Volume 9:03

ACRA EDITION

American Cultural Resources Association

June 2003

The Historic Stoneleigh Hotel is the site of the 2003 ACRA Annual Conference, hosted by GeoMarine, Inc. (see Page 3).

In This Issue...

ACRA's Mission

Our mission is to promote the professional, ethical and business practices of the cultural resources industry, including all of its affiliated disciplines, for the benefit of the resources, the public, and the members of the association by:

- promoting and supporting the business needs of cultural resources practitioners ;
- promoting professionalism in the cultural resources industry;
- promoting and providing educational and training opportunities for the cultural resources industry; and
- promoting public awareness of cultural resources and its diverse fields.

A basic tenet of ACRA's philosophy is the cost efficiency of private-sector firms in meeting the need for expertise in cultural resource management. ACRA is strongly opposed to unfair competition from tax-supported contracting programs. We believe that a greater benefit to society, and to the resources, derives from the existence of a healthy community of tax-paying, job-generating, private sector CRM businesses.

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MEMBERSONLY

In accordance with a board directive, all newsletter articles that contain information related to ACRA business or proprietary information, such as our "Legislative Updates," will be listed in a separate document that resides on the ACRA website in the MembersOnly area. If the newsletter is opened while connected to the Internet the [click here] links will automatically take the reader to these articles.

MESSAGE FROM THE EXECUTIVE DIRECTOR

ACRA Executive Director Tom Wheaton will be reporting in the next issue on the World Archaeology Congress that convenes in Washington, D.C., this month.

LEGISLATIVE UPDATE

[CLICK HERE] Nellie Longsworth keeps the ACRA membership up to date on the latest from Washington, D.C. The latest topics include the following.

- The Administration's TEA-21 Reauthorization Bill Goes to Congress
- Advisory Council Adds to Preservation Expert Members
- Historic Preservation Caucus Created in House

ABOUT THE COVER

Stoneleigh Hotel

A member of Historic Hotels of America, The Stoneleigh Hotel was built in 1923 for the then-staggering sum of just over a million dollars. At the time it was built, The Stoneleigh was showcased as the tallest building in Dallas, as well as the tallest hotel west of the Mississippi River.

Frank J. Woerner designed the Stoneleigh in a combination of Art Deco and Federal styles. The hotel's rich history dates back to Colonel William Stewart of the Confederate Army. Secret passageways, trap doors, mysterious rooms and sliding mirrors are favorite attractions when touring the property. The hotel's unique features also include walls of intricately carved oak from London's Charthouse School, a rooftop neon sign (named a Historic Landmark in 1983), and extravagant mirrored wall pieces from Balmoral of Scotland.

The Stoneleigh has never closed its doors, and the sign atop the hotel has been glowing since 1938. Located in the uptown Turtle Creek neighborhood, the hotel is in the midst of several art galleries and museums as well as upscale shopping and restaurant cuisine.

Check out their web site at:
http://www.stoneleighhotel.com/index.html
For activities in Dallas check out : http://www.dallas.com/

Coming Attraction!

What: **Annual ACRA Convention**
Where: **Stoneleigh Hotel, Dallas, Texas**
When: **September 12-13**
Why: **Networking and Information Gathering**

Watch ACRA-L for More Information

Program Schedule

Thursday, September 11

8:30-12:00 **Board Meeting**

12:00-1:30 **Lunch**

1:30-4:30 **Board Meeting**

Friday, September 12

8:45 – 9:00 **Welcome**

9**:00 – 10:30** **Federal Outsourcing — What Does it Mean for You**?
Speaker TBD

Teaming with Big Brother — the Benefits of the Mentoring Program
SBA Representative

10:45 – 12:00 **Winning and Maintaining a Federal Contract**
Discussants TBD
Successful Federal Contractor
Federal Contracts Manager

Ownership Succession – How to Make it Work for You
Financial Consultant

12:00 – 1:30 **Luncheon**

1:30 – 3:30 **Sovereignty and the Consultation Process**
Discussants ACHP Representative
Native American Representatives
Dr. Joe Watkins

1**:30 – 3:30** **Archiving in the Digital Age**
Speakers: Smithsonian Personnel
Historic Architect
SHPO Representative

2:00 – 4:00 **Dallas Historical Tour**

9:00 – 5:00 **Small Business Exhibits**

7:00 – 9:00 **Reception**

Saturday, September 13

9:00 – 11:30 **Plenary Session – Historic Preservation and the CRM Professional in the 21st Century**
Speakers: ACHP Representative
National Trust
NCSHPO

11:45 - 1:15 **Awards Luncheon**

1:30 – 3:30 **Curation in the 21st Century**
Speakers: Michael Trimble – Director of Center for Excellence in Collections and Curation Management**, USACE**, St Louis District
Museum Representative
DOD Representative

1:30 – 3:30 **The Training of Professionals for the Future: the Role of Graduate Programs, Internships, and Continuing Education**
Discussants: Academic Representative from University with CRM Program
University Internship Program Rep
Contractor Rep with Intern Experience
AIA Representative

3:30 – 5:00 **Member Forum**

5:00 – 6:00 **Board Meeting**

6:00 – 10:30 **Texas Barbecue**

ON THE MOVE

Hardlines Design Company
Mr. Patrick Bennett

Hardlines Design Company announces the addition of Mr. Patrick Bennett to their full-time staff. Mr. Bennett is a prehistoric and historic archaeologist with over 20 years experience in the Cultural Resources Management field in academic, non-profit, and private sectors. He has a wide range of experience, having worked through-out the Midwest and eastern United States. Mr. Bennett has considerable expertise in both prehistoric and historic artifact analysis. His areas of interest include Ft. Ancient and Middle Woodland period research.

Hardlines Design Company is based in Columbus, Ohio, with an additional office in Bethesda, Maryland. Offered services include cultural resources management; architectural and interior design; urban planning, landscape design; remote sensing; and faunal analysis.

Contact hlines@hardlinesdesign.com for additional information on Mr. Bennett and Hardlines Design Company.

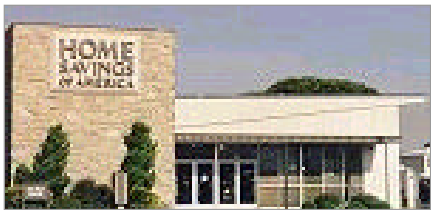
Check the ACRA website for upcoming conference details at: http://www.acra-crm.org/conference.html

CRM IS GOING GOOGIE: ASSESSING 1950S ARCHITECTURE

By Susan E. Lassell
Hicks & Company, Austin, Texas

Presented at the 2002 ACRA Conference, Savannah, GA

Just about every architectural movement is villified by architectural critics about 20 years after the style has fallen out of fashion. Modern architecture is no exception. Additionally, the general public tends to think of the built environment from the post-war years as a case of The Good, The Bad, and The Ugly. The economic prosperity and associated consumerism that characterized the period was good for America's economy and sense of well-being. But there was a "bad" side. Seen in hindsight, this period brought decimation to inner cities through urban renewal, mass public housing programs that failed both as social programs and as architectural statements, and the proliferation of highways and associated traffic congestion and environmental pollution. Aesthetically, the built environment from the period is alternately considered too austere by today's standards, or just plain tacky (consider the Polynesian-inspired Tiki-house restaurants or the Jetson's inspired bowling alleys).



Home Savings Bank, ca. 1955 - an example of the "austere" look of commercial Modern.

But of course, as professionals trained to see the cultural meaning in such trends, we can separate our aesthetic preferences from our professional analysis, right? And we can easily convey the importance of undertaking that analysis to our clients, right? Well, if any of you have tried explaining why you need extra budget to survey a strip mall or suburban tract homes, you know that many of our clients share the less-than-complimentary perception of post-WWII built environments. Our clients can't believe that there's any need to survey these properties because: "That can't be historic, I can remember when it was built!" or "But that stuff is all so ugly, and besides its just falling apart!" or "Hey, these things are everywhere, are you saying that we need to survey every tract home and gas station in town?" and of course, "You need how much budget to deal with this?".

When our clients protest the idea of treating these properties as historic resources, they're really reflecting a general and widely held attitude. Those attitudes are starting to get challenged, but we're still a long way away from embracing 1950s architecture the way we now embrace Art Deco or Craftsman buildings. Our challenge, as part of the avante-garde in evaluating 1950s built environment, is to determine the relative importance of different property types and stylistic expressions, to expand our understanding of Criterion C in light of our nascient knowledge about the social and architectural trends of the period, and to contemplate what it means for a property to be able to convey its significance when we assess integrity in light of the fact that physical condition may play a small role in conveying the significance of 1950s architecture.

This paper was presented in a one-hour time slot at the ACRA 2002 conference. This allowed for an extensive and highly illustrated discussion of the historic context and major themes of the Post WWII period (suburbanization, car culture, leisure and entertainment, consumerism, better living through technology, the Cold War, birth of High Tech) and the architectural movements and associated property types that manifested these themes (International Style, Modernism, Googie, and a host of sub-styles such as Tiki, Ranch, Brutalism, etc.). However, the focus of this article is more nuts and bolts . . . what criteria can we use to evaluate significance, and how can CRM professionals adequately scope and budget for addressing these projects in the compliance context. For a quick overview of the

1950s Air Raid Warning System - infrastructure that represents the Cold War at the local level.

..continued on Page 8

CRM Goes Googie..

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trends and themes that characterize this period, the author recommends a thorough tour of the Recent Past Preservation Network website (http://www.recentpast.org), including the links to more specialized websites that are propogated by scholars and fans of the 1950s period.

When assessing the significance of a property in the CRM context, we are required to apply the National Register of Historic Places (NRHP) eligibility criteria. Within that framework, we are asked to identify the historic context for a property, and develop an evaluation framework that includes specific significance criteria for the themes and property types that represent the significant aspects of the context. In short, the criteria for determining significance are directly related to how a property physically manifests important aspects of that context. For properties dating from the 1930s and earlier, this process has become so intuitive for most of us that we no longer break it down that way. We just "know" which property types are considered important, and can write about that importance without conducting much additional research into the historical trends of the period. The 1950s, however, are new territory for the majority of us. The comparative studies of social, economic, and political trends of the period are still being conducted, so the body of work available to us is limited to those topics that have caught someone's fancy in academia or that are of particular concern to specific agencies (such as the Interstate Highway system, for which FHWA is currently developing evaluation guidelines).

One option for streamlining our efforts to establish evaluation criteria, once again, is to turn to the internet and the groups of preservationists who are leading the advocacy efforts on behalf of the Modern Movement. One such group is called Documentation and Conservation of the Modern Movement, or DOCOMOMO. DOCOMOMO maintains a register of properties that reflect the Modern Movement, along with criteria for listing a property in that register. These criteria can easily be adapted for our use in establishing context-specific significance criteria. Bear in mind that these criteria can be applied to any element of the built environment, from a corporate campus or housing development to individual buildings or elements of infrastructure to individual signs or landscaping features. The DOCOMOMO criteria focus on technological, social, artistic/aesthetic, or cannonic merit or referential value, as described below:

1. Technological Merit
   a. Employ innovative modern technology to solve structural, programmatic, or aesthetic challenges?
2. Social Merit
   a. Reflect changing social patterns?
   b. Form or function intended to improve living conditions, working conditions, or human behaviors?
3. Artistic or Aesthetic Merit
   a. Exhibit skill at composition, handling of proportion, scale and material and detail?
   b. As measured within context of what the Modernists considered "aesthetic".
4. Cannonic Merit
   a. Is the work and/or the architect famous or influential? Is it an exemplary work?
5. Referential Value
   a. Did the work exert an influence on subsequent designers as a result of one or more of its attributes?
   b. Considered at local and regional scale?

When scoping for and conducting surveys and evaluation of 1950s properties, it is important to account for the fact that you won't be able to rely on boilerplate materials or direct precedents. However, we also can't treat every project as an opportunity to cater to our inner-academic and

Woddles Drive-In - an icon of the 1950s that represents car culture, leisure time, and optimism of the period.

write a thesis on the social meaning of the drive-in burger joint (besides, that one's already been done).

The best course of action is to assume that the project will require a greater level of effort than "normal" projects, then to identify methods for focusing in on the tasks necessary to establish a sound evaluation context (theme, property types, significance criteria), and conduct sufficient (not exhaustive!) research on the individual properties in order

to evaluate them within that context. The remainder of this article will share some observations on scoping and budgeting for these efforts. These observations were gained in the course of several years' CRM consulting during which a number of 1950s-era properties "popped up" on projects. These included rocket-engine test stands, an urban Greyhound Bus station, post-WWII National Guard armories, a Richard Neutra chapel, sections of Interstate Highway, and various office, commercial, and residential buildings.

The first observation is on the need to get up to speed on this topic. It's very likely that you've dealt with a 1940s or 1950s property or two in your day, and have begun to contemplate the issues discussed above. However, even if you have, it's also quite likely that you were evaluating them for their "exceptional importance" in order to make an argument under Criteria Consideration G (for properties that are less than 50 years of age). We're still very much in that grey area where on one property you may need to apply Criterion Consideration G, and right next door the bar will be considerably lower and you'll only need apply the NRHP criteria. In anticipation of this predicament, pull down your copy of NRHP Bulletin #22 and find a place for it right next to your computer. You'll be referring to it often. In there, you'll be reminded that your charge is to identify whether the property is significant first, and then consider whether that significance is exceptionally important. Because these properties are or are close to being 50 years old, reviewers are asking that we evaluate their significance without the Criterion Consideration. Bulletin #22 is a great guidebook while navigating this grey area.

Another invaluable resource is the internet. The comparative studies of 1950s design trends and socio-political movements are still being published, and those that have been published tend to focus on narrow aspects of the period. Several preservation organizations have formed to bring together available information, and make it useful for preservation purposes such as survey and evaluation. The Recent Past Preservation Network (http://www.recentpast.org/), DOCOMOMO (http://www.docomomo-us.org/) and the LA Conservancy's Modern Committee (http://www.modcom.org/) provide excellent information about property types, architectural movements, social history trends as well as serving as portals to the more single-interest sites devoted to certain movements, architects, or media.

When preparing scopes for projects that are known to have 1950s resources, assume a higher level of effort in research to establish the context, as well as a higher level of effort to research the history of the property and to describe the property. The work we do is creating the comparative body of knowledge, and you'll need to seek out other CRM projects that have addressed a similar context. Even for known contexts, local and regional themes need to be developed. For example, when evaluating a 1953 Greyhound Bus station that was designed by Skidmore, Owings, and Merrill (SOM), we located reams of material for evaluating 1920s and 1930s Greyhound stations. We also found plentiful resources on the works of the New York and Chicago offices of SOM.

The Lever House in Manhatten is perhaps SOM's most recognizable work, shown here on the cover of the September/October 2002 issue of the National Trust's magazine.

But there was scant secondary material written about the history of Greyhound or of public transportation in the 1950s, or about the San Francisco office of SOM (who turned out to be the actual designers of the station). Even the survey of the bus station took an extra level of effort, as the crew encountered construction materials and techniques that

BOOK REVIEW

THINKING ABOUT SIGNIFICANCE

Reviewed By Anne B. Lee

Book Review Essay

Thinking About Significance: Papers and Proceedings, Florida Archaeological Council, Inc., Professional Development Workshop, St. Augustine, Florida. Robert J. Austin, Kathleen S. Hoffman, and George R. Ballo, editors. 2002. Special Publication Series No. 1, Florida Archaeological Council, Inc., Riverview, FL. 242 pages. $15 (cloth), ISBN 0-9720677-0-1.

Reviewed by Anne B. Lee, M.A., RPA, Hardlines Design Company, Columbus, OH.

Professionals in the Cultural Resource Management (CRM) field, and in government agencies that review the results of CRM investigations, are confronted with the criteria used to determine eligibility to the National Register of Historic Places in some way each day. Despite the availability of publications such as the Advisory Council for Historic Preservation's guide to applying the National Register Criteria (ACHP 1998) and Hardesty and Little's (2000) guide to assessing site significance, many, if not most, professionals struggle with the often subjective implementation of the standards. Arriving at an assessment of a resource's "significance" that is satisfactory to all parties frequently proves to be a trying endeavor. Enter *Thinking About Significance*, a collection of papers and discussions on the topic, produced by the Florida Archaeological Council (FAC). *Thinking About Significance* provides many different, and enlightening, perspectives on the evaluation of significance. While much of the volume's content is specific to the question of significance in Florida, many of the issues raised are pertinent to consultants, reviewers, and interested parties across the nation.

The volume being reviewed is the result of a one-day workshop sponsored by the Florida Archaeological Council in May of 2001. The FAC created an inclusive environment for the discussion of assessing site significance by inviting participants from academia, CRM, federal and state agencies, and the Native American community to write papers on topics related to the concept of significance and/or how it is applied. In certain cases participants were asked to address very specific issues while in other cases participants were given the freedom to explore the topic from their own perspective, guided by a list of questions for consideration.

The workshop and the resulting publication were both organized according to three perspectives: Agency Issues, Native American Issues, and Archaeological Issues. Prior to the workshop a draft version of each author's paper was distributed to all participants for review and comment. During the workshop, authors in a particular section presented a summary of their papers, after which there was a panel discussion. Audience participation was encouraged. After, the workshop authors were asked to revise their papers for publication in light of the comments they had received and points brought out in the discussion.

Thinking About Significance follows the workshop organization by presenting the papers from a particular section and then including a partial transcript of the discussion that took place. After an introduction to the collection by two of the editors (Austin and Hoffman), Ken Hardin, of Janus Research, presents an historical overview of the concept of significance in Florida archaeology. The agency perspective is represented by

papers from Seibert on archaeological significance and the National Register, from Yates on the role Florida's Historical Contexts play in evaluating significance, from Miller on the State Archaeologist's perspective, and from Ballo on the Florida Department of Transportation perspective. The Native American perspective on resource significance is presented by Dayhoff and Terry, representing the Miccosukee, and by Cypress, Underwood, and Doonkeen, representing the Seminole. Three individuals involved in the CRM industry (Penton, Hoffman, and Austin) and one individual from the academic realm (Weisman) provide the archaeological perspective. This volume is completed with a concluding paper by all three editors and an Appendix summarizing relevant federal and Florida state legislation.

This volume is coherently organized, easy to read, and accessible to the public. The issues considered in these papers are thought provoking. Inclusion of partial discussion transcripts adds a dynamic dimension to the topic. The diversity of opinions and experiences found in the collection should broaden the frame of reference of all who read these papers. Exposure to a wider variety of voices can increase the likelihood of a productive dialogue when parties find themselves in disagreement over the rendering of a particular resource's significance. An added bonus is the affordability of the book. At only $15, it's hard to go wrong by adding this volume to your library.

References Cited

Advisory Council for Historic Preservation (ACHP)
1998 *How to Apply the National Register Criteria for Evaluation.* Government Printing Office, Washington D.C.

Hardesty, D. L, and B. J. Little
2000 *Assessing Site Significance: A Guide for Archaeologists and Historians*. Altimira Press, Walnut Creek, CA.

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were experimental at the time, unique approaches used by SOM on this project. In other words, there's no McAlester's Field Guide for the materials, systems, and forms of the Modern Movement. Each time you survey properties from this era, you'll be discovering your inner architect/engineer as you try to figure out what experimental approach was being used by the designer, and whether that approach has technological or referential merit, as characterized by the DOCOMOMO criteria.

Ultimately, a phased approach may work the best. In the scoping phase, answer as many of the basic questions as possible. Who designed it? When was it built? Does anyone in the community consider it an icon or landmark? Many times your client or the local planning department's preservation staff can provide answers to these questions, because the records are more recent and may still be readily available. Whether this is done during scoping or as an initial phase of work, the goal is to identify which themes may be associated with the property so that you know where to focus your efforts in the second phase. The second phase would involve establishing the evaluation context, and should be budgeted for approximately 50-100 percent more than you would normally budget for this task, for all of the reasons elaborated above. The third phase would involve the physical survey of the property, for which you'll want to allow an additional 15-25 percent above your normal level of effort. Expect to spend a bit more time in the field, visually scrutinizing the materials and systems, taking more photographs than usual to help you back in the office, and searching for words to use in describing forms and features that are new to you. For report preparation, you can expect the same 15-25 percent increase, both because you'll need more time to find the right terminology, and because you'll need to document your eligibility arguments. This is a new area of inquiry for all of us, including the reviewers. The consultation process will go more smoothly if the analysis is spelled out clearly and thoroughly. (Ah, and don't forget to budget for at least 25 percent more coordination with your client and agency reviewers . . . this one takes some explaining!)

And finally, I encourage ACRA and its members to make use of the ACRA forum. Whether you post a question to the list serves, or search for other members who have specialized knowledge about a particular modern theme, collaboration among CRM professionals will go along way toward ensuring the recognition and stewardship of a unique period in American history.

APPLIED TECHNOLOGIES

SO, JUST HOW ACCURATE IS MY GPS RECEIVER, ANYWAY?

By Christopher D. Dore

Many cultural resource professionals are now routinely using the global positioning system (GPS) in their day-to-day fieldwork. A nagging problem with GPS receivers, though, is to know how accurate they really are. This is important for a number of reasons, some theoretical and some pragmatic. At a theoretical level, as scientists, we must know the error of the measurement tools we use so that we can know when to attribute patterns in our data to human agents or to measurement error. Pragmatic concerns include knowing if a contractually specified accuracy requirement can be met and, for example, knowing the limitations of how the GPS can be used. An example of the latter is to know that if your GPS measurements are only accurate to two meters, the GPS isn't the right tool for point-positioning artifacts at your archaeological site. This column is focused on some of these pragmatic concerns.

Knowing the accuracy of your specific GPS receiver, in the region you work, under the conditions you work in, is difficult. Just because the manufacturer of your receiver says that it is capable of, for example, sub-meter accuracy doesn't mean that you are getting sub-meter accuracy when you are on-the-job. How do you demonstrate to yourself and to your client who may be requiring sub-meter accuracy, that you are really getting sub-meter accuracy? There is only one way to know how accurate your GPS receiver really is, and that way is to test it. In this column, I am going to show you how to test your GPS receiver and construct an accuracy curve.

First, a word about accuracy and its relationship to precision. Precision, in the GPS receiver context, is a measure of the dispersion of points. If you record GPS positions for any length of time you will get a cluster of position points. The distance across this cluster can be measured (e.g. 5 meters) as can the size of a circle (or sphere) that, for example, 95 percent of the points fall within. GPS receiver processing software routinely provides statistics on precision. Don't be fooled, though, into thinking these precision measures represent the accuracy of your position. Precision has little to do with accuracy. GPS points can be tightly clustered in space but still be far from their true position. The distance of a point from its true position is accuracy (or error) and this is what we really care about. We want to know how far we are from the true position regardless of how our position points cluster in space. GPS receiver processing software can't tell you this. To calculate accuracy, you must already know the true position of a known point. We will call this the test point.

The first step in testing a receiver is to find a test point. You must find a point for which you know the true geographic coordinates. The easiest way to do this in the United States is to get on the web and surf over to the National Geodetic Survey (NGS) (www.ngs.noaa.gov). The NGS is the government agency that is responsible for maintaining the geospatial control system for the country. They do this by establishing monuments at locations around the country—you know, those little brass disks you see from time-to-time. There are datums, horizontal control points, and bench marks, vertical control points. Unfortunately, all monuments are not created equally. Each monument is rated according to its accuracy and, for GPS testing, you must ensure that the error of the monument is smaller than the GPS error you are interested in measuring. For example, many of the bench marks used in the vertical control

system have had their horizontal position simply interpolated from a USGS 7.5 minute topographic map! Beware.

The NGS, though, has made it pretty easy to find a suitable monument from which to work. You can click on the "data sheet" link from their main page and then press the "DATASHEETS" button of the subsequent page. You will be presented with a number of search options. For this test, I used the "Radial Search" option to find the nearest suitable monument to my office, located at N375136, W1221748. To ensure that the monument was suitable for GPS work, I selected "GPS Sites Only". Three monuments were located within three miles of my office. I selected monument HT2935 because it would be easy for me to find (and allowed me to hang out for an hour at the Berkeley Marina!).

I took the GPS receiver to be tested to the monument, and placed the antenna on a tripod over the point. I set the receiver to record positions at one-second intervals. While this particular receiver was capable of receiving a correction beacon from the Coast Guard, I turned this feature off so that I could later compare corrected verses uncorrected data. I set the other receiver settings to values that would be typical for most users. For your test, select the parameter settings like you usually use them for a job. I then turned on the receiver and began collecting positions. For this test, I recorded positions for 45 minutes.

Since I wanted to compare differentially corrected data against uncorrected data, I copied the file and then differentially corrected one version using base station data from the Forest Services' Remote Sensing Laboratory in Sacramento, California: a baseline distance of 122 kilometers. Then, for both files, I extracted the first 30 seconds of data, the first 1 minute of data, the first 2 minutes of data, the first 5 minutes of data, the first 10 minutes of data, etc., up to the full 45 minutes. Using the Universal Transverse Mercator coordinate system (it is important to make sure you use a planer system), the mean northing and mean easting were calculated for each time interval. The mean positions were then subtracted from the published position on the data sheet to obtain the distance from the monument. I used the UTM 10 positions of 4,190,938.506mN, 560,123.954mE and the height above the ellipsoid of - 28.97 (Figure 1, Page 14). To then take the difference in northing and difference in easting to get an absolute distance from the published position, I just did a little trigonometry ($a^2 + b^2 = c^2$). Then I had a distance from the monument for each time interval for both uncorrected and corrected positions. These distances were plotted as a function of time (Figure 2, Page 15) to obtain an accuracy curve for this particular GPS receiver.

This graph is quite interesting. First, it shows that if differential correction is not done, a 30-second recording will result in an accuracy of approximately 2.5 meters horizontally and about 1.75 meters vertically. It takes about 10 minutes of recording for the horizontal position to fall into the sub-meter range and this improves to the 0.5-meter accuracy range only after 35 minutes. Vertical accuracy, always lower than horizontal accuracy due to GPS trigonometry, reaches the sub-meter mark at about 35 minutes and converges with the horizontal accuracy of 0.5 meters after 45 minutes.

Second, the graph shows that with differential correction a horizontal accuracy of about 30 centimeters can be obtained. Interestingly, this accuracy does not improve with time. The vertical position of the corrected data actually starts out with greater error than the uncorrected data and then drops, and stays, at 1 meter after 30 minutes—essentially tracking the uncorrected data after the 15 minute mark. Why does the uncorrected data give a more accurate position than the corrected data after 30 minutes? Frankly, I don't know. If you have ideas, please send them to me.

Calculating accuracy curves for your GPS

The NGS Data Sheet

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 6.42
1        National Geodetic Survey,   Retrieval Date = MAY  6, 2001
 HT2935 ***********************************************************************
 HT2935  TIDAL BM     -  This is a Tidal Bench Mark.
 HT2935  DESIGNATION -  YACHT
 HT2935  PID          -  HT2935
 HT2935  STATE/COUNTY-  CA/ALAMEDA
 HT2935  USGS QUAD    -  OAKLAND WEST (1993)
 HT2935
 HT2935                          *CURRENT SURVEY CONTROL
 HT2935
 HT2935* NAD 83(1992)-  37 51 50.16181(N)     122 18 59.26014(W)      ADJUSTED
 HT2935* NAVD 88      -          3.34   (meters)       11.0    (feet)  GPS OBS
 HT2935
 HT2935  EPOCH DATE   -        1997.30
 HT2935  X            -  -2,695,263.376 (meters)                      COMP
 HT2935  Y            -  -4,260,774.340 (meters)                      COMP
 HT2935  Z            -   3,893,514.076 (meters)                      COMP
 HT2935  LAPLACE CORR-           1.77  (seconds)                      DEFLEC99
 HT2935  ELLIP HEIGHT-          -28.97 (meters)                       GPS OBS
 HT2935  GEOID HEIGHT-          -32.25  (meters)                      GEOID99
 HT2935
 HT2935  HORZ ORDER   -  FIRST
 HT2935  ELLP ORDER   -  FOURTH    CLASS I
 HT2935
 HT2935.The horizontal coordinates were established by GPS observations
 HT2935.and adjusted by the National Geodetic Survey in July 1998.
 HT2935.The horizontal coordinates are valid at the epoch date displayed above.
 HT2935.The epoch date for horizontal control is a decimal equivalence
 HT2935.of Year/Month/Day.
 HT2935
 HT2935.The orthometric height was determined by GPS observations and a
 HT2935.high-resolution geoid model using precise GPS observation and
 HT2935.processing techniques.
 HT2935
 HT2935.This Tidal Bench Mark is designated as VM 8422
 HT2935.by the Center for Operational Oceanographic Products and Services.
 HT2935
 HT2935.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 HT2935
 HT2935.The Laplace correction was computed from DEFLEC99 derived deflections.
 HT2935
 HT2935.The ellipsoidal height was determined by GPS observations
 HT2935.and is referenced to NAD 83.
 HT2935
 HT2935.The geoid height was determined by GEOID99.
 HT2935
 HT2935;                      North         East      Units   Scale      Converg.
 HT2935;SPC CA 3      - 2,142,128.66  6,037,331.95    sFT  0.99993111 -1 06 43.5
 HT2935;SPC CA 3      -   652,922.121 1,840,182.460    MT  0.99993111 -1 06 43.5
 HT2935;UTM  10       - 4,190,938.506   560,123.954    MT  0.99964452 +0 25 10.4
 HT2935
 HT2935:                 Primary Azimuth Mark                     Grid Az
 HT2935:SPC CA 3      -  CAMPANILE UNIVERSITY OF CALIF            081 11 21.2
 HT2935:UTM  10       -  CAMPANILE UNIVERSITY OF CALIF            079 39 27.3
 HT2935
 HT2935|----------------------------------------------------------------------|
 HT2935| PID    Reference Object                    Distance      Geod. Az   |
 HT2935|                                                          ddmmss.s   |
 HT2935|        YACHT RM 1                         16.430 METERS 01418      |
```

Figure 1.

receivers is important and should be done annually or more frequently for important projects. It is the only way to know exactly how your receivers are performing. It also can save you a lot of money in labor. For example, armed with these data, you can tell your field workers exactly how long, and no longer, to occupy a point to get the accuracy you need. Likewise, you would know when you needed to spend the time doing differential correction, and when differential correction would be unnecessary. Finally, your accuracy curves may be the proof you need to convince your client you meet the accuracy requirements of a contract.

Do you have questions about this topic or need help calculating the accuracy of your equipment? Send email to Christopher Dore at cdore@sricrm.com.

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He can be reached at the email address above with comments, suggestions, and submittals for the Applied Technologies column, a periodic contribution to the ACRA Edition. *This article was first published in the* Grapevine Newsletter 11:3 *in May 2001.*

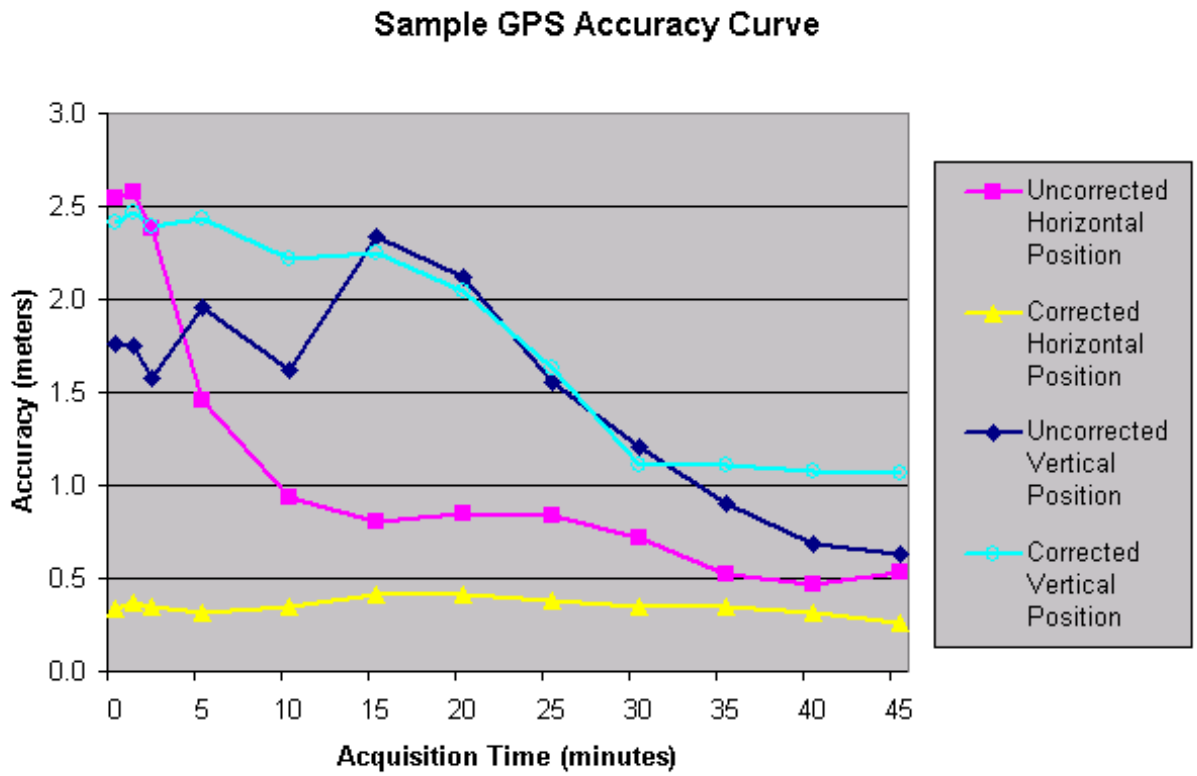

Figure 2.

ACRA EDITION

6150 East Ponce de Leon Ave., Stone Mountain, GA 30083

ACRA's Members-Only Listserver

ACRA now has an online discussion group just for members. "MembersOnly" is a listserver that operates much the same way as ACRA-L, with the exception that it is only available to ACRA members. Its purpose is to offer the board, members, and the executive director a venue to share the latest news from ACRA; promote dialogue between members on current issues; and enable members to post announcements or inquiries.

To subscribe to the list, a member must contact ACRA's Executive Director, Tom Wheaton. Once you have supplied Tom with your e-mail address, he will subscribe you to this list. Contact Tom at 770-498-5159 or e-mail: tomwheaton@newsouthassoc.com.

2003 ACRA EDITION SCHEDULE

DEADLINE	PRODUCTION
February 3	February 17
April 7	April 21
June 2	June 16
August 4	August 18
October 6	October 20
December 1	December 15

ACRA *Edition*

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This publication's purpose is to provide members with the latest information on the association's activities and to provide up-to-date information on federal and state legislative activities. All comments are welcome.

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