

# West Sacramento Levee Improvement Program Safety Assurance Review Plan

October 21, 2009

WEST SACRAMENTO AREA FLOOD CONTROL AGENCY  
1110 West Capital Avenue  
West Sacramento, CA 95691

This document is to satisfy the Safety Assurance Review (SAR) requirements for the West Sacramento Levee Improvement Program (WSLIP) as required by Section 2035 in the Water Resource Development Act (WRDA) of 2007 as described in the U. S Army Corps of Engineers' EC 1105-2-410, Civil Works Review Policy.

The West Sacramento Area Flood Control Agency (WSAFCA) is in the process of designing and constructing improvements to the levee system that protects the City of West Sacramento (City) in California. These improvements are collectively called the West Sacramento Levee Improvement Program (WSLIP). WSAFCA is currently developing a programmatic NEPA/CEQA document to support the improvements proposed as part of the WSLIP. Safety Assurance Reviews ensure that good science, sound engineering, and public health, safety, and welfare are the most important factors in guiding the engineering design and implementation of the WSLIP. WSAFCA is partnering with the State of California to implement portions of the WSLIP as part of the State's Early Implementation Program (EIP) (Figure 1). WSAFCA plans to complete construction of The Rivers and CHP Academy projects in 2010, and the Sacramento Bank Extension project is planned for construction in 2011.

WSAFCA is proactively working to ensure independent review of its WSLIP design and implementation and the proposed actions in this Safety Assurance Plan should satisfy Section 2035 in WRDA 2007. This document outlines how the SAR will be performed and identifies the independent consultants who will comprise the Board of Senior Consultants (BOSC) that will be charged with executing an adequate SAR for the WSLIP.

## 1.0 Program Background

The WSLIP is being designed by WSAFCA to improve the flood protection in the City. The goal of the WSLIP is to achieve a minimum level of 200-year flood protection for the City.

The City's comprehensive flood control strategy has been guided by the following objectives adopted by the WSAFCA in connection with the WSLIP:

- 1) provide at least a 200-year level of flood protection to the City,
- 2) complete urgent levee improvements in advance of construction by the U.S. Army Corps of Engineers (USACE) with funding assistance from the California Department of Water Resources (DWR),

- 3) partner with the USACE and DWR to coordinate efforts on the development of technical documents and of a General Re-evaluation Report (GRR), and
- 4) identify opportunities to work with local and regional partners to complete work efficiently and to supplement local funding.

The WSLIP will meet all of the USACE's current levee design criteria. The specific project design objective is to address under- and through seepage, slope stability, bank erosion, geometry, encroachment and levee height deficiencies in an overall effort to achieve increased flood protection against the flood event with a 0.5 percent chance of occurrence in any given year (referred to herein as the 200-year flood event<sup>1</sup>) as determined using USACE procedures for risk and uncertainty analysis. References in this document as to levels of flood protection needed are based on the deterministic approach (the current Federal Emergency Management Agency [FEMA] method) and should not be taken as USACE concurrence that such levels will be achieved when the USACE probabilistic approach is utilized to define system performance.

## 2.0 Purpose of a SAR

The purpose of a SAR is to ensure that good science, sound engineering, and public health, safety, and welfare are the most important factors that determine a project's fate and is achieved by independent and impartial review.

The SARs are used to inform the USACE Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring public health, safety, and welfare.

Safety Assurance Reviews will address the following questions:

- 1) Are the models used to assess hazards appropriate?
- 2) Are the assumptions made for the hazards appropriate?
- 3) Is the quality and quantity of the surveys, investigations, and engineering for the concept design sufficient to support the models and assumptions made for determining the hazards?
- 4) Does the analysis adequately address the uncertainty given the consequences associated with the potential for loss of life for this type of project?

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<sup>1</sup> Design event analysis results, as a measure of system performance, are given as the expected (mean) frequency of the maximum event that can be safely passed through the reservoir, spillway and downstream leveed system with a set (e.g., 3 feet) "freeboard" above the computed (expected) water surface profile. The design event analysis does not consider uncertainties on the reservoir inflow, the reservoir routing or the individual variables that contribute to the uncertainty in the downstream profile stages. Design event analysis is not the same as the analysis procedure used by the USACE as a basis for determining Federal interest in a project or for USACE certification for the FEMA National Flood Insurance Program (NFIP). The USACE defines system performance as containing a specified frequency event (e.g. 0.5% event = 200-year) with a high level of assurance (e.g., Conditional Non-exceedance Probability = 90%) and includes consideration of system uncertainties.

- 5) Do the assumptions made during the planning phase for hazards remain valid through the completion of design as additional knowledge is gained and the state-of-the-art evolves?
- 6) Do the project features adequately address redundancy, robustness, and resiliency with an emphasis on interfaces between structures, materials, members, and project phases?
- 7) Do the assumptions made during design remain valid through construction?
- 8) For O&M manuals, do the requirements adequately maintain the conditions assumed during design and validated during construction; and will the project monitoring adequately reveal any deviations from assumptions made for performance and is sufficient to evaluate the change in project effectiveness?

### **3.0 SAR Implementation**

The SAR shall include participation by independent experts selected from among individuals who are distinguished experts in civil engineering, geotechnical engineering, hydraulic engineering, hydrology, and other appropriate disciplines. Independent, in this instance, means that the persons selected to review the design are not involved in the original design, have no conflict of interest, and do not carry out or advocate for or against Federal water resources projects for the duration of the project design, construction and follow-up activities. The SAR Panel shall evaluate whether the interpretations of analysis and conclusions based on analysis are reasonable and inform the design team on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring public health, safety, and welfare. The panel will consider how project features adequately address redundancy, robustness, and resiliency and how the findings during construction reflect the assumptions made during design.

The BOSC shall:

- a. Conduct the review for the subject project in a timely manner in accordance with the study and SAR Plan schedule;
- b. Follow the “charge,” but when deemed appropriate by the BOSC lead, feel free to request other products relevant to the project and the purpose of the review;
- c. Receive from USACE any public written and oral comments provided on the project;
- d. Provide timely written and oral comments throughout the development of the project, as requested;
- e. Submit BOSC reports in accordance with the review plan milestones; and

- f. The BOSC lead shall be responsible for ensuring that comments represent the group, be non-attributable to BOSC individuals, and where there is lack of consensus, note the non-concurrence and why.

Safety Assurance Reviews will be conducted on an as needed basis but, at a minimum, will occur at 60 percent design, final design, start of construction, and during construction. The SAR panel has the option to request additional or alternate milestones where warranted and reasonable. The USACE and the California Central Valley Flood Protection Board are required to review and approve the supporting technical documentation and plans and specifications.

The first meeting will be held with the WSLIP Board of Senior Consultants (BOSC), as the SAR Panel is referred to, on September 29 & 30, 2009. The first day of the meeting will focus on familiarizing the BOSC with the flood risk reduction program and include a discussion of the supporting technical documents that demonstrate the need for the program. The second day will focus on providing comments on the plans and specifications for the Early Implementation construction projects (Figure 1). Follow-up sessions with the BOSC will be held on a quarterly basis or as needed depending on the status of the program. In advance of each meeting, the design team will prepare an agenda containing important topics, questions for the BOSC, etc., as well as provide supporting reports and meeting materials. In addition to the BOSC, representatives of WSAFCA, the California Department of Water Resources (DWR), the USACE, and the California Central Valley Flood Protection Board (CVFPB) will be invited to participate in the BOSC meetings. At the conclusion of each meeting, the BOSC will prepare a formal meeting letter report documenting its observations, the questions posed, the BOSC recommendations that were made, and if appropriate, the responses by the design team members. The BOSC reviews may result in the need to obtain additional investigation, perform additional analysis, and potentially modify the design.

Following the design phase of the project, WSAFCA proposes to seek input by means of independent reviews during construction by inviting the panel, DWR and the USACE to attend weekly construction meetings to keep apprised of construction progress. The agenda of these meetings will include construction progress, immediate future construction efforts, findings made during construction, and any issues due to changed conditions or findings that are different than those made during the design. Significant issues will generate a formal SAR. Because all independent reviewers cannot attend every weekly meeting, meeting minutes will be drafted by the construction management lead and Quality Control and Quality Assurance information will be provided to WSAFCA, USACE, DWR, and CVFPB reviewers after each construction meeting.

## **4.0 Reporting & Documentation**

All written comments or recommendations by the panel and related WSAFCA responses will be made available to the public through electronic means on the Internet.

Review reports may be provided at the record of final design in the Design Documentation Report; at the completion of the plans, specifications, and cost estimate;

at the midpoint of construction for multi-year construction contracts, prior to final inspection; and at critical construction milestones. Reports will contain the panel's evaluation, including the panel's assessment of the adequacy and acceptability of the methods, models, and analyses used. All comments in reports will be finalized prior to release of the report. Comments that lack consensus should be clarified to explain the non-concurrence. Since this SAR Plan is a living document, review comments, questions, and responses will be included as the program progresses through review and construction.

## **5.0 SAR Panel**

The WSLIP SAR Panel, or BOSC, does not include members from the Federal Government. The SAR Panel will provide comments and recommendations to WSAFCA and does not advise, or make recommendations to the Federal Government regarding the WSLIP. The SAR Panel does not meet the criteria of a Federal Advisory Committee and is therefore compliant with Federal Advisory Council Act (FACA).

The WSLIP SAR Panel includes Dr. Ray Martin, Mr. George Sills and Dr. David Williams; all are recognized experts in flood control projects and geotechnical engineering (Martin, Sills) and hydrologic and hydraulic engineering (Williams). The panel members' qualifications are clearly indicated in the Conflict of Interest disclosure forms included in Attachment 1. The members of the panel have no conflicts of interest with respect to the WSLIP. They do not own land in the vicinity of the levee footprint nor do they own land in the City. Their fields of expertise and practice are in geotechnical adequacy of embankment designs and construction, hydrologic and hydraulic engineering and they do not carry out or advocate for or against Federal water resources projects.

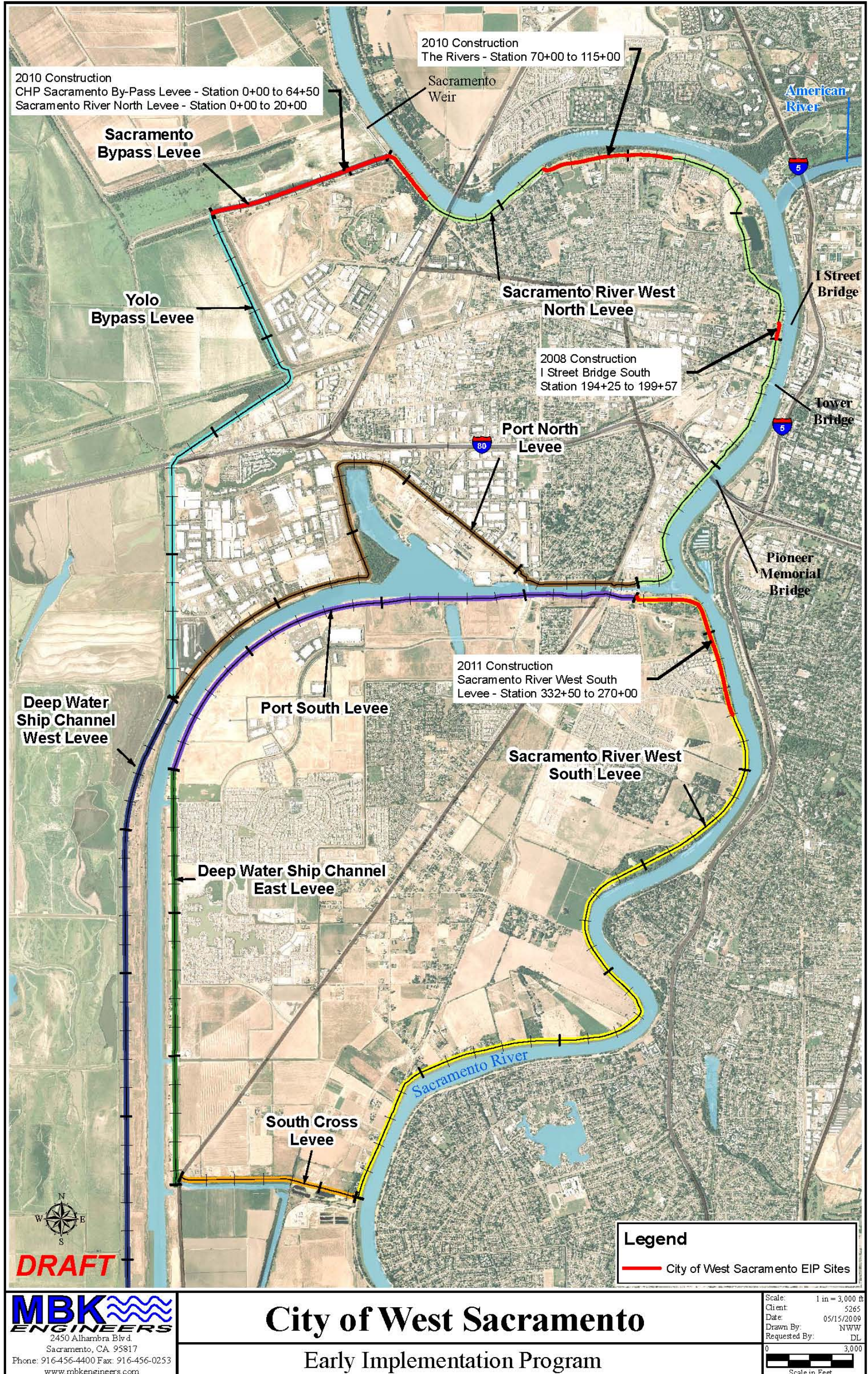
- In terms of construction experience, WSAFCA is fortunate to have Dr. Ray Martin, and Mr. George Sills as independent reviewers for this project. Dr. Martin and Mr. Sills are two of the most well-respected and acclaimed geotechnical engineers across in the United States. Their specialized expertise in levees and dams is sought by agencies undergoing major levee improvement programs.

## **6.0 Adequacy of the SAR**

The information provided in this document demonstrates WSAFCA's effort to ensure good science, sound engineering, and public welfare are the most important considerations during the development of the WSLIP. WSAFCA feels that the planned actions, as carried out in the future, outlined in this document meet the intent of Section 2035 of WRDA of 2007. While specifics of any future Headquarters (USACE) guidance on the Safety Assurance Review are not known at this time, WSAFCA is confident the plan presented in this document is adequate to allow the USACE to approve the eventual Federal credit requests and Section 408 approvals. The SAR Plan is a living document and as presented and can be modified in the future, as needed.



Figure 1: WSAFCA Perimeter Levee System and Early Implementation Projects





# **ATTACHMENT 1**

## **CONFLICT OF INTEREST DISCLOSURE FORMS**



**BI/COI FORM 3**

THE NATIONAL ACADEMIES  
*Advisers to the Nation on Science, Engineering, and Medicine*

National Academy of Sciences  
National Academy of Engineering

Institute of Medicine  
National Research Council

**BACKGROUND INFORMATION  
AND  
CONFIDENTIAL CONFLICT OF INTEREST DISCLOSURE**  
*For General Scientific and Technical Studies and Assistance*

NAME: Ray Martin, Ph.D., P.E. TELEPHONE: 804-798-6218

ADDRESS: 114 North Railroad Avenue  
Ashland, VA 23005

EMAIL ADDRESS: [rayemartineng@aol.com](mailto:rayemartineng@aol.com)

CURRENT EMPLOYER: Self-employed – Consulting Geotechnical  
Engineer

NAS/NAE/IOM/NRC COMMITTEE: NA

There are two parts to this form, Part I Background Information, and Part II Confidential Conflict of Interest Disclosure. Complete both parts, **sign** and **date** this form on the last page, and return the form to the responsible staff officer for *The National Academies* project and committee activity to which this form applies. **Retain a copy for your records.**



## **PART I BACKGROUND INFORMATION**

### **INSTRUCTIONS**

Please provide the information requested below regarding **relevant** organizational affiliations, government service, public statements and positions, research support, and additional information (if any). Information is "relevant" if it is related to -- and might reasonably be of interest to others concerning -- your knowledge, experience, and personal perspectives regarding the subject matter and issues to be addressed by the committee activity for which this form is being prepared. If some or all of the requested information is contained in your curriculum vitae, you may if you prefer simply attach your CV to this form, supplemented by additional responses or comments below as necessary.

**I. ORGANIZATIONAL AFFILIATIONS.** Report your relevant business relationships (as an employee, owner, officer, director, consultant, etc.) and your relevant remunerated or volunteer non-business relationships (e.g., professional organizations, trade associations, public interest or civic groups, etc.).

**Dr. Martin served as a Principal, Executive Vice President, President, CEO and finally Chairman of Schnabel Engineering Associates (SEA) prior to his retirement from the firm in July 2002.**

**Professional Engineer - Pennsylvania, New York, District of Columbia, Georgia, North Carolina, Maryland, West Virginia, Virginia, New Jersey, Delaware**

**Fellow, American Society of Civil Engineers, (ASCE)  
Member, Association of State Dam Safety Officials, (ASDSO)  
U. S. Society on Dams**

**Advisory Board Member and Chairman (two years), Committee of 100, College of Engineering, Virginia Tech, Blacksburg, Virginia, 1982-2000, 2002-2005.**

**Member Geotechnical Engineering Committee, National Research Council, Washington, D.C., 2001- 2004**

**Member of Organizing Committee, ASCE Specialty Conference, "2001 A Geo Odyssey Foundation Conference", Virginia Tech, Blacksburg, Virginia, June 2001.**

**Co-Chairman Organizational Committee, ASCE 1993 Specialty Conference "Geotechnical Aspects of Dam Rehabilitation", North Carolina State University, Raleigh, North Carolina, June 1993.**

**Member, Embankment Dams and Slopes Committee of Geotechnical Engineering Division of ASCE, 1990 - 1997.**

**Civil Engineering Visitor, Accreditation Board for Engineering and Technology, 1988 - 1997.**

**Member, Engineering Geology Committee of Geotechnical Engineering Division, ASCE, 1985-1997.**

**Advisory Board Member, Civil Engineering Department, Virginia Tech, Blacksburg, Virginia, 1987- 1993.**

**Chairman, Virginia Engineering College Deans Liaison Committee, VSPE, 1983-84.**

**Virginia Society of Professional Engineers - Richmond Chapter President, 1978-79, Legislative Committee Chairman, 1989-90, State Treasurer, 1979-80, State President, 1981-82.**

II. GOVERNMENT SERVICE. Report your relevant service (full-time or part-time) with federal, state, or local government in the United States (including elected or appointed positions, employment, advisory board memberships, military service, etc.).

**Dr. Martin is a former member of the Geotechnical Engineering Committee of the National Research Council.**

**Member, Joint Senate-House Subcommittee, Virginia General Assembly, 1983-84, study on how Virginia can best maintain high quality engineering programs in its public institutions of higher education.**

III. RESEARCH SUPPORT. Report relevant information regarding both public and private sources of research support (other than your present employer), including sources of funding, equipment, facilities, etc.

IV. PUBLIC STATEMENTS AND POSITIONS. List your relevant articles, testimony, speeches, etc., by date, title, and publication (if any) in which they appeared, or provide relevant representative examples if numerous. Provide a brief description of relevant positions of any organizations or groups with which you are closely identified or associated.

**Publications:**

**"Seepage and Piping - Lessons Learned", 25<sup>th</sup> USSD Annual Meeting and Conference, Salt Lake City, June 2005**

**"Seepage and Piping in Dams", Virginia ASCE Geotechnical Section Lecture, Williamsburg, VA, May 12, 2005,**

**"Seepage and Piping – The Devil is in the Details" (Invited Lecturer) , 21<sup>st</sup> Central Pennsylvania ASCE Geotechnical Conference, Hershey, PA, March 2005**

**"The Geotechnical Design of Deep Creek Dam", Co-author, South East Regional Conference, ASDSO, Lake Lanier, Georgia, June 2002**

**"Foundations in Weathering Profiles from Igneous and Metamorphic Rocks" (Invited Lecturer), 2001 A Geo Odyssey, ASCE Geotechnical Specialty Conference, Virginia Tech, Blacksburg, Virginia, June 2001**

**"Landslide Evaluation in Virginia Coastal Plain", Co-author, Symposium, Slope Stability in the Coastal Plain, ASCE Annual Convention, Boston, Massachusetts, 1998**

**"Embankment Dams in the Piedmont/Blue Ridge Province", Co-author, Proceedings, Design of Residual Soils: Geotechnical and Environmental Issues, ASCE National Convention, Washington, D.C., 1996**

**"Characterization of Preconsolidated Soils in Richmond, Virginia", Transportation Research Board Meeting, Washington, D.C., 1995**

**"Geotechnical and Geological Aspects of Spring Hollow Dam and Reservoir", Proceedings, ASDSO National Conference, Boston, MA, 1994**

**"Embankment Dam Safety", (Invited Lecturer) Proceedings, Geotechnical Practice in Dam Rehabilitation, ASCE, NCSU, Raleigh, NC, 1993.**

**"Remedial Repairs for Kakeout Dam and Dike", Proceedings, ASDSO National Conference, Baltimore, Maryland, 1992.**

**"Seepage Control Along Conduits Penetrating Embankment Dams" Proceedings, ASDSO National Conference, New Orleans, Louisiana, 1990.**

**"Preliminary Siting and Design of Two Dams", Proceedings, ASDSO National Conference, New Orleans, Louisiana, 1990.**

**"Evaluation of Reservoir Seepage in Karst Topography", Proceedings Geotechnical Engineering Symposium Spring Convention, ASCE, Nashville, Tennessee, 1988.**

**"Water Balance Modeling and Safe Yield Determination for Ground Water Management - Two Case Histories", Co-Author Proceedings, AWRA Symposium on "Coastal Water Resources", Wilmington, N.C., May 22-25, 1988.**

**"Concrete Pile Design in Tidewater Virginia", Co-author, Journal of Geotechnical Engineering Division, ASCE, June, 1987.**

**"Settlement of Residual Soils", Proceedings, Geotechnical Engineering Symposium, Spring Convention, ASCE, Atlantic City, New Jersey, 1987.**

**"Pressuremeter Correlations for Preconsolidated Clay", (Invited Lecturer), Proceedings, Uses of In Situ Tests in Geotechnical Engineering, ASCE, Blacksburg, Virginia, 1986.**

**"Large Diameter Double Underreamed Drilled Shafts", Co-author, Journal of Geotechnical Engineering Division, ASCE, August, 1983.**

**"Parking Garage Supported on Structural Fill", Co-author, Journal of Construction Engineering and Management, ASCE, September, 1983.**

**"Estimating Foundation Settlements in Residual Soils", Journal of the Geotechnical Engineering Division, ASCE, March, 1977.**



V. ADDITIONAL INFORMATION. If there are relevant aspects of your background or present circumstances not addressed above that might reasonably be construed by others as affecting your judgment in matters within the assigned task of the committee or panel on which you have been invited to serve, and therefore might constitute an actual or potential source of bias, please describe them briefly.

## PART II CONFIDENTIAL CONFLICT OF INTEREST DISCLOSURE

### INSTRUCTIONS

It is essential that the work of committees of the institution used in the development of reports not be compromised by any significant conflict of interest. For this purpose, **the term "conflict of interest" means any financial or other interest which conflicts with the service of the individual because it (1) could significantly impair the individual's objectivity or (2) could create an unfair competitive advantage for any person or organization.** Except for those situations in which the institution determines that a conflict of interest is unavoidable and promptly and publicly discloses the conflict of interest, no individual can be appointed to serve (or continue to serve) on a committee of the institution used in the development of reports if the individual has a conflict of interest that is relevant to the functions to be performed.

The term "conflict of interest" means something more than individual bias. There must be an *interest*, ordinarily financial, that could be directly affected by the work of the committee.

Conflict of interest requirements are *objective* and *prophylactic*. They are not an assessment of one's actual behavior or character, one's ability to act objectively despite the conflicting interest, or one's relative insensitivity to particular dollar amounts of specific assets because of one's personal wealth. Conflict of interest requirements are objective standards designed to eliminate certain specific, potentially compromising situations from arising, and thereby to protect the individual, the other members of the committee, the institution, and the public interest. The individual, the committee, and the institution should not be placed in a situation where others could reasonably question, and perhaps discount or dismiss, the work of the committee simply because of the existence of conflicting interests.

The term "conflict of interest" applies only to *current interests*. It does not apply to past interests that have expired, no longer exist, and cannot reasonably affect current behavior. Nor does it apply to possible interests that may arise in the future but do not currently exist, because such future interests are inherently speculative and uncertain. For example, a pending formal or informal application for a particular job is a current interest, but the mere possibility that one might apply for such a job in the future is not a current interest.

The term "conflict of interest" applies not only to the personal interests of the individual but also to the *interests of others* with whom the individual has substantial common financial interests if these interests are relevant to the functions to be performed. Thus, in assessing an individual's potential conflicts of interest, consideration must be given not only to the interests of the individual but also to the interests of the individual's spouse and minor children, the individual's employer, the individual's business partners, and others with whom the individual has substantial common financial interests. Consideration must also be given to the interests of those for whom one is acting in a fiduciary or similar capacity (e.g., being an officer or director of a corporation, whether profit or nonprofit, or serving as a trustee).

Much of the work of this institution involves scientific and technical studies and assistance for sponsors across a broad range of activities. Such activities may include, for

example: defining research needs, priorities, opportunities and agendas; assessing technology development issues and opportunities; addressing questions of human health promotion and assessment; providing scientific and technical assistance and supporting services for government agency program development; assessing the state of scientific or technical knowledge on particular subjects and in particular fields; providing international and foreign country science and technology assessments, studies and assistance. Such activities frequently address scientific, technical, and policy issues that are sufficiently broad in scope that they do not implicate specific financial interests or conflict of interest concerns.

However, where such activities address more specific issues having significant financial implications -- e.g., funding telescope A versus telescope B, government development or evaluation of a specific proprietary technology, promotion or endorsement of a specific form of medical treatment or medical device, connecting foreign research facilities to specific commercial interests, making recommendations to sponsors regarding specific contract or grant awards, etc. -- careful consideration must be given to possible conflict of interest issues with respect to the appointment of members of committees that will be used by the institution in the development of reports to be provided by the institution to sponsoring agencies.

The overriding objective of the conflict of interest inquiry in each case is to identify whether there are interests -- primarily financial in nature -- that conflict with the committee service of the individual because they could impair the individual's objectivity or could create an unfair competitive advantage for any person or organization. The fundamental question in each case is does the individual, or others with whom the individual has substantial common financial interests, have identifiable interests that could be directly affected by the outcome of the project activities of the committee on which the individual has been invited to serve? For projects involving advice regarding awards of contracts, grants, fellowships, etc., this institution is also guided by the principle that an individual should not participate in any decision regarding the award of a contract or grant or any other substantial economic benefit to the individual or to others with whom the individual has substantial common financial interests or a substantial personal or professional relationship.

The application of these concepts to specific scientific and technical studies and assistance projects must necessarily be addressed in each case on the basis of the particular facts and circumstances involved. The questions set forth below are designed to elicit information from you concerning possible conflicts of interest that are relevant to the functions to be performed by the particular committee on which you have been invited to serve.

1. FINANCIAL INTERESTS. (a) Taking into account stocks, bonds, and other financial instruments and investments including partnerships (but excluding broadly diversified mutual funds and any investment or financial interests valued at less than \$10,000), do you or, to the best of your knowledge others with whom you have substantial common financial interests, have financial investments that could be affected, either directly or by a direct effect on the business enterprise or activities underlying the investments, by the outcome of the project activities of the committee on which you have been invited to serve?



(b) Taking into account real estate and other tangible property interests, as well as intellectual property (patents, copyrights, etc.) interests, do you or, to the best of your knowledge others with whom you have substantial common financial interests, have property interests that could be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(c) Could your employment or self-employment (or the employment or self-employment of your spouse), or the financial interests of your employer or clients (or the financial interests of your spouse's employer or clients) be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(d) Taking into account research funding and other research support (e.g., equipment, facilities, industry partnerships, research assistants and other research personnel, etc.), could your current research funding and support (or that of your close research colleagues and collaborators) be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(e) Could your service on the committee on which you have been invited to serve create a specific financial or commercial competitive advantage for you or others with whom you have substantial common financial interests?

**If the answer to all of the above questions under FINANCIAL INTERESTS is either "no" or "not applicable," check here   X   (NO).**

**If the answer to any of the above questions under FINANCIAL INTERESTS is "yes," check here \_\_\_\_ (YES), and briefly describe the circumstances on the last page of this form.**

## 2. OTHER INTERESTS.

(a) Is the central purpose of the project for which this disclosure form is being prepared a critical review and evaluation of your own work or that of your employer?

(b) Do you have any existing professional obligations (e.g., as an officer of a scientific or engineering society) that effectively require you to publicly defend a previously established position on an issue that is relevant to the functions to be performed in this committee activity?

(c) To the best of your knowledge, will your participation in this committee activity enable you to obtain access to a competitor's or potential competitor's confidential proprietary information?

(d) If you are or have ever been a U.S. Government employee (either civilian or military), to the best of your knowledge are there any federal conflict of interest restrictions that may be applicable to your service in connection with this committee activity?

(e) If you are a U.S. Government employee, are you currently employed by a federal agency that is sponsoring this project? If you are not a U.S. Government employee, are you an employee of any other sponsor (e.g., a private foundation) of this project?

(f) If the committee activity for which this form is being prepared involves reviews of specific applications and proposals for contract, grant, fellowship, etc. awards to be made by sponsors, do you or others with whom you have substantial common financial interests, or a familial or substantial professional relationship, have an interest in receiving or being considered for awards that are currently the subject of the review being conducted by this committee?

(g) If the committee activity for which this form is being prepared involves developing requests for proposals, work statements, and/or specifications, etc., are you interested in seeking an award under the program for which the committee on which you have been invited to serve is developing the request for proposals, work statement, and/or specifications -- or, are you employed in any capacity by, or do you have a financial interest in or other economic relationship with, any person or organization that to the best of your knowledge is interested in seeking an award under this program?

If the answer to all of the above questions under OTHER INTERESTS is either "no" or "not applicable," check here   X   (NO).

If the answer to any of the above questions under OTHER INTERESTS is "yes," check here        (YES), and briefly describe the circumstances on the last page of this form.

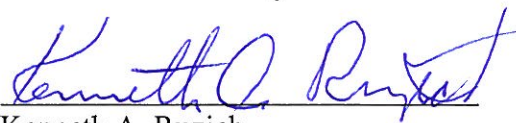
EXPLANATION OF "YES" RESPONSES:

**Not Applicable**

*During your period of service in connection with the activity for which this form is being completed, any changes in the information reported, or any new information, which needs to be reported, should be reported promptly by written or electronic communication to the responsible staff officer.*

  
YOUR SIGNATURE

  9/30/09    
DATE

Reviewed by:   
Kenneth A. Ruzich  
WSAFCA General Manager

  9/30/09    
DATE

**BI/COI FORM 3**

THE NATIONAL ACADEMIES  
*Advisers to the Nation on Science, Engineering, and Medicine*

National Academy of Sciences  
National Academy of Engineering

Institute of Medicine  
National Research Council

**BACKGROUND INFORMATION  
AND  
CONFIDENTIAL CONFLICT OF INTEREST DISCLOSURE**  
*For General Scientific and Technical Studies and Assistance*

NAME: George Sills

TELEPHONE: 601- 638 0436

ADDRESS: 470 Dogwood Lake Dr  
Vicksburg, MS 39183

EMAIL ADDRESS: georgesills@bellsouth.net

CURRENT EMPLOYER: George Sills Geotechnical Engineering Consultant,  
LLC

NAS/NAE/IOM/NRC COMMITTEE: NA

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I. ORGANIZATIONAL AFFILIATIONS. Report your relevant business relationships (as an employee, owner, officer, director, consultant, etc.) and your relevant remunerated or volunteer non-business relationships (e.g., professional organizations, trade associations, public interest or civic groups, etc.).

Professional Engineer, Mississippi  
American Society of Civil Engineers (ASCE)  
Association of State Flood Plain Managers  
United States Society on Dams (USSD)  
Association of State Dam Safety Officials (ASDSO)  
Member, Embankment Dams and Slopes Committee of Geotechnical Engineering Division of ASCE, 2005-2008.

II. GOVERNMENT SERVICE. Report your relevant service (full-time or part-time) with federal, state, or local government in the United States (including elected or appointed positions, employment, advisory board memberships, military service, etc.).

I am retired from the U.S. Army Corps of Engineers (Corps) where I worked for over 36 years. I was employed by the Vicksburg District for 32 of those years and the Engineer Research & Development Center (ERDC) for 4 years. I have extensive experience in the evaluation, design, and construction of dams and levees. I have led several investigations into the causes and mechanisms of seepage distress along levees and have helped the Corps develop a comprehensive understanding of these issues. I have lectured and published numerous technical papers on levee seepage distress and levee design.

While at ERDC, I led the joint Corps and Bureau of Reclamation (Reclamation) team that developed a toolbox for use in performing Probabilistic Risk Assessments (PRAs) on Corps and Reclamation dams with regard to seepage and piping distress. Much of this effort involved leading a diverse group to resolve complex and conflicting guidance criteria to create useable tools for practitioners from different agencies. I have also served on the Corps' National Levee Safety Program to help set policy/methodology for Corps levee assessments in the future. I have also led the team assigned to rewrite the Corps Levee Design Engineering Manual, which instructs engineers in proper design procedures for levee underseepage. This document is currently in draft form and undergoing review.

I have recently served on a team to provide Independent Technical Review of the design for repairs to the Herbert Hoover Dike in Florida. This 145-mile-long dam/dike was constructed over peat and limestone which created seepage problems. Currently, I am a member of the Independent Consulting Board reviewing the ongoing design work for urban levees in the Central Valley of California. I am also serving on the Senior Board of Consultants for the review of levee designs for the Natomas Levee Improvement Program for the Sacramento Area Flood Control Agency.

In 2005, I was selected to serve on the Corps' Interagency Performance Evaluation Task Force (IPET) following Hurricane Katrina as a member of the Perishable Data Team and also as a member of the Performance Analysis Team. I have made major contributions to these efforts and to the IPET document that summarized the team's findings. I have also testified in court about their efforts on this study.

**III. RESEARCH SUPPORT.** Report relevant information regarding both public and private sources of research support (other than your present employer), including sources of funding, equipment, facilities, etc.

See Answer for Question II.

**IV. PUBLIC STATEMENTS AND POSITIONS.** List your relevant articles, testimony, speeches, etc., by date, title, and publication (if any) in which they appeared, or provide relevant representative examples if numerous. Provide a brief description of relevant positions of any organizations or groups with which you are closely identified or associated.

Expert Witness for Litigation

- 2006 testified on IPET forensic work for New Orleans in: Colleen Berthelot, et al., v. BOH Brothers Construction Co., LLC, et al., Civil Action No. 05-4182, May 4, 2006, United States District Court, E.D. Louisiana.
- Calion Lock and Dam - dewatering and differing site condition construction claim - a second claim for rock in the outlet channel.
- Felsenthal Lock and Dam - dewatering construction claim
- John H. Overton Lock and Dam - access road construction claim differing site conditions
- Lock and Dam No. 3 - access road claim - differing site conditions construction claim
- Lock and Dam No. 4 - differing site conditions construction claim - rock in the inlet channel evaluation of difficult driving of sheep pile in rock
- Provided technical assistance to EPA in trial conducted in Texas (1995).
- Provided testimony and assistance concerning "sudden drawdown failures" in lawsuit defended by the Red River Waterway Commission
- Provided numerous depositions in the above listed cases and disputes.

Publications

- Sills, G. (1983), “Long Term Strength Reduction and Slough Slides in Mississippi River Levees”, Technical Report, USACE, Vicksburg MS.
- Sills, G.L.(1984), “Long Term Failure in Compacted Clay Slopes”, International Conference on Case Histories in Geotechnical Engineering, University of Missouri at Rolla, St. Louis, MO.
- Sills, G.L. and Fleming, R. L. (1992), “Slide Stabilization with Stone-Fill Trenches”, Proceedings, Stability and Performance of Slopes and Embankments-II, ASCE.
- Sills, G. L. and Stewart, E (1992), “Lime Stabilization of Levee Slopes”, Second Interagency Symposium on Stabilization of Soils and Other Materials, New Orleans, LA
- Sills, G. L. (1994), “Lime Stabilization of Levees”, Proceedings, REMR Workshop, Vicksburg, MS
- Sills, G. L. (1994), “Stabilization with Stone-Fill Trenches”, Proceedings, REMR Workshop, Vicksburg, MS
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- Sills, G. L. (2005), Published new USACE ETL, “Engineering and Design, Design Guidance for Levee Underseepage”, Engineer Technical Letter (ETL), ETL 1110-2-569, Dated May 05
- Hess, J.R., Sills, G.L., Costa, R., and Shewbridge, S.E. (2005) "Fixing California's Levees" The Military Engineer, Society of Military Engineers, Nov/Dec 2005, Vol. 97, #638
- Shewbridge, S. E., Hess, J.R., Sills, G.L., Costa, R., (2006) “The Evolving Approach to Fixing California’s Levees” Journal of Dam Safety, Association of State Dam Safety Officials, Vol. 4, Issue 4, Fall, 2006, p28-35.
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- IPET Team, Sills, G. L. (major contributor) and others, “Interagency Performance Evaluation Taskforce (IPET), (2006). “Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System Vol. V,” U.S. Army Corps of Engineers, Draft Final Report.



- Sills, G. L. and Vroman, N. D. (2006), “Performance of New Orleans’ Hurricane Protection System: The Good, The Bad, and The Ugly”, Australian National Committee on Large Dams (ANCOLD), Annual Conference.
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V. ADDITIONAL INFORMATION. If there are relevant aspects of your background or present circumstances not addressed above that might reasonably be construed by others as affecting your judgment in matters within the assigned task of the committee or panel on which you have been invited to serve, and therefore might constitute an actual or potential source of bias, please describe them briefly.

## PART II CONFIDENTIAL CONFLICT OF INTEREST DISCLOSURE

### INSTRUCTIONS

It is essential that the work of committees of the institution used in the development of reports not be compromised by any significant conflict of interest. For this purpose, **the term "conflict of interest" means any financial or other interest which conflicts with the service of the individual because it (1) could significantly impair the individual's objectivity or (2) could create an unfair competitive advantage for any person or organization.** Except for those situations in which the institution determines that a conflict of interest is unavoidable and promptly and publicly discloses the conflict of interest, no individual can be appointed to serve (or continue to serve) on a committee of the institution used in the development of reports if the individual has a conflict of interest that is relevant to the functions to be performed.

The term "conflict of interest" means something more than individual bias. There must be an *interest*, ordinarily financial, that could be directly affected by the work of the committee.

Conflict of interest requirements are *objective* and *prophylactic*. They are not an assessment of one's actual behavior or character, one's ability to act objectively despite the conflicting interest, or one's relative insensitivity to particular dollar amounts of specific assets because of one's personal wealth. Conflict of interest requirements are objective standards designed to eliminate certain specific, potentially compromising situations from arising, and thereby to protect the individual, the other members of the committee, the institution, and the public interest. The individual, the committee, and the institution should not be placed in a situation where others could reasonably question, and perhaps discount or dismiss, the work of the committee simply because of the existence of conflicting interests.

The term "conflict of interest" applies only to *current interests*. It does not apply to past interests that have expired, no longer exist, and cannot reasonably affect current behavior. Nor does it apply to possible interests that may arise in the future but do not currently exist, because such future interests are inherently speculative and uncertain. For example, a pending formal or informal application for a particular job is a current interest, but the mere possibility that one might apply for such a job in the future is not a current interest.

The term "conflict of interest" applies not only to the personal interests of the individual but also to the *interests of others* with whom the individual has substantial common financial interests if these interests are relevant to the functions to be performed. Thus, in assessing an individual's potential conflicts of interest, consideration must be given not only to the interests of the individual but also to the interests of the individual's spouse and minor children, the individual's employer, the individual's business partners, and others with whom the individual has substantial common financial interests. Consideration must also be given to the interests of those for whom one is acting in a fiduciary or similar capacity (e.g., being an officer or director of a corporation, whether profit or nonprofit, or serving as a trustee).

Much of the work of this institution involves scientific and technical studies and assistance for sponsors across a broad range of activities. Such activities may include, for



example: defining research needs, priorities, opportunities and agendas; assessing technology development issues and opportunities; addressing questions of human health promotion and assessment; providing scientific and technical assistance and supporting services for government agency program development; assessing the state of scientific or technical knowledge on particular subjects and in particular fields; providing international and foreign country science and technology assessments, studies and assistance. Such activities frequently address scientific, technical, and policy issues that are sufficiently broad in scope that they do not implicate specific financial interests or conflict of interest concerns.

However, where such activities address more specific issues having significant financial implications -- e.g., funding telescope A versus telescope B, government development or evaluation of a specific proprietary technology, promotion or endorsement of a specific form of medical treatment or medical device, connecting foreign research facilities to specific commercial interests, making recommendations to sponsors regarding specific contract or grant awards, etc. -- careful consideration must be given to possible conflict of interest issues with respect to the appointment of members of committees that will be used by the institution in the development of reports to be provided by the institution to sponsoring agencies.

The overriding objective of the conflict of interest inquiry in each case is to identify whether there are interests -- primarily financial in nature -- that conflict with the committee service of the individual because they could impair the individual's objectivity or could create an unfair competitive advantage for any person or organization. The fundamental question in each case is does the individual, or others with whom the individual has substantial common financial interests, have identifiable interests that could be directly affected by the outcome of the project activities of the committee on which the individual has been invited to serve? For projects involving advice regarding awards of contracts, grants, fellowships, etc., this institution is also guided by the principle that an individual should not participate in any decision regarding the award of a contract or grant or any other substantial economic benefit to the individual or to others with whom the individual has substantial common financial interests or a substantial personal or professional relationship.

The application of these concepts to specific scientific and technical studies and assistance projects must necessarily be addressed in each case on the basis of the particular facts and circumstances involved. The questions set forth below are designed to elicit information from you concerning possible conflicts of interest that are relevant to the functions to be performed by the particular committee on which you have been invited to serve.

#### 1. FINANCIAL INTERESTS.

(a) Taking into account stocks, bonds, and other financial instruments and investments including partnerships (but excluding broadly diversified mutual funds and any investment or financial interests valued at less than \$10,000), do you or, to the best of your knowledge others with whom you have substantial common financial interests, have financial investments that could be affected, either directly or by a direct effect on the business enterprise or activities underlying the investments, by the outcome of the project activities of the committee on which you have been invited to serve?

(b) Taking into account real estate and other tangible property interests, as well as intellectual property (patents, copyrights, etc.) interests, do you or, to the best of your knowledge others with whom you have substantial common financial interests, have property interests that could be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(c) Could your employment or self-employment (or the employment or self-employment of your spouse), or the financial interests of your employer or clients (or the financial interests of your spouse's employer or clients) be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(d) Taking into account research funding and other research support (e.g., equipment, facilities, industry partnerships, research assistants and other research personnel, etc.), could your current research funding and support (or that of your close research colleagues and collaborators) be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(e) Could your service on the committee on which you have been invited to serve create a specific financial or commercial competitive advantage for you or others with whom you have substantial common financial interests?

**If the answer to all of the above questions under FINANCIAL INTERESTS is either "no" or "not applicable," check here   X   (NO).**

**If the answer to any of the above questions under FINANCIAL INTERESTS is "yes," check here \_\_\_\_ (YES), and briefly describe the circumstances on the last page of this form.**

## 2. OTHER INTERESTS.

(a) Is the central purpose of the project for which this disclosure form is being prepared a critical review and evaluation of your own work or that of your employer?

(b) Do you have any existing professional obligations (e.g., as an officer of a scientific or engineering society) that effectively require you to publicly defend a previously established position on an issue that is relevant to the functions to be performed in this committee activity?

(c) To the best of your knowledge, will your participation in this committee activity enable you to obtain access to a competitor's or potential competitor's confidential proprietary information?

(d) If you are or have ever been a U.S. Government employee (either civilian or military), to the best of your knowledge are there any federal conflict of interest restrictions that may be applicable to your service in connection with this committee activity?

(e) If you are a U.S. Government employee, are you currently employed by a federal agency that is sponsoring this project? If you are not a U.S. Government employee, are you an employee of any other sponsor (e.g., a private foundation) of this project?

(f) If the committee activity for which this form is being prepared involves reviews of specific applications and proposals for contract, grant, fellowship, etc. awards to be made by sponsors, do you or others with whom you have substantial common financial interests, or a familial or

substantial professional relationship, have an interest in receiving or being considered for awards that are currently the subject of the review being conducted by this committee?

(g) If the committee activity for which this form is being prepared involves developing requests for proposals, work statements, and/or specifications, etc., are you interested in seeking an award under the program for which the committee on which you have been invited to serve is developing the request for proposals, work statement, and/or specifications -- or, are you employed in any capacity by, or do you have a financial interest in or other economic relationship with, any person or organization that to the best of your knowledge is interested in seeking an award under this program?

If the answer to all of the above questions under OTHER INTERESTS is either "no" or "not applicable," check here  X  (NO).


*I authored the Engineer Technical Letter, "Engineering and Design, Design Guidance for Levee Underseepage", ETL 1110-2-569, Dated May 05 during my service with the USACE.*

If the answer to any of the above questions under OTHER INTERESTS is "yes," check here   (YES), and briefly describe the circumstances on the last page of this form.

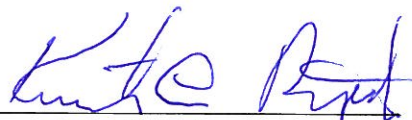
EXPLANATION OF "YES" RESPONSES:

**Not Applicable**

*During your period of service in connection with the activity for which this form is being completed, any changes in the information reported, or any new information, which needs to be reported, should be reported promptly by written or electronic communication to the responsible staff officer.*

  
YOUR SIGNATURE

9/30/2009  
DATE

Reviewed by:   
Kenneth A. Ruzich  
WSAFCA General Manager

9/30/09  
DATE

**BI/COI FORM 3**

THE NATIONAL ACADEMIES  
*Advisers to the Nation on Science, Engineering, and Medicine*

National Academy of Sciences  
National Academy of Engineering

Institute of Medicine  
National Research Council

**BACKGROUND INFORMATION  
AND  
CONFIDENTIAL CONFLICT OF INTEREST DISCLOSURE**  
*For General Scientific and Technical Studies and Assistance*

NAME: David T. Williams TELEPHONE: 619-823-4778

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EMAIL ADDRESS: [david@dtwassoc.com](mailto:david@dtwassoc.com)

CURRENT EMPLOYER: David T. Williams and Associates, Engineers,  
LLC

NAS/NAE/IOM/NRC COMMITTEE: NA

There are two parts to this form, Part I Background Information, and Part II Confidential Conflict of Interest Disclosure. Complete both parts, **sign** and **date** this form on the last page, and return the form to the responsible staff officer for *The National Academies* project and committee activity to which this form applies. **Retain a copy for your records.**

## PART I

### BACKGROUND INFORMATION

#### INSTRUCTIONS

Please provide the information requested below regarding **relevant** organizational affiliations, government service, public statements and positions, research support, and additional information (if any). Information is "relevant" if it is related to -- and might reasonably be of interest to others concerning -- your knowledge, experience, and personal perspectives regarding the subject matter and issues to be addressed by the committee activity for which this form is being prepared. If some or all of the requested information is contained in your curriculum vitae, you may if you prefer simply attach your CV to this form, supplemented by additional responses or comments below as necessary.

I. ORGANIZATIONAL AFFILIATIONS. Report your relevant business relationships (as an employee, owner, officer, director, consultant, etc.) and your relevant remunerated or volunteer non-business relationships (e.g., professional organizations, trade associations, public interest or civic groups, etc.).

See attached resume.

II. GOVERNMENT SERVICE. Report your relevant service (full-time or part-time) with federal, state, or local government in the United States (including elected or appointed positions, employment, advisory board memberships, military service, etc.).

See attached resume.

III. RESEARCH SUPPORT. Report relevant information regarding both public and private sources of research support (other than your present employer), including sources of funding, equipment, facilities, etc.

No research support.

IV. PUBLIC STATEMENTS AND POSITIONS. List your relevant articles, testimony, speeches, etc., by date, title, and publication (if any) in which they appeared, or provide relevant representative examples if numerous. Provide a brief description of relevant positions of any organizations or groups with which you are closely identified or associated.

See attached resume.



V. ADDITIONAL INFORMATION. If there are relevant aspects of your background or present circumstances not addressed above that might reasonably be construed by others as affecting your judgment in matters within the assigned task of the committee or panel on which you have been invited to serve, and therefore might constitute an actual or potential source of bias, please describe them briefly.

All information has been provided

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example: defining research needs, priorities, opportunities and agendas; assessing technology development issues and opportunities; addressing questions of human health promotion and assessment; providing scientific and technical assistance and supporting services for government agency program development; assessing the state of scientific or technical knowledge on particular subjects and in particular fields; providing international and foreign country science and technology assessments, studies and assistance. Such activities frequently address scientific, technical, and policy issues that are sufficiently broad in scope that they do not implicate specific financial interests or conflict of interest concerns.

However, where such activities address more specific issues having significant financial implications -- e.g., funding telescope A versus telescope B, government development or evaluation of a specific proprietary technology, promotion or endorsement of a specific form of medical treatment or medical device, connecting foreign research facilities to specific commercial interests, making recommendations to sponsors regarding specific contract or grant awards, etc. -- careful consideration must be given to possible conflict of interest issues with respect to the appointment of members of committees that will be used by the institution in the development of reports to be provided by the institution to sponsoring agencies.

The overriding objective of the conflict of interest inquiry in each case is to identify whether there are interests -- primarily financial in nature -- that conflict with the committee service of the individual because they could impair the individual's objectivity or could create an unfair competitive advantage for any person or organization. The fundamental question in each case is does the individual, or others with whom the individual has substantial common financial interests, have identifiable interests that could be directly affected by the outcome of the project activities of the committee on which the individual has been invited to serve? For projects involving advice regarding awards of contracts, grants, fellowships, etc., this institution is also guided by the principle that an individual should not participate in any decision regarding the award of a contract or grant or any other substantial economic benefit to the individual or to others with whom the individual has substantial common financial interests or a substantial personal or professional relationship.

The application of these concepts to specific scientific and technical studies and assistance projects must necessarily be addressed in each case on the basis of the particular facts and circumstances involved. The questions set forth below are designed to elicit information from you concerning possible conflicts of interest that are relevant to the functions to be performed by the particular committee on which you have been invited to serve.

#### 1. FINANCIAL INTERESTS.

(a) Taking into account stocks, bonds, and other financial instruments and investments including partnerships (but excluding broadly diversified mutual funds and any investment or financial interests valued at less than \$10,000), do you or, to the best of your knowledge others with whom you have substantial common financial interests, have financial investments that could be affected, either directly or by a direct effect on the business enterprise or activities underlying the investments, by the outcome of the project activities of the committee on which you have been invited to serve?

(b) Taking into account real estate and other tangible property interests, as well as intellectual property (patents, copyrights, etc.) interests, do you or, to the best of your knowledge others with whom you have substantial common financial interests, have property interests that could be directly affected by the outcome of the project activities of the **WSAFCA Board of Senior Consultants for the West Sacramento Levee Improvement Program** on which you have been invited to serve?

(c) Could your employment or self-employment (or the employment or self-employment of your spouse), or the financial interests of your employer or clients (or the financial interests of your spouse's employer or clients) be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(d) Taking into account research funding and other research support (e.g., equipment, facilities, industry partnerships, research assistants and other research personnel, etc.), could your current research funding and support (or that of your close research colleagues and collaborators) be directly affected by the outcome of the project activities of the committee on which you have been invited to serve?

(e) Could your service on the committee on which you have been invited to serve create a specific financial or commercial competitive advantage for you or others with whom you have substantial common financial interests?

**If the answer to all of the above questions under FINANCIAL INTERESTS is either "no" or "not applicable," check here   X   (NO).**

**If the answer to any of the above questions under FINANCIAL INTERESTS is "yes," check here \_\_\_\_ (YES), and briefly describe the circumstances on the last page of this form.**

## 2. OTHER INTERESTS.

(a) Is the central purpose of the project for which this disclosure form is being prepared a critical review and evaluation of your own work or that of your employer?

(b) Do you have any existing professional obligations (e.g., as an officer of a scientific or engineering society) that effectively require you to publicly defend a previously established position on an issue that is relevant to the functions to be performed in this committee activity?

(c) To the best of your knowledge, will your participation in this committee activity enable you to obtain access to a competitor's or potential competitor's confidential proprietary information?

(d) If you are or have ever been a U.S. Government employee (either civilian or military), to the best of your knowledge are there any federal conflict of interest restrictions that may be applicable to your service in connection with this committee activity?

(e) If you are a U.S. Government employee, are you currently employed by a federal agency that is sponsoring this project? If you are not a U.S. Government employee, are you an employee of any other sponsor (e.g., a private foundation) of this project?

(f) If the committee activity for which this form is being prepared involves reviews of specific applications and proposals for contract, grant, fellowship, etc. awards to be made by sponsors, do you or others with whom you have substantial common financial interests, or a familial or

substantial professional relationship, have an interest in receiving or being considered for awards that are currently the subject of the review being conducted by this committee?

(g) If the committee activity for which this form is being prepared involves developing requests for proposals, work statements, and/or specifications, etc., are you interested in seeking an award under the program for which the committee on which you have been invited to serve is developing the request for proposals, work statement, and/or specifications -- or, are you employed in any capacity by, or do you have a financial interest in or other economic relationship with, any person or organization that to the best of your knowledge is interested in seeking an award under this program?

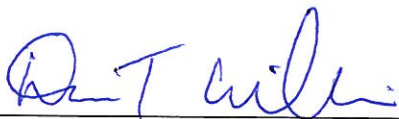
**If the answer to all of the above questions under OTHER INTERESTS is either "no" or "not applicable," check here   X   (NO).**

**If the answer to any of the above questions under OTHER INTERESTS is "yes," check here        (YES), and briefly describe the circumstances on the last page of this form.**

EXPLANATION OF "YES" RESPONSES:

**Not Applicable**

*During your period of service in connection with the activity for which this form is being completed, any changes in the information reported, or any new information, which needs to be reported, should be reported promptly by written or electronic communication to the responsible staff officer.*

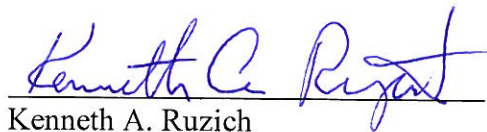


YOUR SIGNATURE

9/30/09

DATE

Reviewed by:



Kenneth A. Ruzich  
WSAFCA General Manager

9/30/09

DATE



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## BOARD OF SENIOR CONSULTANTS RESUMES

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GEORGE L. SILLS, P.E.

## *Engineer/Manager*

### EDUCATION

Ph.D., Philosophy (Candidate), Civil Engineering, Louisiana State University

ME, Civil Engineering, Texas A & M University. 1981

BS, Civil Engineering, Mississippi State University, 1975

### REGISTRATION

Professional Engineer: Mississippi

### Awards

Tau Beta Pi Member

Award for Outstanding Team Effort for planning and testing of temporary, barrier-type flood-fighting technologies. Award-May 2008

Commander's Award for Superior Civilian Service, 2007-for service to ERDC

Commander's Award for Superior Civilian Service, 2007- for service to IPET Team

Certificate of Appreciation from Sacramento District, U.S. Army Corps of Engineers for leading the Levee Seepage Task Force and developing criteria for flood protection – 2003

Selected by National Society of Professional Engineers as one of the Top 10 Federal Engineer of the Year-1999

Commander's Award for Civilian Service-1995, 1999

Commander's Award for Community Service-1994, 1999

Appointed to MS State University National Board of Directors and recipient of the Distinguished Service Award-1994

### PROFESSIONAL SUMMARY

George is retired from the U.S. Army Corps of Engineers (Corps) where he worked for over 36 years. He was employed by the Vicksburg District for 32 of those years and the Engineer Research & Development Center (ERDC) for 4 years. He has extensive experience in the evaluation, design, and construction of dams and levees. George has lead several investigations into the causes and mechanisms of seepage distress along levees and has helped the Corps develop a comprehensive understanding of these issues. He has lectured and published numerous technical papers on levee seepage distress and levee design.

While at ERDC, George led the joint Corps and Bureau of Reclamation (Reclamation) team that developed a toolbox for use in performing Probabilistic Risk Assessments (PRAs) on Corps and Reclamation dams with regard to seepage and piping distress. Much of this effort involved leading a diverse group to resolve complex and conflicting guidance criteria to create useable tools for practitioners from different agencies. George also served on the Corps' National Levee Safety Program to help set policy/methodology for Corps levee assessments in the future. George also led the team assigned to rewrite the Corps Levee Design Engineering Manual, which instructs engineers in proper design procedures for levee underseepage. This document is currently in draft form and undergoing review.

George recently served on a team to provide Independent Technical Review of the design for repairs to the Herbert Hoover Dike in Florida. This 145-mile-long dam/dike was constructed over peat and limestone which created seepage problems. Currently, George is a member of the Independent Consulting Board reviewing the ongoing design work for urban levees in the Central Valley of California. He also serves on the Senior Board of Consultants for the review of levee designs for Natomas Levee Improvement Program for the Sacramento Area Flood Control Agency.

In 2005, George was selected to serve on the Corps' Interagency Performance Evaluation Task Force (IPET) following Hurricane Katrina as a member of the Perishable Data Team and also as a member of the Performance Analysis Team. He made major contributions to these efforts and to the IPET document that summarized the team's findings. He also testified in court about their efforts on this study.

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# George Sills Geotechnical Engineering Consultant, LLC

GEORGE L. SILLS, P.E.

Commander's Award for Civilian Service-1994. During the 1993 Midwest flood, George served as technical advisor for the USACE St. Louis District to answer seepage related questions in the field during the flood event.

During 2003, George was selected to lead the Sacramento District (SPK) Levee Seepage Task Force. The Task Force consisted of six levee experts: two from the federal government, one from the State of California, one private consultant, and two consultants from universities. George led this diverse team to accomplish their mission within budget and within schedule. George later took the information from this study and wrote an Engineering Technical Letter to change procedures currently used by USACE for their nationwide approach to seepage design.

While at the Vicksburg District, Mr. Sills led a study to determine the effects on area groundwater along the Red River which might occur from impounding the pools for navigation on the Red River.

## RELEVANT EXPERIENCE

1994-2003

- While working at the Vicksburg District George performed the following as a Geotechnical Coordinating Specialist: George assisted the Branch Chief with the overall management, direction, control, administration, planning, and review of the engineers and design functions of the Geotechnical Branch of the Vicksburg District (MVK). He evaluated technical staffing and performance and made recommendations on the most economical, efficient, and feasible methods and/or manner to accomplish work. He also established schedules and priorities. He served as Technical Expert and Consultant for guidance and recommendations to MVK, other Corps Districts, A-E firms, and higher Corps echelons. During this period, George led the design effort for the soil nailing of the Natchez Bluffs.

July 1994-December 1994

- Served as a Project Engineer in the Programs and Project Management Division, managing the \$1.8 billion Red River Basin Project. Daily, he coordinated all District functions concerning District policies and procedures. He served as major liaison between the project sponsor and Corps. He also worked closely with Congressional staff in order to meet project milestones. He used innovative problem solving techniques to enable the District to begin pool impoundments as scheduled.

December 1994-December 1995

- Supervisory Civil Engineer, GS-0810-13, Acting Chief of the Analytical Section with the responsibility of supervising twelve engineers and professionals. This responsibility included personnel and administrative matters as well as scheduling and programming funds. During this period, the Section met or exceeded all schedule requirements and operated within budget requirements.

December 1989-July 1994

- Geotechnical Specialist responsible for the designs and reviews of all geotechnical work associated with the Red River Project. This work included designing the foundations for the locks and dams, dewatering requirements, and all other Geotechnical requirements. During this project, George invented a method of slide repair reported in ASCE and currently used by private and government sectors.

January 1991-November 1991

- Served as a professional specialist in Project Management, CEMVD General Management Branch. Responsibilities included executing the project management function for Engineering Division by furnishing staff assistance and managerial and technical advice to Districts and MVD staff. He also coordinated the review of reports and studies, monitored District schedules, identified potential slippages, and took corrective action when necessary.

January 1981-December 1989

- Served as Project Engineer in the Analytical Section where George was responsible for geotechnical design of complex multimillion dollar projects, as well as supervision of as many as 20 engineers and professionals in the execution of field testing operations. These field tests included the pile load test at John H. Overton Lock and Dam for a period of 8 months, as well as field pumping tests at Locks and Dams No. 4 and 5 on the Red River. He was also responsible for programming funds for the entire Red River in CEMVK-ED-G. George was the primary point of contact for design and/or construction problems for Locks and Dams No. 2, 3, 4, and 5 on the Red River.

Concrete Locks and Dams

- Served as Geotechnical Project Engineer for the Red River Waterway Project and was responsible for designing and reviewing all Geotechnical designs of this \$1.8 billion dollar project. This design work included the foundations for the locks and dams, dewatering requirements, and all other Geotechnical requirements.
  - Geotechnical Project Engineer for the Joe D. Waggoner, Jr. L&D (Lock & Dam No. 5) on the J. Bennett Johnston Waterway Project (Red River Waterway). His design and construction experience on this project included a slurry trench design and dewatering wells to unwater the excavation. He also led a field pumping test at this site.
  - Geotechnical Project Engineer for the design and construction of the Russell B. Long L&D (Lock & Dam No. 4) on the Red River Waterway, this design included a slurry trench, dewatering wells, and excavation through a rock formation. He also led a field pumping test at this site.
  - Geotechnical Project Manager for Lock & Dam No. 3 for the design and construction which also included a field pump test.
  - Geotechnical Project Manager for John H. Overton L&D (Lock & Dam No. 2) for the construction phase which included the redesign of the field pile load test program. The pile test program was modified using a method never tried before. Because of these changes, the modified program was able to collect more useable data while saving the Government a sum of \$450,000.
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## **George Sills Geotechnical Engineering Consultant, LLC**

GEORGE L. SILLS, P.E.

- Geotechnical Project Manager for the construction of Lindy C. Boggs L&D (Lock & Dam No. 1) where he answered all geotechnical related questions during construction.
- Geotechnical Engineer performing all phases of geotechnical design for the foundation of Felsenthal L&D and T.K. Thatcher L&D (Calion L&D) on the Ouachita-Black Navigation Project.

### Dams and Levees

- Served on a group to provide Independent Technical Review for the Herbert Hoover Dike in Florida. This 145 mile long dam/dike was constructed over peat and limestone which has created seepage problems. This review team was responsible for assuring the safety of the design repair.
- He led a diverse team of Corps, State of California personnel, and leading academic experts to review the Sacramento Districts practices of levee construction. Results from this study have led to major changes in the procedures the Corps used nation wide in levee design.
- Geotechnical Engineer managing the geotechnical designs of the Sicily Island Levee system. This project included numerous drainage structures, several large pumping plants, and approximately 70 miles of levees.
- Geotechnical Engineer designing numerous miles of mainline Mississippi River Levee enlargements that included stability berms, seepage berms, and relief well designs.
- Geotechnical Engineer designing and providing construction design support for the Swan Lake levee project. This project was constructed over very soft soils with shear strengths less than 100 psf.
- Geotechnical Project Manager for the geotechnical design for the earthen closures at Locks & Dams 2, 3, 4, and 5 on the Red River. All these closures were constructed in the wet.

### Other Experience

- George has worked on numerous deep slurry trenches and has been heavily involved both in design and in the oversight of construction. He is widely known as an expert in several fields of Geotechnical Engineering.
- Publication and expertise in long-term behavior of soils and slope stability, pile design and driving.
- Experience in dewatering, slope stability, slurry trench design and construction, ground water movements, seepage, and foundation design.
- Ameristar Casino (Vicksburg) – review of cofferdam cell keyed into limestone that was sliding – including the development of recommendations to stabilize (for Sverdrup).
- Served as lead geotechnical designer for the \$1.8 billion Red River Waterway project that included five locks and dams. Work included pile design, cofferdam cells, dewatering, slope stability, etc.
- Invented a method of slide repair using stone filled trenches that was later published by the American Society of Civil Engineers.
- Responsible geotechnical engineer for the Natchez Bluff Stabilization Project which used “soil nailing”.



# **George Sills Geotechnical Engineering Consultant, LLC**

GEORGE L. SILLS, P.E.

## Expert Witness for Litigation

- 2006 testified on IPET forensic work for New Orleans in: Colleen Berthelot, et al., v. BOH Brothers Construction Co., LLC, et al., Civil Action No. 05-4182, May 4, 2006, United States District Court, E.D. Louisiana.
  
- Calion Lock and Dam - dewatering and differing site condition construction claim - a second claim for rock in the outlet channel.
  
- Felsenthal Lock and Dam - dewatering construction claim
- John H. Overton Lock and Dam - access road construction claim differing site conditions
- Lock and Dam No. 3 - access road claim - differing site conditions construction claim
- Lock and Dam No. 4 - differing site conditions construction claim - rock in the inlet channel evaluation of difficult driving of sheep pile in rock
- Provided technical assistance to EPA in trial conducted in Texas (1995).
- Provided testimony and assistance concerning “sudden drawdown failures” in lawsuit defended by the Red River Waterway Commission
- Provided numerous depositions in the above listed cases and disputes.

## PUBLICATIONS

- Sills, G. (1983), “Long Term Strength Reduction and Slough Slides in Mississippi River Levees”, Technical Report, USACE, Vicksburg MS.
- Sills, G.L.(1984), “Long Term Failure in Compacted Clay Slopes”, International Conference on Case Histories in Geotechnical Engineering, University of Missouri at Rolla, St. Louis, MO.
- Sills, G.L. and Fleming, R. L. (1992), “Slide Stabilization with Stone-Fill Trenches”, Proceedings, Stability and Performance of Slopes and Embankments-II, ASCE.
- Sills, G. L. and Stewart, E (1992), “Lime Stabilization of Levee Slopes”, Second Interagency Symposium on Stabilization of Soils and Other Materials, New Orleans, LA
- Sills, G. L. (1994), “Lime Stabilization of Levees”, Proceedings, REMR Workshop, Vicksburg, MS
- Sills, G. L. (1994), “Stabilization with Stone-Fill Trenches”, Proceedings, REMR Workshop, Vicksburg, MS
- Sills, G. L. (1997), “Slurry Trench Quality Control”, USACE, WES, Proceedings, REMR Workshop, Vicksburg, MS
- Singh, V. P., Ojha, C. S. P., Adrian, D. D., Ozkan, S. and Sills, G.L., (2002), "Role of Sand Boil Formation in Levee Failure," Proceedings of XXIX International Association for Hydraulic Research Congress: Forecasting and Mitigation of Water-Related Disasters, Edited by G. Li, pp. 226-231, Beijing, China

## **George Sills Geotechnical Engineering Consultant, LLC**

GEORGE L. SILLS, P.E.

- Sills, G. L., Harder, L. F., Duncan, J. M., Groves, C. B., Wolff, T. F., Al-Hussaini, M., Hess, J. R. (2003), Recommendations for Seepage Design Criteria, Evaluation and Design Practices,” Report prepared for the Sacramento District, (USACE), July.
- Hess, J. R. and Sills, G. L. (2004), “A Review of Corps of Engineers Levee Seepage Practices in the Central California Flood Control System”, USSD, 24th USSD Annual Meeting and Conference Proceedings.
- Dunbar, J. B., and Sills, G., 2004. “Geotechnical Investigation Work Plan of Selected Areas, Lower Rio Grande Valley Flood Control Project, South Texas,” Open-File Report, Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS
- Dunbar, J. B., and Sills, G., 2004. “Geotechnical Assessment of Presidio Levees, Presidio, Texas,” Letter Report, Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS
- Sills, G. L. (2005), Published new USACE ETL, “Engineering and Design, Design Guidance for Levee Underseepage”, Engineer Technical Letter (ETL), ETL 1110-2-569, Dated May 05
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- Shewbridge, S. E., Hess, J.R., Sills, G.L., Costa, R., (2006) “The Evolving Approach to Fixing California’s Levees” Journal of Dam Safety, Association of State Dam Safety Officials, Vol. 4, Issue 4, Fall, 2006, p28-35.
- Shewbridge, S. E., Hess, J.R., Sills, G.L., Costa, R., (2006) “The Evolving Approach to Fixing California’s Levees” Geo-Strata, Geo-Institute, Vol.7, Issue 6, p24-28.
- Wibowo, J., Pinkard, F., Sills, G., Ward, D., Taylor, P. (2006), “Testing of Flood Fighting Structures”, ASCE Journal of Hydraulic Engineering.
- IPET Team, Sills, G. L. (major contributor) and others, “Interagency Performance Evaluation Taskforce (IPET), (2006). “Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System Vol. V,” U.S. Army Corps of Engineers, Draft Final Report.
- Sills, G. L. and Vroman, N. D. (2006), “Performance of New Orleans’ Hurricane Protection System: The Good, The Bad, and The Ugly”, Australian National Committee on Large Dams (ANCOLD), Annual Conference.
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- Sills, G. L., (2006), “Levee Design and Emergency Response”, George L. Sills, Fire Engineering, Magazine
- Sills, G.L. and Vroman, N. D. (2007), “A Review Of Corps Of Engineers Levee Seepage Practices In The United States”, Workshop On Internal Erosion And Piping Of Dams And Foundations (Aussois, France), Internal Erosion of Dams and their Foundations, Editors R. Fell and J.J Fry. Taylor and Francis, London, p 209-218.

## **George Sills Geotechnical Engineering Consultant, LLC**

GEORGE L. SILLS, P.E.

- Sills, G. L. (2007), “New Orleans vs. Katrina Overview & USACE Preliminary Response (Emergency Operations)”, ASCE, GEO-Denver, Conference.
- Sills, G. L., Vroman, N. D., Wahl, R. E., Schwanz, N. T. (2007), “Lessons Learned From The Levee Failures In The New Orleans Area And Their Impact On Levee Design And Assessment Across The Nation”, ASCE, GEO-Denver, Conference.
- Sills, G. L., Vroman, N. D., Wahl, R. E., Schwanz, N. T. (2008), “An Overview of New Orleans Levee Failures: Lessons Learned and Their Impact on National Levee Design and Assessment”, ASCE, JGGE Special Issue: Performance of Geo-Systems during Hurricane Katrina, May 2008, Vol. 134, Number 5, p 556-565.
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- Cyganiewicz, J. and Sills, G. L. (2007), “Development of a Unified Method for Estimating Probabilities of Failure of Embankment Dams by Internal Erosion and Piping”, Association of State Dam Officials (ASDSO)
- Pinkard, F., Pratt, T., Ward, D., Holmes, T., Kelley, J., Landris, T. L., Sills, G. L., Smith, E., Taylor, P., Torres, N., Wakeley, L., Wibowo, J. (2007), “Flood-Fighting Structures Demonstration and Evaluation Program: Laboratory and Field Testing in Vicksburg, Mississippi”, Technical Report No. ERDC/GSL TR-07-3, Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS
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- Fell, R., Foster, M., Davidson, R., Cyganiewicz, J., Sills, G., Vroman, N. (2008), “Seepage and Piping Toolbox-Initiation of Internal Erosion”, United States Society on Dams (USSD), Portland, OR, (paper has been reviewed edited and accepted to publish April 2008)
- Cyganiewicz, J., Sills, G., Fell, R., Davidson, R., Foster, M., Vroman, N. (2008), “Seepage and Piping Toolbox-Overview”, United States Society on Dams (USSD), Portland, OR, (paper has been reviewed edited and accepted to publish April 2008)
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- Foster, M., Fell, R., Vroman, N., Cyganiewicz, J., Sills, G., Davidson, R., (2008), “Seepage and Piping Toolbox – Continuation, Progression, Intervention and Breach”, United States Society on Dams (USSD), Portland, OR, (paper has been reviewed edited and accepted to publish April 2008)
- Ozkan, S., Adrian, D. D., Sills, G. L., Singh, V. P., (2008), “Transient Head Development Due to Flood Induced Seepage Under Levees”, ASCE, JGGE, (paper has been reviewed edited and accepted to publish spring 2008)
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***Curriculum Vita***  
***Ray E. Martin, Ph.D., P.E.***  
***Consulting Geotechnical Engineer***  
**804-798-6218**

[rayemartineng@aol.com](mailto:rayemartineng@aol.com)

***EXPERTISE***            Geotechnical Engineering, Engineering Geology

***EDUCATION***            Ph.D./1972/Civil Engineering/West Virginia University  
M.S./1968/Civil Engineering/Virginia Tech  
B.S./1964/Civil Engineering/Virginia Tech

***REGISTRATION***       Professional Engineer - Pennsylvania, New York, District of Columbia, Georgia,  
North Carolina, Maryland, West Virginia, Virginia, New Jersey, Delaware

***SUMMARY***             Dr. Martin has more than 40 years of experience in geotechnical engineering and  
engineering geology related to dams, levees, land stability, groundwater, buildings,  
waterfront structures and industrial facilities. Projects have included:

- New dams/levees, rehabilitation of existing dams/levees and inspections
- Evaluation of natural slopes and embankments
- Office and commercial buildings foundations
- Power and industrial facilities
- Waterfront structures including piers, dry docks and bulkheads
- Transportation facilities
- Groundwater studies

These projects have involved the evaluation of laboratory and insitu test data, slope stability, seepage analyses and settlement analyses, design recommendations, construction considerations, foundation alternatives, subdrainage and earth pressures for walls below grade. He has extensive experience in drilling and sampling techniques, insitu and laboratory testing and instrumentation. Dr. Martin has served as an expert witness and provided assessments of projects during development of legal cases and also in an advisory capa for projects during design/constrution.

Dr. Martin served as a Principal, Executive Vice President, President, CEO and finally Chairman of Schnabel Engineering Associates (SEA) prior to his retirement from the firm in July 2002. During his 30 years with the firm it grew to over 300 employees and expanded from one office to 14 offices located from New Brunswick, NJ to Atlanta GA. During his tenure with Schnabel he was responsible for the geotechnical service area, operations of the firm, and overall leadership of the firm including planning and financial management. Dr. Martin also developed and implemented a new risk management and loss prevention training program for the firm and internal peer reviews for branch offices. In addition he was a certified inhouse facilitator for the Franklin Covey Company's "Seven Habits of Highly Effective People" and "Principle Centered Leadership (Four Roles)".

Dr. Martin was a member of the Virginia Tech College of Engineering Advisory Board for over 20 years and has twice served as Chairman. He also served on the Civil Engineering Advisory Board. He has served on ASCE committees and is a past president of the Virginia Society of Professional Engineers. He is a former member of the Geotechnical Engineering Committee of the National Research Council. He has also published more than 20 technical papers and provided lectures on various geotechnical engineering subjects. Dr. Martin is a former adjunct faculty member at the University of Virginia.

## **Representative Dam, Levee and Slope Projects**

- ◆ **West Bank and Vicinity New Orleans, LA, HPO Sector Gate, South Algiers Canal:** Independent Technical Review of geotechnical aspects of project. (REM, LLC)
- **Hydro Electric Project, Pervari, Turkey:** Geotechnical engineering aspects of Feasibility Study of two sites for 165 m (540 ft) high RCC or rock fill dam and powerhouse (REM, LLC)
- ◆ **Slope Failure, Wal-Mart Shopping Center, Chula Vista, CA:** Assessment of causes and peer review of geotechnical stabilization plan proposed for repair of 50 foot high compacted fill slope. (REM, LLC)
- ◆ **Slope Failure, Wal-Mart Shopping Center, Columbus, GA:** Assessment of causes and peer review of geotechnical stabilization plan proposed for repair of 35 foot high excavated slope. (REM, LLC)
- ◆ **17<sup>th</sup> Avenue Canal Seepage and Stability Evaluation, New Orleans, LA:** Peer review of Corps of Engineers seepage and stability assessments of canal. (REM, LLC with Bob Bachus, Geosyntec, Inc.)
- ◆ **Hydro Electric Project, Pervari, Turkey:** Site visits to assess project feasibility and landslide and to establish scope and develop detailed plan for geotechnical engineering and engineering geology studies required to complete preliminary design for powerhouse and 165 m (540 ft) high RCC or rock fill dam and second powerhouse with 450 m (1,475 ft) of head via a side channel reservoir on second river and 12 km tunnel. (REM, LLC)
- ◆ **Soledad Tailings Disposal Facility, Mina El Mochito, Las Vegas, Honduras, C. A.:** Evaluation of geomembrane liner failure over karst terrain. (REM, LLC)
- ◆ **Value Engineering Workshop, St Vicente Dam, San Diego County, CA:** Review of geotechnical aspects of raising an existing 210 ft high concrete dam 165 ft with RCC bringing the raised dam to a new height of 375 ft. (REM, LLC)
- ◆ **Slope Failure, Wal-Mart Shopping Center, Kilbuck, PA:** Assessment of causes and peer review of geotechnical stabilization plan proposed for repair of major slide across Interstate highway during construction of proposed 140 ft high slope (REM, LLC)
- ◆ **London Avenue Canal Load Test, New Orleans, LA:** Peer review of design and performance of water load test on canal I-wall embedded in levee embankment (REM, LLC with Bob Bachus, Geosyntec, Inc.)
- ◆ **IHNC Protection Hurricane System, New Orleans, LA:** Brainstorming session sponsored by Arcadis and US Army Corps of Engineers to assess short term and long term hurricane protection. (REM, LLC)
- ◆ **Due Diligence Assessment of Edegel Power Company, Lima, Peru:** Field observation of hydroelectric dam assets and review of construction and operation documentation for preparation of a Due Diligence Report to a potential purchaser. (REM, LLC)

- **New Orleans Area Levee Reconstruction:** Member of Corps of Engineers QA Team reviewing reconstruction of levees and recommending modifications related to design and construction practices. (REM, LLC)
- **Potential Failure Mode Analysis, North Anna Dam, North Anna Nuclear Power Plant, Dominion Virginia Power, Louisa County VA.** Facilitator for PFMA for facility. (REM, LLC)
- **Evaluation of Silver Lake Dam Failure, Upper Peninsula, Michigan:** Evaluation of Fuse Plug spillway failure. (REM, LLC)
- **Evaluation of Slope Failures, Wal-Mart Store, Roanoke Co. Virginia:** Consultation and assessment of slope failures and development of remedial alternatives for stabilizing a 60 foot high embankment supporting a parking lot. (REM, LLC)
- **Evaluation Swift No. 2 Power Canal Embankment Failure, Cougar, Washington (CV04-05052RBL):** Seepage evaluation of blowout failure of embankment toe resulting in failure of 93 foot high embankment. (REM,LLC with SEA)
- **Hogan Dam, Spillway Modifications, Pulaski, County, VA:** Consultation on design of spillway in weathered shale cliff. (REM, LLC)
- **Deep Creek Dam, Yadkinville, North Carolina:** Project geotechnical reviewer for 80ft high water supply and flood control dam using earth fill in combination with an RCC spillway section. (SEA)
- **Turner Run Interceptor Landslide Investigation, Henrico County, VA:** Project Reviewer for investigation of landslide caused by 4 ft excavation at toe of 100 ft high slope in Miocene Age marine clays. (SEA)
- **Tobesofkee RCC Dam (30ft.), Monroe Co, GA:** Project geotechnical reviewer for new RCC dam to replace failed embankment dam. (SEA)
- **Yellow Creek Dam (118 ft.), Cherokee Co. GA:** Consulted on geotechnical issues during construction. (SEA)
- **Clifford B. Craig RCC Dam, Roanoke County, Virginia:** Project Manager for geotechnical and hydrogeological aspects of 250 ft high RCC dam founded on interbedded shale and dolomite rock in Roanoke County, Virginia. (SEA)
- **Snake Creek Dam, Carrol County, and Hall County Dam, Hall County, Georgia:** Project Reviewer for two 100 ft high earthfill dams. (SEA)
- **Salto Santiago, Salto Osorio, Passo Fundo Hydroelectric Projects, Brazil, South America:** Project Manager for due diligence evaluation of embankment dams from 47 to 80m high. (SEA)
- **Dam Feasibility, Moliejon Hydroelectric Dam, Belize, Central America:** Project Reviewer for feasibility evaluation of concrete dam on the Macal River, Belize, Central America. (SEA)
- **Slope Failure Remediation, CSX Railroad, Little Kanawah Falls, WV and Luke, MD:** Consultation related to remediation of slope failures above and below railroad tracks. (SEA)



- **FERC Maximum Credible Earthquake and PMF Studies for Smith Mountain and Leesville Dams, Pittsylvania Co. VA:** Project Manger for major review of stability of these two dams. (SEA)
- **FERC Part 12 Inspections, Banister Dam, Little River Dam, Claytor Dam, Niagra Dam in Virginia and Union Falls Dam in New York:** Project Manager or Reviewer for each of the above referenced dams. (SEA)
- **Beaverdam Swamp Dam, Gloucester Co., VA:** Project reviewer for 40 foot high earth dam. (SEA)
- **Water Treatment Lagoons, Chesterfield Co., VA:** Project engineer for 80 foot high embankment dam including a soil bentonite slurry cutoff wall. (SEA)
- **Fly Ash Dam, Breomo Bluff Power Station, Breomo Bluff:** Project Manager for 110 ft high earth fill dam consisting of over two million cubic yards of material and adjustable spillway overflow. (SEA)
- **Expert Witness, Columbus, Mississippi:** Expert witness testimony related to failure of two mile levee along the Luxapalila River. (SEA)
- **Dam Safety Inspections, Various Sites:** Project Manager for Phase I and II dam safety inspections for over 60 dams for the Army Corps of Engineers, private owners, and municipal clients. (SEA)
- **Dam Rehabilitations, Kakeout Dam, Butler,NJ, Lake Robertson Dam, Rockbridge Co., VA, Virginina Power Ash Pond, Chesterfield, VA, Roaring Gap Dam, Roaring Gap, NC:** Project Manager or reviewer for geotechnical rehabilitation studies. (SEA)
- **Instrumentation, Various Sites:** Project Manager for special testing and instrumentation required for dams and natural slopes including piezometers, inclinometers, extensometers, strain gages and pressure cells. (SEA)

#### **Representative Foundation Engineering Projects**

- **Independent Technical Review, Sector Gate South, Innovation Study Geotechnical Report, New Orleans, LA:** Evaluation of geotechnical report and calculations including subsurface stratigraphy, soil properties, and slope stability and pile capa analyses. (REM, LLC)
- **Seismic Evaluation of Proposed LNG Terminal, Puerto Libertad, Sonora, Mexico:** Peer review of geotechnical and earthquake analysis reports for terminal site and development of a site response analysis and report. (REM,LLC with Dr. James R. Martin, Virginia Tech)
- **Development of Geotechnical Criteria, Surry Nuclear Power Station, Dominion Virginia Power, Surry, Virginia:** Evaluation of tunneling under a floor slab in the Service Building. (REM,LLC)
- **Evaluation of Settlement of Residual Soils, Dominion Virginia Power, Richmond, VA:** Consultation and preparation of paper. (REM,LLC)

- **Independent Spent Fuel Storage Installation, North Anna Nuclear Power Station, Dominion Virginia Power, North Anna, Virginia:** Evaluation of settlement of foundation mat. (REM,LLC)
- **Floor Heave Evaluation, Regional Distribution Center, Wal-Mart, Mount Crawford, VA:** Evaluation of floor heave pyretic shale. (REM,LLC)
- **Independent Spent Fuel Storage Installation, Surry Nuclear Power Station, Dominion Virginia Power, Surry, Virginia:** Project manager for geotechnical design (static and dynamic) of foundation mat. (REM,LLC with Dr. James R. Martin, Virginia Tech)
- **Review of Circuit Store Geotechnical Reports throughout the U.S.A.:** Peer review of 20 to 60 geotechnical reports annually for Circuit Stores Architectural Department Project Managers. (REM,LLC)
- **Fire Storage Tank Settlement Evaluation, Surry Nuclear Power Station, Dominion Virginia Power, Surry, Virginia:** Performed settlement and bearing capa evaluation for new tanks with increased loads. (REM, LLC)
- **Intake Canal Leak Investigation, Surry Nuclear Power Station, Dominion Virginia Power, Surry, Virginia:** Performed analysis of groundwater levels and pumping rates, including ground penetrating radar evaluation of plant site to assess potential leakage scenarios. (REM, LLC)
- **Coors Shenandoah Brewery, Elkton, Virginia:** Project Manager for comprehensive geoscience and geotechnical engineering studies, including foundations and an extensive hydrogeologic investigation for \$400 million facility in karst topography. (SEA)
- **Landlevel Ship Construction Facility, Newport News Shipbuilding, Newport News, Virginia:** Project Reviewer for geotechnical engineering study, instrumented load tests, construction observation and testing. (SEA)
- **Pier No 6, Dry Dock 12 Expansion, Outfitting Berths No.1 and 2, Newport News Shipbuilding, Newport News, VA:** Foundation studies, construction observation and testing and instrumented load tests of water front structures over a 15 year period. (SEA)
- **James Center Office Buildings and Omni Hotel, 9th to 12th and Cary Streets, Richmond, Virginia:** Project Reviewer for comprehensive geotechnical engineering studies for foundation design, subdrainage, earth pressures for design of temporary and permanent walls below grade, and construction observation and testing. (SEA)
- **Medical College of Virginia Hospital, Richmond, Virginia:** Project Manager for comprehensive geotechnical engineering studies including first use of double belled drilled shafts for support of multi-story building in U.S; construction observation and testing services. Cost savings of \$500,000. (SEA)
- **Waterside Development, Norfolk, VA:** Geotechnical design of foundations and water front structures including office building, pier and bulkheads. (SEA)
- **Norfolk Southern Locomotive Maintenance Facility, Roanoke, Virginia:** Project Manager for foundation engineering study and construction observation and testing services. (SEA)

- **Cogeneration Facility, Buena Vista, Virginia:** Project Manager for foundation engineering study for power plant facility in sinkhole-prone area. (SEA)

### **Representative Groundwater Projects**

- **Well Location Study, Town of Hillsboro, VA:** Review of geology and previous well data to develop recommended location for new water supply well. (REM, LLC)
- **Well Field Studies, Lake Holiday, Winchester, VA:** Evaluation of geologic conditions and previous well drilling results to provide locations for new well sites including long term aquifer tests and analyses. (REM, LLC)
- **Aquifer Test and Modeling, Stephens Quarries, FCSA, Winchester, Virginia:** Design and performance of long term test and modeling. (REM,LLC with Dr. Tom Burbey, Virginia Tech)
- **Regional Groundwater Study, Shenandoah Valley, Virginia:** Project Manager for regional groundwater study in the area of Elkton, Virginia for the Adolph Coors Company. (SEA)
- **Emergency Water Supply Wells, Portsmouth, Virginia:** Project Manager for location and development of high capa deep wells in Coastal Plain. (SEA)
- **Well Location Study, Keswick Country Club, Albemarle Co, VA.:** Reviewer for well field location studies and design of wells. (SEA)
- **Water Supply Studies, Various Sites, Virginia and West Virginia:** Project Manager and Reviewer for location and design of water supply wells and well fields throughout Virginia and West Virginia. (SEA)

### ***PROFESSIONAL AFFILIATIONS***

Fellow, American Society of Civil Engineers, (ASCE) Member, Association of State Dam Safety Officials, (ASDSO) U. S. Society on Dams

### ***PROFESSIONAL ACTIVITIES***

Advisory Board Member and Chairman (two years), Committee of 100, College of Engineering, Virginia Tech, Blacksburg, Virginia, 1982-2000, 2002-2005.

Member Geotechnical Engineering Committee, National Research Council, Washington, D.C., 2001- 2004

Member of Organizing Committee, ASCE Specialty Conference, "2001 A Geo Odyssey Foundation Conference", Virginia Tech, Blacksburg, Virginia, June 2001.

Co-Chairman Organizational Committee, ASCE 1993 Specialty Conference "Geotechnical Aspects of Dam Rehabilitation", North Carolina State University, Raleigh, North Carolina, June 1993.

Member, Embankment Dams and Slopes Committee of Geotechnical Engineering Division of ASCE, 1990 - 1997.

Civil Engineering Visitor, Accreditation Board for Engineering and Technology, 1988 - 1997.

Member, Engineering Geology Committee of Geotechnical Engineering Division, ASCE, 1985-1997.

Advisory Board Member, Civil Engineering Department, Virginia Tech, Blacksburg, Virginia, 1987- 1993.

Member, Joint Senate-House Subcommittee, Virginia General Assembly, 1983-84, study on how Virginia can best maintain high quality engineering programs in its public institutions of higher education.

Chairman, Virginia Engineering College Deans Liaison Committee, VSPE, 1983-84.

Virginia Society of Professional Engineers - Richmond Chapter President, 1978-79, Legislative Committee Chairman, 1989-90, State Treasurer, 1979-80, State President, 1981-82.

***PUBLICATIONS,  
TEACHING AND  
LECTURES***

"Evaluation of Old Landslides in Reservoir Valley above Proposed 1 65m High Dam, Pervari, Turkey", ASDSO Northeast Regional Conference, Pennsylvania State University, State College, PA, June 2009 (In preparation)

"Seepage and Piping - Lessons Learned", 25<sup>th</sup> USSD Annual Meeting and Conference, Salt Lake , June 2005

"Seepage and Piping in Dams", Virginia ASCE Geotechnical Section Lecture, Williamsburg, VA, May 12, 2005,

"Seepage and Piping – The Devil is in the Details" (Invited Lecturer) , 21<sup>st</sup> Central Pennsylvania ASCE Geotechnical Conference, Hershey, PA, March 2005

"The Geotechnical Design of Deep Creek Dam", Co-author, South East Regional Conference, ASDSO, Lake Lanier, Georgia, June 2002

"Foundations in Weathering Profiles from Igneous and Metamorphic Rocks" (Invited Lecturer), 2001 A Geo Odyssey, ASCE Geotechnical Specialty Conference, Virginia Tech, Blacksburg, Virginia, June 2001

"Landslide Evaluation in Virginia Coastal Plain", Co-author, Symposium, Slope Stability in the Coastal Plain, ASCE Annual Convention, Boston, Massachusetts, 1998

"Embankment Dams in the Piedmont/Blue Ridge Province", Co-author, Proceedings, Design of Residual Soils: Geotechnical and Environmental Issues, ASCE National Convention, Washington, D.C., 1996

"Characterization of Preconsolidated Soils in Richmond, Virginia", Transportation Research Board Meeting, Washington, D.C., 1995

"Geotechnical and Geological Aspects of Spring Hollow Dam and Reservoir", Proceedings, ASDSO National Conference, Boston, MA, 1994

"Embankment Dam Safety", (Invited Lecturer) Proceedings, Geotechnical Practice in Dam Rehabilitation, ASCE, NCSU, Raleigh, NC, 1993.

"Remedial Repairs for Kakeout Dam and Dike", Proceedings, ASDSO National Conference, Baltimore, Maryland, 1992.

"Seepage Control Along Conduits Penetrating Embankment Dams" Proceedings, ASDSO National Conference, New Orleans, Louisiana, 1990.

"Preliminary Siting and Design of Two Dams", Proceedings, ASDSO National Conference, New Orleans, Louisiana, 1990.

"Evaluation of Reservoir Seepage in Karst Topography", Proceedings Geotechnical Engineering Symposium Spring Convention, ASCE, Nashville, Tennessee, 1988.

"Water Balance Modeling and Safe Yield Determination for Ground Water Management - Two Case Histories", Co-Author Proceedings, AWRA Symposium on "Coastal Water Resources", Wilmington, N.C., May 22-25, 1988.

"Concrete Pile Design in Tidewater Virginia", Co-author, Journal of Geotechnical Engineering Division, ASCE, June, 1987.

"Settlement of Residual Soils", Proceedings, Geotechnical Engineering Symposium, Spring Convention, ASCE, Atlantic , New Jersey, 1987.

"Pressuremeter Correlations for Preconsolidated Clay", (Invited Lecturer), Proceedings, Uses of In Situ Tests in Geotechnical Engineering, ASCE, Blacksburg, Virginia, 1986.

"Large Diameter Double Underreamed Drilled Shafts", Co-author, Journal of Geotechnical Engineering Division, ASCE, August, 1983.

"Parking Garage Supported on Structural Fill", Co-author, Journal of Construction Engineering and Management, ASCE, September, 1983.

"Estimating Foundation Settlements in Residual Soils", Journal of the Geotechnical Engineering Division, ASCE, March, 1977.

### **Teaching**

Adjunct Professor of Civil Engineering, C.E., 416, "Foundation Engineering", three hour semester course, University of Virginia, Charlottesville, Virginia, 1996 & 1997

Adjunct Professor of Civil Engineering, C.E. 316, "Introduction to Geotechnical Engineering", four hour semester course, University of Virginia, Charlottesville, Virginia, 1993 & 1994.

Adjunct Associate Professor of Civil Engineering, C.E. 695, "Geotechnical Engineering Case Histories", three hour semester course, Graduate School, Old Dominion University, Norfolk, Virginia, May - July, 1981

### **Lectures/Facilitation**

Lecture on Shear Strength of Residual Soils, GEI Geotechnical Engineering Seminar, Boston, MA, February 2009

Lecture on slope stability, Wal-Mart Technical Seminar, Bentonville, AR, January 2007

Lectures on Embankment Dam Stability and Seepage, New Jersey Dam Safety Officials Conference, Rutgers University, New Brunswick, NJ, August 2002

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Lectures on Embankment Dam Stability and Seepage, FEMA Conference Center, Emmitsburg, MD, 2001  
Lectures on Embankment Dam Seepage Control for "Overview of Earth Dams", ASDSO New England Regional Technical Seminar, Marlborough, Massachusetts, 1999

Lectures on Embankment Dam Seepage Control for "Design of Construction Issues for Embankment Dams", ASDSO Mid-Atlantic Regional Dam Safety Technical Seminar, Mendenhall, Pennsylvania, 1995

Certified Facilitator for "Seven Habits of Highly Effective People" and "Principle Centered Leadership (Four Roles)" for Schnabel Engineering Associates, Franklin Covey Company, Salt Lake , Utah, 1996-2002



# David T. Williams, Ph.D., PE, DWRE, CPESC

## *Principal Technology Professional*

*PBS&J*

### **Education**

Ph.D., Civil Engineering,  
Colorado State University,  
1995  
M.S., Civil Engineering,  
University of California,  
Davis, 1977  
B.S., Civil Engineering,  
University of California,  
Davis, 1972

### **Registrations/Licenses**

Professional Engineer  
California 57020, 1997  
Arizona 24349, 1990  
Hawaii 7796, 1993  
Mississippi 8242, 1981  
New Mexico 12187, 1993  
Texas 80003, 1994  
Washington 23201, 1990

### **Certifications**

Certified Professional in Erosion  
and Sediment Control  
(CPESC)

### **Professional Affiliations**

American Society of Civil  
Engineers (ASCE),  
Environmental and Water  
Resources Institute, Stream  
Restoration Committee  
International Erosion Control  
Association (IECA), Past  
President  
American Society of Testing and  
Materials (ASTM)  
American Institute of Hydrology,  
Certification Committee  
Member

### **Software**

Sediment Transport

Dr. David Williams is a registered Professional Civil Engineer in eight states, a Fellow of the American Society of Civil Engineers, a Professional Hydrologist and a Certified Professional in Erosion and Sediment Control (CPESC). He served as Principal-in-Charge for several flood insurance studies in San Diego and Orange counties. He has written the new HEC-6 User Manual for the U.S. Corps of Engineers Hydrologic Engineering Center, performed HEC-6 and local scour analysis of pipeline crossings in Arizona and New Mexico, headed the Keene Ranch groundwater modeling study and the Nile River sedimentation evaluations. He is the instructor of the American Society of Civil Engineers HEC-2, HEC-RAS and Bridge Scour Analysis short courses, which are presented throughout the U.S. In addition, Dr. Williams is also a frequent instructor for other short courses on various topics of sedimentation and hydraulics. He is well versed in the computer programs HEC-1, HEC-2, HEC-RAS, HEC-6, STORM, and WQRRS. Dr. Williams is a nationally recognized expert in sedimentation engineering and in developing innovative solutions to difficult hydraulic and hydrologic design problems in rivers and estuaries.

Dr. Williams previously served as a two time President of the International Erosion Control Association. He has served as chair of the ASCE Task Committee on Analysis of Laboratory and Field Sediment Data Accuracy and Availability. He is also a past chair of the ASCE Sedimentation Committee as well as the Computational Hydraulics Committee and currently serves on the ASCE Stream Restoration Committee. While chair of the Federal Interagency Technical Committee on Sedimentation, he worked with hydraulic and sedimentation experts from the Federal Highway Administration, Bureau of Reclamation, U.S. Geological Survey, Bureau of Land Management, Forest Service, TVA, Bureau of Land Management and the Agricultural Research Service. His work with the Committee involved developing sediment sampling equipment and sediment data collection methods. He is the author of more than 100 technical papers and reports on hydraulics and sedimentation. Dr. Williams was formerly an Associate Editor of the ASCE Journal of Hydraulic Engineering, as well as a reviewer. He was selected the 1993 Small Business Person of the Year by the Carlsbad, California Chamber of Commerce, and served as chair of the Carlsbad Beach Erosion Committee.

His professional experience includes more than eighteen years as a hydraulic engineer with the U.S. Army Corps of Engineers at the Waterways Experiment Station (WES) in Vicksburg, Mississippi, both the Nashville and Baltimore Districts, and the Hydrologic Engineering Center in Davis, California. While at WES, Dr. Williams worked on research applications of sediment transport in rivers and reservoirs and the solution of unusual hydraulic and sediment related problems using computer models and other state-of-the-art techniques. He also worked on the development of the cohesive and network versions of the HEC-6 sediment transport computer model, and wrote the Reservoir Sedimentation Chapter in the U.S. Corps of Engineering Manual on Sedimentation Investigations. At the Nashville District, Dr. Williams performed erosion control and sedimentation studies for the Tennessee-Tombigbee Waterway Project and also conducted sedimentation and floodplain information studies of proposed flood control projects. He was acting Chief of the Hydrology and Hydraulics Section at the Baltimore District Corps of Engineers. During the mid 1970's, Dr. Williams worked at HEC, helping in the development of spatial data management techniques, evaluation of the economic benefits of flood control projects, and sedimentation in rivers and reservoirs.

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Dr. Williams has been a frequent short course instructor for ASCE for computer training workshops on using HEC-2, HEC-RAS, and HEC-6. In addition, he has taught short courses on channel bed scour for toe protection design, sediment transport and streambank protection.

**Evaluation of Fluvial-12 Sedimentation Model on Pole Creek for Ventura County Watershed Protection District, California.** The sediment transport model Fluvial-12 was used by Chang and Associates to model a sedimentation basin and exit conditions on Pole Creek in Ventura County. The model results were used to justify the location and dimensions of the sedimentation basin as well as the channel dimensions of its outlet to the Santa Clara River. The Ventura County Watershed Protection District required an outside expert, Dr. Williams, to evaluate the Fluvial-12 model results and make recommendations on improvements to the model, if needed.

**Santa Paula Creek Emergency Streambank Protection for Ventura County Watershed Protection District, California.** As the lead technical advisor, Dr. Williams and his team identified potential alternatives to the streambank erosion problem along the Santa Paula Creek which included a No-Action plan, as well as non-structural and structural solutions. The consensus preferred alternative was the use of river training structures such as Bendway Weirs and Spur Dikes. This alternative involved design considerations using geomorphic and natural channel design procedures, determining the dimensions of the low flow channel, scour analyses for preventing undermining of the spur dikes, and the orientation, spacing and dimensions of the spur dikes.

**Evaluation of Sediment Transport and Scour Analyses of the Agua Fria River, Arizona, for the Flood Control District of Maricopa County.** Dr. Williams headed this project in which the PSB&J team was asked to assess the validity of sediment transport and scour analyses that had been conducted on the Agua Fria River as well as conduct an independent study. The analyses included development of an HEC-6T sediment transport model, analyses of levee heights and determination of toe scour depths to protect the levees. The resulting report was used by the Flood Control District of Maricopa County to require the project owners to reconsider their design and use the techniques that were presented in the report.

**Approximate Floodplain Study for Orange County, California.** Dr. Williams prepared an approximate floodplain study for the Orange County Flood Control District to delineate 100-year floodplains for the East Garden Grove - Wintersburg Channel (C05), the Ocean View Channel (C06), and seven tributaries to the C05 channel. This project was undertaken by the District to facilitate lifting of the Santa Ana River floodplain (zone A99) after the completion of the Santa Ana River flood protection project by the U.S. Army Corps of Engineers (Corps). The Corps project has controlled breakout flows from the Santa Ana River (SAR), but the flooding from other sources underlying the SAR floodplain, needed to be delineated before the A99 zone was lifted by FEMA. The study area is located in the Cities of Huntington Beach, Fountain Valley, Westminster, Santa Ana, Garden Grove, Anaheim, and Orange, in Orange County, California.

The C05 and C06 channel system consists of a complex network of leveed channels, storm drains, and detention basins that convey stormwater runoff from

highly urbanized low-lying interior areas to the Pacific Ocean. About 16 miles of flood control channels were analyzed using an approximate hydraulic analysis with the Corps HEC-RAS program. The C05 channel laterals were analyzed using various computer programs including the Corps HEC-RAS program and the HEC-2 program with the split-flow option, and the Los Angeles County Flood Control Districts WSPG program. To obtain a model for an approximate level of analysis, all levees, bridges, and culverts, were removed from the cross-sections.

Engineering judgment was used to interpret the model results based on output that appeared reasonable in accordance with field observations. Field observations were used to verify flow directions, track flow paths, and evaluate the effect of floodplain features such as elevated highway embankments. Approximate studies in urban environments can be especially challenging because of the need to make appropriate assumptions in order to simplify complex hydrologic and hydraulic phenomena. A Zone A approximate 100-year floodplain was delineated. The results of the study satisfied FEMA requirements and were subsequently published for the benefit of the community.

**Cherokee Wash Hydraulic/Sediment Analysis, Paradise Valley, Arizona.**

Hydrologic, hydraulic, and sedimentation studies were performed for the Maricopa County Flood Control District to evaluate options to alleviate flooding and sediment problems. Existing HEC-1 models were evaluated and modified to reflect current and with-project (flow diversions) hydrologic conditions. The existing HEC-2 model was reviewed and found unsuitable; therefore a new model was created to evaluate current hydraulic conditions including controls and flow break-out points. An HEC-6 model was prepared for sedimentation studies of the wash; a sediment sampling program was designed by WEST, and the gradation results were used in the model. Channel sediment continuity and geomorphic analyses were also performed, and the study results were used to render opinions on the need for grade control, sedimentation basins, and maintenance of the project.

**Cumulative Effects Study of Sedimentation Impact, Upper Mississippi**

**River.** Dr. Williams quantified the cumulative man-made and natural effects on sedimentation, stream morphology and ecology along the Upper Mississippi River (UMR) and IWW and predicted future conditions for the year 2050. The study area involves 5 states, 3 Army Corps of Engineer's Districts, and about 1,200 river miles.

The geology and glacial history of the study area was analyzed to define the influences and controls on channel morphology. Hydrologic records were examined to identify changes in discharge and stage along the UMR. Available research was reviewed to define potential impacts of global warming on basin hydrology. The history and extent of human influences on the fluvial system were characterized. Historic plan form and channel geometry data were analyzed to quantify changes in channel morphology. The sources and sinks of sediment along the UMR were quantified and a sediment budget developed to estimate backwater sedimentation rates in navigation pools. Historic changes in nine geomorphic categories were characterized throughout the study area. Predictions of geomorphic conditions along the UMR and IWW in the year 2050 were developed based on trends identified from historic geomorphic data and results of the sediment budget. Ecological conditions in the year 2050 were predicted based on ecological guilds and the trends established for aquatic habitat.

**Eastern Arkansas Water Supply Study.** Study included extensive model application and model calibration to analyze the effect of in-basin water transfers on surface water flow magnitude, frequency, and duration in the La Grue Bayou stream network using Corps of Engineers' programs HEC-1, HEC-2, HEC-DSS, and HEC-FFA. A unique feature to this study was the application of the Memphis District's program HUXRAIN to develop long term (50 years) synthetic discharge hydrographs using calibrated antecedent precipitation index coefficients, a long term rainfall data base, and computed unit hydrographs for the sub-basins. Another component of this work was an interior hydrology study for the of Clarendon, Arkansas. Several scenarios were analyzed using HEC-IFH for continuous simulation with 50 years of data.

**Humboldt Bay Highway Seismic Retrofit Scour Evaluation Study.** Caltrans planned to seismically retrofit the highway bridge crossing Humboldt Bay near Eureka in Northern California. The bridge is approximately 8,000 feet long, and crosses the bay in three sections with two islands. The proposed retrofit would substantially increase the number of piles at each pier and the size of the pile caps. Dr. Williams studied the seismically retrofit using a 2-dimensional hydrodynamic model (using RMA-2) and a 2-dimensional sediment transport model (using SED2D) study was conducted to: (1) determine if the larger bridge foundation might alter circulation patterns in the northern part of the bay, (2) to evaluate the scour at the modified individual bridge piers, and (3) determine if sediment transport processes in the bay might change sufficiently to cause increased sedimentation in sensitive areas, such as a nearby marina. The study included a detailed survey within 2,000 feet of the bridge, development of a detailed finite-element grid in the vicinity of the bridge, model calibration, and model application. A 14-day tide, including neap and spring cycles, was used to analyze the bay's circulation and sediment transport response to normal conditions. A 100-year storm surge was used to evaluate pier scour at the modified bridge.

**IDIQ for Los Angeles District Corps of Engineers.** During this IDIQ contract for hydrology and hydraulics with the Los Angeles District, Dr. Williams completed multiple work orders. A spillway inundation study was conducted for Carbon Canyon using HEC-RAS. A two-dimensional link node model was applied to Mission Creek in Santa Barbara to evaluate flooding. In the Santa Margarita river watershed study HEC-1, HEC-2 and HEC-6 were used to evaluate flooding and sedimentation problems in the river. Two channel restoration and environmental enhancement plans were developed in Phoenix for the Tres Rios and Rio Salado projects. Tres Rios involved HEC-6 modeling, and Rio Salado had both HEC-RAS and HEC-6 models developed for the Salt River. We conducted a flood map revision study and levee analysis report for the Los Angeles River and Compton Creek. During this study numerous HEC-2 models were modified to reflect levee system changes made by the Los Angeles District. Overbank models were also modified to analyze split flow conditions.

**Lead Instructor and Course Notes Author.** Developed short course notes and taught HEC-RAS, HEC-6, Bridge Scour and Streambank Protection short courses. The courses were very technically oriented and geared to immediate implementation of the subjects taught. Certain subjects were enhanced according to the location of the course - local problems and situations. The courses ran from 2 to 3 days.

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*Principal Technology Professional*

**Lindo Lake Park Water Quality Study, Lakeside, California.** Dr. Williams conducted detailed study of water quality conditions, to evaluate lake rehabilitation alternatives, and to develop a restoration plan to improve water quality conditions and to support a wide array of beneficial uses, including active recreation for Lindo Lake Park. Lindo Lake Park Water Quality Study

The Lindo Lake Park Water Quality Study was comprised of five major tasks: 1) public meetings; 2) report on inventory, bibliography and proposed methodology; 3) Quality Assurance Project Plan according to EPA guidelines; 4) Water quality study and associated technical report; and 5) Implementation plan.

**Minnesota and Red River CWMS Watershed Modeling.** To establish a flood forecasting system and reduce future flood damage in the Red River of the North basin (4,010 square miles) and Minnesota River basin (1,770 square miles), Dr. Williams along with the U.S. Army Corps of Engineers, St. Paul District (the Corps), developed a Corps Water Management System (CWMS) model to assist in real time operation of the reservoirs to regulate reservoir outflows.

Dr. Williams developed snow process, hydrologic, water control, and hydraulic models that will be incorporated by the Corps into CWMS as model components. The modeling work included development, calibration, and verification of the Distributed Snow Process Model (DSPM), HEC-HMS, HEC-ResSim, and HEC-RAS models.

**Pipeline Crossings over Desert Rivers and Washes, Arizona.** Dr. Williams was Project Manager and Project Engineer for numerous Pipeline Crossings over Desert Rivers and Washes in Arizona. These efforts required the understanding of fluvial geomorphology, alluvial fan flooding, sediment transport and short duration/high peak discharge as related to desert hydrology.

**Potrero Creek In-Channel Sedimentation Basin Alternative Study, Ventura, California.** Ventura County Flood Control District (VCFCD) proposed building one or more in-channel sedimentation basins to reduce the incoming sediment load from Potrero Creek from reaching the homes located in Lake Dr. Williamslake in Ventura, California. Dr. Williams evaluated the effectiveness of their various sedimentation basin plans.

Dr. Williams formulated a plan to first estimate the average annual sediment yield from Potrero Creek and then model the system using HEC-6T, the sediment transport software package developed by the U.S. Army Corps of Engineers. Dr. Williams estimated average annual sediment yield using two different methods. The first method involved numerical integration of sediment yield-frequency curves for four contributing sub-watersheds provided by the VCFCD. The second method applied U.S. Geological Survey methodology based on a curve of long-term sediment yield in nearby mountain watersheds in Los Angeles and Ventura Counties to the VCFCD data. The sediment yield-frequency curve and U.S.G.S. methods provided two cases for input into sediment transport model.

**QA/QC, 50 Bridge Scour Analyses, Caltrans, California.** Principal in Charge and Senior Project Manager. Responsible for quality control and assurance for over 50 bridge scour analyses that were required under CalTrans seismic retrofit program. The projects ranged state-wide but were concentrated mostly in desert environments in southern California. Dr. Williams also acted as project manager

for complicated situations that involved innovative channel designs or scour protection requirements to minimize the impacts of the bridge retrofit on channel scour. Several of these projects involved fluvial geomorphic analyses.

**Restoration/Environmental Enhancement Plans, Tres Rios and Rio Salado Projects, Phoenix, Arizona.**

Principal in charge and Senior Project Manager: Two channel restoration and environmental enhancement plans were developed in Phoenix for the Tres Rios and Rio Salado projects. Tres Rios involved HEC-6 modeling, and Rio Salado had both HEC-RAS and HEC-6 models developed for the Salt River through Phoenix, AZ. The work involved the use of fluvial geomorphology principles and took into consideration the effects of sand/gravel mining activities. The project also required coordination with biologists and botanists to establish a well-balanced environmentally sound project and still meet the flood control requirements.

**Wellhead Protection Plan for the Los Angeles Corps of Engineers, San Luis, Arizona.**

The components included the delineation of wellhead protection areas, the compilation of a contaminant source inventory, the development of management tools to protect the groundwater and the formulation of a contingency plan for both short and long term losses of one or more wells. Dr Williams was also the Principal-in-charge of several sediment transport studies (Agua Fria, Salt, and Gila Rivers) for the Flood Control District of Maricopa County in Arizona. The purposes of these studies were to develop sediment models that could be used as predictive and management tools. The developed sediment transport models served to evaluate potential effects on channel stability of bank protection measures, floodplain encroachments and sand and gravel mining operations along the rivers.

**U.S. Army Corps of Engineers, New Orleans District, New Orleans, Louisiana.**

Dr. Williams developed a conceptual flood management plan for St. Tammany Parish in southeast Louisiana. Flood management in St. Tammany Parish was a unique challenge, with 100 square miles drained by a complex network of natural bayous and man-made canals. Hydrologic and hydraulic models were needed to evaluate existing conditions and compare flood management alternatives. The results of the hydrologic models provided the input for hydraulic modeling to the New Orleans District with useful answers about their proposed flood management plan, allowing the District and the citizens of St. Tammany Parish to make informed decisions about their watershed.

**Ventura County Flood Control District, Calleguas Creek Sediment Transport Study, Ventura, California.**

An HEC-6T sediment transport model was prepared for Calleguas Creek, Arroyo Las Posas, and Arroyo Simi in Ventura County to establish baseline conditions and to evaluate proposed channel improvements. The model extends 25 miles from State Highway 1 near the mouth at Mugu Lagoon to upstream of Hitch Boulevard in the vicinity of Moorpark. Inflowing sediment loads and sediment discharge to Mugu Lagoon were calibrated to records of historical sediment deposition in the lagoon, historical bed changes in the channel, and records of maintenance sediment removals. A long term hydrological simulation (50 years) was used in HEC-6T to evaluate proposed grade control structures, sediment basins, and other channel improvement options in Calleguas Creek and to determine their effectiveness in reducing sediment inflow to the lagoon.



# David T. Williams, Ph.D., PE, DWRE, CPESC

*Principal Technology Professional*

**West Tennessee Tributaries Project Limited Evaluation Study, Tennessee.** A reconnaissance level analysis was conducted to evaluate the proposed restoration of old river meanders that were cut off from the Middle Fork Forked Deer River by historical channelization projects. This study included an extensive combination of hydrological, hydraulic, and sediment transport simulations, using historical rainfall and runoff records, current field data, and calibration to 1960 and 1979 channel geometry survey data. In addition to Corps of Engineers' programs HEC-1, HEC-2, HEC-DSS, HEC-FFA, and HUXRAIN for surface water flow modeling and standard computer program HEC-6 for sediment transport analysis, the newer HEC-6T, "Sedimentation in Stream Networks", developed by William A. (Tony) Thomas, was used to evaluate the sediment transport of flow converging and diverging at the junctions of the main channel and the old meanders. A sediment-weighted histogram generator modified by WEST Consultants was used to generate the hydrology input for the HEC-6 programs. Designs for rock riprap diversion weirs and bridge protection, and an in-line sediment trap were developed in this study.

**White River Unsteady Flow Model, Arkansas.** An unsteady flow model using the computer program UNET was developed for 70 miles of the White River in eastern Arkansas. Model parameters were calibrated to historical stage and flow records before executing two 47 year simulations. Simulations were run for existing conditions and conditions after installation of an inlet canal and pumping station for an irrigation scheme. Results were provided to the District to help them evaluate effects of the irrigation project on the river. A second part of this project involved evaluation of the irrigation canals for sediment transport and scour/deposition. The computer program SAM was used to help determine stable channel parameters and the amount of scour/deposition that could be expected with the District's design geometry and slope.

**Wolf River Reconnaissance Study, Tennessee.** Included a hydraulic and sedimentation analysis for approximately 75 miles of the Wolf River in western Tennessee. An HEC-2 model for the lower reaches was extended with new survey data into the upper watershed. A HEC-6 model was then developed to evaluate the effect of grade stabilization weirs, environmental enhancement weirs with permanent pools, and reductions in inflowing sediment loads from 9 tributaries in the upper watershed. HEC-1 was used to compute unit hydrographs for calibration to stream gage data. The sediment-weighted histogram generator program was used to construct the HEC-6 input hydrology. The results of a 25-year future simulation were evaluated in terms of vertical bed elevation changes over time and volumetric changes in sediment deposited and scoured on a reach by reach basis.

## **Expert Testimony and Support**

Expert Consultant: Blackfoot and Clark Fork River Restoration Plan, Montana

Expert Consultant: Agua Fria River Streambank Scour Analyses, Phoenix, Arizona

Expert Consultant: Erosion and Drainage, Newport Beach, California

Expert Consultant: Subdivision Flooding Problems and Floodplain Mapping Procedures, Dayton, Ohio

# David T. Williams, Ph.D., PE, DWRE, CPESC

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Expert Consultant: Flooding Problems, Unnamed creek, Los Angeles, California

Expert Testimony: Murrietta Creek Flooding, Riverside County, California

Expert Testimony: Flooding Potential and Analysis of Coconut Grove, Kailua, Oahu, Hawaii

Expert Consultant: Subdivision Flooding Problems, Waialae Iki V, Oahu, Hawaii

Expert Testimony: Flood Problems at Carlton Oaks Country Club, Santee, California

Expert Consultant: Alpine Mobile Home Park Flooding, Alpine, California

Expert Consultant: River Effects of Sand Mining Operations, San Luis Rey River, California

Expert Consultant: Pecos Road Pipeline Scour, Phoenix, Arizona

Expert Consultant: San Diego Creek Revetment Failure, Irvine, California

Expert Consultant: San Luis Obispo Creek Flooding, San Luis Obispo, California

## **Floodplain Hydraulics**

FEMA Studies of River System near Huntington Beach, Orange County, California

River System Studies near Huntington Beach for Orange County for Submittal to FEMA, Orange County, California

FEMA Studies of 27 Streams in the Unincorporated Areas of San Diego County, California

Hydraulic Analysis and Levee Elevation Design of West Williamson, West Virginia, Flood Control Project

Flood Information Study of Pineville, Kentucky

Hydraulic Design of Supercritical and Subcritical Flood Control Channels for the Rio Puerto Nuevo Flood Control Project, San Juan, Puerto Rico

Flood Control Channel Design, Buena Vista Creek, Vista, California, of Vista

## **Other**

Analysis of Proposed Hydraulic Dredging for Construction of Gallipolis Lock and Dam, West Virginia

Design of Sedimentation Basins and Erosion Control Measures, Tennessee-Tombigbee Waterway Project

Dredged Material Disposal Site Analysis in an Ocean Environment for the

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Tampa Bay Deepening Project, Florida

Assisted in the Development of the Cohesive and Network Versions of the Computer Program, "HEC'6, Scour and Deposition in Rivers and Reservoirs"

Evaluation of Structural Alternatives of a Sediment Retention Dam on the Toutle River For Hyper concentration Sediment Conditions from Eruption of Mt. St. Helens, Washington

Debris Analysis of a Proposed Tunnel Cutoff for the Harlan, Kentucky, Flood Control Project

Preparation of the new HEC-6 Manual (Scour and Deposition in Rivers and Reservoirs) for the Hydrologic Engineering Center, Davis, California

Kern River Ordinary Highwater Litigation, Bakersfield, California

Erosion Control Plan, Rancho Verde Development, Escondido, California

Development of Forest Sedimentation Management Plan, Tongass National Forest, Alaska, U.S. Forest Service

Development of Water Resources/Geomorphology Small Stream Classification System, State of Washington, Department of Natural Resources

Development of Computer Based Design Program for Gabion Lined Channels

Development of Computer Based Design Program for Riprap Channels

## **Sedimentation and Scour Evaluations**

Harrow Debris Basin Overtopping Analysis, Los Angeles County, California

Bridge Scour Analyses, Various locations, California Department of Transportation

Ashtabula River Hazardous Waste Project, Ohio

Tia Juana River Valley Surface and Groundwater Water Budget Analysis, San Diego, CA

Sedimentation Investigations of Boeuf River and Tributaries, Louisiana

Sedimentation Analysis of a Cutoff for the Barbourville, Kentucky, Flood Control Project

Analysis of the Effects of Strip Mining on Project Life of Martin's Fork Reservoir, Kentucky

Sedimentation Surveys and Analyses of J. Percy Priest Reservoir, Tennessee

Sedimentation Surveys and Analyses of Laurel River Reservoir, Tennessee

Sedimentation Surveys and Analyses of Martin's Fork Reservoir, Kentucky

# David T. Williams, Ph.D., PE, DWRE, CPESC

*Principal Technology Professional*

Sedimentation Study of the St. Lucie River and Estuary, Florida

Sedimentation Analysis and Debris Basin Design for the Rio Puerto Nuevo Flood Control Project, San Juan, Puerto Rico

Determination of Sediment Yields after the Mt. St. Helens Eruption, Washington

Modeling the Sedimentation Effects of the Removal of the Washington Water Power Dam Lewiston, Idaho

Sedimentation and Dredging Maintenance Requirement Study for the Rochester, Minnesota, Flood Control Project

Sedimentation Study of Tuttle Creek Reservoir, Kansas

Sediment Yield and Debris Basin Evaluation of Goleta, California, Flood Control Project

Sedimentation and Sediment Yield Study of the Harding Ditch, East St. Louis, Missouri, Flood Control Project

Analysis of Sediment Exclusion and Ejection System of the Imdir Irrigation Project, Turkey, for the World Bank

Reservoir Sedimentation Study of Shoccoe Dam, Jackson, Mississippi

Evaluation and Assessment of Sedimentation in the Nile River and Irrigation Schemes, Sudan, for the World Bank

Zink Dam Sedimentation Study, Arkansas River, Tulsa

Erosion and Sedimentation Analysis of South Coast Materials Mine Reclamation Plan, Buena Vista Creek, Carlsbad, California

Incipient Motion Analysis of Spawning Gravel, Cedar River, Renton, Washington

## **Stable Channel Analysis**

San Luis Rey Levee Design and Sediment Transport Analysis

Sediment and Stable Channel Analysis of Pipeline Crossings for El Paso Natural Gas Company, Northern New Mexico and Arizona

Channel Stability Study of the SaltGila River Project, Arizona

Sediment and Channel Stability Study of the Gallup, New Mexico, Flood Control Project

Keene Ranch Stable Channel Assessment, Bakersfield, California

Stability Assessment of Sewer Pipeline, Tia Juana River, San Diego, California

# David T. Williams, Ph.D., PE, DWRE, CPESC

*Principal Technology Professional*

Channel Stability Analysis, East Memphis, Arkansas

Development of Channel Design using Gabions Computer Program

Development of Channel Design using Geosynthetics Computer Program

Development of Riprap Design Program using Corps of Engineers Criteria

## **Water Quality and Groundwater**

Caltrans NPDES Permit Project, Los Angeles County

Keene Ranch Groundwater Quality and Quantity Modeling, Bakersfield, California

Turbidity Plume Analysis of Open Ocean Disposal for the Tampa Bay Deepening Project, Florida

Predictions of the Effects of Structural Alternatives on Turbidity in the St. Lucie Canal at Port Mayaca, Florida

Determination of Light Extinction Coefficients for Lakes and Reservoirs for use in Water Quality Mathematical Models

Analysis of the Behavior of Fine Sediments in Reservoirs for Environmental and Water Quality Operation Systems (EWQOS) Program

PCB Transport Study for the Hudson River, New York

## **Publications**

### **Conference Papers**

**Williams, David T., and Doeing, Brian J., "Variation in Depth of Toe Scour Computations For Stream Restoration Bank Protection Design," Proceedings, International Erosion Control Annual Conference and Exposition, Las Vegas, NV, February 24-28, 2003.**

**Williams, David T., and Doeing, Brian J., "Proposed Methodology for Floodway Determination Using Unsteady Flow in HEC-RAS," Proceedings, ASFP Conference, Biloxi, MS, June 23-28, 2003.**

**Williams, David T., Gusman, A. Jake., and Teal, Martin J., "Proposed Methodology for Floodway Determination Using Unsteady Flow in HEC-RAS," Proceedings, ASFP Conference, Biloxi, MS, June 23-28, 2003.**

**Williams, David T., "Headcut Analysis Due to Overbank Sand and Gravel Mining," Proceedings, ASFP Conference, Phoenix, Arizona, June 24-28, 2002.**

**Williams, David T., Hu, Henry H., and Stefanovic, Dragoslav, "Sediment Flushing From a Flood Control Channel Outlet Into the Pacific Ocean", Proceedings, EWRI 2002 Conference on Water Resources Planning and**

**Management, Symposium on Managing the Extremes: Floods and Droughts, First Symposium on Environmental and Water Resources Systems Analysis, Roanoke, Virginia, May 19-22, 2002.**

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**Bank Stabilization Projects" Short Course, International Erosion Control Association 33rd Annual Conference and Expo, Orlando, Florida, February 25, 2002.**

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**Stefanovic, Dragoslav, Williams, David T., Proceedings, "Two-Dimensional-Vertical Numerical Modeling of Stratified Environments", Proceedings, World Water and Environmental Resources Congress Conference, Orlando, Florida, May 20-24, 2001.**

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**Williams, David T., and Teal, Martin J., "Between A Rock And A Soft Place: Which Riprap Method Should I Use for My Project?" Proceedings, ASCE and EWRI 2000 Joint Conference On Water Resources Engineering and Water Resources Planning & Management, Minneapolis, MN, July 30-Aug 2, 2000.**

**Teal, Martin J., Schulte, Marc A., Williams, David T. and Remus, John I., "Sediment Modeling of Big Bend Reservoir, South Dakota", Proceedings, ASCE and EWRI 2000 Joint Conference On Water Resources Engineering and Water Resources Planning & Management, Minneapolis, MN, July 30-Aug 2, 2000.**

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Williams, David T., and Julien, Pierre Y., "Selection of Sediment Transport Relations: Part III, Numerical Ranking of Sediment Transport Relations," Proceedings, ASCE North American Water and Environmental Congress, Anaheim, California, June 22-28, 1996.

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Using Permanent Geosynthetic Reinforcement Mattings," Proceedings, Sixth Federal Interagency Sedimentation Conference, Las Vegas, Nevada, March 10-14, 1996.

Williams, David T., "Selection and Predictability of Sand Transport Relations Based upon a Numerical Index," Ph.D. dissertation, Colorado State University, Fort Collins, CO, 1995.

Williams, David T., "EC-Design, Erosion Control Design Package," prepared for Synthetic Industries, Chattanooga, Tennessee, 1995.

Williams, David T., "River Restoration: Reverse Engineering of the Environment," invited paper for Third Annual Conference on the

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*Principal Technology Professional*

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**Williams, David T. and Austin, Deron N., "PC-Based Design of Channel Protection Using Permanent Geosynthetic Reinforcement Mattings," Proceedings, ASCE First International Conference on Water Resources, San Antonio, Texas, August 14-18, 1995.**

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- Thompson, James C., Williams, David T. and Bradley, Jeffrey B., "Integration of 2-D Hydrodynamic and 1-D Sediment Transport Models," *Proceedings, Fifth Federal Interagency Sedimentation Conference*, Las Vegas, Nevada, March 1991.
- MacArthur, Robert C., Williams, David T., and Thomas, W.A., "Status and New Capabilities of Computer Program HEC-6: Scour and Deposition in Rivers and Reservoirs," *Proceedings, ASCE National Hydraulics Conference*, San Diego, Calif., August 1990.
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**"Tia Juana River Valley Surface and Groundwater Budget Analysis," prepared for the California Coastal Conservancy, Oakland, California, 1992.**

**"Erosion Potential Evaluation of Gila River Stream Crossing Below Gillespie Dam", El Paso Natural Gas Co., El Paso, Texas, November 1991.**

**"Phase I and II - Detailed Analysis Evaluation of Erosion Potential of Stream Crossings, San Juan Mainline and San Juan Triangle Pipeline Expansion", El Paso Natural Gas Co., El Paso, Texas, July 1991.**

**"Hydrologic and Hydraulic Report, Buena Vista Creek Enhancement Design", prepared for the of Vista, California, August 1990.**

**"Report on Zink Dam Sedimentation Problems", Tulsa River Parks**

David T. Williams, Ph.D., PE, DWRE, CPESC  
*Principal Technology Professional*

**Authority, January 1990.**

**"Report on Sedimentation Problems in Sudan", Ministry of Irrigation,  
Government of Sudan, December 1988.**

**"Assessment of the Sedimentation Characteristics of a Sediment Retention  
Structure at the Green River Site, North Fork Toutle River,  
Washington", Letter Report, USAE Waterways Experiment Station,  
Vicksburg, Mississippi, 1985.**

### **Honors and Awards**

Small Business Person of the Year, Chamber of Commerce, Carlsbad, California,  
1993

Fellow, American Society of Civil Engineers

Diplomate, American Academy of Water Resources Engineers (DWRE)