#### Sustainable Remediation Forum (SURF) SURF 12: January 26 and 27, 2010 Sacramento, California

#### Sponsors: CH2M Hill ENTRIX Terra Systems Northgate Environmental Management

SURF 12 was held in Sacramento, California, on January 26 and 27, 2010, at the office of the Green Team of the California Department of Toxic Substances Control (DTSC). The meeting was generously sponsored by ENTRIX, CH2M Hill, Northgate Environmental Management, and Terra Systems. These companies provided financial support for SURF 12.

Those individuals that participated in the two-day meeting are listed in Attachment 1 along with their contact information. The meeting marked the 12<sup>th</sup> time that various stakeholders in remediation—industry, government agencies, environmental groups, consultants, and academia—came together to develop the ability to use sustainability concepts in remedial decision-making. Previous meeting minutes are available at www.sustainableremediation.org.

#### **Meeting Opening**

The meeting began with Dave Ellis (DuPont) welcoming all participants and thanking ENTRIX, CH2M Hill, Northgate Environmental Management, and Terra Systems for sponsoring the meeting. Dave also expressed his thanks to the DTSC Green Team for hosting the meeting and working so hard to make the meeting a success. Dave noted that during the meeting SURF will become a formal 501(c)(3) nonprofit organization and, as such, challenged participants to think about how SURF will deliver value.

Paul Hadley (California DTSC) represented the Green Team by welcoming participants to the meeting and to California. Paul told participants that signs of SURF's success are all around, beginning with the enthusiasm about the meeting and agenda. Paul said that participant turnout was better than expected considering travel restrictions, and the meeting room capacity was reached quickly. Obviously meeting capacity will be a consideration moving forward, but Paul reminded participants that too much interest was the right problem to have.

Mike Rominger (meeting facilitator) presented the revised mission statement of SURF as follows: "The mission of SURF is to maximize the overall environmental, societal, and economic benefits from the site cleanup process by advancing the science and application of sustainable remediation, developing best practices, professional knowledge exchange, education, and outreach."

Then Mike discussed meeting logistics and ground rules (e.g., expectation that attendees will be active participants, show respect for others, appreciate and encourage divergent opinions, refrain from marketing, and be familiar with previous meeting minutes so the meeting can focus on new information). He also stated that it was assumed that nothing discussed or presented contained confidential information. Mike explained that export control laws that pertain to the transfer of

technology to non-U.S. citizens and their countries do not appear to apply, but advised participants to act appropriately for their organizations. Mike read the following antitrust statement:

"It is not the purpose of this meeting to discuss an existing or planned situation involving any party, whether a participant here today or not, concerning the price, customer base, volume, market, quality, design or cost structure of any commercial product or service, or to plan any course of action having an exclusionary or discriminatory effect."

Efforts to achieve "sustainable neutral environmental behavior" continued at this meeting. Tent cards were reused. Many participants brought their own coffee mugs and water bottles and used public transportation to travel to the meeting location. Some participants reduced the carbon footprint caused by their travel by purchasing carbon offsets. Efforts to achieve sustainable neutral behavior are ongoing and will continue at future meetings.

Mike thanked the Meeting Design Team for their work in planning the meeting agenda. SURF 12 Meeting Design Team members were as follows: Kathy Adams (Writing Unlimited), Kurt Beil (ARCADIS), Brandt Butler (URS Corporation), Dave Ellis (DuPont), Paul Hadley (California DTSC), Tim Havranek (ENTRIX), Karin Holland (Haley & Aldrich), Mike Miller (CDM), Leah Pabst (Conestoga-Rovers & Associates), Dick Raymond (Terra Systems), Mike Rominger (DuPont retiree), Jake Torrens (AMEC Geomatrix), Rick Wice (Shaw Environmental & Infrastructure Group), and Dave Woodward (AECOM Environment).

#### **Board of Trustees**

Mike Rominger briefly reviewed the timeline of SURF, beginning in November 2006 with the first meeting, continuing to consensus that a formal organization was needed in February 2009, and culminating in voting of the first Board of Trustees in January 2010. Mike thanked the members of the Organizational Structure Work Group for developing the voting process, all of the nominators and nominees, Bill Hyatt and Karyllan Mack of K&L Gates for their legal assistance, and all those participants intending to join SURF who voted.

The first Board of Trustees of SURF was announced as follows:

Officers	At-Large
Dave Ellis (President)	Carol Baker
Paul Favara (Vice President)	Stephanie Fiorenza
Maile Smith (Secretary)	Dick Raymond
Brandt Butler (Treasurer)	Dan Watts
	Dave Woodward

The Board of Trustees met during lunch on the first day of the meeting, and Maile Smith presented a summary of their discussions. The Board ratified the By-Laws, passed a resolution to authorize K&L Gates to submit the Certificate of Incorporation, requested a scope of services from Mike Rominger (meeting facilitator) and Kathy Adams (technical writer), and appointed Curt Stanley (Shell Global Solutions) as the SURF liaison to SURF Australia. The Board also set up routine conference calls to discuss outstanding issues (e.g., contracting, financing, committee development).

#### News Items

Participants discussed the news items below. These news items are highlighted on SURF's web site (www.sustainableremediation.org). E-mail addresses and phone numbers for news item contacts are provided in Attachment 1.

- Mike Miller (CDM) mentioned the Redox Technologies conference "Sustainable Approaches to Remediation of Contaminated Land" that will be held November 16-18, 2010 in San Diego, California. The abstract deadline for platform and poster presentations is June 30, 2010. Contact Mike for more information or visit http://www.redoxtech.com/.
- Dave Woodward (AECOM Environment) mentioned the following news items:
  - Region 5 of the U.S. Environmental Protection Agency (USEPA) held a "Greener Cleanups Workshop" on February 9, 2010. Dave pointed out that the new term in Region 5 is "greener" cleanup because of the belief that a cleanup, by virtue of definition, is already "green."
  - USEPA Regions 2, 3, 7, 9, and 10 have policies addressing green remediation, and Region 5 has an interim policy. All participants seemed to agree that some of the emerging policies differ in focus (i.e., implementation only or remedy selection through implementation), which presents a challenge. Final and draft policies are available at SURF's web site. One participant suggested adding USEPA contact names and information next to the policy link on the SURF web site so that people could contact agency personnel directly with questions. In the meantime, the various policies are available through links on the SURF web site at http://www.sustainableremediation.org/links/.
  - AECOM was recognized with an Environmental Business Journal "New Practice" award for advancing the science of green and sustainable remediation.
- Carlos Pachon highlighted the upcoming "Green Remediation Conference" that will be held June 15-17, 2010 in Amherst, Massachusetts. The conference is co-hosted by the Environmental Institute of the University of Massachusetts Amherst, USEPA Office of Superfund Remediation and Technology Innovation, USEPA New England, and Massachusetts Department of Environmental Protection. For more information, visit http://www.sustainableremediation.org/news/2009/10/16/green-remediationconference-call-for-abstracts.html.
- Rusty Harris-Bishop announced his new position as the Green Remediation Coordinator for USEPA Region 9, focusing on training project managers, using renewable energy and cleaner diesel technologies on sites, and considering new technologies for cleanup. Rusty gave the group more detail about the Greener Cleanups Policy which essentially states that, while meeting all statutory and regulatory requirements, the USEPA will strive to integrate sustainability practices into its cleanup actions. Practices, strategies, and technologies are part of the policy and five broad categories are listed as a starting point: air emission reduction, energy conservation and utilization, material use and waste production, toxics reduction in materials and products, and water conservation. Rusty stressed that the policy is

considered an evergreen document that will continue to evolve and change as time progresses.

- Mohit Bhargava (Battelle Environmental Restoration) told participants to register by April 30, 2010 for Battelle's "International Conference on Remediation of Chlorinated and Recalcitrant Compounds." The conference will be held May 24-27, 2010 in Monterey, California and will feature a green and sustainable remediation track. For details about specific topics, visit http://www.battelle.org/ Conferences/chlorinated/tech.aspx. SURF will have a table at the conference; SURF members interested in volunteering at the table should contact Jake Torrens (AMEC Geomatrix).
- □ Erica Becvar (Air Force Center for Engineering and the Environment) mentioned the following news items:
  - The second version of the Sustainable Remediation Tool has been issued (see past meeting notes for information regarding the tool). The tool is free and available for download. For more information and a link, visit http://www.sustainableremediation.org/news/2009/6/18/afcee-sustainable-remediation-tool-now-available.html.
  - The next version of the federally funded Remedial Action Cost Engineering and Requirements (RACER) software is being released in the fall of 2010. The tool is a Windows-based environmental remediation cost estimating system. The system enables users to develop and update cost estimates, evaluate and compare the cost of various treatment options, quantify environmental liability for budgeting or regulatory and financial disclosures, and develop a consistent approach for project budgeting. This upcoming version of RACER will have an optional output of a sustainability assessment that can be interfaced with such tools as the Air Force Sustainable Remediation Tool. For example, RACER users can run a sustainability assessment of the technology that they costed using the RACER tool.
  - The 2010 Air Force Restoration and Technology Transfer Workshop will be held April 6-9, 2010 in San Antonio, Texas. A portion of the workshop is dedicated to green and sustainable remediation and a short course on tools will be provided. For more information, visit http://www.sustainableremediation.org/news/2009/12/9/registration-open-for-2010-air-force-restoration-technology.html.
- Carol Dona [U.S. Army Corps of Engineers Environmental and Munitions Center of Expertise (USACE EM-CX)] updated the group on the progress of sustainability efforts in her organization as follows:
  - The decision framework for incorporating sustainable practices into the Army's environmental remediation program is nearly signed. The end use of the decision framework is expected to be interim guidance within the USACE and may also be folded into Army Headquarter guidance.

- The U.S. Army and Navy have purchased the Battelle Sustainable Environmental Remediation Site-Wise tool. The tool is expected to be available to the public in May 2010.
- As presented in the notes from SURF 11, the Department of Defense (DoD) issued a green and sustainable remediation policy in August 2009. The policy calls for two briefings to DoD from the branches of the Armed Services describing the green and sustainable practices that have been implemented at sites within each Service. The Services (Air Force, Navy, and Army) are informally coordinating efforts by sharing presentations. The briefings were scheduled for December 2009 and June 2010, but the first briefing was delayed and no specific reschedule date has been set.
- □ Issis Rivadineyra (Naval Facilities Engineering Service Center) told participants about sustainability efforts in her organization as follows:
  - The U.S. Navy web portal for green and sustainable remediation is progressing and should be open to the public by May 2010.
  - The Naval Facilities Engineering Command (NAVAC) Optimization Team has developed an outline for a green and sustainable remediation guidance document for the U.S. Navy. Details will be discussed during the team's next meeting on February 22, 2010.
  - The NAVFAC Optimization Team continues to spread the word about green and sustainable remediation. During the Remediation Innovative Technology Seminar (RITS) conference for remedial project managers, Geotrans will present a green and sustainable remediation overview and Battelle will make a presentation about the Site-Wise tool. In addition, the team will be speaking about the Navy's efforts at a handful of conferences. Presentations will be made at the Navy & Marine Corps Cleanup Conference; Battelle conference; Society of American Military Engineers Joint Engineer Training Conference; USEPA Green Remediation Conference; Air Force Restoration and Technology Transfer Workshop; and Environment, Energy Security & Sustainability Symposium & Exhibition.
- □ John Simon (WSP Environment and Energy) told participants to contact him if they are interested in contributing to the Sustainable Remediation Panel in *Remediation*. The journal is published quarterly, and each issue contains a question relating to some aspect of sustainable remediation. Panel members respond on a voluntary basis to the question, and answers are published in the journal.
- Paul Hadley (California DTSC) told participants about the DTSC's Interim Advisory for Green Remediation that was published in December 2009. The DTSC Green Remediation Team prepared the advisory to introduce the concepts of sustainability and life-cycle thinking to project managers, responsible parties, and environmental consultants performing sustainability or green remediation assessments at cleanup sites. The advisory also shows how these concepts can be incorporated into any stage of a cleanup project, including site characterization, treatment alternative selection, remedial design implementation, long-term monitoring, operation and maintenance,

and closure. More information and a link are available at http://www.sustainableremediation.org/news/2009/12/17/dtsc-interim-advisory-for-green-remediation.html.

#### Updates

Participants updated the group about ongoing efforts of interest to SURF, such as the SURF web site, the sustainable remediation activities of the Interstate Technology Regulatory Cooperation (ITRC) and ASTM, the recently published Superfund Green Remediation Strategy, and SURF communications and outreach activities. A summary of these presentations and discussions is provided below.

#### SURF Web Site – www.sustainableremediation.org

Maile Smith (Northgate Environmental Management) provided participants with an update on recent changes to the web site. In her presentation, Maile highlighted the participant portion of the web site, the calendar of events, and the library. Through the web site library, SURF serves as the clearinghouse for sustainable remediation resources, tools, documents, and guidance. Maile encouraged members to visit the web site, post ideas on the discussion forum, and subscribe to news updates to receive an e-mail when a news item has been added (http://www.sustainableremediation.org/subscribe/). Presentation slides are provided in Attachment 2.

Discussions focused on potential changes to the web site to reflect the change in SURF's move from an "adhocracy" to a formal nonprofit organization. Specific questions revolved around the SURF brand and member benefits. Regarding the SURF brand, some participants expressed the desire to be able to put the SURF logo on their company letterhead. Although this is not possible because SURF currently offers only individual memberships, participants expressed the desire for the Board to address this issue. Regarding member benefits, Maile mentioned that a special "members only" access area will be added to the web site, with each member receiving a unique login. Other possible member benefits will be defined but could include the development of a membership directory.

#### ITRC and ASTM Sustainable Remediation Activities

Karin Holland (Haley & Aldrich) provided participants with an update on the sustainable remediation activities of ITRC and ASTM (see below). Presentation slides are provided in Attachment 3.

- □ ITRC Green and Sustainable Remediation (GSR) Team
  - The GSR team's current activities include an Overview document, state survey, and a Technical and Regulatory document. The Overview document provides a summary of the current state of green and sustainable remediation, including definitions, metrics, and approaches and tools. Many SURF participants have contributed to this document, which is currently in the review stage and expected to be published in early spring of this year. The state survey will target regulators, and results will be integrated into the Technical and Regulatory document. This document will be more comprehensive than the Overview document, and the team will likely begin work on this effort in April.

□ ASTM

The ASTM's recent efforts focus on developing a standard guide that provides a consistent, tiered approach to incorporating sustainability during remediation. The guide currently includes balancing environmental, social, and economic considerations. The longer-term goal of the group is to establish a uniform approach to track and evaluate green and sustainable corrective action.

Discussions focused on the overlap of activities being conducted by the ITRC, ASTM, and SURF and how SURF can provide consistency (e.g., through participation in ITRC and ASTM). Karin responded that one of SURF's "big stakes" addresses this issue. The Big Stake #4 group is working on identifying ways that SURF can provide leadership to address the different frameworks and standards that are emerging with the goal of achieving consensus. One participant added that the GSR team and ASTM are working on some of the same issues that are being addressed in a document developed by the ITRC's Remediation Risk Management (RRM) team. The RRM team document is currently in the peer-review stage.

#### Green Remediation at EPA: Update on Superfund Strategy

Carlos Pachon (USEPA Office of Superfund Remediation and Technology Innovation) provided participants with an update of USEPA activities that are aimed at advancing green remediation practices. His presentation focused specifically on the status of the Superfund Green Remediation Strategy. The strategy sets out the plans to promote green remediation practices during Superfund site cleanups without compromising cleanup goals by addressing the following three areas: policy and guidance, resource development and program implementation, and evaluation. Forty-six specific action items are included in the strategy. These action items are aligned with 10 key actions, which Carlos highlighted individually. The strategy document was released for public review in August 2009, and the USEPA received 40 individual comments including over 100 pages of feedback. The majority of comments were positive and constructive, with recurring requests for guidance on the environmental footprint evaluation and remedy selection process, suggestions on scope, and technology developer proposals of green solutions. Carlos said that comments are being addressed, and plans for releasing an updated version are being developed. Presentation slides are provided in Attachment 4.

Discussions focused on two main points: (1) the schedules for releasing best practice documents and addressing specific action items identified in the strategy document comments and (2) how SURF can provide input to the USEPA in developing documents and can help with document distribution.

 $\Box$  Scheduling

Carlos told participants that fact sheets detailing best management practices for excavation and surface restoration, site investigation, and pump-and-treat technologies have been published and are available at http://www.clu-in.org/greenremediation/. A schedule of other fact sheets that will be published this year is available at http://www.clu-in.org/greenremediation/docs/ GR\_fact\_sheets\_topics\_update\_01-25-09.pdf. Carlos also said that the USEPA is developing a table showing the status of action items identified in the public review comments of the strategy document. The USEPA hopes to make the table available to the public soon. □ SURF Input and Assistance

Carlos said that the USEPA welcomes help with document development if SURF participants have a particular area of interest, specific technical insight, and/or project experience. Carlos told participants that his group is leading a study for comparing methodologies for calculating metrics (e.g., greenhouse gases). The group should be ready to work with other groups (e.g., SURF, FTRT) on the effort by early summer 2010. One participant asked about the guidance for evaluating green and sustainable remediation as part of a feasibility study. Carlos indicated that a policy group was working on this effort and told participants that he would forward them additional information on progress after the meeting.

#### SURF Communications and Outreach

The Communications Committee and the Outreach Initiative (formerly Big Stake #1) merged efforts after SURF 11. One of the action items of this group was to create a presentation about SURF for use by SURF members. The goal is to develop slides that present a consistent message to spread the word about SURF. At SURF 12, Jake Torrens (AMEC Geomatrix) presented the draft presentation for the group's review and comment. Discussions occurred in the breakout session later in the meeting and are included in Attachment 5.

#### **Technical Presentations**

SURF 12 presentations addressed the various aspects of the triple bottom line (i.e., environmental, social, and economic) of sustainable remediation. Presentations and subsequent discussions are summarized in the subsections below.

#### Wisconsin's Initiative for Sustainable Cleanups (WISC)

Greg Brooks and Dave Woodward (both AECOM Environment) presented an introduction to the Wisconsin Initiative for Sustainable Cleanups (WISC) program. The goal of the WISC program is to add a sustainable aspect that emphasizes the application of green technologies to clean up contaminated sites to the existing Remediation and Redevelopment Program of the Wisconsin Department of Natural Resources. The guiding premise is that sustainability should be considered in remedy selection and implementation, but must not compromise environmental protection. A number of site-specific green and sustainable remediation evaluations were conducted as part of the program development, and a draft guidance manual has been developed. Greg and Dave presented select site-specific evaluations and a preliminary look at the likely contents of the guidance manual. Presentation slides are provided in Attachment 6.

Discussions focused on clarifying various aspects of the program in relation to purpose and scope. Although the intended audience for the guidance manual is WDNR project managers, others may choose to use the document. Dave said that the WDNR not only recognizes that sustainable concepts are valuable at the remedy selection stage, but also that societal considerations should be included. One participant asked about the program's approach to indirect impacts and ecosystems. Greg responded that for indirect impacts, the evaluations focus on big ticket parameters such as mileage and fuel consumed. Dave said that ecosystems issues are outside of the scope of the group that is working on this program, but that these issues can be captured at the end of the evaluation as a flat number.

At the end of the discussion, Greg and Dave stressed that the program remains in development and, as such, continues to evolve. Although the general direction of the program is set, the details could change. A final guidance manual should be issued in April, depending on WDNR review time.

#### LEED for Neighborhood Development

Laura Bonich (Nolte Associates) provided an overview of the new Leadership in Energy and Environmental Design for Neighborhood Development (LEED ND) program and also discussed the LEED certification points for Brownfield sites, ending with a case study. The LEED ND program, developed by the U.S. Green Building Council (USGBC), has a rating system that integrates the principles of smart growth, urbanism, and green building into the first national rating system for neighborhood design. The goals of the LEED ND program are to reduce urban sprawl, increase transportation choice and decrease automobile dependence, encourage healthy living, and protect threatened species. The program targets infill sites or sites adjacent to previously developed land, compact development, and transit access. Unlike other programs, certification for the LEED ND program can be obtained in all stages. Laura highlighted the Symphony Park project in Las Vegas, Nevada, as an example of the program. The project involved 10 million square feet of development on 61 acres. She also briefly discussed the LEED ND pilot projects at Metropolitan Gardens in Denver, Colorado and at Sacramento Railyards in Sacramento, California. Presentation slides are provided in Attachment 7.

Discussions focused on how SURF can help with the seemingly disparate point distribution in some cases and how much it costs to go through the LEED ND program process with a site. One participant expressed frustration that the points given for a Brownfield site are the same as the points given for a bike rack and wondered how SURF can be part of the process to change apparent inequities. After the meeting, Laura followed up with her contacts within the LEED program. Points were determined by a science-backed weightings process that is being updated for 2012. It is unclear whether ND weightings will change given the limited scope of requirement changes. A public comment period is scheduled for this summer. SURF participants can subscribe to the monthly USGBC news update at www.usgbc.org to be notified of the specific timeframe of the public comment period. In response to a question about costs, Laura told participants that the USGBC charges a fee based on project size (in acres) to participate in the program. Once these upfront costs are invested, additional costs are incremental (i.e., five to six hours per point).

#### SURF LCA Scenario at a Groundwater Treatment Plant

Todd Krieger (DuPont) and Paul Favara (CH2M Hill) presented a case study that highlighted the benefits and challenges of using life-cycle assessment (LCA) methodology to evaluate a common remedial action. The team, which included the presenters and Bob Boughton (California DTSC), Jamie Ginn (DuPont), and Angela Fisher (GE Global Research), developed a scope of work for a generic groundwater treatment plant cleanup and then modeled the cleanup using SimaPro LCA software. Compared to current industry standards, the case study evaluated a more extensive set of impact assessment categories to show how categories other than climate change and energy use can drive changes in the remediation plan. Study results showed the importance of including off-site burdens in the scope of a LCA. The conclusions of the LCA

were that consumables (e.g., granulated activated carbon, sulfuric acid, sodium hydroxide) play a significant role in addition to the electricity required to run the groundwater treatment plant. The LCA identified mercury emissions (which were traced back to the chlor-alkali industry) as a driver to selectively source sodium hydroxide and try to reduce its use in pH adjustment. Electricity was quantified as a significant piece of the burden, which suggests the need for additional studies to see the potential reduction of burdens through renewable energy sources. Todd and Paul listed the challenges as uncertainty in LCA impact assessment categories, unexpected impact of barium emissions in electricity supply chain, a need to evaluate alternative cleanup options, and difficulty normalizing or weighting the different impact categories. The challenges of using mid- and end-point assessments when interpreting and communicating results were also discussed. Presentation slides are provided in Attachment 8.

Discussions focused on participants' concerns and the potential challenges associated with using SimaPro (or similar LCA tools) vs. other tools for sustainability assessments. Participants agreed that identifying how to make LCA a meaningful component of the decision-making process presents one of the biggest challenges. Because LCA is a discipline in and of itself, some participants asked how LCA methodology would be incorporated into a holistic sustainability analysis and how access to LCA equipment and expertise would be ensured for appropriate stakeholders. Participants also discussed the issue of scalability. Although the cost to implement a LCA for a project may be higher than when using other sustainability assessment tools, Todd and Paul stressed that a large part of that cost is associated with the learning curve. Some of the more traditional tools employed on complex projects could actually result in more time and resources than use of a professional LCA tool.

#### Sustainable Bioremediation Technologies for Contaminated Groundwater

Kate Scow and Doug Mackay (both University of California Davis) presented several examples and challenges associated with sustainable natural and engineered remediation of groundwater. The presentation focused on the fact that groundwater systems are often overlooked and not considered to be part of ecosystems, in part because of our limited understanding of how groundwater aquifers interact with other ecosystem habitats and what services groundwater systems provide beyond just drinking water to humans. Kate and Doug presented the four different types of ecosystem services (i.e., provisioning, supporting, regulating, and cultural) and explained that groundwater provides all four types of services. They stressed that groundwater remediation can rely on these services, but at the same time must protect these services. Although biological treatment is a relatively low-impact approach, parameters such as native biodiversity, resource consumption, and the potential for new contamination due to conversion to more toxic metabolites, must be considered when developing a treatment strategy. Presentation slides are provided in Attachment 9.

Discussions focused on the assimilative capacities of aquifers and ecosystem restoration. One participant asked if there were tools to help better understand the assimilative capacity of an aquifer, especially in long dilute plumes. Kate responded that new DNA tools exist that could help, although applications have occurred only at a small scale. Another participant asked how to effectively clean up an ecosystem to its original state (i.e., before contamination) when the original state is unknown. Kate said that it is necessary to look at the function of the ecosystem, rather than trying to quantify numerous naturally occurring species.

# Raising Our Collaborative IQ: Evolving Decision Support Frameworks for Sustainable Remediation

Zann Gill (DESYN Lab) presented principles to overcome conventional mindsets and "raise the collaborative IQ" when working toward sustainable remediation. To achieve sustainable remediation, a variety of people – from engineers to financial analysts, from scientists to policymakers, innovators, and the public – must share knowledge. However, conventional views of problem-solving often lead to lowest common denominator outcomes. Zann presented decision support tools and collaboration platforms that help collaborative, cross-disciplinary teams and networks with diverse priorities and expertise to converge rapidly toward the goal of sustainable remediation.

Some discussions focused on the uncertainty of outcomes when trying to reach the goal with so many stakeholders. Zann suggested starting from the point of uncertainty in a systematic way, gradually focusing as convergence is reached. She showed a spiral symbol to represent this concept. Zann also told participants to strive for collaborative autonomy, which avoids "groupthink." Groupthink sometimes results out of the need for consensus and was originally defined by Irving Janis as "a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action." Finally, Zann told participants that the key to breaking through barriers is the integration of experience and knowledge and that the key to developing a framework is to share knowledge effectively throughout the process.

#### Protecting and Enhancing the Land, Air, and Water

Richard Rominger (California farmer and former Deputy Secretary of Agriculture from 1993 to 2001) discussed the pressure that California agriculture is under from an increasing and expanding population, causing competition for land and water. Richard discussed the similarities between what SURF is doing in developing and implementing sustainable practices for remediation projects and what agriculture is working on to make food production more sustainable. Farmers can become more efficient users of energy, fertilizers, and water; can sequester carbon with no-till farming and perennial crops; and can produce energy by capturing methane from animal waste and biofuels from plants and by tapping into solar and wind power. Richard told participants that if we want a livable, sustainable earth, we need to concentrate on livable sustainable communities. The goal should be communities where it is more convenient for residents to walk, ride bicycles, and use mass transit and where farmers' markets and community-supported agriculture is the norm. Richard ended his presentation by stressing the need for a land ethic, quoting Aldo Leopold that it "enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively, the land." The text of Richard's presentation, including references, is provided in Attachment 10.

Participants discussed the following topics:

□ Localizing Food Sources

Richard had mentioned in his presentation that the average meal travels 1,500 miles to our dinner table. He said that although statistics show an increase in the number of small farms (especially in California), these farms still only make up a small percentage of U.S. production. Richard said that the goal is a whole food system that includes suppliers, producers, wholesaling, and retailing. He said that the challenge is making the process more sustainable while avoiding only a few companies running the show. Richard acknowledged that change is not happening fast, but efforts are underway.

□ Year-Round Crop Production

Richard said that local crop production and distribution is increasing, in part because of the energy crisis. He said that the World Bank is beginning to assist poor farmers in Africa in growing crops to feed their own country, rather than only crops for export.

□ Land Ethic

Participants discussed how to integrate land ethic into the current regulatory framework. Richard told participants that, although regulations are in conflict with one another, focusing on streamlining efforts locally is a good place to start. The Roots of Change has established local roundtables in counties, and these people work on common problems to solve issues. Efforts are being made to establish a statewide ombudsman, located in the governor's office, to serve as a single point of bringing people together so that the goal can be reached. Richard stressed designing the program so that all groups with a stake in it win.

#### **Public Participation 101**

Tracy Craig (Craig Communications) presented the basics of public participation and challenged SURF to tap into the power of the public. Tracy told participants that meaningful public participation can be achieved by identifying stakeholders, engaging them early in the process, managing expectations, following through and doing what you say you will do, establishing and maintaining relationships for the long haul, and communicating clearly. She presented a five-stage model for interacting with the public that involves expressing empathy and concern, keeping your message short and factual, sharing a personal story, and listing follow-up actions. Tracy also presented a case study of public communication efforts at an old gas plant in Kernville, California to demonstrate the process. Presentation slides are provided in Attachment 11.

Discussions focused on using Internet communication tools and how to effectively communicate risk. One participant said that the USEPA is using Twitter, Facebook, YouTube, and Wikipedia to share progress at some sites. The remaining discussion involved how to explain complex risk issues to uneducated communities. Tracy recommended having conversations in smaller forums and told participants that the first discussion with community members should <u>not</u> be a public meeting. She stressed the importance of one-on-one meetings to communicate complex issues.

#### LUST Cleanup Footprint Calculator

Eric Magnan (USEPA Region 9) presented a summary of the leaking underground storage tank (LUST) calculator being developed by the USEPA Region 9. The calculator quantifies greenhouse gas emissions from California LUST cleanup activities, factors all direct on-site activities and transportation, includes five remedial technologies, and is calibrated with real-world data. The calculator tool is designed to be a quick and easy way for regulators, consultants, and UST owners to compare remedial technologies on the basis of their environmental impact. Beta testing of the calculator is scheduled to begin in late spring of this

year. Eric encouraged participants to provide comments on the Beta version of the calculator before the official rollout in early summer. Presentation slides are provided in Attachment 12.

Discussions focused on clarifying the purpose of the tool and some of the considerations that are included in the calculation. Some participants were concerned that the calculator focused too heavily on carbon dioxide emissions without including other important considerations (e.g., off-site impacts). Eric responded that the calculator is designed as a starting point to introduce green remediation to a larger audience within the LUST remediation community with the hope of gaining acceptance for the green remediation concept. Because there are 100,000 LUST sites and performing a full LCA on each site would be burdensome, the calculator includes on-site considerations and transportation to/from the site but not manufacturing values that would be considered in a comprehensive LCA.

#### Social and Economic Elements of Sustainability

Lorraine Larsen-Hallock and Mikos Fabersunne (both of California DTSC) posed questions and presented opportunities for remedying past environmental injustices at remediation sites to assure that the social and economic aspects of sustainability's triple bottom line are given proper due. Lorraine and Mikos presented jobs and reuse options for low-income communities at Brownfield sites, including "green collar" jobs, "green glove" jobs, and "green" automation. Throughout their presentation, Lorraine and Mikos stressed the need for a collaborative effort with the community early in the process so that goals and objectives can be established and that expectations can be set. Challenges to measuring or forecasting the success in meeting the goal were presented and discussed (e.g., weighing of quantitative vs. qualitative factors, ensuring a holistic data set), and the use of data was presented as a good starting point. Environmental data, social data and indicators, and economic data and indicators should be integrated to determine the performance or measure of success of sustainability at a site. Finally, the presenters posed questions to the group about the issues involved in balancing the needs of environmental protection, social well being, and economic benefit while satisfying stakeholders and their different interests. Presentation slides are provided in Attachment 13.

#### **Breakout Sessions**

At SURF 9, participants divided into three groups to address three questions to move SURF forward after the white paper. A summary of each group's discussion, including action items, is provided in the SURF 9 meeting notes. The discussion continued at SURF 11 and at this meeting. Over time, some groups have merged together and others have refocused. At the meeting, the following groups met: Communications and Outreach, Academic Outreach, Regulatory Outreach, LCA, and Framework and Metrics. Summaries of the breakout sessions for each group are provided in Attachment 5.

The only new effort underway is metrics mapping, which is part of the Framework and Metrics group focus. Brandt Butler (URS Corporation) presented a summary of the scope of this group and said that the goal is to identify tools to quantify metrics and map them into existing selection criteria. An enthusiastic discussion occurred, with participants offering the following suggestions for this group to consider:

□ Link with the USEPA's efforts (see "Update on Superfund Strategy") to apply potential metrics to the remedy selection process.

- □ Consider all stakeholders' perspectives.
- Before trying to match qualitative outputs with quantitative outputs which is challenging, begin with smaller steps and use LCA to determine qualitative aspects.
- Determine how metrics will be scaled and consider the semiquantitative assessment tools available from the United Nations' Environment Programme (www.unep.org).
- □ Establish a screening level LCA
- □ Do not rule out LCA for small sites (e.g., gasoline stations) because the large number of these sites can have a significant cumulative effect.
- □ Broaden stakeholder community to those living beyond the adjacent land to the site.

#### Action Items

The following action items were identified during the meeting:

- Chicago-Kent College of Law will host the next meeting (SURF 13), which will be held April 13 and 14, 2010 in Chicago, Illinois. The address is as follows: 565 West Adams, Chicago, Illinois, 60661-3652. The program at SURF 13 will focus on organizing and developing committees (enabling SURF to function effectively) and the technical initiatives (formerly called "big stakes"). Please note that registration for SURF 13 will require that you join SURF. SURF membership applications and SURF 13 registration will be processed on-line via the SURF web site.
- Based on feedback at SURF 12, volunteers for the design team for the next meeting in Chicago are as follows: Kurt Beil (ARCADIS), Dave Ellis (DuPont), Stephanie Fiorenza (BP), Ben Foster (ARCADIS), Tim Havranek (ENTRIX), Karin Holland (Haley & Aldrich), Mike Miller (CDM), Karina Tipton (Brown and Caldwell), Tod Whitwer (Allwyn Environmental), and Dave Woodward (AECOM Environment). Additional members are welcome. Meeting Design Team members should expect to spend about eight hours on the effort between now and the next meeting.
- 3. The work of the committees and initiatives will continue. All prospective members of SURF will be provided the opportunity to express preferences for participation in those efforts.
- 4. SURF 14 will be held July 13 and 14, 2010 at Colorado State University in Fort Collins, Colorado. Based on feedback at SURF 12, volunteers for the design team for the meeting this summer are as follows: Dave Ellis (DuPont), Angela Fisher (GE Global Research), Tim Havranek (ENTRIX), Elizabeth Hawley (Malcolm Pirnie), Mike Miller (CDM), Dick Raymond (Terra Systems), Curt Stanley (Shell Global Solutions), and Rick Wice (Shaw Environmental & Infrastructure Group).

Attachment 1 SURF 12 Participant Contact Information

#### SURF 12 Participant Contact Information

Participant	Affiliation
Adams, Kathy	Writing Unlimited
Baker, Carol	Chevron Energy Technology Company
Barrera, Yanina	ENVIRON
Beil, Kurt	ARCADIS
Bhargava, Mohit	Battelle Environmental Restoration
Bonich, Laura	Nolte Associates Inc.
Boughton, Bob	California Dept. of Toxic Substances & Control
Bull, Louis	Waste Management
Butler, Brandt	URS Corporation
Cooke, Lennie Rae	ANCHOR QEA
Craig, Tracey	Craig Communications
Darby, Elaine	ANCHOR QEA
Demorest, Ana	CH2M Hill
Denson, Scott	Sunpro Services
Devine, Catalina Espino	Chevron
Dona, Carol	U.S. Army Corps of Engineers Environmental and Munitions Center of Expertise
Ellis, Dave	DuPont
Fabersunne, Mikos	California Dept. of Toxic Substances & Control
Favara, Paul	CH2M Hill
Fiorenza, Stephanie	BP
Foster, Ben	ARCADIS
Garson, Nick	Boeing Company
Geckeler, Grant	Good Earthkeeping Organization
Gill, Zann	DESYN lab
Haddad, Elie	Haley & Aldrich
Hadley, Paul	California Dept. of Toxic Substances Control
Hamilton, Lisa	General Electric
Hanak, Mike	Kinder Morgan
Harris-Bishop, Rusty	USEPA Region 9
Havranek, Tim	ENTRIX
Hawley, Elisabeth	Malcolm Pirnie
Hendrickson, Nancy	CH2MHill
Holland, Karin	Haley & Aldrich
Kavanaugh, Mike	Malcolm Pirnie
Kessel, Lowell	EnviroLogek Technologies
Kilgore, Bill	California Dept. of Toxic Substances & Control
Koenigsberg, Steve	ENVIRON
Kou, Jose	California Dept. of Toxic Substances & Control
Krieger, Todd	DuPont
Lantz. Bill	Delta Consultants
Larsen-Hallock, Lorraine	California Dept. of Toxic Substances & Control
Lewis Katie	Boeing Company
Lowis Ray	Sunnro Services
Lowis, ray	University of Colifernia, Davia

#### SURF 12 Participant Contact Information

Participant	Affiliation
Magnan, Eric	U.S. EPA Region 9
Martin, Todd	Integral Consulting, Inc.
Mazgaj, Jan	HDR Engineering
McKalips, Phil	Environmental Standards
Miller, Mike	CDM
Murawski, Steve	Baker & McKenzie
Odencrantz, Joe	Beacon Environmental Services
Parent, Chris	California Dept. of Toxic Substances Control
Raymond, Dick	Terra Systems
Rivadineyra, Issis	Naval Facilities Engineering Service Center
Rominger, Mike	On-Board Consulting
Rominger, Richard	Self
Rosecrance, Ann	Conestoga-Rovers & Associates
Ryan, John	AECOM Environment
Scow, Kate	University of California, Davis
Simon, John	WSP Environment and Energy
Smith, Maile	Northgate Environmental Management
Stanley, Curt	Shell Global Solutions
Thomson, Michelle	DuPont
Torrens, Jake	AMEC Geomatrix
Watts, Dan	New Jersey Institute of Technology
Wells, Elizabeth	San Francisco Water Board
Wice, Rick	Shaw Environmental & Infrastructure Group
Witwer, Tod	Allwyn Environmental
Woodward, Dave	AECOM Environment
Remote Attendees	
Becvar, Erica	Air Force Center for Engineering and the Environment
Brooks, Greg	AECOM Environment
Fisher, Angela	GE Global Research
Furey, Jessica	The Whitman Strategy Group
Kubal, Jerry	Kubal & Associates, Inc.
Madabhushi, Sriram	Booz Allen Hamilton
Pachon, Carlos	USEPA Office of Superfund Remediation and Technology Innovation
So, Charlie	Shaw Environmental & Infrastructure
Spurlin, Matt	ARCADIS
Tipton, Karina	Brown and Caldwell
Wenzlau, Bob	Terradex

Attachment 2 SURF Web Site Update

















Attachment 3 Update on ITRC and ASTM Sustainable Remediation Activities





# Activities to date

- Overview document
- State survey
- Technical and Regulatory document



### **Overview document**

- · Provides a summary of the state of GSR
- In review stage
- · Publication of document anticipated in early spring
- · Contents include:
  - Definitions
  - Inventory of GSR related efforts
  - Metrics
  - Approaches and tools
  - Integration and implementation
  - · Summary and path forward



#### State Survey

- · Results will aid in the development of the TechReg document
- Example questions posed:
  - What is your understanding of GSR?
  - Is GSR encouraged in your state?
  - How does your state address GSR issues?
  - What types of GSR issues are important to you?
  - During which remediation phase(s) should GSR be used?
  - Do you have a GSR guidance document?
  - What metrics should be included for the evaluation of GSR?
  - Can you share any GSR case studies?

#### **Technical and Regulatory Document**

- · Content discussed during Fall meeting
- · Document will be the focus of the Spring meeting
- Comprehensive GSR document, providing:
  - Technical knowledge
  - Improve the sustainability of remediation projects
  - Develop consistent remediation approaches

# ASTM Green and Sustainable Corrective Action Task Group

- Goals:
  - Develop a standard guide that provides a consistent, tiered approach to incorporate sustainability during remediation through the appropriate balancing of environmental, social, and economic considerations
  - Establish a uniform approach to encourage stakeholders to use, track and evaluate green and sustainable corrective action



## Activities to Date

- First meeting in Atlanta October 2009
- Several teams formed to write different sections of guide
- First draft for team review December 2009
- Comments provided to section teams January 2010
- Next meeting April 2010

Tiers/ Categories	Environmental	Social	Economic
Screening/ Qualitative			
Focused Quantitative			
Comprehensive Quantitative			





Attachment 4 Green Remediation at EPA: Update on Superfund Strategy



# Green Remediation at EPA Update on Superfund Strategy

Carlos Pachon pachon.carlos@epa.gov

**OSWER Office of Superfund Remediation and Technology Innovation** 

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Green Remediation - The practice of considering all environmental effects of remedy implementation and incorporating options to maximize the environmental benefit of cleanup actions.

# Green Remediation: Common Themes in Site Cleanup Programs

- Fits within existing frameworks
- Opportunities exist throughout site investigation, design, construction, operation, and monitoring
- Addresses core
  elements







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# Green Remediation Activities In Place

- Green remediation primer, website, and profiles of projects, Internet seminars, and archived discussions
- Tech support for Federal and State project managers
- Renewable energy fact sheets, website, and IA with NREL
- NARPM 4- and 8-hour training in 2008, 2009; 2009 OSC Readiness, 2008
- Regional leadership
- Contracts & Administrative toolkit
- Green Remediation pilots

# OSWER Green Remediation Principles

- OSWER's goal is to evaluate cleanup actions comprehensively to ensure protection of human health and the environment and to reduce the environmental footprint of cleanup activities, to the maximum extent possible
- http://www.epa.gov/oswer/greencleanups/principles.html



# OSWER Green Remediation Principles

- Consistent with existing laws and regulations, it is OSWER policy that all cleanups:
  - Protect human health and the environment
  - Comply with all applicable laws and regulations
  - Consult with communities regarding response action impacts consistent with existing requirements
  - Consider the anticipated future land use of the site



# **Superfund Strategy: Overview**

- Sets out the Superfund Program's plans to promote green remediation practices during site cleanups without compromising cleanup goals
- Covers three areas:
  - Policy and Guidance
  - Resource Development and Program Implementation
  - Evaluation
- Includes 10 "Key Actions"; each action includes several implementation activities (46 total)



### Superfund GR Strategy 10 Key Action Items

- 1. Clarify the role of green remediation in remedy selection, and recommend potential statutory and regulatory changes
- 2. Develop a compendium of practices and tools to help project and Program managers integrate green remediation practices
- 3. Develop Program incentives to encourage use of green remediation practices
- 4. Address air pollutants and diesel emissions
- 5. Develop pilot projects to evaluate and demonstrate green remediation applications

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## Superfund GR Strategy Status of Public Comment

- Approximately 40 individual comments were received.
- Over 100 pages of feedback and comments, in the majority positive and constructive.
- Recurring themes include;
  - Request for guidance on environmental footprint evaluation
  - Request for guidance on remedy selection
  - Technology developer proposals for green solutions
  - Suggestions on scope
- Comments are being addressed in a "Triage" mode (direct edits, minor additions/modifications, and major changes requiring discussion).



# **Green Remediation Activities Underway**

- Baselines, measures, and metrics
- Multiple cross-program and regional workgroups
  - CCCL (plus subgroups)
  - GCS (plus subgroups)
  - Superfund GR (plus subgroups)
- Collaboration with FRTR, ITRC, ASTSWMO
- Engineering Forum "GR review and technical support" capability
- New incentives (ER3, States, etc).
- Model contract and enforcement provisions
- Remedy-specific green remediation "cheat sheets"

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# **More Information**

http://www.cluin.org/greenremediation www.epa.gov/superfund/greenremediation

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Attachment 5 Breakout Sessions **Communications and Outreach** 

January 27, 2010

#### Participants:

Stephanie Fiorenza	Ben Foster	Phil McKalips	Dave Major
Maile Smith	Lowell Kessel	Scott Denson	Brian Quillia
Jake Torrens	Nick Garson	Stella Karnis	Maryline Laugier
Kathy Adams	Rick Wice	Elie Haddad	Beth Hyde
Lisa Hamilton	John Simon	Erica Becvar	Neno Duplan

Note: Shading indicates participant not present during the committee break-out at SURF 12.

- 1. "We Are SURF" Presentation Several suggested that we need a "summary" version of the presentation. It was decided that there needs to be a core presentation (perhaps 3 to 6 slides) that give a very basic overview of SURF. The presentation would still contain additional material as "bonus slides", which the user could include or modify as needed depending on the audience. A suggestion was made that instead of including names of organizations or logos, to include demographic information about the members (perhaps in chart form), as well as perhaps including a map with "pins" marking each member's location. Lisa Hamilton indicated there was too much information in the presentation for "management", and suggested a "higher end" presentation alternative be prepared for those cases (member presenting internally about SURF to their company). She was going to provide some specific examples.
- 2. External Communications Maile suggested that we consider breaking communications responsibilities out to (a) "general administrative/management", including internal SURF communications, both of which the new Board of Trustees will take care of, (b) "technical", which will be handled by a sub-group of the Communications/Outreach committee to field, answer, or if necessary, assign out answering technical questions about sustainable remediation that come in via the website, and (c) "general outreach", which would come from the Communications/Outreach committee to outreach and conference requests, and also our unsolicited work to promote SURF's brand outside of the group.
- 3. **Paper in ES&T** Stephanie followed up on a suggestion made at SURF 11 that the Outreach Committee seek to write/oversee an article written by SURF in a high profile journal such as ES&T. She then spoke with Pedro Alvarez, the editor, who informed her that the journal would not be interested in a general article about SURF the organization or about sustainable remediation, but would be looking for critical thinking/content. Ideas tossed around in the session were: critical/hands-on evaluation of available guidance and tools and do a comparison (e.g., how do you choose an appropriate tool and guidance document?); analysis of the EPA regional guidance documents (e.g., what would you do if you were in a region that didn't have one?); and case studies.
- 4. Presence at Battelle We discussed the logistics for our booth/table at the Battelle conference in May 2010. Discussed the need for a staffing matrix so that there are two SURF members at the booth/table at all times. Rick was tasked with calling Russ Sirabian and getting some details regarding the space and amenities. Rick and John volunteered to work on the pin idea, and Maile with revisit/resend the design to them both so that they can put together a budget estimate. We also discussed the need for a bowl of candy, which Elie had previously volunteered to make happen. Maile will prepare a double-sided fact sheet about SURF, gathering information from the "We Are SURF" presentation and the White Paper press release; Nick volunteered to help with this task as well. John volunteered to print a poster, if the committee could send him an electronic file with the content. Maile will prepare a mock-up of a generic SURF business card, so that we have the ability to exchange cards with visitors to the booth/table. We discussed the need to have a mechanism for recruiting new members at the conference, which

depending on the booth/table amenities, could range from a sign-up form, business card exchange and follow-up, or direct internet connection to the SURF website from a laptop at the table. Would be good to have a poster or other informational device that advertised the talks/posters of the Sustainable Remediation track. Some ideas (such as membership drive) will need to be vetted at the next Board of Trustees meeting (Stephanie and Maile will attend). *Note: See update on following pages.* 

#### Agenda for next telecon/meeting:

- 1. "We Are SURF" presentation
- 2. Battelle table
  - a. Ideas for display area
  - b. Staffing matrix
  - c. Poster(s) and/or banner
  - d. Fact sheet, business card
  - e. Pin
  - f. Candy
  - g. Membership drive
- 3. ES&T article
- 4. Other agenda topics

Battelle Booth/Table Details:

Table: YES

- 2-ft by 6-ft with two chairs; will face the exhibit booths and food and beverage area.
- Raised/visible 8-ft wide by 4-ft high display board behind the table (92-in wide by 44-in high functional display area); push-pins provided.
- Battelle can supply poster board if we want.
- No room for tripods next to the table.

Internet connection and power supply: YES

- Will run from the 'laptop lounge' work area that will be adjacent to us in the Exhibit Hall. No wifi.
- Will need a laptop lock, or else should not be left unattended.
- Need to ask if we need to supply a CAT5 cable, and if so, length necessary.



The following is a layout suggestion from Battelle:

Across the top 12 inches, you have a banner that goes the full length of the display and says "SURF: Sustainable Remediation Forum" or something like that. Then on the left side you have the three circles on a poster that is about 3 feet high by 2 to 3 feet wide. In the middle, you have a poster that is also 3 feet high by 2 to 3 feet wide that has some bulleted points that discuss the importance of SURF and why everyone should join. These stay for the duration of the conference. Then on the right side, you have a poster (again 3 feet high by 2 to 3 feet wide) that lists the talks of the day and changes each day.

Note: A D-Size engineering drawing is 22-in by 34-in. Conceivably, we could have the 12-inch high banner, as suggested, and three portrait-format D-size posters in the display area, but the very top and/or bottom of the posters would be hidden because the functional display area is 46 inches high  $(12 + 34 = 46, and 3 \times 22 = 66)$ .



Academic Outreach

## SUSTAINABLE REMEDIATION FORUM ACADEMIC OUTREACH

January 27, 2010

#### Participants:

Mike Miller	Carol Dona	Steve Koenigsburg	Dan Watts	Matt Spurlin
Louis Bull	Dave Ellis	Katie Lewis	Stewart Abrams	
Catalina Espino Devine	Elisabeth Hawley	Michelle Thomson	Ralph Baker	

Note: Shading indicates participant not present during the committee breakout at SURF 12.

- 1. Promote Academic Involvement The group discussed the importance of holding SURF meetings at universities to encourage academia participation. It was suggested that at least one local academic speak at every SURF meeting and that the presentation be cited as an abstract in *Remediation*. The group discussed the lack of travel funding available to academics. The recommendation was to take the issue to the Board of Trustees to see if SURF could provide funds to offset travel for academics. To make academic participation in meetings as useful as possible, it was suggested that SURF meetings be organized with a block of time set aside for presentations during one of the two meeting days. We may want to consider changing the meeting format to concentrate presentations by having some technical meetings and separate business (nontechnical) meetings.
- 2. Promote Student Involvement –The group listed the benefits of having students participate in SURF as follows: (1) keeps curriculum and issues current, (2) helps students with job search, and (3) provides interesting research topics. A membership category for students was recommended, with annual dues of \$25. The group discussed the concept of a student paper and/or design competition for presentations at SURF meetings. The group discussed that SURF could develop a student paper competition, but funding would be necessary. All agreed that it would be necessary to outline a plan about the proposed competition and may need to request funding from the Board of Trustees. The following items were listed as additional incentives for motivating students to join SURF:
  - Offer SURF funding for student research.
  - Help students define their research topics by introducing real-world problems.
  - Keep students up to date on current trends in sustainable remediation.
  - Facilitate cross-discipline linkages for students' research projects and/or theses.
  - Provide additional student publication opportunities for their research.
  - Assist students with their job search (i.e., networking).
- 3. Identify Faculty and Researchers The group discussed the need to identify key academics who are performing research and/or are active in the fields of sustainability. Everyone seemed to agree that recruiting academics from diverse fields beyond environmental sciences and engineering (e.g., agricultural economics, sociology) was important. One approach would be to link up with academics at Battelle, International Conference & Exhibition on Life Cycle Assessment (InLCA), the American Chemical Society (ACS), the Society of Environmental Toxicology and Chemistry (SETAC), the American Society of Civil Engineers (ASCE), the Geological Society of America (GSA), and the Association of Environmental and Engineering Geologists. The group identified the following academics as a starting point: Paul Nathanail (University of Nottingham); Miriam Diamond (University of Toronto); Arturo Keller (University of California Santa Barbara); Kate Scow, Doug Mackay, Julie M. Schoenung, and Frank Loge (University of California Davis); and Michael Hannemann (University of California Berkeley).
- 4. **Promote Information Exchange** The group suggested establishing a SURF Speakers' Bureau to facilitate frequent communication and the cross-pollination of ideas among key academics and SURF. Establishing a Center for Sustainability and developing curriculum for short courses were also discussed.
- 5. **Identify Funding for Researchers and Partnerships** –The group discussed establishing a SURF Research Fund that has a budget of approximately \$3,000 to \$5,000 per year. All agreed that the effort would begin by writing an outline of how the fund would work. The group also discussed issuing a Request for Proposals within the academic community to address an identified area of sustainable remediation that could benefit from research.

- 6. Action Items Based on the discussions, the following action items were identified:
  - Establish a student membership at \$25. Lead: Dave Ellis
  - Survey existing SURF participants, and develop a list of potential academic speakers for meetings and potential academic institutions for meeting venues. Lead: Katie Lewis
  - Begin gathering information and necessary groundwork for proposed research efforts. Lead: Dan Watts
  - Fund student paper competition at a professional meeting (e.g., next year at Battelle). Lead: TBD
  - Organize a session on sustainable remediation at ACS national meetings. Lead: Dan Watts
  - Identify individuals to participate in a SURF speakers' bureau for both specific case studies and general presentations. Lead: Elisabeth Hawley
  - Identify potential professorial speakers across the country to participate in and be invited to SURF meetings. Co-Leads: Mike Miller and Elisabeth Hawley
  - Create a flyer for general outreach. Lead: TBD

**Regulatory Outreach** 

## SUSTAINABLE REMEDIATION FORUM REGULATORY OUTREACH

January 27, 2010

#### Participants:

Carol Baker	Jose Kou	Elizabeth Wells
Paul Hadley	Eric Magnan	Stewart Abrams
Rusty Harris-Bishop	Todd Martin	Karina Tipton

Note: Shading indicates participant not present during the committee breakout at SURF 12.

- Objectives The group identified the following objectives for the breakout discussion: To identify the barriers to
  increased regulatory participation in SURF and to brainstorm action that SURF can implement to overcome the
  barriers.
- 2. **Barriers** The group identified the following barriers in their discussions:
  - Lack of knowledge and/or understanding of definition of sustainable remediation.
  - Lack of knowledge of SURF's objectives.
  - Budgetary restrictions and/or funding issues that prevent in-person attendance (i.e., travel).
  - Necessity of fitting sustainable remediation into agency mission statements and applicable or relevant and appropriate requirements (ARARs). (Some participants said that agency personnel have difficulty buying into some of the concepts put forth in white paper.)
  - Perspective that sustainable remediation is "greenwashing."
  - Misuse and/or abuse of sustainable remediation concepts (i.e., greenwashing) risks tainting regulator opinions and willingness to participate. (Some participants voiced concerns that SURF promotes that misuse and/or abuse.)
- 3. Actions The group identified the following actions for future work:
  - a. Develop an improved and unified SURF message that emphasizes the following:
    - Sustainable remediation is a "better way" of developing and implementing remediation.
      - Sustainable remediation is not about greenwashing or saving money, it is about implementing remediation in a manner that maximizes net benefit (with "net benefit" being clearly defined).
    - Further clarification of how sustainable remediation meets regulatory agency goals.
  - b. Define priority list of regulators/agencies to target to participate in SURF.
    - Target a minimum of one representative from each EPA region.
      - Start with low-hanging fruit such as those states and/or agencies with sustainable or green remediation policies in place or being developed (e.g., DE, NJ, NY, WI, CA, TX, WA, OR).
      - Seek buy-in at the top by approaching decision makers and trying to get them involved. (Participants believe that a directive from top will facilitate changes in attitude and action.)
      - Develop a list of regulators and/or agencies already involved with SURF, and work with them to identify others (i.e., agencies and regulators) that would be receptive and interested in joining SURF.
      - Involve a regulator who is involved with SURF when reaching out to target regulators.
      - Participate with Association of State and Territorial Solid Waste Management Officials (ASTSWMO), engage participants in SURF discussions, and try to get them involved.
  - c. Provide sustainable remediation education opportunities to regulators in their space.
    - Consider providing "on location" training and/or education, tailoring the training to regulator needs and desires as much as possible.
    - Strive to be a clearinghouse for unbiased information on sustainable remediation, and provide access to regulators who are part of SURF.

- Compile and distribute summaries of conference presentations related to sustainable remediation (e.g., Battelle) that regulators cannot get funding to attend or, at a minimum, compile and provide on SURF web site for regulatory access.
- Compile library of case studies, and provide on SURF web site.
  - Show "real work" in sustainable remediation, including case studies that worked and did not work.
  - Dedicate a percentage of SURF meetings to presenting case studies.
- d. Provide funding discounts or assistance and/or logistics assistance to regulatory agencies.
  - Target meeting locations that facilitate regulatory participation.
  - Consider mass transit options, driving distances, and most bang for buck (i.e., choose meeting locations close to maximum number of potential participants).
  - Specifically invite regulators to give a presentation to increase the chance that their expenses will be covered by SURF.
  - Evaluate funding mechanism to help provide for expenses (question for the Board of Trustees).

Life Cycle Assessment

#### SUSTAINABLE REMEDIATION FORUM LIFE CYCLE ASSESSMENT January 27, 2010

#### Participants:

Paul Favara	Joe Odencrantz	Kurt Beil	Carol Dona	Todd Kreiger	Brendan MacDonald	Karina Tipton
Bob Boughton	Dick Raymond	Buddy Bealer	Dave Ellis	Jerry Kubal	Ann Rosecrance	Dan Watts
Elaine Darby	Richard Rominger	Brad Bradley	Angela Fisher	Joe Keller	Dave Schlott	
Mikos Fabersunne	Carol Baker	Brandt Butler	Jamie Ginn	Karin Holland	Russ Sirabian	

Note: Shading indicates participant not present during the committee breakout at SURF 12.

- Role of Best Management Practices (BMPs) The role of BMPs in green and/or sustainable remediation was discussed as they relate to site assessments. The following questions were discussed: Should BMPs be used in lieu of impact assessments? Do we want to calculate the impacts of our investigations? <u>It was recommended that an impact assessment for an investigation be completed to quantify the impacts and assess if information is generated.</u> The data from this impact assessment are necessary to allow a comparison of impact assessment results with an approach using only BMPs.
- 2. Need for Common Methodology The industry is taking an inconsistent approach to impact assessments. On one hand, there are practitioners addressing emissions impacts on-site. On the other hand, there are practitioners looking at the project more holistically and considering upstream impacts associated with mining, manufacturing, and delivering materials to the site as well as estimating impacts on different populations and systems. This is causing our results to be viewed with some confusion by stakeholders because they are seeing an inconsistent approach to identifying impacts. It was recommended that the industry develop and adopt a LCA methodology for remediation projects that can be used by the industry to provide a common approach that provides consistency.
- 3. Use of "High-End" Tools and Databases The group discussed Todd Kreiger's presentation that provided an overview of the ISO LCA methodology and then focused on the use of SimaPro to assess impacts of a groundwater treatment alternative. There was a general concern that the tool requires significant investment, from both a cost and time perspective. This opinion was countered with the thought that sustainability is new to the industry and new approaches require new tools and resources. Furthermore, the use of a SimaPro can help us identify impacts that are not considered when we focus on a pre-defined set of metrics (e.g., mercury emissions from chlor-alkali industry that produces sodium hydroxide). One participant recommended we assimilate the results of projects that use these high-end tools and prepare "curves" that can be used by practitioners who do not have access to the high-end tools and databases. There was no firm recommendation from this discussion but it was recognized that a consistent methodology (as recommended above) could better define the objectives of our LCAs and the decisions that can be made with the results. This, in turn, would help define the level of tool we need for assessments.
- 4. Role of Societal Considerations in Impact Assessments Our industry is very strong in the environmental component of sustainability. However, we probably need to better research the role of social components to see if we are being complete in our evaluations. It was recommended that we consider a social life cycle assessment approach to better address the social component of sustainability.
- Recommended Work for LCA Group One individual provided the following recommendations to help the industry better understand the role of or need for LCAs and to evaluate whether or not sophisticated tools were required:
  - Conduct a survey of the type of LCAs completed in the remediation industry.
  - Complete side-by-side comparisons of three remediation alternatives using the commonly available tools, and evaluate the types of questions that can be asked with various tools and types of answers provided.
  - Provide guidance on the need to identify a functional unit and establishing boundaries for LCA.

**Framework and Metrics** 

#### SUSTAINABLE REMEDIATION FORUM FRAMEWORK AND METRICS January 27, 2010

#### Participants:

Karin Holland	Carol Dona	Ray Lewis	Joe Keller	Karina Tipton
Brandt Butler	Zann Gill	Issis Rivadineyra	Brendan MacDonald	
Kurt Beil	Tim Havranek	Curt Stanley	Janine MacGregor	
Ana Demorest	Lorraine Larsen- Hallock	Tod Whitmer	John Sohl	

Note: Shading indicates participant not present during the committee breakout at SURF 12.

- 1. **Metrics** The group discussed that metrics need to include all aspects of the triple bottom line: environmental, social, and economic. Metrics should be quantifiable and able to be fit into these three criteria. The group discussed a plan that involves identifying the process, identifying the metrics, and then matching them together. After additional discussion, the group decided that metrics should be an integral part of the framework.
- 2. Purpose of Framework The group discussed the purpose of the framework and the difficulty in developing a framework from scratch, ensuring that all stakeholders are adequately taken into account, and leveraging current efforts (e.g., SURF UK, EPA, states, ITRC, ASTM). Discussions addressed SURF's vision and the need to include social and economic factors in the framework as well as environmental considerations. Everyone agreed that there is no straightforward approach; the framework must be flexible. The goal would be to use the framework when making decisions about remedy selection.
- 3. What does "framework" mean to SURF? The group tried to answer this question by defining the audience (i.e., who are we trying to convince?) and discussing definitions that make sense in light of SURF's vision. It was mentioned that some are currently uncomfortable with integrating societal and economic factors. The group discussed starting by taking small steps using some indicators, but it was unclear how data would be normalized and which indicators can be applied. Other concerns are the fears of some local stakeholders that sustainability is an excuse for not cleaning up a site.
- 4. Social Side The group discussed the variety of factors associated with the societal considerations of the triple bottom line. All agreed that environmental protection remains paramount even when considering societal elements (e.g., if you are developing a park, compliance with regulatory guidelines is required). When considering societal benefits, on- and off-site occupational risk are not considered relevant by many and are often controversial. Some programs consider these risks, others do not.
- 5. Definitions The group discussed the process to evaluate sustainability vs. how to incorporate sustainability into a project (i.e., process vs. a user's guide). Additional discussions focused on how to integrate sustainability from the beginning of a project to site closure. The group decided that the process by which we select and evaluate metrics for the three elements of the triple bottom line should determine what is most sustainable. The group thought that a good starting point would be to map metrics to existing criteria.
- 6. **Next Steps** Next steps were identified as follows: (1) address societal issues, (2) integrate metrics into the current regulatory program, and (3) make sure the entire remediation lifecycle is included.

Attachment 6 Wisconsin's Initiative for Sustainable Cleanups















Pilot Test - Six State Lead Sites								
Site	Site Status	Remedial Process	Contaminants					
N.W. Mauthe	Superfund	Pump and Treat	Chromium, Chlorinated VOCs					
Wisconsin Chrome	State Lead	Pump and Treat/Injection	Chromium and Chlorinated VOCs					
Minocqua Cleaners	State Lead	Pump and Treat/Injection	Chlorinated VOCs					
Refuse Hideaway	Superfund	Leachate Collection System, Methane Collection System	Methane, Leachate					
Delafield Landfill	State Lead	Leachate Collection System, Methane Collection System	Methane, Leachate					
Pentawood	Superfund	LNAPL Recovery, Bioventing, Pump and Treat	LNAPL, Pentachlorophenol, Fuel Oil					
			AECOM					

# Options for Standardized Sustainability Metrics

### Economic

- Life cycle remediation costs including capital and
- operation and maintenance (O&M)
- Dollars per unit of contaminant removed
- Cost/sustainability metrics
- (\$/kWh, \$/ton, carbon dioxide equivalents (CO2<sub>eqv</sub>)
- Green building/Leadership in Energy and Environmental Design (LEED)



AECOM

# Options for Standardized Sustainability Metrics

- Environment
  - Energy use (kWh)
  - Greenhouse gasses (CO2<sub>eqv</sub>)
  - Water use (gals)
  - Waste generation (tons)
  - Recycling (tons)
  - Renewable energy (kWh)



AECOM

# Options for Standardized Sustainability Metrics

- Social/Community
  - Safety (total reportable incidents)
  - Traffic (vehicles per day)
  - Fugitive dust, vapors, noise, odor
  - Beneficial land use/landscape planning/carbon sinks
  - Community involvement/public meetings/written communications

AECOM

- Transparent reporting















Sustainability Matrix								
	Baseline <sup>3</sup> Option 1		Option 2	Option 3				
Sustainability Metrics <sup>1,2</sup>	Annual Life Cycle	Annual Life Cycle	Annual Life Cycle	Annual Life Cyc				
Stewardship System Optimization (Qualitative) Restoration Timeframe (yrs)								
Carbon Footprint/Air Emissions Tons CO2e Tons CO2 sequestered Dust/Particulates								
Energy Usage Electricity (kWh) Natural Gas								
Cost Current Cost Cost of Modification								
Water								
Water Usage/Resource depletion (Gallons) Water Recycled/Reused (Gallons)								
Land & Ecosystems								
Total Area disturbed or requires institutional controls (acres)								
Area returned to unrestricted beneficial use or habitat enhancement (acres) Community Benefits (qualitative)								
Materials & Waste Generation								
Recycled material (tons) or qualitative								
Waste materials generated (tons)								



	Base	line <sup>3</sup>	Op Lanc Extracti Reba	tion 1 Ifill Gas on System Ilancing	Instal Extra Associa	Option 2 lation of 10 LFG ction Wells and ted Header Piping
Sustainability Metrics <sup>1,2</sup>	Annual	Life Cycle	Annual	Life Cycle	Annual	Life Cycle
Stewardship						
System Optimization (Qualitative)	Landfill gas system removing 50 p landfill gas bei	stem is ercent of ng generated.	Modified la system wo 70 percent being gen	andfill gas ould remove t of landfill gas erated.	Modified would ren landfill ga	landfill gas system nove 75 percent of s being generated.
Restoration Timeframe (yrs)	NA	25	NA	25	NA	25
<b>Carbon Footprint/Air Emiss</b>	ions					
Tons CO <sub>2</sub> e	33,776	844,400	22,952	573,800	20,246	506,580
Tons CO <sub>2</sub> e from Combusted Methane	3,344	83,600	4,682	117,050	5,016	125,400
Tons CO <sub>2</sub> e from Combusted Methane	30,404	760,100	18,242	456,050	15,202	380,050
Energy Usage						
Electricity (kWh)	48,036	1,200,900	48,036	1,200,900	48,036	1,200,900
Propane (Pounds)	40	1,000	40	1,000	40	1,000
Cost				1		
O&M Cost (dollars)	\$86,870	\$2,171,750	\$86,870	\$2,171,750	\$86,870	\$2,171,750
Cost of Modification (dollars)	NA	NA	NA	\$15,000 to \$25,000	NA	\$80,000 to \$100,000
Cost per Ton CO <sub>2</sub> e Reduced (dollars)	NA	NA	\$2.30	\$0.09	\$7.40	\$0.30
Land & Ecosystems						
Community Benefits (qualitative)	NA	NA	Reductio methar	on in fugitive ne emitted	Reductio	n in fugitive methane emitted
Materials & Waste Generati	on		_			
Leachate Generation (gallons)	1,200,000	30,022,500	1,200,00 0	30,022,500	1,200,00 0	30,022,500
		21				A



	Bas	seline <sup>3</sup>	Option 1 Prevent Surface Water Infiltration		Option 2 Move Sanitary Sewer Connection and Repurpose Treatment Building		
Sustainability Metrics <sup>1,2</sup>	Annual	Life Cycle	Annual	Life Cycle	Annual	Life Cycle	
Stewardship System Optimization (Qualitative)	System may not designed.	be performing as	Improve effectivenes may be driving conta	s of remedy as infiltration minant migration.	Will not increase the effectiveness remedy.		
Restoration Timeframe (yrs)	NA	500	NA	500	NA	500	
Carbon Footprint/Air Emissions							
Tons CO2e	14.60	7,300	14.57	7,285	1.72	860	
Energy Usage							
Electricity (kWh)	13,488	6,744,000	7000	3,500,000	13,488	6,744,000	
Natural Gas (Therms)	1,714	857,000	1,714	857,000	0	0	
Cost		[					
O&M Cost (dollars)	\$62,086	\$31,043,300	\$58,486	\$29,243,000	\$60,086	\$30,043,000	
Cost of Modification (dollars)	NA	NA	NA	\$100,000	NA	\$20,000 to \$30,000	
Cost per Pound Contaminant Removed	\$7,309	NA	\$6,962	NA	\$7,034	NA	
Land & Ecosystems Community Benefits (qualitative)	NA	NA	Fifty to sixty percent less water is being discharged to sanitary sewer. \$1 000 to \$2 000 in monthly re		rposed for beneficial ally generate revenue nonthly revenue.		
Materials & Waste Generation							
Sanitary Sewer Discharge (gallons)	820,000	410,000,000	240,000	120,000,000	820,000	410,000,00	

# \_ \_



Attachment 7 LEED for Neighborhood Development













# LEED ND 2009 Credits and Points

Smart Location and Linkage	27
Neighborhood Pattern and Design	44
Green Infrastructure and Buildings	29
Innovation and Design Process	6
Regional Priority	4
Total	110






## LEED ND SLL Credit 2: Brownfields Redevelopment

#### 1–2 points Requirements

OPTION 1. Brownfield Sites (1 point) - Locate the project on a site, part or all of which is documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program), or on a site defined as a Brownfield by a local, state, or federal government agency; and remediate site contamination such that the controlling public authority approves the protective measures and/or cleanup as effective, safe, and appropriate for the future use of the site







	SYMPHONY	PARK
	61 Acres Union Pacific Railroad Tra	act
Study I	Office and Medical Residential (3,000 units) 2 Hotels (non-gaming w/800 keys) 1 Hotel/Retail Complex (gaming w/1,000 keys)	1.8 million sf 4.5 million sf 675,000 sf 1.6 million sf
Case	Retail Performing Arts Center	475,000 sf <u>380,000 sf</u>

K

10 million sf

Total Target Square Footage











# SYMPHONY

#### EXECUTIVE SUMMARY

# Case Study I

Previous investigations of the Union Pacific Railroad (UPRR) Rail Yard located in Las Vegas, Nevada have identified the presence of petroleum hydrocarbons, volatile and semivolatile organic compounds (VOC and SVOC), and lead contamination in the soil. Petroleum hydrocarbons and organic compounds have also been detected in the groundwater. This Remedial Action Plan (RAP) addresses remediation of petroleum hydrocarbon and VOC-contaminated soils at the site that are above the groundwater table. Hydrocarbon contaminated soil below the water table will be remediated by the two hydrocarbon recovery systems presently operating at the site and other groundwater remediation systems planned for future installation. A separate RAP addressed remediation of the lead-contaminated soils (USPCI, 1991) and was approved by the Nevada Division of Environmental Protection (NDEP) on December 16, 1991.





ise Study

# SYMPHONY PARK

### **2** Phased Remediation Approach

1.Excavation and off site disposal of 3,200 yds (4,800 tons)

2.Excavation of hydrocarbon contaminated soils and treatment with a mobile thermal unit on-site 45,000 yds (68,000 tons)

Also: Excavate lead and transport to Utah; Groundwater treatment (interceptor tranches and wells)









# LEED BD&C Sustainable Sites Credit 3: Brownfield Redevelopment

#### Requirements

OPTION 1- Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local voluntary cleanup program).

OPTION 2 - Develop on a site defined as a brownfield by a local, state, or federal government agency.

NOLTE



#### Requirements

Conduct a Phase II Environmental Site Assessment (as described in ASTM E1903-97, 2002) and remediated to meet local, state, or federal EPA region residential (unrestricted) standards.





Attachment 8 SURF LCA Scenario at a Groundwater Treatment Plant













SURF LCA S	cenario		
Construction and or system	peration of 1500 GPI	VI grou	undwater treatme
Operation is for 30 y	/ears		
Hypothetical ground	dwater treatment sco	enario	
California assumed	for basis of transpo	ort & e	electricity arid
Influent concentration	ons and discharge l Reclaimed Water	imits o	of contaminants:
Influent concentratio	Reclaimed Water Discharge Limits for Key	imits (	of contaminants: Flow Weighted Estimate Design Basis Influer
Contaminant	Reclaimed Water Discharge Limits for Key COPCs	unit	Flow Weighted Estimate Design Basis Influer Concentrations
Influent concentration	Ons and discharge I Reclaimed Water Discharge Limits for Key COPCs 4 5	unit ug/L ug/L	Flow Weighted Estimate Design Basis Influer Concentrations 7.2 380
Influent concentration	Ons and discharge I Reclaimed Water Discharge Limits for Key COPCs 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	unit µg/L µg/L µg/L	Flow Weighted Estimate Design Basis Influer Concentrations 7.7 380 267
Contaminant bis(2-Ethylhexyl)phthalate Tetrachloroethene 1,1-Dichloroethene	Ons and discharge I Reclaimed Water Discharge Limits for Key COPCs 4 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	unit μg/L μg/L μg/L μg/L	Flow Weighted Estimate Design Basis Influer Concentrations 7.2 380 267 294
Influent concentration	Ons and discharge I Reclaimed Water Discharge Limits for Key COPCs 4 5 5 6 6 6 0.5	unit μg/L μg/L μg/L μg/L μg/L μg/L	Flow Weighted Estimate Design Basis Influer Concentration 7.1 380 267 294 8
Influent concentration	Arrows and discharge I Reclaimed Water Discharge Limits for Key COPCs 4 5 5 6 6 0.5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	mits ( unit µg/L µg/L µg/L µg/L µg/L µg/L	Flow Weighted Estimate Design Basis Influer Concentration 7.1 380 267 294 8 6.6.
Contaminant bis(2-Ethylhexyl)phthalate Tetrachloroethene Tirchloroethene 1,2-Dichloroethene 1,2-Dichloroethane 1,2-Tirchloroethane cis-1,2-Dichloroethene	ons and discharge I Reclaimed Water Discharge Limits for Key COPCs 4 5 6 6 0 0.5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	unit µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L	Flow Weighted Estimate Design Basis Influer Concentrations 7.2 380 267 294 8 6.0 84.2

Process Scheme: Ion /Ex	change, LGAC, with reclaimed water en	d use					_		_	
			04M Requirement	Number of	Total					
0&M Category	Equip. Name	Equip. Description	per Unit	Units.	Requirements	Units	1	Init Cost	-	Cost
Electrical Power	LE Well Pumps to Treatment Plant	235 mm @ 300'	145.940	3	437 819	kw.br				
	<b>CE Wells Pumps to Treatment Plant</b>	170 mm @ 250'	E7.978	2	175.955	kw-hr				
	LE Wells Pumps to Treatment Plant	170 mm @ 270'	95.016	2	190.032	kW-hr				
	Treatment Plant Lead Pump	1300 mm (8 270'	726,692	1	736 490	kwake				
	1GAC Barkwath Pumps	1100 mm @ 75', 1%	1.708	2	3,416	kWahr				
	Mise Controls Diebts (alignments)	1 505 W	16,466	1	16,495	kwake				
		1,000 11	19,494		1 600 000	beer the		0.15		100.0
	Total				1,550,250	KW-er		0.12		100,0
Carbon Make up	1646 adjustedConstituted	Add the Life on	343 100		342.100	th C		100		343.1
	LINK - BUIVERSC PERCEVALES	241 IOLON	343,100		343,100	10 L		1.00		343,1
Chemically Materials	the Robert Robert	1140				1.1		100.01	1	
	son exchange neun	326 OF H 1Å	950	1	350	O.A. 11.		262.51	2	595,7
	ix nesin				1 222 220					
	H2504 (for pH Adjustment)	215 ppm dosage	1225728		1,223/20	to dry	-	0.15	2	183,5
	NaOH (for pri Adjustment)	175 ppm dosage	99001	1	996,061	to dry	- 2-	0.11	1	109,9
	Filter Bags	weenly hag replacement	104	1	304	**		70.00		
	Perymer (for backwash system, snange)	on Negigiare								
<b>Residuals Disposal</b>										
	LGAC	Included above								
	Backwath Sludge Cake (allowance)	The of carbon as 30% sludge	57	1	.6.7	tons	\$	600.00	\$	2,9
	Son Exchange Resin - chrom 6	Included above				(2000fbs)				
Analytical										
	Treatment Plant	Effluent	Weekly	52	2	63	5	300.00	\$	15.0
	Extraction Wells	7 wells	Quarterly	28	ks monitoring well in	5 63	5	300.00	\$	8.4
	Monitoring Wells	10 MWs @ 4 ports ea	Semiannual/Annual	80		6.3	5	300.00	\$	24.0
	Water Samples - Additional Annual Tes	ts-allowance		6		e2.	\$	1,000.00	\$	6.0
Labor										
Labor	and the second se		and shade a sha				1.	45.00		-
	weil Operating	1 Highlay	anarytical only	345		nrs		45.00	-	10,4
	Weil Mancehance	a Htyday B Hay Adam	anarytical enry	345		nrs		45.00		15,4
	operand-own	ems/day	a operation	2920		nrs		45.00	-	131,4
	Maintenance-GWTP	e Hrs/day	e operation	2190		hrs		45.00		90,9
	Supervisory	3 HIS/ GAY	operation	1095		nrs		90.00	1	54,7
	Ciencar	2 HIS/ Gay	operation	730		nfs		20.00		14,9
Subcontracts										
	Monitoring Wells Sampling (Subcontra	d)		1		lot	\$	90,000.00	\$	90,0
	Regulatory Monitoring reports allowan	ce (RWQCB, EPA, Air Emissions Inv	entory)	1		lot	\$	25,000.00	\$	25,0
Parts										
	2% of TP Capital				2%		\$	7,976,403	\$	159,5
									\$	2,091,0
Contingency on Mate	nials/Services				10%				\$	209.1
									Ľ.	
Annual Sewe	r Surcharge		Annual	1			\$	89,530	\$	89,5
						_	_	_	_	





On-Site	On-Site with Electricity	Life Cycle
On-Site worker exposure	On-Site Burdens PLUS	On-Site with Electricity Burdens PLUS
All fuel consumed on- site	All electricity generation for use on-site including	All fuel consumed off- site
	precombustion	All off-site worker exposure
		Production and Transport of consumables (caustic sulfuric acid, GAC, IX resin)
		Disposal of all wastes



































Attachment 9 Sustainable Bioremediation Technologies for Contaminated Groundwater





Part 1 Groundwater resources are essential (but usually overlooked) part of ecosystems

An ecosystem is a dynamic complex of plant, animal, and microbial communities, combined with the nonliving environment they inhabit, interacting as a functional unit.







# Millenium Assessment (MA): largest assessment of the health of Earth's ecosystems

- Experts and Review Process
  - Prepared by 1360 experts from 95 countries
  - 80-person independent board of review editors
  - Review comments from 850 experts and governments
  - Includes information from 33 sub-global assessments
- Governance
  - Called for by UN Secretary General in 2000
  - Authorized by governments through 4 conventions
  - Partnership of UN agencies, conventions, business, nongovernmental organizations with a multi-stakeholder board of directors
  - Finished 2006/7







## **Groundwater's Ecosystem Services**

Groundwater provides all four types of ecosystem services:

- <u>provisioning</u> (e.g. storage of water for drinking, irrigation, stock and industrial use; biodiversity and genetic resources)
- <u>supporting</u> (e.g. bioremediation, nutrient cycling/retention, sustaining linked ecosystems, providing refugia)
- <u>regulating</u> (e.g. flood control, regulation of water flows and supplies, climate regulation, water purification and wastewater treatment, and erosion prevention)
- <u>cultural</u> (e.g. religious-e.g. sacred springs-- or scientific values, education, tourism).

Bergkamp and Cross (ISGWAS)

#### ASSESSMENTS OF GW ECOSYSTEMS—Historical perspective

Assessment of GW quality/quantity traditionally based on chemical and hydrogeological parameters.

**1998**--Swiss Water Protection Ordinance defined ecological as well as water quality goals for GW

**1998**—New Zealand Ministry for Environment proposed use of invertebrate indicators of GW quality

**2003**—W Australian Environmental Protection Authority defined guidelines for assessment of biotic protection in GW exploitation

**2006**—New EU Groundwater Directive (part of 2000 Water Directive) discussed importance of including "ecological status criteria" in future GW monitoring and states the importance of "protective measures for GW ecosystems"

**2007**—Initiation of German national research project to develop first concept for assessment of GW ecosystem status (UBA Study) (*use as example here*)

**2008**—Definition of "modern GW ecosystem concept (Danielopol and Griebler 2008) *From: Steube et al., 2008.* 

Type of Indicator	Specific Indicators
Physical- chemical	pH, T, EC, DO, DOC/TOC, suspended particles, detritus, NO <sub>3</sub> <sup>-</sup> , SO <sub>4</sub> <sup>2-</sup> , PO <sub>4</sub> <sup>3-</sup> , Cl <sup>-</sup> , Ca <sup>+</sup> , Mg <sup>2+</sup> , alkalinity, <sup>2</sup> H, <sup>3</sup> H, <sup>18</sup> O
Microbial (traditional)	Bacterial abundance, biomass and carbon production, colony formation on general plates, coliforms
Microbial	DNA fingerprinting, microbial diversity,
community	<u>community composition 165 rDNA cloning</u>





Impacts of pollutants that are present in short-term pulses but have impacts	Absence of typical invertebrates; absence of pollution-sensitive groups
Impacts of pollutants for which there is no routine analytical method yet	Changes in community patterns compared to reference
Evaluation of connectiveness of surface and subsurface (or different aquifers)	Detection of invertebrates or microbial communities characteristic of other system
Assessment of contaminant degradation and in situ rates	Presence of contaminant degrading microbes and functio(船建建合金 (D.NA)9








Groundwater remediation can rely on these services but at same time must protect these services



## Pitfalls of narrow view

- Groundwater treatment often overlooks that the contaminated portion being targeted is part of a larger ecosystem
- Too broad a focus overlooks multiple microenvironments of the aquifer with potential to <u>hinder or help in treatment</u>
- Too narrow a focus misses opportunities to <u>capitalize</u> on parts of ecosystem with greater potential to support treatment or to <u>identify</u> potentially vulnerable parts of system.
- Possible to end up doing harm to other ecosystem services by focusing only on treatment.

### Scale needs to be appropriate: big enough and/or small enough

With focus on limited volume of the subsurface:

Rarely are assumptions regarding the boundaries considered carefully:

- Inputs (sustainability of electron acceptors, microbes, other ???)
- Outputs:
  - vertical losses due to diffusion/reaction outside the box (benefits/impacts)
  - impacts/attenuation of effluents (altered geochem, byproducts...)

#### Where are the bugs?

- along preferential flow paths in high permeability zones
- In low permeability zones or at contacts with higher permeability zones?
  - Given long contact times, microbes there might do quite a bit of work for us

#### Abiotic reactions?

• In low permeability zones?





Examples/case studies
1. <u>Befriend the natives</u>
N Hollywood: O2 addition ex situ and in situ
VAFB: diffusive release of O2
2. Quantify the problem and the need
mass discharge estimates (COC, electron acceptors, etc.)
3. Define the physical limitations and reduce or take advantage of
them
passive methods for mixing
target amendment release to zones of diffusive flux to aquifers
reduce downward diffusion by plants to create upward advective
flux
4. <u>Degradation in hyporheic zone</u> : natural aerobic biobarrier
MTBE (USGS)
Others??













## Concluding remarks, 1

- Safeguarding of drinking water resources requires understanding of functioning of GW ecosystems and associated ecotones, i.e. transition zones:
  - soil/groundwater
  - surface water/groundwater
  - Aquitard/aquifer
  - Saturated/unsaturated
- Goals :



- define and utilize key indicators (biologic and abiotic) to describe "healthy" GW ecosystems and assess polluted GW ecosystems.
- Use ecosystem assessment frameworks to define options to restore, conserve or enhance the sustainable use of GW ecosystems and consider GW in larger perspective of other ecosystems and forces at play.



Attachment 10 Protecting and Enhancing the Land, Air, and Water

#### PROTECTING AND ENHANCING THE LAND, AIR, AND WATER THAT SUSTAINS US

#### by Richard E. Rominger

California agriculture, number 1 in the country, with production value exceeding that of the next two states combined, is under pressure. A growing population with expanding cities means competition for land and water. Water is shared among agriculture, urban, industrial and environmental uses. Environmental uses have taken more and more water, and the courts have restricted pumping from the Sacramento-San Joaquin Delta to preserve the Delta ecosystem. Invasive pests and diseases are a continuing challenge. Higher costs for energy, other inputs, and regulations like California's first in the nation legislation to reduce greenhouse gasses.

As a fourth generation Yolo County farmer, as is my wife Evelyne, and with our children, the fifth generation now operating the family farm, our hopes are that our grandchildren will be able to farm, and future generations as well. We all know what happened to Los Angeles County, the most agriculturally productive county in the nation 60 years ago. The same thing happened to the Santa Clara Valley, now Silicon Valley, and is happening right before our eyes to the Great Central Valley of California, the last great Mediterranean climate agricultural production area in the world. The cause: our population continues to grow and spread out. A retired county planner recently looked at the plans of the Valley's cities and predicted that if they all developed out to their current "spheres of influence," a child born today could live to see a Central Valley that could not feed itself. Our coastal valleys are also under the same pressure. How do we keep our best farmland from being converted to non-ag uses – strip malls, shopping centers, and sprawling subdivisions? I know I don't want that to happen, and I don't think you do either. The question is, do we have the political will to prevent it? The work you are doing in reclaiming sites will go a long way in helping cities and counties with smart growth – infill and going up instead of out.

There are many similarities between what you are doing in developing and implementing sustainable practices for remediation projects, and what agriculture is working on to make our food production more sustainable. You are working to lessen the ecological footprint of remediation projects, as well as improve the economics and the social impact. Agriculture is struggling to do the same. Some segments of agriculture are leading the way, like the California wine grape industry. The growers and vintners got together and produced a 500 page handbook on sustainability. It's for each grower and winery to assess their activities against economic, environmental and social metrics. Sustainability is ongoing and evolving from wherever you start.

We have to do better than we have in the past, as detailed in the study made in 1938 and 1939, titled "Conquest of the Land through 7,000 Years", by W. C. Lowdermilk, former Assistant Chief of the U.S. Soil Conservation Service. He chronicled the civilizations that have risen and fallen since agriculture began in the "Fertile Crescent" in the Middle East. In a few words, he said mankind marched across the face of the earth and left a desert in his footsteps. Another book, "Topsoil and Civilization", written in 1955 and updated in 1973, by Vernon Gill Carter, a conservation educator with the National Wildlife Federation, and Tom Dale, an education and

information specialist with the U.S. Soil Conservation Service, further spelled out the fragile nature of the earth's topsoil on which civilization depends for food.

We need to support federal, state and local conservation programs to help farmers and ranchers protect our soil, water, air, wildlife habitat, and open space. We also need policies, including tax policies, and regulations that make your work easier. What you are doing in turning unusable sites back into productive areas in the most economic, ecological beneficial and socially productive ways is extremely important in helping save the planet.

Each and every one of us can help make a difference. According to the U.S. Census Bureau, the average density of cities, suburbs, and towns in 1920 was about 10 persons per acre; by 1990, it had dropped to 4 persons per acre, even as the U.S. population doubled. The average new house has doubled in size since 1970, even as the number of people living in it has steadily shrunk, and the average density of some of the most recent housing developments in America is only two people per acre. These statements are from Bill McKibben's newest book, "Deep Economy: the Wealth of Communities and the Durable Future."

As he states in his book, we need a new way of thinking about our economy. Up until recently, more was also better. The simple, cheap, concentrated power of fossil fuel lies at the heart of our modern economy. But, we've probably passed "peak oil," and, as McKibben says, even before we run out of oil, we're running out of planet. Economic growth is stressing the natural world. We've dug it up, eroded it away, cut it down, and polluted it. A thousand types of environmental damage have taken their toll. In 2005, the United Nations "Millennium Ecosystem Assessment", a report put together by 1,300 scientists, found that "human actions are depleting Earth's natural capital, putting such strain on the environment that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted." There have been other warnings as well. Continuing from McKibben's book, "A majority of living Nobel laureates in the sciences recently warned that, 'if not checked, many of our current practices . . . may so alter the living world that it will be unable to sustain life in the manner we know." Continuing with McKibben, "This is the planetary equivalent of the doctor clearing his throat and asking you to sit down."

Climate change is bringing more unknowns, with predictions that weather events will be more extreme, with more severe storms and droughts. Here in California, three years of below normal precipitation has caused many hardships, especially on the west side of the San Joaquin Valley. Predictions are that climate change will mean a smaller Sierra snow pack, our largest reservoir of irrigation water. Agriculture can also be part of the solution by becoming more efficient users of energy, fertilizers and water; by sequestering carbon with no-till farming and perennial crops, and producing energy by capturing methane from animal waste, and bio-fuels from plants. We can also generate energy from solar and wind. As we all know, the federal government is working on climate change legislation. Many in agriculture are concerned that it does not include ways for farmers, ranchers and foresters to be rewarded for sequestering carbon and thus being part of the solution in a cap and trade system, so there is a lot of activity to improve the legislation as it moves through the Congress.

In addition to what SURF is doing, how can we make our communities more livable? Urban sprawl and leapfrog development mean more driving, more congestion, more air pollution, and more greenhouse gases. We need communities where it is more convenient for residents to walk, ride bicycles, and use mass transit. We need to think local, including local food supply – farmers markets and community supported agriculture (CSAs). The average meal travels 1,500 miles to our dinner table. Think of the resources that uses. Local food is fresher and supports local farmers. More and more people want to know where their food came from, who grew it, and how it was grown. I think that is a healthy trend.

We need policies at the local, state and national level that support small farms and organic farms, so they can compete. I don't think we want to depend on imported food like we do on imported oil. Local food production means food security in a time of natural or man-made disasters. This doesn't mean we won't continue to export food to other states and the world. California provides 50% of the fruits, nuts, and vegetables grown in the U. S. Maintaining our tremendous food production capability is a matter of national security. Future generations will not forgive us if we fail to maintain this remarkable agricultural productivity, our ability to feed ourselves as well as many others in the nation and the world.

If we want a livable, sustainable earth, we need to concentrate on livable sustainable communities. I hope we never lose what Wallace Stegner calls our "sense of place". And as John Muir said, "When we try to pick anything out by itself, we find it hitched to everything else in the universe." Aldo Leopold writing sixty years ago in "A Sand County Almanac" talked about a Land Ethic. He said "the first ethics dealt with the relation between individuals, the second with the relation between the individual and society, but there is yet no ethic dealing with man's relation to the land and the animals and plants which grow upon it. This is an evolutionary possibility and an ecological necessity. Ethics are possibly a kind of community instinct in the making. The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land."

Yes, we need a Land Ethic, and we need to think community if we want a sustainable future. You can help make it happen.

#### References

- Carter, V.G. and T. Dale. 1955. *Topsoil and Civilization*. University of Oklahoma Press, Norman, Oklahoma.
- Leopold, A. 1949. *A Sand County Almanac*. Oxford University Press, Inc. New York, New York.
- Lowdermilk, W.C. 1938-1939. *Conquest of the Land through 7,000 Years*. Agricultural Information Bulletin 99, U.S. Dept. of Agriculture Natural Resources Conservation Service.

McKibben, B. 2007. *Deep Economy: the Wealth of Communities and the Durable Future*. Times Books, Henry Holt and Company, LLC, New York, New York.

Stegner, W.E. 1986. The Sense of Place. Wisconsin Humanities Committee.

Attachment 11 Public Participation 101













# What works in getting your story out there...

- Postcards/flyers
- Work notices
- A-frame signs
- Presentations at existing meetings
- One-on-one meetings
- Fact sheets/30-day comment periods
- Open houses
- Community meetings













## Case Study Old Gas Plant, Kernville, CA

- Large-scale remediation
- Across street from lowincome housing
- Low-income, Hispanic community











- We are conducting an environmental investigation at our Service Center to determine if historic gas manufacturing activities contaminated soil and groundwater.
- We found chemicals associated with our former operations immediately along the property fence line in the top 2-3 feet of soil. As a result we would like to collect soil samples from your backyard with your permission.
- Would like to meet to explain the project, show you some historic pictures and maps, and discuss gaining access to your backyard to take samples.
- Gas plants were common and wastes were often buried on-site. The site in its current use is considered safe for on-site workers and neighbors.

Attachment 12 LUST Cleanup Footprint Calculator



## LUST Cleanup Footprint Calculator

Eric Magnan, P.E. U.S. EPA Region 9



















Example Inputs				
	Input Variable	Question or Instructions to User	Site #3: Location	
Pilot-Test	ing System			
	Number of pilot test wells	How many additional pilot test wells are needed?	3	
	Diameter of the pilot test wells (average)	What diameter are the pilot test wells?	2"	
	Depth of pilot test wells (average)	What is the average depth of the pilot test wells?	40 feet	
	Mobile Equipment:			
	Equipment needed	What type of equipment needed for pilot testing?	>5 hp blower, thermal oxidizer	
	Electrical source for the site	What electrical source supplies power to the site?	Diesel geneat	
	Duration of the S∀E pilot test (days)	How long will the SVE pilot testing be performed?	2	
	One-way distance to site (average)	What is the average distance to the site?	75 miles	

Calculation Example: Pump and Treat			ηp
Question Text	Select From Baseline Ranges:	Custom Response (Ilumeric Value Only. Same Units As Pick- List)	Output (Short-tons CO <sub>2</sub> )
Duration of O&M (yrs)	2 - 4 years	0.5	52.9
Groundwater Treatment:	1 - 2 years 2 - 4 years 4 - 8 years		









Examp	le Ou	tput	
P&T Assessment Design Operations Water usage Abandonment		<ul> <li>Assessment</li> <li>Design</li> <li>Operations</li> <li>Water usage</li> <li>Abandonment</li> </ul>	
	Short-tons	Percent	
P&T	CO2	of Total	
Assessment	19.4	17.9%	
Design	52.6	48.6%	
Operations	10.1	9.3%	
Water usage	16.8	15.5%	
Abandonment	9.5	8.7%	
Total:	108.4		

Website Example: Low Impact Living			
calculate impar	ts select projects s household > heating & cooling > ap Number of people in hous	ave profile pliances > trash sehold	TELLA FRIEND HELP FAQ
• size history	3 Type of housing unit Single Family Number of floors in home 2 Lot size	v or unit	skip to projects using remaining default values Defaults are based on typical estimates for your region.
	0.1 acres 2 acres	4 acres	









## Contact

Eric Magnan, P.E. U.S. EPA Region 9 (415) 947-4179 magnan.eric@epa.gov Attachment 13 Social and Economic Elements of Sustainability
















## "Green" Mechanization

## Appropriate Technology

- Matching technology level to project scale, resource availability
- Weighing community needs, e.g. job opportunities v. rapid completion

the







































