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PROPOSAL

Green Solution Project: Upper Los Angeles River Watershed, Phase IV

March 13th, 2014

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PROPOSAL

Green Solution Project: Upper Los Angeles River Watershed, Phase IV

Note: This work is proposed to be funded by the Santa Monica Mountains Conservancy (SMMC) and the State Coastal Conservancy (SCC). Funds from the SMMC will be used only for water-related components.

PROPOSAL SUMMARY

This Green Solution analysis of the Upper Los Angeles River Watershed will further evaluate for implementation the prioritized stormwater capture and water quality improvement projects identified in the CCS Green Solution Project study for the Upper Los Angeles River Watershed, Phase III, by quantifying and incorporating the projects' water supply and reuse capacity, and the resulting energy savings and greenhouse gas emission (GHG) reduction benefits. Park and recreation parcels will be evaluated and analyzed and will be incorporated into the prioritization for Green Solution project implementation.

This study will: quantify the water supply and reuse capacity of the identified stormwater capture 'Green Solution' projects; quantify the regional water supply benefits, embedded energy in development of new water supplies and potential reductions in greenhouse gas emissions; integrate the water supply and reuse, energy savings, and greenhouse gas emission reduction benefits with previously quantified land, habitat, community and water quality benefits; identify priority projects recommended for concept site design as a precursor for implementation; produce concept site reports for up to four priority projects; and evaluate the potential for project funding through state funding sources.

BUDGET (See Exhibit A for detail)

Total Project Cost:	\$547,000
SMMC share:	\$250,000
SCC share:	\$297,000

PROJECT TEAM

See Exhibit B for bios and résumés

Community Conservation Solutions	Project direction, analysis and design
Psomas	Hydrology engineering
Jeremy Thomas Consulting	Water supply analyses
Water Energy Innovations, Inc.	Water-energy nexus
Tim Kidman, WSP USA	Energy-greenhouse gas emission nexus
GreenInfo Network	Geographic Information System (GIS) data analysis and mapping

TIMELINE

Twelve months from the date of execution of all grant documents by both the Santa Monica Mountains Conservancy and the State Coastal Conservancy.

SCOPE OF WORK

Task 1: Data Assessment, Retain Subcontractors, Technical Protocols and Project Team Meeting

- 1.A. Refine scopes of work and execute contracts with subcontractors, develop project protocols, develop project budget tracking, establish detailed project timeline and hold initial Project Team meeting.
- 1.B. Review data needs, assess data availability, scope technical analysis tasks, identify geospatial analyses and integration with data analyses and data products produced in Phase III.
- 1.C. Phone call with Coastal Conservancy and Santa Monica Mountains Conservancy.

Task 2: Park and Recreation Parcel Analysis

- 2.A. Conduct geospatial and data analysis of 179 park and recreation parcels identified in Phase I of the Green Solution Project. Review slope, ownership, parcel boundaries and storm drain proximity. Determine percentage of land suitable for Green Solution project implementation. Conduct statistical analysis.
- 2.B. Analyze and quantify geospatial hydrographic data and determine the stormwater/dry weather runoff capture and treatment, water quality improvement and water storage and reuse capacity, and open space or habitat elements of candidate parcels; conduct statistical analysis to validate.
- 2.C. Analyze and quantify multi-benefit spatial data for community and conservation factors for candidate parcels.
- 2.D. Develop digital interactive maps for on-line use and data summary tables.

Task 3: Water Storage, Recharge and Re-use Evaluation

- 3.A. Quantify the water supply, storage, reuse, and recharge potential for the candidate park and recreation parcels identified and analyzed in Task 2 and the 268 parcels identified in Phase III of the Green Solution Project, Upper L.A. River Watershed. The evaluation shall be based on the potential water supply, Ground Water Augmentation Model and opportunities for storage and reuse based on parcel location, size and land use. Conduct GIS data and statistical analysis.
- 3.B. Develop digital interactive maps for on-line use and data summary tables.

Task 4: Water Supply and Water Savings Potential Analysis

- 4.A. Evaluate water imports into the Upper L.A. River Watershed and perform analysis according to water year types consistent with the California Department of Water Resources
- 4.B. Calculate the beneficial reuse volumes, total potential equivalent water supply benefits and imported water supply offset potential provided by the implementation of green Best Management Practices

stormwater capture projects on the identified opportunity public parcels, and determine expected annual total equivalent water supply benefits.

- 4.C. Conduct GIS data analysis and develop digital interactive maps for on-line use and data summary tables.

Task 5: Analysis of Energy Conservation and Greenhouse Gas (GHG) Emission Reduction Benefits

- 5.A. Compute the energy embedded in water associated with water supplies that could potentially be displaced by the identified stormwater runoff capture and storage projects and the energy savings benefits of project implementation. Quantify avoided energy consumption associated with displaced water supplies.
- 5.B. Quantify the greenhouse gas emission reductions associated with the embedded energy savings and quantify GHG avoided emissions associated with implementation of the stormwater runoff projects on the identified opportunity public parcels, including GHG emissions associated with project construction.
- 5.C. Conduct GIS data analysis and develop data summary tables.

Task 6: Prioritization of Opportunity Public Parcels

- 6.A. Integrate the water supply and reuse, energy conservation and greenhouse gas emission reduction benefits with previously quantified and integrated land, habitat, community and water quality benefits, re-prioritize and rank the opportunity public parcels with the incorporation of park and recreation opportunity parcels.
- 6.B. Review high-ranking sites, identify up to four sites for concept design, and meet with funding agencies for concurrence and approval of selected sites.

Task 7: Develop and Produce Site Concept Designs

Develop concept site reports and schematics for up to four priority projects which integrate runoff capture and treatment through green Best Management Practices, storage of captured water for groundwater recharge and/or reuse for irrigation purposes, natural habitat restoration, and creation of park or open space land. Summarize beneficial reuse volumes; water supply, energy savings and GHG emission reduction benefits; tributary area treated; captured and treated runoff volumes; and park, habitat or open space acreage created, improved or restored.

Task 8: Evaluation of Funding for Project Implementation and Coordination with State Agencies

Coordinate and meet with State Coastal Conservancy and Santa Monica Mountains Conservancy. Evaluate funding potential through state funding sources. Provide technical support and evaluation to determine next steps and provide written recommendations.

Task 9: Produce Maps, Digital Materials and Final Report

Prepare Technical Memoranda summarizing findings, methodologies and assumptions. Prepare white paper explaining how findings can be used by state agencies to estimate the water, energy and GHG

emissions impacts of stormwater runoff capture, treatment and reuse. Produce digital maps, PowerPoint presentations, concept site designs and final report in both print and digital formats adjusted for web viewing.

Task 10: Project Direction, Data Management, Meetings and Correspondence

Meetings, conference calls and WebEx calls with Project Team and between Project Team members; project management; document management; e-mails and correspondence.

DELIVERABLES

Executive Summary; Technical Report with assumptions, methods, analyses, results and references; recommendations for next steps and funding potential; concept site technical reports and schematics; digital interactive maps for on-line use; data index table; PowerPoint. Report on potential use of the study's findings by state agencies in programs to estimate the water, energy and GHG emissions impacts of stormwater runoff capture, treatment and reuse. Produce 11"x17" maps showing overall analysis results for prioritized opportunity public parcels, including stormwater runoff storage and reuse potential, embedded energy and GHG emission reductions. The Final Report shall be delivered in twelve hard copies (six for each agency) and digital format suitable for web viewing.

ASSUMPTIONS

- 1) The work will rely on publicly available data, including the Groundwater Augmentation Model as already applied to the Los Angeles River Basin, and data from the California Department of Water Resources, California Energy Commission, and California Air Resources Board.
- 2) For any source which does not report GHG emissions to the California Air Resources Board, the fuel source will be identified.
- 3) Completion of the Scope of Work described herein relies on timely response of the funding agencies and other public agencies, as applicable. If responses from the public agencies are not provided within the established time frame, the project schedule shall be extended accordingly.
- 4) Work includes one meeting in the San Francisco Bay Area with the State Coastal Conservancy, three meetings with the Santa Monica Mountains Conservancy and one presentation to the Santa Monica Mountains Conservancy Board.

EXCLUSIONS

Data modelling
Collection of new GIS data
Property Boundary and/or Topographic Survey
Water quality sampling
Geotechnical Studies
Design Services

Hydrology Studies
Value Engineering
Permitting and Coordination
Public Hearing Attendance
Services not specified herein

Exhibit A
 PROJECT BUDGET

Community Conservation Solutions
 Green Solution Project: Upper LA River Watershed, Phase IV
 March 2014

Task #	Task	SMMC	SCC	Total
I.	Data Assessment, Retain Subcontractors, Technical Protocols, Project Team Meeting	12,614	18,921	31,535
II.	Park and Recreation Parcel Analysis	22,818	34,227	57,045
III.	Water Storage, Recharge and Re-use Evaluation	33,343	40,752	74,095
IV.	Water Supply and Water Savings Potential Analysis	10,679	13,052	23,731
V.	Analysis of Energy Conservation and Greenhouse Gas Emission Reduction Benefits	-	55,186	55,186
VI.	Prioritization of Opportunity Public Parcels	11,757	27,433	39,190
VII.	Develop and Produce Site Concept Designs	81,340	-	81,340
VIII.	Evaluation of Funding for Project Implementation & Coordination with State Agencies	11,970	17,955	29,925
IX.	Produce Maps, Digital Materials and Final Report	18,440	27,660	46,100
X.	Project Direction, Data Management, Meetings and Correspondence	27,372	32,133	59,505
	Subtotal	230,333	267,319	497,652
	Expenses	6,968	10,632	17,600
	Contingency (6%)	12,699	19,049	31,748
	Total	250,000	297,000	547,000



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Exhibit B Project Team Bios & Qualifications

Green Solution Project: Upper Los Angeles River Watershed Phase IV

March 13th, 2014

Project Team:

- Community Conservation Solutions
- Psomas
- Jeremy Thomas Consulting
- Water Energy Innovations, Inc.
- Tim Kidman, WSP USA
- GreenInfo Network

COMMUNITY CONSERVATION SOLUTIONS

Community Conservation Solution's mission is to tackle the most complex and challenging problems created when people and nature intersect. CCS does this by developing creative, practical and lasting solutions that unite diverse communities and interests and leverage investments of public funds. CCS has successfully crafted innovative solutions to serious environmental problems affecting California's natural and human communities, by integrating the protection and restoration of natural lands and waters with compatible community uses, economic benefits and permanent public benefits.

CCS' successful project solutions include: the two-square mile Baldwin Hills Park in the heart of urban Los Angeles; wetland restoration in Upper Newport Bay; acquisition of the Spring Street Center for the Los Angeles Conservation Corps; the Los Angeles River Natural Park to naturally treat urban runoff while creating a regional river public access gateway; and developing new, quantified approaches to improving water quality through the Green Solution Project. Community Conservation Solution works on diverse projects in urban and rural areas that help both natural habitats and people. Our projects range from parks and beaches to wilderness and watersheds, and from recreational sites to mixed-use developments. CCS is a non-profit, 501(c)(3) organization.

Esther Feldman President

Esther Feldman is a pragmatic and visionary conservation leader. She has been especially successful in building diverse coalitions to achieve community and conservation goals for exceptionally difficult projects. She has a long history of pioneering new conservation initiatives that successfully address challenging environmental problems, and is adept at leveraging funds to ensure the longevity of the projects she directs. She is responsible for generating billions of dollars in public funds to protect parks, beaches, rivers and natural lands, and provide badly-needed urban recreation facilities. She has expertise in public finance, legislation, planning, technical research, water, community outreach, conservation real estate, governmental and public relations and campaigns. Her vision and ability to make that vision a reality have made a permanent impact in the State of California and in many communities nationwide.

Ms. Feldman is responsible for generating **over \$3 billion in public funds** for park, recreation and conservation purposes in California and throughout the U.S. She is President of Community Conservation Solutions (CCS), a non-profit organization dedicated to developing innovative solutions to the challenging problems created where people and nature intersect. CCS conceived of and spearheaded the two-square mile Baldwin Hills Park Project in the heart of urban Los Angeles; launched wetland restoration efforts in Upper Newport Bay; acquired the Spring Street Center for the Los Angeles Conservation Corps; and developed new strategic, regional approaches to solving polluted runoff problems using "smart" green space through CCS' Green Solution Project.

In 1992 and 1996, Ms. Feldman conceived of, wrote, developed and directed the successful campaigns for the two Los Angeles County Park Acts (Props. A), creating over \$1.2 billion. 1996 also saw the approval of a \$200 million park measure in Dade County, Florida, which Ms. Feldman helped design and direct. In 1988, she helped direct the successful \$776 million California Parks and Wildlife Act (Prop. 70).

From 1994 to 1997, she established and directed the Los Angeles Field Office of the Trust for Public Land (TPL), and created TPL's National Public Finance Program. She launched TPL as a leader in creating the 51-mile Los Angeles River Greenway, a network of park, recreation and natural lands along the entire length of the Los Angeles

River, and for establishing TPL's national presence in developing successful park and open space ballot measures throughout the country.

As **Director of Special Programs for the Santa Monica Mountains Conservancy**, she helped create the agency's Los Angeles River Greenway program, led the first acquisitions on the L.A. River and created the SMMC's environmental education program for inner-city youth. Prior to that, she worked for the **Planning and Conservation League**, California's oldest environmental lobbying organization, where she researched and lobbied for state legislation and worked on statewide coastal issues.

Ms. Feldman won a prestigious **National Chevron Conservation Award in 1997**, one of only five professional conservationists in the country to do so. She was a delegate to China for the American Young Political Leaders 1998 Foreign Exchange Program. She was a member of the **Los Angeles County Regional Planning Commission** from 1997 to 2000, which has jurisdiction over 3,000 square miles, an area larger than 46 states. Ms. Feldman has a Bachelor of Science in Soil and Water Science from the University of California, Davis, has a background in organic farming, and is an accomplished outdoorswoman with over 30 years of experience backpacking, rock climbing, mountaineering and outdoor adventure.

Chun Lu **Fiscal Director**

As Fiscal Director of Community Conservancy Solutions (CCS) Ms. Chun Lu is responsible for the organization's financial management. In addition to general accounting, she ensures CCI's financial documents meet accounting and auditing requirements for government and foundation grants. Beyond Ms. Lu's role as Fiscal Director, she also aids CCI in managing document production, digital reproduction and development of printed and electronic presentation, and project coordination.

Prior to joining CCS's team, Ms. Lu worked in many fields of financial and office management which include manufactory, retail, real estate, donation management, grant, contract management and investment analysis. A graduate from University of Washington, she is a founding member of American Red Cross, UW chapter and also served as its first treasurer.

Alyssa Curran **Communications & Development Administration Manager**

Alyssa Curran is the Communications & Development Administration Manager for Community Conservation Solutions. She is responsible for document and office management and organization, administrative support for CCS' projects and programs and direct assistance and support for the President and other staff. Additionally, Alyssa works on production and outreach of electronic communications and web updates, public relations materials, development and implementation of CCS' digital and social media communications strategy, fundraising and support for meetings, presentations, and events.

Alyssa earned her Bachelor of Arts in Geography and Environmental Studies from UCLA, with minors in Spanish and Public Affairs. She graduated *magna cum laude*, Phi Beta Kappa in 2013.

PSOMAS

Psomas is a leading consulting engineering firm serving clients in the water/wastewater; transportation; and public, institutional and private land development markets. Ranked as one of Engineering News Record (ENR) magazine's Top 100 Pure Design Firms in the United States, Psomas offers civil engineering, land surveying, planning and entitlements, program/construction management, natural resources, GIS consulting, and Special District Financing services to the public and private sector. Founded over 60 years ago, Psomas provides services from offices throughout California, Arizona, and Utah.

Psomas specializes in delivery of sustainable storm water management consulting and design solutions to municipalities, public and quasi-public organizations, and private sector clients. Psomas' projects range from studies to constructed solutions; challenging infill development to city and county-wide initiatives; and from integrated low impact development measures to purpose-built treatment wetland systems.

Ross Barker, PE

Principal-in-Charge

Ross Barker has over 40 years of experience covering all aspects of project management and civil engineering design associated with infrastructure development including utility systems, grading, drainage and circulation. This includes extensive experience assessing flood control and water quality issues associated with stormwater runoff from development projects. As a Vice President for Psomas for civil engineering services, Ross oversees engineering projects throughout Southern California.

Project Experience

Antelope Valley Recycling and Disposal Facility (AVRDF) Anaverde Creek Improvements, Palmdale, CA: Principal-in-Charge oversaw design of stream bank protection for the north bank of Anaverde Creek at the Palmdale Landfill. Psomas provided survey, review of the hydrology report hydraulic analysis using HecRas, preparing preliminary bank protection alternatives and estimated impacts to production facilities, reviewing design alternative with the local approval agency, and preparing final construction drawings and specifications, along with plan and permit processing.

Audubon Center at Debs Park, Sustainable Design, Los Angeles, CA: Project Director for the Audubon nature interpretive center. The project includes sustainable development design philosophy including waste filtration, water quality basins, nature trails, and site reclamation.

Caltrans, Stormwater Quality, Southern California: Actively involved in this program and participates in both the development and review of the overall document. Because of his background in highway planning, design and construction, worked closely with team members to develop, evaluate and select BMPs for incorporation into the SWMP. Part of this effort required research, documentation, and companion of existing BMPs and other storm water management practices already in use by Caltrans.

Centennial, Stormwater and Wastewater Systems, Los Angeles County, CA: Principal-in-Charge for development of a new town to be built on 6,000-acres. Critical project design elements include a full sewer system with two wastewater treatment facilities and an extensive stormwater system involving over 400 feet of infiltration storage to meet Low Impact Development goals. Plans for this project include 23,000 homes, a business district, schools, libraries, retail, entertainment, recreation centers and medical facilities to be built over 20 years.

City of Camarillo, 2013 As-Needed Drainage Analysis and Storm Drain Design, Camarillo, CA: Principal-in-Charge for the as-needed contract, Psomas was selected to provide civil engineering drainage analysis and storm drain design to assist the city in the delivery of capital projects. Related work may include preparation of reports, plans, specifications, and estimates; review of reports, plans, specifications, and estimates.

GSA Bakersfield Federal Courthouse, Stormwater Quality, Bakersfield, CA: Project Principal responsible for civil engineering design management and supervision for the Bakersfield Federal Courthouse. Stormwater quality issues include a site grading and drainage plan; WQMP, SWPPP, and NPDES support services.

Lang Ranch Community Park, Stormwater Quality Thousand Oaks, CA: Principal-in-Charge for the Lang Ranch Community Park to be built on approximately 52 acres of the 124-acre site. The park will be constructed adjacent to the existing Lang Creek, which will be preserved in its natural condition and requires compliance with extensive stormwater quality requirements.

Oak Creek Site Hydrology, Agoura Hills, CA: Principal-in-Charge for this 42-acre project located on each side of the existing Medea Creek that is delineated wetland habitat. The project development includes over 600 apartments as well as approximately 250,000 SF of office and commercial space, including two bridges over the existing stream. Psomas was responsible for site hydrology, Hec-Ras analysis for the existing natural water courses and scour analysis for bridge foundation designs. Psomas provided the full range of engineering and surveying services, which included two bridge crossings, grading, drainage, and infrastructure as well as grading and hydraulic modeling of the existing creek as part of the bridge construction and wetland mitigation work.

The Commons, Stormwater Quality, and Calabasas, CA: Project Director for this 24-acre mixed-use development that required detailed drainage analysis to comply with stormwater quality and the existing flow discharge requirements of Los Angeles County.

West Creek Development Hydrology and Storm Drain, Valencia, CA: Principal-in-Charge for the West Creek development which comprised 400-acres of residential and commercial development adjacent to the San Francisco Creek. Psomas was responsible for hydrology report, water quality system designs, storm drainage system design, and debris basin and detention basin designs.

Wilshire Corridor, Los Angeles, CA: Project Manager responsible for the rerouting of existing major storm drain lines from private property to public right-of-way.

Education

BS/Civil Engineering/Queensland Institute of Technology, Brisbane, Australia

Registration

Professional Engineer/ California #32799

Affiliations

American Society of Civil Engineers

Jeff Chess, PE, ENV SP

Senior Project Manager

Mr. Chess has over 19 years of design and management experience covering civil, structural, environmental and architectural engineering. He has prepared and managed site civil engineering design and studies including stormwater, wastewater and site civil for public and institutional projects and programs. Mr. Chess has extensive experience in dealing with environmental aspects of land development including hazardous waste mitigation, BMP implementation and environmental report contribution. He has also vast experience in permitting and approvals with

the most Southern California cities and counties as well as many state and local agencies. Mr. Chess is an Envision Sustainable Professional.

Project Experience

Santa Monica Mountains Conservancy, Green Solutions Projects Phase III, Upper Los Angeles River Watershed, Los Angeles County, CA: Project Manager responsible for Green Solution Concepts and Concept Reports for the properties at Los Angeles Department of Water and Power W.P. Utility Easement located in Granada Hills, and parcels adjacent to the right-of-way along Bell Creek in West Hills. Psomas' scope included GIS data analysis and mapping, and prepared a final report.

City of Los Angeles, Proposition O Bond Program, Los Angeles, CA: Project Manager on Mar Vista Recreation Center, Westminster Dog Park, and Westside Rainwater Park for this \$500 million clean stormwater bond program.

Mar Vista Recreation Center, Los Angeles, CA: Project Manager to provide civil engineering services for the stormwater BMP design to divert, treat, detain, and disinfect runoff from a 270-acre watershed for reuse as an irrigation source for the existing park. The project diverts stormwater from the existing 78-inch storm drain in Sawtelle Boulevard through a treatment train which includes trash removal, hydrodynamic separation, a stormwater diversion and circulation pump station, an underground 260,000 gallon detention facility (constructed under tennis courts), and a chlorination and dechlorination system.

Westminster Dog Park, BMP, Venice, CA: Project Manager to provide civil engineering to capture and treats on-site runoff from the existing Dog Park prior to being released into the existing storm drain system. The project includes runoff pre-treatment treatment through surface vegetation and treatment through a shallow under drain system, connected to a Modular Constructed Wetland Unit.

Westside Rainwater Park, Los Angeles, CA: Project Manager to provide civil engineering for a universal playground and sustainable stormwater treatment and reuse project; a result of a collaborative effort with many stakeholders including the Bureaus of Engineering, Sanitation, and Recreation and Parks; LADWP; and Shane's Inspiration. The project diverts stormwater from an existing storm 10' x 11.5' RCB serving a 3,700-acre watershed; screens the runoff; distributes runoff via a new lift station, and provides further treatment via a subsurface irrigation system. A dry creek and under drain system collects and excess treated stormwater and returns it to the existing storm drain system. The project helps the City to meet stormwater pollution reduction goals in the surf zone, enables the beneficial use of stormwater through subsurface irrigation reducing the need for potable water use for irrigation.

Milton Street Park, Los Angeles, CA: Project Manager of civil engineering for a new 1.2-acre urban park along the Ballona Creek Bike Trail located near the 90 Freeway near Playa Vista. Approximately 1,000 feet in length and 45 feet wide, the park includes a bike path, naturally vegetated open space, LID measures, a regional stormwater capture and treatment facility, and a new adjacent green street component.

Los Angeles Community College District (LACCD), Los Angeles Mission College, Storm Water Master Plan, Sylmar, CA: Project Manager responsible for a comprehensive Storm Water Master Plan Report that presented the regulatory framework, analysis methodologies, hydrologic analysis of existing and proposed conditions, water quality analysis, mitigation measures, and discussions of direct and cumulative impacts. A special design issue was that the site is adjacent to the Pacoima Wash and required assessment of flood plain impacts. Psomas' expertise with innovative solutions to meet the National Pollutant Discharge Elimination System (NPDES) water quality objectives was a significant benefit to the project. This was accomplished by introducing an Arroyo Best Management Practice (BMP) through the campus that provided water quality management and mitigation as well as introducing a new landscape element.

LACCD, Los Angeles Valley College, Parking Lot D Stormwater Treatment Design, Valley Glen, CA: Project Manager to provide additional professional services to the Los Angeles Community College District, Los Angeles Valley College campus Parking Lot D stormwater treatment design. The additional services include design for improvements to the irrigation system and an additional area of landscape along the eastern boundary of Parking Lot D. Construction document phase, along with bid, award and construction administration services were provided.

Education

BS/Civil Engineering Building Science/Architectural Engineering/University of Southern California, Los Angeles

Registration

Professional Engineer/ California #61632

Envision Sustainability Professional Credential/ENV SP/2013

Affiliations

American Society of Civil Engineers

Chi Epsilon National Civil Engineering Honorary, USC Chapter

Southern California Development Forum

Jeremy Thomas, M.L.A.
Senior Water Resources Specialist

BIOGRAPHICAL SKETCH

Mr. Thomas has 14 years of experience as a scientist, planner, and designer, working to enhance and restore natural ecosystem processes in degraded landscapes. He applies a holistic, systems approach towards watershed, river, riparian, floodplain, and wetland projects; fully integrating ecological and biological processes with fluvial geomorphology and water resource planning and engineering principles. He is skilled at river and wetland restoration planning and design, watershed assessment, geomorphic, hydrologic, and hydraulic analyses, and data management and interpretation. Mr. Thomas has experience with project management, technical analyses, planning, and design and engineering on projects all over the continental United States, with specialized knowledge of water resources and ecosystems in California / Nevada, the Mid-Atlantic, and the Northeast.

EDUCATION

M.L.A., Environmental Planning, University of California, Berkeley, 2004
Thesis Title: "*Riparian Conservation in California Wine Country: A Comparison of the County Planning Approach*"
B.A., Environmental Studies, University of Colorado, Boulder, 1995
B.A., Geography, University of Colorado, Boulder, 1995

DISTINGUISHING QUALIFICATIONS

- Expertise in applied fluvial geomorphology and river corridor restoration
- Expertise in ecologically sensitive flood management
- Hydrologic, hydraulic, and sediment transport modeling expertise
- Freshwater and anadromous fish habitat restoration design expertise
- Expertise in LID and green infrastructure
- Expertise in urban stormwater planning and design
- Broad range of experience in ecological restoration planning and design throughout a diversity of bioregions
- Project management and technical experience in comprehensive ecosystem planning efforts

REPRESENTATIVE PROJECTS – NEWFIELDS RIVER BASIN SERVICES (2009-2013)

Senior Geomorphologist; Wildcat Creek Watershed Erosion and Sediment Control Project; East Bay Regional Parks District; Contra Costa County, California; September 2012 to present. Currently assisting in identifying and classifying sites of significant erosion and sources of sediment within the upper Wildcat Creek watershed in Contra Costa County, CA. Assessing and mapping channel stability, rates of down cutting and deposition, locating and mapping significant sources of sediment, assessing the effectiveness of existing sediment impoundments along the creek, and recommending sediment prevention and removal strategies needed to restore channel capacity and function. Providing conceptual design solutions and recommend methodologies for erosion control at identified source points, utilizing analysis and modeling to assess technical feasibility and effectiveness of each proposed conceptual design solution, assessing each conceptual design solution for constructability, and determining detailed budget estimates. Developing recommendations for the long term, programmatic maintenance of water courses within the study area.

Senior Restoration Scientist; South Delta Corridors Analysis; California Department of Water Resources; San Joaquin County, California; May 2010 to September 2012. Lead restoration scientist and planner evaluating the

feasibility of programming corridors for flood management and ecosystem restoration in the San Joaquin River Delta, from Vernalis into the interior Delta. Oversaw the development of a hydrodynamic model and GIS framework to evaluate options for flood bypass, flood corridor expansion, and restoration of floodplain habitat for over 90 miles of the San Joaquin River system. Evaluated river and floodplain hydraulics, floodplain inundation, and ecosystem responses to changes in proposed levee reconfigurations. Presented to a technical advisory committee and regional stakeholders. Led a multiple day workshop with expert panelists to evaluate the feasibility of different corridor configurations. Lead author for technical summaries of findings that were included in the Bay Delta DHCCP.

Senior Fluvial Geomorphologist; Sprague River Restoration Post Project Appraisals and Restoration Manual Development; U.S. Fish and Wildlife Service; Klamath Falls, Oregon; June 2010 to April 2012. Developed post project monitoring study plans and collected geomorphic data on approximately 20 stream restoration projects throughout the Sprague River watershed. Developed conceptual models describing the objectives and expected morphologic responses of the river corridor to restoration actions. Created a spatial database system with tools to organize monitoring data and guide future restoration projects and post project monitoring. Drafted river corridor restoration and monitoring manual for the Sprague River basin highlighting the lessons learned through post project appraisals.

Lead Restoration Designer; Red Bluff Diversion Dam Fish Passage Improvement Project – East Sand Slough Mitigation Habitat Design; Tehama Colusa Canal Authority; Red Bluff, California; June 2010 to present. Lead designer for 24 acres of backbar channel habitat in East Sand Slough, a floodplain slough on the Sacramento River near Red Bluff, CA, to mitigate impacts on riparian habitat associated with the construction of the fish screen and pumping facilities at Red Bluff Diversion Dam. Conducted design workshops with the Technical Advisory Group and outside technical experts. Developed hydraulic and sediment transport models to support habitat design. Created and refined design concepts. Produced design documents for cost estimation and construction. Provided construction oversight and monitoring services. Project completed construction in December 2013 on time and on budget.

Hydrologist; Flood Protection and Water Supply System Reoperation Studies; California Department of Water Resources; Sacramento, California; November 2010 to present. Provided input and expertise on the integration of ecosystem protection and restoration elements in schemes to optimize operations of statewide flood protection and water supply systems in California. Expected to lead identification, evaluation, modification, and improvement of computer models (hydrologic, hydraulic, sediment transport, ecosystem, etc.) for improved analysis of system reoperation opportunities.

Senior Restoration Planner; Dennett Dam Removal Project; Tuolumne River Trust; Modesto, California; Aug 2010 to Present. Provided technical assistance to the Tuolumne River Trust (TRT) in the planning and design for the removal of Dennett Dam, a low-head dam on the Lower Tuolumne River in Modesto, California. The removal of the dam will improve passage of anadromous fish, and remove a significant public safety hazard. Assisted with preparation of grant proposals, and led the hydrologic, geomorphic, and ecological studies to determine baseline conditions at the site, and provide the basis for dam removal engineering and restoration of the river channel and corridor. Developed and evaluated engineering alternatives for dam removal.

Senior Fluvial Geomorphologist; Big Creek Flood Analysis; Fish Camp Block D Homeowners Association; Fish Camp, California; April 2010 to Nov 2010. Performed hydrologic and geomorphic analyses to provide a baseline characterization of flood risk on Big Creek, a tributary of the South Fork Merced River, in Fish Camp, California. Correlated watershed hydrology, cross-sectional surveys of the river channel, and documented flood events to determine flood frequencies and flood stage elevations in a reach of Big Creek adjacent to a residential neighborhood, and assessed possible impacts to flood elevations associated with the development of a proposed resort development.

Hydrologist and Geomorphologist; Amargosa North Solar Generation Facility Hydrology , Water Supply, and Floodplain Hazard Investigation; Iberdrola, Inc; Nye County, Nevada; Sept 2009 to Present. Currently providing a hydrologic, geomorphic, and water supply assessment of the Amargosa North solar generation facility being developed by Iberdrola, Inc and the U.S. Bureau of Land Management. Technical services include a hydrologic assessment and flood frequency analysis of surface waters occurring on the site, a flood hazard investigation and design guidance for proposed solar facilities, and a hydrogeological assessment to inform the use of ground water resources on the project site. These technical investigations are being used to support an Environmental Impact Statement associated with site development.

Hydrologist; Sausal Creek Watershed Hydrologic and Hydraulic Investigation; Friends of Sausal Creek; Oakland, CA; Sept 2009 to Jan 2010. Lead hydrologist in the development of hydrologic and hydraulic modeling analyses intended to support the development of a watershed study and preliminary recommendations for the Sausal Creek watershed in Oakland, California. Developed a hydrologic model in EPA SWMM 5.0 to compute the storm water discharge entering Sausal Creek from the watershed. Simulated hydrologic inputs and outputs for a range of storm events. Used cross-sections and GIS information to develop and refine a HEC-RAS model for existing conditions. Reviewed the effects of proposed stormwater detention facilities and biofilters on runoff rates, runoff volumes, and downstream channel velocities using the hydrologic and hydraulic models. Assisted in the determination of appropriate stormwater management and restoration actions in the watershed.

Hydrologist and Geomorphologist; BOFORS Superfund Site Surface Water and Ground Water Assessment; BOFORS / Noble; Muskegon, Michigan; October 2009 to Present. Assisted in the development of a monitoring plan for a reach of Big Black Creek, as it flows adjacent to the BOFORS Superfund Site in Muskegon, Michigan. Deployed 5 surface water monitoring stations and 15 ground water monitoring wells, using pressure transducers to measure water stage and temperature. Processed and analyzed data to determine surface – ground water mixing processes and measured the potential for contaminated ground water to enter the stream channel.

REPRESENTATIVE PROJECTS – CH2M HILL (2008-2009)

Geomorphologist; Bay Delta Conservation Plan EIR/EIS; CA Dep't of Water Resources; Jan 2009 to Sept 2009. Assisted in the development of an EIR/EIS for the Bay Delta Conservation Plan, including an assessment of the existing geomorphic conditions in the Bay-Delta, development of an impact analysis methodology, and evaluation of potential impacts to geomorphic conditions in the Sacramento and San Joaquin Bay-Delta as a result of proposed alternatives.

Hydrologist; California High Speed Rail; California High Speed Rail Authority; Jan 2009 to Sept 2009. Served as the technical lead for the assessment of potential impacts to hydrological and floodplain resources associated with proposed track alignments for the California High Speed Rail from Fresno to Merced. Duties included development of a quantitative impact analysis methodology, analysis of GIS data, and performing field surveys of existing hydrological resources to evaluate both the risk to proposed railroad facilities as well as potential impacts to floodplains.

Geomorphologist; Anderson Cottonwood Irrigation District Main Canal Improvements, Crowley Gulch Restoration; Anderson Cottonwood Irrigation District; Shasta Co, CA; April 2009 to Sept 2009. Developed a channel restoration design to remove a culvert and restore a portion of an intermittent channel to facilitate steelhead passage. Mr. Thomas created a full design planset including grading sheets, cross sections, details, planting plans, and specifications to install a step-pool structure, and coordinated with a civil engineering team to integrate the design of the restored channel into the proposed improvements to the canal infrastructure.

Geomorphologist; Champlin Creek Restoration Project; Caltrans; Sonoma Co, CA; Sept 2008 to Sept 2009. Provided a geomorphic assessment and restoration design concept for Champlin Creek, a tributary of Sonoma Creek in Sonoma County, CA as part of Stage Gulch Road realignment project for Caltrans. Design objectives included restoration of CA Red Legged Frog habitat and riparian habitat, as well stable channel morphology.

Hydrologist; Travis AFB Runway Improvements; US Air Force; Solano Co, CA; June 2008 to Aug 2008 and April 2009 to July 2009. Performed hydrologic modeling to determine impacts on surface water hydrology as a result of proposed improvements at Travis AFB in Solano County, CA. Using GIS analysis coupled with HEC-HMS and TR-55 models, simulated rainfall and runoff processes over a large area for several different development scenarios, and coordinated with a team of biologists to determine potential impacts to listed species habitats in the region.

Hydrologist and Geomorphologist; Iberdrola Solar Generation Facility Floodplain Assessment; Iberdrola, Inc; California, Nevada, New Mexico, Arizona; Nov 2008 to March 2009. Provided a hydrologic and geomorphic assessment of 12 individual large solar generation facilities proposed to be developed on Bureau of Land Management lands throughout the desert environments in California, New Mexico, Arizona, and Nevada. Using aerial photography and field surveys, mapped floodplains and active geomorphic features on each site, and provided design recommendations for large solar generating facilities.

Geomorphologist; Riley Creek Restoration Project; Riley Purgatory Bluff Creek Watershed District; Carver Co, MN; June 2008 to Dec 2008. Provided a restoration design planset and design specifications for Riley Creek, an intermittent creek in Carver Co, MN. The design included replacement of a culvert, design of a stable outfall using natural materials, and providing geomorphic stability while minimizing disturbances to existing habitats.

Geomorphologist and Water Resources Scientist; Fruit Growers Supply HCP/NCCP; Fruit Growers Supply Co; Yreka, CA. Feb 2008 – Sept 2008. Assisted in the development of an HCP/NCCP to cover the take of listed species associated with commercial timber operations in the Siskiyou National Forest, CA. Evaluated the potential impacts of proposed mitigation measures on hydrologic and geomorphic resources in the affected area. Developed a monitoring program to evaluate effects of proposed operations on in-stream geomorphology and hydrology, and potential impacts to listed salmonid habitats.

Water Resources Scientist; Fruit Growers Supply EIR/EIS; Fruit Growers Supply Co; Yreka, CA. July 2008 – June 2009. Lead author for the hydrology and water resources section of the Fruit Growers Supply EIR/EIS; evaluated potential impacts as a result of implementation of measures

proposed by the HCP/NCCP. Collaborated with federal and state resource agencies and local stakeholders to produce a draft and final version of the EIR/EIS document.

Water Resources Planner; Central Valley Project Yield Feasibility Investigation Strategy Document; U.S. Bureau of Reclamation; Sacramento, CA; Feb 2008 – Feb 2009. Technical leader for the development of a Strategy Document to implement a long-term plan for replacing water yield of the Central Valley Project (CVP) that was reallocated to environmental use during the Central Valley Project Improvement Program in 1992. Collaborated with U.S. Bureau of Reclamation (USBR) management to produce a summary of the CVP Yield Feasibility Investigation program accomplishments to date; organized and helped to facilitate collaborative workshops with the USBR staff to determine a path forward; and published a final Strategy Document that provided a framework for the future of the Program.

Project Manager and Technical Leader; Hog Island Ecological Restoration Master Plan; U.S. EPA; Superior; Northern Wisconsin; Sept 2006 to Sept 2007. Assisted U.S. EPA, Region 5 in the completion of the first ecological restoration plan under the Great Lakes Legacy Act. As the technical lead, performed an assessment of ecological conditions on the 850-acre site, determined preliminary restoration design concepts, and led the consultant team toward creating a process for restoring a formerly degraded site to be a self-sustaining and resilient ecosystem. Also supervised an integrated stakeholder-outreach process, fully engaging the stakeholder group through a series of workshops and translating stakeholder interests into a series of goals, which became the core of the ecological restoration plan.

Water Resources Specialist; Long Term Control Plan; New York City Department of Environmental Protection; New York City; July 2006 to Oct 2007. As a water resources specialist, assisted with the development of New York City's Long Term Control Plan (LTCP). Assessed opportunities to employ stormwater best management practices (BMP) that mitigate the quantity and quality of stormwater runoff entering New York City's sewer system. Given identified opportunities and constraints for this ultra-urban area, the technical team considered a wide array of technologies including: collection, filtering, and treatment systems; non-structural and structural strategies; changes in existing maintenance and management practices; education tools and stakeholder awareness programs; and changes in development regulations, architectural guidelines, and land use policies. New emerging technologies were also explored (green roof canopy concepts, green corridors, and so forth) and "out-of-the-box" ideas tailored to New York City's ultra-urban infrastructure and unique environmental conditions. Assisted in the preparation of a report documenting the methodologies, findings, and recommendations of this study.

Project Manager and Technical Leader; Jamaica Bay Watershed Protection Plan; New York City Department of Environmental Protection; New York City; Sept 2005 to Oct 2007. Served as the project manager and technical leader for the development of a comprehensive watershed management plan and restoration strategy for the Jamaica Bay watershed, a 155-square-mile watershed in a highly urbanized portion of Brooklyn and Queens on Long Island. As a part of this effort, directed a diverse team of scientists, engineers, and planners, and is the primary author of the watershed management document. Duties included the review and integration of existing technical research into the watershed management plan; the analysis and application of complex water quality models, estuarine ecology, and city planning documents; GIS data analysis and management; coordination with project partners and a large body of stakeholders (including federal, state, and local agencies and community members); technical writing; and the production of a peer-reviewed watershed management plan.

Technical Leader; Allen Fork Headwaters Restoration Feasibility Analysis; Sanitation District Number One; Boone County, Kentucky; March 2005 to Sept 2005. In an effort to address impending urban development in a small catchment in rural Kentucky, served as the technical lead on a watershed assessment of the Allen Fork Headwaters for the local sanitary district. This work included a field and GIS-based survey of ecological and geomorphic conditions and stormwater management facilities. Prepared a report that summarized existing environmental conditions, recommended conservation and restoration actions, and assessed the applicability of low-impact stormwater BMPs and practices throughout the watershed.

Technical Leader; Cub Run, Bull Run, and Horsepen Creek Mitigation Opportunities Assessment; Fairfax County Department of Public Works; Fairfax County, Virginia; July 2006 to Aug 2007. Served as the technical lead in the development of a stream, wetland, and riparian restoration assessment in the Cub Run, Bull Run, and Horsepen Creek watersheds of western Fairfax County, Virginia. The project team applied novel channel restoration techniques, involving hydrologic reconnection to historic floodplain terraces through the filling of incised channels in key locations. Directed the technical effort, including characterization of channel and riparian conditions, GIS analyses, developing restoration concepts, cost estimates, and preparing a technical report. Served as the primary contact with the Fairfax County Department of Public Works and Stormwater Management, and as a technical consultant for the VDOT, VDEQ, and USACE partners in this project.

Stream Restoration Scientist; Sevenmile Creek Channel Restoration and Floodplain Enhancement Project; Tennessee Stream Mitigation Program; Nashville, Tennessee; Oct 2004 to Aug 2005. Assisted in the

development of a restoration design for a 0.5-mile length of channel on the outskirts of Nashville, Tennessee. Project duties included geomorphic assessment of the channel, the development of a hydrologic model for the watershed, modeling and designing a floodplain wetland detention basin, and developing restoration design construction documents for the project site.

Technical Leader; Four Mile Run Restoration Project; Arlington County and City of Alexandria; Arlington County, Virginia; Oct 2004 to Feb 2006. Served as the technical lead for the restoration assessment and design of Four Mile Run, a highly urbanized flood control channel in the greater Washington, DC, metro area. Efforts included a full geomorphic assessment and characterization of the channel; modeling of historic and future trends in channel evolution; working with the USACE to develop an existing conditions and proposed conditions HECRAS hydraulic model; modeling bed and bank vulnerability; defining a channel restoration process and method; and evaluating the feasibility of wetland expansion in the tidal reaches.

Stream Restoration Scientist; Moose Lodge Creek Restoration Project; City of Aberdeen; Aberdeen, Maryland; Nov 2004 to July 2005. In an effort to restore 1,000 linear feet of Moose Lodge Creek within the City of Aberdeen, was responsible for stream channel survey and assessment, restoration design, reference reach survey, hydrologic modeling, and floodplain delineation. In addition, researched potential development restrictions on neighboring private properties as a result of local riparian buffer conservation ordinances and FEMA flood hazard zones.

Stream Restoration Scientist; Plumtree Creek Restoration Project; Harford County; Harford County, Maryland; Oct 2004 to Aug 2005. Responsible for performing a feasibility study and conceptual stream restoration plan for the restoration of Plumtree Run from Route 24 to approximately 1,000 feet downstream of Tollgate Road. Duties included a comprehensive stream morphological assessment; riparian conditions survey; wetland delineation; and reference reach search and data collection. Also responsible for performing a hydrologic and hydraulic analysis, developing construction drawings, and submitting a report on the restoration design process.

Stream Restoration Scientist; Rockcrest Creek Restoration Project; City of Rockville Public Works Department; Rockville, Maryland; Sept 2004 to Nov 2007. As a project restoration scientist, developed a restoration design for almost 2 miles of Rockcrest Creek. Duties included a survey and assessment of current channel conditions, stable channel design and improvement of riparian conditions along the creek, bank stabilization, and managing stormwater runoff contributions into the mainstream channel. During construction, served as the construction oversight supervisor.

Stream Restoration Scientist; Cypress Creek Restoration; Harris County Flood Control Agency; Harris County, Texas; Dec 2004 to April 2005. Performed an evaluation of existing channel and riparian conditions, flooding potential, and a restoration / flood management concept plan for 30+ miles of Cypress Creek, on the outskirts of Houston, Texas. The field survey included a Rosgen Stream Assessment, identification of bankfull height, width, and channel entrenchment, quantification of bank erosion and channel morphology, and assessment of riparian composition and condition. Aerial photography was used to assess buffer widths. Also served as the primary author on a channel restoration and flood management technical report for the Harris County Flood Control District.

REPRESENTATIVE PROJECTS - SAN FRANCISCO ESTUARY INSTITUTE (1999 - 2001)

Geomorphic Assistant; Wildcat Creek Watershed Analysis; Contra Costa County, California; 1999 to 2001. Served as an assistant to primary investigator Laurel Collins in the development of a report on the ecology and geomorphology of Wildcat Creek. Duties included geomorphic field work, including the survey of 5 miles of stream channel, quantification of colluvial sediments sources, classification of erosion mechanisms, development of a geomorphic data management spreadsheet, bathymetric surveys, technical writing, and report production.

Geomorphic Assistant; Crow Creek Watershed Analysis; Alameda County, California; 2000 to 2001. Served as an assistant to primary investigator Laurel Collins in the development of a sediment budget for Crow Creek.

REPRESENTATIVE PROJECTS - NATURAL HERITAGE INSTITUTE (1999-2000)

Geomorphic Assistant; Carman Creek Geomorphic Analysis; Sierra County, California; 1999 to 2000. Served as an assistant for the geomorphic assessment of Carman Creek to inform the restoration of a high Sierra meadow ecosystem.

PROFESSIONAL DEVELOPMENT

Applied Fluvial Geomorphology (Rosgen Level I) by Dave Rosgen, Wildland Hydrology
Sediment Transport to Forecast Channel Change by Peter Wilcock, Johns Hopkins University, 26-28 January, University of California Berkeley (2004)
WEAP Software Training by SEI (2012)

TEACHING EXPERIENCE

UC Berkeley, Hydrology for Planners, Graduate Student Instructor, Spring 2004
UC Berkeley, Introduction to Environmental Sciences, Graduate Student Instructor, Fall 2002

PROFESSIONAL ORGANIZATIONS/AFFILIATIONS

Society for Ecological Restoration
Salmonid Restoration Federation

WATER ENERGY INNOVATIONS, INC.

Water Energy Innovations, Inc. was established in 2012 to advance knowledge and understanding of the nation's water-energy nexus. Through a diverse portfolio of activities, the firm is developing and implementing cross-

cutting policies, programs, practices and tools that can attain the substantial resource, economic and environmental benefits that lie at the intersection of water, energy and the environment.

New policy and market frameworks will be needed to support joint planning and management of water and energy resources that have heretofore been separately managed. To assure cost-effective deployment of limited public and ratepayer investments, one of the firm's core strategies is to maximize "leverage" – of resources, relationships, and complementary initiatives.

Achieving meaningful and enduring change requires proactively engaging the participation of all of the key stakeholders that have a significant role in implementation. To this end, Water Energy Innovations is working with policymakers, regulators, water and wastewater agencies, energy utilities, industry associations, research organizations, non-governmental organizations, and a wide variety of other market participants throughout the U.S. to develop and promulgate a new body of leading best practices for comprehensive, integrated planning and management of water and energy.

Laurene Park,
CPA, President

Education

M.B.A., Golden Gate University, San Francisco, CA
B.A., Anthropology, University of Hawaii, Honolulu, HI

Professional Certifications

Certified Public Accountant, California, License #57542

Summary of Experience

Ms. Laurie Park has nearly 30 years of experience in water and energy resources and infrastructure policies, planning, development and management. For seven of those years, she directed all resource and business planning and development for Hetch Hetchy Water and Power, an operating division of the City and County of San Francisco. During the last two years, she served as General Manager. While with Hetch Hetchy, Ms. Park managed all facets of the utility's operations: water supply planning; watershed management; reservoir and hydropower plant operations; wholesale and retail power and transmission contracts and services; capital projects planning; infrastructure security; and emergency response.

Since 2002, Ms. Park has been a consultant advising state agencies, local governments, water agencies, and energy utilities on resource efficiency and sustainability policies, programs, practices, and technologies. In October 2012, Ms. Park established her own business, Water Energy Innovations, for the purpose of dedicating her career to achieving the incremental resource efficiency, economic, environmental and other benefits that are achievable at the intersection of water, energy and climate. Below is a summary of representative project experience.

Embedded Natural Gas in Water Calculator (2012-2013). Ms. Park led the development of a spreadsheet tool to compute the embedded natural gas in water within Southern California Gas Company's (SoCalGas) service area. The project included analyzing natural gas usage by the largest water and wastewater customers that collectively

account for about 90% of SoCalGas' non-power production natural gas sales, and mapping their natural gas consumption to segments of the water use cycle. Computing energy intensity required collecting corresponding water data (volume transported, pumped, treated, distributed, etc.) to estimate the amount of natural gas used per acre-foot or million gallons of water by segment of the water use cycle. Embedded natural gas was computed for each participating agency, and for natural gas consumption upstream (by its water suppliers) and downstream (i.e., for wastewater collection, treatment and disposal).

The purpose of this project was to support SoCalGas in developing its testimony at the California Public Utilities Commission with respect to determining the cost-effectiveness of water-energy measures.

The Role of Natural Gas in California's Water-Energy Nexus (2012-Present). A white paper about distributed natural gas applications in the water and wastewater sectors, and the potential for using new natural gas engines for water pumping to reduce peak electric demand; increase electric reliability; accelerate the shut-down of aged, inefficient fossil fuel plants; and increase the state's ability to effectively integrate high quantities of intermittent renewable energy (e.g., wind and solar). The paper is presently undergoing technical review and is planned for release in March 2013.

Business Case for Natural Gas Drives for Wholesale Water Conveyance

(2012-Present). Ms. Park is assisting Southern California Gas Company's Business Growth Initiatives group in developing a business case for using natural gas for wholesale water conveyance. The business case includes evaluating the potential net benefits that can be achieved by increasing the state's capabilities for integrating intermittent renewable resources with new "flexible power" engines that have very quick on/of and ramp-up/ramp-down capabilities. (One of GE's new engines can accelerate from zero to 100MW within one minute.)

Selected Experience, GEI Consultants, Inc.

Regulatory Monitoring and Participation (2012). Ms. Park assisted multiple water and wastewater agencies in monitoring and participating in proceedings at the California Public Utilities Commission with respect to water-energy nexus programs, energy efficiency, demand response, and renewable energy.

Forebay Improvement, El Dorado Irrigation District, Placerville, CA(2011).Ms. Park conducted an economic assessment of dam raise alternatives under various scenarios of dam height, reservoir capacity and operations, and historical inflows. Multi-year net project cash flows, debt service coverage, simple payback, and internal rates of return were computed for projected ranges of potential power prices under terms of a long-term Power Purchase Agreement (PPA) with Pacific Gas and Electric Company, and estimated capital costs and options for financing the system modifications.

Assessment of a New In-Conduit Hydropower Technology on behalf of a Confidential Investor

(2011) Ms. Park developed the scope and approach, and participated in evaluation of the technical and market potential of a new vertical axis turbine.

Water-Energy Case Study, Southern California Gas Company

(2011) Ms. Park led technical support of a water-energy case study on behalf of Southern California Gas Company's California Sustainability Alliance program. The study included collection, compilation and analysis of hourly electric, natural gas and biogas data for Eastern Municipal Water District (EMWD), a regional water district in southern California that provides water, wastewater and recycled water services to nearly 700,000 customers within its 542 square mile service area.

FloodSAFE California Program Management, California Department of Water Resources,

Sacramento, CA

(2011–ongoing) Ms. Park served as Deputy Project Manager for a multi-year support contract for the FloodSAFE program that requires changing the state's flood management policies, programs, systems, practices, and procedures to support the state's multi-billion dollar investments.

Strategic Energy Assessment, North Kern Water Storage District, Bakersfield, CA (2011) Ms. Park conducted an assessment of options for reducing the district's energy costs that fluctuate significantly with changes in hydrology. The study included a review of tariff options for electricity purchases and an assessment of the range of potential risks and benefits of distributed renewable energy generation options under California's complex power market rules and regulations. The study also included a review of the relative economic performance of a proposed small hydropower facility.

Selected Experience, Navigant Consulting, Inc.

California's Water–Energy Policy Initiative, Rancho Cordova, CA (2003 to 2010). While with Navigant Consulting, Ms. Park managed a variety of client projects:

- *California's Water–Energy Relationship*, the California Energy Commission's (CEC's) landmark study in 2005 that water-related uses account for nearly 20 percent of the state's electricity requirements. Ms. Park wrote portions of the narrative. She also wrote Appendix E, *A Water Energy Roadmap*, in collaboration with multiple stakeholders that participated in the Water–Energy Relationship Working Group that had been formed to help the CEC develop its water–energy findings and recommendations.
- *Statewide Small Hydropower Assessment (2004–2005)*, a study conducted on behalf of the CEC about the potential of small hydropower to help meet the state's Renewable Portfolio Standard (RPS)
- *Water–Energy Research, Development and Demonstration (RD&D) Strategy and Roadmap (2006–2008)*, the CEC' first research portfolio for this emerging area of study
- *The Role of Recycled Water in Energy Efficiency and Greenhouse Gas Reduction*, a study about the potential to achieve substantial energy savings and associated greenhouse gas emissions reductions by accelerating development and beneficial use of recycled water in southern California.
- *Embedded Energy in Water Studies (2009–2010)*, co-managed (with GEI Consultants) two substantial water energy studies for the California Public Utilities Commission (CPUC) that were conducted to facilitate the CPUC's deliberations as to whether and how energy "embedded" in water should be recognized in the state's energy efficiency programs. Ms. Park directed all technical aspects of the work, developing the approach and methodology, data collection and compilation guidelines, and the design of the two tools that were developed through this project:

California Sustainability Alliance, Rancho Cordova, CA (2005 to 2010). Ms. Park designed and managed the California Sustainability Alliance, an innovative market transformation program designed to accelerate adoption of energy efficiency by combining it with complementary sustainability measures (water efficiency, renewable energy, greenhouse gas reduction, transit-oriented development, waste reduction and "smart" growth). The Alliance program encompassed a wide variety of activities: studies about the potential for accelerating adoption of green buildings through green leases; development and implementation of an Emerald California pilot program with the Department of Conservation; evaluation of the energy efficiency and greenhouse gas benefits of recycled water; evaluation of the energy and water efficiency and greenhouse

gas reduction potential of new technologies; conduct of an annual Sustainability Showcase awards competition; and conduct of utilities sustainability roundtables. At the heart of the Alliance program was a unique multi-stakeholder collaborative process that brought together senior policy and industry leaders from all of the key market segments whose support and participation was deemed essential for successfully overcoming sustainability barriers.

Summary of Experience, Hetch Hetchy Water and Power

Hetch Hetchy Water and Power, San Francisco, CA (1995 to 2002). Prior to joining Navigant Consulting, Ms. Park managed all resource and business planning and development for San Francisco's municipal utility, Hetch Hetchy Water and Power. The Hetchy Hetchy system is comprised of five reservoirs and a water bank with a combined storage capacity of 1.2 million acre feet; four hydroelectric generation stations with a combined peak capacity of 400 megawatts (MW); 650 square miles of forested watershed; 165 miles of aqueducts, pipelines, high voltage transmission lines and rightsofway; and 150 staff in Tuolumne and San Francisco counties. Hetch Hetchy supplies an average of 220 millions of gallons per day, or 85 percent of the drinking water consumed by San Francisco and its 29 Bay Area wholesale customers. Hetch Hetchy also supplies about 15 percent of San Francisco's total electric demand, selling excess hydropower to wholesale customers. Ms. Park's responsibilities included management of all contracts: spot and long-term power sales and purchases, water and power banking, fish releases, transmission services, and generator interconnection. Ms. Park represented Hetch Hetchy in negotiations on various aspects of these contracts, including: basis for determining the amount of firm capacity and energy available for sale; determination of Project Dependable Capacity; bases for water supply forecasts and release decisions; and availability of spinning reserves. Day-to-day operations focused on optimizing the system's water and power resources. Models employing 70 years of historical hydrology were used to prepare reservoir release plans that met water supply, environmental (e.g., fish releases), and safety (e.g., flood control) parameters while maximizing revenues from power operations. Snow pack and inflows were closely monitored throughout the runoff season, and plans as to how best to route the water for maximum generation and minimal spill were adjusted daily. Ms. Park also managed an annual professional services budget of \$3 million per year and a team of consultants and attorneys that supported the city on a wide range of policy, legal and regulatory issues related to the city's water and power planning and operations.

Summary of Experience, Applied Power Technology, Inc. and O'Rourke & Company

Prior to joining San Francisco, Ms. Park worked for an independent power developer (1984 to 1986) and also as a consultant to power developers (1986 to 1994) where she performed economic feasibility evaluations of a wide variety of power generation projects, including wind, geothermal, biomass, biogas and hydroelectric.

- Conducted feasibility of various biomass opportunities in California, including wood and agricultural waste. Assessment of feasibility included consideration of market prices for various grades of wood fuel, as well as avoided disposal costs (landfill tipping fees, transport and other related waste disposal costs). The 18 MW Covanta Pacific Biomass Power Plant in Oroville was constructed as a result of one of these studies. Other projects included agricultural wastes in the central valley of California, and a recycled pallet business in Northern California (that sought to supplement destroyed wooden pallets with residential demolition and green waste materials to blend a wood fuel for sale).
- Evaluated the feasibility of several central geothermal merchant plants in California and Nevada ranging in size from 10 to 50 MW.
- Performed feasibility evaluations of digester gas applications for several cities in Northern California, and developed an operations planning model to optimize operations and economic performance of biogas cogeneration

facilities based on gas production characteristics, digester gas storage capacity, natural gas prices, and the time differentiated avoided costs of utility electric purchases.

Modeling Experience

Water-Energy Load Profiling Tool, California Public Utilities Commission (2009-2010); Access database profiling hourly energy consumption by system, facility and function for water and wastewater agencies.

Wholesale Water-Energy Model, California Public Utilities Commission (2009-2010); predictive model of the state's energy requirements under various scenarios of projected hydrology and water demand by hydrologic region and market sector (residential, agricultural, commercial, industrial, institutional).

Screening and Evaluation Tools, California Energy Commission (2004-2008); various applications: scoring and ranking criteria for identifying high potential RD&D opportunities for state investment; screening level technical and economic feasibility evaluations of small hydropower and other renewable energy options using threshold economic performance and other criteria.

Spreadsheets Evaluating Economic Performance of Proposed Power Projects (1984-Present); economic dispatch models and assessments evaluating energy project financial performance under a wide variety of scenarios (capital and O&M costs; estimated revenues from sales of output under wholesale, retail, or bi-lateral contracts; project net cash flows; debt-to-equity; financing rates and terms; allocated risks and benefits under public-private partnerships and other development structures; etc.)

Water Supply Forecasts and Reservoir Operations Optimization (1995-2002); watershed runoff projections and reservoir operations scheduling given long-term historical hydrology, current and projected water demand, and current and projected power prices.

Professional Associations

- American Institute of Certified Public Accounts (AICPA)
- California Society of Certified Public Accountants (CalCPA)
- The Association of Women in Water, Energy and Environment (AWWEE)

Selected Publications

Principal Author of "California's Water-Energy Nexus: Pathways to Implementation", written on behalf of the Water-Energy Sub-Team of the Governor's Climate Action Team (aka "WET-CAT"), September 2012.

Principal Author of "Statewide and Regional Water-Energy Relationship" and "Water Agency and Function Component Study and Embedded Energy-Water Load Profiles," both conducted by the team of GEI Consultants and Navigant Consulting for the California Public Utilities Commission, August 2010.

Principal Author of "Greening California's Leased Office Space: Challenges and Opportunities," California Sustainability Alliance, May 2009.

Principal Author of "The Role of Recycled Water in Energy Efficiency and Greenhouse Gas Reduction," California Sustainability Alliance, May 2008. Co-Author of "Improved PV Business Models for Zero Energy New Homes: Stimulating Innovation in the California Marketplace," California Energy Commission, Public Interest Energy Research Program [CEC-

500-2007-090], January 2008.

Principal Author of "Statewide Small Hydropower Resource Assessment," California Energy Commission, Public Interest Energy Research Program [CEC-500-2006-065], June 2006.

Contributing Author to "California's Water-Energy Relationship," California Energy Commission, November 2005.

Paul Thomas
CEM

Education

B.S., Business Administration, California State Polytechnic University, 2003

Certifications

Project Management Certification, University of California, Irvine

Certified Energy Manager (CEM) #18746, The Association of Energy Engineers (AEE)

Professional Associations

California Water Energy Coalition (CalWEC) – Executive Committee Member

Background

Paul Thomas, a certified project manager, has developed, managed and implemented electric and gas utility customer energy programs with portfolio budgets in excess of \$50 million. In addition to leading Southern

California Edison's (SCE) award-winning water-energy nexus pilot project, *Water Leak Detection Program*, he played a pivotal role in implementing California's *Energy Upgrade California* program, an unprecedented alliance among California counties, cities, non-profit organizations, investor-owned energy utilities, and publicly owned utilities.

Mr. Thomas also led the design, development and implementation of energy efficiency initiatives, programs and projects for water and energy utilities, governmental entities, non-governmental organizations, and endues customers in all market sectors. His activities focus on helping state agencies, utilities and stakeholders formulate, assess and implement new and changed policies designed to achieve California's ambitious energy efficiency, GHG emission reduction and water use efficiency goals. A recognized leader in California's water-energy nexus initiative, Mr. Thomas is a founding member of the California Water-Energy Coalition (CalWEC) and serves on its Executive Committee. CalWEC has received international recognition for its success in fostering voluntary collaboration among water, energy, environmental and other stakeholders committed to accelerating development and implementation of programs and strategies for integrated optimization of the state's water and energy resources.

Selected Experience

Embedded Natural Gas in Energy Calculator – Mr. Thomas is a member of the Water Energy Innovations team that conducted research and analyses, and developed a spreadsheet tool, to assist Southern California Gas Company in computing the amount of natural gas used by its water and wastewater customers within the water use cycle. The project included collecting, compiling and analyzing natural gas consumption data and associated water data (i.e., the amount of water or wastewater that was transported or treated with the natural gas) to compute energy intensity by segment of the water use cycle. Mr. Thomas worked with water and wastewater agencies to develop profiles that described their water and wastewater operations, and

how they used natural gas in their systems.

The Role of Natural Gas in California's Water-Energy Nexus – Mr. Thomas is a member of the Water Energy Innovations team that is conducting research and writing a white paper about the potential costs and benefits of using natural gas for water pumping. The scope of the paper includes an exploration of the relative performance, fuel and operating costs, air quality constraints, and other issues related to natural gas engines. The paper is also exploring the potential benefits to the state's electric system by increasing flexible power capacity for increased electric reliability and improved capabilities for effectively integrating large quantities of intermittent renewable resources into the state's electric portfolio. Mr. Thomas conducted research into the fuel and emissions performance of various types of gas engines, and the types and costs of technologies available to reduce emissions to levels needed for compliance with air quality permits.

Energy Upgrade California – In 2011, Mr. Thomas was brought in as lead project manager to help boost customer participation in Energy Upgrade California (EUC), a statewide, comprehensive residential retrofit program offering technical assistance and financial incentives for energy upgrades. EUC teaches home owners and contractors to view the home as an entire system, with the goal of accelerating implementation of cost-effective residential energy efficiency measures. The program therefore benefits participants by increasing home comfort and reducing utility bills for the homeowner and also creates "green jobs" through education and support provided to residential contractors. At a state level, the program reduces demand for electric, gas and water resources by reducing consumption of energy and water and reducing GHG emissions. Mr. Thomas helped dramatically improve program performance and acted as an ambassador for the program, creating new partnerships and strengthening those existing.

Sustainable Communities – Mr. Thomas was also the project manager for Sustainable Communities, a new construction energy efficiency program focused on comprehensive sustainability for community-scale, master-planned and zero net energy (ZNE) projects. Sustainable Communities was tasked with contributing significantly to the "Big Bold" goals outlined in the California Long Term Energy Efficiency Strategic Plan to achieve the state's vision for "Zero Net Energy." The program is currently on track to exceed its goals.

Water-Energy Pilot – In 2008, Mr. Thomas was charged with managing SCE's Water-Energy Pilot, a landmark statewide effort comprised of both studies and demonstration projects designed to significantly advance understanding of California's water-energy relationship. Mr. Thomas designed, developed and implemented the successful Water Leak Detection Program which paved the way for integration of the water energy nexus into California investor owned utilities' portfolios of energy efficiency program offerings.

Water-Energy Sustainability Initiative – In addition to managing the above customer utility programs, Mr. Thomas led SCE's water-energy strategy efforts for its internal sustainability initiative. In this role, he worked with the Director of Sustainability to develop a strategy for integrating the water-energy nexus into SCE's own internal operations, as well as to identify additional opportunities for water-energy programs and measures for its customers.

Vendor Program – Mr. Thomas developed and implemented Southern California Gas Company's (SoCalGas) first successful trade ally effort, the "Vendor Program". This innovative program forged partnerships between SoCalGas and outside vendors, obtaining their assistance in promoting utility energy efficiency programs and measures. The result was a triple win, as customers enjoyed more energy savings and rebates, vendors increased their business, and the utility benefited from a new and very effective channel for delivering energy efficiency messages, programs, and education. The success of this program led to the utility achieving record energy savings - more than 2 million therms in less than two years - for the vendor program alone.

Account Management – From 2003 to 2006, Mr. Thomas managed more than 1,000 commercial customer accounts for SoCalGas including national retail, restaurant and supermarket chains, acting as primary contact for all interactions between the customer and company. A key objective of this role was promoting energy efficiency projects and programs to the assigned customer base. Mr. Thomas effectively assisted customers in prioritizing energy efficiency, demonstrated by consistently exceeding goals.

Energy Audits – From 1998 to 2006, Mr. Thomas conducted energy efficiency audits for small (5-50,000 annual therm usage) and large (50,000+ annual therm usage) commercial customers of SoCalGas, offering recommendations for energy saving and resultant utility bill reductions.

Jonathan Bower, Associate

Education

Bachelor of Engineering, Chemical and Biochemical Environmental Engineer (2006) AABET Accredited.
Bachelor of Arts, major in Economics (2007).

Additional Training & Certification

Canadian Securities Course (Feb 2009) [similar to Series 7]
Greenhouse Gas Project Level Accounting (Aug 2008)

Summary of Experience

Jonathan Bower is a chemical engineer and greenhouse gas carbon management specialist. His diverse experience includes analyzing emerging technologies and developing emission profiles and models. He has provided regulatory analysis on provincial, state and federal levels for both Canada and the U.S. He has also conducted analyses, quantification and strategy development for a wide variety of technologies: municipal solid waste, bio-fuels, biomass, agricultural related projects, district heating, anaerobic decomposition, ozone depleting substances, and forestry management. Most recently, Mr. Bower served as a Sustainability and Energy Analyst, assisting clients in water-energy integration and renewable energy solutions in California.

REPRESENTATIVE PROJECT EXPERIENCE

Water-Energy Nexus

- ***Natural Gas Embedded in Water Calculator (Southern California Gas, 2012-Present)*** - Mr. Bower is leading the development of an Excel-based calculator that documents all of the natural gas embedded in each participating agency's water (i.e., including upstream water agency suppliers and downstream wastewater agencies).
- ***The Role of Natural Gas in California's Water-Energy Nexus (Water-Energy Sub-Team of the Governor's Climate Action Team, 2012-Present)*** - Mr. Bower is conducting research and analyses about air quality regulations, emissions controls technologies, greenhouse gas sequestration, and California's new Cap and Trade regulation for a water-energy policy paper for WET-CAT. Mr. Bower is also developing an analytical framework for evaluating the efficacy and regulatory challenges associated with converting electric motors to natural gas engines to increase electric reliability and resiliency in California.
- ***Water-Energy Load Profiling Tool*** - Mr. Bower developed a SQL-based tool for developing water-energy load profiles for water and wastewater agencies. The tool modeled the hourly time-of-use profile and computed the energy intensity of various systems and functions within water and wastewater treatment plants.

Sustainability and Clean Energy Projects

Corporate Sustainability Benchmarking and Reporting – Mr. Bower developed annual corporate sustainability reports and greenhouse gas benchmarks for a professional/technical services firm

Solar Project Evaluations and Market Assessments – Mr. Bower monitored developments in the U.S. and global solar markets and assisted in conducting project financial analyses for proposed client solar photovoltaic projects.

Customer Energy Programs – Mr. Bower analyzed regulated utility customer energy efficiency and renewable energy programs for client projects under Feed-In-Tariffs in New York, California, and Vermont; and for energy efficiency programs regulated by the California Public Utilities Commission.

Cap and Trade – Mr. Bower monitored developments under implementation of California's Global Warming Solutions Act [Assembly Bill 32] and the states recently implemented Cap and Trade regulation governing greenhouse gas emissions and establishing a market for trading greenhouse gas emissions credits.

Technology Market Assessments – Mr. Bower conducted market assessments of new technologies for wind energy projects in China and opportunities in Ontario, Canada under the provinces solar Feed-in-Tariff regime.

GHG Emissions Markets (Blue Source) – For the premier carbon offset and environmental commodity firm in North America, Mr. Bower developed a broad spectrum of work products and services including: in-depth analysis, technical review, commercialization strategies, greenhouse gas (GHG) emission inventories and market analyses. Key achievements included:

- Developing a full scale detailed greenhouse gas lifecycle analysis of a biofuel operation for clients.
- Developing lifecycle analysis and overall carbon impacts of a California municipal wastewater facility looking at different expansion options.
- Providing quantification and analysis for GHG offset projects pertaining to municipal solid waste, biofuels, biomass, agricultural projects, energy, anaerobic decomposition, ozone depleting substances and in the forestry sector.
- Developing and leading technical review of a GHG offset protocol to an audience of experienced professionals, academics and government employees, which is in current commercial use in the Alberta Offset System.

Clean Tech Funding – Prepared the technical component for clean tech funding and project development at a small energy consulting/investment company. Developed GHG models and analysis for prospective funding applications and provided analysis for new business and market opportunities. Key achievements included:

- Preparing successful proposals for clients seeking federal and provincial govt funding for new business (e.g. renewable energy micro grids [\$7.5 million], green housing technology and hydrogen fired boilers [\$25 million], nuclear fuels [\$25 million].)
- Conducting research, data gathering and analysis for Japanese investment into Canadian and US agriculture markets

Tim Kidman

Education

Master of Environmental Science & Management (2008)
University of California, Santa Barbara Bren School

Bachelor of Arts (B.A.), Philosophy (2002)
Wesleyan University

Key Expertise

- California Greenhouse Gas Markets
- Greenhouse Gas Reporting
- Greenhouse Gas Emissions Accounting
- Policy Analysis and Evaluation
- Economic Analysis

Data Management and Analysis

Tim Kidman is a Senior Climate Change and Energy Analyst with who works on greenhouse gas (GHG) offset and climate policy, and related sectors including energy efficiency, renewable energy, and transportation. Mr. Kidman has supported the implementation of EPA's Greenhouse Gas Reporting Program (GHGRP) and California Air Resources Board's (ARB) mandatory reporting of GHGs. For SMUD, he recently completed a dynamic economic model for assessing the economics of GHG mitigation measures ranging from energy efficiency to offsets. Mr. Kidman has in-depth knowledge of the offset market, standards development process, verification, and project monitoring. He has worked with clients such as the U.S. EPA, Energy Information Administration, California ARB, Department of Defense, Washington Gas, SMUD, and Pasadena Water & Power. He holds a Master of Environmental Science & Management from the University of California, Santa Barbara where he specialized in economics, and a B.A. from Wesleyan University.

RELEVANT PROFESSIONAL EXPERIENCE

[State of Washington Climate Legislative and Executive Workgroup \[2013\]](#)

For the State of Washington, Mr. Kidman led research into GHG policies in other jurisdictions to explore their potential to achieve emission reductions if implemented in Washington. The research contributed to an effort led by Governor Inslee to better understand potential policy options for the State to achieve established GHG reduction targets. Research was conducted on approximately fifteen different types of policies (e.g., Cap and Trade) and multiple instances of each (e.g., California or Quebec), across a variety of criteria including cost effectiveness, economic impacts, volume of reductions, and potential for infrastructure investment.

[United States Department of Defense \(DoD\) \[2011-2013\]](#)

In support of the Department fulfilling GHG inventory obligations under EO 13514, Mr. Kidman has provided data and methodology quality assurance through Federal Energy Management Program (FEMP) spreadsheet portal preparation of inventories for 15 agencies within the Department, and for the agency-aggregated DoD inventory. Mr. Kidman assisted in the compilation of GHG emissions inventories for the Department of Defense, conducted quality control on reported data, and developed an Excel-based tool to help automate the identification of errors in current and future reporting years.

[Sacramento Municipal Utility District \[2013\]](#)

Mr. Kidman led an effort to analyze GHG offset project types not yet adopted by California Air Resources Board to assist SMUD in understanding opportunities to participate in protocol development or execution of pilot projects. The research included interviews with contacts at ARB, the offset project registries (OPR) and utility stakeholders, as well as detailed review of the available technical literature.

[Arlington County, Virginia \[2012-2013\]](#)

Supported the County in conducting its GHG inventory, including data analysis and quantification. Subsequently, prepared an Excel-based tool for the County. The tool allows the County to execute future inventories without consultant participation and with minimal resources.

[Marginal Abatement Cost Curve for Sacramento Municipal Utility District \[2012-2013\]](#)

For the Sacramento Municipal Utility District (SMUD) Mr. Kidman led a team to analyzing all available climate mitigation opportunities to create a dynamic marginal abatement cost curve model. This includes analysis of energy efficiency, renewable energy, building and vehicle electrification, and greenhouse gas offset measures. The model analyzes the economic costs and benefits of each measure based on user-specified time horizons, discount rates, and other dynamic parameters.

[California Air Resources Board \[2011-2013\]](#)

Mr. Kidman supported the California ARB in implementation of the state's GHG reporting program, California e-GGRT. This included building full-functionality calculation and reporting tools for electric power entities, suppliers of transportation fuels, and petroleum and natural gas systems.

[United States Environmental Protection Agency \[2012 - 2013\]](#)

Mr. Kidman supports the implementation and improvement of EPA's Greenhouse Gas Reporting Program (GHGRP) including content development for the e-GGRT GHG Reporting Instructions; construction of Excel-based calculation tools, serving as a subject matter expert with the program's help desk to answer rule-related questions, and reviewing the consistency of the rule's requirements.

[Confidential Client \[2011-2012\]](#)

For a confidential client, Mr. Kidman created a highly parameterized life cycle assessment (LCA) tool using peer-reviewed life cycle inventory data. The tool is capable of performing a highly detailed LCA, including multiple life cycle phases and product components, based on cascading algorithms derived from limited user inputs. He contributed to market research, data collection, model construction, and execution of model runs

[Washington Gas \[2011-2012\]](#)

For Washington Gas, Mr. Kidman performed GHG analysis of operational emissions associated with its natural gas transmission and distribution network to inform GHG reduction goal setting. This included a review of system characteristics, identification of low-cost/high-yield opportunities, and compilation of data for management review.

[State of Maryland \[2011-2012\]](#)

For Maryland Department of the Environment, Mr. Kidman performed policy analysis to quantify the emissions impacts and reductions associated with proposed and existing policies aimed at increased use of renewable energy resources.

[Climate Action Reserve \(CAR\) \[2011\]](#)

Mr. Kidman led the research and writing of an issue paper analyzing the feasibility of bioreactor landfill protocol implementation for the Climate Action Reserve (CAR). The issue paper analyzed project eligibility,

regulatory implications, monitoring, and GHG calculation methodologies. Using the final product, CAR will determine whether to develop an offset protocol for bioreactor landfills.

[Sacramento Municipal Utility District \[2011\]](#)

Mr. Kidman prepared a report informing the direction of SMUD's green power program. This included research on current and projected trends in voluntary renewable energy purchases; analysis of the drivers of residential and nonresidential participation; review and critical assessment of the debate around use of renewable energy credits; analysis of the likely interactions between voluntary renewable electricity purchases and California's increased renewable portfolio standard and cap and trade regime. This work includes analysis of the intersection between renewable energy credits (RECs) and offsets, considering the impacts that RECs may have on offset additionality.

[United States Energy Information Administration \[2011\]](#)

For the Energy Information Administration, Mr. Kidman is assessing the lifecycle emissions associated with biomass and biofuels from forest and agricultural feedstocks in the context of the National Energy Modeling Software (NEMS). This work includes analysis of the treatment of biogenic emissions within NEMS, and a critical examination of the literature in the areas of management induced emissions and carbon debts/dividends.

[United States Environmental Protection Agency \[2011\]](#)

For the U.S. Environmental Protection Agency (EPA), Mr. Kidman contributed analysis and recommendations for improving the accounting framework and additionality requirements for the Climate Leaders greenhouse gas (GHG) offset protocols. Mr. Kidman is also scoping additional project offset categories. He performs data collection, literature review, and quantitative and qualitative analyses.

[Climate Action Reserve \[2008-2011\]](#)

As an employee of the Climate Action Reserve, Mr. Kidman

- Supported the Reserve's international forestry work, and presented in front of the Governor's Climate and Forest Task Force (GCF) in Aceh, Indonesia. He performed a multi-criteria analysis to inform organizational strategic development by analyzing tropical forest countries' political, ecological, and institutional Reducing Emissions from Deforestation and Degradation readiness.
- Authored the Reserve's ozone depleting substances offset protocols for the U.S. (approved by California Air Resources Board for use under AB 32) and Article 5 countries, working with representatives from the U.S. EPA, World Bank, California Air Resources Board, UNDP, the refrigerant industry, GHG project developers, and GHG verification bodies. He utilized the EPA's Vintaging Model to construct a performance standard and quantification methodology, and developed robust monitoring and verification criteria to ensure GHG project/offset integrity. He performed oversight of ODS projects, and implemented monitoring and verification revisions to improve process and performance.
- Led the Reserve's work on several landfill methane GHG offset protocols. This work included: accurate quantification of GHG reductions; research on monitoring technology requirements; review of landfill practices; development of policies balancing data quality, verifiability, and cost; market assessments of landfill gas destruction operations; NPV analyses of landfill mitigation technologies; and oversight of verification training and process.
- Worked with stakeholders from the natural gas industry to write GHG accounting methodologies for natural gas transmission & distribution. This work was conducted with the participation of El Paso

Corporation, Pacific Gas & Electric, American Gas Association, American Petroleum Institute, Interstate Natural Gas Association of America and others.

- Performed research to inform priority-setting and development of new GHG offset protocols for the Climate Action Reserve. He conducted targeted and extensive background research to assess the viability of each offset type, with particular focus on market demand, additionality, availability of monitoring methodologies, quantification uncertainties, and verifiability.
- Developed verification oversight procedures for Reserve-accredited verifiers. As lead on the most widely used protocols, he conducted numerous landfill and ODS site visits, performed oversight on individual verifiers and verification bodies, crafted internal procedures for documenting and assessing verifier performance, and oversaw final review of verification materials and credit issuance.
- Contributed to the Verification Program Manual, the Reserve's primary resource and rulebook for the verification of GHG offset projects. He developed policy and drafted sections on setting materiality thresholds, the use of professional judgment, reporting findings, and oversight.
- Contributed to the Reserve's composting and organic waste digestion GHG offset protocols. He provided conceptual direction in the accounting of baseline and project accounting, and assisted in preparing protocol elements.
- Wrote training materials and exams, and taught verification courses required by the Reserve for all lead verifiers. He has trained dozens of lead verifiers on essential skills and understanding of protocols, and certified their competency to conduct high-quality verifications and exercise professional judgment.

GREEN INFO NETWORK

GreenInfo Network (www.greeninfo.org) provides Geographic Information System (GIS) and related technology support to a wide range of water, land conservation and many other types of projects throughout California and the U.S. A nonprofit, GreenInfo Network assists other public interest groups and agencies working at local, regional and national scales, providing them with services including data creation and acquisition, geospatial analyses, geographic modeling, conservation and land use planning, watershed-based planning and modeling, database development, and high quality communications design and cartography. GreenInfo Network's staff is highly skilled in effective, efficient and creative use of information technology to help clients more effectively understand and communicate the relationships between issues, people and places.

MEGAN DREGER

Biographical Information

2012 – Current Associate Director, GreenInfo Network
San Francisco, California

GreenInfo Network is a non-profit group supporting over 500 public interest organizations and agencies. With a staff of 12 specialists, we assist groups with GIS technologies and other technical services such as: database design, data development, spatial analysis, map creation/production, web mapping, and presentation materials

2010 – 2011 Intern, City of Los Angeles Watershed Protection Division
Los Angeles, California

Researched policy, design guidelines, and technology in support of departmental goals. Created conceptual and schematic designs for grant submissions. Wrote project descriptions, prepared design presentation

2004 - 2008 Head of GIS, Data, and Government Information Division
University of California, San Diego Library

Managed a staff of seven in a busy research area of the UCSD library. Oversaw a GIS and Social Science Data lab used by UCSD faculty, staff, and students. Lectured on policy research, statistical research, and data analysis. Provided specialized research assistance in a variety of areas, including public policy, GIS, and social

1997 - 2004 Head of Government Information and GIS Department
San Diego State University Library

Managed a staff of five and oversaw several large collections. Initiated, developed, and managed a GIS service for SDSU faculty, staff, and students. Provided specialized research assistance in a variety of areas, including

EDUCATION

2011	Master of Landscape Architecture Cal Poly Pomona
1997	MS in Library Science University of North Carolina, Chapel Hill
1992	BA in Art History University of Oregon

AUBREY L. DUGGER

CURRICULUM VITAE

Phone: 310-663-5115, Email: aubrey@newtide.org, Web: www.newtide.org

SUMMARY

Aubrey Dugger has been providing GIS support to water and land resource management projects throughout California since 1998 through work as a research scientist with Natural Heritage Institute, GIS consultant, project manager, and Associate Director with GreenInfo Network, and currently as an independent consultant. Aubrey brings a background in environmental engineering focused on hydrology and water resources as well as 15 years of experience in the GIS field. Her expertise includes data/database creation and management, advanced geospatial analyses, watershed-based planning, hydrological modeling, and communications design. Aubrey has experience as lead GIS consultant on local site restoration projects such as Los Angeles County's Ballona Wetlands, watershed-scale management plans like the Arroyo Seco Watershed Management and Restoration Plan, and regional and statewide efforts such as strategic planning for stormwater management in Southern California. Aubrey's work balances creative and efficient use of highly technical analytical tools with the critical communication needs of effective resource management.

EDUCATION

PhD Candidate in Environmental Science 2008–2013 (expected)

University of California at Santa Barbara, Bren School of Environmental Science and Management

Focus: Hydrology, Ecohydrologic Modeling, Water Resource Management

Master of Science in Engineering 1997

University of Texas at Austin, Department of Civil and Environmental Engineering

Focus: Hydrology, Water Resource Management, Geographic Information Systems (GIS)

Bachelor of Science in Engineering, cum laude 1996

Duke University, Department of Civil Engineering

PROFESSIONAL EXPERIENCE

Independent Consultant

Santa Barbara, California (<http://www.newtide.org>)

2008 – current

Associate Director and Senior Project Specialist 2000 – 2008

GreenInfo Network - Los Angeles, California (www.greeninfo.org)

GIS Specialist 1999–2000

GreenInfo Network - San Francisco, California (www.greeninfo.org)

Staff Scientist
1999

1998 -

Natural Heritage Institute - San Francisco, California (www.n-h-i.org)

KEY PROJECTS (selected)

Los Angeles Integrated Regional Water Management Plan Update, RMC Water and Environment, Geosyntec Consultants, 2011-12
Orange County Renewed Measure M Environmental Cleanup Program's Tier 2 Grant Program, Orange County Transportation Authority, Geosyntec Consultants, 2011-12
Water Security and Climate Change, Los Alamos National Laboratory, 2008-12
A Clear Blue Future, Natural Resources Defense Council, 2008-09
Green Solutions Water Quality Assessment for Los Angeles County, Community Conservancy International, Santa Monica Bay Restoration Commission, Santa Monica Mountains Conservancy, 2007-10
Ballona Wetlands Restoration Project, California Coastal Conservancy, 2007-09

Los Angeles County-Wide Methodology For Prioritizing Structural BMP Implementation: Guidance for Strategic Storm Water Quality Project Planning, Heal the Bay, Los Angeles County, 2005-06
Arroyo Seco Watershed Management and Restoration Plan, Northeast Trees, 2004-05
California Legacy Project, State of California Resources Agency, 2001-02
An Environmentally Optimal Alternative for the Bay-Delta: A Response to the CALFED Program, Natural Heritage Institute, 1998

PUBLICATIONS & PRESENTATIONS (selected)

Dugger, A.L., Tague, C., Allen, C.D., Ringler, T. How does forest thinning affect short- and long-term water partitioning in the semi-arid Santa Fe Municipal Watershed, and how do these changes compare to unmediated forest responses to climate change? Presentation at the American Geophysical Union Fall Meeting, San Francisco, CA, December 2011.

Dugger, A. L., C. Tague, E. Q. Margolis, C. D. Allen, T. Ringler (2011). Forest-hydrology interactions under a warmer climate: Effects of vegetation productivity dynamics and mortality on streamflow predictions in a semi-arid New Mexico mountain system. Presentation at the Ecological Society of America Annual Meeting, Austin, TX, August 2011.

Dugger, A. L., C. Tague, C. D. Allen, T. Ringler (2010). How Important is Vegetation Drought Stress Response when Predicting Streamflow within the Semi-Arid Santa Fe Municipal Watershed? Presentation at the American Geophysical Union Fall Meeting, San Francisco, CA, December 2010.

Tague, C., Dugger, A.L. Ecohydrology and Climate Change in the Mountains of the Western U.S. - A Review of Research and Opportunities. Geography Compass, November 2010.

Dugger, A.L., Tague, C., Allen, C.D., Ringler, T. Interacting Effects of Land Management Strategies and Climate Change on the Ecohydrologic Systems of the Semi-Arid Santa Fe Municipal Watershed. Presentations at the American Geophysical Union Fall Meeting, December 2009 and MtnClim Biennial Conference, June 2010.

Susilo, K., Dugger, A.L. The Strategic BMP Prioritization Analysis Tool: Implementation of the Los Angeles County-Wide Structural BMP Prioritization Methodology. Presentation at the Headwaters to Ocean (H2O) Annual Conference, October 2007.

Cain, John R., Dugger, A.L., Fullerton, D., Purkey, D., Sunding, D., Thomas, G.A., "An Environmentally Optimal Alternative for the Bay-Delta: A Response to the CALFED Program," Report, October 1998.

AWARDS (selected)

Toyota Motor Sales Fellowship, 2011

Los Alamos National Laboratory Institute of Geophysics and Planetary Physics (IGPP) Water Security and Climate Change Grant, 2008-2011

Deckers Outdoor Corporation Fellowship, 2008

John Muir Conservation Award for GreenInfo Network (Team Award), 2007

ASCE MLAB Outstanding Public/Private Sector Civil Engineering Project for the Los Angeles County Structural BMP Prioritization Methodology (Team Award), 2006

ESRI Special Achievement Award for GreenInfo Network (Team Award), 2006.

PROFESSIONAL AFFILIATIONS & COMMITTEES

Ecological Society of America, member, 2011-current

American Geophysical Union, member, 2009-current

Society for Conservation GIS, member, 1999-current

Southern California Wetlands Recovery Project, Public Advisory Committee, 2005-08