will take. ■ STATE: The surveyor is represented at the state level through an active legislative program, legislative advocate, and liaison with the State Board of Registration. ■ REGIONAL: CLSA is an active member of the Western Federation of Professional Land Surveyors. This federation is composed of associations throughout the western United States and addresses regional issues. ■ NATIONAL: Through institutional affiliation with the National Society of Professional Surveyors and the American Congress on Surveying and Mapping, CLSA is represented at the national level.

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CLSA presents annual conferences which provide technical and business programs, as well as exhibits of the latest in surveying and computing technology. Seminars and workshops are presented to assist in continuing education. CLSA publishes the *California Surveyor* magazine and the *CLSA News* to keep the membership abreast of changing legislation, legal opinions, and other items which affect our profession.

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Product News

Trimble Offers Affordable GPS Surveying System in 3.7 lb Package

Sunnyvale, CA — August 10, 1995 — Trimble (NASDAQ:TRMB) announced its new 4600LS Surveyor system. Trimble's 4600LS is an affordable, easy-to-use, 3.7 lb GPS system capable of delivering centimeter accuracy and high productivity for diverse surveying and mapping applications. The 4600LS's innovative design allows first time GPS survey users the ability to take full advantage of a complete system that costs less than a typical total station. The 4600LS will be available in October 1995.

For more information contact: Lea Ann McNabb (408) 481-7808.

Ashtech Releases Real-Time GPS Software

Powerful Application Specific Software Provides Centimeter Level Accuracy

Sunnyvale, CA — August 21, 1995 — Ashtech, Inc., the leader in precision solutions for global positioning, introduced today the RTZ "Real-Time Z-Tracking," GPS technology providing its user with centimeter-level accuracy in Real-Time. Intended for GPS applications requiring high precision measurements, the system includes application-specified software packages for seismic, mine and topographic surveying.

Ashtech's RTS system comes in two versions to satisfy different accuracy requirements. The Z-12 Receiver is a survey-grade unit utilizing Ashtech's patented Z-Tracking technology to deliver centimeter-level accuracy. The 22-ounce Super C/A is a single-frequency receiver providing decimeter-level accuracy using the C/A code.

For more information contact Sally Kenvin Ashtech, Inc. 408/524-1460.

Nikon Introduces New Compact, Powerful Electronic Digital Theodolite

Melville, NY — July 10 — Surveyors can now zero in on targets faster and easier with the new Nikon NE-20H Electronic Theodolite that offers an accessible dual-line display, extended operating time with a build in battery pack, a revolutionary focusing system, top optical performance and extraordinary ease of use.

Nikon's NE-20H theodolite offers angle measurements accuracy of 7" with an angle reading of 10"/20", 0.05/0. 10MIL selectable with an MIL 6400 reading available as an additional angle unit.

For more information contact: Nikon Inc. Instrument Group, 1300 Walt Whitman Road, Melville, NY 11747; phone (800) 231-3577.

Nikon AL-15 Electronic Level is Easy to Use, Improves Productivity and Enhances Accuracy

Melville, NY — July 14 — Nikon has introduced a new power-packed, lightweight laser level. The AL-15 allows a user with any hand-held or fixed receiver to produce top-quality work quickly and inexpensively after only a few minutes of training. The new level is continuously self-leveling, for easy use and enhanced accuracy.

For more information contact: Nikon Inc. Instrument Group, 1300 Walt Whitman Road, Melville, NY 11747; phone (800) 231-3577.

Geotronics Provides First Customer Training Program in Surveying Equipment Industry

Geotronics of North America, Inc. of Itasca, Illinois, a leading international manufacturer of surveying instruments for the surveying and construction industry, has become the first surveying equipment manufacturer to offer an on-campus training program designed to familiarize its customers with its products. The Geotronics Training Institute, with locations in Denver, Colorado and the Chicago suburb of Itasca, Illinois, maximizes customer investments by offering extensive training in the use of the company's industry-leading Geodimeter line of total stations and Geotracer GPS Systems. The higher leaning program will further Geotronics' philosophy of building partnerships for surveying excellence with its customers.

For more information contact Paul Hahn (708)285-1400.

AGA Introduces MDL Version of CAiCE

AGA Computer Services, Inc., has begun Beta testing of an MDL version of CAiCE Release 5.0 that operates completely inside of the MicroStation environment.

CAiCE-MDL 5.0 contains all of the commands and viewing, windowing and snapping capabilities found in the Windows version. In the MDL version, however, CAiCE graphics can be directly accessed, viewed, edited and printed form MicroStation without running a conversion program. The user can also easily toggle from the CAiCE menus to the MicroStation menus without exiting from one system and starting another.

For more information contact Dr. Michael Morris, AGA Computer Services, Inc. (813) 620-1444.

Ashtech Announces Open-Pit Mine Surveying System

One Man Survey System Reduces Workload

Sunnyvale, CA — June 15, 1995 — Ashtech, Inc., the leader in precision solutions for global positioning technology, has released the Mine Surveyor, a real-time GPS survey system designed for surveyors working in open pit mines. Capable of centimeter-level accuracy, the Mine surveyor can easily be operated by one person while showing its user actual achieved position accuracy's when in the field.

The system consists of two Ashtech GPS receivers joined with a data link , for differential corrections. The Mine Surveyor uses either the Ashtech Z-12 RTZ GPS receiver for centimeter accuracy or the Ashtech Super C/A GPS receiver for submeter accuracy. Both systems use the hand held MS DOS based Husky FS/2 data controller for field operations and are compatible with Ashtech's PRISM post processing software.

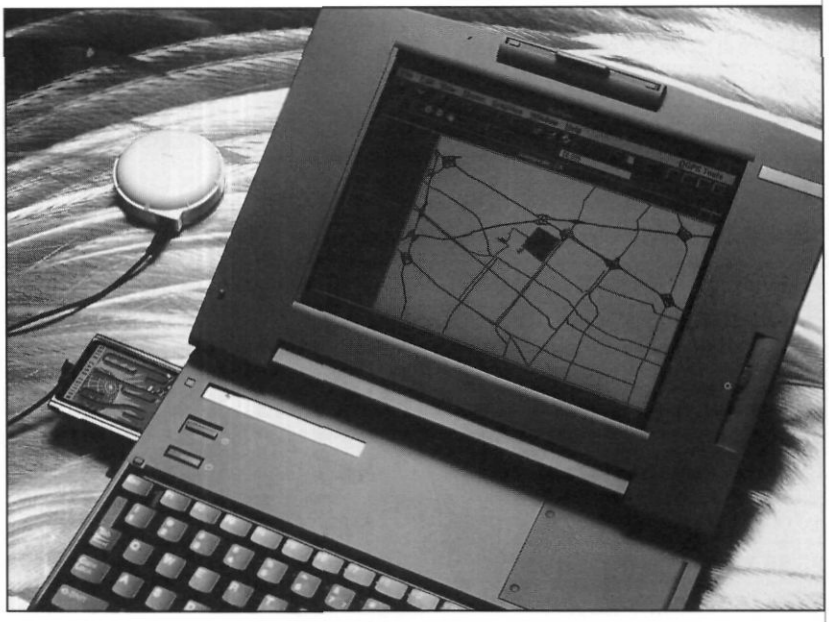
For more information contact: Sally Kenvin, Ashtech, Inc. 408/524-1460.

Trimble Announces Direct GPS for ArcView A GPS/GIS Data Capture System for ESRI's ArcView Software

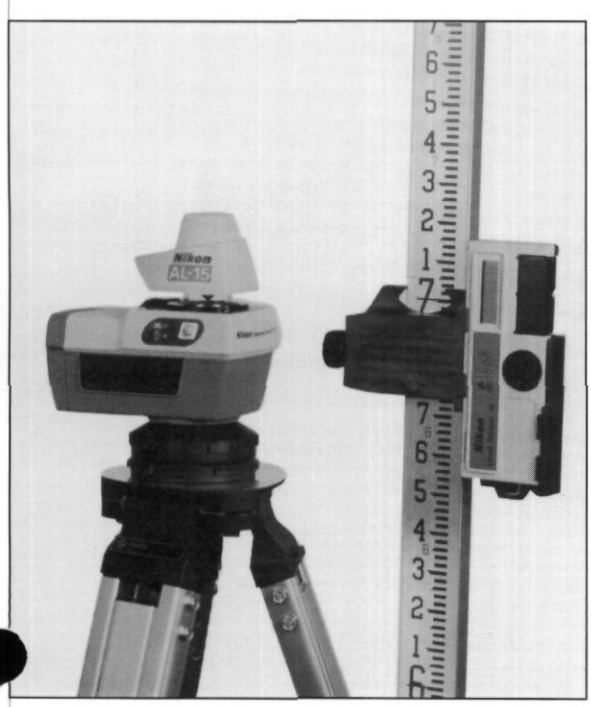
Palm Springs, CA — May 22 —Trimble Navigation Ltd. (NASDAQ:TRMB) announced today the introduction of the DIRECT GPS for ARC View product, a sophisticated GPS/GIS data collection system integrated directly into ArcView Desktop GIS Software Version 2.0 for Microsoft Windows from ESRI. The Direct GPS product is suitable for a wide variety of applications including urban asset management, city planning environmental protection, national resource exploration and development, and wildlife conservation.

For more information contact: Maura Huntz (408) 481-7925 or Roger Betz (408) 481-6915. ⊕

Nikon's new NE-20H Electronic Theodolite has a 10"/20" direct digital reading with an angle accuracy of DIN 7".



The Direct GPSTM for ArcViewTM system combines a Trimble(R) GPS receiver and software for use with ArcView software from ESRI(R) to create a powerful, yet easy-to-use GIS data collection system.



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1995 Refill Package including PLS Roster, PE & PLS Act with Board Rules, and Subdivision Map Act	$ 18.00	$ 28.00		
1995 Refill Package (as above) plus disk	$ 28.00	$ 44.00		
PE Act & PLS Act with Board Rules – 1995 publication (5½" x 8½")	$ 6.00	$ 12.00		
Subdivision Map Act – 1995 publication	$ 6.00	$ 12.00		
California Coordinate Projection Tables – NAD '83 by Ira H. Alexander, C.E., P.L.S., and Robert J. Alexander, P.E.	$ 6.00	$ 12.00		
Right of Entry Cards *(minimum order is two)*	2 / $ 3.00	2 / $ 6.00		
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Land Surveying Brochures *(minimum order is 50)*	$ 15.00 (50)	$ 30.00 (50)		
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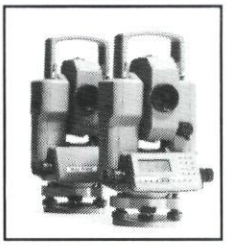
TOTAL STATIONS		ANGLE #PRISMS RANGE			
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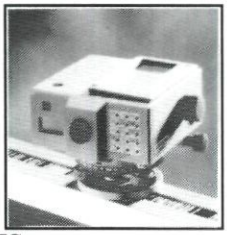
LEVELING EQUIPMENT					
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