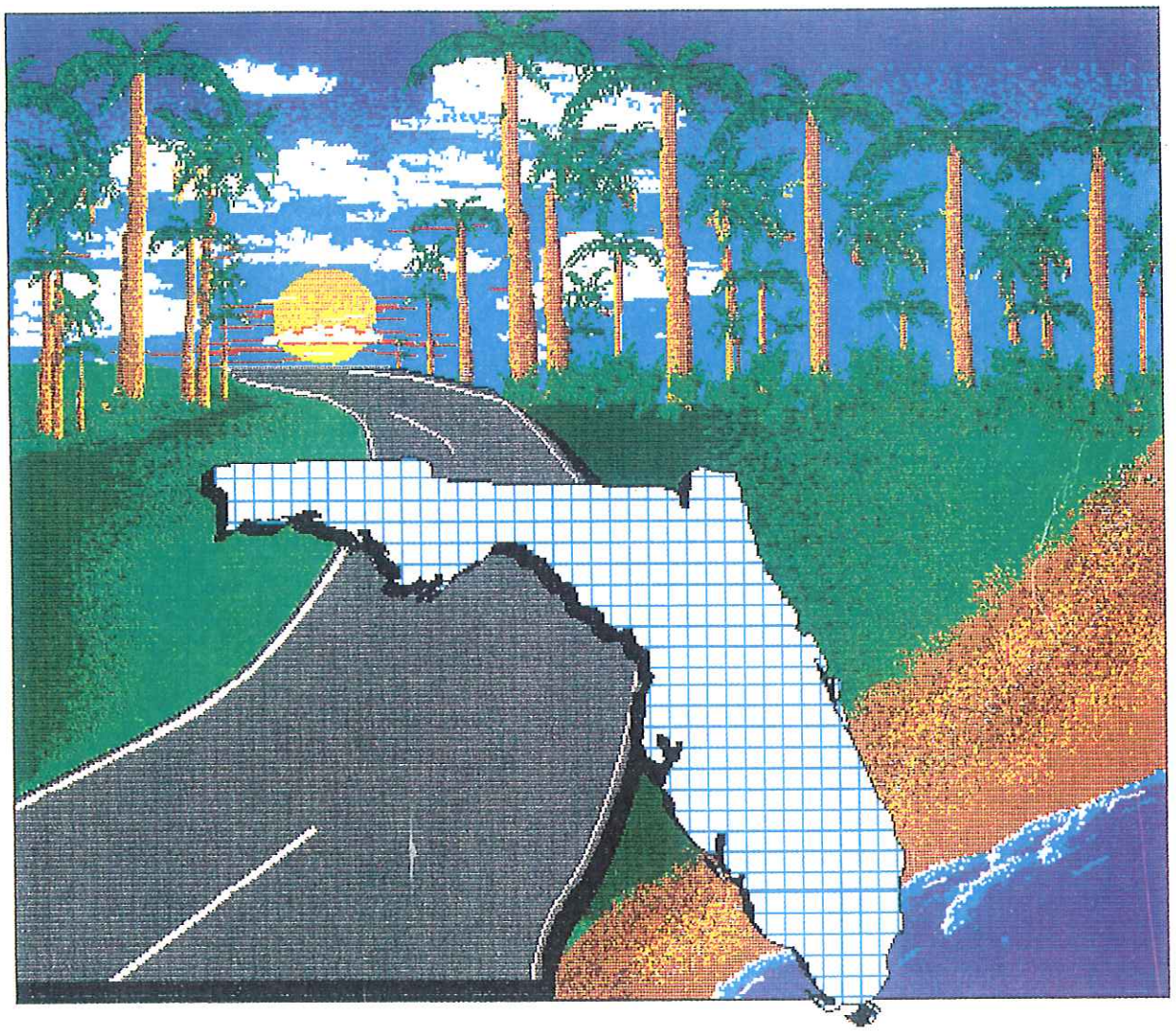
FACERS '90



An Annual Publication of The
Florida Association Of County Engineers
And Road Superintendents

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FACERS 1990 ANNUAL

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FLORIDA ASSOCIATION OF COUNTY ENGINEERS AND ROAD SUPERINTENDENTS

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FEATURES –

What is Facers?

Facers ... The Florida Association of County Engineers and Road Superintendents is a non-profit organization for the benefit of individuals involved in public service at the local level in the State of Florida. Membership in FACERS is open to all, requiring only that Active Members be full-time Coutny Employees and Sustaining Members evidence a sincere interest in the affairs of the Association. The purpose of FACERS is to promote better coordination between the various Florida Counties and with other governmental Agencies. Officers of the organization consist of: President, Vice President, Secretary, Treasurer and five Directors, one of whom is the Immediate Past President, who also serves as the Association's representative to the National Association of County Engineers (NACE), with which FACERS is affiliated. In addition, the Association is affiliated with the Florida Association of Counties and meets twice annually at the same time as that group.

FEATURES: FACERS 1990 ANNUAL

Our appreciation is extended again this year to everyone at Triangle Reprographics, especially Joanne Garner.

PRESIDENT'S MESSAGE

GEORGE W. FLACK, JR.

It has been my honor and privilege to serve as President of the Florida Association of County Engineers and Road Superintendents (FACERS). My year has allowed me to learn about the very dedicated and capable County Engineers and Road Superintendents who serve their various constituents throughout the State of Florida.

FACERS is a state member of the National Association of County Engineers (NACE). This year's annual meeting was held at Colorado Springs, Colorado. We had four members attend, one of whom, Tom Hastings, received the National Urban Engineer of the Year award. This was a very special tribute to Tom for his many years of dedication to both state and national organizations. We are very proud of Tom, and it was my privilege to present him with life membership at his retirement party in Orlando in late June.

Our own Carl Cool, Public Works Director of Highlands County, is a Regional Vice President of NACE. He represents much of the southeast on the NACE Board of Directors.

FACERS, for the first time this year, is awarding two scholarships to students majoring in Civil Engineering at the University of Florida. Advertising in this Annual funds these scholarships.

Our organization meets officially two times per year in conjunction with the Florida Association of Counties (FAC). FAC is the association that our county commissioners belong to that represent the counties' interest in Tallahassee. We find it very beneficial for our meetings to be held in conjunction with the FAC conferences. This allows maximum interaction with county commissioners from around the state and affords all of us the opportunity to learn from each other.

It is my hope that all of our members. county commissioners, county administrators, and advertisers consider this Annual a resource and reference document. By communicating with one another, our association will become stronger and each of us individually will be better able to serve our respective counties.

FACERS OFFICERS
1989 - 1990

PRESIDENT

George W. Flack, Sr., FACERS 1989-90 President, has also held the position of Secretary, in 1987-88, and was Vice President in 1988-89. George is Volusia County's Road and Bridge Superintendent -- a position he has held for the past five years. In addition to his activity with FACERS, George has been President of the DeLand Breakfast Rotary, Chairman of the Code Enforcement Board for the City of DeLand and a Senior Warden of St. Barnabas Episcopal Church. His hobbies include chess, backgammon, bridge and tennis. He and his wife, Poppy, have two children.

VICE PRESIDENT

George W. Cole also served as an Officer in 1988-89 when he held the office of Secretary. In addition, he has served several terms on the FACERS Board of Directors and has been involved as a committee chairman as well as committeeman. George is Deputy Director of Public Works for Orange County, where he has been employed for the past 16 years of his 22 years of public service. He is a registered P.E. in Pennsylvania and New Jersey, as well as in the state of Florida. George is married and has two children. He enjoys gardening and kayaking in his spare time.

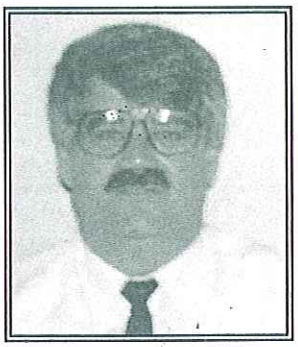
SECRETARY

William C. Whitney, Director of Public Works for Osceola County since 1982, was on the FACERS Board of Directors (1988-89) before taking over the office of Secretary (1989-90). Bill has been with Osceola County since 1978, where he also served as County Engineer for four years. His previous experience includes positions with the Department of Transportation in both Pennsylvania and Florida. Bill is married and has five children and eight grandchildren. His hobbies include playing golf, operating a ham radio, and picking his banjo.

TREASURER

James W. Pinkerton was previously on FACERS Board of Directors (1988-89). He became Citrus County's County Engineer four years ago, after spending 15 years in private practice. He is the Past President of the Tennessee Society of Professional Engineers, Former Vice Chairman of the Metro Knoxville Airport Authority and was Tennessee's Engineer of the Year in 1982. Jim currently lives in Citrus County with his wife, Mary Nell. When given the chance, he enjoys an escape to the outdoors, where he pursues his hobbies of golfing, hunting and fishing.

FACERS BOARD OF DIRECTORS
1989 - 1990



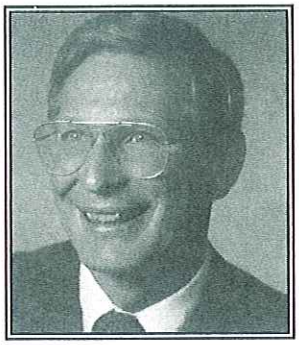
GARY BISHOP

Gary is serving his first term on the FACERS Board of Directors. Currently County Engineer for Escambia County, he was previously Department Director of Public Works for that county. Married, with three children, Gary enjoys sports activities, especially a game of golf or softball.

PHOTO
NOT AVAILABLE

WILLIAM LECHER

Bill Lecher is a first time member of the FACERS Board of Directors. He has been County Engineer for Nassua County since 1988. Bill is married, has two children and enjoys jogging.



RONALD K. BROWN

A member of FACERS since 1986 and on the Board of Directors since 1988, Ronald Brown is County Engineer for Lee County and Deputy Director of the Department of Transportation and Engineering. He is responsible for developing and implementing Lee County's Transportation Project Management Program, including the funding mechanisms for that program. Ron was voted FACERS Urban Engineer of the year award in 1988. He holds P.E and L.S. licenses in the state of Louisiana and a P.E. in the state of Florida.

RICHARD LILYQUIST

Richard Lilyquist has been on the FACERS Board of Directors since 1988. Prior to becoming the County Engineer for Highlands County Richard spent three years in Jacksonville working for a private consulting firm. Richard is married and has two children.

JIM SNELGROVE

Jim is serving his first term on the FACERS Board of Directors. For the past twelve years Jim has been Palm Beach County's Director of Road and Bridges. Jim and his wife, Pat, have two sons. In his spare time he enjoys golf, fishing, racketball.

CONSTITUTION

FLORIDA ASSOCIATION OF COUNTY ENGINEERS AND ROAD SUPERINTENDENTS

AS AMENDED AT THE ANNUAL FALL MEETING OF 1989

ARTICLE I

Name

Section 1:

The name of this organization shall be the Florida Association of County Engineers and Road Superintendents.

ARTICLE II

Membership

Section 1:

Membership in this Association shall be divided into four classes: Active, Sustaining, Honorary and Life.

Section 2:

Active members of the Association may consist of three members in public works positions, i.e. County Engineers, Public Works Directors, County Road Superintendents, etc., who are regularly employed on a full time basis by any one of the Counties of the State of Florida, or any other full time employee of the County approved by the Board of Directors. Only active dues-paid members may vote and each county member shall have one vote.

Section 3:

Sustaining members of the Association shall consist of any person who evidences a sincere interest in the affairs of this Association, and whose application for membership has been approved by the Board of Directors. Sustaining members shall participate in the aims and purposes of this Association, may speak from the floor of the Convention and at special meetings, and shall be able to serve upon committees, but shall not be entitled to vote or hold office.

Section 4:

Honorary members shall consist of any public official or public employee who evidences interest in the affairs of the Association and who are invited to become members by the Board of Directors. Honorary members shall not be entitled to vote or hold office. They may speak from the floor, but may not serve on committees. The Executive Director of the Florida Association of Counties is an Honorary member of this Association.

Section 5:

Life members shall consist of those individuals who have met one of the following conditions:

(1) has been a corporate member in good standing for a minimum of ten (10) consecutive years, and who has retired from active participation in County Engineering or County Road Superintendent activities,

(2) has been an active corporate member in good standing for at least seven (7) years, and who has been either an active corporate member or an active sustaining member for a total of at least fifteen (15) years and who has reached the age of sixty (60) years.

Life members shall not be entitled to vote or hold office. They may speak from the floor and are eligible to serve on committees. Life membership shall be nominated by the Board of Directors and approved by a majority of the members present at a general meeting.

ARTICLE III

Dues

Section 1:

Dues of this Association shall be payable annually on or before the first day of January of each year. Dues shall be recommended by the Board of Directors and set by the membership at the annual meeting. Honorary members and Life members shall not be liable for any dues.

ARTICLE IV

Officers and Their Duties

Section 1:

The Officers of this Association shall be a President and Vice President, a Secretary and a Treasurer -- all of whom shall be actively employed by the Board of County Commissioners of their respective Counties or the equivalent governmental body.

Section 2:

In addition to the officers, there shall be five Directors, and one NACE Director at Large. The Officers, Directors and NACE Director at Large shall constitute the Board of Directors of the Association. The immediate Past President shall automatically be one of the Directors unless he is elected NACE Director at Large. The immediate Past President shall also serve as chairman of the constitution committee.

Section 3:

The duties of the President, Vice President, Secretary and Treasurer shall be those usually devolving upon such officers in organizations similar to this organization.

Section 4:

The duties and powers of the Board of Directors shall be those usually exercised by Board of Directors of organizations similar to this organization.

Section 5:

The terms of the Officers and Directors shall be one year, commencing at the close of the annual meeting. The term of office of the NACE Director at Large shall be three years.

Section 6:

The President and/or the Treasurer are authorized to sign checks for this Association.

Section 7:

The Duties of the Officers shall be as expressed within Exhibit I.

Section 8:

The Officers shall, at the annual Board of Directors meeting, present a written itemized list of those records to be purged in accordance with Exhibit II.

ARTICLE V

Meetings

Section 1:

The Fall or Annual Meeting denotes the beginning of the official year of FACERS. The annual and semi-annual meetings of this Association shall be held at the same time and in conjunction with the annual (or Fall) and the semi-annual (or Spring) meetings of the Florida Association of Counties.

Section 2:

Special meetings of the Association may be called by a majority of the Directors.

ARTICLE VI

Elections

Section 1:

Officers and Directors shall be elected at the annual (or Fall) meeting provided for herein.

Section 2:

There shall be a nominating committee composed of the past three active Past Presidents, and nominations may also be made from the floor in open session in addition to the nominations made by the nominating committee.

Section 3:

In the event only one member shall be nominated or an Officer or Director, no balloting shall be necessary, but in the event of more than one nomination for any office, the election shall be determined by a majority vote. If no candidate receives a majority on the first balloting, the two high candidates shall be voted on in the second balloting.

ARTICLE VII

Affiliation

Section 1:

Affiliation of this Association with the National Association of County Engineers is approved. Of the active dues-paid members per county of this Association, one shall be designated as a member to NACE. Dues are authorized to be paid annually for each designated member of NACE.

Section 2:

The Association shall pay the travel expenses to the annual NACE meeting for the President and the Director at Large.

ARTICLE VIII

Vacancies

Section 1:

In the event of vacancy in the Office of President, the Vice President shall serve as President for the balance of the term.

Section 2:

In the event of vacancy in the Office of Vice President, the President of the Association shall designate one of the Directors or other Officers to serve as Vice President for the remainder of the term.

Section 3:

In the event of a vacancy in the Office of Secretary or Treasurer, the President of the Association shall designate the Vice President or one of the Directors to serve the remainder of the term.

Section 4:

In the event of the vacancy in one of the Directorships, or in the position of NACE Director at Large, a replacement shall be nominated by the Board of Directors and an election conducted at the next regular membership business meeting.

ARTICLE IX

Committees

Section 1:

The President shall appoint from the Active, Life and Sustaining members of the Association, the following committees:

(1) A convention and program committee to be chaired by the Vice President, which shall have charge of arrangements for the holding of conventions and arranging their programs.

(2) Governmental Affairs Committee

(3) A Nominating Committee

(4) Special Committees as he shall deem necessary or advisable.

(5) A Constitution Committee which shall make recommendations to the membership on Constitution changes.

Section 2:

The President shall be an ex-officio member of each committee.

ARTICLE X

Purposes of This Association

Section 1:

The purpose of this Association shall be to foster and maintain a high professional spirit among members of this Association, provide instructive and entertaining programs of interest to those primarily concerned with the programs of interest to those primarily concerned with the planning and operation of County Public Works programs of the Counties of the State of Florida may be coordinated among said Counties and with other governmental agencies.

ARTICLE XI

Amendments

Section 1:

This Constitution may be amended at any annual (Fall) meeting of the Association by a three-fourths (3/4) vote of the eligible members present and voting.

EXHIBIT I
AMENDMENTS

Duties of the President of FACERS

(1) Preside at all meetings of the General Assembly of FACERS.

(2) Appoint a Director or other Officer to fill a vacancy in the office of Vice President of FACERS for the remainder of that term.

(3) Appoint the Vice President or one of the Directors of FACERS to serve as Secretary or Treasurer to fill a vacancy in either office for the remainder of that term.

(4) Appoint committees.

(5) Serve as an ex-officio member of all committees.

(6) Sign checks in lieu of the Treasurer, when necessary.

(7) Call special meetings of the Board of Directors.

(8) Purge all FACERS files on hand, held by the President, and present a written itemized list of those records at the annual Board of Directors meeting.

Duties of the Vice President of FACERS

(1) Preside at all meetings of the General Assembly of FACERS in the absence of the President.

(2) Act as Chairman of the Convention and Program Committees.

(3) Notify each member, prior to a Convention, of the planned convention program.

(4) Act as Parliamentarian for the Association.

(5) Purge all FACERS files on hand by the Vice President and present a written itemized list of those records at the annual Board of Directors meeting.

Duties of the Secretary of FACERS

(1) Keep the official minutes of all regular FACERS meetings and of the Board of Directors meeting.

(2) Prepare and distribute to all members a copy of the minutes of each Association meeting as soon as practicable after each meeting.

(3) Notify new Officers and Board members, in writing, of their election (this is to be done by the new Secretary).

(4) Prepare and distribute to each member, and in the future, to new members, a copy of the present Constitution of the Association and, as directed by the President, any amended Constitution to all members.

(5) Revise the Constitution, as amendments are made.

(6) Prepare a plaque of appreciation to be presented to the outgoing President, at the end of his term.

(7) Notify NACE and FAC Executive Director of new Officers, with their addresses.

(8) Purge all FACERS files on hand, held by the Secretary, and present a written itemized list of those records at the annual Board of Directors meeting.

Duties of the Treasurer of FACERS

(1) Keep checking and saving account records.

(2) Bill members for annual dues.

(3) Send a roster of dues-paid honorary members, annually, to the Secretary.

(4) Disburse funds, as approved by the membership, and pay the annual dues to NACE.

(5) Present a written financial report to the membership at each Association meeting.

(6) Prepare and distribute to each member, annually, an up-to-date roster of all dues-paid active and sustaining members and of honorary and life members. The roster should show the names of the members leaving the Association, changing affiliation and their new addresses, if possible, and the names of deceased members.

(7) Have printed and deliver to each member, annually, a membership card for the year for which dues are paid.

(8) Purge a written itemized list of those records at the annual Board of Directors meeting.

EXHIBIT II

RECOMMENDED RECORDS RETENTION SCHEDULE

(1) Dues statements, vouchers payment records - **Destroy after 3 years.**

(2) Bank statements, canceled checks, deposit slips, cashier's check -

Closed Account - **Destroy after 3 years**

Active Account - **Destroy after 5 years.**

(3) Membership lists - **Destroy after 5 years.**

(4) Miscellaneous invoices - **Destroy after 10 years.**

(5) Minutes of meetings, Correspondence and Treasurer's Report - **File original with Florida Association Counties after 5 years.**

Secretary Minutes and Treasurer's Report

1990 Mid-Year Meeting

FACERS 1990 Mid-Year Meeting, held on February 16, 1990 in St. Johns County, was called to order at 8:45 a.m. by President George Flack. The Secretary Minutes of that meeting and the Treasurer's Report follow:

Secretary Report

The minutes of the General Meeting of September 28, 1989 were read and approved.

Treasurer's Report

Jim Pinkerton gave the Treasurer's Report. A motion was made and seconded to approve the report. The Treasurer's Report was approved.

A motion was made and seconded that the membership dues would remain the same for 1990/1991: $30 FACERS, $60 NACE and $50 Sustaining. The motion was approved.

Committee Reports

- *Convention - George Cole*

(George Cole had to return to Orlando.) President Flack called for assistance and ideas for the fall program.

- *Green Book - Jim Davis/ Carl Cool*

It was reported that the new revision had been published but the committee did not have sufficient time to review it prior to the meeting.

- *Governmental Affairs - Ed Culpepper/ Tom McClelland*

It was reported that the Policy Statement had been adopted by the FACS general membership.

The Membership was alerted on a Utility Bill to be considered by the Legislature. The bill would protect utilities from the effects of construction on County Right-of-Ways by others and also reimburse them for any loss in revenue caused by damage.

- *Stormwater Management - George Cole/ Larry Sellers*

No report.

- *Publication - Ed Dougherty/ Jim Pinkerton*

The FACERS Annual has been published. A motion was made and seconded that Ruth Eversole, a Glace & Radcliffe employee who worked many hours of her own time on the publication, be awarded a honorarium of $500 and a plaque recognizing her efforts. This is to be presented at the next Board of Director's meeting. This was approved by the membership.

It was reported that the Annual was mailed to every County Commissioner and County Administrator in the State of Florida.

- *Awards - Ed Dougherty*

It was reported that the response has been slow. In December, each Administrator in the State was requested to submit nominations. The award will be made at the next Board of Director's meeting.

- *NACE - Carl Cool/ Ed Culpepper*

Carl reported on his attendance with the Maryland County Engineers Association at Virginia City, Maryland. In the Maryland meeting, not only engineers attend, but also Commissioners, technicians, secretaries and survey personnel. Topics of the two and a half day session are varied and include drainage problems and roadway design.

- *Growth Management - Ron Brown/ Rick Lilyquist*

There was no report submitted.

- *Disaster Relief - Jim Snelgrove/ Gary Bishop*

Because of legal problems, it was recommended that the committee no longer pursue this issue.

- *Membership - Jim Snelgrove/ William Letcher*

It was reported that the Committee sent letters to the various County Commissioners whose Engineers were not members of FACERS. The letter outlined the goals and objectives of FACERS and encouraged those not represented to join.

FACERS had a total of 75 members as of February 16, 1990.

- *Constitution - Bill Kenley/ Bill Whitney*

A recommendation to amend the Constitution to add another Director was proposed (see Article IV - Section 2 of the Constitution).

A recommendation to amend the Constitution to change the commencement of the terms of Officers and Directors was proposed (see Article IV - Section 5 of the Constitution).

A recommendation to amend the Constitution in the nomination of a replacement candidate in the event a vacancy in one of the Directorships occurs was proposed (see Article VIII - Section 4 of the Constitution).

- *Continuing Education - Ed Culpepper/ Janet Degner*

The committee reported on the FACERS Scholarship.

It was proposed that each scholarship be for $1,000 per year, distributed at $500 per semester. Awards will be made to students entering the upper level of the Civil Engineering Department. Students would be required to carry a maximum load of hours to be determined later. Applicants will only be considered that meet the University of Florida residency requirements. The students selected for the FACER Scholarship will be recommended to the FACERS Education Committee.

A motion was made and seconded that the Scholarship plan be adopted. This was approved by the membership.

- *T2 Program - Janet Degner*

Janet spoke about the different brochures and instructional aids they have available. Janet reported that their traffic services workshop and seminar has been received well.

Ralph Ellis, from the University of Florida, reported that the T2 van has been operating since December of 1989 and they expect to be operating one day a week. He noted that if the program had the funding, the van could be operating full time.

- *Old Business*

There was no old business.

- *New Business*

President Flack reported that the mutual aid package is not being received well in some Counties because of cash management and legal problems.

Carl Cool reported he would be speaking at the Alabama County Engineers Association meeting.

It was moved and seconded that the Treasurer issue membership certificates to each member. This was approved by membership.

The meeting was adjourned at 9:50 a.m.

ALPHABETICAL LISTING

FACERS MEMBERSHIP

FACERS/NACE MEMBERSHIP
1990

Active members of the Association may consist of three members in public works positions, i.e., County Engineers, Public Works Directors, County Road Superintendents, etc., who are regularly employed on a full time basis by any one of the Counties of the State of Florida, or any other full time employee of the County approved by the Board of Directors. Only active dues-paid members may vote and each county member shall have one vote.

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1990

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Honorary members shall consist of any public official or public employee who evidences interest in the affairs of the Association and who are invited to become members by the Board of Directors. Honorary members shall not be entitled to vote or hold office. They may speak from the floor, but may not serve on committees. The executive Director of the Florida Association of Counties is an Honorary member of this Association.

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Utility Funding For Stormwater Management Services

James E. Scholl, P.E.
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Local governments have historically funded stormwater management services with ad valorem property tax revenues. Since stormwater expenditures must compete with a multitude of government services, the level of funding can be highly variable and often decreases because of competition with funding for other services.

In light of the increasing need to address both quantity and quality considerations, a new and reliable source of funding for local stormwater management is generally needed. A proven method that has gained recent acceptance is the establishment of a stormwater management utility. The premise of this method is that developed property can be charged in proportion to the amount of stormwater runoff generated. Utility customers are the property owners who add runoff to the stormwater system; individual charges can be calculated with an appropriate billing unit formula. The charge per billing unit must be set to generate adequate revenue for providing observable benefits.

The careful development of a rate structure has been found to be critical to the successful implementation and operation of a stormwater management utility. Once an appropriate rate structure is established, procedures for preparing billing records and data base management requirements can be established.

This policy offers criteria and guidance in defining and evaluating the many policy issues that must be addressed when a stormwater management utility rate structure is developed. General requirements for developing billing records and data base management processes also are discussed.

Evaluation Criteria

Experience has shown that the following criteria are important considerations in developing a stormwater management utility rate structure:

1. Charges must be fair, reasonable, and easy to understand

2. Policy decisions related to charges must be legal and locally acceptable

3. The basic algorithm for calculating charges must be flexible and easy to adjust when changes occur

4. Data for calculating charges must be readily available, reasonably accurate, and technically defensible

5. Revenue requirements must be well documented and represent the actual costs of providing services

6. Rates must be set to generate adequate revenues to provide visible service benefits to customers.

These criteria, along with the additional discussion presented below, provide a baseline for evaluating the development of a local program.

Policy Issue Decisions

A "right" answer to each of the many policy issues that must be addressed when a stormwater management utility is established may not exist. Although there is a great deal of flexibility, the key guideline is to avoid arbitrary, capricious, or discriminatory decisions in developing the components of the billing rate structure. The basis for service charges must be fair and equitable to establish program credibility. Policy issue categories, as discussed below, include who must pay for the services, considerations in setting the fee basis and revenue requirements, and the selection of a billing system.

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Who Pays?

To provide a consistent framework for deriving the stormwater management utility rate structure and billing data, local policy issues must be identified, and appropriate decisions should be well documented. The most fundamental policy issue deals with the decision as to who must pay for services. Possible issues on who pays include the following:

1. Will property exempt from ad valorem taxes be charged, and if so, does this include the local government until responsible for providing the services and where does the revenue to pay for those service charges come from?

2. Will undeveloped land be charged and, if so, how will the fees be calculated and the billing and collection be done?

3. When property has one owner with multiple tenants using the improvements, will the owner or the tenants be billed? If owners are billed, can the owner request billings be sent to tenants by providing billing factors for each tenant account?

4. If undeveloped property is to be charged, should agricultural activities be included or should charges be limited to only undeveloped land with non-agricultural zoning?

5. Who pays for the stormwater services associated with common-use facilities such as public roads? If this comes from the general fund, should funding shift to the stormwater management utility rate structure or continue to be covered by the general fund?

6. Are exemptions from stormwater management utility charges allowed and can credits be given for the construction of on-site facilities or for the private provision of operation, maintenance, and construction activities?

The evaluation of pros and cons associated with each of these questions must be considered, and often debated in public hearings, to arrive at appropriate local decisions.

Fee Basis

Having established who pays, the basis for calculating individual charges can be developed. Since charges should be related to the need for service, a measure of how much stormwater is generated from property is typically the basis to determine charges. To evaluate the quantity of stormwater runoff generated from a piece of property, variables such as impervious area, percentage of impervious area, soil conditions, land slope, land use, ground water conditions, and the presence of on-site drainage facilities can be important. Because the requirements for billing data preparation must be kept simple while providing appropriate credibility for considering site-specific factors, rate basis factors are typically limited to impervious area, percentage impervious, or runoff coefficients.

When impervious area measurements are selected as the basis to calculate fees, billing data requirements can be simplified by establishing the impervious area associated with a typical residential property as a unit measure for referencing the calculation of all other charges. This unit measure is often called an equivalent residential or runoff unit (ERU), which should be based on actual measured results for the area of concern. The measurements can be done for selected groupings of residential property such as detached single-family, multi-family or apartment, manufactured or mobile homes, and condominiums or townhouses.

The definition of an ERU is generally based on the impervious area associated with detached single-family residential property. Average values for this measure typically range from under 2,000 to about 2,800 square feet. Since the frequency distribution of these data is typically skewed to lower impervious area values, the median value, which identifies the point at which 50 percent of the parcels are above and below that value, may be a better unit to use for establishing the reference.

An alternative approach for establishing the value of an ERU is to include all residential categories as identified above. This approach results in an average dwelling unit, as opposed to an average single family unit, which is generally near or below 2,000 square feet in area. for this case, the billing factor for all residential property is generally a single ERU. Although this simplifies billing data requirements, it will shift a larger portion of the program costs to non-residential property, since the area assigned to an ERU is divided into impervious area values to give billing factors for non-residential property.

Another alternative is to base all charges on percentage impervious categories for which unit charges per square foot of impervious surface increase as the percentage of impervious area increases.

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For example, rate categories may be assigned on 10 percent intervals of percentage impervious from 0 to 10 percent, from 11 to 20 percent, and so on. Unit charges per square foot of impervious area can then be set so that each property is charged in proportion to the actual percentage imperviousness of the property. Although this increases the fairness of individual charges, additional data preparation may be involved to establish the billing data base.

Revenue Requirements

Funding and expenditures on existing service activities must be reviewed and compared to the funding requirements for desired levels of service to establish the revenue requirements for a stormwater management utility program. Budget estimates for funding requirements may include facility planning and mapping, construction of capital improvement projects, operation and maintenance activities, performance monitoring, regulatory review and enforcement, emergency response, and public information or education. In order to assist with the evaluation of credits, fixed program costs, which are common to all customers, should be separated from variable costs that change from year to year, such as facility construction.

If desired service levels are not being met, policy decisions must provide direction on what services will be provided from each available or expected funding source. For example, if existing general funds are adequate to address the operation and maintenance service levels but are not adequate to construct needed facilities, stormwater management utility revenue could be designated for fund the capital improvement program. The general fund would continue to cover existing operational costs, but as new facilities are constructed, additional operating costs should be covered by the stormwater management utility.

An important policy decision in funding capital improvement projects with stormwater management utility revenues deals with how quickly projects will be constructed. Because the annual revenue of a typical stormwater management utility is generally much lower than total capital improvement needs, projects must be delayed until revenue can be saved, if a "pay as you go" policy is chosen. However, if selected projects cannot be delayed and a bonding financial policy is chosen, projects can be constructed much sooner, as long as financing costs are incorporated into the rate structure.

Billing Options

Three billing options are typically available to a local government: an existing utility billing system, a separate or new billing system, or annual billing by the property tax collector. Ease and cost of implementation, legal implications including mechanisms to deal with non-payment, administrative responsibilities, and availability of billing data are important factors to consider when a billing and collection method is selected.

Because costs can be prohibitive, a separate or new billing system for only stormwater management utility charges is generally avoided. If an existing utility billing procedure is available to the local government, this method will probably be the best choice since administrative costs are minimized, collections are generally monthly or quarterly, which lowers the amount of individual bills, and mechanisms to address non-payment are generally already in place.

Using the property tax collection method for stormwater management utility service charges, since this charge is not an assessment based on property values. It is also unlikely that the tax collector would be legally responsible for collecting the fees and that unpaid bills would not be subject to a tax lien.

Rate Structure

With the policy decision results identified, quantifying the total number of billing units available to the jurisdiction of the affected local government is possible. Preliminary estimates are often based on property tax roll data while the actual billing factors must be derived from a specific analysis developed according to the adopted rate structure criteria. Fees per unit billing factor can then be set to fund the program, if the number of billing units and the desired revenue requirements are known.

Because this process is iterative and may require rate adjustments to meet variable demands for services, a computerized spreadsheet approach is generally helpful. An example rate structure analysis prepared with a computer spreadsheet approach is shown in Table 1. The data in Table 1 is presented in two main parts to identify expenditure categories and revenue sources.

Major expenditure categories shown include operating, capital, planning, and emergency repair costs along with a contingency reserve. the example data are a summary of projected program costs based on detailed line item costs, such as personnel categories, expense items, and equipment needs, which are not shown.

Revenue sources shown in Table 1 include stormwater management utility (SMU) fee income based on the estimated number of ERU's and a specified monthly fee per ERU, bond sale money, and general fund income. Estimates of the SMU revenue potential should consider increases in the number of ERU billing units associated with development along with appropriate adjustments for on-site credits, if they are allowed. In this case the monthly fee per ERU was increased in increments of $0.50 each year to cover increasing program costs. The planning period ends with an approximate cumulative fund balance.

Billing Implementation

General requirements for developing billing factors and data base management processes will depend on the source of raw data and the method for billing. Considerations for preparing the billing data include the number of parcels to be measured, the time available to do the work, and the tolerance for accepting errors. In most cases, a significant amount of field work and raw data compilation is required. Therefore, to the extent that computerized mapping and data base management procedures are developed and applied, manual labor and costs can be reduced while accuracy can be increased.

If impervious area values must be measured, a particularly attractive method is to use aerial photographs and Geographic Information System (GIS) workstations to process data as digital images. These digital images can then be linked to appropriate billing account data. This process also can provide efficient and cost-effective updating and maintenance capabilities.

Important issues to address when data production and management procedures are developed include the need for ground truthing of results, methods to handle setting up new accounts for stormwater management utility services only, procedures and algorithms to assign billing factors, data correction and review requirements, and file updating and maintenance procedures.

Public Information

Public awareness of stormwater management problems and needs is critical to the successful implementation of a stormwater management utility program. The emphasis must be on providing appropriate justification of the program needs and associated costs, including information on how individual charges will be calculated. The public involvement program typically includes several phases to cover the adoption of appropriate local ordinances, the initial implementation of billings, and the ongoing need to respond to public requests for information and to educate the public regarding program activities.

Experience has shown that, although it may initially appear significant, relatively few residents will question stormwater management utility charges. Proper handling of those questions by a well-trained and courteous staff will mitigate most serious problems. An appeals process should be provided for customers to resolve specific billing problems or grievances.

Once a stormwater management utility program becomes operational, continuing public information programs should focus on encouraging residents to protect the capacity and water quality of the stormwater management system. Activities can include programs with the public schools, service clubs, churches, and emergency response units.

Summary and Conclusions

A local government has a great deal of flexibility when a stormwater management utility rate structure is developed. The basis for service charges must be fair and equitable and policy decisions must avoid arbitrary, capricious, or discriminatory factors. The most fundamental policy issue deals with who must pay for services. Additional policy decision categories, which are important, include considerations in setting the fee basis and revenue requirements, and the selection of a billing system.

The pros and cons of rate structure policy questions with local importance, should be debated in public hearings, to arrive at appropriate decisions. Public awareness and input is critical to program success.

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TABLE 1
EXAMPLE STORMWATER MANAGEMENT UTILITY
PROGRAM PROPOSED BUDGET FOR FY 1989 - 1992

	Costs in $1,000					
EXPENDITURE CATEGORY	**FY 89 (6 months)**	**FY 90**	**FY 91**	**FY 92**	**TOTALS**	**%**
OPERATING COSTS[1]						
Salaries	551	1,397	1,519	1,652	5,119	38.4
Expenses	140	515	573	637	1,865	14.0
Billing Costs	30	50	52	53	185	1.4
Billing Setup	250	0	0	0	250	1.9
SUBTOTAL	971	1,962	2,144	2,342	7,419	55.7
CAPITAL COSTS						
Equipment	261	563	78	70	972	7.3
Bond Projects	0	1,000	700	0	1,700	12.8
Bond Costs[2]	90	340	340	340	1,110	8.3
Other Projects	0	200	165	250	615	4.6
SUBTOTAL	351	2,103	1,283	660	4,397	33.0
PLANNING COSTS						
Mapping	50	500	50	0	600	4.5
Inventory	0	200	100	50	350	2.6
Capital Projects	0	0	5	50	55	0.4
Service Level	0	0	50	30	80	0.6
SUBTOTAL	50	700	205	130	1,085	8.1
EMERGENCY REPAIR	0	15	15	10	40	0.3
CONTINGENCY	55	110	110	110	385	2.9
EXPENDITURE TOTALS	1,427	4,890	3,757	3,252	13,326	100.0

TABLE 1
EXAMPLE STORMWATER MANAGEMENT UTILITY PROGRAM PROPOSED BUDGET FOR FY 1989 - 1992

	Costs in $1,000					
REVENUE	**FY 89 (6 months)**	**FY 90**	**FY91**	**FY92**	**TOTALS**	**%**
Monthly Fee/ERU	$3.00	$3.50	$4.00	$4.50		
SMU Income[3]	1,080	2,520	2,880	3,240	9,720	
Bond Sales	0	2,500	0	0	2,500	
General Fund	347	495	265	0	1,107	
REVENUE TOTALS	1,427	5,515	3,145	3,240	13,327	
ANNUAL BALANCE	0	625	(612)	(12)		
CUMULATIVE BALANCE	0	625	13	1		

NOTES:

1. Salary and operating costs are projected to increase 7 percent each year.
2. First year costs are associated with selling bonds. Remaining years are for repayment on $2.5 million of bonds.
3. SMU revenue is the product of the ERU billing unit estimate and the annual fee per ERU.

Components of a public information program should cover the adoption of ordinances, initial implementation of billings, the response to public information needs, and education on important stormwater management issues.

A computerized spreadsheet approach is identified to assist with the iterative process associated with setting billing fees to cover desired program revenue requirements. Developing individual account billing factors can involve a significant amount of field work, raw data compilation is required, and data base management procedures must be well documented.

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MANAGING UNSURFACED ROADS

Unsurfaced roads represent a significant investment in annual maintenance costs for many of Florida's counties. In recent years there has been much attention focused on pavement management systems (PMS) that help managers make sound decisions about reconstruction, rehabilitation and maintenance of pavements. Unsurfaced roads deserve the same careful management to ensure the best value for the public's dollar. This article discusses several unique features associated with the management of unpaved roads including condition assessment, strategy selection and design of rehabilitation.

MAINTENANCE MANAGEMENT

Effective management of unsurfaced roads hinges upon economic considerations, with decisions based upon accurate and complete cost data. The first step, therefore, in effective management of unsurfaced roads is the implementation of a system of tracking actual costs by activity and location. The link between maintenance management and pavement management is perhaps stronger when dealing with unsurfaced roads than with pavements because unsurfaced roads are so maintenance intensive. Maintenance management systems (MMS) provide the manager with the actual cost of maintaining unsurfaced roads. A well designed MMS can identify expenditures of maintenance dollars (personnel, equipment and material) with specific routes, allowing the manager to identify the frequency and intensity of maintenance efforts.

INVENTORY

The next step should be an inventory of the unsurfaced roads in the county, identifying the length, width, location, drainage characteristics, and depth and type of cover material. In addition to physical characteristics, traffic data, in terms of ADT and percent trucks, is very helpful. Armed with good maintenance and inventory records, the manager is now ready to apply PMS principles to unsurfaced roads.

CONDITION ASSESSMENT

Condition assessment for PMS normally involves collecting data on distress types present (what), their density (how much) and severity (how bad). A scoring procedure is applied to arrive at an overall measure of condition, usually known as a Pavement Condition Index (PCI). The dynamic nature of unsurfaced roads makes condition assessment very difficult. We have all seen the classic deterioration curve for pavements, showing a progressive loss of serviceability over a number of years until a rehabilitation project improves the condition and the cycle begins again. A similar curve can be produced for unsurfaced roads, but instead of years, the cycle will probably be over a period of months, or even weeks.

The U.S. Army Corps of Engineers has developed a condition rating and scoring method for unsurfaced roads that allows one to develop a PCI. This method calls for four windshield surveys a year and a detailed survey once every three years to collect data on cross-section deficiencies, drainage problems, corrugation, dust, potholes, ruts and loose aggregate.

The Federal Highway Administration's **Road Surface Management for Local Governments** (1985) suggests a method that considers rutting, corrugations, potholes, aggregate loss, slipperiness, surface erosion and dust generation. This method

relates distress type, density and severity with frequency of maintenance.

The best condition assessment method is one that fits the specific needs of the agency using it. The distresses should be those that are commonly found, the level of detail should match the technical abilities and resources of the agency and the results should match the professional (although frequently intuitive) assessment of experienced people in the agency. These two methods, and probably others can be combined and modified to fit the local needs with very little effort.

STRATEGIES

Once the condition is determined, a strategy should be selected for each unsurfaced road. Strategies that might be considered are:

- **Routine maintenance.** This strategy applies to roads that are in good overall condition and need only periodic blading and local repairs of potholes and correction of drainage problems.

- **Preventive maintenance.** This strategy is appropriate for roads experiencing some deterioration, but not to the extent that expensive rehabilitation is needed. Generally, there is still a hard "crust" and effective crown on these roads. Some expenditure on these roads will forestall further deterioration and keep them in good shape. Actions to be taken might include periodic blading and local repairs, ditch cleaning, dust control and spot addition of cover material.

- **Rehabilitation.** This strategy is for those roads in poor condition that need structural work, including scarifying, addition of cover material, stabilization, shaping and recompaction.

- **Reconstruction.** This strategy, appropriate for failed roads, involves removal and replacement of the roadway structure. Paving should be considered when investigating reconstruction options.

NEEDS ASSESSMENT

Once the ideal strategy for each road has been determined, average unit costs for each strategy can be applied and an overall assessment of needs determined. If the resulting total is not within the funding capacity of the county, some trade-offs must be made. In general, preventive maintenance (on those roads in the appropriate condition) is the most effective use of funds and should receive priority.

PAVE/NOT PAVE DECISION

Economic analysis can help make the pave/not pave decision for those roads that fall in the reconstruction strategy. Such an analysis should consider three costs: first cost, future maintenance and rehabilitation costs, and user costs. First, or initial costs, for paved roads can be substantial. The unsurfaced road to be paved must be adequately crowned and ditched, and base material added, because asphaltic concrete pavements cannot withstand as much flexure as an unsurfaced road. Additionally, the cost of the pavement itself must be considered. Of course,the cost of rehabilitation or reconstruction of the unsurfaced road must be considered if the decision is not to pave.

Next, future routine maintenance, preventive maintenance and rehabilitation must be considered for the two options. The pave option may not have immediate maintenance requirements as would the unsurfaced option. However, over time, the pave option may be the most expensive to maintain. An MMS can be very helpful in determining and evaluating these costs.

The user costs associated with unsurfaced roads is substantially greater than for paved roads. Unsurfaced roads have greater rolling resistance and less traction, increasing fuel consumption. Roughness of the unsurfaced road contributes to additional tire wear and increased maintenance and repair costs. Dust increases engine wear, oil consumption and maintenance costs. The increases in operating costs have been estimated at 30% to 60% for vehicles driven on unsurfaced roads.

An economic analysis of various factors associated with unsurfaced roads can establish an ADT threshold where the pave option should be considered, as shown in the following, simplistic example (all costs are in dollars per mile):

(continued on page 28)

Additional cost of paving over reconstruction of unsurfaced roads	$40,000.00
Additional cost of maintenance for paved roads	$500.00 per year
Savings to public for paved roads: - Average operating cost on paved roads - Increase on unsurfaced roads (40% increase)	 $ 0.30 $ 0.12
Assuming a 6% discount factor and a 15 year analysis period: - The additional cost of pavement is: 40,000 + 500(9.712) = - The savings to the public is: ADT (0.12 x 365 x 9.712) =	 $44,860.00 (present worth) 425 (ADT)
The traffic volume where the additional cost is offset by savings to the public is: $ADT = \frac{44,860}{425} = 106$	

The example above suggests that unsurfaced roads with ADT over about 100 vehicles per day should be candidates for paving when considering reconstruction.

SUMMARY

Pavement management techniques can be very useful in managing unsurfaced roads. Public agencies that own significant miles of unsurfaced roads can and should track their maintenance costs, maintain an inventory, systematically assess their condition, assign strategies and consider alternate treatments. These techniques will help the manager identify needs, assign priorities and justify budgets. There are numerous computer programs available for pavement and maintenance management that can assist the manager in several of these functions. In the final analysis, however, these techniques are simply a common-sense approach that, with or without the aid of a computer, will help to ensure that scarce maintenance and construction funds are used in the wisest possible way.

ABOUT THE AUTHOR

Louis B. Stephens, P.E., is Associate-in-Charge of the Orlando office of Wilbur Smith Asso. He has been active in pavement management training, research and system development during his eight year employment with WSA. He has managed several research and technology transfer projects dealing with low volume road issues for the Federal Highway Administration, Transportation Research Board and several states. Prior to working with WSA, Louis was a highway engineer with FHWA for 10 years and was in the Army 3 years. Louis received his B.S. in Civil Engineering from the U. of Alabama and a Masters in Public Administration from the U. of Kansas.

Computer Aided Design and Drafting

David Keough, P.E. and Steve Laux, P.E.
Jones, Edmunds & Associates, Inc.

If you'd like to get more mileage from a limited budget on your next project, consider the benefits of Computer Aided Design and Drafting (CADD) when choosing your consultant. It's a system that's rapidly gaining acceptance in the engineering field as an alternative to hand-generated design on a variety of projects.

When CADD first came on the scene several years ago, available software packages were dependent upon expensive mainframes that were needed to provide the necessary speed and capacity for program operation. As a result, CADD systems were affordable to only a few large consulting firms for design applications in road work, landfills, pipelines, and other projects.

But with the proliferation of today's fast and relatively inexpensive personal computers, CADD programs are becoming indispensable tools for more and more engineering consulting firms, offering many benefits to both consultant and client. For the consulting firm, CADD means greater productivity and error elimination. To the client, it offers an opportunity to evaluate more design alternatives for dollar value, an attractive feature in today's environment of tight municipal budgets. No matter how you look at it, the bottom line is the same-greater quality for less money.

Benefits of the CADD system begin as early as the proposal stage of a project. In fact, a recent request for proposal by one Florida county specified that only CADD drawings would be accepted for the project. The consultant who uses that system is not only better able to manage a complex database of information, but can offer a potential client a design plan that is 10 to 20 percent completed even before being selected by the client.

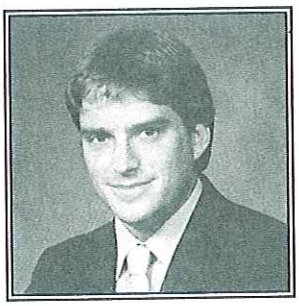
When comparing CADD with conventional ink-on-mylar hand drawings, the time-saving features, which can often cut production time in half, are readily visible. The painstaking production of manual drawings are reduced to an easily manipulated computer database that is less prone to dimensional mistakes. And hard copy printouts can be reduced to an easily manageable 11 inch by 17 inch size with no less of clarity -- a feature often lost when reducing hand drawings.

With the design capabilities of CADD, the need for manual updating on similar future projects is eliminated. Data is easily modified and applied to an even larger database to keep an area-wide set of drawings more current, as might be called for in the expansion of a stormwater plan for example. And should the need arise, the client can easily manipulate data on his own.

(continued on page 46)

ABOUT THE AUTHORS

David Keough, P.E. is an Honors graduate from the University of Florida with a B.S. in Civil Engineering. David's areas of specialization include civil and environmental engineering, hydrology, geohydrology, computer modeling, construction supervision and cost estimating.



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A PAVEMENT MANAGEMENT SYSTEM FOR PUTNAM COUNTY

A Case Study

INTRODUCTION

Funding transportation projects in Florida has been much in the public eye as of late. Most of the attention has been focussed on building new or improved roadways to keep up with growth. But maintaining the existing roadway system (protecting the infrastructure investment already in place) is also a problem aggravated by growth. Increased traffic causes more wear on existing roadways and results in higher maintenance costs to keep up. Maintenance needs are competing with capital improvements project requirements for limited budgeted transportation funds. With limited dollars available, it's extremely important to spend every maintenance dollar as effectively as possible. That's where a Pavement Management System (PMS) can play a vital role.

As with other Florida counties, Putnam County has increasingly experienced this tug-of-war for transportation dollars. The County maintained highway system covers over 1,100 miles of roadway of which approximately only one-third is paved. The County desires to gradually pave more of these dirt roads while maintaining or upgrading the quality of its' existing surfaced roads. To achieve this goal, several questions needed to be answered or addressed. What was the current condition of the existing roadway network? What would it cost to maintain the level of service of the system? What would be the most effective way to spend the dollars? It was clear that when faced with more citizen requests for roadway improvements than available funding, a rationale system was essential to help determine which projects should be given priority.

Harry Lampe, Putnam County Public Works Director, knew that the answer to these questions could best be found by instituting a formalized Pavement Management System. He turned to Howard Needles Tammen & Bergendoff, one of the County's General Consultants, to recommend and institute a PMS system which would eventually be turned over to the County at the end of the project. The County would then use the PMS in its every day operations and expand and update it as necessary.

THEORY OF A PAVEMENT MANAGEMENT SYSTEM AND PAVEMENT LIFE CYCLE

PMS

A PMS is a systematic method for a governmental agency to organize pavement inventory information, evaluate the condition of its roadways and choose the method of maintaining the roadways in a way that will provide the most years of service for the dollars spent.

This goal of minimizing costs and maximizing a roadway network's level of service is a function of a pavement's life cycle (Figure 1).

Pavement Life Cycle

Basically, pavement will remain in relatively good condition for many years until it reaches approximately 75 percent of its design life. After that, it deteriorates quickly and costs increasingly more to repair. To repair a pavement section after it has deteriorated beyond that 75 percent point of its life, may cost four to five times as much as the repair would have cost before the roadway reached its 75 percent life. This difference in repair costs is due to the method of rehabilitation needed at the two different stages. To repair a pavement at or immediately before the 75 percent point, involves fixing only the top surface, whereas after it has failed, the surface, base and sometimes even the subbase must be repaired. One of the key strategies of a PMS is to maintain good pavements, keeping them well above the 75 percent point and to repair pavement before

(continued on page 35)

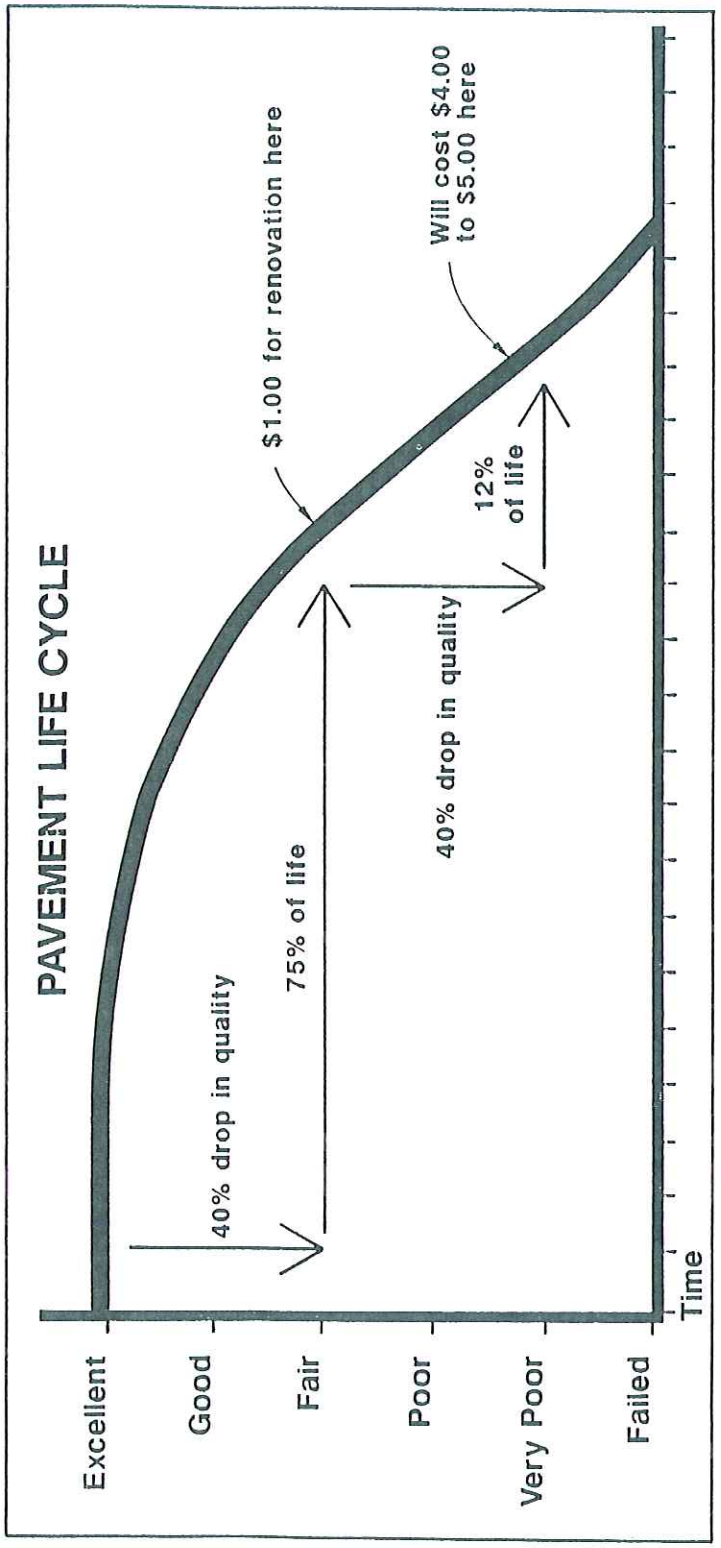

FIGURE I

Taken from APWA Pamphlet: PAVEMENT (MAINTENANCE) MANAGEMENT SYSTEMS

and as they reach the 75 percent drop off point. For repairs prior to the 75 percent period, the life of these "good" pavements can be extended almost indefinitely and at only one-fourth the cost as compared to waiting until the pavement fails.

When pavement sections have declined beyond the 75 percent point, complete reconstruction may be scheduled any time before the pavement section reaches the failed, unsafe level of service.

Software Selection

HNTB's initial task was to recommend a PMS software package.

There were several important criteria identified for selecting the software package to be used for Putnam County's PMS. They included:

- User friendliness
- Non proprietary
- Reasonable cost
- Proven track record
- Well documented

It was the County's desire to take over the system once HNTB set it up. The County would then add more roadways to the system, update it with periodic reinspections and use it as a flexible management tool. This precluded proprietary "black boxes" where each update would have to be hired out at an additional fee and where the County's ability to use the system as a management tool would be limited. Using these criteria, HNTB reviewed selected available software and recommended the American Public Works Association's (APWA) MicroPAVER Version 2.01. This system was used for the study, which required an IBM compatible personal computer with a minimum of 640k RAM and a hard disk drive.

THE PAVEMENT CONDITION SURVEY, ANALYSIS AND REPORT

The initial phase of the PMS covered 250 miles of the County's roadway network. The initial tasks involved defining the specific roadways to be evaluated, setting up the roadway network and defining the roadway branches and sections. Each section was then inspected by a trained field crew to identify the condition. Non-destructive pavement testing was conducted to give bearing capacity information relating to pavement conditions and pavement coring was done to determine pavement type and thickness. Those findings, as well as historical data on pavement sections, County generated traffic data, and maintenance, rehabilitation and reconstruction techniques, developed by the County and HNTB, and unit costs were input into MicroPAVER to create a database. Sample reports were run to test the program using a portion of the input data. Upon successful completion of this test, the program accessed the entire database, and generated a series of reports. Besides showing repair costs, MicroPAVER converted the observed pavement distresses into a Pavement Condition Index (PCI) for each pavement section. The data and reports were then analyzed, recommendations made, and all were incorporated into a report. Following this phase, County personnel were trained on field inspection procedures and use of the MicroPAVER software.

RESULTS

Of the 250 miles of pavement surveyed, the PCI's ranged from an extreme low of 13 to a perfect high of 100. A PCI of 0 - 40 could generally be rated as poor, 41 - 55 as fair, and 56 to 100 as good. The network average of 68 was considered a "good" condition. The most common deficiencies found were those associated with age, climate and shoulder erosion. Sections in poor condition also exhibited distress types expected from over use.

The 13 basic reports available from MicroPAVER provided a wealth of information. From these reports, the following questions could be answered:

- What is the existing condition of each roadway section within the network?
- For each section in need of repairs, which required only maintenance, which rehabilitation and which reconstruction?
- What are the estimated costs for those repairs?
- How much would it cost to attain a certain level of service on the roadway network?

An excerpt from the report is shown in Figure 2, reflecting the different types of data listed on the various MicroPAVER reports.

RECOMMENDATIONS

The recommendations closely followed the basic theories of a PMS.

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REPORT vs. OUTPUT TABLE

OUTPUT	REPORTS												
	List	Inven-tory	PCI	Inspec-tion	PCI Freq.	Budget Planning	Budgets Conditions Forecast	Inspect. Sched.	Condition History	Family Curve	Section Predic-tion	M & R	Network Maint.
Branch Number	o	o	o	o	o	o	o	o		o	o	o	o
Branch Name	o	o	o	o	o			o	o			o	o
Branch Use	o	o	o		o	o	o	o	o				
Branch Area	o				o								
Number of Sections													
Section From & To		o											
Section Number		o	o	o	o	o	o	o	o	o	o	o	o
Section Category		o	o										
Zone		o	o										
Pavement Rank		o	o		o	o	o	o	o				
Surface Type		o	o		o	o	o	o	o				
Section Area		o	o	o		o	o	o				o	o
Last Const. Date			o										
Age			o							o			
Last Insp. Date			o	o	o							o	o
Section PCI			o	o	o					o		o	o
Section Length				o								o	o
Section Width				o								o	o
Section Rating				o									
Inspection Results				o									
Sample Distresses				o									
Sample PCI				o									
Recommended Sampling				o									
Extrapolated Distresses				o									
PCI Freq. Table					o								
PCI Freq. Plot					o		o						
Average PCI					o		o						
Total Section Area					o								
Predicted Section PCI					o	o	o				o		
Pred. Min. PCI						o	o	o	o				
Unit Repair Cost						o	o						
Pred. $ Table						o	o						
Pred. $ Plot						o	o						
Pred. $/Section						o	o						
Year to Repair/Sec.						o	o						
Inflation Rate						o	o						
Insp. Sched. Table								o					
Insp. Sched. Plot								o					
Year to Insp/Section								o					
-Pts/Yr. vs. Insp.								o					
Performance Table									o				
Performance Plot									o				
Section Distresses												o	o
$ to Repair/Section												o	o
Network Distresses													o
$ to Repair/Network													o
Family Pred. Curve										o			
Section Pred. Curve										o	o		
PCI Equations											o		
Family Name										o	o		

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FIGURE 2

- Adopt a policy of maintaining good roads, repairing fair roads and only reconstructing poor roads prior to failure. Reports detailing recommended repair techniques and costs per pavement section arranged by priorities are provided.

- Expand the PMS to cover all County roads.

- Periodically reinspect pavement sections to see how they move along their life cycle. Sections where non-destructive testing results or traffic data varies from strict PCI ratings are signalled for more frequent inspections.

- Adopt a policy of maintaining good roads, repairing fair roads and only reconstructing poor roads prior to failure. Reports detailing recommended repair techniques and costs per pavement section arranged by priorities are provided.

- The PMS should be used continuously to protect the County's investment in the system. As with all software, sporadic or infrequent use will cause users to become less proficient and will severely limit their ability to use the system.

- Since budget scenarios often change, assumptions may vary over time, and actual maintenance performed needs to be factored in, it is unlikely that the specific program printed out in the PMS report will remain intact over the next five years. The reports provided by this PMS system should be revised and updated as often as necessary or as desired.

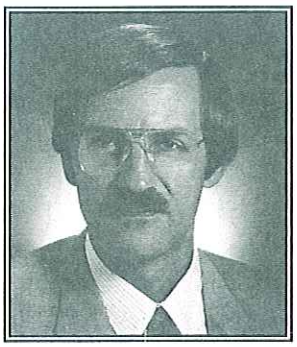
SOME FINAL CONSIDERATIONS

The PMS implemented by Putnam County is dynamic and interactive. When the County, or any other user becomes familiar with the program, the software program can serve as an "answer man." Since the user can vary the grouping and sequencing of data included in almost any report, this program can provide instant answers to many of the questions that come up in evaluating a pavement network's current condition, possible future condition, and repair actions tht may be taken. Analysis of "what if" scenarios are basically unlimited with this type of program. Analyses and reports produced by a PMS system can and should be easily updated to include additions to the network as well as periodic reinspections.

CONCLUSION

Putnam County through its adoption of a Pavement Management System is well on the way to following a systematic method of maintaining and improving their roadway network in a rational, and cost effective manner.

ABOUT THE AUTHOR



Paul R. Brugger, P.E.

Paul R. Brugger, P.E., has served as Project Manager for various Transportation and Environmental projects and is currently the Office Engineer in charge of the Business Operations of Howard Needles Tammen & Bergendoff's (HNTB) Orlando office. HNTB, a nationwide architectural, engineering and planning firm, with other Florida offices in Miami and Tampa, has been serving Florida governmental clients in a variety of engineering disciplines since 1917. Paul is married with three daughters and enjoys racquetball, golf and bowling.

HOW TO CATCH A WILD HOG

A Short Tale By Ed Dougherty

This tale is "probably" true.
The names were changed anyway -- to protect
the innocent, and not so innocent.

Bob was a city boy, wise in the ways of the brick streets and back alleys, and about two years older than his country cousin, who we will call Jeff because that's not his name. Neither, for that matter, was Bob's name Bob, but the names are always changed in relating true stories, even if neither party needs to be protected, or is particularly innocent.

Anyhow, as stated, Bob was a slick article, wise beyond his 16 years, tall, dark haired and handsome. All in all, quite a contrast to his younger cousin, Jeff, who was short, stocky and rather ordinary looking -- also, a little naive. But, as you will see, it was Bob that got the two boys in trouble and ..., but let me tell you the whole story and you judge for yourself which boy was the most stupid. Note I said most stupid, since neither could have been overly bright or what happened would not have happened!

Let The Story Begin . . .

It started late one summer. Bob's parents had had about enough of Bob's summer vacation and suggested he go visit his aunt and uncle, who farmed a piece of land about twenty miles or so from Bob's home, for a couple of weeks. Now, Bob had only recently discovered that girls were a lot better to be around than anything else he had ever been around and he wasn't too anxious to leave town right then. Particularly in view of the fact he had just about gotten one of the neighbor girls to agree to go to the park with him and his feverish young imagination had conjured up all kinds of nice things. But Bob's father was a stern and unforgiving individual and so, despite all his protestations, one Sunday in late August Bob found himself sitting on a rail fence watching his parent's car disappear in the general direction of the city.

The Pig Man Arrives On the Scene

For the first day or so Bob moped around the house, bothering his aunt and interrupting her routine. He did feed the chickens and brought in an armful of cooking wood but no one would let him touch the ax, remembering the time a couple of years before when he pert near cut off his own foot trying to split a log. Then, about the third or fourth day of his "holiday," the Pig Man stopped by and life changed for Bob, as it did for his aunt, his uncle and his cousin, Jeff.

The Pig Man was, as his name implies, a dealer in swine. He ran a small (and dirty) operation just south of Jeff's parents' farm that was littered with garbage of all sorts. His daily work included driving through the nearby small town, collecting garbage in a pick-up truck, which he hauled to the pigs he kept on that small plot of ground. He made a small amount of money on his trash route, something like a dollar a month or so from contributors, but did quite well raising pigs. Socially, the Pig Man was a total disaster, even though he was likely one of the wealthiest men in the area. He and his daughter lived in a rough wooden shack at the edge of the woods bordering his place. His wife had left them some fifteen years or so before the events we're about to relate took place. No one in the community much blamed her, although most folks felt she should have taken her daughter with her.

Katie, the daughter, was the one thing in the world the Pig Man cared about and, as most of the young males in the community agreed, with good reason! As different as night is to day from her father, she was, as our story opens, about eighteen or nineteen years old, maybe five five, a hundred ten or fifteen (give or take a few pounds), black hair and eyes and a complexion that would turn today's pampered skins green with envy. How she kept her looks, not to mention her fastidious cleanliness, living in the midst of a pig sty is anyone's guess. But keep them she did.

Actually, it was more Katie's fault than anyone else's that the boys got in trouble, but she was never aware of it, doubtful she even cared about trouble.

The Pig Man's spread was located right snug against a fairly large and dense wooded area that was owned by a man named Johnson. Anyone who knows anything at all about pigs knows that those critters can get through most any kind of fence and the Pig Man's animals were no exception. I suppose, over the course of a couple years, the Pig Man had probably lost a half dozen or so pigs in the Johnson woods and, of course, those pigs had multiplied. Now, what the Pig Man wanted was to get those pigs back. He had stopped by Jeff's place to let Jeff and his father know he was willing to pay ten dollars apiece for every one of the critters captured and returned to him uninjured.

Beauty And The Beasts

Jeff and his father were, at the time of the Pig Man's visit, in the hill pasture baling hay. If one of them had been present, or if Katie hadn't been with her father, the events that followed might have been avoided. Unfortunately, Katie was there in all her beauty, and once Bob's eyes met hers he was smitten beyond recall. Before he even knew it he had committed to assist in capturing the escaped swine, by now as wild as a March Hare, and returning them to their rightful owner. His reward was a flashing smile and a warm gaze from the lovely Katie, and a sour grunt from her father, as the two pulled away in the battered old pickup.

Now, Bob knew absolutely nothing about wild hogs and precious little about domesticated ones. Even Jeff and his father, farm bred as they were, had no claim to any expertise in capturing wild hogs. Jeff had shot a couple over the last year or so that had wandered out of the Johnson woods and the family had enjoyed the results, but capturing the animals held little appeal to Jeff. Maybe because he remembered the large, sharp looking tusks on the animals he had killed. Whatever the reason, he was less than enthused about it when Bob outlined his plan, and bluntly told Bob to forget it. It was Bob's statement that he (Bob) would forgo the reward if Jeff would help, thus letting Jeff get the ten bucks all for himself, that finally convinced Jeff, reluctantly, to help.

The Plan

Jeff had two major problems with Bob's proposal as it was finalized. First, he didn't think the proper way to capture a wild hog was to dig a pit in the woods and chase the hog into it, and second, it was Old Man Johnson's woods and Jeff had already had several run-ins with that crusty old character. Old Man Johnson, you see, was not only the owner of those woods, but he kept a still hidden back in there, which he really didn't want anyone to see. Also, in one of his better moods, Old Man Johnson was about as obliging as a soreheaded grizzly. Jeff knew about where the Johnson still was located and he made sure to stay a good piece away from it when he happened into the Johnson woods, which was quite often because Jeff and the oldest Johnson girl had a red hot romance going at the time.

He didn't mind the idea of going into the woods and driving the hogs, gently, toward a corral on Jeff's land, from which they could leisurely take them and move them, one at a time, by lead ropes, to the Pig Man's yard. "Put a little corn out," he argued, "and get the pigs headed in that direction and let nature take its course."

Oh, My Hero!!

Bob, who by now had convinced himself Katie secretly returned his passion, remained unmoved by Jeff's logic. "Somehow," he reasoned, "that seems too easy! Now, catching them in a pit, roping them and hauling them in makes a lot of sense. Besides, Katie sure wouldn't see anything great in just corralling them!" Jeff argued in vain. Bob was adamant in his desire to impress Katie as the "Great White Hunter!" Finally, Jeff, by now fully exasperated, agreed to the plan under the condition that Bob dig the pit.

That afternoon, secure in the knowledge that Bob would do nothing further until the following day, Jeff loaded a roll of hog wire on the old hay wagon and repaired to the area he had selected, in his own mind, as the place to trap some hogs. It took him to near sundown to build a stout corral with a narrow opening looking into Johnson's woods and to load his trap with a couple sacks of corn. Satisfied, he returned to the house in time for supper and a last argument with Bob before bedtime.

The sun rose, as usual, very early the next morning, but Jeff beat it up by a good hour. First he visited his corral, grinned to himself at the sounds he heard

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and, quietly as he could, pulled a wire gate across the narrow opening and wired it tightly closed. He was back home by sun up. By seven he and Bob were headed toward Johnson Woods, Bob pushing a wheelbarrow loaded with tools and muttering phrases that sounded a lot like "family ties" and "blood thicker than water."

The Plan Goes Into Action

In addition to his city ways, Bob was just a tad lazy and so it was that Jeff watched in amazement as Bob started his pit and then in pure wonderment as he continued, taking up most of that day to prepare a pit about four and a half to five feet deep by six feet wide and six feet long. As he had promised, Jeff helped by wheeling the dirt excavated to a small clearing a short distance from the site where he scattered it about. He felt reasonably secure, since, as far as he could tell, the trap was being prepared in a corner of the woods far from Johnson's still and a bit north of the cozy little area where he and the oldest Johnson girl were want to meet. Finally, about five that evening, his hands raw and blistered, Bob declared the pit complete and the two boys began the business of preparing the cover, a project they completed just before dark. Bob was much too tired to eat supper so Jeff cheerfully ate his pork chop.

That night as he lay listening to the rain pound on the roof and Bob's snores from the other bed, Jeff thought about his prize. Six of them, all young, penned up, ready to be delivered to the Pig Man. Sixty big dollars! Almost enough to buy that old Model A he had looked at earlier that summer. As he drifted off to sleep the thought occurred to him that he might as well keep the pigs himself, feed them and sell them in the Fall. It's not as if they <u>really</u> belong to the Pig Man, he reasoned, they're just the get of some of his pigs that got out earlier. What bothered him the most was not the idea of keeping the pigs, but the fact he had stolen the corn to trap them from Old Man Johnson's still. Maybe, he thought, that wasn't really the right thing to do. Sleep claimed him right about then.

Early the next morning, the boys headed once more for Johnson Woods, this time with the wheelbarrow loaded with two bags of corn. The plan was simple. They would each trail corn along several paths from the woods, converging on a "main" trail of corn leading right up to the pit. The pigs, Bob said, would follow those trails, see the big trail and eat themselves right into the pit! Easy and simple. Then all they would have left to do was to lasso them, pull them from the pit and haul them to the Pig Man, about half a mile away, using the wheelbarrow. They would, he explained, repair the pit cover after each pig and before they hauled their catch away. Jeff stayed silent.

The Plan Goes Awry

It probably would have worked, it was just that stupid, but a couple things happened that the boys hadn't expected, as well as a few thing they <u>had</u> expected.

For one thing, Jeff was wrong when he assumed Old Man Johnson would be too drunk to know he'd lost a couple sacks of corn. Not only had he discovered that loss only that morning, but he was determined to find out where it had gone. As some of you may know, it takes a certain type of corn in a certain condition to make the best whiskey and that corn was just right, so Johnson was less than happy about the loss as he set about trying to pick up some kind of trail. Luckily, or perhaps unfortunately, the previous night's rain had pretty well obliterated Jeff's trail, but Johnson was no fool and he knew whoever took the corn had to either head north across Jeff's father's place, east across a heavily overgrown slough, or west toward the Pig Man's place. He had a natural dislike for the Pig Man and assumed, immediately, that direction was the most likely, south being out of the question since they would have had to run the gauntlet of what he thought were his vicious dogs.

So, west he headed, as Bob scattered corn from his bag going east from his pit. They met about two or three hundred feet from the pit.

The Chase Is On

All Johnson really saw was a torn sack, obviously with corn inside, and a strange young man holding it. What Bob <u>saw</u> was a six foot four giant of a man with a black beard and fierce blue eyes, carrying what had to look more like a cannon than a 12 gauge shotgun. What Bob <u>did</u> was to drop his corn, turn tail and run, as fast as his legs would carry him, in the direction from which he had just come.

In the meantime, a big old boar hog had ambled out of the bush beside the path Bob had showered with corn and started rooting and eating his way along the path, not, as might be hoped, in the direction of the pit, but in the direction of Bob, who, by now, was speeding toward him in long strides. They met right where the narrow path ran along a creek, swollen now from the recent rain.

Bob, for all his city ways, was no fool. He took one quick look at the long tusks facing him as he skidded to a stop, one desperate glance at the enraged Johnson behind him and, without hesitation, leaped for the nearest tree. Unfortunately, that tree was sort of small and was growing along the creek bank. Now, its roots loosened by the rain and over weighed by the sudden impact of a hundred sixty pounds of frightened boy, it slowly and majestically fell, slap dab into the middle of the creek, Bob holding desperately to it all the way down.

By now the boar realized something was wrong. The trail of corn still lay before him, but his senses told him there was something large and hostile along that trail. Determined to keep his food source secure, the big animal snorted and began paving the ground. Now, a wild boar, with tusks several inches long and weighing four or five hundred pounds, is a formidable foe. Even Johnson recognized that fact and put on the brakes as he came face to face with the boar. As stated, the rain the previous night had a lot to do with what happened -- in this case Johnson's feet slipped, flying above his head, and he landed with a thud flat on his back. As he hit the ground his shotgun went off with a roar.

It so happened he had been running with the shotgun pointed at the ground and, as luck would have it, the blast occurred as the gun's barrel was pointed in the general direction of his feet, which happened to be parallel to the ground and pointed at the boar hog at the time. Now the shot from a 12 gauge shotgun, even one loaded with bird shot, is not much fun if it hits from thirty feet or so, even if only the edge of the pattern hits. The boar, stung by the pellets and by now thoroughly confused, turned and high tailed it directly toward Bob's trap, some fifty or so feet away.

A Flirting Bobcat

While all the excitement was going on Jeff, figuring discretion to be the better part of valor, had climbed into a big cottonwood tree growing along the creek bank and, straddling a big limb about half way up, was watching the action. About the time the gun went off he had the uneasy feeling that something was watching him, along with the action below. Nervously, he looked about and there it was, a big, very big, bobcat, laying along a branch just below his refuge and about six feet away. For a long moment the beast and the boy stared at each other before the cat turned his attention to the drama below. Jeff would always swear the animal winked at him as it turned away.

By now Johnson was on his feet again, swearing at the top of his voice, and following the big boar hog. The boar, excited and unsure, had almost reached the edge of Bob's trap when something warned it and it cut to the right bypassing the trap and crashing off into the woods in the general direction of the North Pole. Old Man Johnson was not so lucky.

Surprise Catch In The Pit

Aware that the faint trail along which all the action had taken place would curve to the north a few feet beyond the point where the boar had turned, Johnson rushed along the path and fell, perplunk, into Bob's pit, now nearly filled with muddy water from the previous night's rain.

Jeff knew the man was all right from the sound of his swearing, the only sound he could hear except for the gurgle of the creek running through the underbrush and, Jeff feared, over the body of his cousin Bob. He looked in the direction but could see nothing except the tree lying in the stream with water starting to back up slightly from its damming action. He glanced in the direction of the bobcat and was relieved to see that the limb was empty. Quickly, he climbed from his perch and hurried in the direction of the fallen tree, glancing anxiously over his shoulder toward the trap and Old Man Johnson. There was no sign of pursuit and he could still hear the old man cursing, quietly now, but steadily.

Bob was nowhere to be seen, but marks on the opposite bank, where a heavy body had obviously pulled itself up, or had been pulled up, attested to the relative safety of his cousin. Jeff worked his way downstream a short distance where he knew a fallen tree spanned the small stream and made his way across it to the

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opposite shore. Staying well out of sight of the stream and any possible sighting by Johnson, he made his way back to the point where it appeared Bob had left the stream, where he hunkered down behind a thick bush. Soon, peeking through the bush, he saw Johnson staggering along the path on the opposite bank, apparently unhurt and headed in the general direction of his house.

As soon as Johnson was out of sight, Jeff took up the trail of cousin Bob, moving as swiftly as he dared. It was easy to follow, going due west, bush crushed by the hurried passage of a large frightened teenager. Finally, right at the edge of Johnson's woods, he found the young man, firmly caught by the barbed wire fence that separated the Pig Man's farm from Johnson's place. He was a sight to behold! Scratched and bleeding from dozens of brush cuts on his arms and face, his shirt tattered and torn, his trousers in about the same shape, he was a pitiful sight as he hung from the barbed wire held firmly by what remained of his shirt and trousers.

It took awhile to release the shaken Bob from the grasp of the barbed wire and even longer to get him calmed down to the point where they could try to come up with an excuse for his condition. Jeff knew, instinctively, that regardless of what story they told he would get full credit for his cousin's condition. After all, Bob was a guest!

The Big Payoff

There was a bit of a to-do when the two boys finally arrived home. As it turned out, Jeff came off a lot better than he deserved and a good deal better than he expected. Bob, of course, as the injured party, was pretty well confined to the house under the critical eye of his aunt, while Jeff was more or less returned to his chores and the opportunity to feed and water his captures in private. A week later, Bob returned to the city and Jeff, breathing a sign of relief, prepared to deliver his "catch" to the Pig Man and collect his fee.

Imagine his surprise when he found one little pig was all that was left of the half dozen that had been happily squealing when he left them the day before. Search as he might he could find no evidence of an escape route. Only the twist to the wire holding his narrow gate in place was different and, he realized, it gave evidence of some human hands involved. When he found the half emptied sacks of field corn he had stashed in a clump of bushes nearby were also gone he was sure his pigs had been stolen.

Somewhat disheartened, he caught and tied the remaining pig, then led it to the Pig Man's place. When he got there he found only Katie was home. Her father, she told him, had gone to the city for the day with a load of pigs and wouldn't be back until late.

"The strangest thing," she continued. "Old Man Johnson came by early this morning with five pigs about the same size as yours! He told Daddy he needed the money right away because he was trying to get a little nest egg for his daughter, who was moving to the city soon. I suppose he meant Betty, since the young ones are still in school."

That was about all Jeff needed to finish off his summer. Not only had Old Man Johnson stolen his pigs, but he was using the money from them to send the love of his life away! Something of his feelings must have shown for Katie, with first a surprised look, then with a knowing smile, continued. "Bet there's at least one young man around here that'll be sorry to see her go!" Her black eyes danced as she reached out and curled her index finger around the top button of Jeff's shirt. "But if you want to come inside where the fan's going I'll make you some iced tea and show you there's no need to feel bad!" Meekly, he followed her into the old shack.

Jeff's first class, when school resumed a week or so after the foregoing incident, happened to be English. As usual, Miz Taylor's first request was for a short paper, " a single sheet," she told them, describing what adventures they had enjoyed over the summer. Jeff thought for a minute, then wrote:

"Fed cattle, baled hay, stripped bluegrass, caught one bass and three catfish. No adventures."

He folded the paper lengthwise, the way Miz Taylor liked it, wrote his name, the date and the class at the top, and laid it on the corner of the teacher's desk as he quietly left the room.

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Bridge Management Today Reduced Program Cost Tomorrow

OVERVIEW

It has been estimated that $50 billion would be needed to replace or rehabilitate the nation's deficient bridges. This estimate is based upon the cost to eliminate the deficiencies of 131,562 structurally deficient bridges and an additional 112,084 functionally obsolete bridges. The $50 billion in needs has remained nearly constant for the past several years in spite of a growing program of bridge improvements which now approximates $5 billion per year in expenditures -- including $3 billion in Federal aid -- to replace or improve up to 10,000 bridges annually.

The above figures present an alarming picture of the status of current bridge needs. The sheer number of deficient bridges in comparison with the total number provides a quick indication of the scope of current bridge needs and the complexity of the bridge management problem. While a small percentage of bridges are in "mint" condition, and many are in good condition serving traffic well, there remains a high percentage that have serious problems. Added together, some forty percent of the nation's bridges are either structurally deficient of functionally obsolete.

The $50 billion figure reflects the estimated cost of improving, or in other words, erasing the deficiencies of the number of bridges that meet the eligibility criteria for the Highway Bridge Replacement and Rehabilitation Program. This cost estimate provides a "yardstick" measurement of the magnitude of the nation's bridge needs but is not a refined estimate of needs by any means.

When we look at these national statistics, the problem appears large and unmanageable. Let us focus on the conditions that exist in our state and how we may manage our bridge problems.

Recent data showed that Florida had 10,226 bridges on the state, county and city road systems. Some 2,312 of these bridges are classified as structurally deficient or functionally obsolete. This is less than twenty-three percent of all Florida bridges. When this percentage is compared to the national percentage of forty percent, Florida as a whole looks good.

However, when we look within the state, we find that thirty percent of local government bridges are structurally deficient or functionally obsolete as compared to only seventeen percent of the state's bridges.

While the local government percentage for deficient bridges is still below the national percentage, it does point out the disparity in the number of deficient bridges between state and local governments in Florida.

The two most significant reasons for this disparity in deficient bridges are the amount of resources available to the state versus those available to local governments and how each of these groups manages their resources. While the amount of resources should be proportional to the need, it is most difficult to define and quantify the need. However, well-organized and well-managed bridge replacement, rehabilitation and maintenance programs will both move to define the needs and open the way for the appropriate allocation of resources. Today, many states and local governments are developing Bridge Management Systems (BMS) that address total management of their bridge facilities.

DEFINING NEEDS

Before a BMS can be implemented, it is necessary to develop a concept of needs. Management must know what the needs are in physical terms and in terms of the funding required for improvements; have a reliable method for predicting future needs; and understand how the needs vary both from bridge to bridge and system-wide in response to various policies and actions.

Estimation of present and future needs is a key issue. A bridge management system should

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include both the data and analytical procedures necessary to provide reliable estimates. A BMS can provide this output if it incorporates the following:

- Sufficient and reliable data for describing the condition of each bridge.
- Criteria and functions for developing current needs estimates based upon a bridge's geometry, condition, traffic volume, functional class, etc.
- Analytical models for predicting the change in bridge condition due to future deterioration and bridge improvement work.
- A means for expressing needs in terms of the amount of work required or the cost.

COMPREHENSIVE BRIDGE MANAGEMENT SYSTEM

A general definition of a BMS could be any system or series of engineering and management functions that, when taken together, result in the actions necessary to manage an effective bridge program under known or anticipated resource conditions. Simply stated, these actions are:

- Inventory and inspecting bridges
- Evaluating bridge problems
- Establishing priorities
- Selecting bridge improvement projects
- Programming and initiating projects.

A bridge management program is more likely to result in sound, cost-effective decisions if formal, preferably written, procedures are used to ensure consistency in the decision-making process; state-of-the-art analytical tools or models are used to evaluate needs, priorities, and options; and an adequate database is developed to support the analytical models.

A comprehensive BMS may rely heavily on automated data processing. However, a BMS is not intended to be a wholly automated series of computerized procedures that eliminate the need for judgement (engineering, fiscal, etc.). Neither is it intended to make all decisions on bridge improvement activities. Rather, the BMS should include automated procedures to provide analysis and necessary information for program managers to make more cost-effective and efficient decisions.

The concept of a comprehensive BMS is presented in Figure 1. System components, typical inputs and typical outputs are identified in the concept. Important features of a BMS that cannot be overstressed are the interdependency between components and the formalized feedback and evaluation process.

WHY A BMS?

A BMS is intended to assist in making bridge program decisions. this may represent a sharp departure from previous practices in which bridge engineers rely heavily on field inspections and judgments to set priorities for bridge programming. In other words, reliance on systematized procedures for making bridge programming decisions is different from applying engineering expertise on a case-by-case basis.

An agency may be reluctant to establish and rely heavily on a BMS if its purpose is to supplant many of the traditional roles of the engineer. For this reason, it is important to ask, why a BMS? What can be gained from it above and beyond the input engineers traditionally have been able to offer?

A BMS does not look at bridges on a case-by-case basis but allows an agency to examine simultaneously the implications of undertaking bridge replacement, rehabilitation and repair. One gets a glimpse of the whole, not just the parts -- the whole being more than the sum of the parts. With a BMS, it is possible to compare long-term needs with short-term needs and to identify shifts in the age distribution of bridges over time, hence shifts in the relative replacement and repair needs. It is possible to determine intertemporal tradeoffs. If more is spent on preventive maintenance now, can the lives of bridges be extended and replacement needs be reduced? By being able to rapidly and systematically compare life cycle costs of many projects or measures of cost effectiveness, it is possible to identify packages of projects that will make the available funds go the furthest.

An important potential purpose of a BMS is to be able to analyze different policies, such as the implication of different capacity, roadway width and clearance standards or the implications of increasing the number of bridges funded with local monies only. An agency also might be able to determine the desirability of issuing bonds to complete certain bridge projects by comparing the implicit rate of return due to life cycle cost savings with the cost of borrowing money.

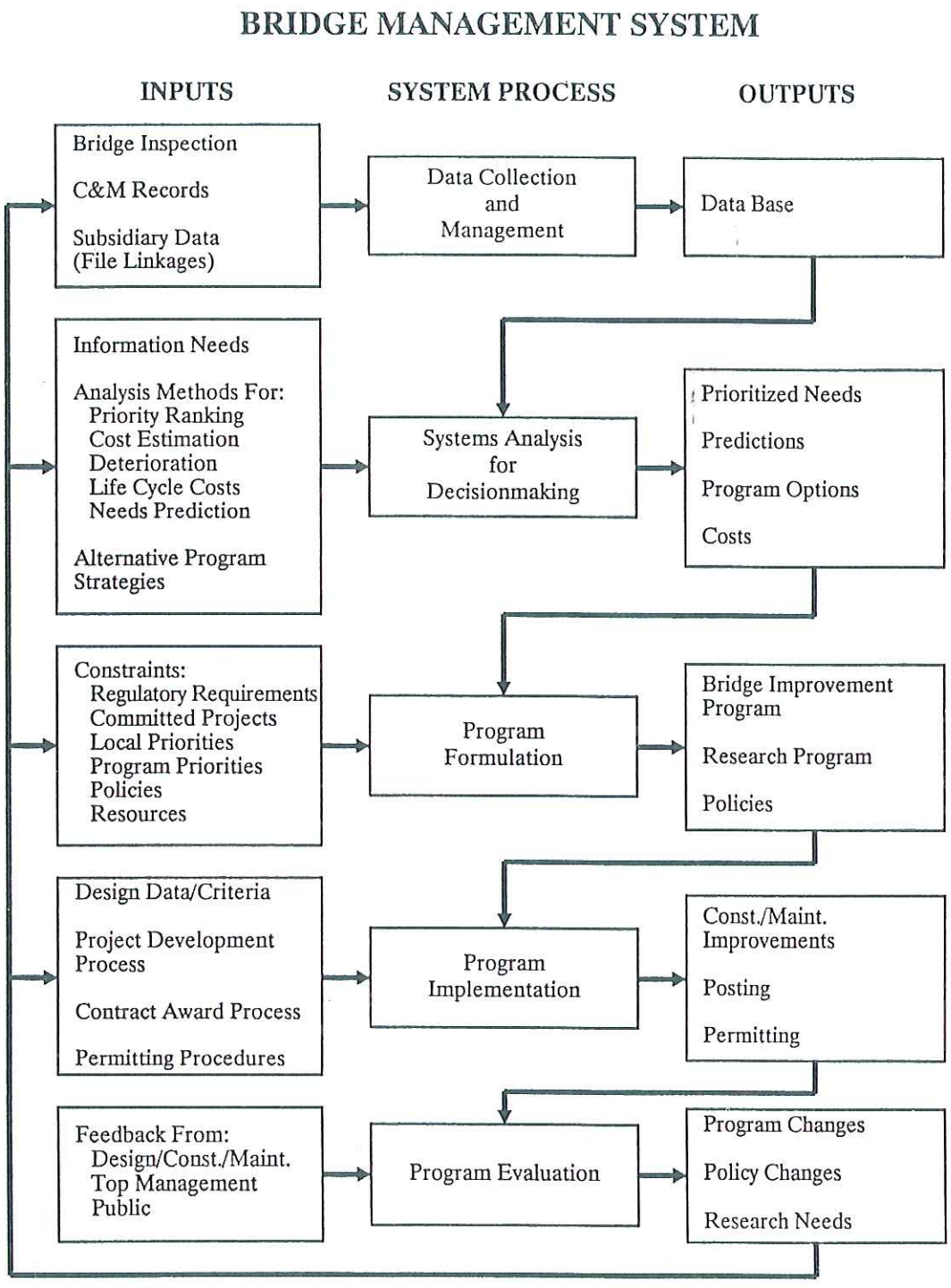
BRIDGE MANAGEMENT SYSTEM
INPUTS
SYSTEM PROCESS
OUTPUTS
Bridge Inspection
C&M Records
Subsidiary Data (File Linkages)
Data Collection and Management
Data Base
Information Needs
Analysis Methods For:
Priority Ranking
Cost Estimation
Deterioration
Life Cycle Costs
Needs Prediction
Alternative Program Strategies
Systems Analysis for Decisionmaking
Prioritized Needs
Predictions
Program Options
Costs
Constraints:
Regulatory Requirements
Committed Projects
Local Priorities
Program Priorities
Policies
Resources
Program Formulation
Bridge Improvement Program
Research Program
Policies
Design Data/Criteria
Project Development Process
Contract Award Process
Permitting Procedures
Program Implementation
Const./Maint. Improvements
Posting
Permitting
Feedback From:
Design/Const./Maint.
Top Management
Public
Program Evaluation
Program Changes
Policy Changes
Research Needs

FIGURE 1

A corollary to these kinds of questions is whether the BMS should address long-run, mid-term or short-run issues. Agencies that want a BMS to assist in making specific bridge investment decisions in the present will want a system with plenty of detail to approximate and augment the traditional decision-making process of engineers. Engineers using a tool like this for short-run analysis and programming will want to be able to compare their own firsthand understanding of a bridge's substructure, superstructure and deck condition with the corresponding information from a BMS. If the BMS lacks this kind of detail and poorly approximates engineers' own decision making criteria, then those engineers responsible for program and project decisions will be less likely to trust it. On the other hand, the BMS may provide data of a long-run nature which engineers have not traditionally had, such as estimates of future maintenance costs, predictions of future conditions and life cycle costs. These new bits of information may allow engineers and managers to make better decisions.

Some agencies may shy away from a BMS that potentially competes with their short-run or mid-term bridge programming process, but they might be more prepared to accept a BMS that concerns long-run trends and that allows them to perform system or strategic planning for bridges.

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COMPUTER AIDED DESIGN & DRAFTING

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MANAGING UNPAVED ROADS IN HILLSBOROUGH COUNTY

Back To The Future

Les Eighmey
Director
Road Department

Unpaved roads are a fact of life for nearly every public agency in Florida. The historical progression of roadway construction here has often been categorized as from "Cowpaths to Highways." A significant, often long, transitional stage in that process is the dirt or unpaved roadway. "Unpaved" is a difficult term to precisely define. For the purposes of this discussion we will define "Unpaved as "Being without an asphalt or concrete bound surface."

In order to make quality decisions regarding unpaved roads it was essential to get the facts regarding the typical profile of an unpaved roadway in Hillsborough County. The typical unpaved roadway is in a distinctly rural, generally tree-lined setting, is less than 20 feet wide, is often in a high groundwater area with poor drainage conveyance, and is generally described as being an asset to the character of the community except for the inconveniences of poor ride quality and fugitive dust. As we are all aware, they are very costly items to maintain. A typical action time line profile was also developed, as shown in the chart:

The data shown in the box below shows the routine maintenance cost of about $0.25 per square yard per year. This competes with an average routine maintenance cost of about $0.12 per square yard for paved roadways. Thus the unpaved roads cost twice as much as paved roads to maintain! The final improved road provided is a double surface treatment over limerock base.

Given this information the problem statement becomes "How can we reduce the routine maintenance cost as well as the improvement cost?" Obviously, the primary strategy is to manage these roads not to perpetually maintain them. Secondarily, pave them as soon as possible reducing the routine maintenance cost from that of an unpaved road to that of a paved road. As with most problems the answer hinged on finding available funding to address this. The key to a best-case solution would be to significantly reduce the total improvement cost. Many alternatives were explored. Many alternatives were discarded. Ultimately, a practical solution was found. Interestingly, it was a "Back to the Future" strategy. Asphalt mixed-in-place roadway construction technology was very popular in Florida during the 1930-50's. It involves mixing liquid asphalt with in-place materials to form a highly impervious, high strength, long durability road at less than the cost of a conventional aggregate base road. Here was our answer. With this technique we have consolidated the initial $10,000 stabilization cost, the $45,000 base and surface cost and the additional unpaved road routine maintenance cost. In their place we substituted a one time $30,000 per mile mixed-in-place cost. The

TEXT	ACTION DESCRIPTION	COST/MILE
-	Road accepted for County maintenance	
1 - 3 mos.	Initial improvement cost - stabilization	$10,000
1 - 4 yrs.	Routine maintenance cost at $3000/year	12,000
5th year	Final improvement cost - base and surface	45,000
		= = =
Total Typical Cost:		$67,000

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final improved road is a 6-inch mixed-in-place with a sand sealed surface.

Thus, currently:

TEXT	ACTION DESCRIPTION	COST/MILE
-	Road accepted for County maintenance	
1 -3 mos.	Improvement cost - mixed-in-place	$30,000
		= = =
Total Typical Cost:		$30,000

The engineering economics are obvious. We now can do two miles for each one. We gain a road with fewer maintenance needs from water saturation. We reduce the need to adjust grades by constructing mixed-in-place at grade. We significantly increase the structural coefficient. We also more closely maintain, the character of the community while eliminating poor ride quality and fugitive dust problems. We anticipate exceeding the maintenance life cycle of our previous strategy.

We are working to have no more unpaved roads in Hillsborough County by early 1992. We will then apply the funds currently used maintaining and improving unpaved roads toward improving the service level of our paved roadway network. As we reduce routine maintenance needs on unpaved roads we gain the use of valuable employee time to address other maintenance needs. We are currently using a wide variety of different rehabilitation strategies on our paved roadways, but that's another story.

CADD - The Dilemma of Progress

Stephen D. Webb, P.E.
Greiner, Inc.

Computer-Aided Drafting and Design (CADD) for Personal Computers (PC) is here! Over the space of a few short years, PC-CADD has become an integral part of our daily routine as engineers, technicians and drafters. As an essential, and sometimes required, part of the plan production efforts, PC-CADD has also evolved into a quick, efficient design tool that can readily supply three-dimensional graphics or quantities, as well as concise engineering drawings.

Difficulty still exists, however, in attaining a proficient, reliable method of utilizing PC-CADD to produce a set of engineering design plans. This dilemma can be attributed to three basic causes. In some cases, the computer system may be unable to accommodate an agency's PC-CADD needs and demands. Another problem may occur with the basic methods and procedures that are used to operate the PC-CADD system on a daily basis. Lastly, the management of the PC-CADD system requires discipline, as well as a high degree of understanding.

The first of these basic difficulties can lie in the computer hardware and software of the individual system. It is imperative that the system and its peripherals match the intended tasks. Major considerations in the selection of a computer system are the speed of its microprocessor, its memory storage capabilities, output devices such as a printer or a plotter, and the method of data transfer.

Most engineering uses for PC-CADD require that the speed of the microprocessor be state of the art. In today's market, a basic system would include an 80386 or 80486 processor providing rapid regeneration of on-screen graphics and minimization of an operator's down time.

The speed of a PC-CADD station can also be affected by the amount and type of memory storage utilized. In general, the more memory supplied the more efficient the system. RAM memory, which is memory immediately available to keyboard operations, provides for quick access to large amounts of programs or data. Hard-disk memory provides for on-line storage of large amounts of data or large drawing files. With most popular engineering software packages, a minimum of 4 Megabytes of RAM and 150 Megabytes of hard-disk storage will provide an operator the flexibility to efficiently handle large-scale projects.

Engineering projects have historically required detailed outputs of both calculations and drawings. To achieve the output in the desired format, the type and quality of output devices is imperative. A graphics printer capable of quality, high-speed output to both text and graphs is essential. Plotting capabilities are imperative to the output of distinctive, color exhibits, such as project graphics or details.

Most engineering firms require the capability of computer communications or the ability to talk to other systems. High-speed data transfer is accomplished through phone modems. Low-end data transfer is accomplished through floppy disks. File archival, or the transfer of non-essential data from the hard-disk in order to free up space, is also accomplished through the use of low-end data transfer. Engineering applications will normally require a high-speed modem, two floppy disks, either 5-1/4" or 3-1/2", and a high-speed tape drive, used for file archival and data backup. By utilizing these guidelines, an engineering firm can establish a solid foundation from which to develop a productive PC-CADD department.

Another difficulty encountered by all users concerns the operational techniques that are used for PC-CADD production.

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Many techniques can be acquired through formal training, which can help minimize the learning curve. These techniques include a systematic backup and updating of computer files. This should be done not only for archival purposes, such as at the completion of a project, but on a daily or weekly basis as well. Because most PC-CADD software packages are lacking in an adequate paper trail, it can be an insurmountable task to re-create lost data files.

An additional technique that must be employed regularly is standardization. Most agencies will require the services of more than one operator. It is imperative that all PC-CADD operators utilizing the same work station or working on the same project standardize their daily routines. Basic line types, colors, and shapes must be used from project to project. To fully realize the full potential of PC-CADD, in addition to standardization, there must also be some customization, both of the software and of the PC system itself. This can be done by an outside programming consultant or by the PC-CADD operators.

Another technique that must be developed is in record keeping. Greiner has found that PC-CADD files can become quite large and complicated, requiring the operator to temporarily archive portions of the project. We employ daily archival of records, file storage and contents.

Finally, the greater part of the PC-CADD dilemma can be best described as a challenge in management. Many of today's managers were educated prior to the age of computerization. Indeed, many mid-level project engineers are in this group as well. These professionals are most comfortable with such familiar tools as calculators, scales, triangles, and reference texts.

Instead, today's engineers are being graduated with an advanced education in computers. Generally, they are at ease and even somewhat dependent upon computers to the point of being spoiled by their speed and accuracy. As a manager tries to integrate new computer analysis techniques into the design process, he must increasingly rely on his most inexperienced designers, the young engineering graduates, to implement this work. To survive this dilemma, the manager must exercise patience. The inexperienced PC-CADD designer must be allowed to develop his skills within an established system of checks and balances while at the same time being shown how to access conventional tools such as calculators and reference texts to correlate the conclusions of the computer software. With proper guidance and training, the PC-CADD designer will become the most valuable component of the entire design team.

Each engineering manager must learn to adapt his own strengths and the strengths of his department to realize an efficient PC-CADD operation. Training, experimentation and patience are all a part of this education process. With the proper computer hardware, carefully selected software, and management techniques, a PC-CADD system can be a productive and integral part of the engineering work force.

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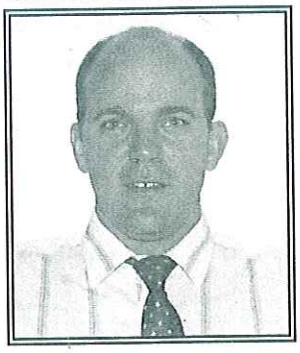

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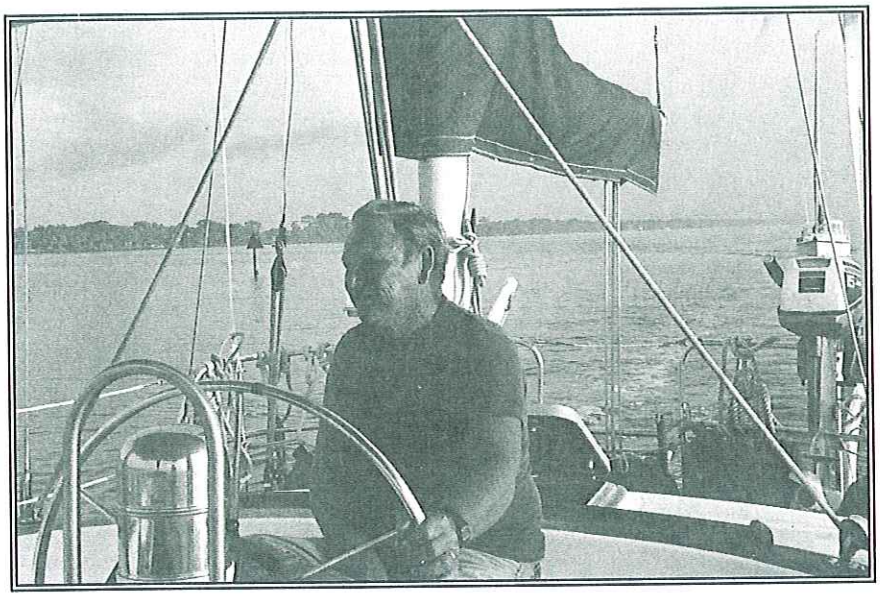
TRIBUTE TO A FLORIDIAN COWBOY

By Arlene Lowery

Secretary to George Flack
Volusia County Road and Bridge Director

My nineteen year old daughter, Anne, had to conduct an interview and write a paper about the life of a person at least sixty years old for her college psychology class. Her teacher had advised the students to simply talk to their grandparents. Unfortunately, we were Florida transplants, and the nearest grandparents in our family were some 1,200 miles away. Our neighbors were strangers to us, and our friends simply not old enough for her assignment. Out of desperation, I asked around my office and found out just who qualified. After much teasing about who was "old," the Assistant Road and Bridge Director kindly granted an interview. Anne begged me to go with her -- "Mom, you know him better than I do." Indeed, I thought I knew him, but not his story!



Lewis Hardy, the Floridian Cowboy, today.

EARLY DAYS

Lewis A. Hardy was born on May 30, 1929, in New Smyrna Beach, Florida. In those days people knew everyone because the population was nothing like it is now. There were few tourists and the beach was beautiful and spacious enough for horse racing. The only road that connected the east coast to central Volusia County (if you wanted to go to the DeLand County Courthouse) was Old Highway 44. Lewis was one of three children. He had both a sister, Jennamay Hardy, and a brother, Francis. His parents, Cecil and Ruth Hardy, were simple, hardworking farm people. His early years were spent in a house with no plumbing or electricity, which was not unusual for all the homes in that area.

When Lewis was five years old he was involved in a vehicle accident that impacted his entire life. His family was on their way to market some cows when suddenly a logging truck hit the Hardys and Lewis flew out of his sister's lap and through the windshield. In those days there wasn't anything like "safety glass," just brutal slivers of death flying and slicing this young boy deeply on he sides of his face. Luckily, a kindly neighbor happened by and he held Lewis' bloody head together until medical help arrived. It was months before Lewis recovered. In fact, he had to repeat the first grade because he missed so much school.

Growing up in Lewis' world was very different compared to today's hurried lifestyle. Mothers stayed home to take care of their families and fathers were the strong figurehead. Lewis' father was the stern disciplinarian. "We didn't dare get out of line," he commented. There weren't many toys in his childhood either, but there were chores and a sense of pride in pulling your own weight. Their farm spread out for acres and there were always cows to be

rounded up using dogs and horses. There wasn't any television, video games, or such pastimes -- just sun through the trees, the cries of birds, and the sweet smell of the damp earth as the horse worked the cows toward the proper pasture. This peace became part of him. When he wasn't working, he was in the woods hunting or just walking and enjoying nature.

As a young man, Lewis learned carpentry from an uncle, Emery Hardy. His appreciation for hand made furniture and wooden structures stayed with him throughout his life. If he couldn't build it himself, he found someone who could. He was personable and people would do things for him.

THE REUNION

After school and a short time in the military service, Lewis came to work for the very man who had stopped and saved his five year old life. It wasn't until years later that Lewis realized how much he owed this man who was captain for some boats that sailed the Great Lakes. Lewis became a sailor for him, and met and fell in love with his wife, Sandy, the captain's daughter. Sandy made quite an impression on him, just as friendly and as nice a girl as one would ever want to meet. Lewis claims he doesn't remember asking Sandy to marry him. He just took all his savings and bought her a diamond ring, and they've been together ever since.

FAMILY LIFE

Lewis' career as a sailor on the Great Lakes ended, and his final job was with Volusia County Road and Bridge Division of Public Works. "I grew up next door to Road and Bridge at the prison farm because my father was the warden there." Cecil Hardy worked for Volusia County at both the New Smyrna Beach and DeLand prison farms for more than 34 years.

Lewis' next thirty years were spent farming cows, raising a family, working for Road and Bridge, and building six different houses. "My children were as different as night and day, but they had a good life and never got into trouble. They were good kids," he remarked. Most of the childhood of his two daughters, Terri and Debbie, and his son, Rick, was spent in the house he built by the lake. "My girls would go camping in the woods and I wouldn't see them for days and I didn't worry about them." It was a good life, people still trusted each other and there was "no need to put locks on your doors." When asked about drug or alcohol problems, it was foreign to him. "I don't drink, smoke or use drugs, nor does my family. We were just too busy for it."

I asked him if he was happy to see his children grow up and leave home. He shot me a painful barb that brought tears to my own eyes -- "No." There was a brief pause and then he reconsidered. "I didn't want them to leave, but grown kids need their own place." Now his daughter, Terri Montgomery, her husband, Sam, and his grandson, Ryan, are in Hawaii. His other daughter, Debbie Hyde, and her husband, Bill, fill the quiet gaps with brief visits that include their two children, Steven and Sara. His son, Rick Hardy, lives down the road from Lewis' newest house in Lake Helen. Rick is a mason and he loves to fish. He and his wife, Rafaella Hardy, have two children, Jason and Amanda.

When asked if he ever thought much about death, there was another silence. "Yes, just lately." He explained that Sandy's mother had had a bad stroke, and her father had been terminally ill. They mercifully passed away on the same day. "I feel a deep loss because he was my friend. They were both such good people."

When asked about the afterlife, Lewis didn't think there would be angels flying around and St. Peter opening a pearly gate to Heaven. "That doesn't make sense to me." He said he thinks that this life is all you have to live and you should do the best you can with it. "People should get along."

Lewis likes people. "I think I've only had three fights in my whole life, but I try to get along with everyone." He said he was happy with his job at Road and Bridge, and that he still loves his wife after all these years -- "She's still just like the day I met her."

THE FUTURE

What does the future hold for Lewis Hardy? "I'm looking forward to my retirement from Volusia County service, as long as my health holds up." Lewis and Sandy have a sailboat that they've already taken to the Bahamas and he says he still has some finishing touches to add to the house he's been building. He says he's been encouraging Sandy to continue her painting, as she's a very gifted artist. "We even got a pottery wheel that we're going to learn to use."

At the conclusion of our interview, although I was glad to hear of his plans for his retirement, my heart still twinged.

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For the past seven years my relationship with him had grown from casual acceptance to full blown respect. He was more than a friend to me -- he was a gentleman with over thirty years experience with Volusia County and he was willing to show me how to survive it all. In my opinion, as an Assistant Director for Road and Bridge, there was none who could fill his shoes. Employees naturally gravitated towards him because he LISTENED to them. He had always encouraged me to do my best. "I have all the faith in the world in you," he'd quip whenever I'd falter. He is certainly appreciated, this decent, upstanding Floridian Cowboy.

ABOUT THE AUTHOR

Arlene Lowery

Arlene Lowery has been a Volusia County employee for ten years. Arlene is married and has two teenage children. Her hobbies include swimming, boating, jazzercise and creative writing.

Ed Dougherty:

CAMPING AND CATFISHING

Once upon a time, not so long ago, when I was a young lad, I had two very close friends, both of whom lived in the small town close to the farm on which I was raised.

In those days young people on farms had certain assigned chores that they must do if the family was to stay peaceful. Mine were simple -- milk the cow at 5:30 a.m., bring in the wood for the day (we kept a couple days supply in the wood box on the back porch just in case of rain or something unusual), eat breakfast, go about my daily life, cut wood in the evening for the next day, milk the cow about 6 p.m., eat supper, listen to the radio until about 9 p.m. and go to bed.

In the winter my daily routine consisted of clearing a path to the hen house and the outhouse if it had snowed, then to school. After I got old enough I took a job in town that took care of my time between 7 and 8 a.m. and 4 and 6 p.m. weekdays and 7 a.m. to 10 p.m. on Saturdays. Summers, before the town job, were generally spent helping my father cut noxious weeds (dock, thistle, etc.) from the pasture, stripping blue grass (for the seed) and putting up hay, amongst other things like fence repair, feeding cattle, etc. I did have some free time before the town job -- usually after the 6 p.m. milking on Saturday and all day Sunday (except for church, which was mandatory).

The little town near our farm had a movie theater that changed the film every two to three days and cost, if memory serves, ten cents per entry (children) and a quarter for adults. Since most of the adults made somewhere between $15 and $25 per week, a quarter represented a lot of work for them. The town had, usually in August or early September, a "Frontier Days" celebration when all the merchants dressed up like western movie stars and walked around with a "six gun" strapped about their hips. I guess they enjoyed it, but it did get kind of tiresome seeing them challenge each other to "Draw, pardner!"

Once a year there was a medicine show that came to town and stayed for a week. As, I suppose, did most of those type shows, this particular show featured a "Doctor," an Indian, a young man, an older woman who sang and a young woman who danced. Basically, it was harmless entertainment, I guess, though the "medicine" they sold surely contained a high content of grain alcohol. The claims made by "Doc," as he was called, were extravagant, supposedly curing everything except athlete's foot, but people had a good time and we never heard of anyone suffering any ill effects from it. (A friend of mine did get a bit tipsy once, but the darn fool drank a whole bottle of the stuff at once!)

That was the extent of entertainment at the time of which I speak. The little town housed a Baptist college on the eastern side, high on a hill, and on the west side of town, also atop a high hill, sat the high school -- the only secondary school in the county. Most of the high school graduates that attended college just went from the west side of town to the east side. They were few in number -- college was something only the well-to-do could afford in the 30s.

Since church was mandatory, none of us boys got much from it, other than the realization that we were headed straight for "Hades." The preachers in those days wouldn't use the word "hell" except in the context "hell and damnation," this expression being used only in an extreme situation such as might occur when one of the flock had been caught in adultery or committed a real serious crime. Then the preacher would promise the congregation that individual was condemned forever to "hell and damnation." None of us wanted to be publicly branded like that, so we were real careful to behave -- well, reasonably careful. Even so, when faced with our sins each Sunday morning, we were thoroughly convinced we were headed helter-skelter for Hades. Somehow, the idea that "Hades" and "hell and damnation" were the same thing never occurred to us!

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But I digress. This all started as an effort to tell you about one of my happiest childhood memories and it's time to get about the subject.

We had a small lake on our place, fairly shallow, running six to eight feet deep at the dam, about 350 to 400 long north and south, and slightly longer east to west. It was spring fed, cool even in summer, and stayed fresh all year round. It had been on the place for as long as anyone around those parts could recall, and was far enough from the perimeter fence that no one bothered to go there. Someone had built a hog-tight wire fence around it, which kept the cattle out, and there were several large cottonwood trees along the north bank -- all in all, a pretty place. There was a large wooded area below the dam that belonged to someone else, and those woods were full of fallen timber and small dead trees that could be readily made into fire wood. It all made for a natural camp ground and that's what the three of us -- my two good friends and I -- used it for.

Summer nights in western Missouri are hot and, generally, humid with little or no breeze. Under the cottonwoods, however, it seemed there was always a little air stirring and, if it was exceptionally hot (as it usually was!) a dip in the cool waters generally lowered the body temperature enough for some degree of comfort.

We would normally head for the lake, which was about a mile from my house, about 6:30 or 7:00 p.m. on Saturday evening. My mother furnished a big frying pan, a slab of bacon and a dozen or so potatoes. The other two boys brought along a jug of iced tea, a sack of corn meal, a flashlight, and canteens of fresh water. All of us carried a bed roll consisting of a ground tarp and a blanket. We would find some fairly large stones and use them to build a semi-circular fire place that was the site for a camp fire once we arrived and had gathered enough dry wood for the night and the next morning.

One of the most important articles that we each carried, and one I failed to mention above, was two empty pint whiskey bottles, a pocket full of fish hooks and a ball of fish line. The importance of these items will be discussed later.

Each boy had a specific assignment. Mine was to start the fire, cut enough bacon to get a meal underway and wrap three or more (depending upon size) potatoes in mud, which I tossed into the fire after it had burned to the point a layer of coals were built up. Once I was satisfied the potatoes were about half done, I would drop the sliced bacon into the frying pan and start the meat cooking.

While all this was going on, one of my friends prepared the six whiskey bottles by tying a stretch of line about four feet long to them, a hook on the other end and a piece of bacon on the hook. As he prepared each, he cast them into the lake before starting the next one. The third boy was responsible for gathering whatever additional fire wood we might need and laying out the ground tarps.

By the time the bacon had gotten hot clear through and the camp was all laid out, at least three, sometimes all, the whiskey bottles were bobbing around the lake, pulled by pan-sized fish, usually bullhead cats, twelve to eighteen inches long. Once in awhile we got a blue gill and, on very rare occasions, we caught a bass. It took only a few minutes to strip off and chase down the bottles, clean the fish, roll them in corn meal and drop them in the hot bacon grease. By the time we had cooked and eaten our catch, the potatoes were done -- hot, mealy and delicious.

It's difficult to tell what the most pleasurable time was, whether it was lying there at night, filled with good food and chatting with good friends, whether it was after the talk died down and the croaking of the frogs and chirping of the crickets were the only sounds, or whether it was waking in the morning at the first light, a mist rising from the lake and a complete stillness surrounding one. They all carry a happy memory with them.

We always recast our floats the last thing before we rolled up to sleep, so the next morning we went immediately into the lake to retrieve our catch. Seldom did we fail to catch at least three, sometimes five, edible-sized fish, both evening and morning, so there were always plenty to eat.

In the morning, my job was to start the fire again, make sure the potatoes we had put into the fire the night before were in position to heat up and fry enough bacon to obtain grease for the fish fry. By sunup we had eaten, cleaned up the camp area and were prepared to leave.

Not a very exciting time by today's standards and I suppose we would have done something different had we lived in a different time. But life itself was

different then yet, in many ways, very similar to life today. If I remember those "camping and catfishing" moments with fondness, perhaps it's because I remember the nights under the stars -- so many more stars than it seems we have today. The sky, above the lake anyhow, was a deep, deep velvet and the stars were bright and filled that sky from horizon to horizon. I wonder if there are still places left where the air is so clear and ground lights so few that the stars glitter like diamonds in blue velvet? And the early mornings with the mist over the water, so still and mysterious, with a sort of tension in the air like the world was waiting for something good to happen. Then, when the first rays of the sun came across the fields, a whole riot of noise, like all the birds and insects in the world had suddenly come to life!

Those are the moments I remember most and I thank you for allowing me to share them with you!

FLORIDA'S FORECAST: SOLAR TO YESTERYEAR?

John H. Rhoades
Vice President of Marketing
Southern Concrete Pavers, Inc.

Florida, the starting point of SunRace 90, entailed solar powered cars racing to set records of speed and storage from the burning light above. The Race of the Future shines upon Florida while memories of early 19th century provide new life to Florida's heritage.

Several families' first eye-opening Florida experience came through windows aboard chugging locomotives. Memories tickle as one looks as far as the eyes can see up abandoned railways between the majestic trees -- abandoned only because convenience with other modes of transportation were more independent. Today, reaching some 200,000 miles, abandoned track stretches over the Nation with very few options for use to create memories for future generations.

Converting abandon tracks is like Mom's apple pie -- it has been around for many years. In Florida, the Department of Transportation (DOT) employs members to monitor track abandonment and requires public announcement from owners. If DOT conveys that the corridor is too narrow for road use, the Department of Natural Resources (DNR) can implement projects, such as Rails to Trails -- a project to convert old track lines into Trails for public recreation. Local governments throughout the state have not been as active as needed to push such projects through the red tape and assist with funding alternatives. These corridors need to be preserved for our future and should not be allowed to lose the links of "right-of-way".

Greg Diehl and Mary Anne Koos, both from the DNR, have spent exhausting hours supporting the Rails to Trails project. The task is to create a natural-like recreational trail for walking, jogging, bicycling, etc., and even equestrian avenues along side. Faced with granite rocks over miles of wilderness, yet passing through some of the largest urban areas in the state, a total conversion must take place. The actioninvolves creating a low cost, maintenance free trail 10 to 12 feet wide. However, remember Wendell Chastain's article in the 1989 FACERS, "Maintenance Free," really does not exist.

The construction of these trails is of some great debate. Where to place the trail, start to finish, made of what material, how may entrances or ramps, and finally, where to get the money. Creating a low cost primitive trail of pressed rock disappoints bicycle enthusiast like Dr. Kermit Sigmon, University of Florida, Gainesville, who stressed that most bikes have thin tires at 100lbs pressure and could easily be popped riding over rocks. Dr. Sigmon, a supporter of the Rails to Trails program, looks forward to the completion of a 20 mile Gainesville-Hawthorne trail, which, once constructed, will provide never ending scenery over the Paynes Prairie State Nature Preserve. His vision is that these trails will have a solid smooth texture for all to enjoy, including bike enthusiasts.

The local government should be involved strongly with the initial planning and placements of the Trails. Key emphasis should be placed on avenues of public accessibility, an eight year experienced view from Citrus and South Marion, the counties' representative, Dick Locke. State funding for Trails construction should be provided and the state should maintain them as well. Rep. Locke awaits the Dunnellon-Inverness-Trilby

Trail of approximately 45 miles long. This would be Florida's longest trail to date. The importance of preserving these "right-of-ways" is shared between Rep. Locke, the DOT, the DNR, and Dr. Gary Long, associate professor of Civil Engineering, University of Florida, Gainesville. Dr. Long, a transportation planning professor, sees this preservation from a future light. These corridors very well may be Florida's next generation of transportation avenues and should not be allowed to be interrupted by buildings, etc.

From first eye-opening experience to wonderful memories, these abandoned railways may become the avenues for solar powered transportation of tomorrow. Help Florida preserve the land and share your Forecast, please contact:

Florida Recreational Trails System

Division of Recreation and Parks
Department of Natural Resources
Tallahassee, Florida 32399-3000
(904) 487-4784,
SUNCOM 277-4787

ABOUT THE AUTHOR

John H. Rhoades is Vice President of Marketing for Southern Concrete Pavers, Inc. in Lecanto, Florida. John received his B.A. in Sociology from Elon College, North Carolina, in 1987. He was born in St. Petersburg, Florida and now resides in Citrus County, where he and his wife, Jody, enjoy golf, tennis and trips to the variety of beaches Florida offers.

A Dual In The Sun or How Not To Play Baseball!

By
Ed Dougherty

The story I'm about to relate is true -- at least as true as a 47 year memory can make it. It concerns two people, for the most part, although there are a lot of minor characters involved.

"Smokey" was about 16 years old when all this happened. They called him Smokey because he was one of the few fellows on the pick-up baseball team that smoked. The other main character in this sad tale was called "Moose" for reasons that will shortly become apparent.

The two youngsters (Moose was 18 or 19 at this time) were as different as night is to day. Smokey was about 5'-9" tall, solidly constructed. His 160 pounds looked less than that on him -- he looked, in fact, downright thin. A generally quiet young person, he seldom joined bull sessions except as a listener, he possessed a hidden sense of humor that tended to spring into being at all the wrong times. Moose, as his nickname implies, was huge. All of 6'-2" or 3", weighing well over 200 pounds, he was a strong young man, toughened by farm work, and could, when he was crossed, be a handful to handle.

Now, Moose didn't like Smokey much and the feeling was mutual. Part of the problem between the two stemmed from the previous fall when they met, for the second time, on opposite sides, during the high school football season. You see, Moose played for a school with 3 - 4 times the enrollment (and 3 - 4 times the number of players) as the school for which Smokey played. Moose played fullback, Smokey was a guard. The team Moose played for had, for four seasons, taken advantage of Moose's size and power by utilizing the single wing attack. For those of you who don't know, the single wing features a big strong full back, who sits up about five or six yards behind center, takes the snap from the center and spins, faking (or handing off) to one of the other backs coming around. If he keeps the ball he spins back and plows through a hole his line opens in the defense. It's "three yards and a cloud of dust" all the way but it will wear out a small light team pretty fast. The offense features a lot of traps and two-on-one blocking and is difficult to stop. Moose was an outstanding high school fullback -- great power and good speed to go with it. What he didn't know, and no one else had apparently picked up on, was the fact he always looked at the hole he was to hit as he lined up and Smokey had discovered that fact a couple years before. Anyhow, Smokey called the defense and he always called a five man line when Moose was in the game, which allowed Smokey to line up in the center line backer slot and watch Moose's eyes. It made a lot of difference in the game, for instance the fall before this story takes place, Moose had gained only 40 plus yards in the annual game against Smokey's team and Smokey caught him five times in the back field. Moose didn't like that.

In those days most of the towns had what was called "Town Baseball Teams" and they played other town teams around their vicinity. Most farm boys were left out, however, since the town teams got together in the evenings to practice and the farm boys couldn't get away during daylight hours. So, for the farm kids (and some of the older guys, too) in the area surrounding the small towns in that part of the world, there were "pick-up" games, often a semi-formal arrangement, which generally started about 2:30 on a Sunday afternoon. Umpires were from the spectators and the players generally wore overalls and old shirts. Smokey played regularly for one of those groups, Moose played for another. The games generally took place in a pasture near Smokey's home, which made the game real exciting because one never knew where a ground ball would go! Also, unless hit pretty hard, said ground ball would be very apt to die in the high grass that made up the

infield.

As the game started on this particular day, Smokey was stationed at third, the position he usually played when not pitching and Moose was on first for his team. Smokey's team had a big fire balling left-hander pitching, while Moose's team had a young right hander going for them. For the sake of convenience and to differentiate between the two teams, let's call Smokey's team the "Smokies" and Moose's group the "Meese."

The Smokies being the home team, the Meese batted first and, folks, they really hammered the Smokies big left hander! In the first inning the Meese sent 10 men to the plate and six of them scored. The Smokies got one back in their half of the inning when the Meese center-fielder lost the ball in the sun and it fell behind him for a triple with a runner on first. In the second, the Meese scored three more runs and left the bases loaded as they batted around. Smokies came up with two in the bottom of the second on a walk and a home run. When Lefty loaded the bases in the top of the third with two outs, the Smokies captain decided he'd had enough and called on Smokey to take over the pitching chores.

As luck would have it, the first batter Smokey faced was Moose. Now, let me tell you a little about Smokey as a pitcher. First, he threw moderately fast. About the only way we could judge how hard a pitcher threw in those days was by the sound the ball made when it hit the catcher's mitt and Smokey's fast ball made a nice "pop." Judging by the way they measure today, I'd guess his top speed was probably in the mid 80's. He was tough to hit however, since he had a lot of movement on his pitches. His fast ball, when thrown side arm, for instance, broke in and down on a right handed batter whereas when he threw over the top it broke in and up. He had a good curve, threw a knuckleball with control and varied the speed of his pitches very well. In addition, he had excellent control.

Now, that all sounds great, and it wasn't too bad usually. But his first pitch to Moose was right where Moose liked them and he promptly hit one high and deep into the hole in right-center field. By the time the fielder got to the ball and got it back into the infield, Moose had circled the bases and the score stood at 13-3 with two out. Smokey got the next batter to pop up to the infield to finally retire the side.

Smokies picked up 3 runs in the bottom of the third, Smokey made the final out of that inning as he hit a vicious line drive that nearly tore the glove off the third baseman, leaving the bases loaded. That decided the Meese captain and, when the Smokies came to bat in the bottom of the fourth, Moose was on the mound for the Meese. Moose, as you might expect, threw H-A-R-D, like WOW! No one liked to catch him, but everyone knew what was coming -- no finesse, no mixture of pitches -- nothing but fast and faster!

Neither team scored in the fourth and neither team had a base runner. In the fifth, Smokey walked the lead off batter, then got the next three hitters on fly balls. Moose gave up four hits, a walk and a hit batsman to allow four runs in the bottom of the fifth, bringing the score to 13 - 10. Moose led off the top of the sixth.

Up until that point the game had been played in a reasonably gentlemanly fashion. Unfortunately, Brenda, Moose's lovely and talented sister had questioned Smokey about his pitch to Moose in the third inning and her words stuck in the young hurler's head.

"Why didn't you give him the high hard one?" she had asked. "You know, the one that goes in one ear and out the other!"

Brenda was angry at her brother right then and must have figured Smokey would get even for her! With that thought in mind, his first pitch to Moose was an overhand fast ball that broke up and in, passing about an inch from the big batter's nose. Moose glared at Smokey from where he sat, rose, brushed himself off and stepped back in. The next pitch was a nice curve that caught the inside corner about letter high. Moose glared first at Smokey from where he sat, then at the umpire who had called the strike. The next curve ball missed outside and Moose, his confidence returning, edged closer to the plate. Smokey promptly sat him down again with a hard pitch inside. With a 3-1 count everyone in the general area knew Smokey would have to come in with a strike and at least 90% of the folks expected Moose to kill the ball, something he was perfectly capable of doing. A side arm fast ball caught the outside about thigh high for called strike two, and once more Moose glared his disagreement. The 3-2 pitch was a knuckleball that floated in about chest high. Moose nearly tied himself in a knot missing the dinky pitch. The next two men went down on pop ups.

The Smokies sent five men to the plate in the bottom of the sixth, scoring one and the Meese went down in order in the seventh. No one was surprised that Moose walked the lead off batter in the bottom of the seventh, because the on-deck batter was Smokey.

Most everyone who has

followed sports of any nature has experienced one of those breathless moments when everyone involved knows something is going to happen. The sudden stillness, almost like natures' so-called "quiet before a storm," that almost breathless anticipation of something good or bad about to happen. Well, that's the way it was when Smokey stepped to the plate with one on, no outs and facing a 2 run deficit. Everyone just knew Moose was going to pour that fast, fast ball through some part of Smokey's body! They just hoped he didn't kill Smokey.

We'll never know why Moose did what he did. Maybe he just figured Smokey would be expecting the pitch in tight and would move away, allowing Moose to get an easy first strike. Moose never talked about that game, ever, so no one ever knew what was in his mind as he poured a well-thrown fast ball right down the middle, just below the waist, which Smokey promptly sent high and deep into left center field, then jogged around the bases with the tying run as the outfielders frantically searched for the ball in the tall grass. That was, as far as I know, the last pitch Moose ever threw. Before Smokey had rounded third Moose was on his way to his car, parked behind first base and, by the time Smokey had reached the bench and was aware something unusual had happened, Moose was gone, the tail end of his Model A roadster disappearing through the pasture gate.

Like I said, no one ever knew why Moose did what he did. Some folks claimed he lost his nerve, but that's nonsense. Without his nerve he'd have never won two decorations for bravery, the Silver Star for one, as well as the Purple Heart, while serving with the Marines in the South Pacific. My guess is he was too much the Man to take a chance on hurting a brash youngster and simply decided it wasn't worth it. Maybe I'm wrong, wouldn't be the first time, but I do know Moose and I became friendly after the war, had a few drinks together and generally discussed "old times." But we never did talk about that game. I don't remember who won, incidently.

FACERS Scholarship Program Opens

Candidates to be awarded FACERS Scholarships have been nominated by the Scholarship Committee and approved by the Board of Directors in special session, all in accordance with procedures approved by the membership. The prerequisite required that a candidate be a U.S. citizen, a third year student and involved in a Civil Engineering curriculum.

The successful nominees for the 1990-91 school year are Roger W. Rossitto and Larry M. Mitchell, both of whom are exceptional students, scoring very well with respect to their grade point averages and, in addition, contributing in various other ways to the university. The following brief resume describes both men.

ROGER W. ROSSITTO

Mr. Rossitto is a graduate of Palm Beach Community College and has been in the University of Florida College of Engineering program, where he is currently classified as a 3 EG in the Department of Civil Engineering, since August 1989. He has expressed an interest in construction, as well as design of transportation projects and developments. Roger currently carries a 3.14 GPA on 24 upper division semester hours. He is a student member of the American Society of Civil Engineers and Florida Engineering Society. His eventual plan is to locate in or around Palm Beach County. During the periods when Roger has not been actively engaged in receiving his education he has worked in various capacities for an architect and, later, for a consulting engineer.

LARRY W. MITCHELL

Mr. Mitchell is from Micanopy, Florida and a graduate of Florida Community College in Jacksonville where he accumulated a grade point average of 3.52. He entered the University of Florida in the Summer A term, 1990. He comes highly recommended by his professors at FCC Jacksonville, his Physics Professor stating flatly, "Larry Mitchell has been my best all-around student." Quite a remarkable recommendation! His stated goals are "to become the best engineer possible and to be well educated with good professional standards." We all wish Larry the best of luck in reaching those goals. While at FCC Jacksonville Larry tutored physics in his open periods.

Both the candidates will receive a $500.00 award for each of the next two semesters. FACERS sincerely hopes that award will prove to be of assistance to these two students and that their interest in engineering and Public Works will remain strong.

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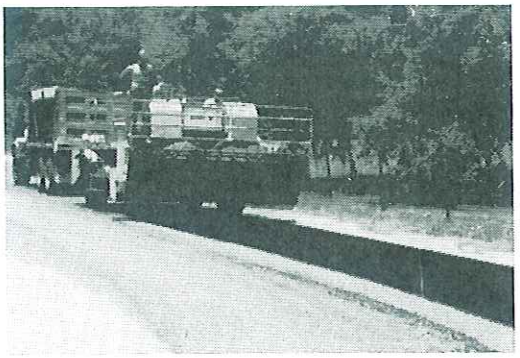

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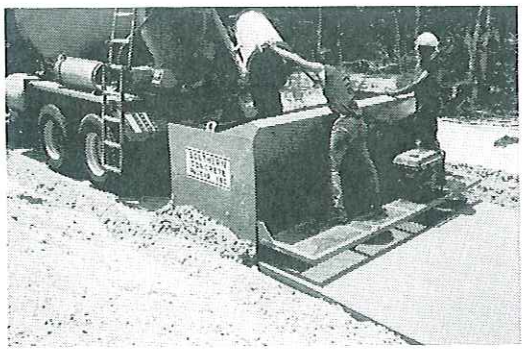

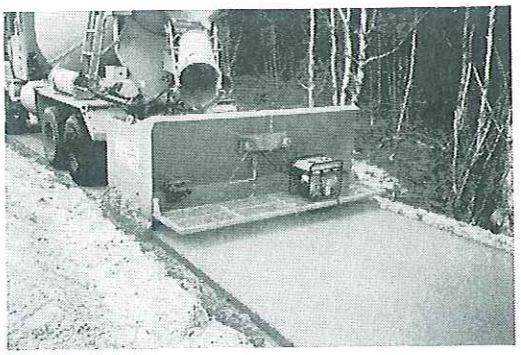

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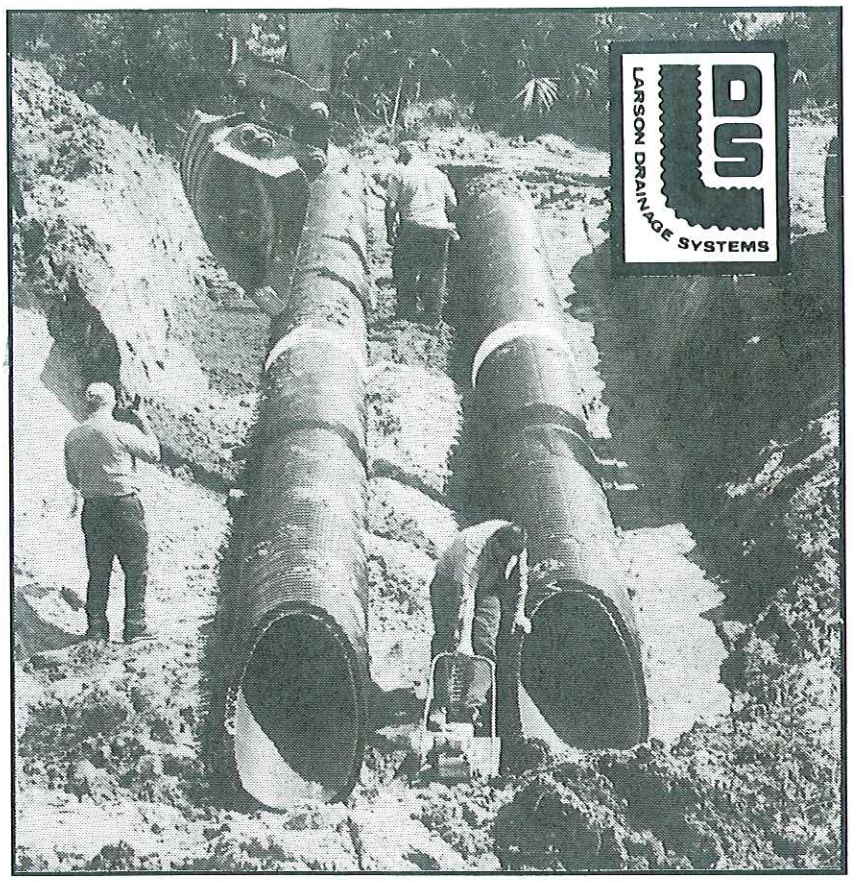

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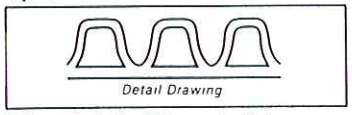
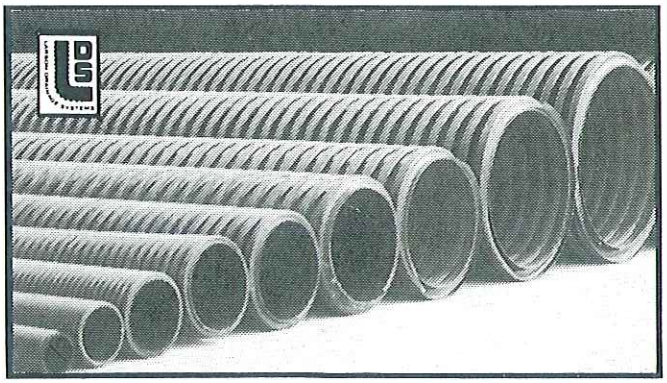
The pipe shall be corrugated polyethylene pipe (slotted and unslotted) conforming to AASHTO M-294 "Interim Specification for Corrugated Polyethylene Pipe 12" to 24" Diameter" and ASTM F-667 "Standard Specifications for Large Diameter Corrugated Polyethylene Tubing and Fittings (8", 10", 12", 18", 24")."

Filter Fabric: Filter fabirc shall be subsurface drainage type meeting the requirements of Florida Department of Transportation Standard Specifications Section 985.



All filter fabric joints shall lap a minimum of one (1) foot.

Pipe detail: Pipe shall be manufactured with a smooth inside wall in addition to the structural corrugated pipe in accordance with "Detail Drawing."



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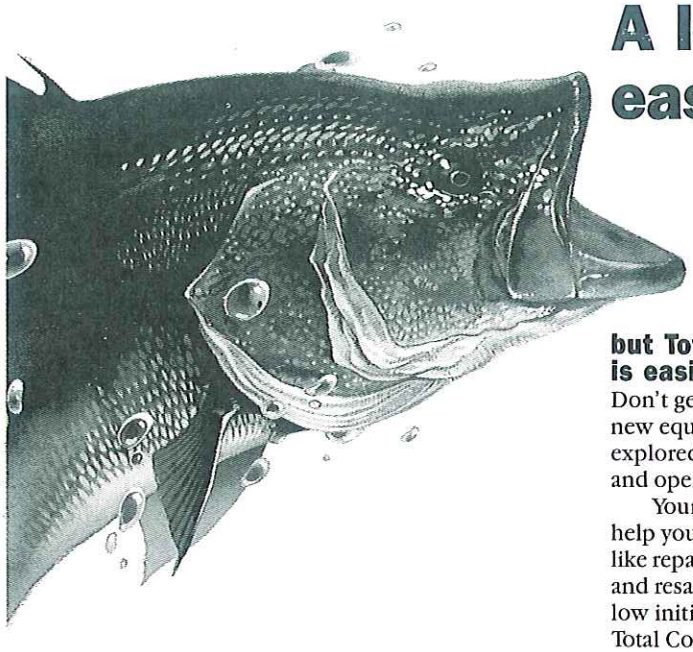

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Comparison Chart: Cost Factor	Machine A	Machine B	Machine C
Initial Purchase Price	$100,000	$92,500	$85,000
Repair Costs (5 yrs. or 5,000 hrs.)	$ 8,000	$ 9,500	$11,000
Maintenance Costs (5,000 hrs.)	$ 3,000	$ 6,000	$ 9,000
Repurchase Price	$ 75,000	$60,000	$50,000
TOTAL COST	**$ 36,000**	**$48,000**	**$55,000**

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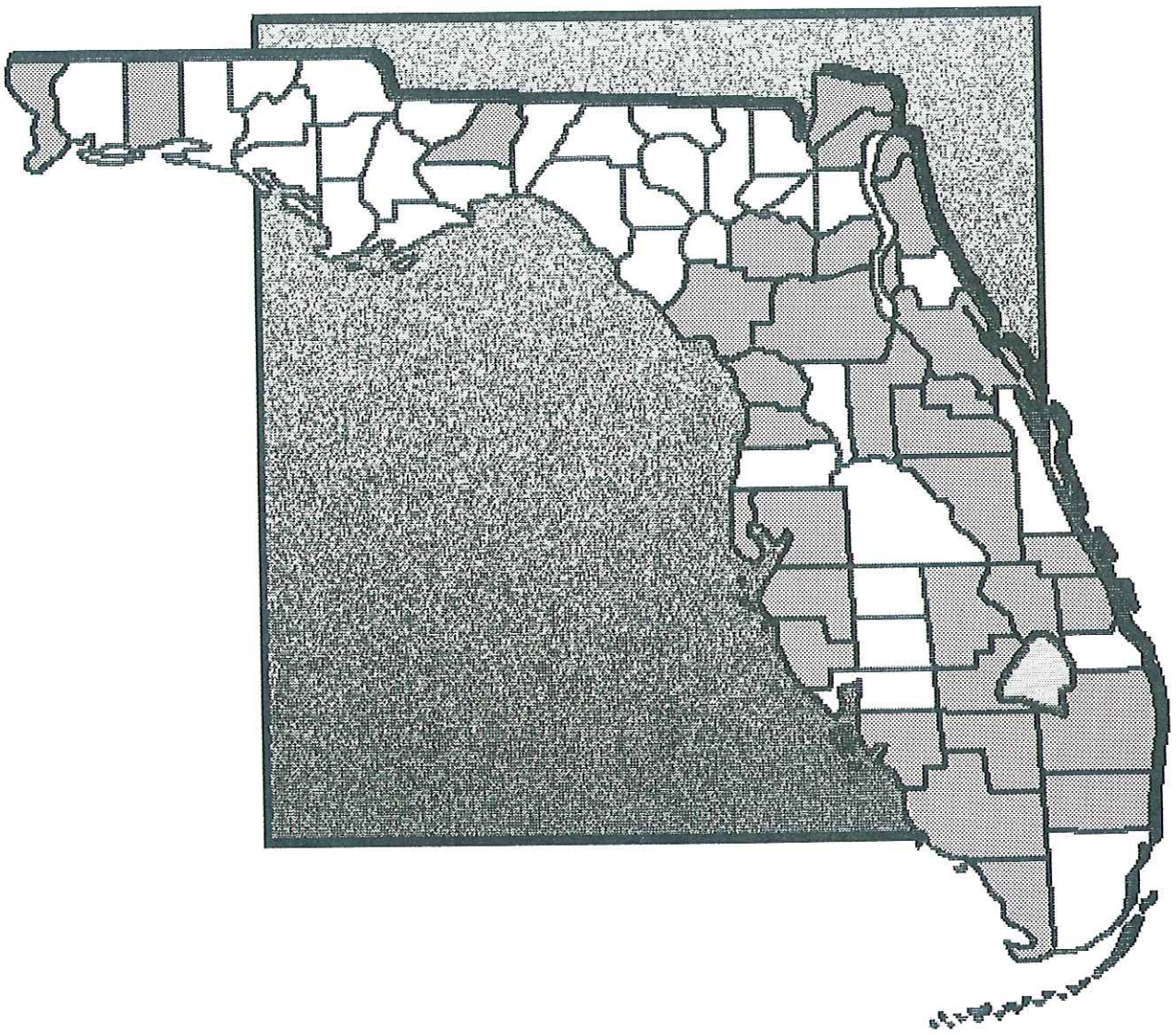

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