

**Sustainable Remediation Forum (SURF)
SURF 11: September 22 and 23, 2009
Newark, New Jersey**

**Sponsors:
AECOM Environment
Geosyntec Consultants
K&L Gates, LLP**

SURF 11 was held in Newark, New Jersey, on September 22 and 23, 2009, at the office of K&L Gates. The meeting was generously sponsored by AECOM Environment, Geosyntec Consultants, and K&L Gates. These companies provided financial and logistical support for SURF 11. Companies interested in sponsoring future meetings should contact the meeting facilitator, Mike Rominger (see Attachment 1 for contact information).

Those individuals that participated in the two-day meeting are listed in Attachment 1 along with their contact information. The meeting marked the 11th 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 AECOM Environment, Geosyntec Consultants, and K&L Gates for sponsoring the meeting. Dave told participants that the meeting was designed as a working meeting so the group could make the decisions necessary to formalize its status as a nonprofit legal entity and also determine what SURF will focus its energy on next.

Bill Hyatt (K&L Gates) welcomed participants to New Jersey and K&L Gates' office. Bill noted that it is clear that SURF is on the front lines of the sustainable remediation movement. He cited the recent U.S. Environmental Protection Agency (USEPA) green remediation strategy document and its commonalities with the SURF white paper as evidence of the group's affect on the sustainable remediation field.

Mike Rominger (meeting facilitator) 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.”

Mike thanked the Meeting Design Team for their work in planning the meeting agenda. SURF 11 Meeting Design Team members were as follows: Kathy Adams (Writing Unlimited), Brandt Butler (URS Corporation), Kathy Conahan (K&L Gates), Carol Dona [U.S. Army Corps of Engineers (USACE) Environmental and Munitions Center of Expertise (EM-CX)], Dave Ellis (DuPont), Jessica Furey (The Whitman Strategy Group), Lisa Hamilton (GE), Tim Havranek (ENTRIX), Karin Holland (Haley & Aldrich), Bill Hyatt (K&L Gates), Karyllan Mack (K&L Gates), David Major (Geosyntec Consultants), Mike Miller (CDM), Leah Pabst (Conestoga-Rovers & Associates), Mike Rominger (DuPont retiree), and Karina Tipton (Brown and Caldwell).

Efforts to revise SURF’s mission statement were initiated at SURF 10 and continued at this meeting. Mike read the following most recent version of the mission statement: “To promote the use of sustainable practices during the remedial action process (decision making through implementation) in a way that balances the conservation of natural resources and biodiversity, economic viability, and quality-of-life enhancements for surrounding communities while providing long-term protection of human health and the environment and achieving public and regulatory acceptance.

Efforts to achieve “sustainable neutral environmental behavior” continued at this meeting. Name badges and 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. In addition, interested meeting participants walked to a happy hour and dinner after the first day of the meeting. Efforts to achieve sustainable neutral behavior are ongoing and will continue at future meetings.

News Items

Participants discussed the news items below at the beginning of the meeting. 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.

- ❑ Stephanie Fiorenza (BP) told participants about efforts underway in the Interstate Technology & Regulatory Council (ITRC) and ASTM.
 - The ITRC’s Green and Sustainable Remediation Team is currently writing an overview document. Many SURF participants contributed to and provided peer review for the document, which is currently in the final review process. The document is scheduled to be complete by the end of the year. Stephanie encouraged SURF participants to join ITRC and said their upcoming meetings are October 26-30, 2009 in Louisville, Kentucky, and April 19-23, 2010 in Austin, Texas.
 - As highlighted at previous meetings, the ASTM Green Cleanup Task Group is establishing a standard to encourage property owners, regulators, responsible parties, developers, and communities to use green cleanup practices during project planning and implementation. Upcoming meetings are scheduled for

October 22, 2009 in Atlanta, Georgia and April 19-22, 2010 in St. Louis, Missouri. Stephanie encouraged participants to join ASTM and be part of the process.

- ❑ Dave Woodward (AECOM Environment) brought up the following two news items:
 - Dave commented on the Superfund draft strategy document that Bill Hyatt mentioned in his opening remarks. Dave pointed out that the document advocates looking at green and sustainable methods during the remedy selection stage and that this fact shows that the USEPA is serious about including sustainability in their decisions.
 - Dave told participants about the Wisconsin Initiative for Sustainable Cleanups (WISC) spearheaded by the Wisconsin Department of Natural Resources. Dave said that a draft guidance document is scheduled to be made available in the fall and that legislation is being initiated concurrent with the publication of the guidance document.
- ❑ Mike Miller (CDM) told participants that late registration is being accepted for the “25th Annual International Conference on Soils, Sediments, Water, and Energy.” The conference will be held October 19-22, 2009, at the University of Massachusetts at Amherst. An afternoon session of the conference is dedicated to sustainable remediation, and many SURF participants are attending or presenting.
- ❑ Dick Raymond (Terra Systems) told participants that an article in a local Wilmington, Delaware, newspaper featured Dave Ellis (DuPont) and SURF. Dick also mentioned that he is currently working with the GeoEnvironmental Protection Council (i.e., technical firms within Japan) to initiate efforts of SURF Japan. Those individuals interested in participating in SURF Japan’s efforts should contact Dick Raymond.
- ❑ Rick Wice (Shaw Environmental & Infrastructure Group) and Carol Dona (USACE EM-CX) told participants of a Department of Defense policy that requires all departments of the U.S. Army, Air Force, and Navy to include sustainability in contracting goals. The policy became effective in August 2009.
- ❑ Carol Dona (USACE EM-CX) updated the group on the progress of sustainability efforts in her organization as follows:
 - Carol told participants of the most recent progress of the decision framework for incorporating sustainable practices into the Army’s environmental remediation program. 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. Carol said that the preparation of the latter will depend on feedback received from the Department of Army, with Army Headquarters coordinating any Army-wide guidance preparation and review.
 - In response to a question, Carol told participants that the primary difference between the USEPA green remediation strategy and the USACE document is the amount of detail in considering, implementing, and documenting the incorporation of sustainable principles throughout the remediation cycle. She said that the USACE framework uses several of the tables presented in SURF’s white paper. The document also provides many examples of best

management practices and gives summaries of the application of the Battelle Sustainable Environmental Remediation Site-Wise tool to compare remedies at one site and to optimize the existing remedy at another site. Currently, federal agencies are working through the Federal Remediation Technologies Roundtable to achieve consensus on tool recommendations and metrics selection for federal agencies.

- Carol also mentioned that the Department of Defense (DoD) issued a green and sustainable remediation policy in August 2009 that requests DoD components to consider and implement green and sustainable remediation practices “where and when it makes sense.” The policy also calls for two briefings (December 2009 and June 2010) 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 exact dates and the audiences for the briefings have not been determined.
- ❑ Stephanie Fiorenza (BP) told participants about the GreenRemediation Conference in Copenhagen, Denmark, on November 9-10, 2009, a few weeks before the UN Climate Change Conference being held at the same location. Many SURF 11 participants are attending the meeting. Proceedings from the conference can be found at <http://www.sustainableremediation.org/links/>.
- ❑ Issis Rivadineyra (Naval Facilities Engineering Service Center) told participants that the U.S. Navy has developed a fact sheet about sustainable environmental remediation. The fact sheet is available by link at <http://www.sustainableremediation.org/links/>.
- ❑ Dave Ellis (DuPont) briefly updated participants on SURF UK activities. As mentioned in the last meeting, SURF UK published a report with the goal of determining the range of factors considered by different sets of sustainability indicators and identifying an existing data set or developing a new data set to integrate sustainability into remediation projects. In addition, SURF UK is working on a framework for sustainable remediation in cooperation with the Environment Agency. The framework is currently in the review stage. A link to the web site for SURF UK is available at <http://www.sustainableremediation.org/links/>.
- ❑ Karin Holland (Haley & Aldrich) told participants that the momentum of the white paper continues. Shortly after the white paper was published, Karin was invited to write an editorial about sustainable remediation for the *Environmental Forensics Journal*. The editorial will appear in the March 2010 issue of the journal.

Technical Presentations

SURF 11 presentations addressed the various aspects of the triple bottom line of sustainable remediation. Presentations and subsequent discussions are summarized in the subsections below.

Legal Perspectives on Sustainable Remediation

Bill Hyatt (K&L Gates) presented the practical legal problems in implementing sustainable remediation in existing Superfund programs and options of how the concept of sustainable

remediation can be fit into the existing remedy selection process. After discussing the many options (e.g., amending the statute, writing regulation, issuing guidance), Bill noted that the remedy selection process contained in the National Contingency Plan (NCP) and the remedial investigation and feasibility study (RI/FS) already include concepts of sustainability. Bill then presented various examples of where sustainability concepts are inherently included (e.g., Tables 6-1 and 6-3 in the RI/FS guidance, threshold criteria of the overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements). Presentation slides are provided in Attachment 2.

Discussions focused on the challenges of perception and implementation when trying to integrate sustainable concepts into the remedial process. Bill provided participants with an analogy, comparing sustainable remediation to environmental justice. Similar to environmental justice, sustainability is not mentioned per se, but the concept can be drawn into the process over time.

When asked to comment on how to integrate sustainability after a remedy has been selected, Bill acknowledged that this situation is a challenge. He suggested looking for opportunities to integrate sustainability concepts into the threshold criterion of “overall protection of human health and the environment” during the USEPA-required five-year review of all projects. Bill stated that some parties may be wary of this approach for fear that the Record of Decision would be reopened.

Additional discussions focused on comparative risk. Bill told participants that comparative risk is not included in CERCLA and he doesn’t believe this will change because there is no mechanism for comparative risk comparisons. Bill also told participants that he believes comparative risk could threaten to derail the entire effort of integrating sustainability into the remedial selection process and encouraged participants to work on achievable goals.

During the discussion, participants suggested different ideas about where SURF should focus its efforts next. All ideas seemed to involve sustainable remediation implementation. One participant suggested that SURF could focus its efforts on developing guidance on how to include sustainable concepts in the NCP that might be acceptable to regulators. Another participant agreed, suggesting leveraging the efforts of the USEPA and the work in the new strategy document.

Clean and Green: USEPA Region 2 Green Remediation Policy

Walter Mugdan (USEPA Region 2) described the recent “Clean and Green” policy in his region and shared information about the results to date. In March 2009, the USEPA Region 2 issued its “Clean and Green” policy — the first such policy in the nation. The policy requires that the environmental footprint of any USEPA-managed cleanup (whether fund-financed or carried out by potentially responsible parties) must be minimized. While every aspect of remediation is to be evaluated, four specific “touchstone” technologies are established as default expectations for all cleanups, including clean diesel and electricity from renewable sources. Presentation slides are provided in Attachment 3. Additional information about the policy is available via link at <http://www.sustainableremediation.org/links/>.

Discussions focused on beginning the process of integrating sustainable concepts into the remedial process by “picking the low-hanging fruit.” As an example, Walter told participants that one of the simplest methods to optimize existing remedies is to change the use of traditional sources for site electricity to renewable sources.

Strategies for Addressing Cumulative Impacts in Environmental Justice Communities

Stewart Abrams (Langan Engineering & Environmental Services) presented the latest report published by the EJAC, an advisory group to the New Jersey Department of Environmental Protection. The report, *Strategies for Addressing Cumulative Impacts in Environmental Justice Communities*, reflects the research and findings of an EJAC subcommittee over the course of more than a year. Stewart's presentation focused on the following nine key recommendations from the report: (1) identify vulnerable and burdened communities, (2) adopt requirements for additional analysis in these hot spot areas, (3) reduce or eliminate existing impacts in burdened or vulnerable neighborhoods, (4) reduce air pollution burden in the state overall, (5) improve technical tools, (6) educate and involve municipal officials, (7) empower citizens, (8) empower union members and workers, and (9) mobilize state government to be more aware of environmental justice issues. The report is available via link at <http://www.sustainableremediation.org/links/>.

After the presentation, one participant asked about the method used to map the disparate burden. Stewart responded that various parameters (e.g., income distribution, health, location of various industries) were all input into a model. All participants seemed to agree that the voice of environmental justice communities should be included in the society consideration of the triple bottom line of sustainable remediation. One participant stressed the importance of community involvement during the process so that the priorities of the community can be reflected in the outcome. For example, some communities would rather the contaminants be left in place rather than hauled away in trucks through the neighborhood. For other communities (like the ones surrounding the Passaic River in New Jersey), truck traffic is not a concern and the higher priority is contaminant removal.

Life-Cycle Assessment (LCA) and Remediation

Todd Krieger (DuPont) presented the basics of life-cycle analysis and how it applies to both remediation and to SURF. He provided examples of how industry is currently using LCA as well as the potential applications of LCA to remediation (including remedy enhancement, remedy selection, and site prioritization). Todd presented a detailed review of an application of life-cycle analysis to showcase the ability of LCA to identify key contributors, the importance of consumables, the need for sensitivity analysis, and the importance of functional equivalence among systems being compared. Presentation slides are provided in Attachment 4.

Discussions focused on the importance of performing the LCA in stages and involving project remediation professionals during the LCA process to optimize alternatives. Todd said that size and risk factors are usually considered when deciding whether to use LCA for a remediation site and noted that the amount of work involved decreases with every additional LCA performed. One participant asked Todd to comment on the costs of LCA models and the level of expertise needed to use the models. Todd told participants that many LCA models exist, such as those for energy supply and electricity supply. Cost packages vary by supplier. One includes a single license for \$2,500 plus a similar yearly fee. A different vendor has higher upfront fees for additional costs for data, but no yearly service fees. Todd acknowledged that understanding the LCA process and interpreting the results requires expertise.

Paul Favara (CH2M Hill) presented the second part of this presentation, which discussed the current state of LCA within the remediation field and identified concerns and limitations (e.g., resources, metrics, credibility, weighting factors, level of analysis). Presentation slides are provided in Attachment 5. Paul then asked participants the possibilities of addressing the concerns and limitations and the group discussed what roles SURF can and/or should serve in the process. After brainstorming challenges and potential solutions, participants identified the following three questions as those questions that are most important to answer for SURF:

- ☐ How can SURF set project-specific objectives?
- ☐ How can SURF help integrate LCA in regulatory decisions?
- ☐ How is data consistency achieved?
- ☐ How do are residual/collateral impacts (i.e., comparative risk) included?

Participants seemed to agree that all of these questions could be addressed in a comprehensive white paper authored by SURF about LCA. A detailed summary of the brainstorming discussion, potential solutions, and SURF's role in the process is provided in Attachment 6. The path forward resulting from these discussions is highlighted at the end of these notes.

Updates

Two presentations were made to update SURF participants on the progress of different SURF efforts. Presentations and subsequent discussions are summarized in the subsections below.

SURF Web Site Update

Maile Smith (Northgate Environmental Management) updated participants about the SURF web site located at www.sustainableremediation.org. Maile showed participants the updates to the library and links pages based on input from SURF participants and meeting notes. She encouraged participants to use the great resources listed and to provide additional links to keep the resource library current. Maile proposed the formation of a Communications Committee to enhance information delivery, promote the SURF brand, and protect the SURF mission and message. Presentation slides are provided in Attachment 7.

Discussions focused on Maile's proposal, and participants seemed to agree that a Communications Committee was appropriate and necessary. The path forward resulting from Maile's proposal is highlighted at the end of these notes.

Green/Sustainable Remediation Track at Battelle Conference

Russ Sirabian (Battelle Memorial Institute) updated participants on the progress of the Green/Sustainable Remediation track at the "Seventh International Conference: Remediation of Chlorinated and Recalcitrant Compounds" presented by Battelle. The conference will be held on May 24-27, 2010, in Monterey, California, and many SURF participants are making presentations. Russ presented the sessions in the track and the session chair names. He also gave the names of the track's subcommittee members, all of whom are active in SURF. Russ said that the subcommittee has had several conference calls to date. Russ ended his presentation by telling participants that a preliminary program will be distributed in November. For more information, visit the conference web site at www.battelle.org/chlorcon. Presentation slides are

provided in Attachment 8. Discussions after the presentation focused on logistical information for session chairs regarding the timing of reviews and deadlines.

SURF Organizational Structure Discussion

Dave Ellis (DuPont) provided grounding for the SURF organizational structure discussion, highlighting some of the challenges that SURF faces due to a lack of formal structure. Summaries of these challenges and SURF's efforts in developing a formalized structure is provided in previous meeting notes (see notes from SURF 7 through SURF 10).

First, Karyllan Mack (K&L Gates) updated participants on the progress of SURF's Certification of Incorporation and By-Laws. Drafts of these documents were sent to SURF prospective members via e-mail before the meeting. Participants asked Karyllan questions to clarify some of the details of these documents, including some of the details about Officers and the Board of Trustees. Karyllan told participants that there are four Officer positions on the Board (i.e., President, Vice President, Secretary, and Treasurer) and five Nonofficer positions on the Board. Karyllan also told participants that K&L Gates will serve as the registered office (i.e., address location) and registered agent free of charge to SURF.

After participants' questions had been answered, they voted by a show of hands to incorporate SURF as a nonprofit corporation and to maintain the current organizational name (i.e., Sustainable Remediation Forum). Path forward items associated with the Certificate of Incorporation and By-Laws, as well as the procedures for voting for the Board of Trustees are provided at the end of these notes.

Then participants divided into two groups to answer specific questions regarding the mission statement and By-Laws and membership to assist in issuing the next draft of the By-Laws. A brief summary of the discussions is below.

❑ Mission Statement

Dave Major (Geosyntec Consultants) led the breakout group discussion on the mission statement, and Russ Sirabian (Battelle Memorial Institute) was the scribe. The group rewrote the mission statement as follows: "The mission of SURF is to maximize the overall environmental, societal, and economic benefits from the site cleanup process by: (1) advancing the science and application of sustainable remediation, (2) developing best practices, (3) professional knowledge exchange, (4) education, and (5) outreach."

❑ Membership

Mike Houlihan (Geosyntec Consultants) led the breakout group discussion on membership issues, and Dick Raymond (Terra Systems) was the scribe. The group expressed a strong and unanimous preference against group members, favoring individual memberships instead. The group agreed that membership dues should be used only to offset administrative costs and that each meeting should be self-funded by way of a registration fee. The group also suggested that SURF consider other sources of funding, such as funds from sustaining member firms and those from advertising and sponsorship. In addition, a benefactor category could be used during SURF's startup. A detailed account of the breakout session discussion is provided in Attachment 9.

The action items resulting from these breakout group discussions are highlighted at the end of these notes.

Next Big “Stake in the Ground” Discussion

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. A continuation of the discussion was scheduled at SURF 10, but time was limited. An action item from SURF 10 was to have the “next big stake” discussion at SURF 11. Before the meeting, questions were developed based on previous meeting discussions and white paper recommendations. Participants divided into five breakout groups to answer the following five questions:

- ☐ Big Stake #1
How might SURF have a great outreach program?
- ☐ Big Stake #2
How might SURF promote a view of sustainable remediation that includes all stakeholders and impacts?
- ☐ Big Stake #3
How might SURF and the academic community work together to improve sustainable remediation?
- ☐ Big Stake #4
How might SURF provide leadership toward a consensus sustainable remediation framework?
- ☐ Big Stake #5
How might SURF provide leadership in developing standardized evaluation criteria and metrics?

Detailed notes from these discussions are provided in Attachment 10. In general, common themes of consensus building and collaboration emerged among all of the five breakout groups.

After each group reported back with their ideas, participants were encouraged to sign up for working groups so that progress could continue to be made on these next big stakes. A listing of these groups is provided in the Path Forward section at the end of these notes.

Path Forward

The following path forward items were identified during the meeting:

1. The Green Remediation Team of the California Department of Toxic Substances Control (DTSC) will host the next meeting, which will be held January 26 and 27, 2010, in Sacramento, California. The address is as follows: 8800 Cal Center Drive, Sacramento, California, 95826. Meeting logistics will be forwarded as they become available. A draft agenda will be developed by the Meeting Design Team and will be circulated via e-mail. Active feedback and suggestions are encouraged.
2. Based on feedback at the meeting, volunteers for the design team are as follows:
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), Jake Torrens (AMEC Geomatrix), Rick Wice (Shaw Environmental & Infrastructure Group), 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. Participants agreed to form a subgroup within SURF to prioritize the action items stemming from the LCA and remediation presentations and discussions. The subgroup will be lead by Todd Krieger (DuPont) and Paul Favara (CH2M Hill) and will consist of the following team members: Carol Baker (Chevron), Kurt Beil (ARCADIS), Brandt Butler (URS Corporation), Carol Dona (USACE EM-CX), Dave Ellis (DuPont), Angela Fisher (GE), Tim Havranek (ENTRIX), Karin Holland (Haley & Aldrich), Joe Keller (Groundwater & Environmental Services), Brendan MacDonald (CDM), Dick Raymond (Terra Systems), Issis Rivadineyra (Naval Facilities Engineering Service Center), Russ Sirabian (Battelle Memorial Institute), Karina Tipton (Brown and Caldwell), and Dan Watts (New Jersey Institute of Technology). The subgroup will report on their progress at the next meeting.
4. The following action items and/or decisions were made to achieve a formal organizational structure by early next year:
 - The Certificate of Incorporation and By-Laws will be revised based on discussions at the meeting. These documents will be sent via e-mail for larger group input. Comments on these documents are due by November 4, 2009. After the meeting, the deadline was extended to November 12, 2009. The Organizational Structure Work Group will integrate comments and send out a final version of the By-Laws by December 16, 2009. At the next meeting, participants will finalize and, by consensus, recommend adoption of the By-Laws.
 - After the meeting, the Organizational Structure Work Group developed a nominating process for Officers and Nonofficers of the Board of Trustees. Based on the consensus reached at SURF 11, only individuals that have attended at least one SURF meeting to date and intend to become a member of SURF may nominate someone. Nominees must have attended at least three SURF meetings to date and intend to become a member of SURF. A listing of those individuals who have attended three meetings or more to date will be distributed. Nominators should check with the nominee to ensure that s/he is eligible for nomination and willing to serve. Nominators can nominate one person for each Officer position on the Board and up to three Nonofficer members. The nomination deadline is January 12, 2010.
 - Voting will take place at SURF 12, and voting by proxy will be available. Individuals must sign a Letter of Intent signifying their intent to join SURF in 2010 and submit it to Kathy Adams by January 12, 2010, in order to vote at the next meeting. Additional voting procedures will be distributed as information becomes available.

5. The following action items and/or decisions were made based on the organization structure breakout group discussions:
 - The rewritten mission statement will be distributed to SURF prospective members for input. The Organizational Structure Work Group will finalize the mission statement based on the input and will present the final mission statement at the next meeting.
 - Prospective members of SURF will be surveyed to obtain feedback about membership fees. The Organizational Structure Work Group will process the survey results.
6. The work of the next big stake breakout groups will continue in the form of separate work groups (see listing below). All prospective members of SURF were invited to participate in the various groups via e-mail. Since the meeting, the General Outreach Work Group (Big Stake #1) has combined with the Communications Work Group proposed by SURF's web master Maile Smith (Northgate Environmental Management). A portion of the next meeting will be dedicated to updating participants on the progress of these groups.
 - **Big Stake #1: General Outreach**
This various activities in this group are being led by Stephanie Fiorenza (BP), Maile Smith (Northgate Environmental Management), and Jake Torrens (AMEC Geomatrix). Group members are as follows: Elie Haddad (Haley & Aldrich), Beth Hyde (Roux Associates), Dave Major (Geosyntec Consultants), Phil McKalips (Environmental Standards), John Simon (WSP Environment & Energy), and Rick Wice (Shaw Environmental & Infrastructure Group).
 - **Big Stake #2: Inclusive View of Sustainable Remediation**
This group is being led by Carol Baker (Chevron). Group members are as follows: Stewart Abrams (Langan Engineering & Environmental Services), Stephanie Fiorenza (BP), Elie Haddad (Haley & Aldrich), Todd Martin (Integral Consulting), and Karina Tipton (Brown and Caldwell).
 - **Big Stake #3: Academic Outreach**
This group is being led by Mike Miller (CDM). Group members are as follows: Stewart Abrams (Langan Engineering & Environmental Services), Matt Spurlin (ARCADIS), and Dan Watts (New Jersey Institute of Technology).
 - **Big Stake #4: Consensus-Based Framework**
This group is being led by Karin Holland (Haley & Aldrich). Group members are as follows: Brandt Butler (URS Corporation), Carol Dona (USACE EM-CX), Brendan MacDonald (CDM), Janine MacGregor (New Jersey Department of Environmental Protection), John Sohl (COLUMBIA Technologies), and Karina Tipton (Brown and Caldwell).
 - **Big Stake #5: Criteria and Metrics**
This group is being led by Brandt Butler (URS Corporation). Group members are as follows: Tim Havranek (ENTRIX), Joe Keller (Groundwater and Environmental Services), Todd Krieger (DuPont), Dick Raymond (Terra Systems), Russ Sirabian (Battelle Memorial Institute), Maile Smith

(Northgate Environmental Management), and John Sohl (COLUMBIA Technologies).

7. Tentative upcoming SURF meeting plans are as follows:

- SURF 13 – April 2010 at the Georgia Institute of Technology in Atlanta, Georgia
- SURF 14 – Mid-summer at Colorado State University in Fort Collins, Colorado

Attachment 1
SURF 11 Participant Contact Information

SURF 11 Participant Contact Information

Participant	Affiliation
Abrams, Stewart	Langan Engineering & Environmental Services
Adams, Kathy	Writing Unlimited
Baker, Carol	Chevron Energy Technology Company
Baker, Ralph	TerraTherm
Beil, Kurt	ARCADIS
Butler, Brandt	URS Corporation
Dona, Carol	U.S. Army Corps of Engineers Environmental and Munitions Center of Expertise
Dulcey, Rich	ERM
Ellis, Dave	DuPont
Favara, Paul	CH2M Hill
Fiorenza, Stephanie	BP
Fisher, Angela	GE Global Research
Haddad, Elie	Haley & Aldrich
Hansen, P.J.	TRC Solutions
Havranek, Tim	ENTRIX
Holland, Karin	Haley & Aldrich
Houlihan, Mike	Geosyntec Consultants
Hyatt, Bill	K&L Gates
Hyde, Beth	Roux Associates
Keller, Joe	Groundwater & Environmental Services
Krieger, Todd	DuPont Engineering
MacDonald, Brendan	CDM
MacGregor, Janine	NJ Dept. of Environmental Protection
Mack, Karyllan	K&L Gates
McGuinness, Eileen	The Whitman Strategy Group
Major, Dave	Geosyntec Consultants
Martin, Todd	Integral Consulting, Inc.
McKalips, Phil	Environmental Standards
Miller, Mike	CDM
Mugdan, Walter	USEPA Region 2
O'Dell, Brent	MACTEC Engineering and Consulting
Pabst, Leah	Conestoga-Rovers & Associates
Quigley, Jim	VeruTEK Technologies, Inc.
Raymond, Dick	Terra Systems
Rivadineyra, Issis	Naval Facilities Engineering Service Center
Rominger, Mike	On-Board Consulting
Siet, Ken	TRC Solutions
Simon, John	WSP Environment & Energy
Sirabian, Russ	Battelle Memorial Institute
Smith, Jeff	Langan Engineering & Environmental Services
Sohl, John	COLUMBIA Technologies
Spurlin, Matt	ARCADIS
Taddeo, Art	AECOM Environment

SURF 11 Participant Contact Information

Participant	Affiliation
Tipton, Karina	Brown and Caldwell
Torrens, Jake	AMEC Geomatrix
Watts, Dan	New Jersey Institute of Technology
Wice, Rick	Shaw Environmental & Infrastructure Group
Woodward, Dave	AECOM Environment
<i>Remote Attendees</i>	
Boughton, Bob	California DTSC
Drugan, Sophia	Kleinfelder
Furey, Jessica	The Whitman Strategy Group
Hadley, Paul	California DTSC
Karnis, Stella	Canadian National
Smith, Maile	Northgate Environmental Management

Attachment 2
Legal Perspectives on Sustainable Remediation

Legal Perspectives on Sustainable Remediation

William H. Hyatt, Jr. Esq.
September 22, 2009

www.klgates.com

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- Practical Legal Problems in Implementing Sustainable Remediation in Existing Superfund Programs
- How the Concept of Sustainable Remediation can be Fitted into the Existing Remedy Selection Process

Practical Legal Problems in Implementing Sustainable Remediation in the Existing Superfund Program

The Nine Remedy Selection Criteria Based on Section 121 of CERCLA

Threshold Criteria

- (1) Overall Protection of Human Health and the Environment
- (2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Primary Balancing Criteria

- (3) Long Term Effectiveness and Permanence
- (4) Reduction of Toxicity, Mobility or Volume Through Treatment
- (5) Short-Term Effectiveness
- (6) Implementability
- (7) Cost

Modifying Criteria

- (8) State Acceptance
- (9) Community Acceptance

Attachment 3
Clean and Green: USEPA Region 2 Green Remediation Policy

Clean & Green:
Region 2's
Green Remediation
Policy
September, 2009

CLEAN and GREEN Policy

EPA Region 2 issued *Clean and Green* Policy on 3/17/09:

- All Superfund cleanups – whether “fund lead” or “PRP lead” – will use green remediation techniques.
- EPA-lead RCRA Corrective Action projects will also apply this policy.
- http://www.epa.gov/region2/superfund/green_remediation/

What is Green Remediation?

- *Green remediation is the practice of considering environmental impacts of remediation activities at every stage of the Remedial process in order to maximize the net environmental benefit of a cleanup. Considerations include selection of a remedy, energy requirements, efficiency of on-site activities, and reduction of impacts on surrounding areas.*

Note: Green remediation objectives do not “trump” applicable cleanup objectives.

Impacts of Site Remediation

- Energy Use
 - Remedial actions are energy intensive
 - Groundwater pump-and-treat systems operate for decades
 - Soil/sediment excavation requires heavy fuel use for construction equipment and off-site transportation
- Air Emissions
 - Construction equipment produces diesel emissions, often in densely populated and/or low income or minority communities
- Water Discharges
 - Groundwater pumping depletes aquifers and changes local hydrology
 - Treatment plant effluent affects surface water quality
 - Increased stormwater runoff and sewer overflows from construction sites and impervious surfaces
- Generation and Management of Waste Materials
 - Re-deposition of Hazardous Substances in different locations
- Land
 - Topographical and Hydrological Changes
 - Changes in Land Use

Touchstone Technologies

R2 Clean & Green Policy identifies four “Touchstone” Technologies. These must be used unless demonstrated to be impracticable at a particular site:

1. Purchase 100% of electricity from renewable sources
2. Concrete made with Coal Combustion Products (CCP) replacing a portion of traditional cement
3. Clean diesel fuels and technologies
4. Methane capture at landfill sites

Touchstone Technologies: Renewable Electricity for Cleanups

- Superfund cleanups are estimated to use 14 billion kilowatt-hours (kWh) from the five most energy intensive treatment technologies between 2008 and 2030
- Greenhouse gas emissions associated with this energy demand = >9.3 million metric tons of CO₂

Superfund Energy & Carbon Footprint

Remedy	Estimated energy use Annual Avg. (kWh*10 ³)	Total estimated energy use 2008-2030 (kWh*10 ³)	Estimated CO2 emissions Annual Avg. ² (metric tons)	Total estimated CO2 emissions 2008– 2030 (metric tons)
Pump & Treat	489,607	11,260,969	323,456	7,439,480
Thermal Desorption	92,919	2,137,126	57,756	1,328,389
Multi-Phase Extraction	18,679	429,625	12,000	276,004
Air Sparging	10,156	233,599	6,499	149,476
Soil Vapor Extraction	6,734	154,890	4,700	108,094
Total	618,095	14,216,209	404,411	9,301,443

Reduce the Footprint: Buy Renewable Energy

- When electricity for a site must be purchased from the grid, there is usually an option to purchase electricity made from renewable sources, such as wind and small scale hydro-electric.
 - Available everywhere in NY and NJ; cost differential is 1-2 cents per kWh.
 - Not yet available in PR and USVI.

Example of Cost to Purchase 100% Electricity:

Mohonk Example

Estimate of Annual kWh Used	168,000	
Baseline Annual Energy Cost	\$ 21,600.00	
Cost to Switch to 100% Wind		Percent Cost Increase
100% Usage	\$ 4,200.00	19%
50% Usage	\$ 2,100.00	10%
Cost to Switch to 35% Wind / 65% Hydro		
100% Usage	\$ 1,680.00	8%
50% Usage	\$ 840.00	4%

The least cost option for achieving 100% renewable electricity use would be to switch to the 35%/65% option at a total increased cost of \$1680/year -- an 8% increase in electricity costs. This represents an increase of less than 0.5% in total annual site O&M costs of ~\$350k - \$400k, and yields a reduction of ~ 64 tons of CO2/year.

Even Better Alternative: Make Renewable Energy On-Site

- The former St. Croix Alumina site in the U.S. Virgin Islands uses electricity generated onsite by several windmills and solar arrays to drive pumps





BP 275-KV solar field

BP Petroleum site in Paulsboro, NJ, uses a 275-KV solar field to power six recovery well pumps, aerators and blowers

The former Ferdula Landfill in NY uses *fans* for vapor intrusion mitigation systems powered by roof-top solar panels or wind-driven vacuum systems



Ferdula Landfill in NY - Landfill gas extracted by the wind-generated vacuum system is treated inside an adjacent 150-ft² building.

Touchstone Technologies: Green Concrete

- Concrete is the second most widely used material on earth.*
- Concrete manufacture accounts for 5% - 10% of global GHG emissions; most come from making Portland cement.
- Coal Combustion Products (CCP – coal ash) can replace Portland cement in concrete.



* Water is the most widely used.

Green Concrete

- Replacing one ton of Portland cement with one ton of CCP --
 - removes >0.8 tons of CO₂ from the air (equivalent to 2 months of an automobile's CO₂ emissions).
 - Conserves enough landfill space to hold about 1,200 pounds of waste, the amount of solid waste produced by one American over 270 days.
 - Saves enough energy to provide electricity to an average American home for 19 days.

AND --

- ***Reduces risk of massive discharges from large storage sites.***

Coal Ash Spill in Tennessee

Dec. 2008



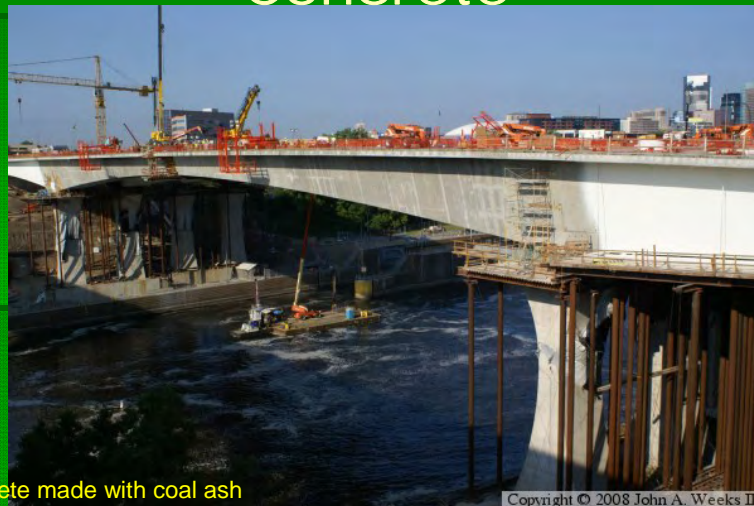
Green Concrete

Performance equal to or better than conventional concrete



Destiny Mall in Syracuse, NY using 30% CCP in concrete, > 5400 tons to date. **NY Mets** will use ~ 1000 tons. **St. John University in NYC** will use 50% CCP.

New I-35 Bridge in Minneapolis: Built with Green Concrete



Concrete made with coal ash and blast furnace slag

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Touchstone Technologies: Clean Diesel

- Diesel construction equipment emits large amounts of NO_x and PM, both of which contribute to various and numerous negative health impacts.



Clean Diesel Strategies

- Repair & Maintain engines
- Switch to Cleaner Fuels
 - Ultra-low Sulfur Diesel (ULSD)
 - Bio-Diesel
- Reduce Idling
- Repower/Replace
- ***Retrofit***



Cleaner Fuel



- Ultra-low Sulfur Diesel Fuel
 - Will be off-road standard by 2010
 - 99% sulfur removed
 - 10 – 20 cents more per gallon
 - Widely available now
- Bio-Diesel
 - 5 – 9 % particulate reduction
 - Increasing availability
 - ACUA using B-20 in all trucks (>100)
 - Destiny Mall (Syracuse, NY) using B-100 in all equipment, >175,000 gals. to date

Diesel Retrofit

- Diesel Oxidation Catalyst (DOC)

- Diesel Particulate Filter (DPF)

BEFORE ... and ... AFTER



Boston's "Big Dig"

Retrofit Costs and Benefits

Diesel Oxidation Catalyst

\$500 – \$2,000

30% PM reduction

50% HC reduction

40% CO reduction



Diesel Particulate Filter

\$3,000 – \$10,000

90% PM reduction

90% HC reduction

90% CO reduction



All diesel equipment > 50 HP used in reconstruction of downtown Manhattan has been retrofitted – over 170 pieces of equipment.

Passaic River Removal Action will use Clean Diesel dredges.



Touchstone Technologies: Methane Capture

- All landfills generate methane gas.
- Methane has a global warming potential 23 times higher than carbon dioxide.
- Methane has fuel characteristics similar to natural gas.
 - Can be used to generate electricity
 - Can be used to fuel vehicles
 - Can be used for heating
- Collection of methane from landfills is a common and well-understood technology.

At the Operating Industries site in CA, landfill gas is captured and converted for energy use at an average rate of 5,500 scfm. Approximately 30% of the total gas content consists of methane.



Additional Green Remediation Best Management Practices

- Less Energy-Intensive Remedies
- Aquifer Recharge
- Sediment & Wetlands Restoration
- Site Re-Use – Ecosystem Benefits

Less Energy Intensive Remedies

- Bio-remediation relies on micro-organisms, fungi or other biota to remove contaminants from the environment and/or convert them through metabolic processes into harmless or less harmful constituents



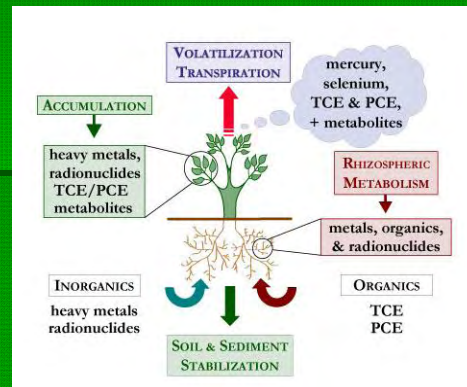
Pleurotus ostreatus: may be useful in the break down of polyaromatic hydrocarbons (PAH's), helping to remediate petroleum products in soil

- Not suitable in all circumstances

- Phyto-remediation is a sub-class of bio-remediation, in which certain kinds of green plants (including various types of grasses, shrubs and trees) are used to extract contaminants from soil or water

- In some cases, plants concentrate the contaminants and are then harvested for proper disposal.

- In other cases the plants render the contaminants less hazardous, or move them out of the ground and into the atmosphere through transpiration.



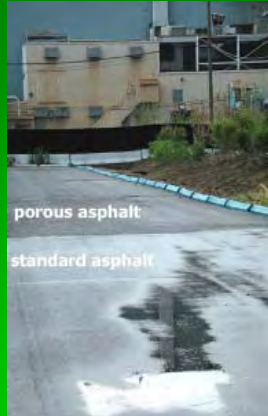
Aquifer Recharge

- At Rowe Industries in Sag Harbor, NY, on-site air stripper receives 137 millions gallons of PCE-contaminated water per year from eight groundwater recovery wells. The treated water is then discharged into two recharge basins from which it percolates back into the ground.

Rowe Industries Recharge Basins



- Permeable pavement can be used on non-contaminated areas of sites



- Stormwater management through berms and swales



Compost

- Can be used for site stormwater management
 - Superior filtration & erosion prevention/control
 - More easily installed & maintained
 - Control & reduction of non-point source pollution.
 - Does not require removal or disposal from site once job is complete



Compost has been proven effective for remediating:

- Chlorinated & nonchlorinated hydrocarbons
- Wood-preserving chemicals
- Solvents
- Heavy metals
- Pesticides
- Petroleum products
- Explosives



Sediment and Wetlands Restoration

- Treated or grey water can be used to irrigate vegetative cover on-site
- Biosolids from a treatment system can be used for soil amendment

- At the DeSale Reforestation Area in PA, acid mine drainage is being treated passively through a series of natural, gradient-driven engineering steps involving settling ponds, vertical flow ponds, and constructed wetlands.



Prior to restoration



Five years after planting

Native plants in the De Sale Restoration Area wetlands include broad-leaved cattails, soft rush, and tussock sedge.

- A remedy can be designed to maximize the ecological productivity of the site: wetlands, surface water and other habitats can be restored, and native species can be replanted.

- “Return to nature” -- maintaining use or access restrictions can confer significant ecological benefits.

- Former Rocky Flats nuclear weapons plant became a National Wildlife Refuge in 2005.

- Portions of former Naval facility in Vieques, PR turned over to DOI as a wildlife refuge.

Site Re-use



Rocky Flats, a former nuclear plant located just 16 miles northwest of Denver, Colorado is a new refuge in the US Fish and Wildlife Refuge System

- Capped landfills may be able to be reused as solar energy farms. Other remediated sites may also be suitable for generation of renewable wind or solar energy.
- Commercial or residential re-use can be accomplished using green construction techniques or LEED standards.

Voluntary or Obligatory?

Can EPA require use of a green remediation technique, even if it might increase the overall costs or impose a burden?

- **“Short Term Effectiveness” Criterion of NCP: Short-term impacts of alternatives shall be assessed considering --**
 - *The “short-term risks that might be posed to the community during the implementation of an alternative”;*
 - *The potential impacts on workers during the remedial project; and*
 - *The “[p]otential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation”.*
- **Clean diesel equipment reduces short-term risks to nearby residents and workers.**
- **Use of green concrete, purchase of renewably generated electricity (or use of on-site renewable energy generation) and capture/reuse of methane gas from landfills all result in reduced GHG and other air emissions associated with a remedial construction project, and therefore reduce the environmental impacts of the remedial action.**

- **“Community Acceptance” Criterion of NCP:**
Support or opposition from interested members of the community should be considered in selecting a remedial alternative.
- **If residents near a remedial construction site are presented with thorough information about clean alternatives and the environmental exposures they will experience under various options, it is likely they will express strong preference for greener alternatives (e.g., clean diesel).**

EPA Cannot ...

- Force a particular re-use strategy on a land owner (e.g., require a landfill owner to use site for solar power generation).
- Overrule local zoning and land use restrictions.

EPA Can ...

- ... ensure through remediation that the site is suitable for appropriate forms of green re-use.
- ... encourage the development of renewable energy on formerly contaminated lands and mining sites by identifying such lands and providing resources and information for developers and industry.

AND –

EPA Can . . .

- Require use of appropriate, cost-effective Green Remediation techniques when selecting a response action at Superfund sites...
- ...and federal lead RCRA corrective action sites.

This is the purpose of the *Region 2 Clean and Green Policy*.

National EPA Green Remediation Initiatives

- *Principles for Greener Cleanups* issued 8/27/09 by EPA Office of Solid Waste & Emergency Response (OSWER).
 - Goal is to “ensure protection of human health and the environment and to reduce the environmental footprint of cleanup activities, to the maximum extent possible.
- *Superfund Green Remediation Strategy* issued 9/7/09 by OSWER for public review.
- Both documents, and others related to Green Remediation, can be found at:
<http://www.epa.gov/oswer/greencleanups/index.html>

Other EPA Regional Policies

- **Greener Cleanups Policy – EPA Region 9**
Issued 9/14/09
- *Establishes preference for use of a range of practices, strategies and technologies to support the implementation of greener cleanups*

Attachment 4
Life-Cycle Assessment and Remediation

Life Cycle Assessment and Remediation

DuPont Engineering Evaluations & Sustainability

Todd Krieger

9/22/2009



Life Cycle Assessment (LCA)

Environmental assessment tool to evaluate the “environmental footprint” of a product/process

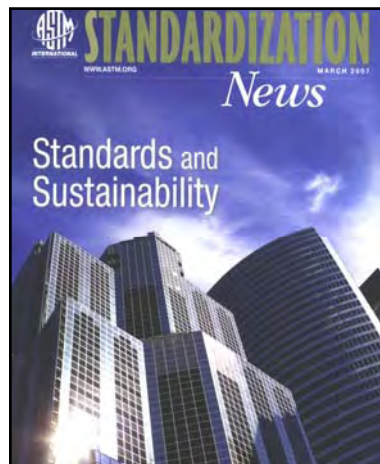
- material and energy consumption
- key environmental releases

Holistic approach:
evaluate impact of all upstream and downstream products and processes



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ISO Standards collection on CD-ROM:
ISO 14000 – Environmental management
2005, Version 4, English, ISBN 92-87-10415-2

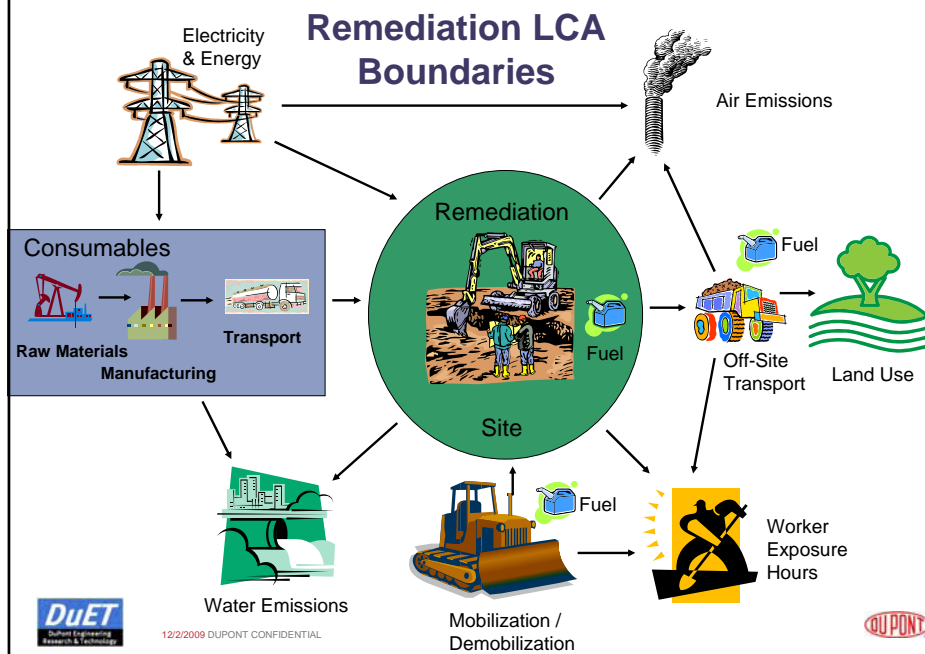
Contents	
ISO Guide 64:1997	Guide for the inclusion of environmental aspects in product standards
ISO 14001:2004	Environmental management systems — Requirements with guidance for use
ISO 14004:2004	Environmental management systems — General guidelines on principles, systems and support techniques
ISO 14015:2001	Environmental management — Environmental assessment of sites and organizations (EASO)
ISO 14020:2000	Environmental labels and declarations — General principles
ISO 14021:1999	Environmental labels and declarations — Self-declared environmental claims (Type I environmental labelling)
ISO 14024:1999	Environmental labels and declarations — Type II environmental labelling — Principles and procedures
ISO/TR 14025:2000	Environmental labels and declarations — Type III environmental declarations
ISO 14031:1999	Environmental management — Environmental performance evaluation — Guidelines
ISO/TR 14032:1999	Environmental management — Examples of environmental performance evaluation (EPE)
ISO 14040:1997	Environmental management — Life cycle assessment — Principles and framework
ISO 14041:1998	Environmental management — Life cycle assessment — Goal and scope definition and inventory analysis
ISO 14042:2000	Environmental management — Life cycle assessment — Life cycle impact assessment
ISO 14043:2000	Environmental management — Life cycle assessment — Life cycle impact assessment — Examples of application of ISO 14042
ISO/TR 14047:2003	Environmental management — Life cycle assessment — Examples of application of ISO 14042
ISO/TR 14048:2002	Environmental management — Life cycle assessment — Data documentation format
ISO/TR 14049:2000	Environmental management — Life cycle assessment — Examples of application of ISO 14041 to goal and scope definition and inventory analysis
ISO 14050:2002	Environmental management — Vocabulary

Life Cycle Analyses (LCA) Methodology References

LCA documented in ISO standards 14040 series LCA is the only standardized method to evaluate the environmental footprint of the whole supply chain. => ISO standards 14040 cc



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Applications of LCA

- **Evaluate environmental impacts**
 - products
 - processes
- **Benchmark alternative options (internal or external)**
- **Evaluate alternatives**
 - raw materials, process options, supply routes
 - end of life: reuse, recycle, landfill, incinerate
- **Guidance in R&D and product development**
 - identify improvement opportunities
 - focus on high impact areas
- **Marketing Strategies (Customer Engagement)**



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LCA Uses in Industry

Packaging Choices - Stonyfield Yogurt

LCA used to identify PP as packaging material – HDPE may be easier for consumer to recycle, but requires more mass. Current recycle practice for wide mouth containers suggests HDPE yogurt containers aren't recycled. Therefore – focus on savings via manufacturing. Explain to customer base via LCA. www.stonyfield.com

Reduce Product Footprint - Proctor & Gamble – Tide® Cold Water Detergent

Burdens of clothes washing are mainly from heating the water. Match performance of high temperature detergents and significantly reduce the overall burdens by reducing energy in the use phase

http://www.scienceinthebox.com/en_UK/sustainability/casestudies_en.html

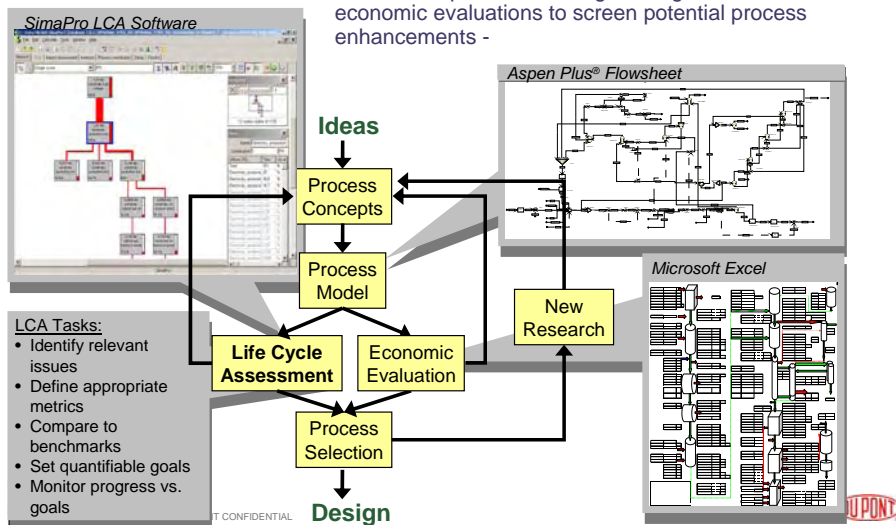


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Support to R&D - Design Criteria – DuPont – Cellulosic Ethanol Production

Use LCA in parallel with engineering technical and economic evaluations to screen potential process enhancements -



LCA - Application to Remediation

➤ Improve Chosen Remedy

- Quantify key contributors
- Identify opportunities for renewable energy uses
- Select among remediation chemicals / manufacturers

➤ Remedy Selection

- ONE Part of Balancing Criteria – Short-term effectiveness
- Quantify and Identify Key Contributors – Often Consumables / Off-site transportation

➤ Which Site should be given priority

- More difficult to compare – particularly if contaminant is significantly different

DuPont Case Study

Remediation of Perchloroethylene, Trichloroethylene,
Dichloroethylene, and Vinyl Chloride

Incremental Case Development

Model Using SimaPro Life Cycle Software

Three Areas for potential In-situ Remediation

Source Area

- Three potential Reagents – different use rates
- One event (Base Case)

Down-gradient Surface Water Protection (DSWP)

- Two potential Reagents with different use rates
- Treatment Every 3 years via horizontal well (Base Case)

Dissolved Phase Plume Control (DPC)

- Two potential Reagents with different use rates
- Treatment Every 3 years via horizontal well (Base Case)



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Reagents

1. Reagent A – Bio Reduction

- Currently modeled as 60% Reagent, 40% water – Dilute to 20% Reagent
- Transport from East Coast to CA by rail; local truck included

2. Reagent B – Chemical Reduction

- Dilute with water on site to 15% solution
- Transport from central US to CA by rail; local truck included

3. Reagent C – Chemical Oxidation

Reagent in two equal parts

- Dilute on-site with water
- Transport from CA via truck only



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Case 1 = Baseline – Monitored Natural Attenuation

Tasks

- Monitor Well Installation
- Groundwater Sampling
- Annual Maintenance (for 30 years base case)
 - Includes Fencing repair (250 linear ft as base case)
 - Periodic Maintenance (every 5 years)
- Closure

Each Task includes its own mobilization / demobilization, consumables

Baseline burdens are small compared to in-situ treatment burdens



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Use of Results

- Compare Reagents for a given Treatment Area
- Compare Burdens of Treatment areas
- **Must address difference in end results with other balancing factors**
- Identify Key Contributors
- **Identify magnitude of uncertainty**

Impacts

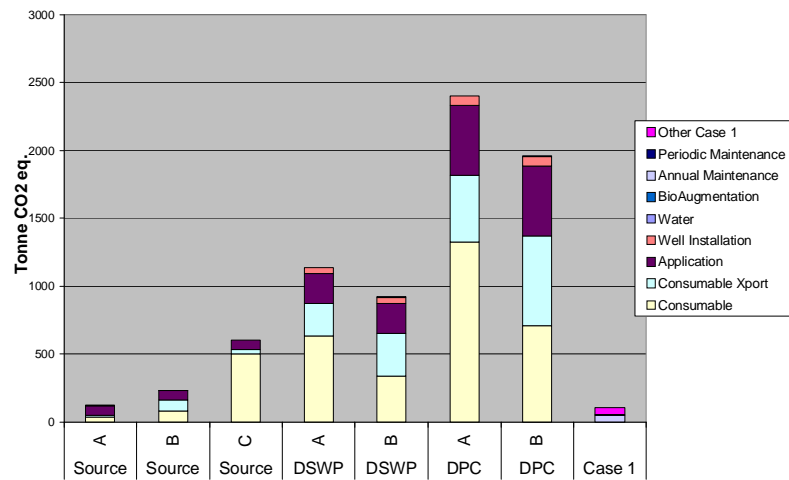
- Main Focus - Energy, GHG emissions, Workhours,
- Secondary - Water Use, Mileage, Fuel Use



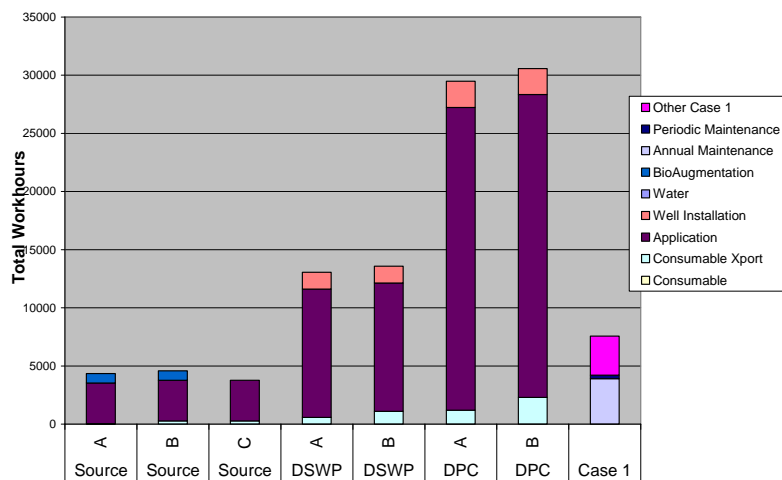
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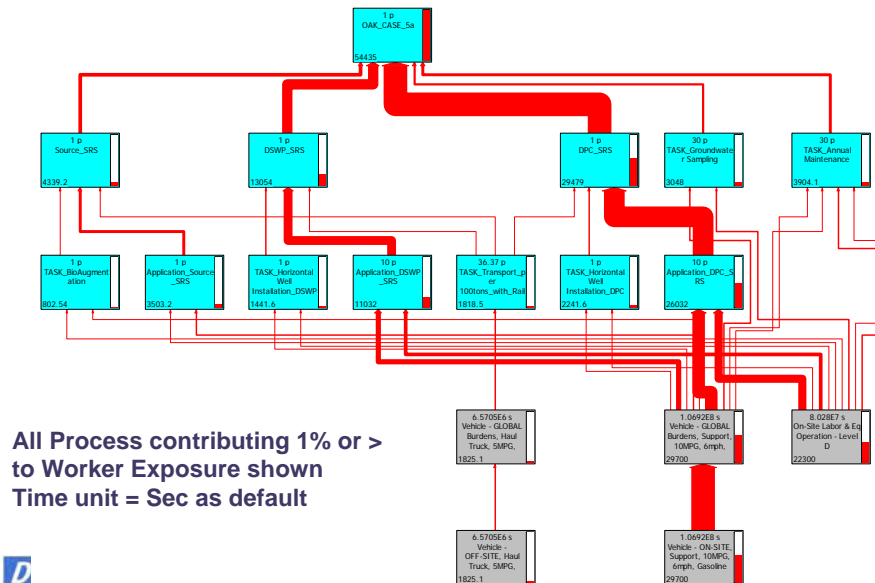
GHG Emissions by Treatment Area/Reagent/Task



Workhours by Treatment Area/Reagent/Task

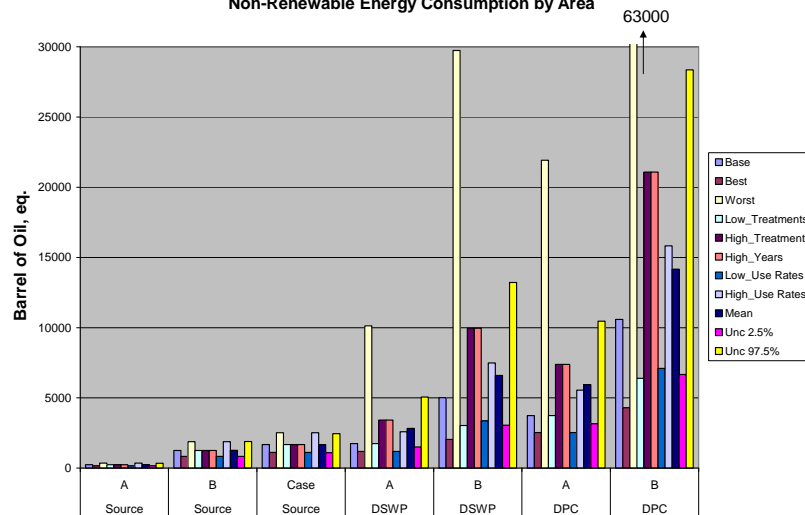


SimaPro Sankey Diagrams – Worker Exposure



Sensitivity

Non-Renewable Energy Consumption by Area



Observations from Source Area Data

Source Area

- Reagent A lower than B & C due to low use rate
- Less Uncertainty than DSWP/DPC due to 1 treatment
- Reagent A for Source has lower burdens compared to DSWP / DPC
- Reagent A dominated by application while B & C dominated by Consumables for NRE & GHG

DSWP Area

- Reagent A lower in NRE, slightly higher in GHG, similar in Workhours to B
- Reagent A DSWP < Reagent A DPC; Reagent B DSWP < Reagent B DPC

DPC Area

- Reagent A lower in NRE & Workhours
- A & B similar in GHG – Depending on case either can be higher
- High degree of uncertainty

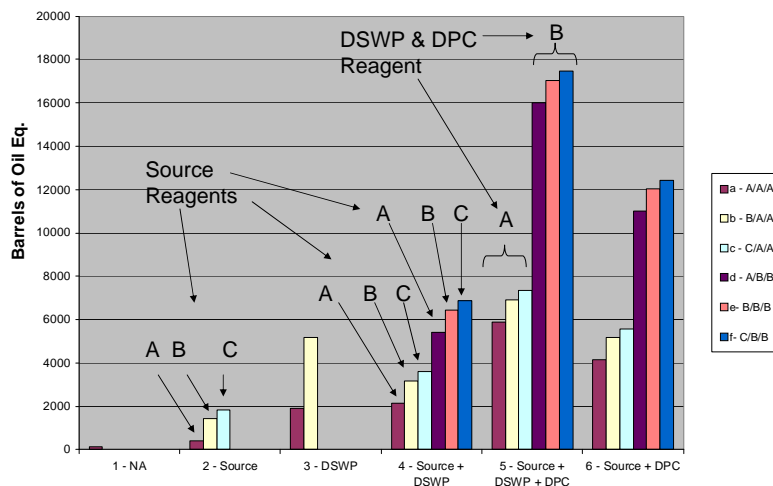


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Non-Renewable Energy by Case

Primary Energy Consumption by Case



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Observations from Case Data

Selection among a-c and d-f moot since source area << DPC / DSWP for cases 4,5,6

Uncertainty is substantial –

- If basis for uncertainty is contaminant then $A < B$ holds true
- If basis for uncertainty is reagent effectiveness, then A & B are more equivalent
- Based on assumptions, DSWP < DPC (or Case 4 < Case 6) but not at 95% certainty

Dramatic increase in burdens & uncertainty with treatment beyond Source area

- Magnitude based on quantity of reagents
- Uncertainty hinges on use rate & duration



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Sustainability Conclusions

Impacts dominated by In-Situ Remediation requirements

Source burdens < DSWP burdens < DPC burdens

Source Energy, GHG, Workhours: $A < B < C$

DSWP & DPC GHG & Workhours similar for A & B

DSWP & DPC NRE & Water : $A < B$

On-site Water Use: $B > C \gg A$

Uncertainty is quite high based on treatment duration, project duration

Comparison between Cases must address assumed Effectiveness – Use additional balancing criteria.



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Case Study Teachings

- **Care must be taken to compare functionally equivalent processes**
- **Sensitivity and Uncertainty are important**
- **Key Contributors can be readily identified**
- **Consumables may dominate impacts**



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Questions??

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Backup Slides



2015 Sustainability Goals Reducing DuPont's Footprint

2015 Sustainability Goals
SOLUTIONS FOR A BETTER, SAFER, HEALTHIER WORLD

**Reduce GHG Emissions 15% from
2004 Baseline**

Water Conservation

- Reduce by > 30% where supply is stressed
- Hold all other site consumption flat



Fleet Fuel Efficiency – 100% Leading Technology

Reduce Air Carcinogen Emissions 50% from 2004

**100% Third-party evaluation of sites for
environmental system effectiveness**



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WAL★MART® Sustainability Scorecard

7 “R’s” of Packaging by Wal Mart

1. Remove (getting rid of unneeded packaging altogether).
2. Reduce (reducing the amount of packaging – source reduction).
3. Reuse (utilizing reusable packaging where possible).
4. Renew(able) (using renewable-resource-based packaging and renewable energy when possible).
5. Recycle(able) (using packaging materials that are made from recycled materials or can be recycled easily).
6. Revenue (not increasing the system cost of packaging).
7. Read (using packaging to educate the public about the benefits being delivered).

Sustainable Packaging Scorecard

To drive improvement in their packaging supply chain...

- **Renewable energy used** (5% weighting)
- **Greenhouse gas emissions** (life cycle) (15% weighting)
- **Package to product ratio** (15% weighting)
- **Cube Utilization** (15% weighting)
- **Transportation** – Ave. distance package travels from mfg site to filling point. (10% weighting)
- **Recycle content** (10% weighting)
- **Recovery Value / Recyclability of materials used** (10% weighting)
- **Material Value** (15% weighting)
- **Innovations to use less energy** (5% weighting)

Wal-Mart's Goal: 65,000 suppliers registered by February 2008



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LCA - Application to Remediation

➤ Specific Concerns with LCA and Remediation

- Functional Unit comparison among methods
 - Different modes of remediation (mobility / toxicity / volume reduction)
 - Time Horizon of remediation (i.e. pump & treat vs In-situ chemical reduction)
- EPA concerned LCA will be used as reason for doing nothing
- Address more than GHG & Energy
 - Human Health?, Ecotoxicity? (Better done with Risk analysis)
 - Air acidification, ozone depletion
 - Worker exposure hours, miles driven, noise?



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LCA - Application to Remediation

➤ Limitations of LCA and Remediation

- DATA
 - IP concerns limits data availability
 - Data needs to apply to scope; geographic, technological, temporal, level of detail
- Accuracy
 - Unknowns about contaminant (quantity / concentration / etc.) lead to unknowns in LCA
 - 10% difference in LCA is not a difference
 - Ranges should be used to allow for Sensitivity Analysis of key contributors
- Analysis techniques
 - Currently each of us using own methodology, spreadsheets
 - LCA software would help, but does cost \$\$



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LCA Methodology

Goal and Scoping

Life Cycle Inventory (LCI)

Life Cycle Impact Assessment (LCIA)

Life Cycle Interpretation



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LCA Methodology

Goal and Scoping

- Product systems to be studied
- Intended application of the assessment
- Motivation for carrying out the study
- Intended audience (VOC)
- Function and functional unit,
i.e. basis for fair comparisons versus benchmarks
- System boundaries (cradle-to-gate, cradle-to-grave,
temporal & spatial)
- Data collection strategy
 - Accuracy, assumptions, limitations
 - Internal versus external data
- Environmental effects to be reviewed



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Functional Unit

Per ISO 14040

- Section 14044:2006(E) 4.2.3.2 - Comparisons between systems shall be made on the basis of the same function(s)...
- Section 14044:2006(E) 4.2.3.3.1 - The deletion of life cycle stages, processes, inputs, or outputs is only permitted if it does not significantly change the overall conclusions of the study
- Examples –
 - Filling a sandbox => Volume of Sand
 - Transporting people => # of people * distance
 - Painting a surface => Area-year covered (NOT kg or volume of paint)
 - Remediation – A Good Question!
 - Meets Threshold Criteria?
 - Risk Reduction?
 - Minimum level of mobility / toxicity / volume reduction



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LCA Methodology

Life Cycle Inventory

Develop a flow diagram

- Assess all inputs and outputs
- Track materials and energy “back to the ground”

Devise a data collection plan

- Define data quality goals
- Identify data sources, types, and benchmarks

Collect data

Validate data

Calculate inventories



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SimaPro Terminology – Modeling Building Blocks

•Processes

- Production of specific chemicals or materials
- Steel, Asphalt, Pipe, Activated Carbon, ZVI Clay, etc
- Build using variables and parameters

•Processing Steps

- Processing burdens of handling materials / performing tasks
- Forklift operation, Bull dozer operations, Excavator, transport, etc.

•Energy Consumption

- Gasoline, Diesel, Electricity (by region)

•Assemblies

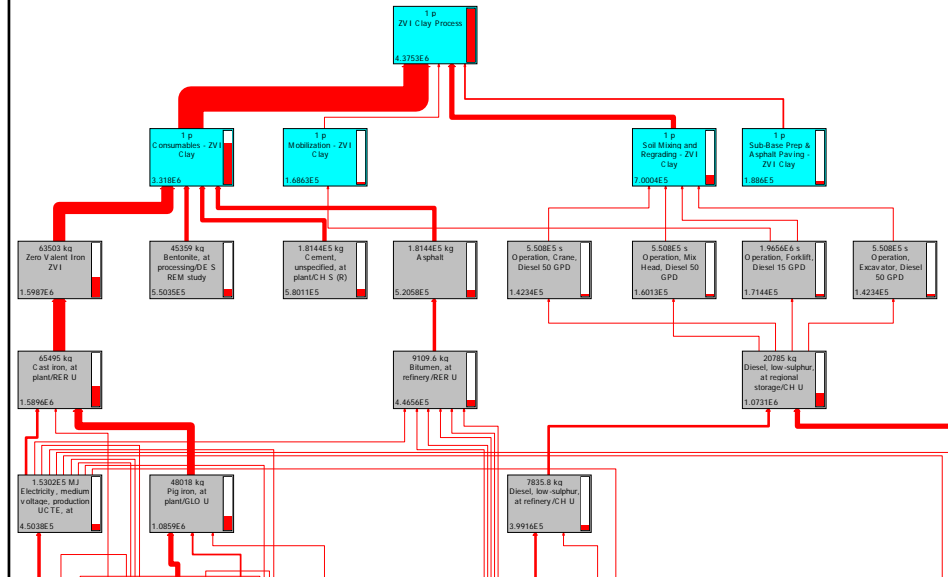
- Combines processes and processing steps into specific tasks



- Mobilization Consumables, Soil Mixing & grading



SimaPro – Life Cycle Software



SimaPro – Process / Process Step

52.102.121.68Defaultw716_032608: Remediation

File Edit Calculator Tools Window Help

Known outputs to technosphere: Products and co-products	Name	Amount	Unit	Quantity	Allocation %	Waste type	Category	Comment
Carbon, Activated - Thermal process from Coal	(Insert line here)		kg	100 %	not defined		U1 Remediation	

Known outputs to technosphere: Avoided products

Name	Amount	Unit	Distribution	SMR	Mass
(Insert line here)					

Inputs

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD	Min	Max	Comment
(Insert line here)								

Known inputs from technosphere (materials/fuels)

Name	Amount	Unit	Distribution	SD	Min	Max	Comment
Hard coal, at regional storage/RNA U	1	kg	Unc				Yield loss accounted for in Hard coal, burned in industrial furnace
Hard coal, burned in industrial furnace 1:10MW/RNA U	(1/10V-1):0.0345 = 67.437	MJ					Yield loss assumed to all be burned. Provides heat to process as well. Hard coal model assumes 0.0345 kg coal yields 1 MJ energy

Known inputs from technosphere (electricity/heat)

Name	Amount	Unit	Distribution	SD	Min	Max	Comment
Crushing, rock/RE R U	1/0Y = 3.3333	kg					Coal briquettes crushed prior to fill
Transport, 1m/RE R U	100/0Y = 333.33	kg/m					Assumed distance for coal, hard

Outputs

Name	Sub-compartment	Amount	Unit	Distribution	SD	Min	Max	Comment
(Insert line here)								

Emissions to air

Name	Sub-compartment	Amount	Unit	Distribution	SD	Min	Max	Comment
(Insert line here)								

Transport

SimaPro – Assembly

52.102.121.68\Default\w716_032608; Remediation

File Edit Calculate Tools Window Help

Input/output Parameters

Name: Consumables - ZVI Clay Image Com

Status:

Materials/Assemblies	Amount	Unit	Dist	SD	Min	Ma	Comment
Zero Valent Iron ZVI	70*2000 = 1.4E5	lb					
Bentonite, at processing/DE 5 REM study	50*2000 = 1E5	lb					
Cement, unspecified, at plant/CH 5 (R)	200*2000 = 4E5	lb					
Asphalt	200*2000 = 4E5	lb					
Soil	200*2000 = 4E5	lb					No burden assigned
Groundwater	130000*(62.4/7.4805) = 1.0844E6	lb					No burden assigned
(Insert line here)							

Processes	Amount	Unit	Dist	SD	Min	Ma	Comment
Transport, lorry >16t, fleet average/RER U (25mph)	(200+200)*2000/2.20462*30*.62 = 6.7495E6	kgkm					Asphalt 4= gravel
Transport, lorry >16t, fleet average/RER U (50mph)	(70+50+200)*2000/2.20462*150*.62 = 2.6998E7	kgkm					Others except water
(Insert line here)							

Dupont



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SimaPro Capabilities

•Data –

- Literature data for virtually any energy source
- > 2000 materials and processes
- Easily develop project specific models from similar literature models

•Impact Assessments

- Go beyond GHG & Energy - Include various toxicological impact methods
- Develop specific methods of interest for workhours / driving miles/time
- Most methods already developed and accepted externally

•Sensitivity analysis

- Easily vary unknown parameters / check alternative materials or energy data , etc.



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SimaPro Output

•Network maps

- By Impact category, emission, single product
- Relative burdens shown clearly

•Overall Burdens – broken down by category

- Tabular and graphical display
- Easily configured to group as desired

•Specific Emissions or sources of emissions for each impact category

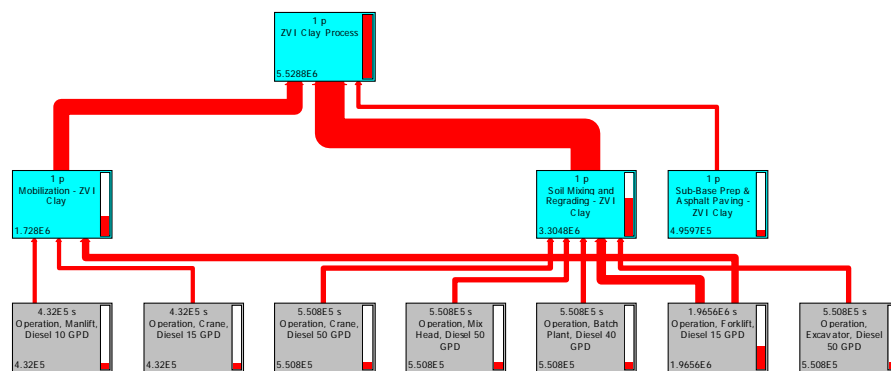
- Quickly identify main contributors



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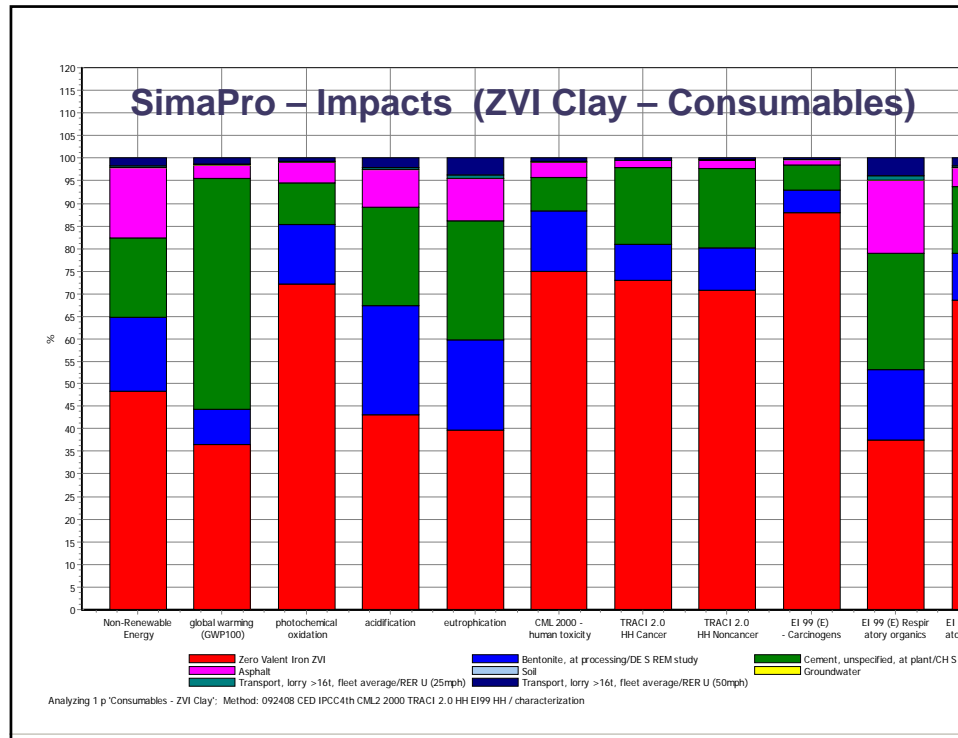


SimaPro – Networks (ZVI Clay – Work time)



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40

SimaPro Advantages

- **Fast & Consistent**
 - Use processes built from previous work
- **Robust**
 - No issues with Excel cells forgetting their references
- **Accepted**
 - Industry leader (along with GaBi)
 - Uses Globally accepted impact assessments as required by ISO 14040
 - Databases from Ecoinvent, Plastics Europe, others all available
- **Comprehensive**
 - Evaluate all impact categories of interest
 - Develop your own impact categories when none already available



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Summary

•Life Cycle Assessments can be done for Remediation

- Issues with Functional Units / Equivalent Comparisons
- How to handle temporal issues and degrees of remediation
- Address more than just GHG & Energy

•SimaPro

- Fast, Robust, Comprehensive
- Accepted by industry and used in DuPont
- Easily configured to handle remediation processes
 - Modular – Build it once and re-use it again and again.



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Attachment 5
Remediation Life-Cycle Assessment Issues and Challenges



Remediation LCA Issues and Challenges

...and does SURF have a role in resolving?

“State of the Practice”

- **Adhocracy**
 - Variable objectives and goals
 - Variable methodologies (e.g., spreadsheet versus LCA models)
 - Different ways in how results are used and expressed
 - Different skill sets and experience of practioners

“State of the Practice”

- **Resources**

- Different tools
- Variability in data
- Majority of data is EU based
- Hard to find data
- How is data developed

- **Metrics**

- Standard short-list
- Flexibility for other important factors (rules of thumb)
- Are we over-looking important factors (e.g., acid rain, eutrophication)

“State of the Practice”

- **Comparison to “conventional” LCA**

- ISO 14044 standard compliance
- Clear definition of scope and goal of assessment
- Boundaries and cut-off criteria
- Clear definition of functional unit
- Documentation
- Sensitivity analysis
- Understanding life cycle is an uncertain practice
- Critical review

“State of the Practice”

- **Stakeholder perspectives**

- Can stakeholders have confidence in results?
 - *How do stakeholders look at the variable products being provided*
- Is the analysis process transparent?
- Is it being used to “game” the system?
- Do regulatory agencies have the resources to assess results

Questions To Help Assess SURF's Contribution

- **Tool conformity and credibility**

- Remediation specific methodology developed
- Development of common LCA input dataset
- Nexus for sustainability parameters
 - *review, share, qualify*
 - *Industry pushes their data to SURF to share*

- **Consistency in applications**

- Training
- Provide leadership on ASTM/ITRC on integration of results
- Peer review group

Questions To Help Assess SURF's Contribution

- **Recommendations for project budgeting for sustainability – standard percentage?**
 - We are on a learning curve – costs for sustainability assessments are uncertain but something should be budgeted
- **How do you weight different factors (what is better)**
 - Talk to stakeholders
 - The Ellis Unit (unit of remediation)
- **At what level do we do our life-cycle (ties into the functional unit)**
 - Threshold criteria, balancing factors

Attachment 6
Life-Cycle Assessment Challenges,
Potential Solutions, and SURF's Role

Life-Cycle Assessment Challenges, Potential Solutions, and SURF's Role

Brainstorming

The group began with a brainstorming session and mentioned the following challenges of using life-cycle assessment as a tool to achieve sustainable remediation:

- Which methodology is appropriate?
- What criteria should be used to guide the LCA?
- How do you achieve stakeholder buy-in?
- How much of remedial cycle should be included in “life cycle”?
- How do you demonstrate value to stakeholder so financially supported?
- How do you start to draw the boundaries?
- How much does a LCA cost?
- Which should be used – a spreadsheet or software?
- What are the cutoff factors?
- Which impact assessments do you consider?
- How do you handle resource requirements?
- How do you handle scalability of costs?
- How do you set project-specific objectives?
- When is it best to implement a LCA?
- How do you achieve data consistency?
- How do you include residual/collateral impacts (i.e., comparative risk)?
- How do you integrate LCA in regulatory decisions?
- How do you handle the few vs. the detailed assessments for standard remediation technologies?
- What are the key topics?
- What is best LCA modeling tool to use?
- How do we overcome lack of familiarity of LCA in the remediation industry (obstacle to industry practitioners and regulatory community)?

Potential Action Items

From this laundry list of challenges, the group formulated the following list of potential action items:

- Develop modules for key remediation technologies.
- Find large, medium, and small projects using different technologies and perform a LCA to develop database of case studies.
 - Compare LCA case studies to traditional sustainability analyses that have been completed.

- Use LCA case studies to evaluate impacts (e.g., how more in-depth information provided by LCA helps stakeholders understand overall impacts that have not been considered using traditional methods).
- Identify method to establish project-specific objectives (i.e., standardize analysis) and include agency priorities to set the goals of the LCA.
- Develop standard LCA approach and identify which impacts to track.
- Identify role of subjective versus objective assessments.
- Develop standard LCA models for commonly used remediation activities (e.g., sampling activities, in situ chemical oxidation, enhanced reductive dechlorination, excavation and disposal, air sparging/bio sparging).

The group identified two items that were not mentioned but that were nonetheless important. The first item was the lack of clarity on a functional unit of comparison to compare case studies. The second item was the lack of a weighting process to apply to LCA impact categories.

SURF's Role

The group identified the following three questions as those questions that are most important to answer for SURF:

- How can SURF set project-specific objectives?
- How can SURF help integrate LCA in regulatory decisions?
- How is data consistency achieved?
- How do you include residual/collateral impacts (i.e., comparative risk)?

Discussions focused on the questions that the group was trying to answer. Discussions are summarized in the subsections below. All of these questions can be addressed individually or in a comprehensive SURF LCA white paper.

How can SURF set project-specific objectives?

The group listed the questions below as those that they would need to answer to achieve their goal (i.e., setting project-specific objectives). The group seemed to agree that LCA could and should be used throughout the project to verify that project objectives have been addressed.

- How can we make LCA more balanced to consider the triple bottom line of sustainable remediation (i.e., environment, social, economic)?
- How do we set weighting for outcomes?
- How is LCA defined?

How can SURF help integrate LCA in regulatory decisions?

The group listed the following questions as those that they would need to answer to achieve their goal (i.e., integrating LCA in regulatory decisions):

- How can we best work with agencies through pilot studies?

- What does LCA mean to regulators?
- What is SURF's role in LCA (e.g., educators, integrators, infiltrators)?

How is data consistency achieved?

The group listed the questions below as those that they would need to answer to achieve their goal (i.e., achieving data consistency):

- Where do we obtain the data?
- How do we verify that the data are accurate?
- How do we ensure that the standard values match product as delivered?
- What is the process to document the impact factors?
- What is SURF's role?
 - Should we collect and/or vet industry data?
 - Should we compile documented values collected by members?
 - Should we collect real-life data to verify calculated values?
- When should sensitivity analyses be performed?
- How should we engage vendors in the process?

How do you include residual/collateral impacts (i.e., comparative risk)?

The group listed the questions below as those that they would need to answer to achieve their goal (i.e., including comparative risk in LCAs):

- What are the significant factors and/or impacts to consider?
- How do we compare the various risks against one another (i.e., health and safety risks vs. chemical risks vs. greenhouse gas risks)?
- How do we define "acceptable risk"?

Attachment 7
SURF Web Site Update




SURF WEBSITE UPDATE

www.sustainableremediation.org



SURF 11
Newark, New Jersey
September 22, 2009

L. Maile Smith, PG
Northgate Environmental Management, Inc.



what's new

- minor site reorganization since SURF 10
 - home
 - about
 - [news](#) (blog format)
 - [library](#) (document downloads)
 - [links](#) (resources and affiliates)
 - discussion forum
 - contact (submission form)
 - other resources (gallery, participants, [RSS feed](#), [meeting materials](#))
- uploaded/linked to resources from SURF members
- established need for a Communications Committee to enhance information delivery, promote SURF brand, protect SURF mission and message





home page

new
"member-
only access"
pages

ABOUT NEWS LIBRARY LINKS DISCUSSION FORUM CONTACT SURF

SURF

SUSTAINABLE REMEDIATION FORUM

OTHER RESOURCES

- member login
- gallery
- participants
- subscribe to SURF news
- meeting materials

NEXT MEETING:
SURF's next meeting is September 22-23, 2009, in Newark, New Jersey.

THE SUSTAINABLE REMEDIATION WHITE PAPER IS NOW AVAILABLE IN OUR LIBRARY!

The Sustainable Remediation Forum (SURF) promotes the use of sustainable practices during implementation of remedial action activities with the objective of balancing economic viability, conservation of natural resources and biodiversity, and the enhancement of the quality of life in surrounding communities.

SURF has authored a groundbreaking White Paper on sustainable remediation that has been published in a special edition of the Summer 2009 Remediation Journal, and is currently available in our library.

The White Paper communicates SURF members' thoughts on incorporating sustainability principles into environmental remediation. SRe owners and local communities are increasingly knowledgeable about sustainability issues. In this paper, sustainable remediation is broadly defined as a remedy or a combination of remedies whose net benefit on human health and the environment is maximized through the judicious use of limited resources.

RECOVER & REBUILD

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links to resources

ABOUT NEWS LIBRARY LINKS DISCUSSION FORUM CONTACT SURF

SURF

SUSTAINABLE REMEDIATION FORUM

OTHER RESOURCES

- member login
- gallery
- participants
- subscribe to SURF news
- meeting materials

RESOURCES AND GUIDANCE

- ITRC Green and Sustainable Remediation Interstate Technology and Regulatory Council
- Clu-In Green Remediation Contaminated Site Cleanup Information
- EPA Green Remediation Primer: Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites
- Clean and Green Policy EPA Region 2 green cleanup policy
- Introduction to Energy Conservation and Production at Waste Cleanup Sites EPA Engineering Forum Issue Paper, Michael Gill (Region IX) and Katarina Mahutova (Region X)
- EPA Smart Energy Resource Guide Catalog of practices and technologies to reduce emissions due to energy use at remediation sites
- Green Remediation and the Use of Renewable Energy Sources for Remediation Projects 2007 report prepared for the EPA by Amanda D. Dellens, National Network for Environmental Management Studies Fellow, Case Western Reserve University
- The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts: Journal of Industrial Ecology article describing the EPA's TRACI computer program for LCA
- Framework for Responsible Environmental Decision-Making Using LCA 2000 report prepared by the EPA Office of Research and Development
- CL:AIRE Guidance Bulletins Guidance bulletins and documents describing the characterisation, monitoring, or remediation of contaminated soil or groundwater
- SURF:IM Research Bulletins Documents summarizing the key research finds of SURF:IM, published in association with CL:AIRE
- FRTR Publications

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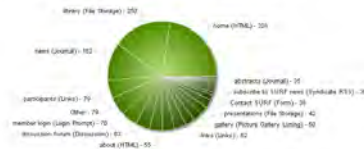


statistics

Popular Content Summary

Squarespace tracks the most frequently visited pages on your site for various time periods. The counts below represent the number of **visitors** (not unique) accessing each particular page on your system.

Within the past week, you received a total of 1,445 page views to your top content pages.



Summary for past day | 7 days | 14 days | week | month

Count	Page
328	Home (HTML)
250	Blog (File Storage)
162	Home (HTML)
79	Participants (Link)
70	Member Login (User Forum)
63	Discussion Forum (Discussion)
55	About (HTML)
52	Links (HTML)
50	Gallery (Picture Gallery Listing)



questions?

www.sustainableremediation.org/contact

L. Maile Smith, P.G.
Northgate Environmental Management, Inc.
300 Frank H. Ogawa Plaza, Suite 510
Oakland, California 94612
510.839.0688, ext. 223
maile.smith@ngem.com

Attachment 8
Green/Sustainable Remediation Track at Battelle Conference

Status of Green and Sustainable Remediation (GSR) Track for Battelle's Monterey Conference

SuRF 11 Meeting

Newark, NJ - September 22, 2009

Russell Sirabian, Battelle

BUSINESS SENSITIVE 1

Background on the "Battelle Monterey Conference"

- General Conference Information
 - 7th International Conference on Remediation of Chlorinated and Recalcitrant Compounds
 - May 24-27, 2010 in Monterey, California
 - www.battelle.org/chlorcon
- Connection with SuRF
 - Conference participants are generally the same community of professionals that SuRF would work with and target for outreach
 - Sustainable remediation panels and sessions have been very well attended at past Battelle conferences
 - SuRF members were participants of these panels/sessions
 - In past only one session per conference

BUSINESS SENSITIVE 2

Why is this Year's Conference Different

- Battelle is working with SuRF to develop a GSR Track to run the full length of the conference
 - Eight technical sessions
 - 45 platforms
 - Panel discussion
- Goals/Benefits of a full GSR Track:
 - Develop a comprehensive track that covers the key elements of GSR
 - Provide quality presentations from a wide variety of environmental/GSR professionals
 - Promote discussion of GSR concepts and practices among environmental professionals

BUSINESS SENSITIVE

3

GSR Track Sub-Committee

Angela Fisher	GE Global Research
Carol Baker	Chevron Energy Technology Company
David Woodward	AECOM Environment
David Ellis*	DuPont
Carol Dona	U.S. Army Corps of Engineers
Mike Miller	CDM
Paul Favara	CH2M Hill
Richard Wice	Shaw Environmental & Infrastructure Group
Russell Sirabian*	Battelle

*Dave and Russ are also on Conference Steering Committee

BUSINESS SENSITIVE

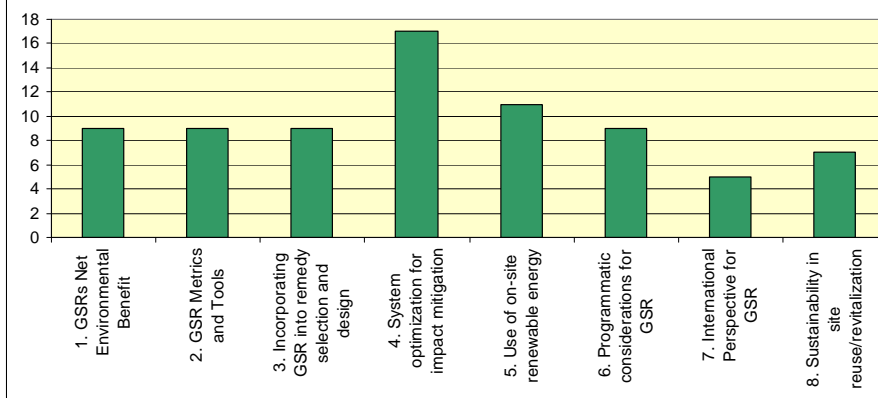
4

Sessions and Session Chairs (Session names may be tweaked)

1. GSRs Net Environmental Benefit	Mike Miller (CDM) Paul Hadley (CA DTSC) or Angela Fisher GE)
2. GSR Metrics and Tools	Ralph Nichols (SRNL) Paul Favara (CH2M-Hill)
3: Incorporating GSR into remedy selection and design	Dave Woodward (AECOM) Carol Dona (USACE)
4. System optimization for impact mitigation	Rick Wice (Shaw) Dave Becker (USACE)
5. Use of on-site renewable energy	Erica Becvar (AFCEE) Beth Moore (DOE)
6. Programmatic considerations for GSR	Russ Sirabian (Battelle) Carlos Pachon (EPA)
7: International Perspective for GSR	Dave Ellis (Dupont) Curt Stanley (Shell)
8. Sustainability in site reuse/revitalization	Alessandro Battaglia (AECOM) Deb Golbum (EPA)

5

Number of Abstracts per Session



Total of 76 Abstracts Submitted to GSR Track for 45 Slots

Almost 1,000 Abstracts submitted to Conference for about 380 slots

6

One Panel within GSR

- Preliminary title (will be tweaked):
 - **Cost and Value of GSR: Making the Business Case**
- Overall themes (will be tweaked):
 - Discuss economic cost (to evaluate and to implement) and impacts on site closeout time due to implementing GSR.
 - Discuss where it costs more and where it costs less.
 - Discuss other incentives that would add value.
 - Portfolio costs are more important than individual sites.
 - Bottom Line: Why should we do GSR???

GSR Panelists

David Ellis	DuPont (Industry) - Moderator
Carlos Pachon	US EPA (Federal Regulatory Agency)
Tom O'Neil	NJDEP (State Regulatory Agency) - ITRC GSR Team Lead
Richard Mach	US Navy (DoD) - Director Environmental Compliance and Restoration Policy, Deputy Assistant Secretary of the Navy (Environmental)
Paul Hardisty	Worley Parsons (Consultant) - Global Director Sustainability and EcoNomics™ for Worley Parsons in Australia

Attachment 9
Membership Breakout Session

Membership Breakout Session

Classes and Categories

The group expressed a strong and unanimous preference against group memberships for corporations, government, and nongovernment categories. Concern was expressed about the ability of government employees to join under a group designation and the potential for large corporations to dominate the discussion at the expense of smaller organizations. As a suggestion, the following classes of membership were offered:

- Corporate Member
- Government Member
- Academic Member (with a separate category for students)
- Sustaining Member Firm (non-voting)

Voting Rights

The group noted that no discussion of voting is provided in the By-Laws. Karyllan Mack (K&L Gates) clarified that the only issues requiring a vote of the members is determining Board of Trustee members and changing the By-Laws. Others commented that voting does not tend to affect work on committees or selection of topics for the group to pursue (that is at the discretion of the President and/or a Committee appointed by the Trustees or President).

Benefits

The group brainstormed the following list of benefits that could accrue to members and/or their organizations:

- Leadership
 - Engagement on the issue
 - Certification program
 - Opportunity to lead the industry on this topic
- Advancing the Profession
 - Vote (e.g., By-Laws, organizational structure, Board of Trustees)
 - Affect policy
 - Serve as hub for engagement of all stakeholders
 - Advance the state of the practice
 - Affect education and development of young professionals in the field
- Personal Professional Development
 - Learning (e.g., newsletter, web page member access)
 - Professional development
 - Professional society
 - Meeting attendance
 - Author papers

- Opportunity to obtain continuing education credits
- Networking
 - Early access to news, developments, methods, and trends
 - Networking with others interested in sustainable remediation
 - Advertising
 - Speakers' bureau
 - Discounts on costs for meetings, etc.

Funding

The group agreed that the funding in the By-Laws appears to cover only routine meetings (for which there is no additional charge) but not pursuit of the “big stake” issues. Any additional conferences (e.g., a technical conference) do not appear to be funded. The target funding amount of \$100,000 was discussed and agreed to cover administrative costs as well as costs to host the two group and two committee meetings a year. However, the group noted that it is not known what actual costs will be once work on the “big stake” issues is initiated.

The group suggested the following annual dues:

- Corporate Member: \$125 to \$150
- Government Member : \$75
- Academic Member: \$100 (students = \$25)
- Sustaining Member Firm (non-voting): undecided

It was also separately suggested (for ease of administration) that all memberships pay the same amount except for students and sustaining member firms.

The group discussed an example. If SURF had about 100 corporate members, 20 government members, and a few academic members, the annual dues would generate only about \$20,000. The group believed that this amount was insufficient to fund work on any “big stake” issues.

With further discussion, the group agreed that membership dues should be used only to offset administrative costs and that each meeting should be self-funded by way of a registration fee. For example, if a meeting costs \$4,000 for an attendance of about 50 people, the registration fee would need to be about \$80/person. The group also agreed that additional meetings not included in the By-Laws should be funded through participant registration fees.

The group also agreed that SURF should consider other sources of funding, such as funds from sustaining member firms and those from advertising and sponsorship. In addition, a benefactor category could be used during SURF's startup. Benefactors would be organizations that offer to cover shortfalls in operating costs under specific circumstances and up to a specific limit in the event that SURF takes one to two years to “ramp up” to fully successful operational status.

Attachment 10
Big Stake Breakout Sessions

Big Stake #1 Breakout Session

Big Stake #1 Breakout Session: How might SURF have a great outreach program?

Facilitator: Stephanie Fiorenza, BP
Scribe: Jake Torrens, AMEC Geomatrix
Group: Elie Haddad, Haley & Aldrich
Dave Major, Geosyntec Consultants
Beth Hyde, Roux Associates
Rick Wice, Shaw Environmental
Phil McKalips, Environmental Standards
John Simon, WSP Environment & Energy

Stephanie led the group through a brainstorming session in this sequential process:

1. Generated a list of ideas without editing.
2. Generated ways to accomplish our goals and identified tactics/ideas that SURF is currently implementing.
3. Created a chart that ranked the ideas from low to high value and low to high effort. This classified the tactics/ideas into four decision squares to qualitatively assess value and effort.
4. Based on the ranking, made a list of action items for the path forward.

The notes generated at each stage of the session are summarized below. It is important to note that not all of the ideas generated during the session were new; current tactics and goals also were identified during this brainstorming session. This was reassuring to see that SURF is on the right track, but useful at identifying other complimentary ideas that will hopefully enhance the overall effort.

Brainstorming

Tactics/Ideas SURF currently implementing

- Organizing conferences
- Created web site
- Presenting case studies at conferences and in publications

New Initiatives

- Provide training
- Implement white paper ideas
- Educate
- Host on-line web site webinars
- Increase SURF presence at conferences
- Prepare materials for distribution
- Collaborate with universities (college clubs, departments, professors)
- Organize workshops (i.e., Battelle 2011/2012)
- Team/network with other professional societies:

- National Ground Water Association (NGWA)
- Groundwater Resources Association of California
- Society of Women Environmental Professionals (SWEP)
- Air and Waste Management Association
- Geologic Society of America
- American Geophysical Union (AGU)
- American Society of Engineers
- Advertise
- Team with ITRC and ASTM

Implementation

The following list describes how the group would implement the goal of establishing a great outreach program for SURF:

- Book SURF booth at conferences [e.g., Battelle (for free)]
- Start a blog
- Apply for grants
- Join LinkedIn (professionals)
- Join Facebook (university students)
- Establish a Certification Program
- Identify journals to submit the one-page summary of the white paper
- Reach out to nongovernmental organizations (NGOs) related to environmental justice (e.g., community organizations, Sierra Club)
- Develop SURF pamphlets
- Self-promote at panel discussions at conferences to generate traffic toward informational booths
- Promote SURF with professional colleagues
- Have SURF members outreach to their alma mater
- Have SURF members outreach to their university contacts

Then, the group divided their ideas and tactics into four decision squares evaluating high value, low value, low effort, and high effort. The result is the table on the following page.

	Low Effort	High Effort
Low Value	<u>New Initiatives</u> <ul style="list-style-type: none"> • Print advertising • LinkedIn • Facebook • Pamphlet 	<u>New Initiative</u> <ul style="list-style-type: none"> • Outreach to NGOs
High Value	<u>Tactics/Ideas SURF currently implementing</u> <ul style="list-style-type: none"> • Battelle attendance • Battelle booth • Attendance at professional conferences • Presenting older case studies • Remediation Journal forum • Circulate the White Paper one-pager to other trade and technical journals • Teaming / networking with professional societies <u>New Initiatives</u> <ul style="list-style-type: none"> • Prepare a Summary of SURF for circulation in trade and technical journals • Self promotion • Create promotional power point presentation for SURF for marketing • Press Releases 	<u>Tactics/Ideas SURF currently implementing</u> <ul style="list-style-type: none"> • Network with ITRC/ASTM • Website updates <u>New Initiatives</u> <ul style="list-style-type: none"> • Workshops • New case studies • Newsletter • Grants • Certification (too early to quantify this overall benefit) • Publications

Action Items

The result of the prioritization was the following list of action items:

- Develop a summary of SURF for circulation in trade and technical journals
- Request a free booth at Battelle and prepare a pamphlet for distribution
- Prepare a promotional presentation summarizing SURF
- Develop a workshop (long range)
- Develop a press release for Battelle, NGOs
- Explore research grant opportunities
- Coordinate/strategize internally with the Communication Committee
- Develop logo and address branding (e.g., SURF pin with a surf board)
- Designate bar/party for SURF revelry and networking at the 2010 Battelle conference in Monterey, California

Big Stake #2 Breakout Session

Big Stake #2 Breakout Session: How might SURF promote a view of sustainable remediation that includes all stakeholders and impacts?

Facilitator: Carol Baker, Chevron
Scribe: Kathy Adams, Writing Unlimited
Group: Todd Martin, Integral Consulting
Art Taddeo, AECOM Environment
Dave Woodward, AECOM Environment

The group began by defining stakeholders per the white paper (i.e., regulatory entities, site owners, the public, and environmental service providers). Impacts were defined as the triple bottom line: consideration of the environmental, economic, and social concerns.

The group decided to approach the question in an all-encompassing manner, meaning that all ideas would be included (e.g., risk of remedy, comparative risk). In addition, the group decided that the promotion of sustainable remediation would occur using a consensus-building approach.

Brainstorming

The group brainstormed various ways to promote a view of sustainable remediation that includes *all* stakeholders and impacts. After brainstorming, the group divided the ideas into three groups: (1) critical short-term task, (2) critical long-term task, and (3) not critical but would support the effort. These divisions are shown below.

Critical Short-Term Tasks

- Develop workshop for regulators
- Respond to *Superfund Green Remediation Strategy* individually
- Issue statement as SURF commending the USEPA on the strategy document
- Facilitate regulatory participation in meetings (e.g., attend meetings for free, improve remote participation meeting tools)
- Plug into Association of State and Territorial Solid Waste Management Officials (ASTSWMO) and get their thoughts on sustainable remediation
- Coordinate SURF meeting with an ASTSWMO meeting (similar to the meeting SURF coordinated with the USEPA)

Critical Long-Term Tasks

- Hold workshops at universities or colleges to get nongovernmental organizations (NGOs) involved so we can educate them and learn from them
- Publish SURF case studies that address the triple bottom line
- Assign SURF member to monitor and report on ASTSWMO activities

- Encourage SURF members to give presentations to state regulators as a representative of SURF (vs. individual company)
- Continue to monitor and provide input into ITRC and ASTM activities

Not Critical but Support the Effort

- Individually educate own company about sustainable remediation
- Work with other professional societies
- Provide consulting services on a pro-bono basis to the public as a pilot program to create case studies and solicit broad-based opinions
- Develop sustainable remediation certification program

Action Items

After brainstorming and dividing the tasks into priority categories, the group developed a high-priority action plan that involves work groups to achieve the tasks. A leader for each work group was assigned if possible. The group felt it was important that the work group contain no more than five people, with the outputs being reviewed by the larger group. High-priority action items were identified as follows:

- Plug into ASTSWMO (Lead: Carol Baker)
 - Get on the agenda for the next meeting
 - Get their input...make it interactive!
 - Identify gaps in knowledge and differences in their approach to green/sustainable remediation and SURF's approach
 - Identify action items based on interaction
 - Identify ASTSWMO members interested in joining SURF
- Respond to USEPA green remediation strategy (Lead: Carol Baker)
 - Make sure SURF members respond as representatives of their company by the deadline (November 10, 2009)
 - Identify a small group of people to develop a SURF statement commending agency and allow SURF members a short timeframe to comment on the statement
- Hold working sessions with regional and federal regulators (Lead: Dave Woodward)
 - Contact Deb Goldblum (USEPA Region 3) for input (e.g., brainstorm on content that would provide the most value, obtain contact information for key individuals, consider coordinating with work group meeting) (timing = after November 10, 2009)
 - Represent SURF to regional agency personnel through presentations
- Facilitate regulatory participation in SURF meetings (no lead identified)
 - Identify group of people charged with this task

- Identify barriers for participation based on input (e.g., budgetary constraints, ethics concerns)
- Develop action plan for every barrier identified
- Invite regulators in states where SURF holds meetings and use K&L Gates to help get the right people
- Ensure that each meeting location has technology needed for remote participation

Finally, the group listed the following longer-term action items that should begin and can be implemented with minimal effort now:

- Assign a SURF member to monitor ASTSWMO activities and report back to SURF members at meetings (Lead: Carol Baker)
- Continue to monitor ITRC and ASTM activities and report back to SURF members at meetings (Carol Baker lead but several SURF members involved in efforts)
- Form a committee to develop a process for SURF-endorsed presentations and papers (Lead: Todd Martin)

Big Stake #3 Breakout Session

Big Stake #3 Breakout Session: How might SURF and the academic community work together to improve sustainable remediation?

Facilitator: Mike Miller, CDM
Scribe: Stewart Abrams, Langan Engineering & Environmental Services
Group: Ralph Baker, TerraTherm
Jim Quigley, VeruTEK Technologies
Matt Spurlin, ARCADIS
Dan Watts, New Jersey Institute of Technology

Brainstorming

The group began by brainstorming various ways in which SURF could reach out to and involve the academic community in its work to advance and improve sustainable remediation.

- Increase professorial participation
- Identify segments of academic community interested in sustainable remediation and recruit them into SURF
 - Begin by compiling list of research faculty who have worked on sustainable remediation
 - Educate these individuals about their potential connection to SURF
- Identify research needs (e.g., LCA protocols and/or guidance)
- Identify sources of funding for research [e.g., the Department of Defense's Environmental Security Technology Certification Program (ESTCP) or the Strategic Environmental Research and Development Program (SERDP)] and have them draft a statement of need (possible program contacts – Jeff Marqusee, Andrea Leeson)
- Promote publishing through SURF via a SURF Journal or the web site
- Develop education modules and/or coursework about sustainable remediation to provide a “hook” for academics (e.g., similar to educational programs in Europe)
- Leverage meeting locations with academic participation
 - Recruit academics from University of California – Davis and Berkeley, Stanford, and Lawrence Livermore National Laboratory to speak and/or attend SURF 12 in Sacramento
- Form a standing committee within SURF to address the issues of working together with the academic community in both remediation and sustainability
- Identify the incentives of the academic community (e.g., research exposure, involvement) and leverage them
- Possibly act as collaborators/liaisons/advisors to assist with obtaining research funding
- Include the triple bottom line in all efforts, making sure to find individuals who are already interested in remediation—capitalize on the interdisciplinary nature of our work

- Social sciences (e.g., psychology, sociology)
- Environmental justice?
- Economics
- Environmental engineering/ Environmental science
- Sustainable engineering
- Sustainability programs
- Alternative energy programs
- Promote information exchange between academics
- Reach out to national laboratories (e.g., Lawrence Livermore, Sandia, Brookhaven, Oak Ridge)
- Recruit academics based on who submitted abstracts to Battelle
- Coordinate with Outreach/Communications Committee
- Involve both undergraduate and graduate students in all efforts
 - Recruit through appropriate societies and clubs
 - Identify interested individuals through publications

Action Items

After brainstorming and discussing priorities, the group identified the following action items:

- Form an Academic Outreach Committee within SURF
- Identify faculty and researchers from a broad range of disciplines and locations
- Promote information exchange
 - Academic speakers
 - Publishing (e.g., online journal)
- Identify research needs
- Obtain funding for research
- Develop curricula for short courses or degree programs and provide guest lecturers from SURF
- Promote student involvement (e.g., student chapter)
- Coordinate with Outreach/Communications Committee

Big Stake #4 Breakout Session

Big Stake #4 Breakout Session: How might SURF provide leadership toward a consensus sustainable remediation framework?

Facilitator: Karin Holland, Haley & Aldrich
Scribe: Karina Tipton, Brown and Caldwell
Group: Carol Dona, USACE EM-CX
Dave Ellis, DuPont
Mike Houlihan, Geosyntec Consultants
Brendan MacDonald, CDM
Janine MacGregor, New Jersey Department of Environmental
Protection

The group began by agreeing on the definition of a sustainable remediation framework as a consensus-based practice for integrating sustainable concepts into the remedial process. The group believed that the goal would be to define a standard of practice and method that could be applied regardless of location.

Brainstorming

The group brainstormed various ways that SURF could provide leadership toward a consensus sustainable remediation framework. The group brainstormed ideas of the value of a sustainable remediation framework to different stakeholders. Values were divided into four stakeholder groups: the community, the regulator, industry and consulting firms, and others [e.g., academia, nongovernmental organizations (NGOs)]. The values identified as important for each stakeholder group are listed below.

Community

- Treat different communities the same (i.e., same baseline)
- Allows communities to gain unrealized benefit through education
- Establishes sense of belonging
- Adds societal impacts to remediation discussion
- Provide a standard approach
- Enable communities to know where and how to participate
- Empowers communities because they will have an idea of what to expect from the process

Regulator

- Develop a standard
- Allows sustainability to be more defensible because there is a convention and process in place
- Provide a standard approach
- Allows consistency and predictability in the implementation of sustainable remediation
- Results in a better product for people who are regulated

- Results in a process that is easier to implement
- Provides additional information that may facilitate decision making

Industry and Consulting Firms

- Provides higher certainty of resolution
- Requires less specialization
- Responds to Corporate Social Responsibility requirement and guidance
- Allows “big picture” thinking that improves the organization’s bottom line
- Allows easier documentation
- Requires less resources
- Provides the opportunity to introduce “big picture” sustainability

Other

- Considers ecological effect on sites to be remediated
- Gain cultural benefits of full-system thinking
- Addresses the global effects of greenhouse gases
- Provides larger, long-term community benefit

Grouping of Categories

The values identified above for each of the stakeholder groups were classified into a number of categories. Each category portrayed a specific idea and was therefore provided with a title to reflect this idea. The category titles were as follows:

- Process definition
- Reputation
- Consistency
- Universal benefit
- Advancing process
- Community engagement

Problems/Countermeasures for Categories

For each of the categories identified above, the group identified a number of problems or roadblocks to developing a sustainable remediation framework as well as associated countermeasures to address such problems. These problems and countermeasures formed the starting point of an impact-difficulty analysis.

Impact-Difficulty Analysis

The group performed an impact-difficulty analysis to determine (i) the degree of difficulty of addressing the problem/countermeasures identified for each of the six categories identified above and (ii) the level of impact of the problem/countermeasure would have on developing a sustainable remediation framework. The impact-difficulty analyses performed for the six categories are shown in Figures 1 through 6.

Action Plan

Those problems/countermeasures with a high impact rating and low difficulty rating were selected and included in an action plan, summarized in the table below.

#	Description of Problem	Countermeasure	Responsible	Due
1	Identifying stakeholders	Education	(Karina)	TBC
2	Community informed in decision late in process	Include earlier in process	(Karina)	TBC
3	Preventing greenwashing	Tiered approach	(Brendan)	TBC
4	Trust	Make SURF part of lexicon	(Brendan)	TBC
5	Early input from too many parties with different views, preventing consistency	SURF continue as leader to solve problem	(Dave)	TBC
6	Agency guidance early and inconsistent SURF participants may not like product	Drop back to larger picture	(Carol)	TBC
7	Research funding and time requirements	Seek public and private grants	(Janine)	TBC
8	Too detailed process and not defined yet	Define evaluation processes and stay broad	(Janine)	TBC
9	Sustainable remediation seems small in universal benefits	Define nonquantified benefits of sustainability	(Mike)	TBC
10	Endpoints and goals may not be agreed upon	Consensus building and small steps first	(Mike)	TBC

Notes:

TBC = to be confirmed

Figure 1
Process Definition

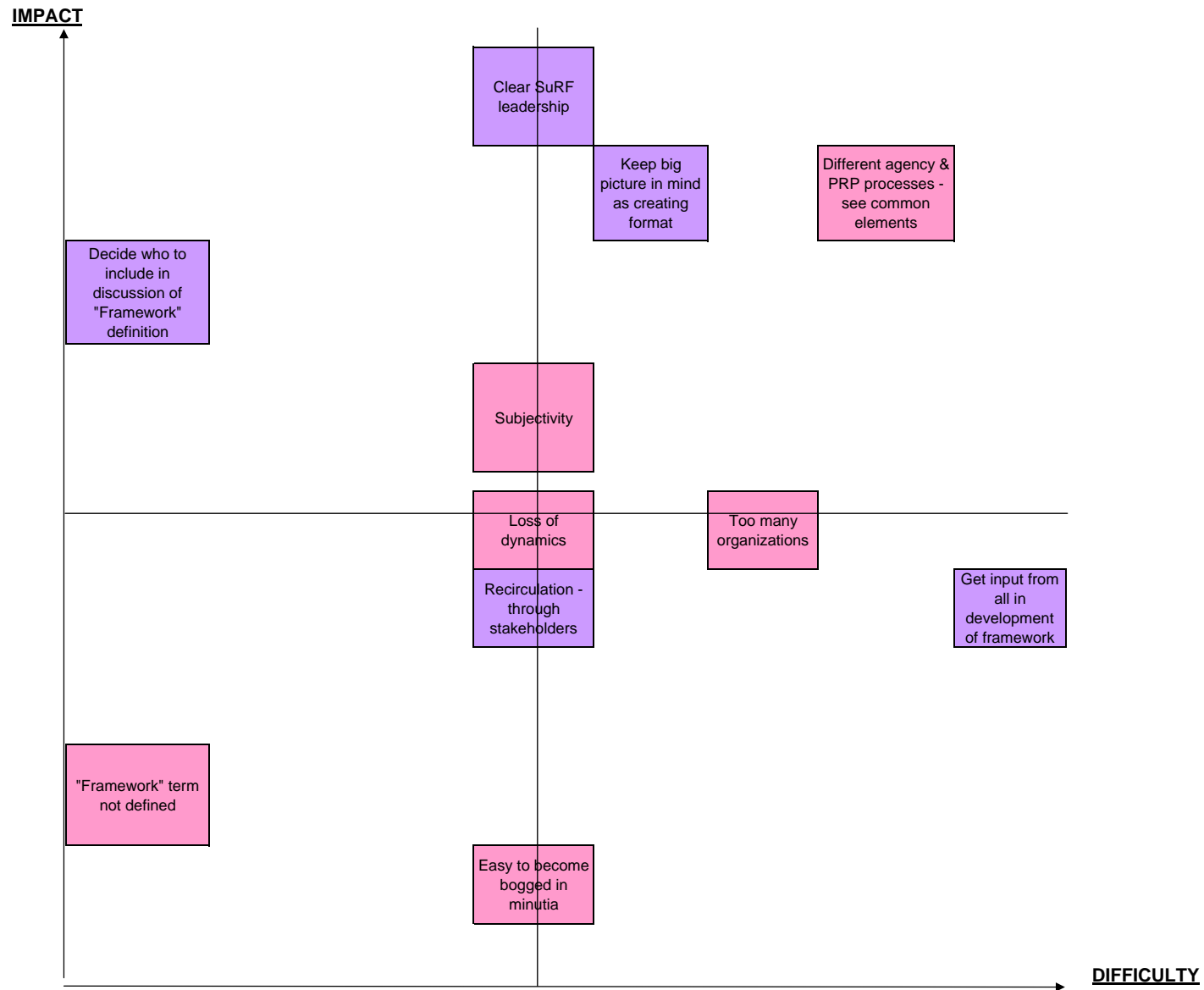


Figure 2
Reputation

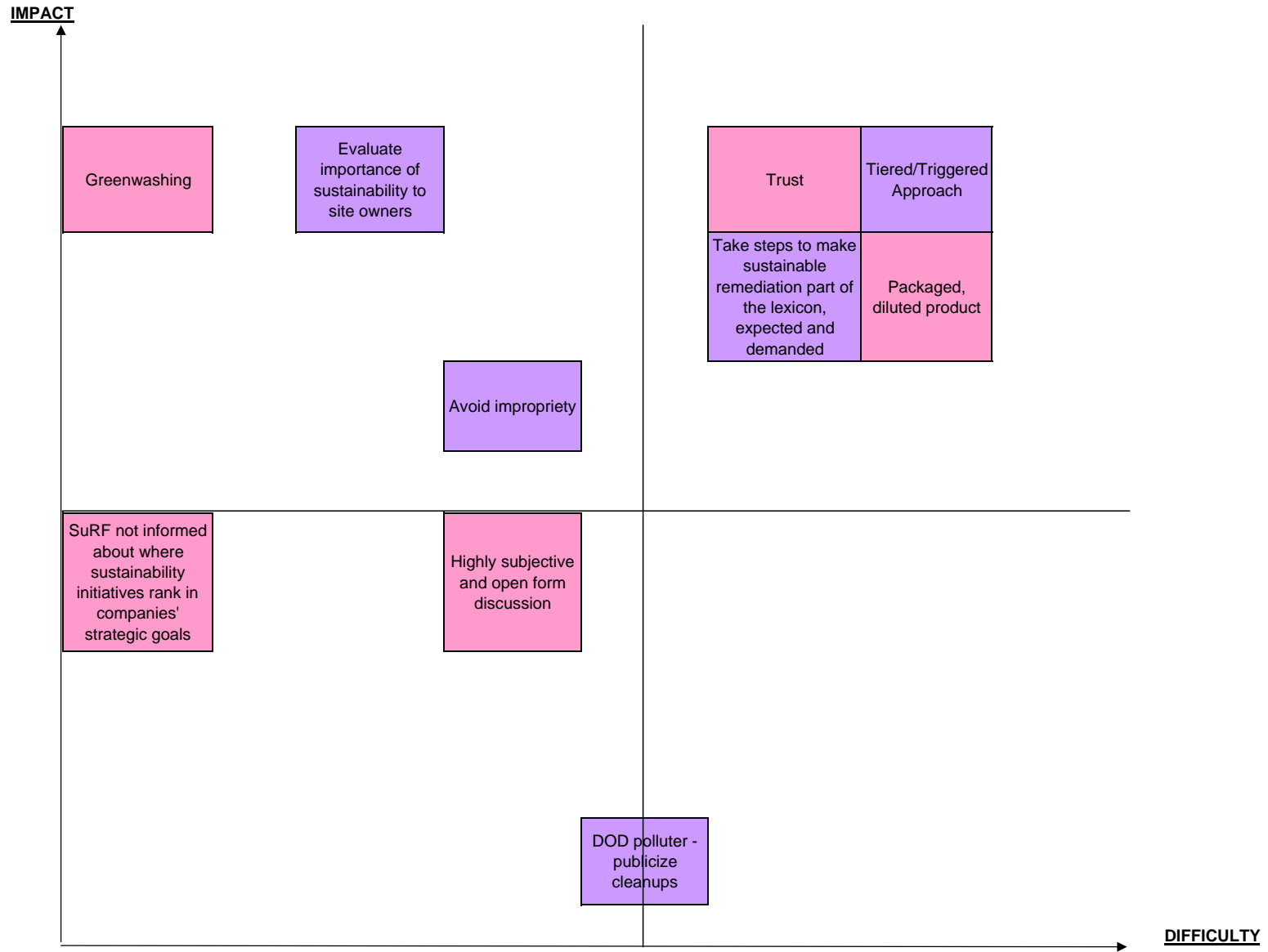


Figure 3
Consistency

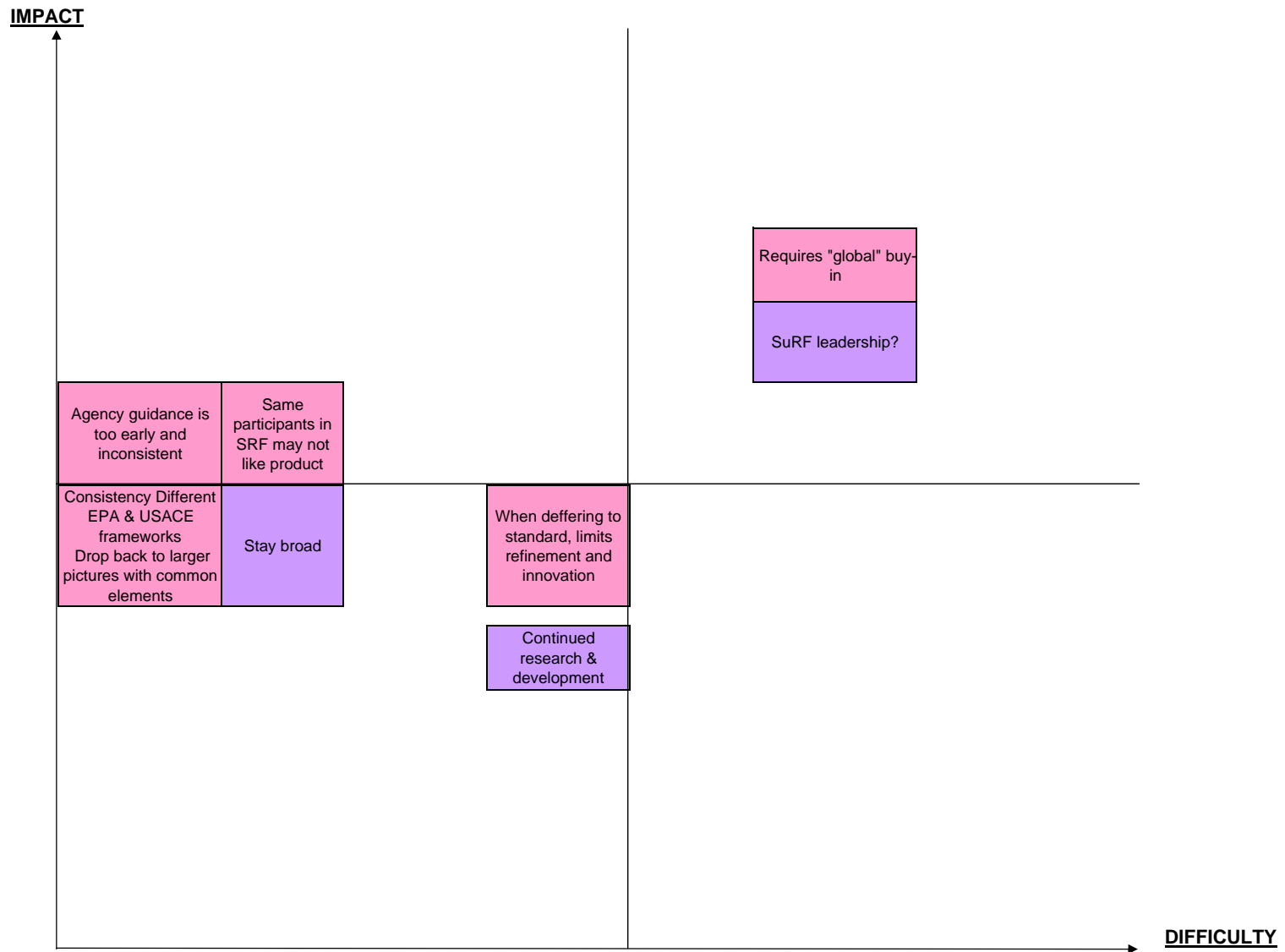


Figure 4
Universal Benefit

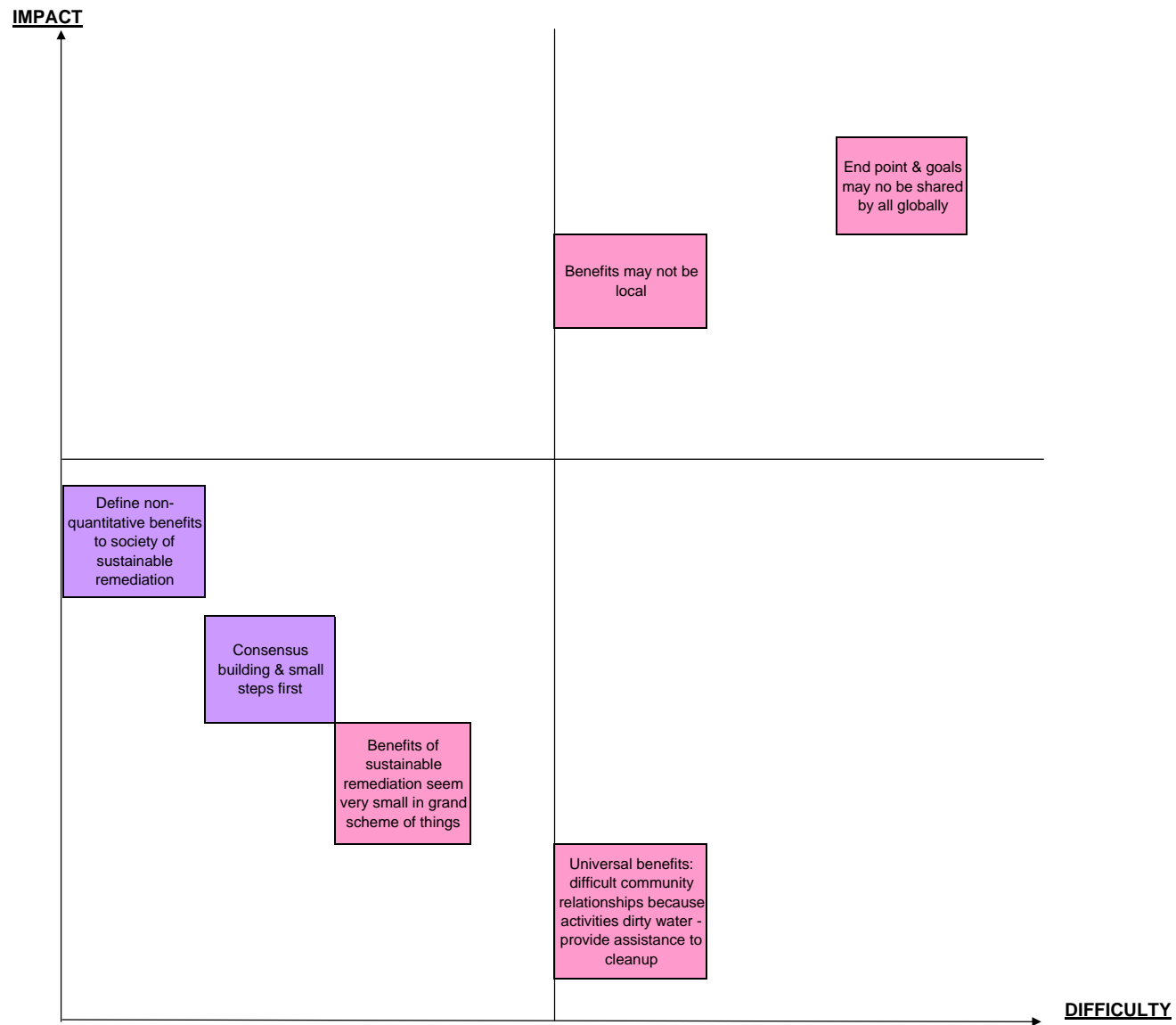


Figure 5
Advancing Process

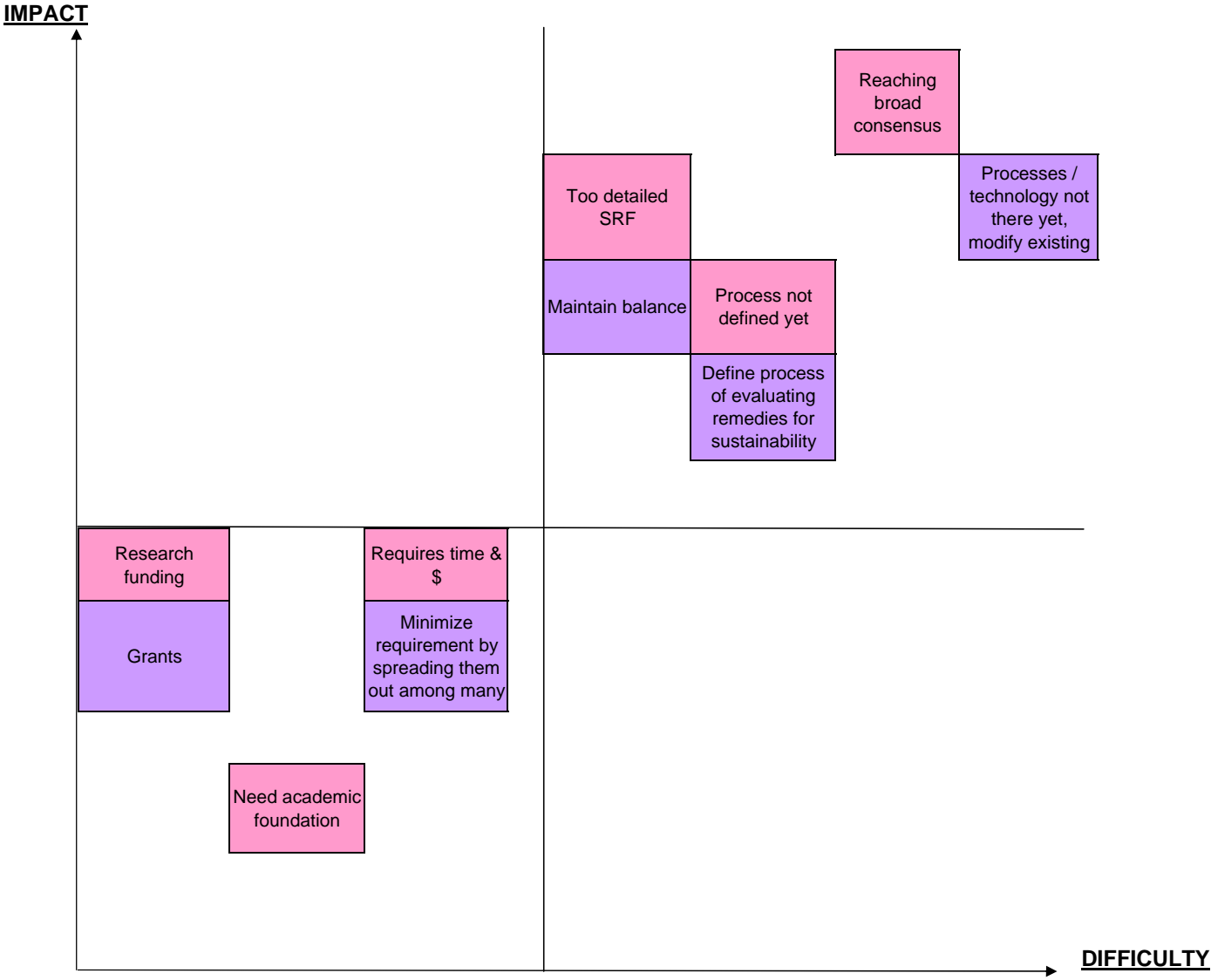
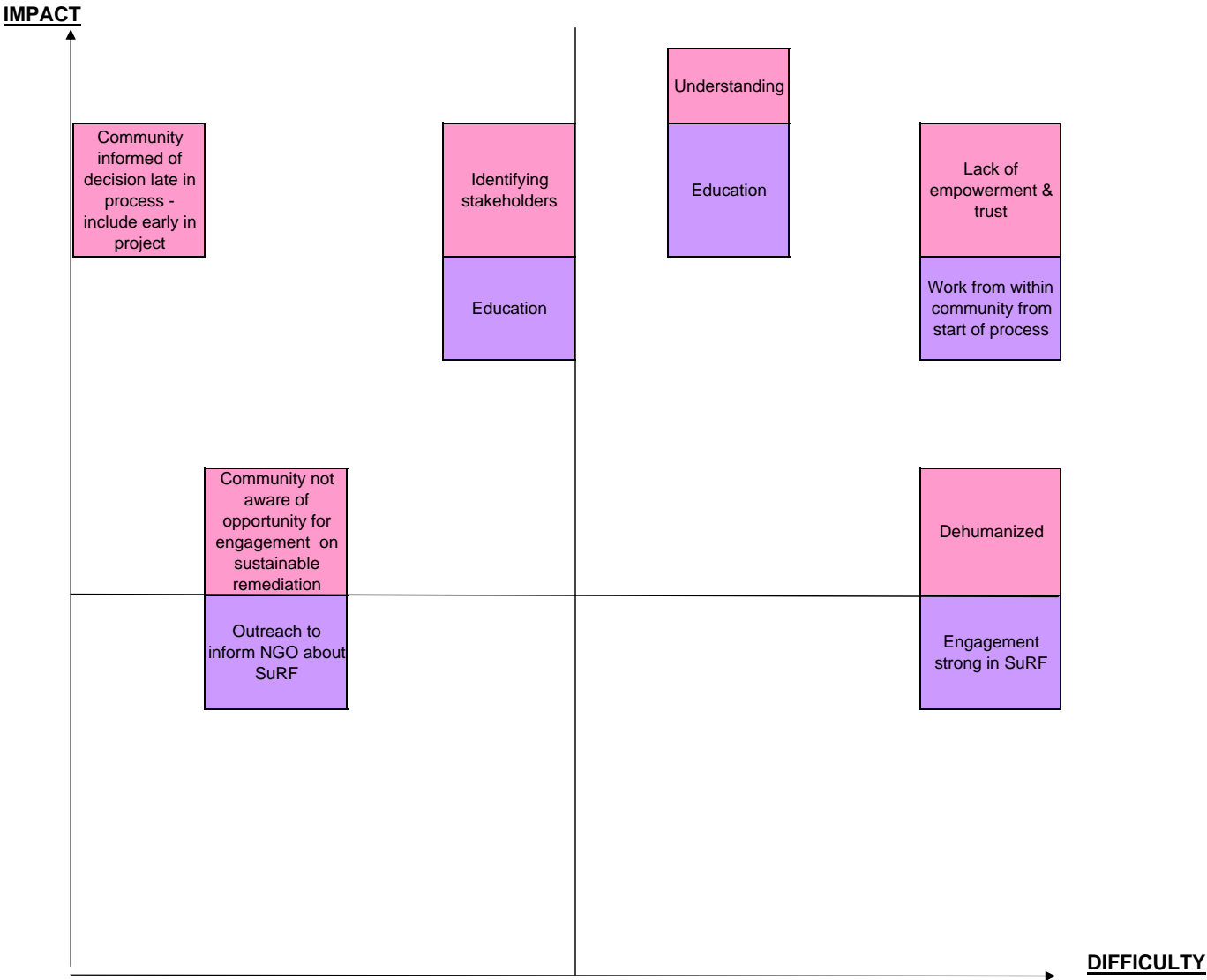


Figure 6
Community Engagement



Big Stake #5 Breakout Session

Big Stake #5 Breakout Session: How might SURF provide leadership in developing standardized evaluation criteria and metrics?

Facilitator: Brandt Butler, URS Corporation
Scribe: Issis Rivadineyra, Naval Facilities Engineering Service Center
Group: Kurt Beil, ARCADIS
Paul Favara, CH2M Hill
Paul Hadley, California DTSC
Tim Havranek, ENTRIX
Stella Karnis, Canadian National
Joe Keller, Groundwater and Environmental Services
Todd Krieger, DuPont
Russ Sirabian, Battelle Memorial Institute
Maile Smith, Northgate Environmental Management
John Sohl, COLUMBIA Technologies

The group began by defining the term “metric” as something that can be measured or assessed. Then, the group listed the following reasons for why a standard criteria is needed: consistency, credibility, validation, transparency, quantification, and predictability. The following were discussed as goals that could be met once a standard criteria is developed:

- Achieve broad-based acceptance, including regulatory acceptance
- Improve remedy selection
- Promote the advancement of sustainability

Brainstorming

The group brainstormed the potential metrics and criteria that could be developed in each of the three areas of the triple bottom line. These ideas are listed below.

Environmental

- Greenhouse gas
- Energy
- Water use
- Landfill space
- Ozone depletion
- Fuel or diesel use
- Natural resource use or consumption
- Land use
- Ecosystem (e.g., habitat restoration, protection, creation)

Social

- Worker safety
- Job creation

- Truck miles and traffic
- Noise
- Land use and land value
- Travel time
- Environmental justice

Economic

- Cost
- Jobs
- Land value
- Brand image
- Liability avoidance
- Impact before and after

Then, the group brainstormed ideas to answer the question at hand. The following ideas were discussed:

- Ensure that SURF's efforts are in parallel with ASTM and ITRC activities by making certain that SURF members attend ASTM and ITRC meetings and serve in leadership roles
- Identify the most important metrics for remedial evaluations and optimization and the units associated with them
 - Within SURF
 - Outside organizations
- Identify the core evaluation criteria and advocate the criteria externally

Summary of Session and Action Plan

After the brainstorming discussion, the group agreed that it was necessary to clarify SURF's role in the process (i.e., methodology vs. flanging criteria to existing protocols) before moving forward. The group also outlined the following general action plan:

- Collaborate with ASTM and ITRC
 - Assign a SURF spokesperson at ASTM and ITRC meetings to provide leadership from SURF's perspective
 - Advocate and learn (i.e., bring SURF's work products and learn from others)
 - Fill the gaps where others are struggling
- Focus on the selection criteria and process to ensure that sustainability concepts are included or reflected
 - Document guidance to analyze metrics
 - Select and apply metrics that are well defined and flexible and can be applied to core and optional criteria
 - Provide leadership within and outside of SURF