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NARPM Presents...Redux of NARPM 2011 Greener Cleanups Sessions: Greener Cleanups Case Studies

Sponsored by: U.S. EPA Office of Superfund Remediation and Technology Innovation

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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 interupt 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.

Greener Cleanups
Savannah River Site Case Studies

Rachel McCullough, RPM
EPA, Region 4, Superfund Division

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Green Remediation Definition

EPA defines green remediation as the practice of *considering all environmental effects* of remedy implementation and incorporating options to *minimize the environmental footprints* of cleanup actions.

Green remediation is intended to *reduce the demand* placed on the *environment* during cleanup actions and to conserve natural resources.

Federal Facilities Sites

- EPA is not the Lead Agency
- Communication
  - Communicate early, clearly, and often
  - Explain your needs and expectations and why you need them
  - How would a Win-Win look?

Win-win includes EPA, the PRP(s), their contractors, the environment, and the community (reuse, protection, jobs, local contractors), etc.

What Are Your Needs (and Theirs)?

- Are they measuring what you are measuring?
  - If not, can or will they?
- What are their Agency's goals?
  - Do they have a green remediation strategy or equivalent "directive"?
- Consider the size, mission, and funding of the Agency.
  - Perhaps another Agency measures these for them or they have an agreement with an university or nonprofit

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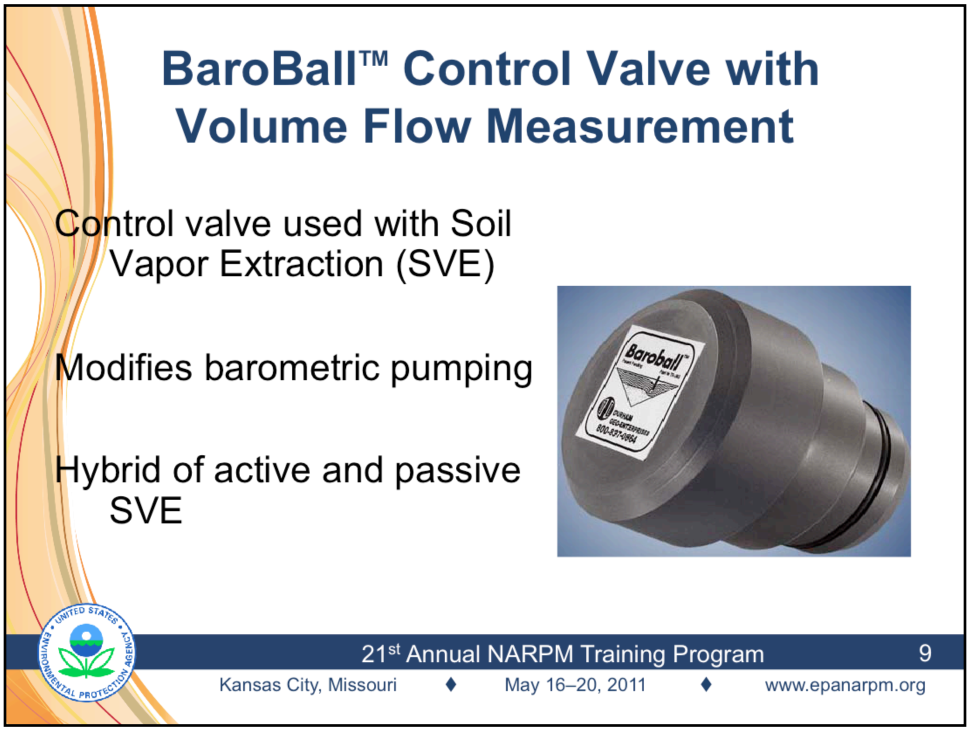
Consider the motto: you do as you are measured! If being green is not a metric being measured in the PRP's or their contractor's performance, it may not be a priority.

Who Has What You Need?

- Coordinate with the PRP's organization to get what you need
  - Who manages their green remediation strategy?
  - Information is in another department, i.e., Public Relations, Facilities Management, Pollution Prevention (P2), Contracting, their Headquarters agency, or Contractors
  - Contractors may be incentivized to measure or reduce greenhouse gases or their company may want to do it for their public relations efforts

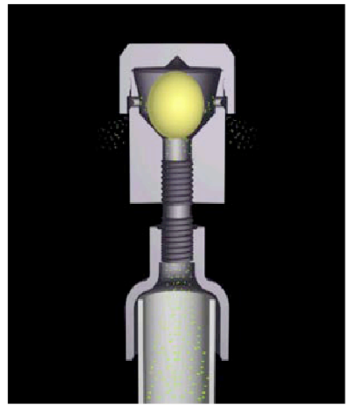
Owned by the Department of Energy in Aiken, South Carolina
Over 300 acres on the Savannah River near Augusta, GA
Part of the nuclear weapons complex since the 1950's



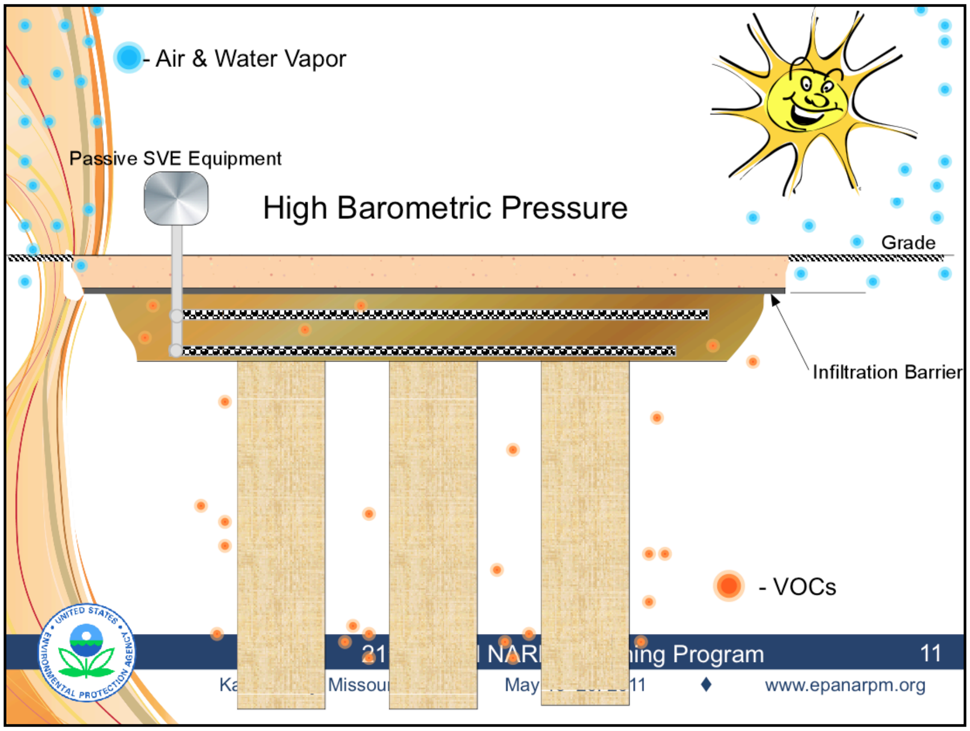
The BaroBall™ control valve increases the efficiency of barometric pumping and allows natural soil gas to flow out of an underground well, while restricting air flow from the surface into the well. Air flowing into the well from the surface will dilute and possibly spread contaminants still present in the subsurface.

The BaroBall™ Control Valve: a ping pong ball

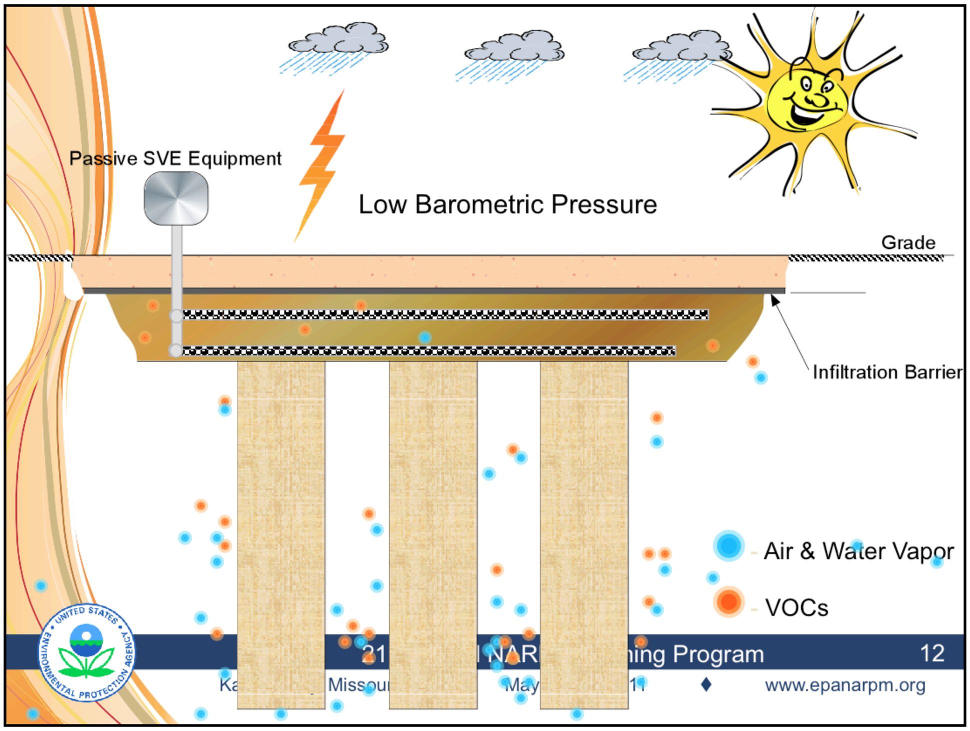
- When atmospheric pressure is higher than the pressure in the well, the ball is forced down and seals the valve, preventing surface air from entering
- When the pressure in the well is greater than the surface pressure, the ball rises on the stream of air, opening the valve and allowing vapor to exit.



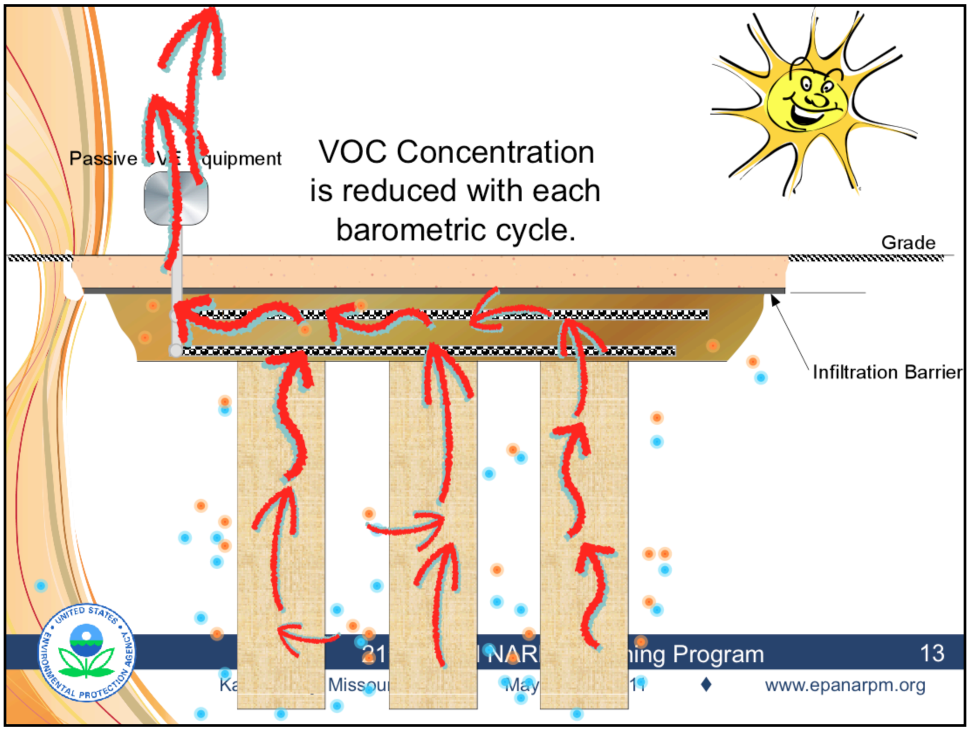
The Baroball significantly increases the effectiveness of barometric pumping by preventing the inflow of air into a venting well when atmospheric pressures reverse, a condition that can reduce contaminant removal by diluting and disbursing the pollutant. Its design consists of a simple plastic sphere that seals the well from incoming surface air.
It is an enhancement of a “passive” system and uses no energy to operate.



High Barometric Pressure keeps the VOCs within the vadose zone and from escaping into the atmosphere



When atmospheric pressure is low, gas/vapors from the soil raise and exit the surface


VOC Concentration
is reduced with each
barometric cycle.
Passive
Grade
Infiltration Barrier
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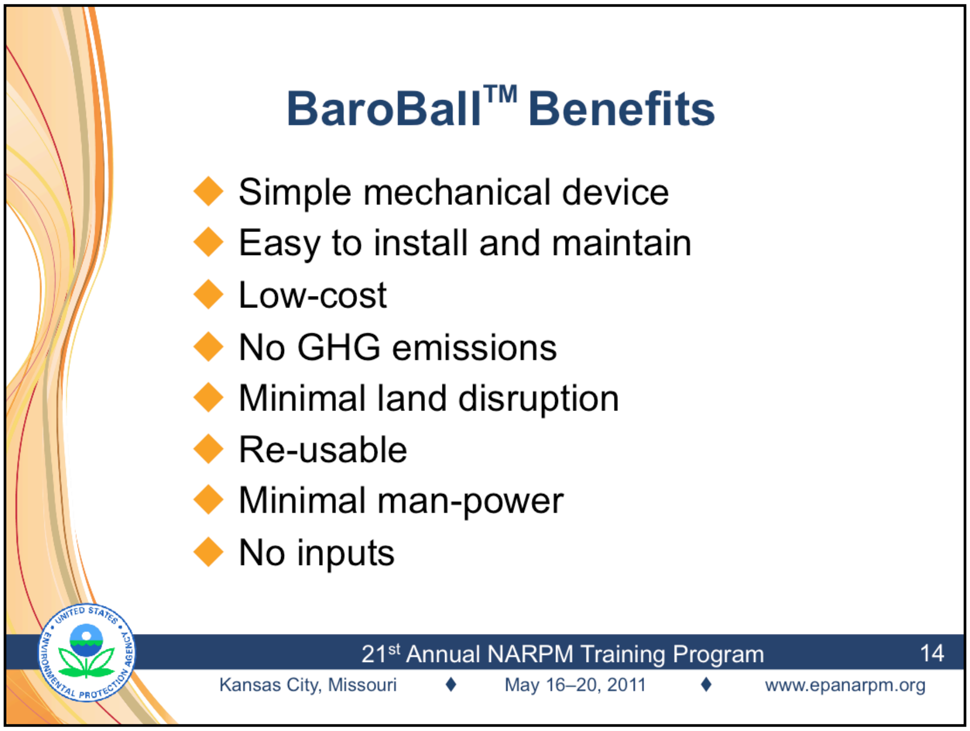
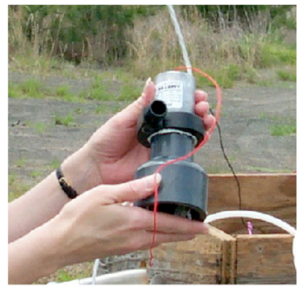


Compare other methods to remediate volatiles from the vadose zone – dig and haul, cap have much higher environmental impacts and cost. Bioremediation could have greater cost in terms of chemical inputs and last disruption. SRS is using this technology in at least 8 Operable Units at their facility.

MicroBlowers

- Subsurface remediation tool
- Small pump connected directly to the wellhead to remove contaminated soil gas (SVE)
- Useful for long-term cleanup, particularly where mass transfer limits the rate of remediation
- Can be powered by small batteries, small photovoltaic panels, or wind generators (requires 20 – 40 watts of power)



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The microblower is a low flow, low power, active soil vapor extraction device connected directly to the wellhead to remove contaminated soil gas. Microblowers can be operated either by power provided directly by a solar panel or by a solar recharged battery.

MicroBlowers

- Removed 234 pounds of volatile organic compounds from a contaminated groundwater plume over 10 months
- Can be used with a Baroball™ in a hybrid system

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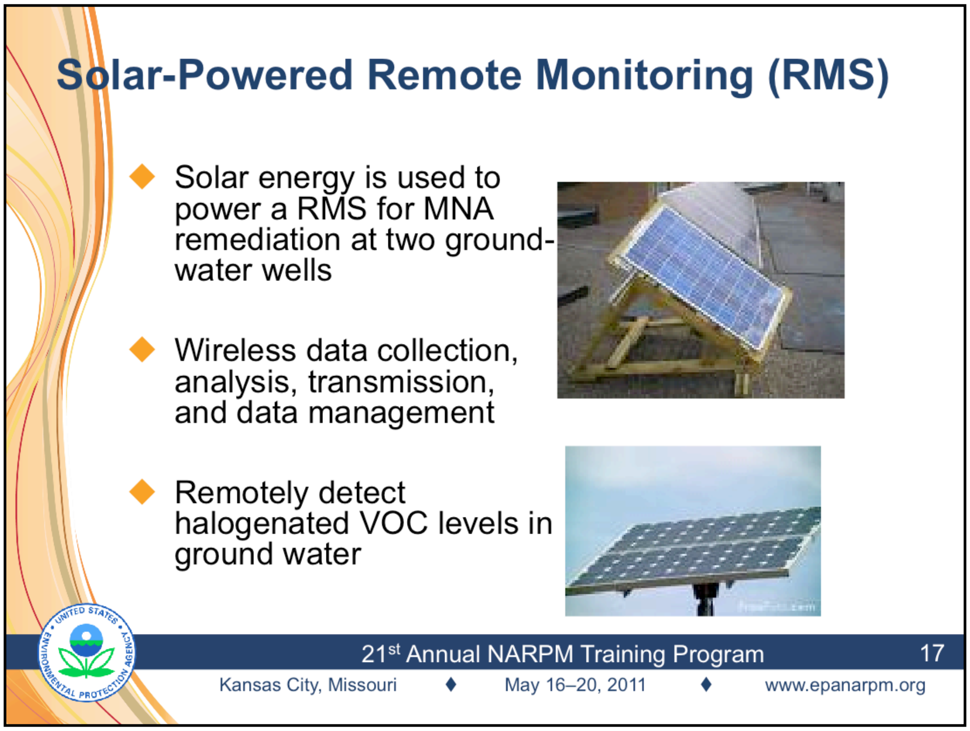
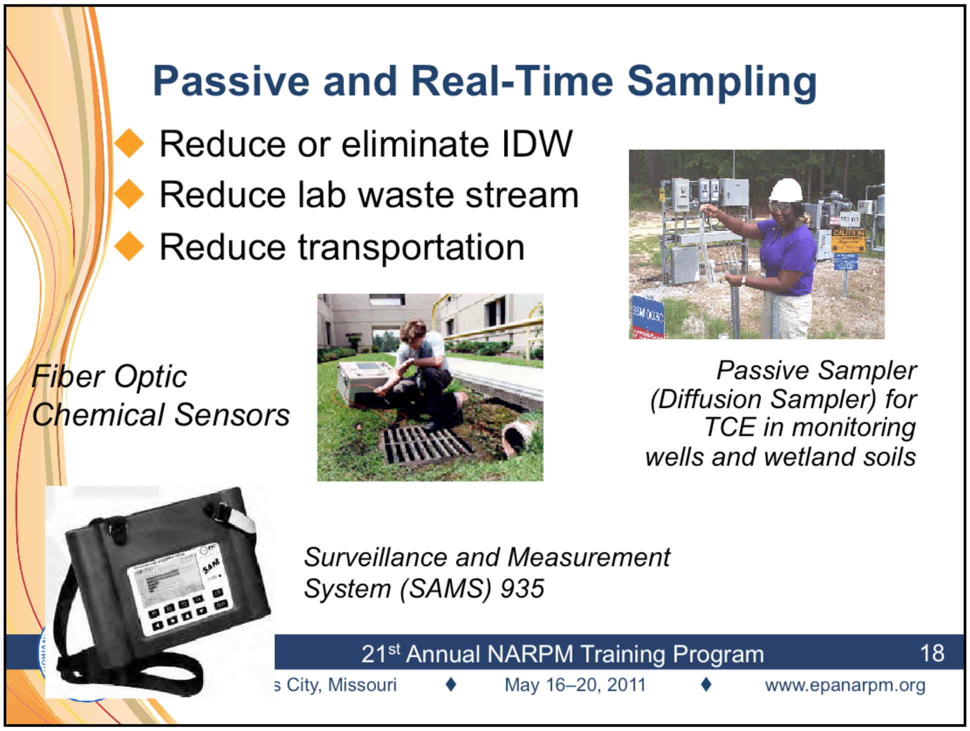
In a hybrid system with the Baroball, during daylight hours, the microblower would operate to remove soil gas. In the afternoon/evening, when solar power is not available, barometric pumping would remove contaminated soil gas.
Perhaps the greatest potential for the MicroBlower is in treatment polishing of an area treated by an expensive, large blower system that still has residual contamination. Installation of an economical MicroBlower system to finish the cleanup at greatly reduced costs, allows the larger systems to be used where they can produce greater returns.



In addition to the solar powered microblowers, solar energy is used to power a remote monitoring system (RMS) for MNA remediation at two ground-water wells. The RMS consists of wireless data collection, analysis, transmission, and data management, and is intended to remotely detect halogenated VOC levels in the contaminated ground water.

Environmental Benefits :
Reduced transportation: Routine Field Work: Two pickup trucks for site preparation, construction, treatment system monitoring, sampling, and repair over five-year duration 19,760 gallons fuel 383,344 pounds of CO2
Reduced IDW and Lab waste stream



Opportunities to reduce environmental footprint in sampling and investigations.

Passive samplers (sometimes referred to as diffusion samplers) consist of sealed polyethylene bags filled with deionized water. The bags are suspended directly in a well screen for a period of approximately 14 days. During this time, the bag is exposed to the natural groundwater flow through the screen zone. Representative amounts of trichloroethylene (TCE) and tetrachloroethylene (PCE) have been demonstrated to diffuse from the groundwater into the deionized water in the bags. The deionized water can then be sampled and analyzed using conventional methods. **No pumping of groundwater is required and sampling labor costs and purge water disposal costs are significantly reduced.**
1QFY00, 2QFY00**Study Area/Project:** A/M Area Southern Sector, C-BRP

Fiber optic chemical sensors provide real time capabilities for stream monitoring and down well groundwater and waste processing. Fiber optic chemical sensors have been developed to monitor carbon tetrachloride (CCl_4) and trichloroethylene (TCE). Fiber optic chemical sensor technology detects carbon tetrachloride at parts per million levels and trichloroethylene at parts per billion levels. This technology provides real time analysis versus one week lab analysis.

The Surveillance and Measurement System (SAM) 935 is a hand-held radiation detector used as a screening tool to determine the presence of contaminants. The SAM 935 uses a thallium-activated sodium iodide detector to provide isotopic identification.

- It provides instant results. Real time analytical results allow the project team members to make informed decisions in the field;
- It decreases the number of samples sent to the laboratory for analysis by identifying “suspect” areas of contamination;
- It lowers the potential dose to the sampler by decreasing exposure time;
- It decreases waste generation during sampling. *In situ* analyses require less field equipment, generate less investigative derived waste and reduce the need for tighter radiological controls than conventional invasive sampling;
- *In situ* analyses eliminated the need for extensive mobilization planning

3QFY04 **Study Area/Project:** TNX Outfall Delta

Rapid Hydrophobic Sampling (FLUTE)
provides detailed delineation of DNAPL

Reusable nylon liner, with a hydrophobic ribbon impregnated with dye, used in borehole

Presence of DNAPL is indicated by brilliant red marks on the ribbon

Can be used in small diameter CPT holes

In situ, eliminates need for drilling and collection of soil samples to determine DNAPL locations

Relatively inexpensive and quick

No special equipment

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If used to optimize location of drilling, FLUTE can reduce environmental impacts (GHG), Investigation Derived Waste (IDW). The hydrophobic flexible membrane was used at SRS in FY98 beneath M Area Solvent Storage Tanks to determine a vertical profile of NAPL in the subsurface. This technology is reusable, quick, in situ, inexpensive, and reduces the need for drilling and soil collection.

Bamboo have shallow roots, and are needed to crowd out pines, prevent erosion, and limit infiltration.
SRS is also exploring a groundwater treatment technique that employs agricultural oils to stimulate endogenous microbes which accelerates the cleanup.
The oils tested include a wide variety of oils including canola oil, rapeseed oil, coconut oil, corn oil, cottonseed oil, olive oil, and beeswax. The system utilizes a long-term, slow release, electron donor/carbon source for microorganisms.
This technology can be used to treat wastewater, seepage, surface water and/or groundwater contaminated with sulfate, nitrate/nitrite, perchlorate, redox sensitive metals, or chlorinated solvents.

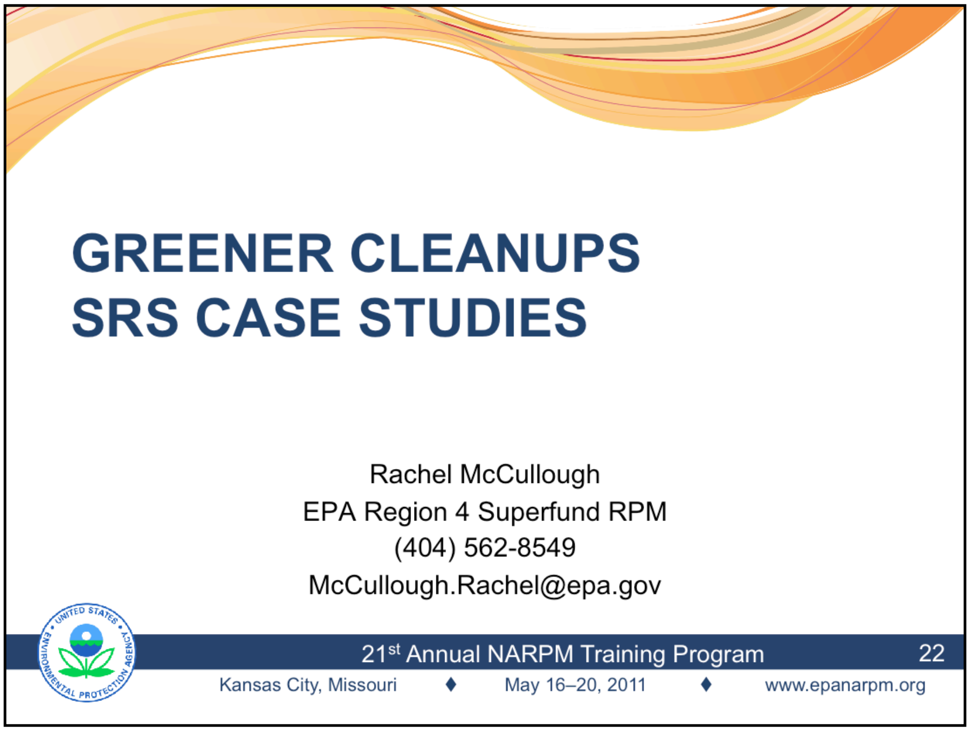
Edible Oil Deployment

• Recently deployed in T Area to remediate solvent contaminated groundwater
– Injection / extraction to enhance treatment zone
• Promotes enhanced attenuation
– Aquifer becomes anaerobic, initiating reductive dechlorination
• Positive test results
– Solvent (TCE) plume size decrease
– Biological / chemical parameters confirm reductive dechlorination is occurring (i.e., methane generation)
• Allows shutdown of existing pump-and-treat system

SRNL: vegetation cover to prevent erosion and extract water from the cap. Vegetation on a cap has to be quick-growing, shallow-rooted so as not to penetrate the layers, densely rooted, cold hardy, drought tolerant, and able to thrive in full sun. It also needs to be good at preventing invasion of other plants, especially pines. We thought bamboos would have good potential.

Green Remediation at Federal Sites

- Can be a win for everyone involved
- Requires effective communication, Agency coordination, and consideration of each other's needs and priorities
- Can be a great asset for engaging the community
- Can be cost effective, especially with long-term O&M costs and oversight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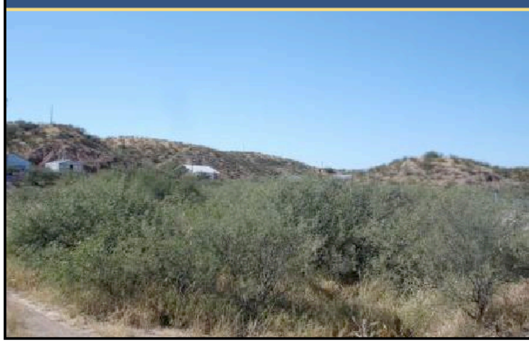
Questions?

EPA United States Environmental Protection Agency

Renewable Energy Pre-Feasibility Analysis at Apache Powder Superfund Site



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NARPM 2011 Greener Cleanups Webinar
April 23, 2012

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Apache Powder Presentation Overview

I - Site Overview – History and "Green" Remedies

II - Renewable Energy (RE) Evaluation Process

III - Moving Towards a Solar Future

IV – Lessons Learned

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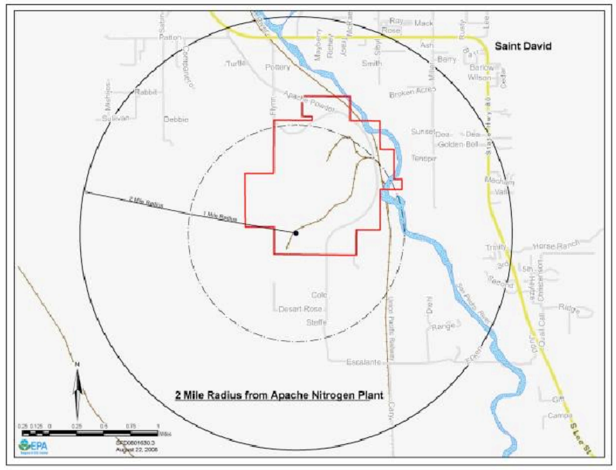
Site Location: Apache Nitrogen Products, Inc. (Benson, AZ)

Site occupies 9 square miles (~1,100 acres)



Background and Site History

- Apache Powder Company began explosives manufacturing operations in 1922.
- Manufactured dynamite for mines & nitrogen fertilizers for local agriculture.
- Closed powder line in 1980’s & detonating cord plant in 1990’s.
- Groundwater and soils contamination resulted from prior disposal practices.
- Listed on NPL in 1990.

Soils Remedy: Closed and Capped Infiltration Ponds

- Superfund "construction complete" in 2008 for soils and groundwater activities
- Apache Nitrogen Products, Inc. (ANPI), the former Apache Powder Company, continues to manufacture fertilizers and chemical products on the Site

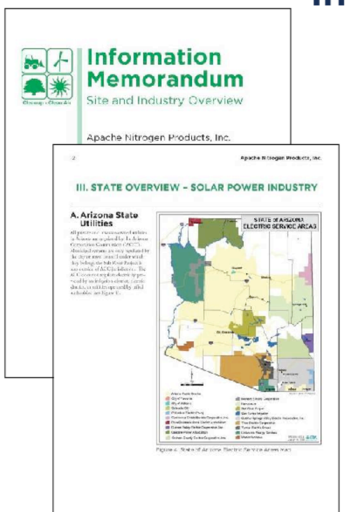
Groundwater Remedy: Wetlands & Monitored Natural Attenuation

- Constructed wetlands system treats nitrate-contaminated groundwater (24/7 - 365/days year)
- Avoids chemical usage, energy consumption and waste generation associated with traditional treatment methods
- Solar power used to circulate water between the wetlands ponds

Renewable Energy Analysis Process

1. Evaluate the renewable energy resource
2. Assess site suitability
3. Consider technology specific criteria
4. Review market and incentives

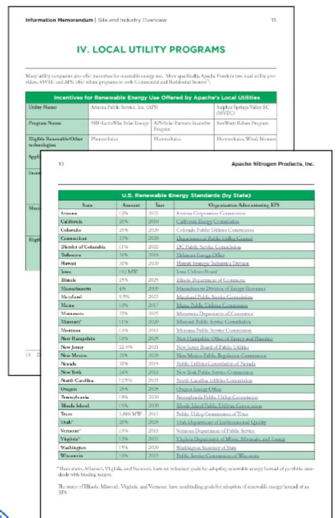
EPA Region 9 2008 Solar Energy Information Memorandum



The Memorandum provided:

- An overview of renewable energy industry in Arizona
- An overview of relevant State and federal standards
- A summary of site history and operations, status of the site clean-up, and facility physical assets

Evaluating State/Federal/ Utility RE Policies

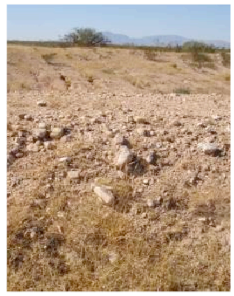


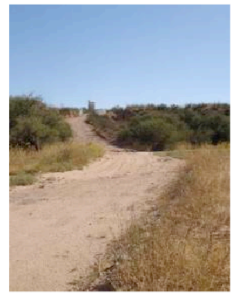
Memorandum also provided:

- An overview of U.S. renewable energy standards ("RES")
- Summary of federal and state tax incentives
- Local utility incentives
- While tribes may not be able to take the credits, subsidiary companies created by developers may be able to take credits

Purpose of Pre-Feasibility Solar Assessment

To evaluate the suitability of solar energy generation as a reasonable future use at the Apache Powder Superfund site and identify key considerations for further evaluation





Apache Energy Context

- On-site electricity use
  - 1-1.5 MW daily base use, 2 MW peak daily energy demand for operations
  - 2007 electrical consumption was ~14 million kWh
  - Sulphur Springs Valley Electric Cooperative (SSVEC) is local electricity provider (utility)

- Transmission Capacity
  - Existing substation rated at 69 kV
  - Transmission lines to Apache property are 10 MW, line capacity to substation is 40 MW
  - Future (2011-2012) 69 kV line will have 100 MW capacity

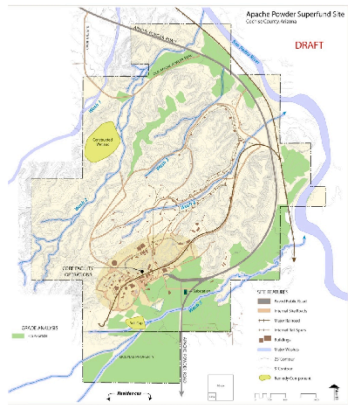
Apache Renewable Energy Evaluation

- Potential Solar Generation Scenarios for Site:
  - On-site Use:
    - Provide an on-site electricity source for all or a portion of facility's electricity use
    - Provide on-site steam to support manufacturing operations
  - Grid Use: Generate utility scale energy for the grid with potential revenue/financial benefits to Apache

Evaluating Site Suitability

Criteria included:

- > 15 acres
- < 5% slope
- Road Access
- Proximity to infrastructure
- Areas with washes, remedy components and facilities excluded



Assessment identified large, flat contiguous areas that are unrestricted by natural or constructed features.

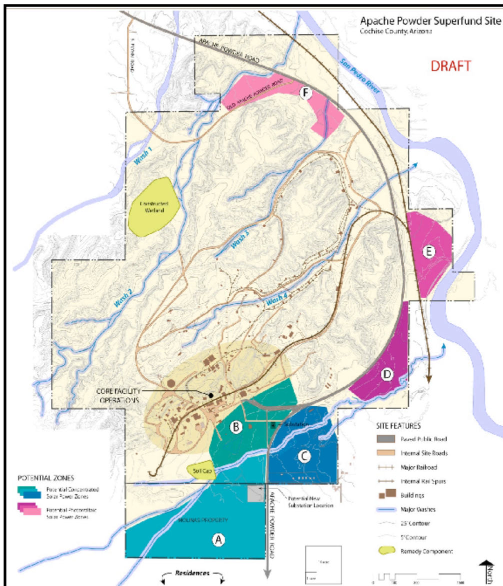
Solar Technology Assessment

Concentrating Solar Power (CSP) Versus Photovoltaic (PV)

Solar Technology Type	Acres per MW	Minimum Practical Acreage	Site Needs	Storage Capacity	Estimated* Annual Water Usage
CSP	3 – 8 acres / MW	40 – 50 acres	Large, contiguous, level area	Yes	Significant
PV	4 – 10 acres / MW	N/A	Flexible	No	Negligible

*Estimates can vary based on specific technology

Site Suitability



CSP Potential

Zone A = 70 acres

Zone B = 25 acres

Zone C = 35 acres

= **130 Total Acres**

PV Potential

Zones A+B+C = 130 acres

Zone D = 15 acres

Zone E = 20 acres

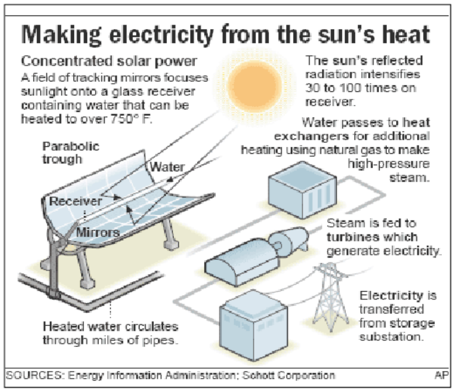
Zone F = 20 acres

= **185 Total Acres**

Net PV and CSP potential = 185 acres

Technology Overview

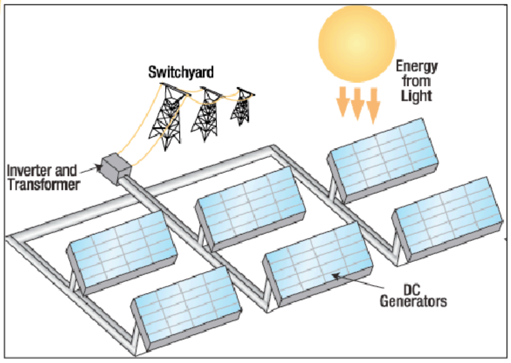
Concentrating Solar Power (CSP)



- CSP plants indirectly generate electricity
- Mirrors concentrate solar energy into high temperature heat or steam that powers a turbine
- Various solar thermal technologies at differing levels of commercial readiness

Technology Overview

Photovoltaic (PV)



- PV devices make use of highly purified silicon to convert sunlight directly into electricity
- PV can be expensive to operate on a kWh basis
- PV panel conversion efficiency typically between 10-20%

Utility Scale PV: Installed Cost Estimates

Solar Photovoltaic Technology Type	Acres per MW	Estimated Facility Size (MW)	Estimated Land Area Needed (acres)	Estimated Capital Cost ($ 1000)	Estimated Annual O&M Cost ($ 1000)
Thin Film (fixed axis)	6-8	5	30-40	$25,000 – 30,000	$400 – 600
Crystalline Silicon (fixed axis)	4-5	5	20-25	$30,000 – 36,000	$450 – 600
PV Tracking	8-10	5	40-50	$35,000 – 40,000	$900 – 1,100

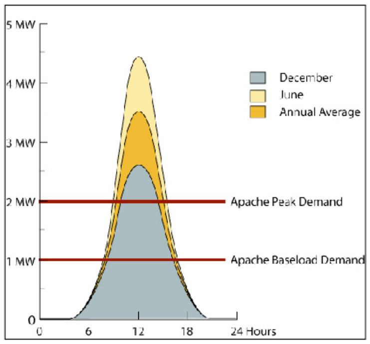
Tracking PV panels follow the sun to allow for increased solar capture.

Fixed axis PV panels aligned to be south facing.

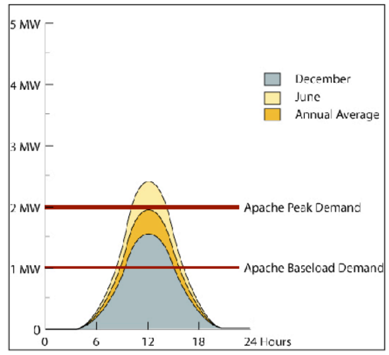
PV Output - Sizing to On-site Demand

Hypothetical Daily Generations

5 MW PV Array



3 MW Array



Summary of Site Opportunities

Potential Benefits of Solar	Potential Limitations for Solar
▪ Solar could help reduce peak electricity demand from grid ▪ CSP could generate on-site steam ▪ Solar could help hedge against conventional energy price volatility ▪ Opportunity to generate and sell RECs (additional income) ▪ Public relations benefits by use of renewable energy at an NPL site	▪ Not all on-site demand could be replaced due to intermittent electricity production ▪ Arid, southwest environment (water issues) and available acreage limits viability of a CSP facility at site ▪ Natural gas used in mfg. operations; solar would not impact natural gas use ▪ A solar project exceeding 5 MW would require substation and transmission line upgrades

Market Opportunities & Incentives

Solar Incentives / Market Drivers

- Federal Incentives
  - Business Energy Tax Credits (aka Investment Tax Credits (ITCs))
  - Clean Renewable Energy Bonds (CREBs)
- State Incentives
  - Renewable Portfolio Standards (RPS)
  - Commercial/Industrial Solar Energy Tax Credit Program
- Utility Incentives
  - Up front incentives (Rebates)
  - Performance-based incentives
  - Feed-in Tariffs (FITs)

State Solar Deployment Trends

- Assess growth of PV solar from year to year
- Evaluate total PV capacity installed in a state relative to neighboring states or previous years

State	2009 Installed Capacity (MW)	2008 Installed Capacity (MW)	2007 Installed Capacity (MW)
California	220	178.7	91.8
New Jersey	257	22.5	20.4
Colorado	23	21.7	11.5
Arizona	23	6.4	2.8
Hawaii	14	8.6	2.9
New York	12	7.0	3.8
Nevada	7	14.9	15.9

Plans Toward a Solar Future

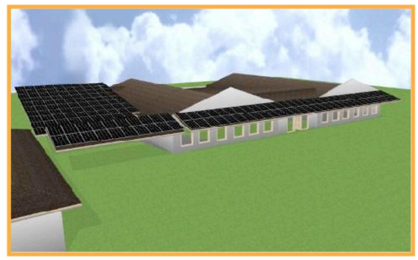
- Several small-scale solar applications in place:
  - Flow measurement at the wetland
  - Lighting, motion detector, security camera and gate control
  - Pump for contaminated perched water extraction

New Solar Shade Design

- Solar shade across the front and between ANP's Administration Buildings
- 41 kilowatt system. Annual electricity cost savings of $6,400/year.
- Offsets 45% of energy usage. Payback in 6 years.
- Almost 100% of capital costs covered by federal and state tax credits, and utility incentives.

Before

After



Solar Canopy Installed with Water Harvesting - November 2010

Long Term - High Concentration Photovoltaic (HCPV) Solar Technology

- Apache considered HCPV technology
- 2-axis tracking
- Uses 5 acres for 1 MW of rated capacity
- 72 feet wide and 49 feet high
- 3 foot pedestal with 18 foot installation depth

Lessons Learned - Apache

- Solar energy development is compatible with Site and Superfund remedy
- Site has potential for direct use and utility-scale solar (PV preferred)
- High upfront capital costs for both CSP and PV (5 MW - minimum $25M for PV and $35M for CSP)
- Ability to utilize incentives and obtain a long term PPA critical for the economic viability of a utility scale project

Lessons Learned - General

- Public-Private Partnerships can effectively support renewable energy projects
- Establishing and Maintaining Relationships (Agencies/Utilities) is critical
- Superfund remedial process can provide information to fulfill permitting and other regulatory requirements
- Utility-scale renewable energy projects are complex, but manageable

Questions and Answers

Presenter Contact Information

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United States Environmental Protection Agency

Green Remediation South Tacoma Channel Well 12A

Kira Lynch – Region 10 STL

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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_{2e}	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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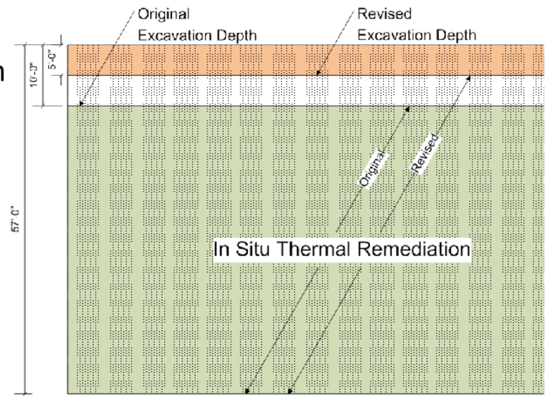
Green Remediation Design Modifications

- 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 by the metrics evaluated has a low environmental footprint relative to excavation

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. Subsequent RD Investigation supported further excavation volume reduction



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

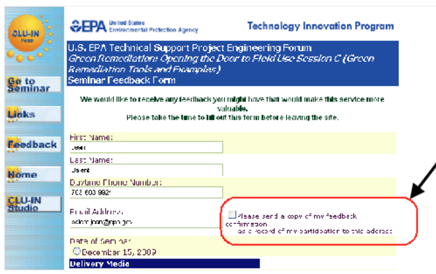
- No idling policy for all vehicles and equipment
- Require use of cleaner engines, cleaner fuel, and cleaner diesel emissions control technology on all diesel equipment > 50 hp
  - Engines to meet or exceed Tier I (off-road) or 2004 On-Highway Heavy Duty Engine Emissions Standards (on-road)
  - Low 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

- ITR design investigation being conducted to refine CSM and delineate treatment zone using a dynamic work approach and 3-D modeling so the remedy can be implemented in the most efficient manner
  - ITR treatment zone will be refined thus minimizing the footprint of that technology
- Green remediation excavation specifications were developed specifying means and methods was avoided

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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