



Welcome to the CLU-IN Internet Seminar

Session 3 of 3:

**Your Role in Green Remediation Implementation
and**

**Case Studies in Green Remediation - This Year's Models and Tools
(The 2010 NARPM Green Remediation Session Follow-on Webinars)**

Sponsored by: US EPA Engineering Forum

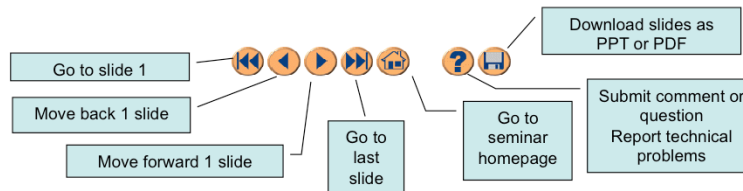
Delivered: Thursday, Feb. 10, 2010, 1:00pm-3:15pm, EST

*Instructors: Kirby Biggs, Brad Bradley, Raji Josiam, Tim Brincefield, Kira Lynch, and Vince Malott
Moderator: Suzanne Davis*

Visit the Clean Up Information Network online at www.cluin.org

Housekeeping

- Please mute your phone lines, Do NOT put this call on hold
 - Press *6 to mute your line, #6 to unmute your line at anytime
 - This is a two hour webinar with no scheduled breaks
 - We intend to offer time for Q&A near the end of each hour, but you may submit questions at any time using the question submission button in your browser
 - Turn off any pop-up blockers
- Move through slides using # links on left or buttons



- This event is being recorded
- Archives accessed for free <http://clu.in.org/live/archive/>

February 10, 2011

GR Webinar Session 3 of 3

2

Although I'm sure that some of you have these rules memorized from previous CLU-IN events, let's run through them quickly for our new participants.

Please mute your phone lines during the seminar to minimize disruption and background noise. If you do not have a mute button, press *6 to mute #6 to unmute your lines at anytime. Also, please do NOT put this call on hold as this may bring delightful, but unwanted background music over the lines and interrupt the seminar.

You should note that throughout the seminar, we will ask for your feedback. You do not need to wait for Q&A breaks to ask questions or provide comments. To submit comments/questions and report technical problems, please use the ? Icon at the top of your screen. You can move forward/backward in the slides by using the single arrow buttons (left moves back 1 slide, right moves advances 1 slide). The double arrowed buttons will take you to 1st and last slides respectively. You may also advance to any slide using the numbered links that appear on the left side of your screen. The button with a house icon will take you back to main seminar page which displays our agenda, speaker information, links to the slides and additional resources. Lastly, the button with a computer disc can be used to download and save today's presentation materials.

With that, please move to slide 3.

Overview

- The purpose of this webinar series is to enhance the audience's understanding of the current status of Green Remediation at EPA through a mix of presentations on GR Policy and real-world case studies.
- Each of the 2-hour webinar sessions (there are a series of 3) includes approximately one hour of policy presentations, followed by one hour of case studies. Each of the 3 webinars contains different material.

February 10, 2011

GR Webinar Session 3 of 3

3

In today's seminar we will cover a few topics. First, I'll provide a brief explanation of the motivations behind today's seminar, along with an overview of the CLUIN website and its relationship to the EPA's Technology Innovation Program for those who are new to the website and our services. Next I will highlight recent updates to CLUIN with a break to discuss users' opinions of these changes. We'll then take a sneak peak at a few planned updates to the site, pausing of course to hear what you think of these ideas. We will then move onto a similar review of the existing CLUIN internet seminar platform (that's what we are using today) and talk about our vision for future seminars. Finally we'll take a few moments to hear additional comments and wrap things up.

Most importantly, there will be a series of very specific questions on changes to CLUIN and our internet seminar platforms included in the feedback form at the very end of our talk. Please take a few moments to complete this form as this information is one of primary reasons for hosting today's seminar.

Lets move to the next slide.

Overview (cont.)

- Participants will contribute by submitting questions (either by telephone during one of the Q&A sessions near the end of each hour, or online at any time).

Agenda

- 1:00-1:05 Welcome and Housekeeping – Moderator Suzanne Davis, DTSC/EPA EF
- 1:05-1:25 Environmental Results through the Environmental Council of the States– Kirby Biggs, EPA HQ
- 1:25-1:32 Update on Green Remediation efforts in EPA Region 5 – Brad Bradley, EPA R5
- 1:32-1:40 Update on Green Remediation efforts in EPA Region 6 – Raji Josiam, EPA R6
- 1:40-1:55 Q &A on first half of Webinar

Agenda (Cont.)

- 1:55-2:05 PRPs Approach to Greener Remediation in the LDW Site RI/FS– Tim Brincefield, EPA R10
- 2:05-2:15 Green Remediation Elements of the South Tacoma Channel Well 12A Excavation Design– Kira Lynch, EPA R10
- 2:15-2:35 Green Treatment Technology for SVE Systems – Vince Malott, EPA R6
- 2:35-3:15 Q&A on 2nd Half of Webinar



Environmental Results through the Environmental Council of the States



Kirby Biggs
Project Officer
703.823.3081
biggs.kirby@epa.gov



2/9/11



Hazardous Waste Research Cooperative Agreement RT-83326001

- ✦ Supports achievement of EPA Strategic Plan - Goal 3, Objective 3.2: Restore Land, Sub-objective 3.2.2: Clean up and Reuse Contaminated Land, and Objective 3.3: Enhance Science and Research, Sub-objective 3.3.3: Conduct Research to Support Land Activities.
- ✦ Helps implement the mandated CERCLA §311(b) Innovative and Alternative Technology Development and Demonstration Program.
- ✦ Awarded non-competitively (co-regulator exception) for 2001-2006 and 2007-2011 agreements.

2/9/11



OSRTI Objectives

- ♦ The Technology Innovation and Field Services Division in the Superfund Office has managed a hazardous waste research cooperative agreement with the Environmental Council of the States (ECOS) since 2001.
 - Foster interstate collaboration to promote awareness and technical understanding of alternative and innovative hazardous site remediation assessment technologies.
 - Produce information that states can use to carry out their responsibilities in hazardous waste cleanups.
 - Increase federal/state coordination of technical and regulatory issues in developing, evaluating, and implementing innovative and alternative treatment and assessment technologies at hazardous waste site cleanups.

2/9/11



ECOS/ITRC Funding

- ✦ CA Budget/POP = \$3M/FY06-FY11
- ✦ Current 4 year total = \$1,836,147
 - EPA = \$1,758,058
 - ECOS cost share = \$78,089 (4%)
- ✦ Probable 5 year total ≈ \$2.1M
- ✦ Offices contributing
 - OSRTI/TIFSD - OSRTI/ARD
 - OSRTI/TIIB - OSRTI/TAB
 - ORD/NRMRL (inc. ADA, LV)
 - ORD/HQ -OUST
 - OSWER/LRO - OSWER/FFRO
 - ORCR - OEM
- ✦ CA can accept T, C (S&T), and EPM

2/9/11



What does the ITRC do?

- ✦ Funding from EPA, DoD, and DoE sponsors state-managed teams that:
 - **evaluate innovative or alternative treatment/characterization technologies for hazardous site remediation** (e.g. phyto-remediation, in-situ oxidation, permeable reactive barriers, optimization);
 - **prepare and disseminate technical and regulatory analyses and guidance** for the technologies, strategies and methods;
 - **develop and deliver internet-based training** on the guidance (offered free at EPA's www.cluin.org);
 - **develop and deliver classroom training** on the guidance.



ITRC Composition/Operation

- ✦ In 2010, ITRC membership totaled around 500 with about 200 state and local environmental agency members from all states except Louisiana, Idaho, Montana, and the District of Columbia
- ✦ A network of 50 state points of contact reviews the documents, obtains State concurrence, and assists in deploying the technologies and techniques at site cleanups.
- ✦ The POCs annually review and assemble high priority issues in their state to inform the selection of teams for each fiscal year.
- ✦ Industry Affiliates Program incorporates private sector.
- ✦ Each team includes community and tribal stakeholders.

2/9/11

12

Louisiana, Idaho, and Montana all are having budget problems and cannot field personnel for this effort. DC has minimal hazardous waste problems.

20 States had problems traveling personnel to the ITRC Spring meeting, and traveled fewer personnel in total, due to budget issues.



ITRC Deliverables

- ✦ By the end of 2010, ITRC produced 49 tech-regs, 35 technology overviews, and 14 case study compilations with state issue survey summaries as resource guides.
- ✦ Has had a total of 41 teams pass through the 3-year project lifecycle. 12 teams are currently active.
- ✦ 51 internet-based training courses are available through Clu-in and at (<http://www.itrcweb.org/ibt.asp>)
- ✦ Internet-based training has reached 66,000 people through June 2010 for a total of 180,000 training hours.
- ✦ ITRC has developed and deployed 9 multi-day classroom training courses. (LNAPL). About 4,100 people have participated in the classroom courses.

2/9/11

13



2010-2011 ITRC Teams

1. **Environmental Molecular Diagnostics (EMD) – NEW**
2. **Biofuels – CLOSING 2011**
3. **Green & Sustainable Remediation (GSR) – CLOSING 2011**
4. **In Situ Stabilization and Solidification (ISS) – CLOSING 2011**
5. **Integrated DNAPL Site Strategy (IDSS) – CLOSING 2011**
6. **Incremental Sampling Methodology (ISM) – CLOSING 2011**
7. **Contaminated Sediments – CLOSING 2011**
8. **Permeable Reactive Barriers – CLOSING 2011**
9. **Mining Waste – CLOSING 2010**
10. **Natural Attenuation of Metals & Radionuclides – CLOSING 2010**
11. **UXO Wide Area Assessment – CLOSING 2010**
12. **Remediation Risk Management – CLOSING 2010**

2/9/11



2010 Expected Products

2010 Products – 7 documents, 5 new training courses

- 1.) UXO Wide Area Assessment Overview Document
- 2.) Remediation Risk Management (RRM) Tech Reg Document and Internet Based Training Course
- 3.) RRM Overview Document on Technical Impracticability Assessments
- 4.) Green and Sustainable Remediation Overview Document
- 5.) Mass Flux Overview Document (Integrated DNAPL Team) and Internet Based Training
- 6.) Mining Cleanup Technologies Tech Reg Document (web-based) and Internet Based Training
- 7.) Natural Attenuation of Metals and Radionuclides Tech Reg Document and Internet Based Training
- 8.) LNAPL Classroom Training

15



2011 Expected Products

2011 Products – 8 documents, 7 new training courses

- 1.) Permeable Reactive Barriers (PRB) Tech Reg Document and Internet Based Training
- 2.) In Situ Stabilization (ISS) Tech Reg Document and Internet Based Training
- 3.) Incremental Sampling Methodology (ISM) Tech Reg Document (web based) and Internet Based Training
- 4.) Integrated DNAPL Site Strategy Tech Reg Document and Internet Based Training
- 5.) Biofuels Tech Reg Document and Internet Based Training
- 6.) Green and Sustainable Remediation (GSR) Tech Reg Document and Internet Based Training
- 7.) Environmental Molecular Diagnostics (EMD) Overview Document



Short/Intermediate Term Environmental Results

- ✦ ITRC products increase knowledge and expertise by helping federal, state, and local personnel understand the advantages and limitations of technologies, hazardous substance handling and treatment procedures, and approaches to regulatory issues in deploying innovative or alternative cleanup projects.
- ✦ Promotes adoption of best management practices by clearly describing the characteristics, use, and deployment of technologies and crafting advanced methods and approaches to site investigation and cleanup.
- ✦ New, emerging, and established but unproven cleanup technologies and methods are reviewed, introduced to the market, and available to State, Federal, and Local regulators, and the private sector.

2/9/11

17



Long Term Environmental Results

- ✦ Emerging or optimized remedies and techniques can substantially reduce cost, resource use, energy requirements, and potentially, the greenhouse gas footprint of site cleanup activities.
- ✦ Increased certainty in selecting most effective remedial action offers increased protection of public health and the environment.
- ✦ Interagency structured collaboration on the ITRC Board of Advisors promotes harmony and consistency around sometimes conflicting interagency goals and speeds cleanups.

2/9/11



Why ITRC Green and Sustainable Remediation?

- ✦ Little nation-wide guidance on how to best incorporate green and sustainable remediation into a regulated cleanup process.
- ✦ Need for increased consistency in how to use and interpret sustainability metrics and/or life cycle analysis.
- ✦ Need a way to communicate best practices to state regulators and environmental consultants



ITRC's Green and Sustainable Remediation (GSR) Team

Goal:

Provide documents and training that educate state regulators and other environmental professionals on how to appropriately incorporate sustainability and green technologies into the cleanup process.

20

Source, the ITRC project proposal see the planning tab at www.itrcweb.org



GSR Team Leadership

- ✦ Tom O'Neill – NJ Dept. of Environmental Protection, Site Remediation Program, and Rebecca Bourdon – MN Pollution Control Agency – Petroleum Remediation Program
- ✦ 15 states have committed team members
- ✦ US EPA HQ as well several regions have committed members
- ✦ Team membership commitments from major industry organizations, DOD, DOE, DOI, and Citizen/Academic/Tribal stakeholders



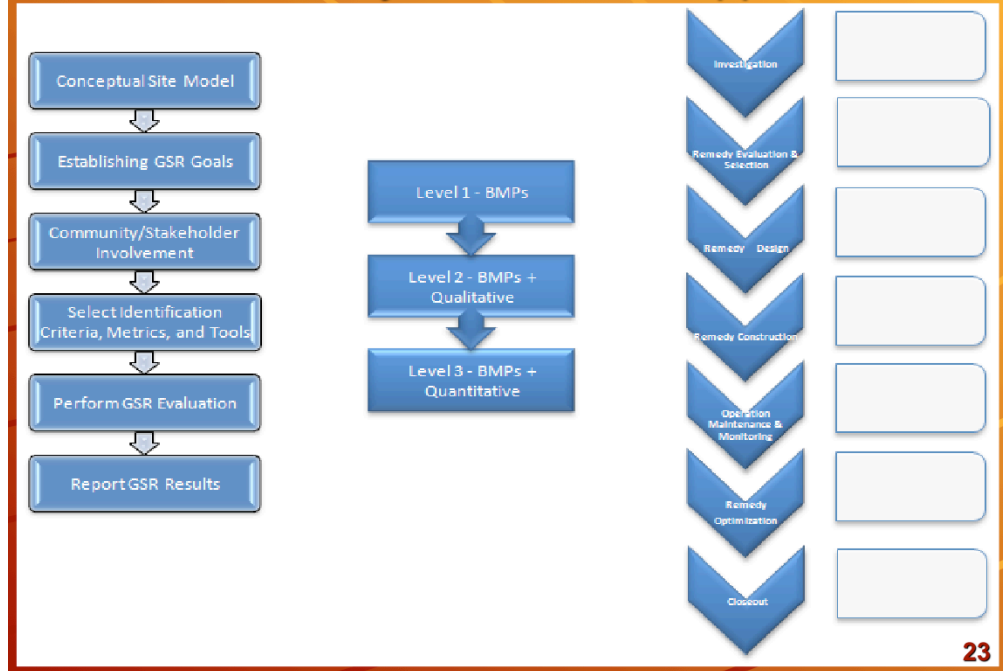
ITRC's Green and Sustainable Remediation (GSR) Team

- ◆ What metrics are most useful and have the greatest impact?
- ◆ What is a consistent and appropriate way of interpreting the metrics?
- ◆ How can we minimize the overall risk to human health and the environment by applying sound GSR practices?
- ◆ How can we reduce energy consumption or use alternative sources of energy that will be less harmful to overall environment?
- ◆ How do we promote the use and development of GSR technologies?

22

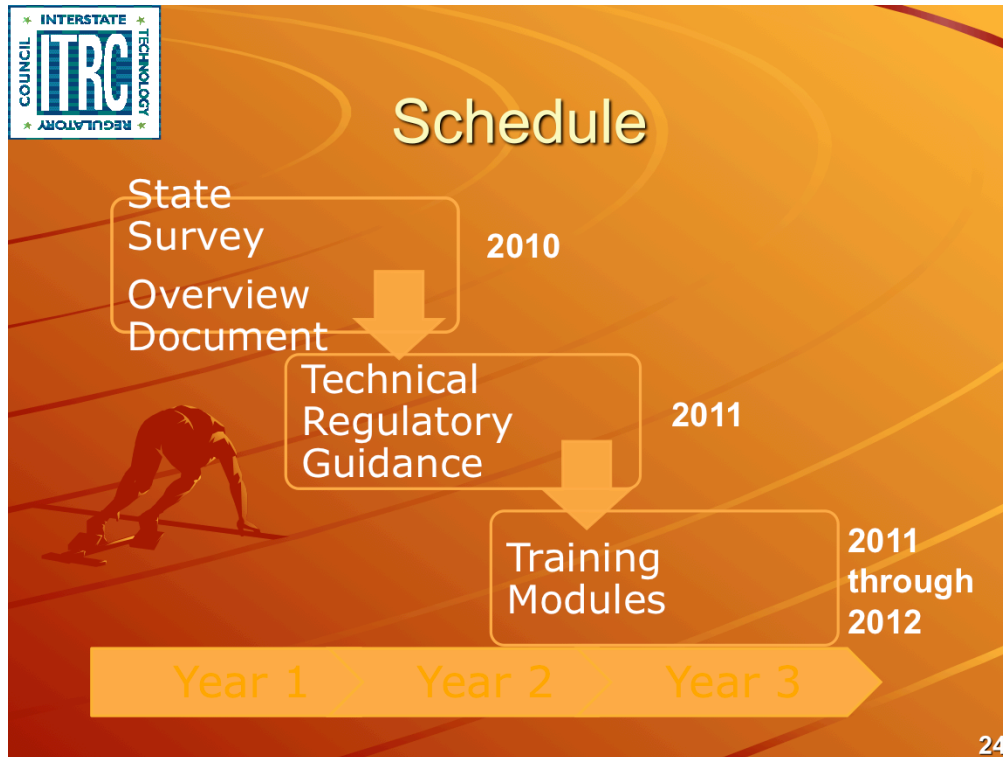
These are the areas of interest expressed by the team and the States at the time the project proposal was prepared. Again, see the project proposal and the team statement at www.itrcweb.org , planning and teams tab respectively.

Summary of ITRC GSR approach



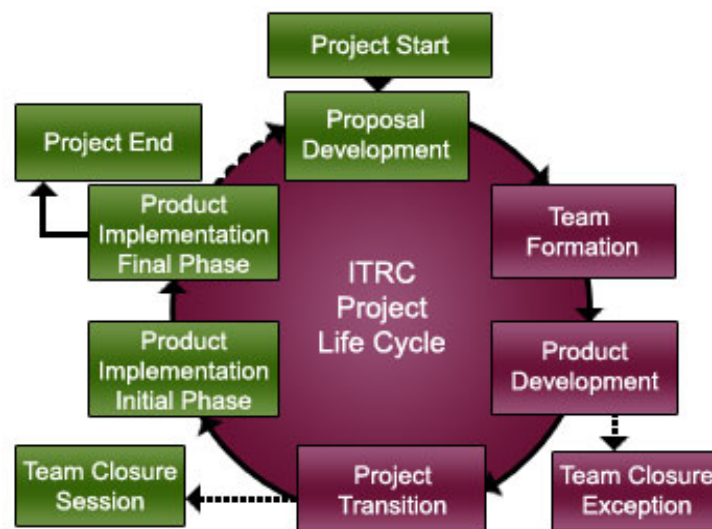
For each phase on the right hand side, one of the three levels of GSR evaluation is conducted as identified by the stakeholders. A corresponding table for each of these phases is included in the document to highlight the respective evaluations at each phase for each level of complexity.

The process on the left hand side is The GSR planning and assessment approach which includes a series of planning and scoping steps to gather and evaluate pertinent information used to select the GSR assessment method. This is followed by performing the GSR assessment, integrating the results into the rest of site activities, and conducting follow-up to verify and communicate the impact of the GSR remedy over time. The importance of planning and stakeholder involvement in all the steps in the process is indicated by the stakeholder involvement at the core of the figure. Also, the figure indicates that the scope and outcome of the GSR assessment can be refined through iteration.



Training will go on into the project implementation phase which will end in 2013.

ITRC Project Lifecycle Model:





GSR Team Related Activities

- ◆ Members from several other related organizations:
 - ASTM
 - SURF
 - ASTSWMO
 - SERDP/ESTCP
 - EPA
- ◆ Green Initiatives, HQ and Regional
- ◆ ETV/MMR

25

The team has a well balanced membership



Highlights of the Overview Document

- ◆ Document finalized for outside review
- ◆ Definitions and boundaries
- ◆ Different related efforts
- ◆ Some considerations for GSR
- ◆ Greening of traditional technologies
- ◆ Tools
- ◆ Contacts list for states, federal, and other programs

26

Remediation, in the context of this document, is the abatement, cleanup, or use of a variety of other methods to contain, remove, and/or destroy hazardous substances from the environment to protect human health and the environment. A remediation project typically consists of multiple stages, including: planning, investigation, assessment of remedial alternatives, remedy selection, remedy design, and construction and implementation of the chosen remedy, often followed by years of operation and maintenance. A remediation project may also require subsequent site restoration and redevelopment to support a meaningful end use. Remediation projects are typically subject to an array of regulatory and other stakeholder requirements. Traditionally, these requirements have focused on human health and a limited number of different environmental risks to inform the remedy selection process. A more holistic approach is increasingly being applied during the remediation lifecycle, namely the integration of “green and sustainable remediation” (GSR).



Highlights of the Tech Reg Document

- ◆ Technical Regulatory Guidance Documents
 - Concurrence process
 - Training is provided, internet based, Clu-in.org
- ◆ Stress Practicality
 - Useful definitions
 - Tools for calculating green and sustainable characteristics
 - Case studies will be provided

Pennsauken, NJ
Phil. Inquirer, 2009



27

Some items that may be considered in the Tech Reg:

The integration and implementation of GSR practices into the site remediation process requires an understanding of the following key elements:

Applicable programs and requirements given the location of the project site. An increasing number of states have GSR guidance or programs that identify how to integrate GSR concepts.

Metrics that best fit the particular project given the GSR activities being considered.

Tools that enable a user to evaluate the applicability and benefits resulting from a particulate GSR practice, considering the environmental, social and economic aspects.

Options available to 'link' a GSR activity with a program that provides financial incentives resulting from such activities as: the use of renewable energy; energy conservation measures; or the creation of open space or protected habitats.

The consideration of GSR throughout the site remediation process requires 'Balanced Decision Making Process' in which all reasonable GSR options are considered and the net benefits are defined in the context of the environmental, social and economic aspects of the project.

GSR options should be considered throughout the site remediation process during the planning of each of the primary phases, including:

Site Investigation

Feasibility Study/Response Action Plan

Remedial Design

Remedial Action Implementation/Construction Management

Remedial Process Optimization

Site Closure



Tech Reg Document Outline

◆ Introduction

- Problem statement (including a mention of greenwashing) and Boundaries of GSR

◆ GSR Planning

- Scale, CSM, GSR goals, Stakeholders, Evaluation performance

◆ GSR Framework

- Investigation, Optimization, Transition

◆ GSR Tools and Technologies

- Summary of current science, costs & benefits, metrics and measures, incentives to GSR



Status of the Tech Reg Document

- ◆ **Revised the outline at the team meeting January 12-13.**
 - **Streamlined the outline**
 - **Three levels of GSR evaluations**
- ◆ **A simplified approach from the perspective of a state regulator who will have limited resources for executing and reviewing GSR evaluations**
- ◆ **Provide a training that includes practical approaches and case studies to highlight evaluations**



Where do we go from here?

- ✦ **Path forward to Green & Sustainable Remediation**
 - Survey of State Interest Completed and received input from 25 states
 - Technical Regulatory Guidance Document & Training
- ✦ **Links to RRM, PBEM, RPO**
- ✦ **Ongoing effort to identify and communicate best practices**
- ✦ **Training for these related topics**
 - ✦ RPO
 - ✦ CSM & ES
 - ✦ PBEM
 - ✦ PBC
 - ✦ GSR – metrics, standards, evaluations, tools, etc.



Questions?



Tom O'Neill
New Jersey DEP
609-292-2150
tom.o'neill@dep.state.nj.us



Minnesota Pollution Control Agency



Sriram Madabhushi
Booz Allen Hamilton
210-487-2611
madabhushi_sriram@bah.com

Rebecca Bourdon
MN PCA
651-757-2240
rebecca.bourdon@state.mn.us



Kirby Biggs
Project Officer
703.823.3081
biggs.kirby@epa.gov



EPA Region 6 GR Status

February 10, 2011

Region 6 GR Strategy and Policy

R6 Clean Energy and Climate Change Strategy

- Signed in 2008
- Facilitate the development of green remediation projects in Region 6
- Provide training and guidance to EPA, State, and Tribal staff on green remediation
- Develop annual goals

R6 Superfund Clean and Green Policy

- Signed in September 2009
- General greener cleanup objectives are listed

Cross divisional Ad-Hoc workgroup

- Formed to address R6 CECC annual goals and update management on the status



Webinars and Training

- Webinars being offered and provided to staff and will be extended to State and Tribal staff
- Sustainable Revitalization Training by RCRA program (includes GR)
 - Provided training to Region 6 employees
 - Provided training to Texas and Louisiana project managers
 - In 2011 training is planned for other states in the region as well (based on availability of travel funds)

Specific Projects Underway

- **Chevron Mining site, NM - Superfund**
 - ROD issued in 2009 included plans for solar energy facility on the tailing facility
 - Construction of 1 MW solar facility at Questa, NM on tailing pile is complete by Chevron
 - Pilot demonstration for 5 years to test concentrating PV technology and evaluate the effectiveness of 1-, 2-, and 3-foot cover depths
 - Energy being provided to utility transmission line this week

Specific Projects Underway

- **Holly Street Power Plant, TX - Brownfields**
 - EPA, Austin Energy, City of Austin Parks Dept, NREL
 - EPA provided recommendations to incorporate sustainability and GR concepts in their RFP to dismantle the former power plant
 - Meeting in January to further discuss decommissioning and sustainable revitalization of the area
 - Parties agreed to continue meeting and share information during cover the next two years as the project progresses

Specific Projects Underway

- **Santo Domingo Pueblo, NM - Brownfields**
 - EPA and DOT coordinating efforts to promote sustainable development at a former trading post and new train stop constructed with ARRA funds
 - Phase 1 Environmental Site Assessment completed for the former CC Housing site
 - Cleanup of the former CC Housing site under evaluation – GR principles will be used

Specific Projects Underway

- **State Road 114, TX – Superfund Site**
 - Cryogenic Compression and Condensation (C3) being used for recovery of SVE from groundwater plume
 - Carbon footprint evaluation planned in 2011

Specific Projects Underway

- **Grants Chlorinated Solvent Site, NM - Superfund**
 - Carbon footprint evaluation Pilot Study being conducted
 - Various tools are being used to compare the carbon footprint for ongoing cleanup activity at the site
 - Tools include Batelle's SiteWise, Air Force Center for Excellence (AFCEE) Sustainable Remediation Tool (SRT), and SimaPro

Other

- Other projects are in the works – at different stages
- Environmentally preferable practices being incorporated in contracts - in terms of waste minimization, materials management, resource conservation, and reduction in emissions

Observations

- Awareness level varies amongst the different RPMs
- Challenges are
 - Time
 - Steep learning curve
 - Funding
 - Resources
 - Implementation guidance

Contact
Raji Josiam
USEPA Region 6
214-665-8529
Josiam.raji@epa.gov



National Association of
Remedial Project Managers
Annual Training Program

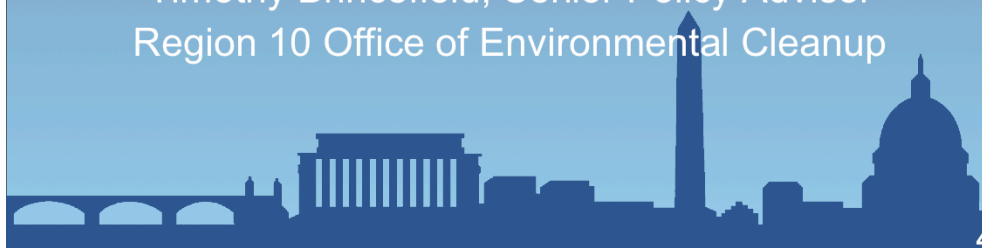


May 24-28, 2010 • Potomac Yard • Arlington, Virginia

USEPA Region 10

PRPs Approach to Greener Remediation in the LDW Site RI/FS

Timothy Brincefield, Senior Policy Advisor
Region 10 Office of Environmental Cleanup



43



May 24-28, 2010 •

44

So now we'll talk about the Duwamish and how the SF law is being applied there.

Study area is from S end of Harbor Island to just S of dredged channel
Green line is the area that drains to Duwamish.

Site Status

- ◆ Lower Duwamish: large urban River/Sediment Site in Seattle;
- ◆ Major PRPs (Boeing, Port of Seattle, City, County) doing RI/FS and early actions in 4 subareas;
- ◆ EPA recently commented on latest draft of FS

Pollution Sources

Storm water runoff from:

- Roads
- Residential yards
- Industrial/manufacturing operations

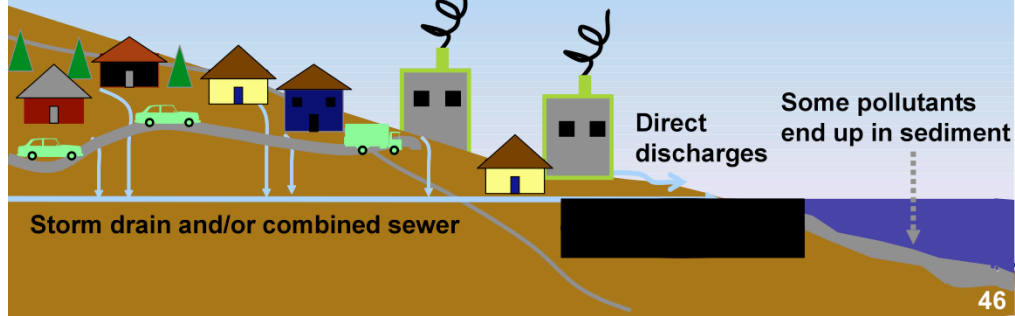
Contaminated soil or groundwater

Combined sewer system overflows:

- Storm water runoff
- Municipal sewage/wastewater
- Industrial wastewater

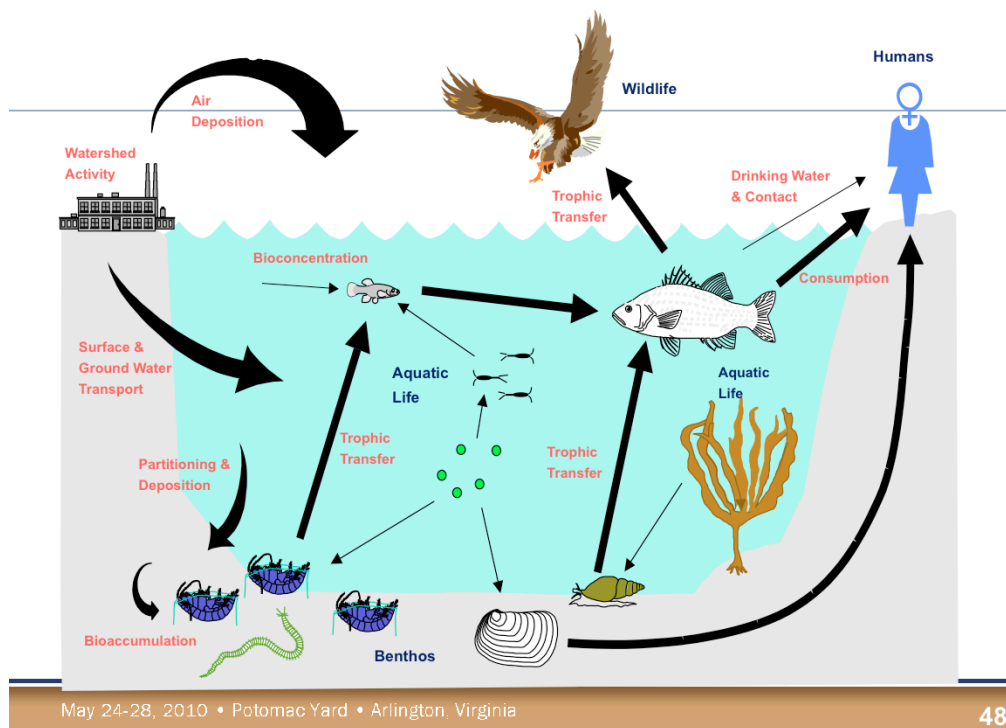
Direct Discharges

Air Deposition



Primary COCs

- ◆ PCBs,
- ◆ Arsenic,
- ◆ CPAHs,
- ◆ Dioxins/Furans

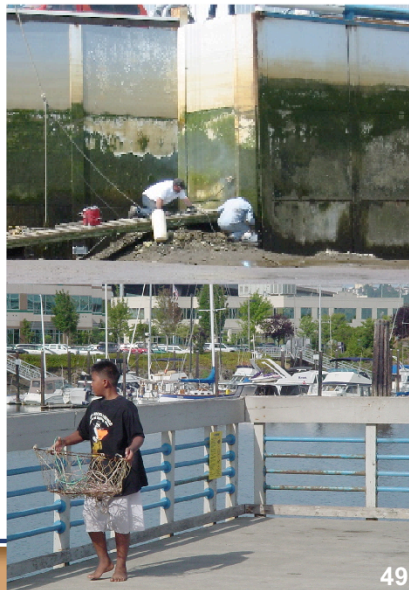


So once we have calculated the risks, we have to figure out how much sediment needs to be cleaned up to reduce concentrations in fish, invertebrates, etc to “safe” levels. We now know that contaminants are cycling through the system and ending up in lots of different organisms.

We do something called a food web model – a computer model that simulates how contaminants move through a system. But it’s a very crude tool.

LDW Conceptual Site Model for Human Health Risk Assessment

- ◆ Beach play/work/
commercial net fishing
 - dermal contact, incidental ingestion of sediments
- ◆ Consumption of fish and shellfish
 - Adult tribal scenario
 - Child tribal scenario
 - Asian Pacific Islander scenario



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49

Phase 1 HHRA put us in a good position to develop our CSM for Phase 2. Similar to what was used in Phase 1 but with some changes. So, these were the scenarios we will use in Phase 2 HHRA and guided selection of spp for Phase 2 sampling.

Remedial Technology Options

- ◆ Dredging and Offsite Disposal;
- ◆ Capping;
- ◆ Monitored Natural Recovery
- ◆ Alternatives vary as to how much to rely on each.
- ◆ All alternatives require source control; most also need ICs and O&M.

Preferred Alternative

- ◆ Likely some combination of the 3 main technologies
- ◆ Real question is where/how much to employ each;
- ◆ PRPs prefer MNR for as much of the Site as possible after early actions;
- ◆ The larger the dredged footprint, the more COCs removed from the environment. But, PRPs argue: the higher the cost, greater short-term impacts and minimal time or risk-reduction savings.

PRPs Draft FS includes “sustainability metrics” under Short-Term Effectiveness

- ◆ PRPs describe sustainability metrics as “footprints of remedial alternatives, e.g., energy and material consumption, GHG, and carbon footprint per EPA guidance”
- ◆ PRPs conclude dredge + off-site disposal has largest carbon footprint, GHG, impacts on and risk to environment, workers and communities, followed by capping then MNR. Thus they rate MNR much higher in terms of Short-Term Effectiveness (STE) and dredging much lower.
- ◆ PRPs failed to discuss ways to mitigate impacts despite Guidance, R10 C&G policy and repeated comments

PRPs Also Using STE Concerns to Drive Protectiveness Evaluation

- ◆ PRPs also carry their “sustainability metrics” heavily into Overall Protectiveness of PH&E, and justify based on 2nd sentence of NCP 300.430(e)(9)(3)[A] :
 - “Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.”;
- ◆ We counter with the 1st sentence:
 - ““Overall Protection of Public Health and the Environment” relates to the protection of PH&E “from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site...””.

□

Per EPA AA for OSWER's 8/27/09 "Principles for Greener Cleanups" Memo

- ◆ EPA does not consider cleanups that do not satisfy threshold requirements for protectiveness and site-specific cleanup objectives to be "greener".
- ◆ Policy not intended to trade cleanup program objectives for other environmental objectives.
- ◆ "EPA will select the alternative that meets the threshold criteria ...and provides the best balance of the remaining criteria, and then seek to minimize the environmental footprint of the selected cleanup, by using equipment that emits less particulate matter into the air, sizing equipment appropriately to avoid wasted energy, water, and material, and using renewable energy or recycled material to the extent possible.
- ◆ Point is to make selected remedies greener, not to use GHG, etc. to drive remedy selection

Mitigation Needs to Be Addressed Well in FS per Policy, Guidance, NCP

- ◆ We know much more about mitigation options and ways to make cleanups greener than we used to and are learning more all the time;
- ◆ This is important information to develop and document well in the FS;
- ◆ Particularly important to factor into remedial design and action after remedy selection.

OSRTI working on GR Guidance or Policy Memo

- ◆ Generally good news, such guidance would help, we look forward to reviewing and commenting on draft
- ◆ We agree with them on “no 10th criteria” and emphasizing that where short-term impacts are identified, identifying and documenting ways to mitigate impacts is essential in FS, important to inform RD;
- ◆ However, it would be troubling if HQ comes out in favor of considering GR under multiple criteria (not just STE). R10 does not support that approach as it is likely to bias decision-making;

R10 Strongly Recommends:

- ◆ Limit discussion of GHG & other impacts to Short Term Effectiveness, which is the appropriate place to identify potential environmental effects and impacts associated with alternatives and how to mitigate them
- ◆ Emphasize that discussing ways to mitigate impacts is essential in FS, important to inform RD;
- ◆ STE should have no more (or less) weight than it has had to date & should not be major factor in re Protectiveness (except in extraordinary circumstances);
- ◆ Focus on actively mitigating or reducing impacts and otherwise making remediation greener as part of RD and later O&M, not remedy selection.



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USEPA Region 10

Green Remediation Elements of the South Tacoma Channel Well 12A Excavation Design



58

Well 12A - Amendment to the Record of Decision October 2009

- ◆ The RODA includes discussion of green remediation concepts in Section 7.1 Protection of Human Health and the Environment
- ◆ Consistent with the RAOs, opportunities may be sought during the implementation of the remedy to reduce its environmental footprint as defined in US EPA Office of Solid Waste and Emergency Response Principles for Greener Cleanups

Green Remediation Evaluation

- ◆ Green remediation evaluation was performed on the selected remedy identified in the ROD amendment in order to
 - Estimate the environmental footprint of the selected remedy
 - Identify the largest contributors to the footprint
 - Identify potential options for reducing the environmental footprint
- ◆ Findings were used to modify the design

Table 23. Unit Footprints for Each Remedial Technology

		Excavation		ITR		EAB		GETS	
Volume Treated		4,200		26,600		76,900		76,900	
Units for Volume Treated		cy		cy		cy		cy	
		Total Footprint	Unit Footprint per cy	Total Footprint	Unit Footprint per cy	Total Footprint	Unit Footprint per cy	Total Footprint	Unit Footprint per cy
Energy	Used (btu)	1.5E+09	3.5E+05	1.0E+11	3.9E+06	2.2E+09	2.8E+04	2.8E+10	3.7E+05
Water	Used (gal)	1.2E+06	3.0E+02	6.3E+05	2.4E+01	5.1E+06	6.6E+01	2.6E+08	3.4E+03
CO ₂ e	Emitted (lbs)	2.3E+05	5.4E+01	4.4E+05	1.7E+01	3.5E+05	4.6E+00	4.8E+05	6.3E+00
NO _x	Emitted (lbs)	1.3E+03	3.1E-01	1.1E+03	4.1E-02	7.8E+02	1.0E-02	1.3E+03	1.7E-02
SO _x	Emitted (lbs)	6.2E+02	1.5E-01	1.3E+03	4.7E-02	7.3E+02	9.5E-03	4.6E+03	6.0E-02
PM	Emitted (lbs)	3.2E+03	7.5E-01	2.7E+02	1.0E-02	1.1E+02	1.4E-03	3.0E+02	3.9E-03
Landfill Space	Used (tons)	7.9E+03	1.9E+00	2.1E+02	8.0E-03	1.3E+02	1.7E-03	0.0E+00	0.0E+00
Local Electricity	Used (kWh)	0.0E+00	0.0E+00	7.4E+06	2.8E+02	0.0E+00	0.0E+00	1.8E+06	2.3E+01
Local Water	Used (gal)	5.5E+03	1.3E+00	1.9E+05	7.2E+00	3.2E+06	4.1E+01	4.7E+04	6.1E-01
Local NO _x	Emitted (lbs)	1.3E+03	3.0E-01	6.2E+02	2.3E-02	5.3E+02	6.9E-03	1.6E+02	2.0E-03
Local SO _x	Emitted (lbs)	6.0E+02	1.4E-01	4.1E+02	1.6E-02	9.6E+01	1.2E-03	1.2E+02	1.5E-03
Local PM	Emitted (lbs)	3.2E+03	7.5E-01	6.9E+01	2.6E-03	4.5E+02	5.9E-03	9.4E+01	1.2E-03
Groundwater	Used	2.0E+05	4.7E+01	3.6E+03	1.4E-01	2.8E+04	3.6E-01	2.6E+08	3.4E+03
Other Factor 1	Used	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Other Factor 2	Used	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

 Highest unit footprint for that metric

 Lowest unit footprint for that metric

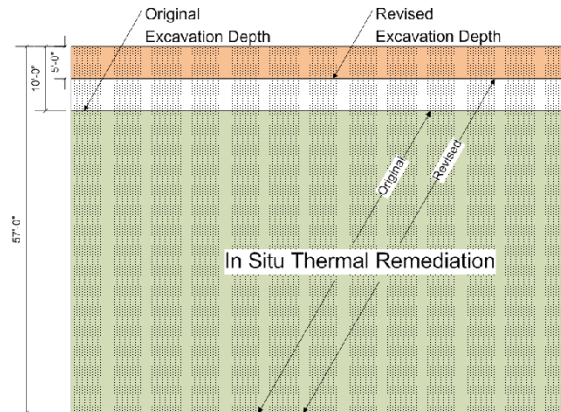
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Green Remediation Design Modifications

- ◆ Design modifications focused on the largest contributors to the environmental footprint
 - Excavation and offsite disposal was determined to have the greatest unit footprint per cubic yard by most metrics evaluated
 - While in situ thermal remediation (ISTR) is energy intensive, >98% of Tacoma's electricity is generated from hydroelectric and nuclear sources and thus has a relatively low environmental footprint by the metrics evaluated

Key Green Remediation Design Modification

Excavation volume reduced by ~50% from conceptual design presented in FFS in favor of ISTR to minimize the environmental footprint of the remedy



Transportation and Disposal

- ◆ Specified preference for local borrow sources and disposal facilities
- ◆ Concrete to be segregated and recycled locally ~3 miles from site
- ◆ Soil to be pre-characterized for disposal at nearest subtitle C landfill to minimize transportation
- ◆ If treatment is required prior to disposal, the selected facility generates energy from the treatment process which goes back into the grid and is sold to the City of Seattle
- ◆ Transportation analysis to determine greenest transport method to disposal facility considering both rail, truck, and combination methods

Diesel Emissions

- ◆ No idling policy for all vehicles and equipment
- ◆ Require use of cleaner engines, cleaner fuel, and cleaner diesel emissions control technology on all diesel equipment > 50 hp
 - Engines to meet or exceed Tier I (off-road) or 2004 On-Highway Heavy Duty Engine Emissions Standards (on-road)
 - Low sulfur / Biodiesel requirements
 - EPA or California Air Resources Board (CARB) verified diesel particulate filters (DPFs) or diesel oxidation catalysts (DOCs)
- ◆ Contractor required to track emissions reduced associated with using cleaner diesel equipment and fuels

Other Green Remediation Elements

- ◆ Remedial design investigation being conducted to refine CSM and delineate treatment zones using a dynamic work approach and 3-D modeling so the remedy can be implemented in the most efficient manner
- ◆ Improvements to storm water system
- ◆ Existing roof drains to be disconnected from sanitary sewer and routed to storm water system during restoration



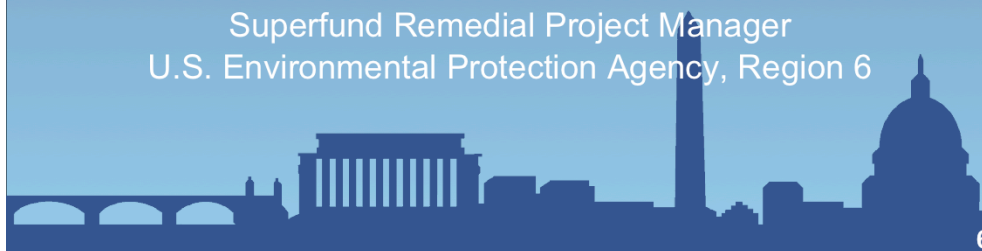
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Incorporating Green Remediation Technology at a Texas National Priorities List (NPL) Site

Vincent Malott
Superfund Remedial Project Manager
U.S. Environmental Protection Agency, Region 6



67

Site Setting



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68

Site Background

- ◆ Source area is a former 64-acre refinery that operated between 1939 and 1954.
- ◆ Liquid wastes disposed in pits as well as commingled spills from process areas.
- ◆ Property is now occupied by a Farmers Cooperative and commercial businesses.

Site Contamination

- ◆ Ground Water
 - Depth to water is 140 - 150 ft.
 - Saturated thickness is 40 – 80 ft.
 - Hydraulic conductivity of 14 – 20 ft/day
 - Seepage velocity of 130 – 185 ft/year
- ◆ 1.2-mile long ground water plume containing benzene and 1,2-DCA.
- ◆ Residual LNAPL layer beneath the facility.

71

72

Remedial Action Objectives and Goals

- ◆ Ogallala aquifer is a current drinking water supply
 - Prevent exposure
 - Prevent or minimize migration of the plume
 - Prevent or minimize further releases from source material
 - Restore to beneficial use
- ◆ Remedial goal of 5 µg/L for Benzene and 1,2-DCA in groundwater

Remedial Strategy

- ◆ Groundwater extraction system for hydraulic containment and aquifer restoration of the dissolved plume.
- ◆ Soil vapor extraction for source area reduction.
- ◆ Cryogenic compression and condensation (C3) technology for off-gas treatment. System components selected to achieve:
 - Minimal or no emissions from treatment system.
 - Maximize SVE production rates to shorten source area remediation time frame.

CERCLA – State Obligations

- ◆ For groundwater restoration remedies:
 - EPA provides 90% of the funding for the first 10 years
 - State assumes O&M costs after 10 years
- ◆ State assumes O&M on September 2, 2020

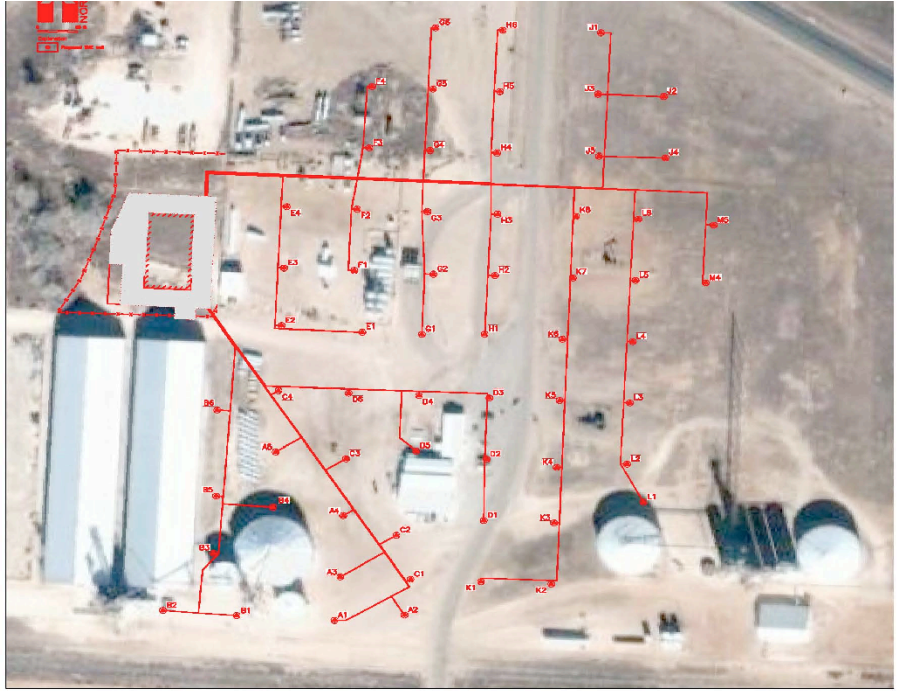
Ground Water Extraction System

- ◆ 11 on-site extraction wells within the former refinery area:
 - Average total flow of 66 gpm
 - Benzene concentration range of 2500 – 64,800 µg/L
 - 1,2-DCA concentration range of 76 – 1820 µg/L
- ◆ 10 off-site extraction wells in agricultural and residential area:
 - Average total flow of 215 gpm
 - Benzene concentration range of ND – 6,590 µg/L
 - 1,2-DCA concentration range of ND - 516 µg/L
- ◆ 4 off-site injection wells for return of treated water.



Soil Vapor Extraction System

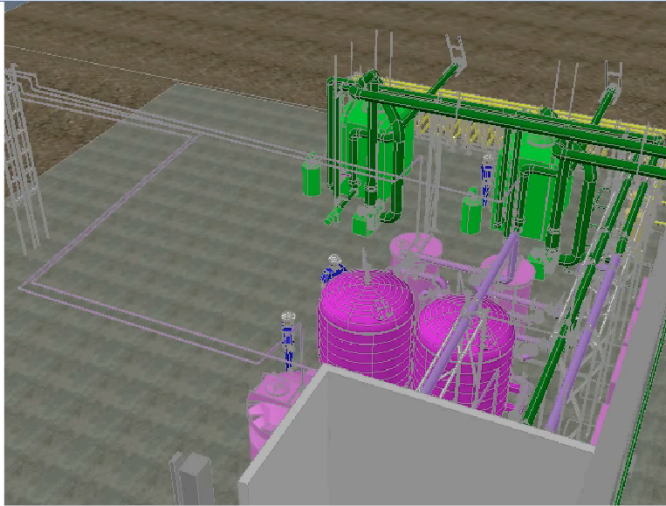
- ◆ 62 dual-completion soil vapor extraction wells
 - Shallow zone screened from 70 – 90 feet
 - Deep zone screened from 110 – 140 feet
- ◆ Estimated LNAPL extent is 717,000 ft² with a median thickness of ½ ft.
- ◆ Estimated volume of recoverable LNAPL is 285,000 to 570,000 gallons.
- ◆ Pilot test results
 - Shallow zone influent was 300 – 11,500 ppmv
 - Deep zone influent was 39,000 – 49,000 ppmv



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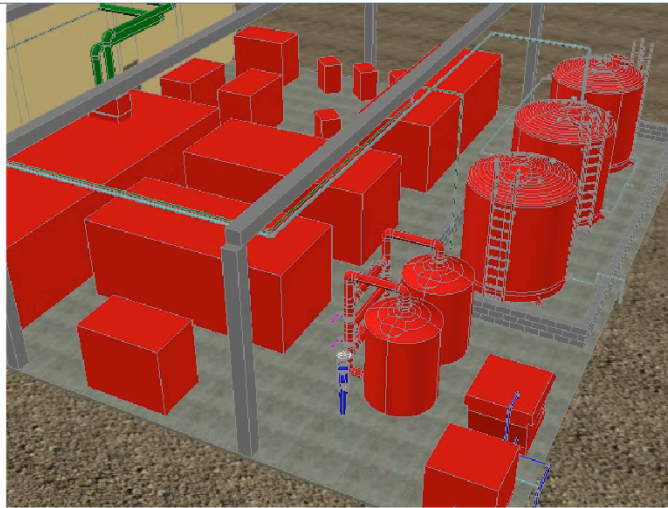
Treatment Plant Components

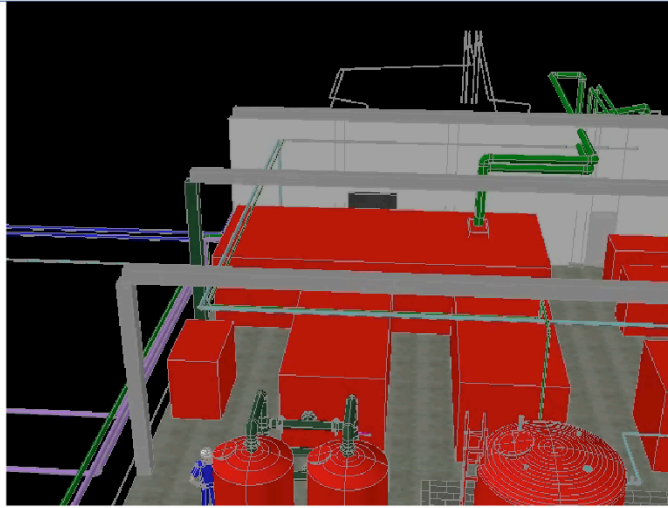
- ◆ Oil-water separator for groundwater flow from 11 on-site wells with potential LNAPL content.
- ◆ Metals treatment using coagulation and filtration for arsenic, manganese, and iron.
- ◆ Two air strippers for removal of benzene and 1,2-DCA.
- ◆ Off-gas from air strippers routed to zeolite rotor concentrator.
- ◆ Vapor condensation technology to convert SVE and off-gas vapors to recyclable product.



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81





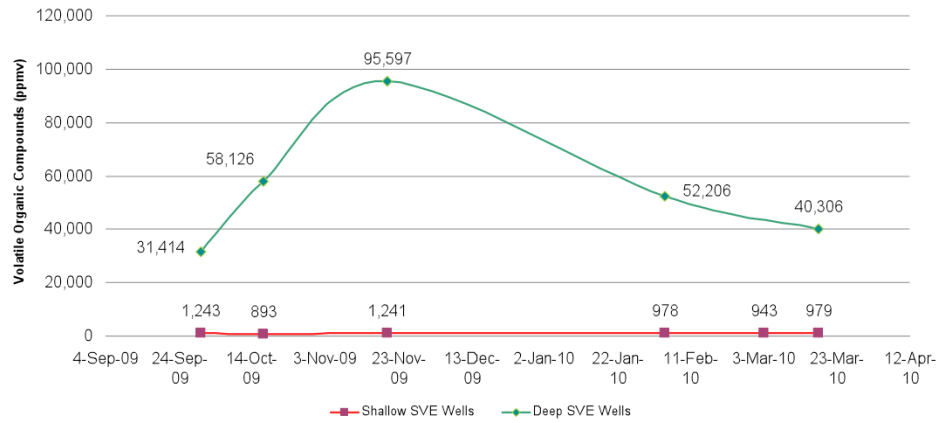
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83

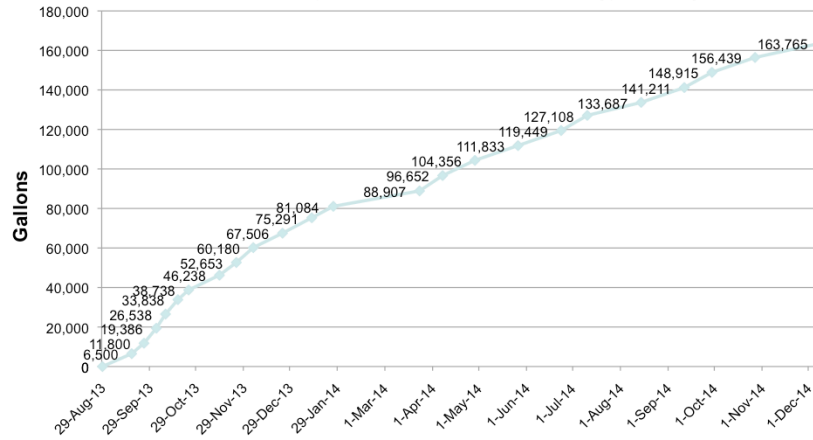
Performance Data

- ◆ SVE system influent
- ◆ Total hydrocarbons recovered
- ◆ Kilowatt hour usage
- ◆ Energy costs vs. hydrocarbon revenue

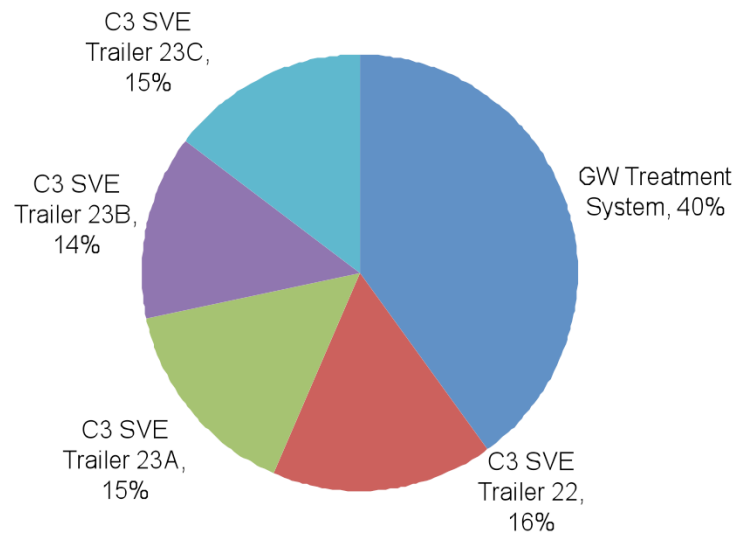
**Gas Chromatograph Analysis of
SVE System Influent
Volatile Organic Compounds (ppmv)**

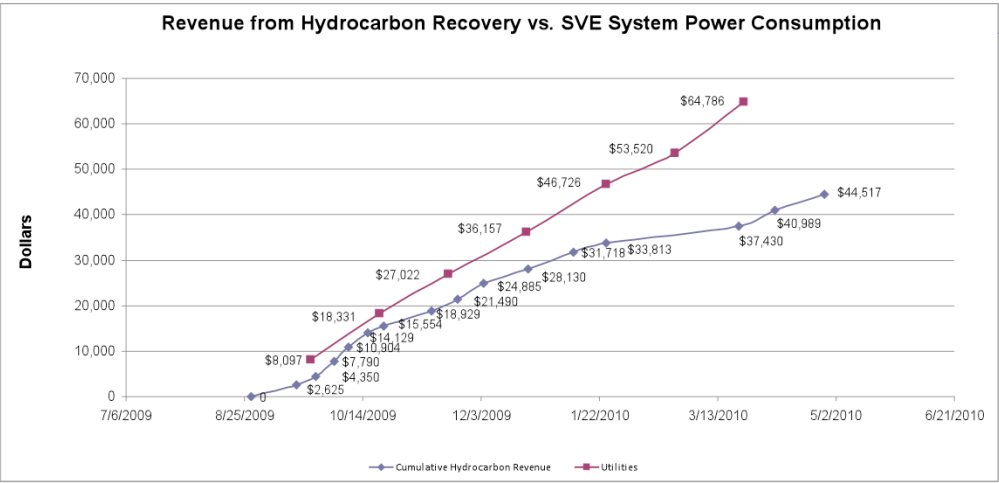


Total Hydrocarbon Recovered (gallons)



Kilowatt Hour Usage Breakdown at SR 114
11/19/2009-3/24/2010





Next Steps

- ◆ Periodic optimization reviews of system.
- ◆ Document approaches for carbon footprint analysis of SVE and P&T components.
- ◆ Integrate clean, renewable energy sources for operating system.
- ◆ Share findings and lessons learned through Region 6 website.

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Questions?

Vincent Malott
EPA Region 6 Superfund Division
214-665-8313
malott.vincent@epa.gov

□

Thank you for your time!

If you have additional questions or comments, please
contact

Session Moderator
Suzanne Davis
sdavis@dtsc.ca.gov

February 10, 2011

GR Webinar Session 3 of 3

92

Thank you again for your attention and comments. I want to remind each of you that we are looking for your specific responses to many of the issues discussed today in our feedback form following this session.

Also, there are several resources and related documents included in the links to more resources on this page.

If you have any additional questions or comments, please feel free to contact myself or fill out a comment form on CLUIN.

Thank you and have a great afternoon.

Resources & Feedback

- To view a complete list of resources for this seminar, please visit the [Additional Resources](#)
- Please complete the [Feedback Form](#) to help ensure events like this are offered in the future

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93