SSFL NPDES WORKPLAN:
ENTS & Expert Panel Workplan for SSFL Outfalls 008 & 009

BACKGROUND

The Regional Water Quality Control Board, Los Angeles Region (Regional Board) adopted Cease and Desist Order (CDO) No. R4-2007-0056 on November 1, 2007. This CDO requires The Boeing Company (Boeing) to submit a workplan to evaluate, select and implement natural treatment BMPs (referred to in this report as engineered natural treatment systems, or ENTS) for stormwater discharges in the areas tributary to Santa Susana Field Laboratory (SSFL) Outfalls 008 and 009 (Figure 1). ENTS are an increasingly used practice for treating urban stormwater runoff. Examples of ENTS include constructed treatment wetlands, vegetated detention basins, retention ponds, bioretention systems, and biofiltration systems.

Conventional engineered water treatment systems, such as those employed for the treatment of industrial and municipal wastewaters, use physical, chemical and/or biological treatment processes to remove pollutants from a waste stream. These systems are often operation-intensive and reliant on the consistent availability of resources including power, chemicals, and labor. Any interruption of these resources can render these systems non-operational. For these and other reasons, conventional water treatment systems are rarely used to treat stormwater, particularly given the sporadic, unpredictable, and widely varying volume/flowrate characteristics of these flows.

Additionally, there are other, generally proprietary, mechanical treatment technologies designed specifically for stormwater that rely on sedimentation and/or filtration for sediment and pollutant removal. However these technologies have rarely been applied to stormwater at the scale necessary for implementation at Outfalls 008 and 009 at the SSFL.

ENTS, on the other hand, offer several advantages over proprietary stormwater treatment technologies and conventional water treatment systems. For instance, ENTS are less subject to upset, generally require less maintenance, and are less environmentally intrusive at most locations. Conventional water treatment systems, if constructed at the scale required for treating stormwater design flows and volumes at the SSFL, may cause significant environmental impacts due to the materials, energy, and area required for siting, constructing, operating, and maintaining the necessary structures (e.g., dams, storage tanks, treatment equipment, power supply facilities, and chemical storage). In addition, ENTS have the advantage of treating a wide
range of pollutants while also potentially offering other environmental benefits such as habitat creation. Finally, Boeing recently agreed to donate their portion of the SSFL to the State to be used as open space after Boeing has completed clean-up of soil and groundwater contamination. ENTS are more compatible with this open space goal than conventional treatment systems and their associated infrastructure.

ENTS utilize many of the same processes as conventional treatment systems by creating conditions favorable to pollutant removal either through physical controls or by incorporating biological processes that perform similar functions as the physical or chemical processes of conventional treatment systems (e.g., filtration, adsorption and sedimentation). ENTS have an advantage however in that they are less reliant on external resources (e.g., power and labor). Furthermore, ENTS can be designed to reduce hydraulic and pollutant loadings by encouraging infiltration (where feasible and appropriate) and evapotranspiration of runoff as well as reduce in-channel runoff velocities by increasing detention storage and desynchronizing the runoff hydrograph.

To help meet effluent limitations for stormwater discharges from the SSFL, engineered multimedia filtration systems have been implemented where immediately feasible, including at Outfalls 003-007, 010, 011 and 018 (shown in Figure 1). Engineered treatment systems have not yet been designed or implemented at Outfalls 008 and 009, primarily due to a reluctance to build environmentally-intrusive treatment structures, with their associated construction-related impacts, at these remote and difficult-to-access riparian areas. ENTS would be preferable in these jurisdictional drainage locations in particular because of the lesser environmental impact they would have on the riparian and other habitats that currently exist there. Therefore, because historical data suggest that treatment of stormwater discharges at these outfalls is required to meet the effluent limits in the NPDES permit, Boeing proposes to implement ENTS in the areas tributary to these compliance points as well as at the outfalls themselves, where possible.

The design process for stormwater treatment systems, including ENTS, requires a “design storm” for sizing guidance. A “design storm” is an expression of the volume, or flow rate, of water to be treated. However, in general, the larger the volume of stormwater to be treated, the greater the size of the treatment system and its water storage area, and therefore the greater the environmental impacts. Regional Board staff originally suggested that the 1 year, 24-hour storm, based on consistency with the Los Angeles Region Trash Total Maximum Daily Loads (TMDLs), may be an appropriate site specific design storm for sizing stormwater treatment systems at the SSFL. This storm was estimated to be equivalent to a 2.3 inch 24-hour event (which has a 6% probability of occurring on any given storm day [i.e., a day recorded with 0.1 inches of rain or greater], based on data from Ventura County Watershed Protection Department.
SSFL NPDES Expert Panel Workplan

gauge #249 formerly located at the SSFL) using methods consistent with the Los Angeles County Department of Public Works Hydrology Manual. The existing engineered treatment systems in use at the site, as well as initial design concepts for the ENTS proposed for the Outfall 008 and 009 watersheds, were sized based on this existing site specific design storm. The NPDES Permit for stormwater discharges at the SSFL includes a provision to re-open the permit and incorporate a site specific design storm once one has been recommended to and approved by the Regional Board. For stormwater flows or volumes above the site specific design storm, Boeing has proposed that the numeric effluent limits of the NPDES Permit for stormwater discharges from the SSFL apply only as non-enforceable benchmarks.

Constructing stormwater treatment systems, whether ENTS or conventional water treatment systems, at many locations in the Outfall 008 and 009 watersheds will likely require permits from and coordination amongst Federal, State, and local agencies. The conceptual approach for treatment at these locations and the design of the treatment systems need to be well vetted before this process is initiated. To assist with this vetting and to help assure that the proposed conceptual ENTS designs incorporate the current state of art for stormwater treatment and control, Boeing has proposed to assemble a panel of stormwater hydrology and BMP design experts to perform the following tasks. The expert panel will review and provide recommendations for:

- the proposed site specific design storm for use in sizing all stormwater treatment systems at the SSFL, including the ENTS, and

- the ENTS designs proposed for implementation in the Outfalls 008 and 009 watersheds.

This document is intended to fulfill the requirement of the CDO for the preparation of a workplan, and, in particular, details the tasks and any resulting deliverables required for the review of the proposed design storm, the ENTS evaluation and implementation process, and the proposed schedule for completion.

While the workplan includes a proposed time schedule for the completion of certain tasks, the schedule is intended only to provide an approximate timeframe. It is the Regional Board and Boeing’s intention to provide public review and an opportunity to comment at certain stages of the process, which may impact the proposed schedule. Also, availability of the Expert Panel members may affect when work can be completed. Lastly, to the extent permits are required from governmental agencies, Boeing is unable to ensure when such permits are issued. Thus, the various dates included in this workplan are not intended to function as deadlines. The only applicable compliance dates are those set forth in the NPDES permit for the SSFL and the CDO.
OUTFALLS 008 & 009 ENTS IMPLEMENTATION AND SITE SPECIFIC DESIGN STORM DEVELOPMENT WORK PLAN

This workplan describes the individual steps that will be taken to implement ENTS in the areas tributary to Outfalls 008 and 009 at the SSFL and to develop a site-specific design storm. Table 1 itemizes each task, the team members involved and the target dates for completion. Each task is then described in more detail below.
Table 1. ENTS Workplan Tasks and Estimated Completion Dates

<table>
<thead>
<tr>
<th>Task</th>
<th>Involvement</th>
<th>Estimated Date of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Expert Panel Selection and Assembly</td>
<td>Geosyntec, Regional Board staff, Potential Panelists</td>
<td>December 21, 2007</td>
</tr>
<tr>
<td>2. Public Outreach and Involvement</td>
<td>Geosyntec, Boeing (and Boeing Project Team Members), Interested Stakeholders</td>
<td>Ongoing</td>
</tr>
<tr>
<td>9. Complete ENTS Permitting (assuming EIS/EIR is not required)</td>
<td>Geosyntec, Other Contractors, Boeing</td>
<td>August 15, 2008</td>
</tr>
<tr>
<td>10. Complete ENTS Construction (assuming EIS/EIR is not required)</td>
<td>Geosyntec, Other Contractors, Boeing, and review by Expert Panel</td>
<td>October 31, 2008</td>
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Task 1. Expert Panel Selection and Assembly

*Estimated Completion Date:* December 21, 2007

*Deliverables:* Panel Selection summary memorandum

An independent panel of experts will be assembled to establish a design storm and to provide technical oversight on the design of the ENTS being evaluated for Outfalls 008 and 009. Geosyntec Consultants (Geosyntec) submitted a proposal to Boeing on October 30, 2007, to
SSFL NPDES Expert Panel Workplan

manage the Expert Panel design storm and ENTS design review process and was provided to Regional Board staff on November 1, 2007. This proposal is included as Attachment 1 to this workplan. The proposal includes a proposed organization chart describing the project team and the lines of communication for the ENTS design and Expert Panel review process.

Geosyntec has compiled an extensive list of potential panelists who are each an expert in a field related to stormwater hydrology and/or BMP design. This list was based on recommendations from Boeing’s consultants (including Geosyntec) and included input from Regional Board staff and a local environmental advocacy group, Heal the Bay. A list of these experts, and their resumes (for those who provided them), is included as Attachment 2 to this workplan.

Interest solicitation letters were reviewed by Regional Board staff and then mailed and emailed to each listed potential panel member on Friday, November 16, 2008. An example request letter is included as Attachment 3 to this workplan. The letter introduces the project, inquires about the potential panelist’s willingness to participate in the Expert Panel, and asks interested potential panelists to provide a “statement of qualifications” or similar information no later than November 30th, 2007. Upon receiving letters of interest from potential panelists, Geosyntec, in consultation with Regional Board staff, will then choose 4 to 6 preferred panelists representing the various areas of relevant technical expertise. Upon approval from Regional Board staff, Boeing will make public the final list of names and resumes of those experts chosen to serve on the Expert Panel through publication on the Boeing project website as well as through public outreach events (see Task 2). Provided timely input from the Regional Board, the selection process will be completed by December 21, 2007.

Once selected, Geosyntec will provide the Expert Panel with the documents necessary to provide background information on the project and coordinate a site visit and meeting to take place as soon as possible, likely after the first of the year. Geosyntec will then prepare a technical memorandum that describes the purpose, membership, and timeline for the Panel for submittal to the Regional Board, as well as for distribution to the public and posting on the project website. Preliminarily, it is anticipated that the Panel will meet on a regularly scheduled basis during the period of January through March, 2008. The remainder of the coordination and communication with the Panel members will occur through conference calls and emails.

Task 2. Public Outreach and Involvement

Estimated Completion Date: Ongoing

Deliverables: None
Numerous stakeholder groups and members of the general public have expressed interest in the stormwater issues at the SSFL at past Regional Board hearings. In an effort to keep these groups and others apprised of progress (e.g., of ENTS planning/implementation and of the Expert Panel review process), and provide an opportunity for public input, periodic public forum meetings will be held.

Geosyntec and the Expert Panel will periodically meet with stakeholder groups and the general public during the review and development process. Project status reports and submittal documents will also be posted on the Boeing project website after major project milestones and prior to public outreach meetings. The general public and stakeholder groups will be invited to participate in meetings led by Geosyntec or other Boeing team members to gather public input on the Expert Panel process and the proposed ENTS plans and the site specific design storm. In this way, the public can actively participate in the project, providing stakeholders an opportunity to provide input at various stages throughout the ENTS planning process, including input that the Expert Panel can consider in reviewing and approving the ENTS.

This task will be ongoing. It is anticipated that website publications and meetings will be scheduled when necessary except where particularly noted in each task description. The following public meetings are tentatively scheduled at this time.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Approximate Date</th>
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<tbody>
<tr>
<td>Introduce Expert Panel to stakeholder group, present initial ENTS alternatives, stakeholder Q&amp;A</td>
<td>January, 2008</td>
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<tr>
<td>Present conceptual ENTS design status and Expert Panel design storm recommendations, stakeholder Q&amp;A</td>
<td>March, 2008</td>
</tr>
<tr>
<td>Present conceptual ENTS designs and Expert Panel ENTS design recommendations, stakeholder Q&amp;A</td>
<td>April, 2008</td>
</tr>
<tr>
<td>Present ENTS implementation status</td>
<td>September, 2008</td>
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<tr>
<td>Present initial (year 1) ENTS performance monitoring results</td>
<td>June, 2009</td>
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Task 3. Expert Panel Review of Site Specific Design Storm

Estimated Completion Date: February 15, 2008

Deliverables: Recommendations for Site-Specific Design Storm
Geosyntec will prepare a technical memorandum that summarizes modeled hydrology and potential site specific design storms, as well as analysis results of various potential design storms on stormwater treatment system performance (e.g., percent average annual runoff volume captured and treated, and reduction in number of discharge events per year). The Expert Panel will review this information along with existing precipitation data for the site and area and hydrologic modeling reports and analyses. They will then use this information to assess the appropriateness of the existing 1 year, 24-hour design storm used at the site to size the multimedia stormwater filtration systems currently in place and/or the proposed ENTS. They will evaluate the appropriateness of this design storm, the need, if any, for modifications to this design storm, and ultimately recommend the site-specific design storm (or, potentially, multiple watershed-specific design storms) for use at the SSFL.

**Task 4. Draft Conceptual ENTS Designs**

*Estimated Completion Date: February 15, 2008*

*Deliverables: Draft ENTS Conceptual Design Report, including ENTS selection rationale technical memorandum, ENTS design flow technical memorandum, ENTS drainage area maps, and conceptual ENTS design drawings*

Geosyntec will review drainage information for the outfall subwatersheds, identify priority areas for siting the ENTS, delineate ENTS drainage areas (based on topography data, stormdrain drawings or video technology, and visual observations), and model the drainage areas to compute the 1 year, 24-hour design flows and volumes for use in ENTS sizing. These hydrologic and ENTS sizing calculations may need to be revisited after the Expert Panel provides final recommendations on the site specific design storm. ENTS types and locations will then be selected for the priority locations based on the following objectives:

- Maximize compliance with the Permit’s final numeric effluent limits for Outfalls 008 and 009;
- Capable of being implemented within the Permit’s compliance schedule;
- Feasible given unique site conditions (i.e. remediation issues, topography, and climate);
- Have the ability to treat stormwater discharges up to the design storm;
- Provide redundant treatment of runoff to maximize compliance;
- Incorporate design options that would minimize and/or mitigate impacts on the surrounding environment; and
• Provide habitat value to indigenous plant and animal species.

Permitting and CEQA consultants, as well as SSFL remediation staff, will provide input during the ENTS location selection phase to improve the likelihood of project success, and to initiate the permitting process with various agencies. Geosyntec will also coordinate with SSFL remediation and facilities management staff early in the planning process to identify opportunities and constraints according to those personnel most familiar with the site and the areas tributary to Outfalls 008 and 009.

Continuous hydrologic modeling of existing and proposed (i.e., after ENTS implementation) scenarios will be performed to evaluate hydrologic performance and discharge frequency and/or volume reductions. Initial draft concepts, such as the initial proposed ENTS locations and types, which should be available in December, will be presented to the Expert Panel for their consideration and input to facilitate the review process and minimize significant design changes late in the planning process. This information will also be presented to interested stakeholders during a designated public outreach meeting.

Conceptual ENTS design drawings will then be prepared for presentation to and review by the Expert Panel.


*Estimated Completion Date:* April 15, 2008; July 1, 2008; and July 31, 2008, respectively

*Deliverables:* Recommendations on ENTS design

Geosyntec will present the draft conceptual, preliminary, and final ENTS designs for Outfalls 008 and 009 to the Expert Panel. The Expert Panel will review the ENTS designs in light of the newly recommended site-specific design storm, BMP performance monitoring studies and reported data, NPDES permit requirements, receiving water issues (including TMDLs), and SSFL effluent limit compliance history and discharge monitoring data. The Expert Panel will evaluate the conceptual BMP designs and recommend modifications as necessary with the intent to finalize conceptual system designs that best meet the previously stated objectives. They will also review the preliminary and final designs provided by Geosyntec.

**Task 6. Final Conceptual ENTS Designs**

*Estimated Completion Date:* May 15, 2008
Deliverables: Final ENTS Conceptual Design Report

Geosyntec will prepare final conceptual ENTS designs for Outfalls 008 and 009 based on comments, feedback and recommendations from the Expert Panel on the draft conceptual ENTS designs. These final conceptual designs will be presented to Expert Panel for final review.

Task 7. Preliminary ENTS Designs

Estimated Completion Date: June 16, 2008

Deliverables: Preliminary (30%) ENTS Design documents

Geosyntec will prepare 30% ENTS designs for Outfalls 008 and 009. Geosyntec will consult with the Expert Panel throughout the preparation of these design documents to ensure that the designs are completed according to the Expert Panel’s expectations. The preliminary designs will be presented to the Expert Panel for their review and comment.

Task 8. Final ENTS Designs

Estimated Completion Date: July 15, 2008

Deliverables: Final ENTS Design documents

Geosyntec will prepare final ENTS designs for Outfalls 008 and 009. Geosyntec will consult with the Expert Panel throughout the preparation of these design documents to ensure that the designs are consistent with the Expert Panel’s expectations. The final designs will be presented to the Expert Panel for their review and comment.

Task 9. Acquire Permits

Estimated Completion Date: August 15, 2008

Deliverables: None

Geosyntec, Boeing staff and other contractors will coordinate with the appropriate agencies regarding any permits required for ENTS implementation. Depending on locations of the ENTS, permits may be required from the following agencies: California Department of Fish and Game (CDFG), Army Corps of Engineers (ACOE), Regional Water Quality Control Board (RWQCB), and the County of Ventura. These permits may or may not include the following: ACOE/RWQCB 404/401 certification; CDFG 1601 streambed alteration agreement;
CEQA/NEPA approval; SWRCB general NPDES permit for discharge of stormwater from construction sites (including an associated SWPPP); and County grading, encroachment and protected tree permits. Where permits are required, it will be necessary to determine the appropriate level of CEQA/NEPA review, if any. Geosyntec will begin coordination with the relevant agencies early in the design process to prevent delays to construction due to permitting. CEQA/NEPA support will be provided by Impact Sciences. This effort will be initiated in December, 2007 to ensure environmental documentation is completed in time for the targeted construction start date of August 15, 2008. This schedule assumes that an EIS or EIR is not required for construction of the ENTS.

Task 10. ENTS Construction

*Estimated Completion Date:* October 31, 2008

*Deliverables:* None

Geosyntec, other contractors and Boeing staff will manage and perform construction of the ENTS at areas tributary to Outfalls 008 and 009 after final designs are completed. The targeted start date for Boeing contractors to begin construction is August 15, 2008, with completion of construction anticipated by October 31, 2008; the final schedule will be dependent upon permitting. The target date for vegetation establishment and system performance stabilization is June 2009, when final Permit effluent limits become effective at Outfalls 008 and 009.

The Expert Panel will be available to provide technical oversight to Boeing contractors during the construction phase of the project so that final system design and installation is conducted according to the Panel’s expectations. They will also inspect the facilities upon completion.

Task 11. ENTS Performance Monitoring

*Estimated Completion Date:* June 2009

*Deliverables:* ENTS Performance Monitoring Plan, ENTS Performance Monitoring Reports

Geosyntec will coordinate with the Expert Panel to develop an ENTS performance monitoring plan to assess the water quality treatment and Permit compliance performance of the ENTS. The monitoring plan will specify how the performance of the ENTS will be assessed, and will be submitted for Regional Board approval in July 2008. ENTS performance monitoring will begin in the 2008/2009 wet season, however maximum performance will not be expected until after vegetation establishment, or at the start of the 2009/2010 wet season. An ENTS performance
monitoring report summarizing results from the 2008/2009 monitoring season will be completed prior to the first storm of the 2009/2010 wet season.

* * * * *
ATTACHMENT 1
PROPOSAL: SSFL ENTS Design and Expert Panel Management

Geosyntec Consultants (Geosyntec) is pleased to provide this proposal to assist with the development of Engineered Natural Treatment System (ENTS) designs for outfall 008 and 009 watersheds, and management of the Design Storm and ENTS Expert Panel process. An Expert Panel of leading ENTS researchers and practitioners will be convened consistent with requirements of the revised tentative Cease and Desist Order for the Boeing Santa Susana Field Laboratory (SSFL or Site), as part of the NPDES permit for stormwater discharges from the Site. The Expert Panel’s primary scope items will consist of reviewing a site-specific design storm and reviewing ENTS designs proposed for outfall 008 and 009 watersheds.

Geosyntec’s scope will consist of the following tasks:

- develop an outfall 008/009 work plan for submittal to the Regional Board by December 15, 2007 and to include those components listed in the Cease and Desist Order (i.e., time schedule for planning, design, permitting, and construction tasks that are to be conducted between November 2007 through June 2009; Expert Panel formation and milestones; conceptual ENTS design reports; and schedule to evaluate ENTS performance);

- facilitating and managing Expert Panel meetings;

- coordinating with the Expert Panel, such as providing them with background information on, or answering questions about, the Site;

- developing options for the Expert Panel to consider for potential site-specific design storms and incorporating Expert Panel recommendations on a site-specific design storm into the ENTS conceptual designs for outfall 008 and 009 watersheds;

- incorporating Expert Panel recommendations on the ENTS into revised conceptual designs documents/drawings;

- incorporating follow-up design recommendations from the Expert Panel into the preliminary and final ENTS designs; and

- Manage the implementation of the ENTS designs (i.e., construction and installation).
The attached organizational chart summarizes the key members of our proposed team, including Geosyntec and non-Geosyntec task leaders. Lines of communication are shown, along with roles of each person. The roles included on the organizational chart are described as follows:

**Principal in Charge** – This person will interface with Geosyntec’s Project Manager. The Principal in Charge for Geosyntec generally has a perspective of the Geosyntec-client relationship that extends beyond the current project. The Principal in Charge also serves as an alternate point of contact if issues arise that need to be discussed with a Geosyntec contact other than the Project Manager.

**Expert Panel Coordinator/Facilitator** – This person will facilitate Expert Panel meetings, and assist the Expert Panel by providing the resources needed to reach resolution.

**Expert Panel Technical Advisor** – This person will be responsible for direct interaction with the Expert Panel, including overseeing preparation and presentations of technical documents and fielding technical questions from the Panel on the Panel’s scope and/or questions about proposed plans, designs, potential design storms, project constituents of concerns, permit requirements, and other technical information.

**Senior Technical Advisor** – This person will provide consultation on high level issues related to the design storm and design recommendations from the Expert Panel, and will provide additional review of design drawings produced by the Geosyntec team. This person will be regularly updated on Expert Panel progress and findings by the Project Manager.

**Project Manager** – This person will interface directly with the Expert Panel Facilitator and Technical Advisor, will provide both Boeing and Los Angeles Regional Water Quality Control Board (LARWQCB) staff with updates on Expert Panel progress and findings, and will manage budget and schedule issues. This person will also interface with the various technical leaders in managing the overall effort of implementing recommendations received from the Expert Panel.

**ENTS Design** – These task leaders will be responsible for incorporating ENTS design storm and other recommendations into conceptual, preliminary, and final designs.

**Hydrology** – These staff will be responsible for conducting additional hydrologic analyses for the purpose of preparing design storm options for the panel to consider, as requested by the Expert Panel, and as needed for design.
**Geotechnical** – These staff will be responsible for assessing geotechnical issues as they relate to ENTS design and implementation and for assistance in conceptual through final design of the ENTS systems.

**Remediation** – These staff will be responsible for coordinating with remediation and groundwater hydrology experts as issues arise related to ENTS location, design, and construction.

**Construction Oversight** – These staff will be responsible for managing contractors, schedule and budget during the ENTS construction effort. They will also provide advice during the planning through final design phases with regards to construction issues (constructability) as well as scheduling of construction.

**Performance Monitoring/Adaptive Management** – These staff will be responsible for developing ENTS performance monitoring plans, overseeing implementation of the ENTS performance monitoring program, and providing recommendations regarding ENTS design modifications/upgrades based on monitoring results for Expert Panel review.

**Other Contractors** – These non-Geosyntec contractors will be utilized as necessary to assist with NEPA/CEQA permitting, ACOE and CDFG permitting (for projects planned within jurisdiction drainages), native plant species recommendations, design aesthetics and irrigation issues (landscape architect), shallow and deep groundwater hydrology as depth to groundwater and potential groundwater quality issues impact ENTS designs, hydraulics and pumping design elements, and construction and installation.

As we have not yet secured the entire project team, some roles have question marks remaining in the organizational chart. These project staff assignments will be designated in coming weeks as the scope and project details become clearer after the November 1st Board hearing and ensuing meetings with Regional Board staff, and we have an opportunity to approach candidate contractors to discuss this project opportunity with them.

The Geosyntec staff that are assembled for this project represent highly-qualified experts in their respective fields, and bring many years of relevant project experience to the Site. Biosketches for these key Geosyntec staff are attached.
Please contact us with any questions or comments regarding this proposal. We appreciate the opportunity to continue work on this challenging and interesting site.

Sincerely,

For Eric Strecker, P.E. Brandon Steets, P.E.
Principal Project Manager

Attachments: Organizational Chart and Geosyntec Staff Biosketches

Copies to:

Mr. Strecker is a recognized authority in the area of stormwater management, especially in the design, monitoring, and evaluation of BMPs. For over 17 years, Mr. Strecker has provided technical direction and assistance to public and private sector clients in stormwater master planning, NPDES permitting and surface water pollution assessment and control. On behalf of the United States Environmental Protection Agency (USEPA), Mr. Strecker conducted a comprehensive, nationwide study of BMP effectiveness. Included in this study was an assessment of the protocols used to evaluate BMPs. The results, which concluded that there exist wide discrepancies in evaluating the effectiveness of BMPs, were provided to USEPA headquarters. He has also prepared municipal NPDES stormwater permit applications for the cities of Portland, Eugene, and Gresham, Oregon, and Boise, Idaho. All four permits involved development of city-wide stormwater management plans specifically designed to address local stormwater pollution issues. The City and County of Honolulu also retained Mr. Strecker to develop water quality standards that the City and County could use to control run-off from new development projects. Mr. Strecker is currently working on the San Diego Creek Natural Treatment System project in Orange County, which involves the design of 31 stormwater treatment wetlands throughout the over 100-square mile watershed; in addition to, the Clackamas County Stormwater Master Plan.

Mr. Mark Schultheis, P.E. – Expert Panel Coordinator, Remediation

Mr. Mark Schultheis, P.E. is an Associate Environmental Engineer with Geosyntec Consultants in Huntington Beach. His professional practice focuses on developing solutions to complex environmental problems, and in gaining consensus from regulatory agencies. He has extensive experience in managing projects for superfund programs that include a broad range of disciplines. His work on such programs includes work plan preparation, remedial investigations, feasibility studies, remedial design, construction management, startup, and operation & maintenance. He has worked frequently on multi-party sites, under regulatory oversight provided by DTSC, RWQCB, and USEPA. Mr. Schultheis also has considerable experience in management of Brownfields sites and other redevelopment projects. For such projects, Mr. Schultheis develops and implements regulatory strategies designed to gain agency concurrence with client redevelopment goals. In particular, Mr. Schultheis has led Geosyntec teams emphasizing redevelopment over properties that pose potential indoor vapor risk.

Brandon M. Steets, P.E. – Project Manager

Mr. Steets has significant experience in conducting and managing water quality modeling projects to support BMP planning, watershed assessment, and TMDL development/implementation activities. His experience includes watershed modeling, stormwater water modeling, BMP selection and design, water quality monitoring, and providing regulatory liaison support for municipal NPDES and WRR permits. Recent projects have included: technical review of complex watershed and groundwater-surface water interaction modeling studies for the Santa Clara River nutrient and chloride TMDLs, management of an intensive ongoing receiving water monitoring program to support a proposed wastewater reclamation plant’s municipal NPDES permit application, stormwater quality modeling and BMP design support for various Southern California new development projects, SWPPP development and design and construction of structural stormwater treatment BMPs for a hazardous waste site in Orange County, and development of the Los Angeles Countywide Structural BMP Methodology for Heal the Bay, Los Angeles County, and the City of Los Angeles.


Mr. Howell has more than nine years of experience in water resources projects. His experience includes; designing and installing stormwater quality monitoring equipment for Portland BES and Caltrans, stormwater monitoring for the Cities of Gresham, Portland, and Spokane, statistical analysis and reporting of stormwater monitoring data (USEPA and Caltrans), and water quality modeling. Mr. Howell conducted research on Best Management Practices (BMP) effectiveness for EPA’s Nationwide BMP Database. Mr. Howell is also familiar with stormwater
BMP design, construction, and maintenance requirements having personally conducted an assessment of over 150 privately owned stormwater BMPs for Washington County’s Unified Sewerage Agency. Mr. Howell developed the stormwater monitoring plan for the Crystal Cove development in southern California. Mr. Howell is also managing the “ODOT Water Quality Facility Investigation” and the “North Natomas Wet-Basin Study” currently being conducted by GeoSyntec. Mr. Howell has worked on several innovative water quality improvement projects. He was project manager for a pilot study to evaluate the effectiveness of constructed wetland at removing selenium from groundwater for which he set up and evaluated both micro- and mesocosm scale experiments. He designed a reclamation and reuse system for a private golf facility that captures and treats return flows using cisterns and pumps all but eliminating surface discharge from the property. He designed and constructed outlet modifications for a marsh system that employs siphons to regulate discharge under complex tidal backwater conditions. He was lead design engineer for a landfill phyto-cap leachate reuse irrigation system that employed booster pumps, an integrated control system to optimize irrigation application based on evapotranspiration and soil moisture, complex telemetry, and large scale hydraulic design.

Nathan Jacobsen, P.E. – ENTS Design

Mr. Jacobsen specializes in hydrology and hydraulics, water quality analysis and sampling and design of BMPs. Some of his relevant experience includes his recent involvement in providing emergency post-fire assessment of potential erosion and flooding impact from the October 2003 San Diego County fires. Mr. Jacobsen was the Lead Coordinator of field teams assessing impacts and implementing erosion and sediment control BMPs to mitigate watershed impacts. For the Huntington Beach Surf Zone and Urban Runoff Water Quality Investigation, Mr. Jacobsen assisted in the design of a Surf Zone Monitoring Plan, which included continuous water quality sampling at various locations of State and City-owned beaches. He led a field crew to conduct 24-hour surf zone sampling; assisted in the identification and coordination with the analytical laboratory; developed sanitary surveys specifically designed to identify bacterial water quality of urban runoff; defined the watershed boundaries through analysis of storm drain and topographic maps; and assisted in the conceptual designs of BMPs to remedy bacterial effects in the surf zone. For the Caltrans Detention Basin Optimization Study, Mr. Jacobsen assisted in the redesign of 18 detention basins along SR-73 to assess the effectiveness of various detention basin sizes and outlet controls to improve water quality. The design included determination of existing hydrology and hydraulics, establishing basin layouts to minimize construction costs and facilitate maintenance equipment, and developing plans, specs, and estimates for construction.

Ken J. Susilo, P.E., D.WRE, CPSWQ – Hydrology

Mr. Susilo, has over 16 years of experience in engineering design, hydraulics, hydrology, computer modeling, and storm water management. This experience includes project management and using statistical and analytical models for water quality, hydraulic, and hydrologic analyses. A major part of Mr. Susilo’s work involves water quality and NPDES Phase I and Phase II permitting, and strategies for the improvement of water resources. Mr. Susilo’s efforts focus on the development of multi-benefit, environmentally sensitive solutions to design and planning efforts, while cost-effectively leveraging leading-edge technologies to enhance the natural and built environment. In 2006, Ken was recognized as the ASCE Outstanding Civil Engineer in the Private Sector by the Los Angeles Section, Metropolitan Los Angeles Branch, and Region 9 (State of California). Mr. Susilo was the Technical Project Manager for the Santa Monica Bay Bacterial TMDL Implementation Plan (J1/4), Technical Consultant to the Los Angeles Unified School District, and was technical lead or manager for BMP prioritization studies conducted for the Santa Monica Bay Restoration Commission, North East Trees, City of Anaheim and Heal the Bay. He served on the ASCE Report Card subcommittees for Urban Runoff for Los Angeles County, Orange County, and the State of California. He is also a Board Member for the AWRA Southern California Section (Founding Member), the Urban Water Institute, and University of California, Berkeley Engineering Alumni Association.

Alex Sandu, Ph.D., P.E. - Senior Staff Engineering Specialist
Dr. Sandu’s water treatment design experience includes performing multidisciplinary calculations for wetland design (natural treatment systems), hydraulic modeling for storm system sewer design, and preparing detailed design plans using AutoCAD. He proposed the conceptual design for the Constructed Treatment Wetlands Fairview Park Restoration Project in Costa Mesa, CA. Dr. Sandu prepared designed plans for the implementation of a prospective BMP (Street Ends Biofiltration Project) for the City of Los Angeles, which involved the calculation of site runoff volumes using multiple methods. Dr. Sandu has analyzed water and land development, environmental data, health parameters, watershed planning and Brownfields data. Dr. Sandu also developed and applied an innovative GIS database for historically polluted sites to support multi-criterion and multi objective analysis and decision making for Brownfields resource planning, rehabilitation and management. Dr. Sandu has also interpreted pilot water treatment plant results, analyzed water quality parameters, and written technical reports. As a project manager, Dr. Sandu has interfaced with numerous City and Public Works agencies, has prepared and evaluated plans, progress reports, and cost evaluations, has conducted code compliance inspections, and has supervised and coordinated work schedules for up to 80 employees.

Ron Johnson, P.E. – Geotechnical

Mr. Johnson’s 18 years of experience includes that of a design manager, team leader, and project manager/engineer on individual geotechnical consulting assignments and multidisciplinary civil engineering projects. He is responsible for engineering analysis and design, technical administration, scheduling, quality assurance, client relations and financial management. His experience project experience includes transportation and water infrastructure, solid waste facilities, low-level radioactive waste disposal facilities, power generation, large land development, high-rise developments, commercial/industrial facilities, coastal structures, landslides, and heap leach mining facilities. He has been the PM for three engineering service contracts with San Diego County.

Gregory T. Corcoran, P.E. – Geotechnical

Mr. Corcoran’s experience in civil and geotechnical engineering practice and construction includes technical contributions to many geosynthetic, embankment, landfill liner system, and landfill closure system designs. Mr. Corcoran has over 15 years of landfill design and construction experience and has been involved with the design and construction of over 60 landfill bottom liner and final cover systems consisting of geosynthetic and natural soil and aggregate materials. Mr. Corcoran’s experience with environmental remediation includes technical contributions to several soil vapor extraction (SVE), dual phase extraction (DPE), pump and treat, excavation and removal, chemical oxidation, bio-augmentation, and natural attenuation remedial technologies. His experience in design/build/operate (DBO) of remediation systems has allowed for several successful turn key projects.

David Oliver – Construction Oversight

Mr. Oliver has more than 25 years of experience in general construction and environmental remediation, specializing in management, design build/value engineering, design review for constructability, problem resolution, contract administration, project controls, quality assurance/quality control (QA/QC). His experience includes projects in public utilities, soil and groundwater remediation under CERCLA and RCRA, landfill leachate and landfill gas controls, the space and defense industries, and in dealing with local, state, and federal regulatory agencies. Past projects have included design and construction services for groundwater, leachate and semiconductor manufacture waste water treatment systems, building demolition the excavation and disposal of PCB, VOC- and hydrocarbon-laden soils; installation of underground utility systems, mechanical and electrical system installation, and building construction. Mr. Oliver has managed construction projects and coordinated Brownfield redevelopment projects. He has supervised the preparation of project schedules and cost estimates and managed project cost tracking. In addition, Mr. Oliver has supervised subcontractors, monitored on-site health and safety and managed field construction, operation and maintenance and contract administration staff.

Ryan Smith – Construction Oversight
Mr. Smith has 6 years experience in the environmental industry and has a solid background in environmental assessment and remediation. His professional experience includes removal, assessment and remediation at Leaking Underground Fuel Tank sites, including design, field implementation, and oversight of groundwater monitoring well installation, remedial excavations, thermal oxidizer/Soil Vapor Extraction installation and operation, groundwater extraction and treatment systems, and hydrogen peroxide injection systems. Mr. Smith has direct field experience with soil and groundwater remediation system installation, remedial soil excavation, groundwater monitoring well installation and sampling, aquifer pump testing and monitoring, surface water monitoring and sampling, and soil vapor probe installation and monitoring and sampling.

**Donna Bodine – Performance Monitoring / Adaptive Management**

Ms. Bodine has twelve years of experience in environmental consulting specializing in water resources. Her primary areas of expertise are municipal NPDES Permit compliance and stormwater management. Ms. Bodine has experience conducting water quality monitoring and data analysis. She has designed and implemented monitoring studies to evaluate the effectiveness of stormwater treatment systems and other best management practices, and to evaluate the effects of watershed activities on water quality. This includes preparation of monitoring and quality assurance plans, field sampling activities (including training of field crews), and data analysis. Ms. Bodine is also an expert in evaluating the quality and limitations of analytical data and has served as project chemist on more than 50 surface water, groundwater, and soil investigation projects.
Invited Expert Panel Members (in alphabetical order by last name)

1. Rich Ambrose, Ph. D
2. Michael Barrett, Ph. D
3. Norris Brandt, P.E.
4. Bob Gearheart, Ph. D
5. Wayne Huber, Ph. D, P.E.
6. Bill Hunt, Ph.D, P.E.
7. Rich Horner, Ph. D
8. Jon Jones, P.E.
9. Mike Josselyn, Ph. D
10. Robert H. Kadlec, Ph. D
11. Bob Pitt, Ph. D, P.E.
12. Larry Roesner, Ph. D, P.E.
13. Betty Rushton, Ph. D
14. John Sansalone, Ph. D
15. Ken Schiff
16. Mike Stenstrom, Ph. D, P.E.
17. Martha Sutula
18. Ben Urbonas, P.E.
19. Marty Wanielista, Ph. D
EDUCATION

Ph.D. Civil Engineering, University of Oklahoma, 1969, Professor George Reid
M.S. Civil Engineering, University of Oklahoma, 1965, Professor George Reid
B.A. Biology and Mathematics, North Texas State University, 1964, Dr. J. K. G. Silvey

Professional Engineer – Registered Civil Engineer, State of California – C 38158

EMPLOYMENT EXPERIENCE

1975- Emeritus Professor, Department of Environmental Resources Engineering, Humboldt State University, Arcata, California, undergraduate engineering instruction, water quality, low cost water and wastewater treatment, hazardous waste management. Co-Director of International Development Technology Program Graduate Program. Research wetland treatment systems for domestic effluent and water reclamation, non-point source pollution marsh treatment system, use of wetlands for denitrification and perchlorate reduction, role of wetland restoration and watershed management, use of conjunctive watershed/lake models to manage eutrophication, surf zone and ocean monitoring, solid and hazardous waste management, and environmental impact analysis. Advising graduate students, Engineering, Biology, Geology and International Development, Faculty Advisor for HSU’s Chapter of Engineers Without Borders

1971-1975 -Associate Professor, Division of Environmental Engineering, Utah State University, undergraduate and graduate instruction, research, statewide extension program, water supply, water reclamation, wastewater treatment and solid waste management, spray irrigation of waste effluent.


1968-1971 -Assistant Professor of Civil Engineering; University of Arkansas-Undergraduate and graduate courses in Sanitary Engineering-Research in eutrophication and water quality modeling, and biological treatment processes.

ORGANIZATIONS/AFFILIATIONS

American Water Works Association-Life member
Water Environment Federation
International Water Association
Society of Wetland Scientists
Sierra Club
Audubon Society

RESEARCH AND CONSULTING EXPERIENCE

2007 Water Reuse Foundation, Water Reuse Alternatives for small Communities, John Carollo Engineers, Walnut Creek, Ca.
2007 US Fish and Wildlife Service, Sprague River Valley, Oregon, Design of Constructed Wetland to treat irrigation tailwater and agricultural runoff
2007 City of Arcata, California, Upgrade of Arcata’s water reclamation constructed wetland
2007 Humboldt Bay Harbor and Recreation District, Community member on 5 years strategic master plan-water quality and harbor natural resources
2007 Orick Community Service District, Orick, California, MOU between HSU and District to assist with decentralized wastewater treatment and water reclamation
2007 WorldBank, Wastewater Management Master Plan, Dhaka, Bangladesh, Mike 11 Model
2007 USEPA, Review of stormwater wetland system for Boise, Idaho, Dept. of Public Works
2007 Brown and Caldwell, Portland, Oregon, Review of Boeing Aircraft Stormwater Wetland
2006 Guizhou Province, China, Feasibility Plan for Use of Constructed Wetland to Treat Refinery Waste and toRestore Wetland Habitat, Sino-US Prosper in Peace Association
2006 Garberville, California, Design of constructed wetland to treat domestic effluent with use of UV
2006  Conceptual Design of Wetland System to Treat Domestic and Agricultural Wastewater, Lake Qarun, Fayoum, Egypt, Montgomery Watson Harza Engineering

2005-Present  Hatfield Science Team, USFWS-Klamath Falls, Oregon

2005  City of Cumberland, B.C., Design of Constructed Wetland to treat Domestic Wastewater

2004  City of Fort Bragg, California, Wetland Treatment Conceptual Plan for Redevelopment of the Georgia / Pacific Industrial Site

2004  Technical Review Team for Malibu Lagoon Restoration Plan-Heal the Bay/California Coastal Conservancy

2003-Present  Review Bureau of Reclamation Flow Studies for the Klamath River-Yurok Tribal Council

2003  Wetland restoration design Caledonia Marsh, Klamath Falls Oregon, USFWS

2004  Wetland design, agricultural runoff, K and K Ranch, Klamath Falls, Oregon USFWS

2004  Treatment Wetland Design for Collins Products, Klamath Falls, Oregon


2001-2003  Fish and Wildlife Service-Klamath Falls Oregon-Wetland design-agricultural runoff/habitat

2002  Santa Clara Valley Water District – Water reuse wetland application.

2002  DeForest Park Wetland Design – Long Beach, CA Coastal Conservancy.

2001-Present  Colorado Lagoon – Long Beach, CA. Non-point source pond/wetland treatment system.


2001  American Red Cross, Honduras, Design of Wetland Treatment systems for two re-settlement communities- Cuidad Espana and Colonia Cruz Roja

2000  USAID/Harza Engineering, El-Fayoum, Egypt, Middle Egypt Water and Sanitation Master Plan, Lake Quran, Maadi, Egypt. Low cost wastewater treatment (wetlands), Lake water quality, waste load allocation, and stream modeling.

2000  City of Petaluma, California – Value Engineering- Review of Facility Plan, specific input dealing with low cost treatment and reuse options, Carollo engineering, walnut Creek, Ca.


1999-Present  City of Willits, California, Wetland Treatment -Effluent Disposal and Treatment Upgrade Plan, Larry Moran, Water and Wastewater Supervisor.

1998-Present  City of Willits, California, Effluent Management Plan and Pond-Wetland Treatment Design


1998-Present  Collins Wood Forest Products, Klamath Falls, Oregon, Bureau of Reclamation/Fish and Wildlife Service Wetland Restoration Initiative, Travis Huntley, CWP


1997-Present  World Bank - working with an International consulting firm combined with local engineering firms on a World Bank wastewater treatment project in Recife, Brazil. This includes assessing the capability of natural systems, wetlands and mangrove swamps to treat wastewater for protection of natural systems.

1997-Present  Department of Justice, Couer D’ Alene, Idaho - Expert Witness-US Department of Justice - analysis of restoration techniques and monitoring methods and expert analysis of water quality and watershed contaminant loading issues associated with mining -Super Fund Project


1997 Finalize the WAWTTAR decision support software for USAID/EHP for selecting appropriate wastewater/water reclamation technologies. Utilization of an expert system to compare wetland treatment system with conventional treatment systems. Craig Hafner Environmental Health Project, Arlington, Virginia.


1996-1997 The Nature Conservancy of Oregon - Project manager for developing a restoration plan for the Williamson River at Upper Klamath Lake, Oregon. Five thousand acres of diked and drained wetlands converted to riverine, riparian, and wetland values and functions, Mark Stern, TNC, Portland.


1996 Korea/KAWACO - Consultant for Harza Engineering working with SunJin Engineers in designing a constructed wetland to treat non-point source pollution and untreated domestic wastewater, Dr. B.K. Lee, Harza Engineering, Chicago, Ill.

1996 -Arcata, California Design and construction of a free surface constructed wetland to treat animal waste from a 200 head dairy in Humboldt County.

1996 -Dinuba, California - Odwalla Corporation - 1996. Assist in the design of a closed loop water, wastewater, energy, and solid waste system for a juice company concerned with a wide range of environmental and community issues related to food processing industries. Includes a wetland treatment process of industrial wastewater.

1996 -Initiative to Combat Desertification, World Bank - Tunisia

1996 Palau Republic - Winzler and Kelly Engineers and Engineering Science Parsons. Presented three seminars to local decision makers concerning the use of constructed wetlands to treat domestic wastewater. Prepared a basis for design report for the use of constructed wetlands for Karor, Palau to protect nearshore receiving water within the barrier reef.

1995 USAID/EHP Project, Design-Gaza City- Evaluation of wastewater wetland for water reclamation.


1994 Manila Community Service District, Humboldt County, California, Facility Plan and Basis for Design of a Pond/Wetland/Infiltration System.

1994 Palo Cedros High School, Shasta County, California-Non-point Source Wetland System for 120 acre development.

1994 - USAID’s Environmental Health Project (Arlington, Virginia/Low Cost Wastewater Treatment System for Rural Communities in Egypt).

1993 - Union Carbide, Seaport, Texas, Use of Free Surface Constructed Wetland to Remove Suspended Solids from Oxidation Pond Effluent - Polyester Plant.


1993 - City of Napa, California - Constructed Wetland Alternatives for Treating Oxidation Pond Effluent - Facility Plan Amendment.

1993 - City of Santa Rosa, California - Technical Review Team for EIR Supplement - Wetland Treatment/Habitat Alternative.

1993 - USAID/Mideast Bureau of State Department, Development of An Interactive Expert Computer Model To Select Appropriate Water and Wastewater Treatment System for Reuse in Developing Countries, Workshop July 25-Aug. 5, 1993 at Newport Beach, California for 17 representatives from Middle East countries.


1992 - Lih-Lani Recreation Community - Oxidation Pond/Wetlands Wastewater Treatment and Reclamation System, Engineering Concepts, Honolulu, HI.


1992 - State of Washington Attorney General, expertise witness for the state on use of constructed wetland as a viable wastewater treatment alternative - City of Sequim, WA.


1991 - City of Davis Wetlands Demonstration Project, Larry Walker and Associates, Davis, CA.


1990 - AAAS- Sub-Saharan Malaria Project - Committee Member- Contribution Author - An Intersectional Approach to Malaria in Development in Africa.

1988 - Consultant to Peace Corps-Programming Water Supply and Health/Sanitation Volunteer-Pre-service and in-service training courses - Sierra Leone, Ghana, Nepal, Morocco, Mauritania, and Niger.

1980-Present - Consultant to USAID through Water & Sanitation for Health Project (WASH I & WASH II) - short term technical assistance training programs in area of rural water supply/sanitation-hygiene education for Indonesia, Belize, Sierra Leone, Kenya, Tanzania, Swaziland, Malawi and Ghana.

**SEMINARS AND SHORT COURSES**

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
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<tbody>
<tr>
<td>2006</td>
<td>-Lorman Seminar Series., Constructed and Restored Wetlands:: The Future of California Water Quality, San Francisco, California</td>
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<tr>
<td>2006</td>
<td>-UAJBO-Oaxaca, Mexico, Constructed Wetland Short Course</td>
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1996-2004 - Annual Constructed Wetland Workshop, Humboldt State University, Director and Lead Instructor for a 5 day lecture, laboratory, and fieldwork workshop for engineers, planners, and biologists. Use of Constructed Wetlands for Improved Water Quality-Planning and Design,

2001 - Wetland Short Course, Butte Montana, Montana AWWA-WEF Annual Conference
1998-1999 - Technology Transfer Workshop, EPA Region 4, Kansas City, Kansas Use of Constructed Wetland to Treat Domestic Effluent.
1990 - City of Paradise, California- Constructed Wetland Treatment Systems.
1990 - Graduate Seminar Presentation- Civil Engineering Dept., U.C. Davis on Arcata Wetland Treatment System- May 1990.

SELECTED PUBLICATIONS AND REPORTS
Gearheart, R.A., Use of Constructed to Manage Water Quality, Southwest Hydrology, January-March

HONORS AND AWARDS
2002 Specially Recognized Alumnus Biology Department-North Texas University, Denton, Texas
1998 American Society of Civil Engineers Northcoast Section-Engineer of the Year
1989 -Scholar of the Year - Humboldt State University.
1988 -Boston Visions - 2nd Place Award for a solution to Boston Harbor's water quality problems - use of wetlands to treat point and non-point source pollution affording recreational opportunities in an urban setting - Boston Society of Architecture and Boston's Redevelopment Agency.
1986 -Meritorious Service Award - Humboldt State University
1987 -Ford Foundation Award - Part of the City of Arcata's Task Force (1978-1986). Resulting in the Arcata Marsh and Wildlife Sanctuary - Principal Engineer on the project. $100,000 award.
BACKGROUND AND QUALIFICATIONS
Richard R. Horner

I have 30 years of experience in the urban stormwater management field and 11 additional years of engineering practice. During this period I have performed research, taught, and offered consulting services on all aspects of the subject, including investigating the sources of pollutants and other causes of aquatic ecological damage, impacts on organisms in waters receiving urban stormwater drainage, and the full range of methods of avoiding or reducing these impacts.

I received a Ph.D. in Civil and Environmental Engineering from the University of Washington in 1978, following two Mechanical Engineering degrees from the University of Pennsylvania. Although my degrees are all in engineering, I have had substantial course work and practical experience in aquatic biology and chemistry. For 12 years beginning in 1981 I was a full-time research professor in the University of Washington’s Department of Civil and Environmental Engineering. I now serve half time in that position and have adjunct appointments in two additional departments (Landscape Architecture and the College of Forest Resources’ Center for Urban Horticulture). While my research and teaching continue at a somewhat reduced level, I spend the remainder of my time in private consulting through a sole proprietorship. My full credentials are available upon request.

I have conducted numerous research investigations and consulting projects together involving all aspects of stormwater management. Serving as a principal or co-principal investigator on more than 40 research studies, my work has produced two books, approximately 30 papers in the peer-reviewed literature, and over 20 reviewed papers in conference proceedings. I have also authored or co-authored more than 75 scientific or technical reports. In addition to graduate and undergraduate teaching, I have taught many continuing education short courses to professionals in practice. My consulting clients include federal, state, and local government agencies; citizens’ environmental groups; and private firms that work for these entities, primarily on the West Coast of the United States and Canada but in some instances elsewhere in the nation.

I have helped to develop stormwater management programs in Washington State, California, and British Columbia and studied such programs around the nation. I was one of four principal participants in a U.S. Environmental Protection Agency-sponsored assessment of 32 state, regional, and local programs spread among 14 states in arid, semi-arid, and humid areas of the West and Southwest, as well as the Midwest, Northeast, and Southeast. This evaluation led to the 1997 publication of “Institutional Aspects of Urban Runoff Management: A Guide for Program Development and Implementation” (subtitled “A Comprehensive Review of the Institutional Framework of Successful Urban Runoff Management Programs”).

My background includes 14 years of work in Southern California, where I have been a federal court-appointed overseer of stormwater program development and implementation at the city and county level and for two Caltrans districts. I was directly involved in the process of developing the 13 volumes of Los Angeles County’s Stormwater Program Implementation Manual, working under the terms of a settlement agreement in federal court as the plaintiffs’ technical representative. My role was to provide quality-control review of multiple drafts of each volume and contribute to bringing the program and all of its elements to an adequate level. I have also
evaluated the stormwater programs in San Diego, Orange, Riverside, San Bernardino, Ventura, Santa Barbara, San Luis Obispo, and Monterey Counties and a multi-county program in the San Francisco Bay Area. At the recommendation of San Diego Baykeeper, I have been a consultant on stormwater issues to the City of San Diego, the San Diego Unified Port District, and the San Diego County Regional Airport Authority.
November 30, 2007

Eric Strecker
Geosyntec Consultants
55 SW Yamhill, Suite 200
Portland, OR 97204

Cassandra Owens
Los Angeles Regional Water Quality Control Board
320 W. 4th Street, Suite 200
Los Angeles, CA 90013

Dear Mr. Strecker and Ms. Owens:

Thank you for the invitation to join the panel for Design Storm and BMP Selection at the Santa Susana Field Laboratory. I am interested in participating but must alert you that I have time limitations and, particularly, constraints on travel. Before detailing my availability, I refer you to my attached curriculum vitae and other biographical materials as statements of my qualifications and areas of expertise.

I have previous commitments that limit my availability for meetings in southern California to the following dates and times in the first six months of the year: from 1:00 PM Mondays to 12:00 noon Fridays the weeks of January 7, 14, and 21; February 11; March 10, 17, and 24 (only March 24 and 25 of that week); April 7 and 14; May 12, 19, and 26; and June 2 (only June 2 and 3 of that week), 16, 23 (only June 23 and 24 that week), and 30. I must note that I do have to make some other arrangements that could take away some additional dates for panel activities. I hope that you can work with my constraints, but if you anticipate difficulties in getting the work done with my schedule, I certainly will understand if you choose not to include me.

I would be pleased to provide any other information you may need.

Sincerely,

Richard R. Horner
BIOGRAPHICAL SKETCH

HORNER, Richard Ray
230 NW 55th Street
Seattle, WA  98107
Telephone: (206) 782-7400
Facsimile: (206) 781-9584
E-mail: rhorner@u.washington.edu

Consulting services in the analysis and management of
watershed systems, water resources, and stormwater
Research Associate Professor, University of Washington (half
time); Landscape Architecture, Civil and Environmental
Engineering (Adjunct), and Center for Urban Horticulture
(Adjunct)

Date of Birth: 11-26-43

EDUCATION

1978      University of Washington, Seattle, WA; Ph.D. (Civil Engineering, Environmental Engineering
          and Science Program)

1966     University of Pennsylvania, Philadelphia, PA; M.S. (Mechanical Engineering)

1965      University of Pennsylvania, Philadelphia, PA; B.S. (Mechanical Engineering)

EMPLOYMENT

1986-Present     Richard R. Horner, Environmental Engineering and Science, Sole Proprietor
1981-Present     University of Washington, Seattle, WA
1969-1981        Northampton Community College, Bethlehem, PA; Professor of Engineering and
                  Environmental Studies
1976 - 78         University of Washington, Seattle, WA; Research Engineer and Research Assistant
1966 - 69         Exxon Research and Engineering Company, Florham Park, NJ; Project Engineer

SELECTED RESEARCH PROJECTS

The Ecological Response of Small Streams to Stormwater and Stormwater Controls; sponsored by U. S.
Environmental Protection Agency, cooperating with Watershed Management Institute (Crawfordsville,
FL); 1995-2003.

Vegetated Stormwater Facilities Maintenance; sponsored by Washington State Department of

Puget Sound Wetlands and Stormwater Management Research Program; sponsored by Washington
Department of Ecology, U. S. Environmental Protection Agency, and King County, WA; 1986-1996.

Critical Phosphorus Concentrations in Flowing Water, Phase 1-4; sponsored by National Science
Foundation; 1980-1996.

Evaluation of Infiltration Practices for Storm Runoff Quantity and Quality Control; supported by grant
from Washington Department of Ecology for establishment of the Center for Urban Water Resources
Management at the University of Washington; 1990-1993.

Environmental Monitoring and Evaluation of Calcium Magnesium Acetate for Roadway Deicing;
sponsored by Transportation Research Board, National Research Council; 1985-87.
SELECTED CONSULTING PROJECTS

Santa Monica Baykeeper v. Carson Auto, Inc.; Special Master advising United States District Court, Central District of California, Los Angeles, CA; 2001-present.

Storm Water Pollution Prevention Program, City of San Diego; Advising on response to municipal stormwater NPDES program; 2001-present.

Clean Water Act lawsuits, technical expert; consultant to Natural Resources Defense Council, Los Angeles, CA; 1993-present.


BOOKS PUBLISHED


SELECTED JOURNAL AND BOOK CHAPTER PUBLICATIONS


CURRICULUM VITAE

HORNER, Richard Ray

Environmental Engineering and Science
230 NW 55th Street
Seattle, WA  98107
Telephone: (206) 782-7400
Facsimile: (206) 781-9584

Date of Birth:  11-26-43

EDUCATION

1976 - 78 University of Washington, Seattle, Washington; Ph.D. (Civil Engineering)
1965 - 66 University of Pennsylvania, Philadelphia, Pennsylvania; M.S. (Mechanical Engineering)
1961 - 65 University of Pennsylvania, Philadelphia, Pennsylvania; B.S. Cum Laude (Mechanical Engineering)

HONORS AND AWARDS

Augustus Trask Ashton Scholarship, University of Pennsylvania, 1961 - 65
Annual Academic Honors, University of Pennsylvania, 1961 - 65
Tau Beta Pi National Engineering Honor Society
National Science Foundation Traineeship, University of Pennsylvania, 1965 - 66

EMPLOYMENT

1986 - Present Richard R. Horner, Environmental Engineering and Science, Sole Proprietor
1981 - Present University of Washington, Seattle, Washington
1986 - 1990 King County, Seattle, Washington
Coordinator of Puget Sound Wetland and Stormwater Management Research Program (part-time; continuing through present under contract to University of Washington)
1969 - 81 Northampton Community College, Bethlehem, Pennsylvania
Engineering Department (Coordinator, 1971 - 73 and 1978 - 79)
Environmental Studies Department (Co-coordinator, 1973 - 76 and 1978 - 1981)
Professor, 1978 - 1981; Associate Professor, 1973 - 78;
Assistant Professor, 1969 - 73;
Leave of Absence, 1977 - 78; Sabbatical Leave, 1976 - 77
1977 - 78 University of Washington, Seattle, Washington
Department of Civil Engineering
Research Engineer, Highway Runoff Water Quality Project
1976 - 77 University of Washington, Seattle, Washington
Department of Civil Engineering and Institute for Environmental Studies
Research Assistant and Teaching Assistant

1966 - 69 Exxon Research and Engineering Company, Florham Park, New Jersey;
Project Engineer

1965 - 66 University of Pennsylvania, Philadelphia Pennsylvania
Department of Mechanical Engineering; Research Assistant

NATIONAL COMMITTEES


Co-chair, Engineering Foundation Conference on Effects of Watershed Development and Management on Aquatic Ecosystems, 1996.

National Academy of Sciences Panel on Costs of Damage by Highway Ice Control, 1990-91.

American Society of Civil Engineers Urban Water Resources Research Council, continuing appointment beginning in 1990.


RESEARCH PROJECTS

* Principal Investigator.
** Co-Principal Investigator. (Where undesignated, I was a member of the faculty investigation team without principal investigator status).

Ultra-Urban Stormwater Management; Seattle Public Utilities; $1,035,000; 1999-2007.*

Roadside Vegetation Management Study; Washington State Department of Transportation; $50,000; 2004-2005.

The Ecological Response of Small Streams to Stormwater and Stormwater Controls; U. S. Environmental Protection Agency, cooperating with Watershed Management Institute (Crawfordsville, FL); $579,117; 1995-2003.*

Vegetated Stormwater Facility Maintenance; Washington State Department of Transportation; $86,000; 1998-2000.*

Roadside Drainage System Management for Water Quality Improvement; King and Snohomish (WA) Counties; $70,000; 1997-2000.*

Standardization of Wet Weather Protocols for Stream Impact and Treatment Technology Performance Assessments; Water Environment Research Foundation, cooperating with
Water Research Center (Huntington Valley, Pennsylvania) and University of Illinois; $125,000; 1996-97.

Road Shoulder Treatments for Water Quality Protection; Washington State Department of Transportation and King County Roads Division; $90,000; 1995-96.**

Control of Nuisance Filamentous Algae in Streams by Invertebrate Grazing; National Science Foundation; $193,691; 1994-96.


Region-Specific Time-Scale Toxicity in Aquatic Ecosystems; Water Environment Research Foundation, cooperating with Water Research Center (Huntington Valley, Pennsylvania) and University of Illinois; $670,000; 1994-96.


Stormwater Management Technical Assistance to Local Governments; Washington Department of Ecology; $115,000; 1992-93.*

Center for Urban Water Resources Management; Washington Department of Ecology; $336,490; plus $157,400 matching support from seven local governments; 1990-93.*

University of Washington Cooperative Unit for Wetlands and Water Quality Research; King County, Washington; amount varied by year; 1987-1995.*

Assessment of Portage Bay Combined Sewer Overflows; City of Seattle; $132,676; 1990-91.*

Water Quality Impacts of CMA, An Alternative Road Deicing Agent; Graduate School Research Fund; $3,945; 1989-90.*

Velocity-Related Critical Phosphorus Concentrations in Flowing Water, Phase 3; National Science Foundation; $108,332; 1988-90.**

Design of Monitoring Programs for Determining Shellfish Bed Bacterial Contamination Problems; Washington Department of Ecology; $12,000; 1988-89.*

Puget Sound Protocols Development; Tetra Tech, Inc. and Puget Sound Estuary Program; $10,144; 1988.*

Improving the Cost Effectiveness of Highway Construction Site Erosion/Pollution Control, Phase 2; Washington State Department of Transportation; $97,000; 1987-89.*

Wetland Mitigation Project Analysis; Washington State Department of Transportation; $74,985; 1987-89.*


Quality of Management of Silver Lake; City of Everett; $67,463; 1986-88.
Effectiveness of WSDOT Wetlands Creation Projects; Washington State Department of Transportation; $42,308; 1986-87.*

Improving the Cost Effectiveness of Highway Construction Site Erosion/Pollution Control; Washington State Department of Transportation; $41,608; 1986-87.*

Management Significance of Bioavailable Phosphorus in Urban Runoff; State of Washington Water Research Center and Municipality of Metropolitan Seattle; $32,738; 1986-87.**

Environmental Monitoring and Evaluation of Calcium Magnesium Acetate (CMA); National Academy of Sciences; $199,943; 1985-87.*

Conceptual Design of Monitoring Programs for Determination of Water Quality and Ecological Change Resulting from Nonpoint Source Discharges; Washington State Department of Ecology; $49,994; 1985-86.**

Development of an Integrated Land Treatment Approach for Improving the Quality of Metalliferous Mining Wastewaters; Washington Mining and Mineral Resources Research Institute; $4,000; 1985-86.*

Preliminary Investigation of Sewage Sludge Utilization on Roadsides; Washington State Department of Transportation; $6,664; 1984-85.*

Source Control of Transit Base Runoff Pollutants; Municipality of Metropolitan Seattle; $26,867; 1984-85.**

Lake Sammamish Future Water Quality; Municipality of Metropolitan Seattle; $28,500; 1984-85.

Implementation of Highway Runoff Water Quality Research Results; Washington State Department of Transportation; $13,998; 1984-85.*

Performance Evaluation of a Detention Basin and Coalescing Plate Oil Separator for Treating Urban stormwater Runoff; Washington State Water Research Center; 1984-85; $11,724.**

Velocity-Related Critical Phosphorus Concentrations in Flowing Water, Phase 2; National Science Foundation; $99,088; 1983-85.**

Development of a Biological Overland Flow System for Treating Mining Wastewaters; Washington Mining and Mineral Resources Research Institute; $6,030; 1983-84.*

Nutrient Contributions of Agricultural Sites to the Moses Lake System; Moses Lake Conservation District; $15,039; 1982-84.*

Planning Implementation of Runoff Water Quality Research Findings; Washington State Department of Transportation; $12,735; 1982-83.**

Transport of Agricultural Nutrients to Moses Lake; Brown and Caldwell Engineers; $22,725; 1982-83.**

Investigation of Toxicant Concentration and Loading Effects on Aquatic Macrornvertebrates; University of Washington Graduate School Research Fund; $3,788; 1982.*
Sampling Design for Aquatic Ecological Monitoring; Electric Power Research Institute; $542,008; 1981-86.

Velocity-Related Critical Phosphorus Concentrations in Flowing Water; National Science Foundation; $70,310; 1980-82.

Highway Runoff Water Quality; Washington State Department of Transportation; $461,176; 1977-82.

BOOKS


REFEREED JOURNAL PUBLICATIONS AND BOOK CHAPTERS


**REVIEWED PROCEEDINGS PUBLICATIONS**


TECHNICAL REPORTS


PRESENTATIONS AND DISCUSSIONS

*Presented by a co-author.  In all other cases, I presented the paper.


Regional Study Supports Natural Land Cover Protection as Leading Best Management Practice for Maintaining Stream Ecological Integrity.  Invited presentation at the Comprehensive Stormwater and Aquatic Ecosystem Management Conf.; Auckland, New Zealand; February 1999.

Watershed Determinants of Ecosystem Functioning.  Invited presentation at the Engineering Foundation Conference on Effects of Watershed Development on Aquatic EcosystemsUrban Runoff and Receiving Systems; Snowbird, Utah; August 1996.


Constructed Wetlands for Urban Runoff Water Quality Control.  Invited presentation at National Conf. on Urban Runoff Management; Chicago, Illinois; March 1993.
Training for Construction Site Erosion Control and Stormwater Facility Inspection. Invited presentation at National Conf. on Urban Runoff Management; Chicago, Illinois; March 1993.


Environmental Evaluation of Calcium Magnesium Acetate for Highway Deicing Applications. Invited presentation at Conference on Calcium Magnesium Acetate, An Emerging Chemical for Environmental Applications; Boston, Massachusetts; May 1991.


The Impact of Nonpoint Source Pollution on River Ecosystems. Invited presentation at the Northwest Rivers Conference; Seattle, Washington; November 1990.


Control of Urban Runoff Water Quality. Invited presentations at American Society of Civil Engineers Urban Stormwater Short Courses; Bellevue, Washington; April, 1990; Portland, Oregon; July 1990.

Various Aspects of Erosion Prevention and Control. Invited presentations at University of Wisconsin Erosion Control Short Course; Seattle, Washington; July 1990.

Examination of the Hydrology and Water Quality of Wetlands Affected by Urban Stormwater. Presented at the Society of Wetland Scientists Annual Meeting; Breckenridge, Colorado, June 1990 (prepared with L.E. Reinelt).*

Analysis of Plant Communities of Wetlands Affected by Urban Stormwater. Presented at the Society of Wetland Scientists Annual Meeting; Breckenridge, Colorado; June 1990 (prepared with S.S. Cooke).*

Environmental Evaluation of Calcium Magnesium Acetate. Invited presentation at the Symposium on the Environmental Impact of Highway Deicing; Davis, California; October 1989.

Application of Wetland Science Principles in the Classroom and Community. Invited presentation at the Annual Meeting of the Association of Collegiate Schools of Planning; Portland, Oregon; October 1989.


Progress in Wetlands Research. Invited presentation at the Pacific Northwest Pollution Control Association Annual Meeting; Coeur d'Alene, Idaho; October 1988.


Highway Construction Site Erosion and Pollution Control: Recent Research Results. Invited presentation at the 39th Annual Road Builders' Clinic; Moscow, Idaho; March 1988.


What Goes on at the Hanford Nuclear Reservation? Invited presentation at the Northwest Association for Environmental Studies Annual Meeting; Western Washington University, Bellingham, WA; November 1987.


Nonpoint Discharge and Runoff session leader. American Society of Civil Engineers Spring Convention; Seattle, Washington; April 1986.

Prevention of Lake Sammamish Degradation from Future Development. Invited presentation at the American Society of Civil Engineers Spring Convention; Seattle, Washington; April 1986.
Design of Monitoring Programs for Nonpoint Source Water Pollution Problems. Invited presentation at the American Society of Civil Engineers Spring Convention; Seattle, Washington, April 1986 (prepared with L.E. Reinelt, B.W. Mar, and J.S. Richey).*


A General Approach to Designing Environmental Monitoring Programs. Invited presentation at the Pacific Section AAAS Symposium on Biomarkers, Bioindicators, and Bioassays of Environmental Quality; Missoula, Montana; June 1985 (prepared with J.S. Richey and B.W. Mar).


Factors Affecting Periphytic Algal Biomass in Six Swedish Streams. Presented at the American Society of Limnology and Oceanography Annual Meeting; Vancouver, British Columbia; June 1984 (prepared with J.M. Jacoby and E.B. Welch).*


Panel Discussion. Public Forum: Perspectives on Cumulative Effects; Institute for Environmental Studies; University of Washington; Seattle, Washington; August 1983.


Phosphorus and Velocity as Determinants of Nuisance Periphytic Biomass. Presented at the International Workshop on Freshwater Periphyton (SIL); Vaxjo, Sweden; September 1982 (prepared with E.B. Welch and R.B. Veenstra).*
The Development of Nuisance Periphytic Algae in Laboratory Streams in Relation to Enrichment and Velocity. Presented at the American Society of Limnology and Oceanography Annual Meeting; Raleigh, North Carolina; June 1982 (prepared with R.B. Veenstra and E.B. Welch).


Stream Periphyton Development in Relation to Current Velocity and Nutrients. Presented at American Society of Limnology and Oceanography Winter Meeting; Corpus Christi, Texas; January 1979 (prepared with E.B. Welch).

A Comparison of Discrete Versus Composite Sampling of Storm Runoff. Presented at the Northwest Pollution Control Association Annual Meeting; Victoria, British Columbia; October 1978 (prepared with B.W. Mar and J.F. Ferguson).*


GRADUATE AND UNDERGRADUATE COURSES TAUGHT (University of Washington)

Landscape Architecture 590, Urban Water Resources Seminar; 3 quarters.

Landscape Architecture 522/523, Watershed Analysis and Design; 15 quarters.

Engineering 260, Thermodynamics; 1 quarter.

Engineering 210, Engineering Statics; 2 quarters.

Civil Engineering/Water and Air Resources 453, Water and Wastewater Treatment; 1 quarter.

Civil Engineering/Water and Air Resources 599, Analyzing Urbanizing Watersheds; 1 quarter.

CONTINUING EDUCATION SHORT COURSES TAUGHT (University of Washington; multiple offerings)

Infiltration Facilities for Stormwater Quality Control

Wetlands Ecology, Protection, and Restoration

Storm and Surface Water Monitoring

Fundamentals of Urban Surface Water Management

Applied Stormwater Pollution Prevention Planning Techniques

Construction Site Erosion and Pollution Control Problems and Planning

Construction Site Erosion and Pollution Control Practices
Construction Site Erosion and Sediment Control Inspector Training

Inspection and Maintenance of Permanent Stormwater Management Facilities

Biofiltration for Stormwater Runoff Quality Control

Constructed Wetlands for Stormwater Runoff Quality Control

LOCAL COMMITTEES

Technical Advisory Committee, City of Seattle Environmental Priorities Project, 1990-91.

Environmental Toxicology Graduate Program Planning Committee, University of Washington, 1990.


Nonpoint Source Pollution Conference Advisory Committee, 1986-87.


Accreditation Review, University of Washington Department of Landscape Architecture, 1986.

Planning Committee for University of Washington Institute for Environmental Studies Forum on Perspectives on Cumulative Environmental Effects, 1983.

CONSULTING


U. S. Federal Court, Central District of California; Special master in Clean Water Act case; 2001-present.

Orange County Coastkeeper and Lawyers for Clean Water; Assistance with legal cases involving construction site pollution control and monitoring; 2001-present.

Storm Water Pollution Prevention Program, City of San Diego; Advising on response to municipal stormwater NPDES program; 2001-2002.

San Diego Baykeeper, San Diego, California; Technical and program analysis and testimony on potential legal cases involving municipal and industrial stormwater NPDES permit compliance; 1996.

Clean South Bay, Palo Alto, California; Technical and program analysis and testimony on potential legal cases involving municipal and industrial stormwater NPDES permit compliance; 1996.

Watershed Management Institute, Crawfordsville, Florida; Writing certain chapters of guides for stormwater program development and implementation and maintenance of stormwater facilities; 1995-present.

Natural Resources Defense Council, Los Angeles, California; Technical and program analysis and testimony on legal cases involving municipal and industrial stormwater NPDES permit compliance; 1993-present.

King County Roads Division, Seattle, Washington; Teaching two courses on construction erosion and sediment control; 1995.

Snohomish County Roads Division, Seattle, Washington; Teaching a course on construction erosion and sediment control; 1995.


Economic and Engineering Services, Inc., Bellevue, Washington; Assessment of the potential for water quality benefits through modifying existing stormwater ponds; technical advice on remedying operating problems at infiltration ponds; 1994-96.

Washington State Department of Transportation, Olympia, Washington; Teaching courses on construction erosion and sediment control; 1994.

City of Bellevue, Washington; Peer review of documents on potential erosion associated with a road project; analysis of stormwater quality data; 1993-95.

City of Kelowna, B. C., Canada; Teaching short courses on constructed wetlands and erosion and sediment control; 1993.


Whatcom County, Bellingham, Washington; Mediation on lakeshore development moratorium among county, water district, and local community representatives; 1993.

Boeing Commercial Airplane Company, Renton, Washington and Sverdrup Corporation, Kirkland, Washington (at request of City of Renton); Review of stormwater control system design; design of performance monitoring study for system; 1992-94.


Smith, Smart, Hancock, Tabler, and Schwensen Attorneys, Seattle, Washington; Technical advice on a legal case involving a stormwater detention pond; 1992.


CH2M-Hill, Inc., Bellevue, Washington and Portland, Oregon; Technical seminar on constructing wetlands for wastewater treatment; literature review on toxicant cycling in
arid-region wetlands constructed for wastewater treatment; literature and data review on lake nutrient input reduction; expert panel on TMDL analysis for Chehalis River; 1989-1995.

Kramer, Chin and Mayo, Inc., Seattle, Washington; Watershed analysis in Washington County and Lake Oswego, Oregon; literature review in preparation for stormwater infiltration system design; literature review and contribution to design of constructed wetland for municipal wastewater treatment; 1989-1995.

Woodward-Clyde Consultants, Portland, Oregon and Oakland, California; Analysis of wetland capabilities for receiving urban stormwater; design of a constructed wetland for urban stormwater treatment; technical advisor on Washington Department of Ecology and City of Portland stormwater manual updates; 1989-present.


Boeing Computer Services Corporation, Bellevue, Washington; mediation among Boeing, citizens’ group, and City of Bellevue on stormwater control system design; 1990.


U.S. Environmental Protection Agency, Duluth Laboratory; Review of certain provisions of WET 2.0 wetland functional assessment model; 1989.

King County Council, Seattle, Washington; Review of King County Surface Water Design Manual; 1989.

Port of Tacoma, Washington; Assessment of stormwater control strategies; 1989.


Impact Assessment, Inc., La Jolla, California (contractor to Washington State Department of Ecology); Socioeconomic impact assessment of the proposed high-level nuclear waste repository at Hanford, Washington; 1987.

Technical Resources, Inc., Rockville, Maryland (contractor to U.S. Environmental Protection Agency); assessment of water treatment waste disposal at pulp and paper plants; 1987-88.

Dames and Moore, Seattle, Washington; analysis of the consequences of a development to Martha Lake; 1987.

Harper-Owes, Seattle, Washington; project oversight, data analysis, and review of limnological aspects for Lake Chelan Water Quality Assessment Study; 1986-88.

URS Corporation, Seattle, Washington and Columbus, Ohio; presentation of a workshop on nonpoint source water pollution monitoring program design; analysis of innovative and alternative wastewater treatment for Columbus; development of a stormwater utility for Puyallup, Washington; watershed analysis for Edmonds, Washington; 1986-88.


University of Washington Friday Harbor Laboratory; analysis of adjacent port development and preparation of testimony for Shoreline Hearing Board; 1986.


Foster, Pepper, and Riviera Attorneys, Seattle, Washington; analysis and testimony on provisions to reduce pollutants in stormwater runoff from a site proposed for development; 1983.

Williams, Lanza, Kastner, and Gibbs Attorneys, Seattle, Washington; collection and analysis of water quality data to support a legal case and preparation of testimony; 1982.


Brown and Caldwell Engineers, Seattle, Washington; data collection and analysis for watershed study; 1982-83.

City of Marysville, Washington; environmental impact assessment of proposed bridge construction; 1982-83.

F.X. Browne Associates, Inc., Lansdale, Pennsylvania; contributions to manual on lake restoration for U.S. Environmental Protection Agency; preparation of funding proposals and permits for lake restoration; lake data analysis; literature reviews and analysis of septic tank contributions to lake nutrient loading and availability of different forms of nutrients; 1980-83.

Reston Division of Prentice-Hall, Inc., Reston, Virginia; review of and contributions to texts on environmental technology; 1978-79.

November 29, 2007

Via Federal Express

Mr. Eric Strecker, P.E.                        Ms. Cassandra Owens
Geosyntec Consultants                        Los Angeles Regional Water Quality Board
55 SW Yamhill, Suite 200                     320 West 4th Street, Suite 200
Portland, OR 97204                           Los Angeles, CA 90013

Re: Santa Susana Field Laboratory Expert Panel

Dear Mr. Strecker and Ms. Owens:

I was honored to receive your November 16, 2007 letter in which you asked if I would like to participate as an expert panel member to oversee the selection and design of engineered natural treatment systems (ENTS) to meet National Pollutant Discharge Elimination System (NPDES) permit-specified numeric limits for stormwater runoff at Boeing’s Santa Susana Field Laboratory (SSFL), located in southern California. I (with the assistance of the other members of our firm, Wright Water Engineers, Inc. [WWE]) am highly interested in serving as an expert panel member. I sincerely appreciate your consideration of my qualifications to serve in this capacity, as summarized in this letter and the attachments.

To prepare this submittal, I have reviewed your November 16 letter and information on the various websites that were referred to in that letter. In addition, earlier in 2007, WWE was privileged to provide peer review for Geosyntec, Inc. on the post-fire recovery assessment for the SSFL. Tasks involved compiling a literature summary of post-fire watershed recovery data, providing input on the field sampling plan and analysis of data collected, and observing Geosyntec in the field to provide input on data collection methods. Through these activities, we became familiar with SSFL.

Based on our current knowledge of this site and our review of the information that you referred to, this letter and the attachments are divided into the following categories to demonstrate my personal (as well as WWE’s) experience to serve as a panel member:

1. Engineered natural treatment systems, including channel stabilization.
2. Development of site-specific design storms.
3. NPDES permit compliance, including the requirement that stormwater discharges meet numeric limits.
4. Post-fire recovery.
5. Stormwater monitoring.

6. Radionuclide migration and mitigation.

7. Construction phase water quality protection.

8. Stormwater management at industrial sites with known sources of surface water and groundwater contamination.

9. California experience.

10. Serving as a member of expert panels and on controversial projects with significant public input.

Prior to addressing each of these subjects, I have prepared a brief overview of WWE’s history, and my personal experience, as follows.

GENERAL BACKGROUND

WWE was founded in 1961. I joined the firm in 1981 after having worked as a college student intern for the United States Environmental Protection Agency (USEPA) for three years. WWE works throughout the United States and internationally on water resources engineering assignments. I have personally worked on assignments in 26 states and am a registered professional engineer in 10 states. WWE is characterized by long-term, highly satisfied clients, many of which have retained us for 20 years or longer. We have particular expertise and a strong track record on projects that require public presentation and/or expert testimony on controversial, politically charged situations involving complex technical issues.

Beginning approximately 10 years ago, the University of Denver School of Business helped us to begin an annual survey of our clients. We ask eight questions on a scale of 1 to 5, including (as examples) clarity of communications, engineering competence and cost-effectiveness. WWE’s composite score is consistently 4.6 to 4.7 (out of 5.0). Representatives of the University of Denver have told us that this is outstanding for a service organization. Such ratings are likely one reason that we have been privileged to receive such awards as the 1996 “Colorado Ethics in Business Award” and the equivalent award at a national level in 1999 by the National Society of Financial Professionals.

I have bachelor’s and master’s degrees in civil engineering from the University of Virginia in 1980 and 1981. In my nearly 27 years at WWE, I have worked on numerous projects involving stormwater management around the United States, for public and private sector clients. I was privileged to chair the committee of over 100 engineers from the United States, Canada and Europe that prepared the widely disseminated 1992 reference published by the ASCE and WERF entitled Manual of Practice for the Design and Construction of Urban Stormwater Management Systems. I was a contributing author on the follow-up reference published by ASCE and WERF.
in 1998 entitled *Manual of Practice for Urban Runoff Quality Management*. Along with Eric Strecke, P.E., I serve as co-principal investigator of the *International Stormwater BMP Database*, described below. I have been privileged to serve as co-author of numerous stormwater drainage criteria manuals, watershed plans and major drainageway master plans around the United States. I am particularly proud to have served in this capacity for Volumes 1 and 2 of the Denver Urban Drainage and Flood Control District’s *Urban Storm Drainage Criteria Manual*, which is one of the most widely cited documents of its kind in the contemporary literature. The Denver Manual provides detailed, “hardcore” design guidance. As shown in my resume (which is the final document in the attached comb-bound collection of materials), I regularly publish and serve on numerous professional committees. I have testified as an engineering expert on approximately 75 occasions. Over the past decade, I have managed many assignments for WWE involving ENTS and the development of site-specific design storms, as described below.

Eric Strecke is familiar with WWE’s business practices (and my personal qualifications and approach to business), having worked with us for the past 10 years on co-development of the *International BMP Database* (www.bmpdatabase.org). This is the largest scientific database of BMP performance available. The database is co-sponsored by the Water Environment Research Foundation (WERF), American Society of Civil Engineers (ASCE), USEPA, Federal Highway Administration (FHWA), American Public Works Association (APWA) and the Environmental and Water Resources Institute (EWRI). This database, which will be highly relevant for the SSFL expert panel, has been well received by stormwater management practitioners nationally and internationally, and was selected by the American Society of Civil Engineers in 2004 for its prestigious Innovative Project of the Year award. I cite the *International BMP Database* as a representative project not only because of its relevance to SSFL, but also because it demonstrates key characteristics of my approach to assignments:

1. Provide regular and clear written and verbal communications.
2. Assure timeliness
3. Provide work of excellent quality
4. Foster collaboration with other experts
5. Seek out independent review by recognized experts
6. Commit to getting the work done well, even under challenging conditions (Geosyntec and WWE have continued to support the BMP Database even when funding was minimal.)

With that as brief introduction, I turn now to providing representative examples of my personal and our corporate experience in the ten broad categories listed above.
Engineered Natural Treatment Systems

WWE is regularly called upon by our public and private sector clients to assist with the planning, design, construction oversight and follow-up maintenance/monitoring of sustainable ENTS, such as wetlands, slow-flow channels, wet ponds, low impact development (LID) practices, infiltration facilities, and other features of this kind. Since WWE’s inception in 1961, we have consistently called for the preservation of natural drainage systems and have advocated “designing with nature.” We emphasize the need for stormwater quantity and quality management facilities that are safe, community amenities, multipurpose in nature and which will last for many years. Eric Strecker knows that many of our staff conduct paleohydrologic research at Machu Picchu in Peru, Mesa Verde National Park in Colorado, and Roman waterworks in Europe. Our research has shown that properly engineered water supply and drainage systems can serve as community amenities for centuries, in a sustainable manner.

Specific examples of my personal and our corporate ENTS experience are as follows (please refer to the tabs in the attached comb-bound document):

Tab 1: The Cliffs at Castle Pines Subdivision, Douglas County, Colorado—These LID design drawings are highly relevant for Santa Susana because the topographic setting is similar. Essentially, very large homes sit at the top of a cliff, and our design objective was to minimize adverse impacts to houses located at the base of the cliff and to remove pollutants from stormwater runoff. Steep, ephemeral channels drain the property. The various LID components that were constructed have proven to be highly effective hydrologically and from a water quality standpoint, and they have been maintainable, functional and attractive.

Tab 2: Chatfield Green Stormwater Bypass/Management System—Chatfield Green is a residential development on the west side of the Denver metro area. It is located immediately upslope from the Denver Arboretum, owned by the City and County of Denver. Denver was concerned about receiving contaminated stormwater runoff from the development, so WWE co-designed a stormwater bypass and management system. Key components of this systems were three large wet ponds and two wetlands. Drawings for the wetlands are included. WWE worked with the parties to develop a stormwater quality monitoring plan. On the basis of the data collected, the Denver Arboretum came to recognize that the ponds and wetlands were highly effective at removing pollutants from the stormwater, and they ultimately asked that the treated stormwater be discharged onto the arboretum for irrigation. This has been a highly successful project that was initially controversial and somewhat confrontational (prior to WWE’s involvement).

Tab 3: Wilson Mine in Hot Springs, Arkansas—For the past decade, WWE has been working for Union Carbide on a large mine reclamation plan for a uranium/vanadium open pit mine near Hot Springs, Arkansas. We have designed and overseen the construction of numerous ENTS at this mine, including the photographs that appear under Tab 3, for wetlands, slow-flow wetland channels, grade control structures and the like. Our work
is overseen by the Arkansas Department of Environmental Quality (ADEQ), and they require that all facilities are sustainable. I provide this as an example not only because the ENTS that we have designed have been successful, but also because stream water quality/biology has shown a continual improvement in response to the implementation of the ENTS, and, because similar to Santa Susana, this site contains a complex mixture of industrial surface and subsurface pollutants.

Tab 4  **Biotechnical Engineering Features/Pond Edge and Channel Treatments**—This single sheet drawing depicts generalized approaches that we use for the design of channels and pond/wetland edge treatments. We have found that the approaches depicted on that drawing are not only effective hydraulically and from the standpoint of maintaining channel stability, but that they are also sustainable, attractive, and well received by local residents.

Tab 5  **Strategies for Minimizing Adverse Hydrologic Impacts to Wetlands**—This single sheet drawing demonstrates various techniques that we have utilized to minimize hydrologic impacts to wetlands and streams of development features such as buildings, roads, etc. I have overseen the preparation of numerous stormwater quality management plans for mountainous development, and a common objective with these is to strictly minimize adverse impacts to wetlands and stream water quality (many of these projects are in sensitive environmental settings). Post-construction monitoring by our staff indicates that the kinds of features depicted on this drawing are highly effective hydrologically, require little maintenance, and are sustainable.

Tab 6  **Valley Water Mill Reservoir Wetland in Springfield, Missouri**—These drawings depict a wetland design that we conducted for the Watershed Committee of the Ozarks for a pretreatment wetland at the upper end of Valley Water Mill Reservoir in Springfield, Missouri. The purpose of this wetland was to provide pretreatment of wet weather flows prior to their discharge into a reservoir. To perform this design, it was necessary to develop an understanding of the groundwater and surface water hydrologic regime, which proved to be complex. We also estimated sediment loadings/movement through the wetland. It was necessary for us to assess bed load and suspended load movement into and through the wetland as part of our design.

Tab 7  **Rocky Mountain Arsenal Stormwater Habitat Pond**—WWE is extremely proud of a large ENTS that we designed and oversaw the construction of on the Rocky Mountain Arsenal, as shown in these drawings. Since this facility’s construction, follow-up field observations indicate that the wetland is thriving and that the facility serves as a magnet for wildlife. It is highly attractive. The wetland/pond complex is highly regarded by local governments and federal agencies.

Tab 8  **Eagles Nest Golf Course**—The Eagles Nest Golf Course and residential community is located in Summit County, Colorado, and is adjacent to the Blue River, which is a Gold Medal trout stream. It was necessary for our client, Intrawest, to develop Eagles Nest with a high level of water quality sensitivity. Consequently, we worked closely with
Intrawest and their general site civil engineer to design ENTS that would provide a high level of treatment prior to discharge to the Blue River. We have conducted annual macroinvertebrate monitoring in the Blue River immediately upstream and downstream from Eagles Nest to evaluate the effectiveness of the water quality protection strategy that we developed, and field data demonstrate that there have been no measurable adverse effects to aquatic life from the development.

Tab 9 Lena Gulch Channel Improvements—Lena Gulch is a major drainageway near Golden, Colorado, in a residential area. WWE was retained by Jefferson County and the Urban Drainage and Flood Control District to develop a channel restoration plan that would emphasize water quality enhancement, aesthetics and the creation of a “natural” feel. The resulting plan was developed through extensive communications with residents of the neighborhood. Aesthetic grade control and stream channel stabilization measures were utilized (see photograph).

Tab 10 Greens at Springfield—Working as a subconsultant to Crafton Tull Sparks Consulting Engineers (Rogers, Arkansas), WWE prepared a stormwater quality management plan for a golf course/apartment development in southwest Missouri known as the “Greens at Springfield.” Tab 10 provides drawings of the many stormwater quality management features that were used at the site, including, for example, slow-flow channels, aesthetic grade control structures, wetlands, wet ponds, multiple nonstructural measures for the golf course, such as integrated pest management and others. The objective was to provide a high level of treatment using aesthetic features to protect the downstream public water supply reservoir. Our philosophy was to utilize multiple measures in series (i.e., a “treatment train” approach) and to utilize conservative design criteria.

Tab 11 Lone Tree Pond L-3 Water Quality Improvements—This recent project serves as a good example of retrofitting a conventional stormwater detention pond into a water quality treatment facility. This work was conducted for a long-time client, the Arapahoe County Water and Wastewater Authority. Water quality retrofitting is a component of many of our assignments.

Tab 12 Grade Control Structures in Springfield, Missouri Storm Drainage Criteria Manual—From the materials that you have sent, it appears that stream channel stabilization measures will need to be utilized at the Santa Susana site. I (and WWE) have considerable experience in this area, at projects around the United States. Tab 12 provides examples of drop structure designs that we prepared for the City of Springfield, Missouri and Greene County, Missouri, in a storm drainage criteria manual we recently prepared. Note that we developed details for “sculpted-architectural” drops that we have successfully utilized elsewhere. These are designed to blend into the natural topography, yet be fully functional and stable in the design storm. To be sustainable, the SSFL channel stabilization measures will need to be structurally sound during large runoff events and heavy debris loads.
DEVELOPMENT OF SITE-SPECIFIC DESIGN STORMS

I (and WWE) have considerable experience with the development of site-specific design storms for water quality facilities, and rainfall analysis, in general. For example, please see representative text from the 1992 *Manual of Practice for the Design and Construction of Urban Stormwater Management Systems* that I have provided in Tab 13, and the "Rainfall" chapter from the Denver Urban Storm Drainage Criteria Manual, provided as Tab 14. I played a major role in the preparation of the text of those documents, including the underlying technical foundation/analysis.

In 2003–2004, I was asked to assist land planners and civil engineers in Columbia, Missouri with the development of a sophisticated, multifaceted stormwater quality management plan for a proposed 500-acre commercial/residential development known as Phillips Farm. The Phillips Farm site drained into two streams that were classified as "sensitive" by the City of Columbia—Gans Creek and Clear Creek. The City had specified that certain impervious area limits could not be exceeded by the development. There was local skepticism that stormwater best management practices (BMPs) could work effectively to protect the receiving streams, during both construction and post-construction conditions. One of the key elements of our work was to develop site-specific design storms. The objectives that we needed to meet with these storms were (1) protection of existing stream channel morphology/stability, (2) removal of pollutants to predevelopment levels (the site had historically been a dairy farm, so the expectation was the nutrient and solids loading could be reduced), and (3) attenuation of larger storms to predevelopment levels, up to and including the 100-year storm. Ultimately, the storm drainage system for the full site was designed on the basis of the 70th percentile annual exceedance probability event, 1-year storm and 2-year storm for channel stability and water quality objectives, coupled with the 10-year, 25-year and 100-year storms for flood control. WWE developed continuous hydrologic simulation models to evaluate the effectiveness of these design events.

As another example, WWE prepared the master drainage plan for the 11-square mile Rocky Flats nuclear weapons complex, northwest of downtown Denver (see Tab 15). This U.S. Department of Energy (DOE) facility has now been remediated and is in the final stages of transformation into a wildlife refuge to be administered by the U.S. Fish and Wildlife Service. When the site was an active industrial facility, the DOE and its prime contractor tasked WWE with the preparation of an overall site master drainage plan, which included development of site-specific design storms that would be acceptable to local governments, the State of Colorado and the USEPA. Relative to water quality, WWE provided recommendations for storms smaller than the one-year event, along with the 1- and 2-year events for channel stability and water quality enhancement. WWE's master plan, along with additional studies related to off-site transport of uranium, americium and plutonium were adhered to by DOE during site closure activities and are being followed today with the site in a post-closure condition.

In approximately 2002, WWE was retained by Laing-Village Homes, LLC to prepare a water quality protection plan for Aurora Reservoir, a public water supply reservoir for the City of
Aurora, Colorado, in response to a proposed 800-acre residential development immediately upstream from the reservoir. This was another case where WWE developed a continuous hydrologic model to define suitable site-specific design storms, along with appropriate assemblages of BMPs to assure that the reservoir would be adequately protected.

WWE has frequently designed and installed rain gage networks and has maintained these rain gages. For example, we played a significant role in the design of the rainfall/runoff data collection program at the Rocky Flats nuclear weapons site. We have assisted various municipalities with addressing the question of how many rain gages are necessary and where they should be located to provide statistically reliable rainfall data. On numerous occasions, we have statistically analyzed large amounts of rainfall data, ultimately leading to master planning and/or designs.

**NPDES PERMIT COMPLIANCE, INCLUDING NUMERIC STANDARDS**

WWE (and I) have worked on numerous NPDES permitting assignments throughout the United States, for public and private parties. These permits have addressed wide-ranging issues, including industrial wastewater treatment, municipal wastewater treatment, construction site stormwater runoff, post-development urban stormwater runoff, dewatering discharges, and others. Representative NPDES clients include:

- Coors Brewing Company
- Arco Coal Company and Arch Coal Company
- U.S. Department of Energy
- City of Springfield, Missouri
- City of Lincoln, Nebraska
- City of Rockford, Illinois
- City of Tulsa, Oklahoma
- City of Overland Park, Kansas
- City and County of Denver
- ExxonMobil
- BP America
- Colorado ski resorts
- Numerous residential developers and homebuilders, including, as examples, Lennar Homes, Centex Homes and Pulte Homes

I have frequently been retained by public and private entities that need to meet numeric limits with stormwater discharges. The factors prompting this requirement have varied widely, ranging from complying with local environmental regulations to satisfying downstream water owners/users.

An excellent example is provided in Tab 16, an article from *Stormwater* magazine concerning the Grant Ranch residential development in Littleton, Colorado. For the past eight years, WWE
has maintained a network of five fully automated stormwater collection stations to monitor the performance of three extended dry ponds, all which feed into a water quality–wetland pond. The discharges from this system must comply with numeric limits for multiple contaminants (see article for list of constituents), for four wet weather and four dry weather events, each year. Long-term performance of the system has been superb, with total suspended solids (TSS) levels consistently less than 10 mg/l and often less than 5 mg/l, and total phosphorus values typically in the range of 0.10 to 0.13 mg/l. There has rarely been a metals concentration above the detection limit, and all have been below lake standards. The factor that triggered these numeric discharge limits was that the proposed Grant Ranch residential development was to discharge into Bow Mar Lake, which is owned by the Bow Mar Homeowners Association and used for swimming and fishing. The homeowners would not accept the stormwater unless stringent limits were agreed to. I negotiated the list of constituents and their respective limits with engineers who worked for Bow Mar, and prepared the structure of the overall stormwater agreement. We also developed a numeric limit for the construction phase of the development. Based on guidance from the Missouri Department of Environmental Quality (MDEQ) and our experience in that state, we adopted a limit of 2.5 ml/l/hour for total settable solids, using an Imhoff cone.

I have worked at many other sites where our clients need to meet numeric limits with stormwater discharges, including, for example, the Rocky Flats nuclear weapons site (including 12 large retention ponds that we have designed retrofits for), Chatfield Green residential development, the Phillips Farm commercial/residential development in Missouri and, currently, a proposed residential development by Deltaic Timber in the Lake Maumelle public water supply watershed outside of Little Rock, Arkansas (Geosyntec has worked on this project).

**POST-FIRE RECOVERY**

WWE has extensive experience in post-fire recovery of watersheds. As noted in the introduction to this letter, we provided peer review for Geosyntec on the post-fire recovery assessment for SSFL. I thought that you might be interested in two somewhat detailed explanations of other fire recovery projects that we have conducted, one at the Los Alamos National Laboratory and the other in the San Juan National Forest in southwest Colorado.

Regarding the Los Alamos example, in May, 2000, a controlled burn at the Bandolier National Monument that got out of hand started the Cerro Grande wildfire, which burned extensive parts of the Los Alamos National Laboratory (LANL). LANL is a location where contamination from nuclear experimentation is known to exist and where nuclear testing facilities are still active, so the changes in hydrology were of great concern for safety of the laboratory, downstream communities and water quality in the Rio Grande. WWE worked as part of the LANL modeling team to assess changes in hydrology, hydraulics, floodplain extents and sediment transport following the fire. For example, we used the HEC-HMS model for hydrologic analysis, relying heavily on GIS information for input of such parameters as coverage of burned areas, watershed sizes, flow path lengths, etc. This enabled us to develop a hydrologic/hydraulic model for a network of canyons encompassing more than 20 square miles. We followed this up with HEC-RAS modeling that included more than 2,000 cross sections. This was followed by initial
sediment transport work and recommendations regarding erosion and sediment control measures that could be utilized in the field to minimize the risk of downstream sediment transport.

The Missionary Ridge wildfire in 2002 burned more than 70,000 acres, mostly in the San Juan National Forest near Durango, Colorado. There was immediate concern about adverse downstream impacts to aquatic life and public water supplies. The Florida Water Conservancy District retained WWE to design rehabilitation measures. The Conservancy District, through WWE, obtained a Section 319 grant through the Colorado Department Public Health. Approximately $600,000 was spent on rehabilitation. For instance, log erosion barriers were installed over 230 acres at a density of 90 to 250 per acre. These were routinely monitored, sediment was removed and positions were adjusted. Thirteen check dams and detention basins were constructed and were regularly maintained and monitored. Five steel debris racks ranging in width from 15 to 47 feet were installed along major drainage paths and trapped thousands of cubic yards of debris. Approximately 100 acres of the most critical areas were mulched with approximately 200 tons of straw (75 acres of which were hand crimped, seeded and planted). The crimping significantly boosted effectiveness. A 700-foot long bypass channel was constructed with barriers above an endangered spillway area. The effectiveness of all of these measures was put to the test in early September, 2003, when 2.5 inches of rain fell over a 13-hour period. While typical sediment yield rates following other wildfires in the area had approached 50 tons/acre/year, the soil loss rates in the area where our restoration work had occurred ranged from 7 to 14 tons/acre. The Colorado Department of Public Health and Environment cited this project as a model Section 319 project and awarded WWE and our client the 2004 Section 319 “Hall of Fame” Award.

STORMWATER MONITORING

WWE has designed, implemented and maintained numerous stormwater monitoring systems. For most of these projects, I have served as WWE’s managing principal or project manager. Eric Strecke is familiar with our monitoring capability, because one of the major documents that was prepared as part of the International BMP Database was a manual on how to monitor BMP performance. Geosyntec took the lead on preparing this document, although WWE provided substantial review and input.

An excellent example of our experience with monitoring is that Grant Ranch residential development, described above and summarized in an article in Tab 16. Another example is the monitoring that we are now conducting for the National Renewable Energy Laboratory (NREL) at a WalMart store in Aurora, Colorado. This monitoring is being conducted as part of WalMart’s consent decree with the USEPA for construction site NPDES permit violations. The WalMart store has five different stormwater BMPs (including various types of porous pavement), all of which are being monitored by WWE. Our fully automated monitoring is being conducted over three years, and it includes not only collection of water chemistry data (such as to measure bioswale performance), but also hydrologic data for the porous pavement, to determine how much of the precipitation runs off versus how much is infiltrated.
I also have considerable experience with monitoring the effectiveness of construction site BMPs. A number of our clients have had to meet numeric limits of some sort with construction discharges, typically for TSS, turbidity or settleable solids. For example, when Keystone Resort proposed constructing the Schick Lodge adjacent to the Snake River in Summit County, Colorado, the local government expressed concern about sediment and phosphorus loading to the river from the approximately one-third mile long driveway to the lodge. WWE designed the construction-phase water quality controls, obtained a discharge permit from the Colorado Department of Public Health and Environment (CDPHE) that addressed both dewatering and stormwater discharges and monitored the site during dry weather and wet weather conditions. Numeric limits were applied for TSS, turbidity and other constituents. The system performed exceptionally well under difficult site constraints.

RADIONUCLIDE MIGRATION AND MITIGATION

WWE (and I) has strong work experience at DOE facilities, dating back to 1989. Our work began for DOE in 1989 at the Rocky Flats nuclear weapons complex shortly after the FBI “raided” the site and shut down all operations due to alleged environmental crimes. Approximately two months after the FBI raid, the State of Colorado Water Quality Commission conducted a special hearing to impose stringent site-specific stream classifications and standards at Rocky Flats and immediately downstream. I was the engineering expert for the DOE (and their prime contractor, Rockwell International) at this hearing. From that hearing in 1989 until the present, we have worked continuously to assist DOE and their various contractors with multiple activities that recently led to final closure of the site. Please refer to Tab 15 for a brief summary of our DOE site experience.

We have also conducted considerable work at the Los Alamos National Laboratory, including post-fire reclamation and associated hydrologic studies. Another major client with water quality issues related to radioactivity is Union Carbide, and its mining subsidiary Umetco. We have assisted Umetco with the design, construction and monitoring of stormwater management facilities in Colorado, Wyoming and Arkansas.

I have personally played a significant role on many of our projects involving DOE and Umetco facilities.

CONSTRUCTION PHASE WATER QUALITY PROTECTION

This is an area of considerable strength for WWE (and for me personally) around the United States. We have prepared numerous guidance documents on erosion and sediment control, and I was an invited reviewer by the USEPA for their BMP guidance manual for construction sites. We have prepared hundreds of construction site stormwater management plans, and have conducted numerous site inspections. Two of the nation’s largest homebuilders have retained us to audit their construction site stormwater programs, nationally. We have frequently been retained by entities such as ski resorts, oil and gas companies and mines which propose
construction in sensitive watersheds and where local, state and federal regulators have viewed it as unacceptable for essentially any sediment to leave the construction zone. For example, over the past two years, we have worked for developers and construction companies that are reconstructing the core of the base area of the Snowmass Ski Area at Aspen/Snowmass, Colorado. For approximately the past six years, we have served in a similar capacity at the Copper Mountain Ski Area in Summit County, Colorado. We have designed, overseen the construction of, and assisted with maintenance/monitoring of, numerous construction BMPs. We have also monitored the receiving water, West Tenmile Creek (a Gold Medal Fishery), immediately upstream and downstream from Copper Mountain. We have conducted both water chemistry and biological monitoring, along with stream channel morphology. We have been very pleased that the physical, chemical and biological data indicate that runoff from the ski resort is having no measurable impact on West Tenmile Creek.

Tabs 10 and 11 provide representative construction BMP drawings.

STORMWATER MANAGEMENT AT INDUSTRIAL SITES WITH KNOWN SOURCES OF SURFACE WATER AND GROUNDWATER CONTAMINATION

I have frequently been asked to consult on stormwater quality management at industrial sites that have known surface and subsurface contamination sources, comparable to the Boeing site. Frequently, these cases have involved a complex mixture of regulatory requirements under RCRA, CERCLA, NEPA and the Clean Water Act. In the course of planning, evaluating and designing BMPs, it has been necessary for us to address not only contaminants on the ground surface, but contributions from contaminated groundwater as well. Frequently, we have developed sophisticated site water balances to facilitate BMP selection.

Representative industrial sites where we have conducted stormwater planning/design assignments (and where I have personal involvement) include, as examples:

- Black Pine Mine in Idaho
- Total Petroleum Refinery in Commerce City, Colorado
- Lowry Landfill in Denver, Colorado
- Black Thunder Coal Mine in Wyoming
- West Elk Mine in Colorado
- ExxonMobil oil and gas facilities in Colorado and Wyoming
- BP America oil and gas facilities in Colorado
- Bekaert Steel in Bentonville, Arkansas
- Dover-Norris Island in Houston, Texas
- Union Carbide (Umetco) mining facilities in Colorado and Arkansas
- U.S. DOE sites—Rocky Flats and Los Alamos
EXPERIENCE IN CALIFORNIA

WWE (and I) has work experience in California. Representative clients include the following:

- Lennar Homes in Fresno and Stockton
- Centex Homes throughout the Los Angeles and San Francisco metropolitan areas
- San Diego County (storm drainage criteria manual peer review)
- Contra Costa Water District (as subconsultant to Carollo Engineering)
- Santa Susana Field Laboratory (as subconsultant to Geosyntec)
- Special study for Coors Brewing Company related to locating a potential new brewery in the Central Valley
- Imperial Irrigation District
- U.S. Internal Revenue Service
- Pauma Indian Tribe

SERVING AS A MEMBER OF EXPERT PANELS AND ON CONTROVERSIAL PROJECTS WITH SIGNIFICANT PUBLIC INPUT

Over my 27 years at WWE, I have frequently served as an expert panel member, often working on highly controversial projects that were in the public eye. As noted in the introduction to the letter, I have testified over 75 times, and on many occasions, in front of juries. Many of our projects have included public participation, so I am quite experienced at responding to questions and comments from members of the public. On many occasions, public comments have been sharp (and, occasionally, hostile), and I am quite comfortable under these circumstances. I serve on many advisory committees, editorial boards and professional committees, and always enjoy the collegiality and professionalism associated with such endeavors. Let me provide you with a few examples that are relevant for the SSFL:

- Approximately two years ago, I was appointed by the Governor of Colorado to serve as a board member of the Cherry Creek Basin Water Quality Authority. The charge of this authority is to protect water quality in Colorado’s most important and popular recreational reservoir, Cherry Creek Reservoir, located on the south side of the Denver metro area. Our authority deals with difficult lake water quality management issues routinely, given that there are stringent water quality standards for the reservoir that must be protected. A key aspect of the regulatory program for the Cherry Creek watershed is implementation of BMPs to control phosphorus from urban stormwater runoff. Parties are required to submit calculations to us to project how much phosphorus will be removed from runoff. Wastewater dischargers are required to discharge 0.05 milligrams per liter of total phosphorus, which leads them to believe that they are unfairly being singled out. Local governments do not see eye-to-eye on a number of issues. Most of my fellow board members are elected officials, so I have developed an appreciation for how the political process works.
• I was one member of a committee of approximately eight people who oversaw the transformation of an office site in Boulder, Colorado, from a traditional drainage system into an advanced low impact development-based facility. Parking lot swales, grass swales around the perimeter of the site, planter boxes and other LID features were utilized. This project served as one of 25 projects around the United States that *National Geographic* used as case studies on implementing sustainable water management technologies. Interestingly, WWE was asked to develop a surface water and groundwater quantity monitoring plan for the site, so that a sophisticated water balance could be developed. With financial assistance from the City of Boulder, we developed such a plan and installed the necessary monitoring facilities. The monitoring plan was conducted for three years, and it was noteworthy that during that time, only one precipitation event resulted in off-site runoff (the rest of time, all of the water was retained on site).

• The Colorado State Engineer’s Office requested that I participate in revisions to state regulations regarding dam safety, including selection of design storms. This was one of the predecessor steps to significant revision of the state regulations.

• I was requested by the USEPA to serve on a committee that had the charge of determining whether expenditures by the USEPA for water quality improvement were “making a difference.” This panel worked during the early 1990s, and the Center for Watershed Protection served as a facilitator. This involved frequent correspondence and occasional meetings. Ultimately, our committee (along with Center for Watershed Protection) developed a long list of “indicators” of water quality progress.

• I have frequently chaired or co-chaired national conferences (Eric, you are quite familiar with this process, having just been through it last summer). For example, I co-chaired the 2001 conference sponsored by the United Engineering Foundation, ASCE and the USEPA entitled “Linking Stormwater BMP Designs and Performance to Receiving Water Impact Mitigation.” In the early 1990s, I chaired a conference that was held in Washington, DC, and which was co-sponsored by multiple federal agencies, engineering societies and other professional societies entitled “National Environmental Regulations—Where Is the Pendulum Now?” Through activities such as this and chairing or otherwise participating on numerous committees sponsored by ASCE, Water Enviroment Federation (WEF), APWA and other organizations, I have worked with peers on numerous occasions to evaluate the kinds of issues that you will be addressing at the Boeing facility in southern California.

In closing, I reiterate my great enthusiasm at potentially being one of your expert panel members. I am honored by the opportunity to submit my qualifications. I can assure you that if selected, you will find my work to be thorough, competent and timely (I will meet your aggressive schedule requirements). In addition, I sincerely appreciate the opportunity to interact with professional colleagues and members of the public and consistently do so in a positive and constructive manner, even when conditions are not necessarily favorable.
Thank you for your consideration and please call with questions.

Sincerely,

WRIGHT WATER ENGINEERS, INC.

By
Jonathan E. Jones, P.E., D.WRE
Chief/Executive Officer

Attachment

Z: Project Files GO 997-999 991-999.056 Admin Ltr SSFL Proposal 11-29-07.doc
EXPERT PANEL
DESIGN STORM AND BMP SELECTION AT THE SANTA SUSANNA FIELD LABORATORY

STATEMENT OF QUALIFICATIONS
MICHAEL JOSSELYN, PHD, PWS

PURPOSE

The purpose of this SOQ is to submit my qualifications to serve on the Expert Panel for the Design Storm and BMP Selection at Boeing's Santa Susanna Field Laboratory. I am submitting this statement to provide expertise in wetland restoration and treatment processes.

GENERAL STATEMENT OF QUALIFICATIONS

Scientific knowledge of the wetland ecology

I am currently a Professor Emeritus of San Francisco State University where I taught Wetland Ecology from 1978 to 2000. I also taught courses in Phycology (study of algae), Biological Oceanography, Wetland Ecology and Management, and General Biology. For seven years, between 1982 to 1989, I was Director of the Romberg Tiburon Center for Environmental Studies, a field station of San Francisco State University that focused on the ecology of San Francisco Bay. As director, I supervised other professional researchers and academic scientists in developing a comprehensive program to train graduate students and to undertake basic scientific research on the Bay. During that time, I had research grants from various state and federal agencies to study the ecology of the Bay and I published articles on a wide variety of topics dealing with wetland ecology, restoration, and management.

As President of WRA, Inc., I have led the biological design component of many restoration planning projects in both tidal and non-tidal wetlands, especially within the San Francisco Bay region. Outside of San Francisco Bay, I have been the biological consultant for the 1000 ac Bolsa Chica tidal marsh restoration, the 650 ac Batiquitos Lagoon enhancement project, the 200 ac Ballona Wetlands Restoration, and the 450 ac San Dieguito Lagoon restoration project. I led restoration design for the 400 ac Pacific Commons vernal pool restoration project in Fremont, CA.

Experience on Technical Advisory Panels

I have served and continue to serve on a variety of technical advisory panels. In the past, I have served on Corps of Engineers, Environmental Protection Agency, CalFED, and National Research Council panels dealing with wetland ecology and restoration. I served on a National Panel that investigated the restoration of the Louisiana Delta and issued an independent scientific assessment of the past efforts with recommendations for future restoration. I am currently a scientific panel member with the City of San Francisco PUC investigating alternative treatment systems for waste and stormwater in San Francisco. I am also a scientific panel member on the Scientific Advisory Panel for the Wetland Recovery Project in southern California and the Technical Advisory
Committee for the Ballona Wetlands Restoration project.

**Experience conducting quality control**

As Director for the Romberg Tiburon Center, I was responsible for many grants and contracts to the Center. Many of these grants, especially those from the SWRCB and Sea Grant required the development and oversight of data quality control programs. I currently serve as a technical reviewer to the SWRCB on regulations related to water quality standards to protect estuarine systems. I have conducted scientific reviews of the TMDL for Upper Newport Bay, the recent San Francisco Bay RWQCB standards for rapid assessment of contaminated sites, and the Guadalupe River Hg TMDL.

**Technical expertise**

I am a Certified Professional Wetland Scientist and am trained as an ecologist and botanist. My expertise is in wetland ecology and restoration processes.

**Ability to attend meetings**

I am located in San Rafael, CA, but have easy access to air travel to attend meetings in Southern California.

**Interest and compensation**

I am very interested in participating in this panel as the type of work involved interests me professionally and I believe I can contribute to the quality of the final product through my experience in wetland restoration and water quality management. I am available to work on this project during the time frame that is provided in the November 16th invitation.

My hourly rate is $225/hr and expenses will be billed at cost + 10%.

**Other supporting information**

A brief resume is attached. Information on my firm and its range of projects can be found at [www.wra-ca.com](http://www.wra-ca.com). I would serve on this Panel through my firm, WRA, Inc. which is a certified California small business.
Michael Josselyn is the founding principal of WRA, Inc. The firm was established in 1982 for the purpose of utilizing the best scientific information to improve wetland management and regulation in the United States. Since then, the firm has performed projects throughout the country and currently has 45 employees based on San Rafael, CA. Under Dr. Josselyn's leadership, the firm has completed over 2000 projects for industry, government, and non-profit organizations.

Dr. Josselyn was a Professor of Biology and former Director of the Romberg Tiburon Center for Environmental Studies at San Francisco State University. He taught wetland and estuarine ecology and as Director headed the University's research program on San Francisco Bay. He is now a Professor Emeritus. He is a certified trainer for the Corps wetland delineation methodology and has regularly provided training in routine and advanced wetland delineation throughout California. He has been an instructor for the Corps of Engineers In-Service Training Program since 1984.

Dr. Josselyn has served as the project manager for wetland mitigation and restoration projects including several projects exceeding 1000 acres. He has been the wetland design team leader coastal wetland restoration at the 400 ac Batiquitos Lagoon for the Port of Los Angeles, the 1000 ac Bolsa Chica wetland for the California Coastal Conservancy, the 400 ac San Dieguito River Wetland Restoration for Southern California Edison, and the 3000 ac Commercial Hay Farm wetland restoration for Public Service Gas and Electric on Delaware Bay. He has been the project leader for restoration in freshwater wetlands, including the 400 acre vernal pool wetland restoration at Pacific Commons in Fremont, CA.

Dr. Josselyn has also performed work for several state agencies including the Department of Fish and Game (DFG), the State Coastal Conservancy (SCC), and the Department of Parks and Recreation (DPR). For DFG, he developed Operation and Management Plans for 12 properties along the Sacramento and Feather Rivers. For the SCC, Dr. Josselyn was the on-call biological consultant from 1984-2000 and he performed assessments and biological studies for the Conservancy throughout the State of California. He has conducted biological assessments for coastal lagoons and rivers throughout the State. He has developed riparian restoration plans for the Conservancy’s watershed program including the 100 acre Valley View Ranch riparian habitat restoration on the Santa Clara River. He is a member of the Scientific Advisory Panel for the Southern California Wetlands Recovery Project, Science Team for the South Bay Salt Pond Restoration Project, Science Advisory Committee for the Ballona Wetlands, and the Technical Advisory Committee for the City of San Francisco’s Master Water Quality Plan.

Dr. Josselyn has won environmental awards for projects in the City of San Francisco, City of Newark, Orange County, Monterey County, and for the 100 acre Goose Creek wetland, the largest forested wetland restoration in northern Virginia. He was selected as Conservator of the Year by the Bolsa Chica Conservancy in 2000.

Dr. Josselyn is also a leader in his profession. As a certified Professional Wetland Scientist, Dr. Josselyn is a past President of Society of Wetland Scientists Professional Certification Program. He
has served as an advisor to the National Oceanic and Atmospheric Administration's Coastal Ocean Program, a member of numerous panels for the National Research Council, a member of the US-Japan Coastal Ocean's Panel, and a consultant to the Environmental Protection Agency Scientific Advisory Panel. He is an elected member of the California Academy of Sciences.

Degrees:

Cornell University, BS with Distinction 1972
University of Miami, MS 1975
University of New Hampshire, Ph.D. 1978

Selected publications (from list of 50)


PROFESSIONAL RESUME

Michael K. Stenstrom

Professor
University of California
Civil & Environmental Engineering Dept.
5714 Boelter Hall
Los Angeles, CA 90095-1593

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stenstro@seas.ucla.edu
www.seas.ucla.edu/stenstro

EDUCATION

1976 Ph.D. Environmental Systems Engineering, Clemson University, Clemson, SC. Minors in Chemical and Electrical Engineering. Dissertation Title: "A Dynamic Model and Computer Compatible Control Strategies for Wastewater Treatment Plants".
1972 M.S. Environmental Systems Engineering, Clemson University. Thesis Title: "Biological Process Simulation for Operator Training".
1971 B.S. Electrical and Computer Engineering, Clemson University.

REGISTRATION

Registered Professional Civil Engineer, California C35497, 1982 - present
Diplomate, American Academy of Environmental Engineers, 1989 - present

HONORS AND AWARDS


WORK EXPERIENCE

July 1, 1985 to Present
Assistant, Associate and Professor, UCLA, School of Engineering and Applied Science. Responsibilities include teaching and research at the graduate and undergraduate levels and various administrative responsibilities, including C&EE Dept. Chair (1991-1999), Assist Dean (1985-1991), Associate Dean (2001-2003).

August 1975 to September 1977 Research Engineer and Project Manager (1-1-77) for the Amoco Oil Co., (Standard Oil (Indiana)), Naperville, IL.

OTHER PROFESSIONAL EXPERIENCE

Part time consultant to industry, consulting engineering firms and government. Active in professional organizations, including ASCE-EWRI (Member of Oxygen Transfer Standards Committee, 1977-present and Chair, 2001-present); WEF (Member and Chair of IAC Subcommittee, 1999-2001), IWA (Member of Diffuse Pollution Specialty Group (2004-present), ACS and AEESP.
SELECTED REFEREED PUBLICATIONS RELATING TO STORMWATER AND URBAN RUNOFF


**SELECTED RESEARCH GRANTS AND CONTRACTS RELATING TO STORMWATER AND URBAN RUNOFF**

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<tr>
<th>Grant Description</th>
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<td>Assessment of Contaminants in Storm Drains: Biological Impacts</td>
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<td>Urban Stormwater Pollution Reduction from Parking Facilities</td>
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<td>Assessment of Biological Impacts of Contaminants in Storm Drains Phase II - Wet Weather Flow.</td>
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<td>Practical Application of First Flush in Treatment BMPs</td>
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Marty Wanielista

Marty Wanielista is the director of the Stormwater Management Academy, Professor of Engineering, a Pegasus Professor, and Professor Emeritus at the University of Central Florida. He has been at UCF for 37 years. He has a Civil Engineering degree from the University of Detroit, Masters from Manhattan College, and a PhD in Environmental Systems from Cornell. He has completed over 70 research projects in the areas of Hydrology and Stormwater, and is currently working on eight projects. He has over 200 publications including 7 textbooks. He was very active with the new stormwater lab and helped formulate policies for stormwater management in the State. He has been identified as the grandfather of stormwater management and credited with introducing green roofs to the State of Florida as a stormwater management alternative. He is very active in promoting stewardship of sustainable water resources by promoting the reuse of stormwater.
A. Professional Preparation

Cornell University  Environmental Systems Engineering  Ph.D., 1971
Manhattan College  Sanitary Engineering  M.S., 1965
University of Detroit  Civil Engineering  B.S., 1964

B. Appointments

Academic Appointments at the University of Central Florida
2002 -  Director of Stormwater Management Academy
1993 - 2003  Dean of Engineering
1985 - 1988  Director of Research and Interim Associate Dean
1978 - 1985  Chair of Civil and Environmental Engineering

2006 -  Professor Emeritus
2003 -  Distinguished University Professor
1976 - 2006  Professor of Engineering
1972 - 1976  Associate Professor of Engineering
1970 - 1972  Assistant Professor of Engineering

Recognition

2. North America Lakes Management Award, "Deevie Award" given to one whom advances an understanding and protection of State Waters. May, 1995.


5. Spangler Award – Life Time Achievement, ASCE Florida Section, 2004


(i) Five Recent Publications Most Related to the Proposal


(ii) Five Other Recent Publications Most Relevant to the Proposal


D. Synergistic Activities

1. Teaching in the areas of hydrology and stormwater management for over 38 years. Developed curriculum materials and textbooks.
2. Service to the profession on over 100 committees related to the research.

E. Collaborators and other Affiliations

(i) State of Florida Departments of Transportation, Environmental Protection, and Community Affairs, working with watershed and springshed protection models and analyses. Established with the help of national and state programs, a soil erosion and sedimentation lab at the University.

(ii) Thesis Advisor and Postgraduate-Scholar Sponsor:

Completed eleven in the last 5 years. All in the water resources and stormwater management areas.
Position
Principal, Wetland Management Services, Chelsea, Michigan
Professor Emeritus of Chemical Engineering, University of Michigan

Registration
Professional Engineer (Michigan)

Education
BS, Chemical Engineering, University of Wisconsin, 1958
MS, Chemical Engineering, University of Michigan, 1959
PhD, Chemical Engineering, University of Michigan, 1962

Professional Societies
International Water Association
Society of Wetland Scientists

Honors and Awards:
Editor, AIChE Journal, 1976-1985
MCEC Eminent Conceptor Award (Wetlands Treatment), 1976
ACEC Honor Award (Wetlands Treatment), 1976
All-time Outstanding Engineering Project (Wetlands Treatment), State of Michigan, 1987
Chairman, IAWQ Specialist Group on Macrophytes in Water Pollution Control. 1992-1997
Distinguished Career Award (Wetland Science). IWA and U. FL, 2000
PROFESSIONAL EXPERIENCE

Dr. Kadlec's professional work has been primarily concerned with the implementation of wetland systems for water pollution control, under the business name Wetlands Management Services. He has participated in the design of over one hundred wetland treatment systems, and conducted feasibility studies for many others. These span all types of treatment wetlands: surface and subsurface flow, natural and constructed, domestic and industrial wastewaters, and urban and agricultural runoff.

Design and Construction of Wetland Facilities.

Beginning with a small-scale project at Houghton Lake, Michigan in 1975, Dr. Kadlec has helped develop designs for many wetland treatment systems. This project continues to operate successfully. It was designated as one of the ten most outstanding engineering projects in the history of the State of Michigan. Dr. Kadlec has helped develop and construct pilot wetland systems where there has been a need, and has been involved in the construction of many full scale wetland facilities, as well as in the retrofitting of wetland units. Operating plans have been selected and tested to achieve the desired water treatment goals. Interactions with regulatory agencies are key processes in wetland implementation for wastewater renovation, and Dr. Kadlec works with the agencies to develop proper permits. Monitoring of operational facilities is an ongoing activity at several sites. He has experience with all scales of application, ranging from single family on-site systems to 200+ bgd constructed wetlands of thousands of acres in the Everglades Agricultural Area.

Consultation.

Dr. Kadlec has worked with a wide variety of public and private organizations on wetland related matters. These include USEPA, COE, TVA, USDOJ, USDOI, USFS and USFWS at the national level, and several state and regional agencies at the local level. He has collaborated with many consulting engineering firms on the feasibility, design, construction and operation of more than 200 wetland treatment facilities. He currently is an advisor to the US Department of Interior, tasked with monitoring the design and construction of Everglades protection wetlands. Dr. Kadlec is immediate past chairman of the Macrophyte Specialist Working Group of IWA, in which capacity he coordinated international information transfer, and international wetlands conferences.

Monitoring.

Dr. Kadlec has worked on many wetland monitoring projects. These include performance monitoring for natural and constructed treatment wetlands as well as impact assessment monitoring of wetlands that act as receiving waters for treated effluents. Activities include determination of hydrology and water quality, soils and biota; however, he usually contracts with colleagues for any necessary detailed biological assessments. He performs the field work for projects in or near Michigan, and provides direction for field work in more remote sites.
TREATMENT WETLAND APPLICATIONS

Dr. Kadlec has been involved in many applications of treatment wetlands. As the technology has grown and branched into new water types, varied projects have been developed, and are being developed, under his direction. Some examples of projects in diverse usage are:

**Domestic Wastewaters**

Onsite Treatment: Grand Lake, MN; Millersylvania State Park, WA; Fenton, MI; Camp Warren, MN
Lagoon Effluent: Lake Nebagamon, WI; Nulato, AK; Roblin, MAN; Benton, KY
Secondary Wastewater: Byron Bay, AUS; Eskilstuna, Sweden; Carson City, NV; Columbia, MO; Phoenix, AZ

**Urban and Agricultural Runoff**

Urban Stormwater: Calgary, ALB; Miami-Dade, FL; Fort Wayne, IN; Melbourne, FL
Agricultural Runoff: Wind Lake, WI; Everglades, FL; Brighton, FL; Klamath, OR
Industrial Stormwater: Lambton, ONT; Savannah River, SC
Urban+Agricultural: Des Plaines, IL; Dixboro, MI; Bar-el-Bakhar, Egypt

**Water Reuse**

Lagoon Effluent: Sakhnin, Israel (olive crops)
Secondary Wastewater: Salem, OR (nut crops); Phoenix, AZ (green space); Silverton, OR (botanical garden); Yelm, WA (greenspace)
Industrial Effluent: Connell, WA (fodder crops)

**Industrial Wastewaters**

Pulp & Paper: Columbus, MS
Food Processing: High River, ALB; Fremont, MI; Carberry, MAN
Fertilizer: White Spring, FL; ICI, ONT; Brandon, MAN
Mining: Musselwhite, ONT; Tucush, Peru; Lynn Lake, MAN

**Landfill Leachate**

Closed Facilities: Isanti-Chisago, MN; Saginaw, MI; Grand Rapids, MI
Marion, Mercer, Bullitt and Bowling Green, KY; BiState, IL;
Zionsville, IL; Laraway, IL
Open Facilities: Hanover Co., NC; Matanuska-Susitna, Alaska

**Groundwater Remediation**

Chlorinated Hydrocarbons: Hillsdale, MI; Burlington, IA
Hydrocarbons: Southington, CT; Wellsville, NY; Casper, WY
Metals: Bunker Hill, ID; Bronson, MI; Lynn Lake, Manitoba
Dr. Kadlec has been involved in many aspects of wetland research for more than thirty years, directing comprehensive multidisciplinary projects. Work has included field investigations of physical, chemical and biological processes in wetlands; as well as laboratory studies and computer simulation of wetland phenomena. Research University research was conducted from 1969 to 1995. As principal of Wetland Management Services, Dr. Kadlec continues active field and desktop research. Primary areas of endeavor include:

**Wetland Hydrology**

The key factors in the water budgets for wetlands have been studied at several sites. Evapotranspiration and infiltration studies in Florida and Arizona have contributed to understanding of water budget effects on wetland chemistry and biology. Overland flow resistance has been a second focus of research work. Wetland water budget and conveyance computer models have been developed and used successfully at several sites. Work has focused on residence time distributions, head loss in surface flow wetlands, and on the hydraulic capacity of gravel bed wetlands.

**Wetland Waterborne Substances**

Nutrients, tracers, metals, solids and other constituents have been studied in the context of wastewater discharges to wetland ecosystems. Work has ranged from compliance monitoring to in-depth studies of the fundamental transport processes. Field, laboratory and computer simulation research have been applied to wetland interactions with wastewater, agricultural and industrial chemicals. Phosphorus cycling has been the focus of a large effort related to protection of the Everglades.

**Multi-System Analyses of Wetland Processes**

The databases on treatment wetland performance have increased remarkably over recent years, due to the rapidly accelerating growth of the technology. Dr. Kadlec has been active in assembling and analyzing that data to gain better understanding of the key pollutant removal processes. Products include his comprehensive textbook, and technology assessments for various wetland types and application areas.

**Literature Review.**

The literature on wetlands for water quality improvement has been followed since its inception. This involves a considerable amount of information in the form of internal reports, design and operating data, as well as standard scientific publications. A computer database has been compiled for wetland treatment system performance. Dr. Kadlec is a member of the editorial board of Ecological Engineering.

**Continuing Education**

Dr. Kadlec conducts short courses on treatment wetland technology. These have included many offerings via the University of Wisconsin Extension. Specialized offerings have included courses for the Water Environment Federation, the New Zealand Water and Waste Association, a two week course for participants from the Mediterranean region, held in Zaragoza, Spain; PhD courses in Denmark, plus workshops for the states of Alaska, Arizona, Florida and Virginia, and for Ducks Unlimited Canada.
Lynn Lake, Manitoba
   A mine water tailings leachate treatment wetland is in design.

Madison, Florida
   A bottled water backwash wetland feasibility study is in design.

Kimmirut, Nunavut, Canada
   A municipal wastewater treatment wetland is in design.

Columbia, Missouri
   Performance of treatment wetlands is under evaluation.

Hillsdale, Michigan
   Wetland remediation of contaminated groundwater is in operation.

Burlington, Iowa
   Wetland remediation of contaminated groundwater feasibility study is in progress.

Kentucky
   Four wetlands for landfill leachate treatment are in final design.

St. Clair County, Illinois

Laraway, Illinois
   A wetland for landfill leachate treatment is in conceptual design.

Zionsville, Indiana
   A wetland for landfill leachate treatment is in conceptual design.

Matanuska-Susitna, Alaska
   A wetland for landfill leachate treatment is in conceptual design.

Phoenix, Arizona
   A full-scale wetland for re-use is in design.

Everglades, Florida
   The evaluation of wetlands for removing phosphorus from agricultural runoff is in progress. The project includes 41,000 acres to treat 1000 mgd.

Armorel, Arkansas
   Constructed wetlands for metal processing feasibility study is in progress.

Chicago, Illinois
   Design of wetlands for river nutrient reduction is in progress at three sites.

DePue, Illinois
   A constructed wetland for removing nitrogen from gypsum leachate is in startup.

Glen Arbor, Michigan
   A subsurface constructed wetland for domestic wastewater treatment is being evaluated.

Tucush, Peru
   Wetlands for metal mine wastewater treatment are in startup.

Alcoa, Tennessee
   Treatment wetlands are being piloted for remediation of groundwater cyanide.

Houghton Lake, Michigan, Wetland Treatment System
   The response of the wetland to added water and nutrients is being studied for the thirty-fourth consecutive year, the last thirty at full scale.

Wivenhoe, Australia
   Treatment wetlands in conceptual design for drinking water reservoir recharge.

Clairmont, Alberta
   Treatment wetlands feasibility is in progress.
# R. H. Kadlec - Wetland Projects

Key:
- **F** = Feasibility study
- **D** = Participated in design
- **M** = Facility monitoring
- **R** = Research project
- **P** = Performance evaluation
- **V** = Value engineering

## USA

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### R. H. Kadlec - Wetland Projects

**Kentucky**
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- Hardin: F,R
- Madisonville: F
- Pembroke: F,P
- Caney Creek: F,D
- Mercer County: F
- Warren County: F
- Marion County: F
- Bullitt County: F

**Massachusetts**
- Chicopee: F,D
- Bellaire: F,D,M,R,P
- Berrien County: F
- Boyne City: F,D
- Chelsea: F
- Commerce Township: P
- Fremont: D
- Cranberry: R
- Denton: R
- Dexter: F,M,R,P
- Dixboro: F,D,R,P
- Fenton: D
- Genoa-Oceola: M
- Glen Arbor: P
- Grand Rapids: F
- Hillsdale: F
- Hillsdale-Schilling: F,D,M,P
- Holly: F
- Houghton Lake: F,D,M,R,P
- Hudson: F,D,M
- Kalamazoo: F,D,R
- Kinross: M,R,P
- Ogihara: M
- Lapeer: F,D,P
- North Bronson: F
- Onaway: F,D,P
- Pentwater: R
- Rawsonville: F,D
- Rockwood: D,R
- Saginaw: F,D,P
- Salem Lakes: F
- Stockbridge: F,D
- Sumpter TWP: F,D
- St. Helen: F,D
- Williamston: D

**Michigan**
- Biwabik: F,P
- South International Falls: F
- Grand Lake: D,R,P
- Camp Warren: F,D,P
- Islanti-Chisago: D,P
- NERCC I: D,R,P
- NERCC II: D
- Northern Lights: D
- Onamia: F,D,M
- Country Supper: D
- Thompson: D
- Duluth: D

**Massachusetts**
- Chicopee: F,D
- Bellaire: F,D,M,R,P
- Berrien County: F
- Boyne City: F,D
- Chelsea: F
- Commerce Township: P
- Fremont: D
- Cranberry: R
- Denton: R
- Dexter: F,M,R,P
- Dixboro: F,D,R,P
- Fenton: D
- Genoa-Oceola: M
- Glen Arbor: P
- Grand Rapids: F
- Hillsdale: F
- Hillsdale-Schilling: F,D,M,P
- Holly: F
- Houghton Lake: F,D,M,R,P
- Hudson: F,D,M
- Kalamazoo: F,D,R
- Kinross: M,R,P
- Ogihara: M
- Lapeer: F,D,P
- North Bronson: F
- Onaway: F,D,P
- Pentwater: R
- Rawsonville: F,D
- Rockwood: D,R
- Saginaw: F,D,P
- Salem Lakes: F
- Stockbridge: F,D
- Sumpter TWP: F,D
- St. Helen: F,D
- Williamston: D

**Michigan**
- Biwabik: F,P
- South International Falls: F
- Grand Lake: D,R,P
- Camp Warren: F,D,P
- Islanti-Chisago: D,P
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<tr>
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<td>Pelee Island</td>
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<td>Vaughan</td>
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<td>Sudbury</td>
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<td>Falcon Lake</td>
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<td>Deloro</td>
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<td>Whitehorse</td>
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<td>Nunavut</td>
<td>Kimmirut</td>
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## Other Countries

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<td>Byron Bay</td>
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<td>Wivenhoe</td>
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<td>Egypt</td>
<td>Port Said</td>
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<td>Israel</td>
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<td>France</td>
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<td>Sweden</td>
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<td>Eskilstuna</td>
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<td>New Zealand</td>
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<td>Peru</td>
<td>Tucush</td>
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### Wetland Management Services Client List

Aarhus University  
A.G. Crook  
Alan Plummer & Assoc.  
ASCI  
Australian CRC  
Ayres Associates  
Becher-Hoppe  
Bellaire Village  
Black & Veatch  
BHE  
Bonar  
Boss  
Brennan Beach  
British Petroleum  
Burns & McDonnell  
Byron Shire Council, AUS  
Capital Consultants  
CDM  
CH2M Hill  
CH2M Gore & Storrie  
City of Chicago  
City of Portland  
City of Phoenix  
City of Florence  
Coastal Systems Int., Inc.  
Consoer Townsend  
Culp, Wesner & Culp  
Cummins & Barnard  
Danish Government  
Davis County  
Delta Consultants  
Dillon Consultants  
Ducks Unlimited Canada  
Earth Tech  
East Shore Corp.  
Ecology & Environment, Inc.  
Environmental Concern  
Environmental Services & Permitting  
Environ  
Eskilstuna Energi & Miljo  
Foster Pepper & Shefelman  
Galilee Society  
Gerber Foods  
Giffels & Webster  
Golder Associates  
Gosling Czubak  
Harms & Associates  
Harza  
HDR  
Hey & Associates  
HLSA  
Homestead Dev.  
HydroQual, Inc.  
I.E.S.  
Inland Seas  
Interfluve, Inc.  
IRRRRB  
Kelley, McLaughlin  
Kirkbride Assoc.  
Klohn Leonoff  
Limnotech  
Liq. Waste Ind. Serv.  
Louis Berger  
Malcolm Pirnie  
MacVicar, Federico & Lamb  
McCulley, Frick & Gilman  
McNamee, Porter & Seeley  
Metcalf & Eddy  
Midwestern Consulting  
Midwest Environmental Cons.  
NIWA  
Novatec, Inc.  
O’Brien & Gere  
Onaway  
Parametrix  
Parsons Engineering Science  
P. Lane Assoc.  
PFRA  
Phytokinetics  
Psomas  
R. A. Smith Assoc.  
Riparia  
SAIC  
SESI  
SEQWater  
Service Environmental & Engineering  
Skillings-Connolly  
SKVB  
Smith-Culp  
So. Florida WMD  
Southwest Wetlands  
Spicer Engineering  
SRI  
St. Johns River WMD  
St. Louis County  
Svoboda Ecological Resources  
Tekniska Verken  
Terra Environmental  
Tetra Tech  
TetrES Consultants
WETLAND MANAGEMENT SERVICES CLIENT LIST
(continued)

Thatcher Engineering
TRC
TRI
Trow
TVA
TWI
U.S. Dept of Justice
U.S. Dept. of Interior
U.S. Forest Service
United Nations DP
U. MN NRRI
USEPA
V3
Varga Assoc.

Versar
Wade Trim
Washtenaw Co.
Westinghouse SRC
Wetlands Initiative
Wetlands Research, Inc.
Weyerhaeuser
Wolverine Engineering
Woodstone/Homestead
Whitman & Howard
Winter, PLC
Woodward Clyde
YMCA
R. H. Kadlec – Wetlands Publications
(Papers of the Last Six Years)

Books

Conference Proceedings Edited

Papers


NON-WETLAND VITAE

ROBERT H. KADLEC

1. Name: Robert Henry Kadlec
2. Department: Chemical Engineering
3. Date of Birth: June 11, 1938
   Citizenship: U.S.A.
4. Present Academic Rank: Professor Emeritus
   Dates of appointment to various academic ranks at The University of Michigan:
   Assistant Professor: 1961
   Associate Professor: 1965
   Professor: 1970
   Professor Emeritus: 1995
5. Degrees:
   B.S.: Chemical Engineering, University of Wisconsin, August 1958
   M.S.: Chemical Engineering, The University of Michigan, June 1959
   Ph.D.: Chemical Engineering, The University of Michigan, February 1962
6. Appointment fractions during present term:
7. Other teaching experience:
   Numerous short courses for Dow Chemical and Procter and Gamble
8. Full-time industrial experience:
9. Part-time industrial experience:
   Procter and Gamble, Summer 1957, Cincinnati, Ohio
   California Research Corp., Summer 1959, Richmond, California
   Esso Research Labs., Summer 1967, Baton Rouge, Louisiana
   Marathon Oil Co., Summer 1970, Littleton, Colorado
10. States in which registered: Michigan.
11. Consulting work in the past five years:
    Review panel member, Hazardous Waste Research Center, LSU
12. Scientific and professional societies of which a member (1994):
    IPS, NSPE, MSPE, SWS, ASCE, WEF, IAWQ.
13. Honors and awards:
    Distinguished Service Award for Assistant Professors (Development Council - 1965)
    Tau Beta Pi; Phi Kappa Phi; Sigma Xi; Phi Lambda Upsilon; Phi Eta Sigma
Phi Lambda Upsilon Outstanding Teaching and Leadership Award, 1971-72.
MCEC Eminent Conceptor Award, 1976.
ACEC Honor Award, 1976.
Editor, AIChE Journal, 1976-1985
Associate Executive Editor, Encyclopedia of Science and Technology, 1984-
Chemical Engineer of the Year, Detroit AIChE, 1985.
All-time Outstanding Engineering Project, Decade of the 70's, State of Michigan, 1987.
Teaching Excellence Award, College of Engineering, 1988
Chair, IAWQ International Wetland Working Group, 1992-
Advisor, Australian National Wetlands Project, 1992-

14. Committee and counseling assignments in department, college, and university:

15. Recent activities during summer periods outside of academic appointments:

16. Leaves of absence and sabbatical leaves while at Michigan:
17. Current contracts and grants under your direct supervision:

18. Contract and grant proposals funded during the past year:

19. Students Supervised

Ph.D. Dissertations Supervised:


Roger Keranen Rains (1968). Reduction of Aluminum Oxide to Aluminum in Radio Frequency Generated Plasmas Light Source.


M.S. Theses Supervised:


Thomas Swenson (1982). Oxygen Solubility in Sodium Sulfate and Sodium Chloride Solutions at 50\(^\circ\)C.


Willem Bastiaens (1992) RTDs in Wetlands

Jay Helsel (1992) Fill and Draw Wetlands

20. Specific contributions to classroom and laboratory instruction at both undergraduate and graduate levels:

Courses Developed:
ChE 446, 566 (w/R.L. Curl), 588 (w/B. Carnahan)
407, 507, 607, 400, 500
691, (w/S.W. Churchill)
460 (control laboratory)
Chemical Engineering for Non-ChE's

Courses Taught:
ChE 202, 230, 231, 330, 340, 341, 342, 343, 344, 360
400, 407, 446, 460, 500, 507, 528, 566, 588
607, 691, 800, 801, 895
PUBLICATIONS – Non-wetland:

(1) Patents:


(2) Journal Articles:


(3) Proceedings and Transactions:


Statement of Qualifications

Background Overview

Dr. Hunt is the head of NC State University’s Stormwater Engineering Group. The 15-member team conducts applied research and outreach of stormwater management issues. A particular focus is given to stormwater treatment technology performance, water harvesting, maintenance of practices, and economics. Since 2002, Hunt’s team has designed, constructed, and / or monitored over 70 stormwater technologies. In addition the team teaches practicing engineers and other design professionals 25-30 workshops in North Carolina and throughout the United States. Stormwater team alumni currently work in Boston, Mass.; New York City, NY; Baltimore, MD; Gainesville, FL; and throughout North Carolina. Hunt was recent chair of the 2nd National Low Impact Development Conference held in Wilmington, NC, in March 2006.

Qualifications Specific to Santa Susana Project

1. Extensive experience in monitoring stormwater management projects, including project specific monitoring and large watershed (>500 acre) monitoring.

2. Design, construction, and monitoring of vegetative stormwater management practices, including stormwater wetlands, bioretention / biofiltration, green roofs, and level spreader – riparian buffer systems. Several projects have specifically been designed for recreation and/ or public amenities.

3. Developing maintenance protocols for above mentioned practices and several others. Creator of first training course in the US dedicated to training and certifying maintenance professionals on vegetated stormwater treatment practices.

List of Current Research Projects (Partial)

Runoff Reduction and Nutrient Sequestering of Grassed Bioretention Cells. Funded by the North Carolina Department of Environment and Natural Resources (NC DENR)

Monitoring of 12 Stormwater Management Practices in Charlotte, NC. Funded by the City of Charlotte, NC.

Pathogenic Bacteria Removal by 5 Coastal Stormwater Practices. Funded by NC DENR

Hydrology of Coastal Plain Bioretention Facilities. Funded by CiCEET

Vegetative Uptake and Phosphorus Sorption of Stormwater Wetlands. Funded by the NC Ecosystem Enhancement Program.

Evaluating Linear Wetland Swales and Traditional Swales in DOT Rights-of-Way. Funded by the NC Department of Transportation.

Side-by-Side Evaluation of Four Permeable Pavement Types for Hydrology and Water Quality. Funded through the US EPA, section 319(h) grants administered by NC DENR.
5 Related Publications (complete list @ www.bae.ncsu.edu/stormwater/pubs.htm)


Honors and Activities

Water Conservationist of the Year (NC Governor’s Award). 2006

NC State University Alumni Association: Outstanding Extension Award (University-wide honor). 2007

*Phi Beta Kappa* and *Tau Beta Pi*

American Society of Civil Engineers

Bioretention Committee, Co-Chair

Permeable Pavement Committee, Chair

LID Technical Committee, Member

American Society of Agricultural and Biological Engineers

NC Section, Chair

National Extension Committee, Past-Chair

Related Web Sites:

[www.bae.ncsu.edu/people/faculty/hunt](http://www.bae.ncsu.edu/people/faculty/hunt) - Dr. Hunt’s Individual Website

[www.bae.ncsu.edu/stormwater](http://www.bae.ncsu.edu/stormwater) - Stormwater Team Website

[www.bae.ncsu.edu/topic/bioretention](http://www.bae.ncsu.edu/topic/bioretention) - NCSU Bioretention Research Website

[www.bae.ncsu.edu/topic/permeable-pavement](http://www.bae.ncsu.edu/topic/permeable-pavement) - NCSU Permeable Pavement Research Website

[www.bae.ncsu.edu/topic/waterharvesting](http://www.bae.ncsu.edu/topic/waterharvesting) - NCSU Water Harvesting (Cistern) Website
HUBER, Wayne C.  BIRTH DATE
Professor August 2, 1941

DEGREES
B.S., Engineering, California Institute of Technology, 1963
M.S., Civil Engineering, Massachusetts Institute of Technology, 1965
Ph.D., Civil Engineering, Massachusetts Institute of Technology, 1968

ACADEMIC POSITIONS
Research Assistant, California Institute of Technology (summer), 1962
Research Assistant, Massachusetts Institute of Technology, 1963-68
Assistant Professor of Environmental Engineering Sciences, University of Florida, 1968-73
Associate Professor of Environmental Engineering Sciences, University of Florida, 1973-79
Professor of Environmental Engineering Sciences and Affiliate Professor of Civil Engineering,
University of Florida, 1979-91
Professor, Department of Civil, Construction, and Environmental Engineering, Oregon State
University, 1991- present, Department Head, 1991-00

NON-ACADEMIC POSITIONS
Engineering Trainee, California Division of Highways Los Angeles, California (summers), 1960-61
Surveyor, Construction Supervisor, Alaska Department of Highways, Nome, Alaska (summer), 1965
Consultant to:
Environmental Engineering, Inc., Diffusion Studies, 1970
Central and Southern Florida Flood Control District, Hydrologic Studies in Everglades, 1971-72
Pan American Health Organization, Invited Lecturer on Water Pollution, 1972
Water and Air Research, Drainage Studies, Lake Hydrology, Thermal Pollution, EPA 208
Planning, 1972-77
Frederic R. Harris, Inc., Water Quality Studies on St. Johns River, 1973
James F. MacLaren, Ltd., Urban Runoff Studies, 1974-75
Corps of Engineers, Urban Hydrology Lecturer, 1974
Environmental Science and Engineering, Impact of Finger Canals on Harbor Water Quality,
1974-75
University of Massachusetts, Applications of Stormwater Management Models, 1974-76
University of North Carolina, EPA 208 Planning Methodology, 1975
Brevard Engineering Corp., Water Quality Analysis of Urban Development, 1975-76
Howard, Needles, Tammen and Bergendoff, EPA 208 Planning, 1976-77
C.D.D. Howard and Assoc., Urban Runoff Analysis, Hydraulic Transient Studies, 1976-77
Environmental Science and Engineering, Inc., Hydrologic Impact of Marsh Development, 1977
Deltona Corporation, Assessment of Projected Lake Water Quality, 1978-82
Woodward-Clyde Inc., EPA Nationwide Urban Runoff Program Advisory Group, 1978-83
Black and Veatch, Detroit EPA 201 Advisory Committee, 1978-80
Clinton-Bogart Associates, Elizabeth, NJ and Boston EPA 201 Studies, 1978-79
December 11, 2007

Eric Strecker  
Geosyntec Consultants  
55 SW Yamhill, Suite 200  
Portland, OR 97204  
estrecker@geosyntec.com

cc: Cassandra Owens, LARWQCB, Cowens@waterboards.ca.gov

Subject: Statement of Qualifications

Dear Eric:

Attached is my resume describing my qualifications and experience to participate on your project review team for the Boeing Santa Susana Field Laboratory. I am well qualified to assist in the selection and design of engineered natural treatment systems for stormwater. In addition, I have extensive experience and knowledge concerning stormwater hydrology and stormwater and other characteristics affecting its’ treatability and effects.

I have conducted research and developed stormwater controls for more than 35 years for a broad range of applications. For the past 20 years, I have been associated with universities where I have taught environmental engineering and water resources classes. I am currently the Cudworth Professor of Urban Water Systems in the Department of Civil, Construction, and Environmental Engineering at the University of Alabama. Prior to my academic career, I was a senior engineer in industry and government for 16 years. I have conducted more than $6 million in research concerning the effects, sources, and control of urban runoff during my 20 years in academic positions. I have written more than 100 publications, including journal articles, book chapters, research reports, and several books (including co-authoring of Construction Site Erosion and Sediment Controls: Planning, Design, and Performance, 2007; Contemporary Modeling of Urban Water Systems, 2007; Water Systems Modelers User’s Guide to SWMM, 10th edition, 2005; Stormwater Effects Handbook: A Tool Box for Watershed Managers, Scientists, and Engineers, 2002; and Groundwater Contamination from Stormwater, 1996). I have developed specialized course materials that have been used at many institutions, including international Internet-based instruction in urban water systems. I received a Distinguished Service Citation from the University of Wisconsin, was a member of the project team that received a first place national award for a combined sewer project from the Water Environment Federation, and have received several outstanding teaching and volunteer service awards. I am a registered Engineer (WI), a Diplomate of the American Academy of Environmental Engineers, and a Diplomate of the American Academy of Water Resources Engineers. I have served on numerous professional
committees in the U.S. and abroad, including current memberships on the Homeland Security Committee of the EPA’s Science Advisory Board; the Committee on Reducing Stormwater Discharge Contributions to Water Pollution of the National Academy of Science; and am directing several project review panels for the Water Environment Research Foundation, and others.

I have spent many years studying and developing modeling procedures addressing urban hydrology issues, especially concerning stormwater quality control. Since the late 1970s, I have been developing and expanding the Source Loading and Management Model (WinSLAMM) and the Water Quality Detention Pond Model (WinDETPOND). These models incorporate much of our research findings and are designed to assist regulators and designers in meeting numeric water quality standards. I have developed a number of stormwater quality control devices, including the Multi-chambered Treatment Train (MCTT) and the UpFlow filter, as part of EPA and SBIR-funded research. The development of these devices was based on rigorous research on stormwater treatability and the application of complementary treatment unit processes. I have also conducted much research on the role of soils and other treatment media on stormwater quality enhancement, and protection of groundwater resources associated with stormwater infiltration. Natural treatment systems that we have extensively researched include grass swales and ponds. Many of my research reports are available on my research web site, at: http://unix.eng.ua.edu/~rpitt/Publications/Publications.shtml. In addition, my web site also contains most of my lecture materials concerning wet weather flows, at: http://unix.eng.ua.edu/~rpitt/Class/Classes.shtml. Much of my current work involves integrating urban water systems to incorporate water supply, wastewater, and wet weather flows with landscaping, water reuse, and building material choices.

The attached resume lists much of my accomplishments from the past 20 years, and my teaching and research web site contains many examples of my work.

If you would like any additional information, please do not hesitate to contact me at rpittal@charter.net.

Regards,
Bob Pitt
Robert E. Pitt  
Cudworth Professor of Urban Water Systems  
Director of the Environmental Institute  
Director of Environmental Engineering Programs

School of Engineering  
Department of Civil and Environmental Engineering  
University of Alabama, Box 870205  
Tuscaloosa, Alabama 35487-0205

(205) 348-2684 (office and messages)  
(205) 348-0783 (fax)  
email address: rpitt@eng.ua.edu  
Teaching and research web page: http://unix.eng.ua.edu/~rpitt/

Rank and Department
Cudworth Professor of Urban Water Systems, Department of Civil and Environmental Engineering, University of Alabama  
Director of Environmental Institute, University of Alabama  
Director of Environmental Engineering programs, University of Alabama

Education
Ph.D., Civil and Environmental Engineering, with major work in the areas of water resources, environmental chemistry and statistics, University of Wisconsin-Madison, WI, 1987  
M.S.C.E., Environmental Engineering/Hydraulic Engineering, San Jose State University, CA, 1971  
B.S. Engineering Science, Humboldt State University, Arcata, CA, 1970

Engineering Registrations
Professional Engineer, State of Wisconsin (No. 24044, 1984)  
Diplomate, American Academy of Environmental Engineers (No. 93-20037, 1993)  
Diplomate, American Academy of Water Resources Engineers (No. 00129, 2005)

Teaching, Research and Industrial Experience
Director, Environmental Institute, University of Alabama, Tuscaloosa, AL, 2004 – present.  
Cudworth Professor of Urban Water Systems, Department of Civil and Environmental Engineering, University of Alabama, Tuscaloosa, AL, 2002 – present.  
Professor, Department of Civil and Environmental Engineering, University of Alabama, Tuscaloosa, AL, 2001 – present.  
Professor, Department of Civil and Environmental Engineering, with a secondary appointment in the Department of Environmental Health Sciences, University of Alabama at Birmingham, 1997-2001.  
Founding Director, Environmental Health Engineering Ph.D. program, University of Alabama at Birmingham, 1997-2001.  
Associate Professor, Department of Civil and Environmental Engineering, with a secondary appointment in the Department of Environmental Health Sciences, University of Alabama at Birmingham, 1993-1997.  
Assistant Professor, Department of Civil and Environmental Engineering, with a secondary appointment in the Department of Environmental Health Sciences, University of Alabama at Birmingham, 1987-1993.

Memberships in Professional Societies
American Society of Civil Engineers (ASCE), Member
  Member, Urban Water Resources Research Council
Water Environment Federation (WEF), Member
  Issue Area Team Member for WERF research
American Water Resources Association (AWRA), Member
Alabama Academy of Science, Member
  Chair, Engineering and Computer Science Committee
  Member, Carmichael Award Committee
Sigma Xi, Member

Journal Reviewer
Journal of Water Resources Planning and Management (ASCE)
Journal of Environmental Engineering (ASCE)
Water Environment Research (WEF)
Water Research (IAWQ)
Water Resources Bulletin (AWRA)
Water Science and Technology (IAWQ)
Watershed Protection Techniques (Center for Watershed Protection)

Past Reviews for State and National Agencies
National Academy Press (National Research Council)
Department of Ecology (Washington)
Wisconsin Water Resources Institute (University of Wisconsin)
Alabama Department of Environmental Management (Montgomery)
Computational Hydraulics Institute (Guelph, Ontario)
California Sea Grant Institutional Program (Univ. of Southern California)
Urban Waste Management and Research Center (Univ. of New Orleans)
Water Resources Division (Wisconsin Department of Natural Resources)
Baldwin County Public Works Department (Alabama)
Vermont Water Resources and Lake Studies Center (Univ. of Vermont)
Center of Environmental Research Information (U.S. Environmental Protection Agency)
Division of Water Quality (Minnesota Pollution Control Agency)
Watershed Evaluation Branch (U.S. Environmental Protection Agency)

Memberships on Professional Committees and Boards
Sustainable Sites Initiative of the American Society of Landscape Architects and the Lady Bird Johnson Wildflower Center, hydrology subcommittee to develop standards to guide and rate the environmental performance of landscapes. 2007.
National Research Council, National Academy of Science, Committee on Reducing Stormwater Discharge Contributions to Water Pollution. 2006 – present.
American Society of Civil Engineers, Urban Water Resources Research Council, Executive Committee Member, 2001 – 2005.
Construction Industry Research and Information Association (CIRIA), London, steering committee member, Management of Gully Pots for Improved Runoff Quality. 1997.
New York City, Department of Environmental Protection, member of Technical Advisory Committee on Combined Sewer Overflow Program. 1997 – 2000.
Center for Watershed Protection, member of Work Group on Stormwater Indicators. 1995.
The Rensselaerville Institute, NY, committee on evaluating Phase II U.S. EPA Stormwater Discharge Permit Requirements. 1995.
U.S. EPA Planning Committee on Pollution Prevention Research, Risk Reduction Engineering Laboratory, 1990.

Conference Program Committees
**Honors, Awards and Listings**


Haywards Fellow, Manaaki Whenua - Landcare Research, New Zealand, 2005.


Distinguished Service Citation, School of Engineering, University of Wisconsin, 2002.

Listed in:

Guest Lecture at University of Tel Aviv, Israel, 2001.

Outstanding Student Chapter for 1997, American Water Resources Association, faculty advisor.

Board of Visitors Faculty Award for Distinguished Achievement, 1995.

Guest Lectureship, Universität Gesamthochschule Essen, Germany, 1994.

Ellen Gregg Ingals/UAB National Alumni Award for quality of teaching, finalist for 1994.

Excellence in Teaching Award, UAB School of Engineering, 1994.

Water Environment Federation, first place national award for combined sewer project (member of New York City project team), 1992.


Take Pride in America, first place Alabama environmental volunteer award, 1991.

Award of Recognition, U.S. Department of Agriculture, 1990.


**Representative Experience**

Dr. Pitt has been the project manager and principal investigator for many urban water resources research projects. He has worked on lake management projects, environmental research projects, hazardous material management plans, facility location studies, and environmental assessments. His major area of interest is in stormwater management, especially the integration of drainage and water quality objectives.

Dr. Pitt has conducted research for the U.S. EPA, Environment Canada, Ontario Ministry of the Environment, states, and local governments concerning the effects, sources, and control of urban runoff for more than 35 years. He was also been involved in a number of projects that have used this research information to develop management plans, stormwater ordinances, and design manuals. As an example, he was a member of the technical advisory group for the EPA’s Nationwide Urban Runoff Program (NURP). He also prepared the Source Loading and Management Model (SLAMM) and developed the watershed analysis procedures to investigate urban runoff for the priority watershed program of the Wisconsin Department of Natural Resources. These procedures are still being used as the basis for state cost-sharing for major runoff control retro-fitting programs. He has also prepared manuals of practice which contain design procedures and construction specifications for stormwater and erosion control practices and has supervised their construction.

Dr. Pitt has also conducted research for the EPA to develop and test procedures to recognize and reduce inappropriate discharges of wastewaters to separate storm drainages. These procedures are being used by municipalities involved in the Clean Water Act’s stormwater permit program as a field screening technique to identify and quantify discharge sources. He has also directed a series of EPA research projects to investigate the sources and control of stormwater toxicants. As an example, he has found that combinations of sedimentation, aeration, and photo-degradation can significantly reduce stormwater toxicity. Automobile service facilities have
been identified as a significant toxic pollutant source and a specialized treatment system to be located at these sources has been designed and tested at several locations. He developed the Multi-Chambered Treatment Train (MCTT) for high level controls of stormwater toxicants at critical source areas, and also helped develop an upflow filter for high rate treatment in urban areas.

His research also examined stormwater effects on groundwater, and a book on this research was published by Ann Arbor Press. He has also evaluated the effects of separate sewage overflows on human health, especially considering toxic metal and organic pollutants and pathogens. Another EPA project directed by Dr. Pitt examined past drainage design procedures and recommends future approaches for drainage design. He has co-authored several books and numerous chapters based on this and related material, especially integrating stormwater modeling tools for water quality and drainage design objectives.

Current EPA – funded research includes developing a nationwide database of national stormwater permit information and conducting comprehensive evaluations of this data. He is also updating field screening procedures used for identifying inappropriate discharges to storm drainage systems. Recent research included investigating innovative heavy metal removal techniques for stormwater. He is currently investigating the sources and significance of stormwater bacteria and the transport and effects of stormwater gross solids. Other current projects are examining the presence and treatability of emerging contaminants in wet weather flows, the scour of sediment from stormwater control devices, and the development of rapid analysis methods for the detection of organic contaminants in sediments and water using laser spectrographic techniques.

He has also carried out a number of receiving water impact studies associated with stormwater. These studies have included a variety of field monitoring activities, including water and sediment quality, fish and benthos taxonomic composition, and laboratory toxicity tests. He is the co-author of a book (published by CRC/Lewis) detailing field, laboratory, and data analyses methods for use in examining stormwater effects on receiving waters.

Dr. Pitt was the project manager and principal investigator of a project with the telecommunications industry (sponsored by Bellcore, AT&T, plus many “baby Bells” from throughout the U.S.) to evaluate and develop methods that may be needed to treat stormwater that collects in telecommunication manholes. This water needs to be pumped before repair operations can be conducted and stormwater NPDES permits are typically required before its discharge to local drainage systems. He has worked with the industry and the EPA and conducted a comprehensive characterization and field evaluation program and developed protocols to examine potential treatment methods.

Dr. Pitt has helped prepare training manuals on the operation of sanitary wastewater treatment plants and on the clean-up of oil spills. He has evaluated the effects of municipal, industrial, and nonpoint water pollution discharges on receiving water quality and beneficial uses, including model development. He has also been involved in the preparation of contingency plans for spills of petroleum products and other hazardous materials, especially in the assessment of potential water and air quality problems. He has completed the noise, air and water quality assessments for a variety of projects; including nuclear and fossil fuel power facilities, oil refineries, oil fields, coal mines, uranium mines, gravel removal operations, airports, urban redevelopment projects, pipelines, and hazardous material transfer and storage facilities. Many of these studies involved field and laboratory work, as well as statistical analyses and modeling. These projects have been located throughout the United States (including Alaska and Hawaii), and in the Middle East. An experienced photographer, Dr. Pitt has used both aerial and underwater photography in conjunction with many projects. He has developed and managed water and air quality laboratories capable of monitoring a wide range of inorganic and organic pollutants.

Dr. Pitt moved to the University of Alabama campus in Tuscaloosa in 2001. Earlier, he had served on the School of Engineering faculty at the University of Alabama at Birmingham from 1987 to 2001. Prior to that, he was a senior engineer for 16 years in industry and government, and continues to consult to many municipalities and engineering firms. He has also taught workshops and has been a guest lecturer at several universities (including the Univ. of Wisconsin; the Univ. of Minnesota; Syracuse University, the University of Nevada, Tel Aviv University, Israel; the University of Guelph, Ontario, Canada; Singapore National University; and the Universität Gesamthochschule, Essen, Germany). He has published more than 100 chapters, books, journal articles, and major research reports. Dr. Pitt is a Diplomate of the American Academy of Environmental Engineers and a Diplomate of the American Academy of Water Resources Engineers (eminence), and is a registered engineer in the state of Wisconsin.
Research Funding Obtained as Principal Investigator

Expansion of the Center for Optical Sensors and Spectroscopies (NSF and the University of Alabama at Birmingham): $625,000 (2008 – 2012); my portion of $6.5 million award.


Verifying the Performance of the Full-Scale Upflow Filter at the Tuscaloosa City Hall (Hydro-International): $40,000 (2007).

Developing Local Stormwater Indicator Monitoring Programs to Demonstrate Environmental Results, with the Center for Watershed Protection (EPA Office of Wastewater Management 104(b)3 grant): $175,040 (2006 – 2007).

Development of the Center for Optical Sensors and Spectroscopies (NSF and the University of Alabama at Birmingham): $450,000 (2005 – 2008); my portion of $5.3 million award.


Evaluation of NPDES MS4 Stormwater Monitoring Data, with the Center for Watershed Protection (EPA Office of Wastewater Management 104(b)3 grant): $419,114 (2001-2004).

Techniques for Identifying/Correcting Inappropriate Discharges, with the Center for Watershed Protection (EPA Office of Wastewater Management 104(b)3 grant): $477,231 (2001-2004).


Development and Testing of a Methodology to Assess the Health Risks and Environmental Impacts from Separate Sanitary Sewer Overflows, co-principal investigator, with UAB EARTH Center (U.S. Environmental Protection Agency): $199,996 (cooperative agreement) (1996-1997).


Example Consultations
CEDARS (Center for Economic Development and Resource Stewardship) and Tennessee Valley Authority, Nashville, TN. Conservation design for stormwater management at selected industrial and commercial development sites, 2005 – 2007.
Havens and Emerson, Boston, MA. Value engineering evaluation of Cleveland CSO plan. 1993.
Liesch Companies, Minneapolis, MN. Evaluation of the retention pond design for the Minneapolis-St. Paul International Airport. 1999.
Loomis & Assoc., Austin, TX. Preliminary design for EquaFlow stormwater control program for Waller Creek watershed in Austin. 1995.
MARC (Metropolitan Area Regional Council), Kansas City, MO. Planning, training, and evaluation associated with 10,000 rain garden demonstration project for US EPA. 2007 – 2011.
P.E. LaMoreaux and Assoc., Tuscaloosa, AL. Evaluation of stormwater drainage design, Shelby Co. 1995-1996.
Santa Clara County Flood Control District, CA. Review of special metals control plan for South San Francisco Bay. 1996.
SWMA (Stormwater Management Authority), Jefferson County, AL. Modifications to WinSLAMM incorporating stormwater management costs and interfacing to receiving water models. 2005 – 2006.
Urban Waste Management Center, Univ. of New Orleans, LA. Training of field personnel for screening testing of stormwater outfall. 1995-1996.
Wisconsin Dept. of Natural Resources, Madison, WI. Design of the multi-chambered treatment tank (MCTT) for Milwaukee public works area. 1995.

Dissertation

Major Computer Programs
WinDETPOND. A Water Quality Detention Pond Analysis and Design Program. 1986-present (with J. Voorhees).

Books


### Chapters in Books (peer-reviewed)


Journal Articles (peer-reviewed)


Annual Wet Weather Flow Literature Reviews


Other Articles (not peer-reviewed)


Pitt, R. “Some Benefits of Street Cleaning as Measured in a Recent Study.” *American City and County Magazine,* pp. 41-43. April 1980.

**Research Reports (peer-reviewed)**


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**Published Conference Proceedings (generally not peer-reviewed)**


21


**Conference Presentations**


Bathi, J. R., Pitt, R., Mirov, S. “Understanding the fates of PAHs using thermal desorption as an analytical tool.” Poster to be presented at *NSF EPSCoR National Conference*, Hawaii, November 6-9, 2007 (poster).


Pitt, R. “Soils and swales research at the University of Alabama.” Presented at Swale Research at the US EPA symposium, Edison, NJ. March 23, 2006. (invited)


Pitt, R. “Stormwater management for highway projects.” Keynote presentation at the Symposium on the Pollution of Water Sources from Road Run-Off. Tel Aviv University, Israel, Sponsored by The Committee for Public Transportation, the Faculty of Life Sciences, The Institute for Nature Conservation Research, and the Porter School of Environmental Studies at Tel Aviv University. March 19, 2001. (invited)


Pitt, R. “Predicting changes in water quality resulting from changing land use.” Presented at the AWRA Alabama Section Symposium, Gulf Shores, AL. September 2000.


Pitt, R. “Management Alternatives for Urban Stormwater,” Presented at the Marquette University Nonpoint Pollution Symposium, Milwaukee, WI, the U.S. Environmental Protection Agency, April 1985 (invited).


Selected Older Research Reports


Characterization and Control of Storm Water Pollution; Source Loading and Management Model (SLAMM): Volume I: Model Development and Summary. Wisconsin Department of Natural Resources, March 1989.
SLAMM: Volume II: Model Documentation; Wisconsin Department of Natural Resources, March 1989.
State Plan for the Control of Construction Site Erosion and Stormwater Runoff, Wisconsin Department of Natural Resources, July 1987.
Model Ordinance for the Control of Construction Site and Stormwater Runoff, Wisconsin Department of Natural Resources, October 1986.
Water Quality Study for Pittsburgh Power Plant Units 8 and 9, for the Pacific Gas and Electric Company (West Pittsburgh, California), 1978.
Oil Spill Movement Study, for the Port of Long Beach (San Pedro Bay, California), 1978.
Recommended Measures for the Control of Surface Runoff, Alameda County Flood Control and Water Conservation District, September 1977.
Water Quality and Biological Consulting Services Concerning Sewage Treatment Discharge Effects on Alaskan Tundra Ponds, Atlantic Richfield Company (Prudhoe Bay, Alaska), 1977.
Ute Mountain Uranium Exploration Activities, for Mobil Oil Corporation (Montezuma County, Colorado), 1977.
Geothermal Resources Studies, for the Phillips Petroleum Company (Roosevelt Hot Springs, Utah), 1977.
Crow Indian Reservation Coal Mining Lease, for Shell Oil Company (Big Horn County, Montana), 1976.
Water Quality and Biological Survey of the Zeyandeh Rud near Isfahan, Iran, for E. I. duPont de Nemours Company, 1976.
The Effects of Sand and Gravel Removal on Arctic and Subarctic Streams, for the U. S. Fish and Wildlife Service (Alaska), 1976.
Air Quality Effects of Oil Spills, Standard Oil Company of California (Santa Barbara), 1975.
Contingency Plan for a Proposed Ammonia and Urea Transfer and Storage Facility, for Collier Carbon and Chemical Corporation (Sacramento, California), 1975.
Environmental Effects of a Possible Oil Spill at Morro Bay, for the Pacific Gas and Electric Company (Morro Bay, California), 1974.
Twin Creek Coal Mine, for the Rocky Mountain Energy Company (Lincoln County, Wyoming), 1974.
Oakland Airport Maintenance Facility Expansion, for the Port of Oakland (California), 1973.
Environmental, Social, and Economic Impact of the Proposed 1972-1977 Capital Improvement Program for the San Jose Municipal Airport, for the City of San Jose (California), 1972.
Industrial Waste Survey of the Northwest Fruit and Vegetable Canning Industry, for the Environmental Protection Agency (Washington, Oregon, and Idaho), 1972.

Department of Civil, Construction, and Environmental Engineering Courses Taught:
CE 333 - Water Supply and Drainage Design
CE 335 - Water and Wastewater Treatment
CE 378 – Water Resources Engineering
http://unix.eng.ua.edu/~rpitt/Class/Water%20Resources%20Engineering/WREMainPage.htm
CE 401 – Senior Design Project
CE 435 - Environmental Engineering
CE 484 - Hydraulic Engineering Systems
CE 485 - Engineering Hydrology
CE 499 - Senior Design
CE 527 Urban Water Systems
http://www.eng.ua.edu/~rpitt/Class/Computerapplications/MainCA.html
CE 544 - Engineering Statistical Analyses
CE 636 - Stormwater Management
http://www.eng.ua.edu/~rpitt/Class/StormWaterManagement/MainSWM.html
CE 637 - Experimental Design and Field Sampling
http://www.eng.ua.edu/~rpitt/Class/ExperimentalDesignFieldSampling/MainEDFS.html
CE 638 - Chemical Processes and Pollutant Impacts in Water
CE 485/685 – Construction Site Erosion Control
http://www.eng.ua.edu/~rpitt/Class/Erosioncontrol/MainEC.html
CE 641 - Environmental Engineering and Water Resources Seminar
CE 685 - Research Methods in Civil and Environmental Engineering
CE 687 - Stormwater Detention Pond Design
http://www.eng.ua.edu/~rpitt/Class/Detentionponddesign/MainDPD.html
CE 690 – Effects and Fates of Hazardous Materials
http://www.eng.ua.edu/~rpitt/Class/EffectsandFates/MainEffectsandFates.html
CE 690 - International Internet based courses on Stormwater Modeling and Stormwater Management
CE 691 – Internet based course on International Urban Water Systems
http://unix.eng.ua.edu/~rpitt/Class/International%20urban%20water%20systems/IUWSMainPage.htm
HON 101-406 - Honors course: The Environment: The Earth in Our Shadow
HON 107/407 - Honors course: The Environment: Earth, Air, Fire, and Water

**Major Advisor for the Following Graduate Students:**

Delawadia, Naran. MSCE. *Validation of the DETPOND Model*. 1996.
Goertz, Susan. MSCE. *Runoff Quality from a Xeroscaped Area*. 1996.

**Engineering Professional Development Courses and Workshops Taught:**

36
and Conservation Design
Appleton, WI, 2005
Birmingham, AL, 1989 - 1998
Boston, MA, 1993
Essen, Germany, 1994
Fair Hope, AL, 1995, 1997
Guelph, Ontario, 1995
Huntsville, AL, 1999
Madison, WI, 1991 - 2007
Milwaukee, WI, 1990, 1999
Minneapolis, MN, 2005, 2007
Montgomery, AL, 1999, 2000
Niceville, FL, 2006
Portland, OR, 1989, 1992
Portland, ME, 1994
Seattle and Olympia, WA, 2003
Singapore, 1991
Syracuse, NY, 2002, 2003
St. Paul, MN, 1993
Vancouver, BC, 2003

Madison, WI, 2005 – 2007

Construction Site Erosion Control: Birmingham, AL, 1989 – 2005
Guntersville, AL, 2003
Mobile, AL 2003, 2005

Birmingham, AL, 1989 - 1997
Boston, MA, 1993
Chicago, IL, 1998
Guelph, Ontario, 1995
New York City, 2001
Portland, OR, 1993
Portland, ME, 1994
Rochester, NY, 2001
Syracuse, NY, 2001

PE Exam Review: Birmingham, AL, 1988 - 1993
FE Exam Review: Tuscaloosa, AL, 2002

University Committee Assignments and other Intramural Activities:
School of Engineering Service:
ABET Accreditation Committee
Computer Network Committee  
Strategic Planning Committee  
Faculty Affairs Committee  
Academic Misconduct Advisory Panel  
Nonacademic Discipline Committee  
Selected speaker for 1999 UAB Day for perspective engineering students  
EGR100 Pre-College Summer Program keynote speaker, 1990  
Selection committee for Presidential Award for Excellence in Teaching  
Faculty advisor to student chapter of the American Water Resources Association (joint with Univ. of Alabama, Tuscaloosa and UAB campuses) (first place national chapter for 1997)  
Faculty advisor to student chapter of the Water Environment Federation  
Graduate Program Committee Chair  

University Service:  
  Director, Environmental Institute, UA, 2004 – present.  
  Research Grants Committee, UA, 2006 – present.  
  Institutional Biological Safety Committee, UA, 2004 – present.  
  Developed new Departmental Honors Program, UAB, approved February 1999.  
  Developed new Ph.D. program in Environmental Health Engineering, UAB, approved December 1996.  
  UAB Faculty Senate, 1996 - 1997.  
  9 and 12 Month Conversion Committee, 1996.  
  Graduate Student Research Day Committee, 1996.  
  EARTH Center Executive Board, 1994 - 1995.  
  Southern Association of Colleges and Schools Self-Study accreditation committee for professional and graduate schools, 1993.  
  Coca-Cola Summer Scholars program mentor, 1993 – 1995.  
  Teacher Education Council (School of Education), 1990 - 2001.  
  Task Force on Quality of Teaching, School of Arts and Humanities, 1994.  
  Summer Scholar Program mentor, 1990.
Water and Air Research, River Basin Modeling, Lake Destratification, 1981-82
Paul Larsen Associates, Flooding in South Dade County, 1984
CH2M-Hill, Recharge/Recycling for the Peace River Water Supply, 1983-84
Orange County, Florida, Waste Load Allocation Study, 1984
Tennessee Eastman Company, SWMM Seminar, 1985
Citrus County, Florida, Review of Small Hydropower Development, 1986
Holland and Knight, Peace River Hydrology, 1986-88
Woodward-Clyde, Inc., Nonpoint Source Pollution of San Francisco Bay, 1987-91
Mann and Davis, Flooding of Lake Floyd, Orange County, 1988
Chain of Lakes Property Owners Assn., Lake Kissimmee Hydrology, 1988
West Coast Regional Water Supply Authority, Tampa, FL, Hydrologic Impact of Pumping, 1988-89
International Institute for Hydraulic and Environmental Engineering, Delft, Netherlands, Urban Drainage Workshop, 1988-91
Woodward-Clyde, Inc., EPA Nationwide Nonpoint Source Analysis, 1988-91
Cohen, Milstein and Hausfeld, Pollution Assessment, 1989-90
Rose, Sundstrom and Bentley, Lake Hydrology, 1989-90
Roy F. Weston, Inc., NOAA Nonpoint Source Assessment Review, 1990-91
South Florida Water Management District, Hydrologic Review, 1991
Louis Berger and Assoc., Narragansett Bay CSO Study Review, 1992-93
Camp, Dresser and McKee, Inc., Detroit-Rouge River Review, 1993
Kent, Ridge and Crawford, Jacksonville Superfund Site Evaluation, 1994-95
Camp, Dresser and McKee, Inc., Massachusetts NPS Model Review, 1996
Environmental Protection Agency, Planning for EPA Modeling Activities, 1997-99
Phillip Williams and Associates, Johnson Creek Modeling, 1999
University of Georgia, SWMM and TMDL Modeling, 1999
Hardin-Davis, HSPF Modeling Review, 2003
GeoSyntec Consultants, Salt Water Marsh Modeling, 2004
Brake Pad Institute, Evaluation of SF Bay Cu loadings, 2004-07
TetraTech, CSO modeling in Louisville, 2005-06.

FIELDS OF SPECIALIZATION
Urban hydrology and stormwater management
Engineering hydrology
Pollutant transport
Nonpoint source water quality control
Mathematical modeling of surface water quantity and quality
Application of hydrology and hydrodynamics to environmental problems

PROFESSIONAL ACTIVITIES

Registration
Professional Engineer, State of Florida

Professional Societies
Life Member, American Society of Civil Engineers
Diplomate, American Academy of Water Resources Engineers
Member, ASCE Environmental and Water Resources Institute
Member, American Geophysical Union
Member, International Association for Hydraulic Research
Member, American Water Resources Association
Member, Tau Beta Pi

Committees
Member, Watershed Council, ASCE EWRI, Chair 1999-00
Member, Awards Committee, ASCE EWRI, 1999-03, 2007-2010
Chair, Executive Committee, ASCE Water Resources Engineering Division, 1998-99
Member, ASCE Urban Water Resources Research Council, Chair 1990-92
Member, ASCE-USGS Task Committee on Urban Gaging Networks, 1990
Member, ASCE Committee on Mgmt. Group D Reorganization, 1992-93
Member, ASCE Planning Committee for 2009 Joint ASCE-IAHR Congress
University of Florida Science Representative, Intercollegiate Alliance for Undergraduate Education, 1990-91
Member, City of Corvallis, Stormwater Planning Committee, 1998-02
Member, National Research Council, Committee on the Causes and Management of Coastal Eutrophication, 1998-00
Member, National Research Council, Committee on Restoration of the Greater Everglades Ecosystem, 1999-05
Member, National Research Council, Committee to Review Florida Keys Carrying Capacity Study, 2001-02. Member follow-up review committee for The Nature Conservancy, 2002-03.
Working Group Member, Implementation of Total Maximum Daily Loads (TMDLs) through Municipal Separate Storm Sewer System (MS4) Permits in Oregon, Oregon Dept. of Environmental Quality, 2002.
Member, ASCE EWRI Conference Planning Committee for IAHR International Conference, Vancouver, BC, 2009.
Honors and Awards
National Science Foundation Trainee, 1965-66
Lorenz G. Straub Award from University of Minnesota for “Outstanding Thesis in Hydraulic Engineering,” 1969
ASCE Hilgard Hydraulic Prize for technical paper in Hydraulics, 1973
1981-1982 President, Gainesville Branch ASCE
Outstanding Dept. of Env. Eng. Sci. Professor, 1982 (by student vote)
Florida Engineering Society, Outstanding Technical Achievement Award, (for EPA Storm Water Management Model), North Central Chapter Award, 1984, FES State Award, 1985.
Engineer of the Year, 1986, Gainesville Branch, ASCE
Eminent Speaker and Invited Lecture Tour, Institution of Engineers, Australia, February 1992
Invited Speaker and Lecturer, Kyoto and Tokyo Universities, October 1998
Kennison Lecturer, Boston Society of Civil Engineers, May 2000
Oregon Section ASCE Engineer of the Year, September 2005
ASCE Life Member, January 2006
Invited lecturer, University of Florida, November 2006
ASCE/EWRI Julian Hinds Award, May 2007

PUBLICATIONS

Books and Book Chapters


Technical Journals (Refereed)


**Conference Proceedings Edited**


**Conference Proceedings Papers (Refereed)**

(Asterisk means only the abstract is refereed. Final, completed paper subject to minimal or no review).


Huber, W.C., “Technological, Hydrological and BMP Basis for Water Quality Criteria and Goals,” *Design of Urban Runoff Quality Controls*, L.A. Roesner, B. Urbonas and M.B.


Non-Refereed Publications

Reviews

Monographs/Reports
(All monographs have been subjected to extensive internal and external review prior to acceptance for publication by the sponsoring agency. Multiple authorship implies a contribution from each.)


Metcalf and Eddy, University of Florida and Water Resources Engineers, *Storm Water Management Model*, EPA Water Pollution Control Research Series Washington, DC, (W.C. Huber wrote two chapters and was a minor contributor to the remainder):


Program Project 25-9, Dept. of Civil, Construction, and Environmental Engineering, Oregon State University, Corvallis, OR, October 2000, 300 pp.


Miscellaneous Reports


Oregon State University, GeoSyntec Consultants, University of Florida, University of Colorado and Low Impact Development Center, Hydrologic Screening for Task 5 BMP and LID Regionalization: Planning the Analysis, Technical Memorandum No. 3, NCHRP Project 25-20, Oregon State University, August 2004. 35 pp.


Oregon State University, GeoSyntec Consultants, University of Florida, University of Colorado and Low Impact Development Center, Hydrologic Screening for Task 5 BMP and LID Regionalization: Planning the Analysis, Addendum B: Task L2.1 Hydrologic Screening Methods for LID, Technical Memorandum No. 3-B, NCHRP Project 25-20, Oregon State University, October 2004. 15 pp.


Oregon State University, GeoSyntec Consultants, University of Florida, and Low Impact Development Center, Hydrologic Screening for Task 5 BMP and LID Regionalization: Schemes 1 through 3 Results for Storage-Type BMPs, Technical Memorandum No. 5, NCHRP Project 25-20, Oregon State University, January 2005. 72 pp.

University of Florida, University of Colorado, Oregon State University, GeoSyntec Consultants, and Low Impact Development Center, Hydrologic Screening for Task 5 BMP and Task L2.2 LID Regionalization: Scheme 1b Results for Infiltration-Type BMPs, Technical Memorandum No. 6, NCHRP Project 25-20, Oregon State University, January 2005. 45 pp.

RESEARCH
(PI = Principal Investigator, Co-PI = Co-Principal Investigator, Co-I = Co-Investigator)

Current Research

Prior Research
Storm Water Management Model, Co-I, FWQA, 1969-1970 ($125,000)
Decision Model for Stormwater Management, Co-PI, EPA, 1971-1973 ($105,000)
Comprehensive Procedure for Socio-Economic Analysis in Upper St. Johns River Basin, Co-I, Corps of Engineers, 1972-1973 ($60,000)
Data Collection Strategy for Water-Quality Studies, Co-PI, NSF, 1972-1974 ($45,000/yr)
An Environmental Study of the Gordon River, Naples, Florida, Co-I, Collier County, 1972 ($5,000)
Environmental Resources Management Studies in the Kissimmee River Basin, Co-PI, Central and Southern Florida Flood Control District, 1973-1975 ($76,000)
Nationwide Characterization of Stormwater Discharges (with American Public Works Association), Co-PI, EPA, 1973-1976 ($100,000)
Decision Model for Stormwater Management, Co-PI, EPA, 1973-1975 ($100,000)
Analysis of Storm Water Recharge Basin, Co-I, OWRR, 1974-1976 ($32,000)
Establishment of an Urban Rainfall-Runoff-Quality Data Base, Co-PI, EPA, 1974-1975 ($48,000), 1976-1977 ($14,000), 1977-1978 ($50,000)
Urban Stormwater Management Model, Co-PI, EPA, 1975-1977 ($120,000) and Urban Runoff Analysis Methodology, 1976 ($25,000)
Multipurpose Stormwater Management, Co-PI, EPA, 1977 ($59,000)
Urban Rainfall-Runoff-Quality Data Base, Co-PI, EPA, 1978-1979 ($51,000)
General Methodology for Evaluating Urban Stormwater Quality Management Alternatives, Co-PI, EPA 1978-1980 ($73,000)
Assessment of Receiving Water Impacts from Urban Stormwater Pollution, EPA, Co-I, 1978-1979 ($79,000)
Evaporation Estimates Based on Surface Temperature and Net Radiation, Co-I, OWRT, 1979-1981 ($18,000)
Urban Rainfall-Runoff-Quality Data Base, PI, EPA, 1980-1982 ($20,000)
Dynamics of Nutrient Cycles in Lake Okeechobee: Development of Spatially Resolved Models for Nitrogen and Phosphorus, Co-I, South Florida Water Management District, 1979-1980 ($47,000)
Hogtown Creek Environmental Study, Co-PI, Florida Department of Environmental Regulation and UF Engineering and Industrial Experiment Station, 1980 ($20,000)
Receiving Water Quality Data Base and Model Review, PI, EPA, 1980-1983 ($94,000)
Development of Classification Systems for Florida Lakes, Co-PI, Florida Department of Environmental Regulation, 1981-1982 ($65,000)
Water Demand During the 1981 Drought in South Florida, Co-I, South Florida Water Management District, 1982-1983 ($39,000)
Computerized Data Base Integration for a Major Command Environmental Planning Office, Co-PI, U.S. Air Force, 1983 ($61,000)
Impacts of Development on the Water Resources of Cypress Creek North of Tampa, Co-PI, Southwest Florida Water Management District, 1984-1986 ($113,000)
Florida Temik Study, Co-I, EPA, 1984-1985 ($341,800)
Design Procedure to Estimate Pollutant Loadings from Highway Stormwater Runoff, PI, FHWA (Subcontract through Woodward-Clyde Inc.), 1984-1987 ($30,000)
Multi-purpose Management of Mosquito Control Impoundments in Coastal Areas, Co-I, Sea Grant, 1985-1986 ($29,000)
Phosphorus Dynamics in Lake Okeechobee, Co-PI, South Florida Water Management District, 1988-1991 ($100,000 out of $1,500,000)
Formulation of New Hydrologic Methodologies, PI, Florida DOT, 1988-1990 ($100,000)
Modeling Assistance for Barton Creek Watershed, PI, Espey-Huston and Associates, 1990-1991 ($14,000)
Review of Water Quality Standards for the Suwannee River Basin, Co-PI, Suwannee River Water Management District, 1990-1991 ($100,000)
Stormwater Runoff from Landfills, Co-PI, Florida Center for Solid Wastes, 1990-1991 ($45,000)
Tualatin River Basin Study, Co-I, Oregon Dept. of Environmental Quality, 1992-1993 ($204,000)
SWMM-ARC/INFO AML Development, PI, Delaware Dept. of Natural Resources and Environmental Quality, 1993-1994 ($100,000)
Evaluate/Improve SWMM Modeling Techniques for Stormwater, Sanitary Sewer Overflow, and Combined Sewer Overflow Management, PI, Environmental Protection Agency, 1997-2001 ($49,000)
SWMM Water Quality Enhancements for Coastal Areas, PI, University of New Orleans (funds from Environmental Protection Agency STAR grant), 2000-2001 ($76,354)
Sustaining Multiple Functions for Urban Wetlands, Co-I, National Science Foundation, 2001-2003 ($70,000)
Optimization of Urban Sewer Systems During Wet-Weather Periods, Co-PI, Environmental Protection Agency through subcontract from University of Colorado, 2001-2004 ($54,793)
Water Quality Facility Investigation, PI, Oregon Department of Transportation, 2002-2005 ($94,931)
Technical Services for Storm Water Management Model (SWMM) Redevelopment, PI, Environmental Protection Agency, 2002-2005 ($25,000)
Critical Assessment of Stormwater Treatment and Control (BMP) Selection Issues, Co-PI, Water Environment Research Foundation through subcontract from GeoSyntec, 2003-2005 ($52,000)
November 16, 2007

Bob Gearheart, Ph.D.
Humbolt State
1 Harpst St., House 18
Arcata, CA 95521

SUBJECT: Request for Interest in Participating on an Expert Panel for Design Storm and BMP Selection at the Santa Susana Field Laboratory

Dear Dr. Gearheart:

The purpose of this letter is to inquire about your willingness to participate as an Expert Panel member in overseeing the selection and design of engineered natural treatment systems (ENTS) to meet NPDES permit specified numerical limits for stormwater run-off at Boeing’s Santa Susana Field Laboratory (SSFL) located in Southern California. The Facility is a 2,800 acre site that includes a combination of undeveloped land with unlined ephemeral streambeds and developed areas that many of which have surficial and subsurface contamination due to past experimental testing activities in support of the U.S Space program and the U.S. Department of Energy's research in nuclear power systems. The following links will provide more information on the past activities at SSFL:

Boeing Website
http://www.boeing.com/aboutus/environment/santa_susana/programs.html

Cal-EPA Dept of Toxic Substance Website
http://www.dtsc-ssfl.com/

U.S. Department of Energy Website
http://www.cteg.energy.gov/

SSFL has an NPDES permit that regulates stormwater discharges issued by the Regional Water Quality Control Board – Los Angeles Region (Regional Board). The permit contains enforceable numeric effluent limits based on California Department of Health Services drinking water Maximum Contaminant Levels (MCLs), California Toxics Rule criteria, and Total Maximum Daily Load waste load allocations for the various receiving streams that SSFL discharges to. Since 2004, the facility has achieved a 97% compliance rate with the numeric limits, but the NPDES permit requires compliance at all times.

At their public hearing on November 1, 2007, the Regional Board adopted modifications to the permit (with changes to the monitoring program) and approved a Cease and Desist order that will require, among other things, an expert panel to be formed that will have a
twofold mission. The first is to oversee the development of a site specific design storm\(^1\) to be proposed for the use in the sizing of existing and new treatment systems as well as assessing compliance, and the second is to provide technical expertise in the selection and design of engineered natural treatment systems (ENTS) to meet the water quality limits in the permit. The Expert Panel will be comprised of three to five scientists or engineers with expertise in the area of natural treatment of stormwater discharges and/or stormwater hydrology and it is expected that final selection of the panel members will be made in consultation with the staff of the Regional Board.

A copy of the tentative draft permit and Cease and Desist Order (CDO) may be found at: [http://www.waterboards.ca.gov/losangeles/html/permits/tentative_order/Individual/Boeing/theBoeing.html](http://www.waterboards.ca.gov/losangeles/html/permits/tentative_order/Individual/Boeing/theBoeing.html).

Due to the strict limits and requirements of the permit, including a short implementation schedule, there will be significant challenges in selecting and designing the ENTS. Boeing is working with a team that includes Geosyntec Consultants, Montgomery-Watson Harza, and Flow-Science to prepare preliminary conceptual designs of proposed ENTS for review by the Expert Panel. It is anticipated that the panel would review and assist with the revision of the conceptual plans to come up with the best technical solution for meeting the permit limits taking into account environmental considerations as well as sustainability.

The Boeing Company has agreed to donate the land to the State of California for parkland after clean-up activities are completed, so the implemented ENTS must work on a long-term sustainable basis and fit within the natural setting of the site. ENTS are the preferred approach by Boeing, although it is acknowledged that one of the key challenges will be selecting and designing ENTS that will have reasonable likelihood of achieving the NPDES permit numeric effluent limits, which include TCDD and Mercury near lab detection limits.

The schedule will be fast-track. Pursuant to the draft permit and CDO, Boeing is required to submit a work-plan to the Regional Board by December 15\(^{th}\) that includes a schedule of when activities are to be performed and the expected completion dates as well as a schedule for the Expert Panel activities. The goal is to install the ENTS during the summer of 2008. The draft CDO requires that the systems will be operational and able to meet permit limits by June 10, 2009, with a final report on the results of the BMP implementation and evaluation and final recommended BMPs due August 15, 2009.

The panel may also be asked to assist with post-construction review of the ENTS as well as oversight of a monitoring and evaluation program that would determine if potential alterations to the ENTS (adaptive management) are warranted.

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\(^1\) For reference, Regional board staff originally suggested that the design storm from the Los Angeles River Trash TMDL be used at the site – i.e., the 1-year 24-hour storm event, or 2.3 inches at the site. This design storm was used for sizing the existing stormwater filtration systems currently in use at the site.
It is expected that the majority of the effort would occur between December 2007 and June 2008, with additional effort at a reduced intensity after that. As the work-plan has not been prepared, it is difficult to determine the number of meetings, but it could include monthly in-person meetings to visit the site, review plans and designs, with additional conference call meetings. It would also involve review time outside of the meetings. It is expected that there will be a public involvement portion of this plan and as such the panel may be asked to participate in questions and answers on the planned approach.

If you are selected to participate on the panel, your efforts would be compensated on an hourly basis and expenses would be reimbursed. We believe the Regional Board staff intends to keep the panel to 3 to 5 experts with some overlapping and distinct areas of expertise. Selection will be based on the concept of having members with one or more areas of expertise in the various aspects of this project so that each area will be adequately addressed. As such, it is not expected that each member be an expert in all areas of this project rather that just each be able to serve as an expert in one area (or more) and be able to complement other members who have expertise in other areas. We look forward to hearing about your interest in serving on such a panel. If you wish to have more information on this project, please feel free to call me at 503.222.9518, Paul Costa of the Boeing Company at 818.466.8778, or Cassandra Owens of the Regional Board at 213.575.6750 with any questions that you may have.

If you are interested in participating on this panel, please provide a statement of qualifications and areas of expertise (either e-mail or mail is fine) to Cassandra Owens of the Los Angeles Regional Board and me by the 30th of November at:

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We look forward to hearing from you.

Sincerely,

Eric W. Strecker, P.E.  
Principal, Geosyntec Consultants