



# PORTSMOUTH EM SITE SPECIFIC ADVISORY BOARD

•OSU Endeavor Center• 1862 Shyville Road • Piketon, Ohio 45661 • (740) 289-5249 •

## Proposed Agenda for the May 6, 2010 Board Meeting

### Co-Chairs

Val E. Francis  
Richard H. Snyder

### Board Members

Shirley A. Bandy  
L. Gene Brushart  
Dr. Edwin G. Charle, Ph.D.  
Lindy A. Coleman  
Bobby E. Graff  
Franklin H. Halstead  
Michael J. Lilly  
Sharon E. Manson  
Stephen E. Martin  
Daniel J. Minter  
R. Daniel Moore  
Larry A. Parker  
Michael E. Payton  
Cristy D. Renner  
Terri Ann Smith

### Deputy Designated

Federal Official  
Joel Bradburne

### DOE Federal Coordinator

Greg Simonton

**6:00**

Call to Order, Introductions  
Review of Agenda  
Approval of March Minutes

### DDFO Comments

Risk Assessment and Risk Based Cleanup Presentation

--15 minutes

### Federal Coordinator Comments

--10 minutes

### Liaison Comments

--10 minutes

### Administrative Issues

Subcommittee Updates  
Recommendation 10-02  
EM SSAB Chairs Meeting Update

--20 minutes

### Public Comments

--15 minutes

### Final Comments from the Board

--10 minutes

### Adjourn

### Support Services

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Piketon, OH 45661  
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## **PORTSMOUTH EM SITE SPECIFIC ADVISORY BOARD**

Minutes of the March 4, 2010, SSAB Meeting • 6:00 p.m.

**Location:** The Ohio State University Endeavor Center, Room 160, in Piketon, Ohio

**Site Specific Advisory Board (SSAB) Members Present:** Shirley Bandy, Gene Brushart, Ed Charle, Lindy Coleman, Val Francis, Frank Halstead, Michael Lilly, Sharon Manson, Steve Martin, Dan Minter, Daniel Moore, Larry Parker, Michael Payton, Cristy Renner, Terri Ann Smith, and Richard Snyder

**SSAB Members Absent:** Bobby Graff

**Board Liaisons and Related Regulatory Agency Employees:** Brian Blair, Craig Butler, and Maria Galanti, Ohio Environmental Protection Agency (Ohio EPA); Michael Rubadue, Ohio Dept of Health; David Snyder, Ohio Historic Preservation Office

**U.S. Department of Energy (DOE) and Contractors:** Joel Bradburne, Bill Murphie, Melda Rafferty, Greg Simonton, Kristi Wiehle, and Cid Voth, DOE; Julie Galloway, EHI; Julie Loerch, Paul Mohr and RD Schoz, Fluor; Sandy Childers and Bill Franz, LATA/Parallax (LPP); Janie Crosswait and Kevin Ironside, Restoration Services, Inc. (RSI)

**Facilitator:** Eric Roberts, EHI

**Public:** Vina Colley, PRESS/NNWI; Mark Johnson, Tri-State Building Trades; David Manuta, Manuta Chemical Consulting Inc; Geoffrey Sea, SONG

**Call to Order:**

*Francis* called the meeting to order and introductions of the Board.

*Roberts* explained that the new binders would be the one binder the Board uses throughout the 2010 year and that EHI staff will give the Board bi-monthly packets to put in them each meeting.

**Agenda:**

*Francis* called for any modifications or proposed changes to the Agenda.

*Roberts* stated that after meeting with the Executive Subcommittee the following items need to be added to the agenda:

Discussion of proposed Meeting Ground Rules

- Public comment before the vote on any recommendation
- Board review of the Top 3 issues, Major Board Accomplishment and Activity that will be presented at EM SSAB Chairs Meeting in Oak Ridge.
  - *Halstead* motioned to accept the Agenda as amended, *Motion seconded*.
    - *Motion carried, Agenda approved*

**Meeting Ground Rules:**

*Roberts* reviewed the Meeting Ground Rules.

- Start and End Our Meetings on Time
  - Adhere to the Agenda
- Everyone is Encouraged to Participate
- Strive to Accomplish Stated Objectives
- No One Person will Dominate Discussion
- No One will Interrupt Anyone Else
- There will be No Side Conversations
  - *Payton* motioned to accept the Meeting Ground Rules, *Motion seconded*.
    - *Motion carried, Meeting Ground Rules approved*

**November Minutes:**

*Roberts* called for any modifications or proposed changes to the November Minutes.

- *Halstead* motioned to approve the November Minutes as presented, *Motion seconded*.
  - *Motion carried, Minutes approved*

**DDFO Comments:**

*Bradburne* presentation:

The update included the following information:

- Agenda
- ARRA Projects Update
- X-533 Switchyard Demolition
- X-701B Groundwater TCE Source Removal
- X-633 Cooling Tower Complex D&D
- Disposition of Surplus Uranium Materials
- X-760 Chemical Engineering Building D&D
- Other EM Base Program Activities
- FY 2009 Waste Disposition
- Procurement Status
- Forthcoming SSAB Discussions
- Upcoming Events
- Funding for Portsmouth Cleanup
- FY 2010 Funding Breakout

A copy of the above-stated presentation can be viewed on the SSAB website at [www.ports-ssab.org/1003DDFOPres.pdf](http://www.ports-ssab.org/1003DDFOPres.pdf)

<b>Question/Comment:</b>	<b>Answer:</b>
<b>Francis</b> asked what is being done with the soil from the X-701B site once it is mixed.	<b>Bradburne</b> stated that the soil is treated and put back in place. There is a chemical reaction with the contaminant and the reaction continues over time.
<b>Charle</b> asked if DOE intends to neutralize the entire X-701B plume this way. What will the purpose be once the soil is neutralized and will it be useable?	<b>Bradburne</b> stated this was a new approach and DOE's plan is to finish the entire plume this same way. The ARRA money will cover a portion of this activity. Physically, the soil will not look any different. As far as future use, there will always be a restriction zone associated with this site. <b>Galanti</b> stated that right now the plan is to remediate about half the source area. When that is completed, a portion of the plume will be capped. The cap will be completed in the next 2-3 years. This approach was very successful compared to any other remedial technology that has been put in place at the plume site. In terms of future use for the land area itself, the ground water will most likely be contaminated for some time.
<b>Bandy</b> asked what it means to "cap" a site.	<b>Galanti</b> stated that the site would be covered with manmade material as well as clay and then covered with vegetation to protect any future worker or resident in the area from encountering contaminants.
<b>Charle</b> stated there has always been a lot of concern voiced about the plume. Does the action taken now with the plume remove that concern?	<b>Galanti</b> stated that it should reduce it significantly. Ohio EPA's goal is to reduce the levels of contamination.
<b>Francis</b> asked if the success for the plume is the fact that TCE is not in groundwater but only in the earth (the weathered shale).	<b>Galanti</b> stated that TCE is a DNAPL (dense nonaqueous phase liquids) that sinks and gets in the weathered shale. No matter what technology is utilized, the TCE would not release from that shale. With this technology, we have been able to expose the shale and apply oxidant to treat the TCE.
<b>Snyder</b> asked if the cleanup standard is 5 parts per billion.	<b>Galanti</b> stated yes and that Ohio EPA's objective for groundwater on site is to remediate to the residential, potable groundwater standard.
<b>Brushart</b> asked what the difference is between industrial and nuclear cleanup standards.	<b>Roberts</b> stated there would be a presentation in the near future that will explain the differences between the cleanup standards.

**CERCLA:**

**Ironside** presentation:

- Introduction/Purpose
- Portsmouth Regulatory Structure
- What Decision Must be Made at the Portsmouth Site?
- PORTS CERCLA Approach
- What is CERCLA?
- Who is Responsible for CERCLA?
- Where is the CERCLA Process Being Implemented at Portsmouth?
- Why is the CERCLA Process Being Implemented at Portsmouth?
- What is DOE doing to Expedite the Cleanup of the Portsmouth Site?
- Where is Portsmouth Currently in the CERCLA Process?
- CERCLA Process
- What the Law Requires in Making Cleanup Decisions
- How Does the Community Participate?
- What is DOE Doing to Expedite the Cleanup of the Portsmouth Site?

- Where has DOE done this before?
- CERCLA Public Participation
- References

A copy of the above-stated presentation can be viewed on the SSAB website at [www.ports-ssab.org/1003CERCLAPres.pdf](http://www.ports-ssab.org/1003CERCLAPres.pdf)

<b>Question/Comment:</b> <i>Charle</i> stated that if we are at the beginning of the CERCLA process then the things you are talking about have been in process for years.	<b>Answer:</b> <i>Ironside</i> stated that the CERCLA process is in the early stages. The steps the Board has been taking have been leading to this point in the process. The decision to move forward and award the contract is recent.
<i>Smith</i> asked how DOE could clean up or say it is cleaning up the site and plumes when part of the plant still has an ongoing nuclear project that is contaminating the environment and affecting our health.	<i>Ironside</i> stated that the CERCLA process is only being used to make decisions with the gaseous diffusion plant and DOE has rules in place that address protection of human health and the environment.

#### **Federal Coordinator Comments:**

*Simonton* gave an update on the upcoming meetings:

- Future Land Use Subcommittee will meet on Tuesday, March 9 at 4:30 p.m.
- Decontamination & Decommissioning (D&D) Subcommittee will meet Tuesday, March 23 at 4:30 p.m. This meeting will be open to the public and be considered a workshop with a presentation from Bill Murphie, Manager of the Portsmouth/ Paducah Project Office.

#### **Liaison Comments:**

##### **Ohio Environmental Protection Agency (Ohio EPA):**

*Galanti* stated that DOE has comments from Ohio EPA on the X-533 Action Memo, the X-533 Removal Action Work Plan and the X-533 Soil Sampling Plan. She also encouraged everyone to read the X-760 EE/CA and provide comments. Ohio EPA's comments on the X-760 EE/CA will go to DOE before March 16, 2010. Ohio EPA really values the Boards input. It is time to start working together to make decisions on what is a final disposition for these facilities.

##### **Ohio Department of Health:**

*Rubadue* stated that the Department of Health would be working with Ohio EPA and DOE on the review of the EE/CA documents.

#### **Administrative Issues:**

##### **Decontamination & Decommissioning (D&D) Subcommittee:**

*Parker* stated the D&D Subcommittee met in January but not in February, due to the weather. Some administrative matters that were discussed in the January meeting included accepting the Meeting Ground Rules and Mission Statement. The subcommittee is concerned about the volume of waste that has and is going to be generated. The subcommittee thanked DOE for providing the pie chart that showed progress in 2009. We appreciate that we get immediate responses to our questions. The subcommittee is looking forward to the Recycling Workshop on March 23, 2010. *Next Meeting Tuesday, March 23, 2010, at 4:30 p.m.*

##### **Future Land Use Subcommittee:**

*Manson* stated that the Future Land Use Subcommittee met in January and voted to accept the Meeting Ground Rules. The subcommittee also discussed the language on the Energy Parks Initiative Recommendation. Mr. Parker will provide the members a copy of his Energy Park Initiative's Report from the trip to Oak Ridge. The subcommittee discussed the historical legacy and cleanup that they want for the Portsmouth Site. *Next Meeting Tuesday, March 9, 2010, at 4:30 p.m.*

**Recommendation 10-01 End Use Study for the Portsmouth Gaseous Diffusion Plant:**

**Manson** stated that the Future Land Use Subcommittee does recommend that the study be approved by the SSAB Board because this will prove to the community how serious the Board is on community input.

- **Parker** moved to accept Recommendation 10-01 End Use Study, **Motion seconded.**

**Roberts** asked for discussion from the Board on the recommendation.

<b>Question/Comment:</b>	<b>Answer:</b>
<b>Smith</b> asked what departments from the Ohio University would be used for this study.	<b>Roberts</b> stated that the recommendation calls for an Ohio based institution of higher learning. <b>Bradburne</b> stated that the Voinovich Group is being looked at to do the study.

**Roberts** asked if there was any further discussion from the Board. The floor will now be open for a public comment session each community member will have one minute to address any concerns about Recommendation 10-01.

**Public Comments on Recommendation 10-01:**

**Geoffrey Sea, SONG**, asked the Board not to pass this recommendation, stating that it is not the right time. Sea claimed the community is confused, why waste money doing a study now? Tell the community that the process is just starting and have them come to the meetings to get educated. The community needs real proposals based on facts and not mythology that has been spread in our local newspapers.

**Vina Colley, P.R.E.S.S.**, stated that the community is not being involved in this process. If you really want to listen to the community, you would withdraw from this Board because the members do not represent the victims.

**Roberts** stated to pass a recommendation the Operating Procedures calls for a 2/3 vote or 14 “yes” votes:

- **Motion carried (needed 2/3 vote – 15 yes, 1 no, 0 abstained and 1 not present), Recommendation 10-01 approved**

**EM SSAB Oak Ridge Chairs Meeting:**

**Roberts** stated that there would be a group of members traveling to the EM SSAB Chairs Meeting in Oak Ridge, Tennessee. The Board will have an opportunity to share with Assistant Secretary Inez Triay its concerns and issues that they would like to see the Department of Energy address. The Executive Subcommittee has narrowed it down to the following general topics:

**Top 3 Issues:**

- SSAB involvement with the community, developing a broader future plan for the site, which grows economic development opportunities and advances overall reindustrialization for the Piketon Site.
- Evaluating the 3700-acre site to determine what portion can be released for industrial use immediately and how much more can be donated for industrialization use for the next 20 years.
- Recycling D&D materials and a pathway for industrialization.

**Major Board Accomplishment:**

- Increase in funding from 2009 – 2010 for the DOE site.

**Major Board Activity:**

- Large number of members from the Board that have toured other sites.

**Roberts** asked if there was any further discussion from the Board. The Executive Subcommittee with help from the staff will rework and put the information in the correct format that is required for the EM SSAB Chairs Meeting. A copy will also be sent to the Board before it is sent to DOE head quarters.

<b>Question/Comment:</b>	<b>Answer:</b>
<b>Minter</b> stated he would like to ask that when relaying the Major Board Accomplishment to state that it took a lot of combined effort from local and regional leadership such as Senator Brown and his staff.	
<b>Manson</b> stated to specify that the Board worked together as partners with our Congressional Representatives to get the funding.	
<b>Smith</b> asked if the Board is getting funding for tours.	<b>Roberts</b> clarified that the Board is listing a major accomplishment for the EM SSAB Chairs Meeting and that the accomplishment is DOE is getting a larger amount of money over the next year.

**Public Comment:**

**Vina Colley, P.R.E.S.S.**, stated she would like to ask Senator Brown’s office to find out why the Board does not know the site doubled the scoring for the superfund site. She stated her concerns as to why Ohio EPA does not mention all the other stuff that is in the TCE, the fractions in the bedrock, or how much is going in to the drinking water in the Teays River Valley. She also stated her concerns of why the Board is not being informed about the site and would like to know when the public can get answers to some of their questions.

**David Manuta, Manuta Chemical Consultants Inc.**, stated he has been on travel during the last several times the Board has met. The TCE discussion was very interesting I would like to get together with the Ohio EPA or anyone else that would like to discuss this.

**Geoffrey Sea, SONG**, stated he was very heartened by Kevin Ironside’s presentation. This is the first time someone has laid out very clearly for this community a legal process for determining the future use and activities at the site. DOE has also done a good job about going back to the drawing board and realizing the agency was out of compliance. Now the agency is trying to come into compliance, which is a great process. In order for that to happen, you have to take seriously that we are at the very beginning of the process. The decisions about future site work will be made down the road. For this to work in a way that will produce jobs for the community, we have to do it legally according to the process. That means going back to the beginning and involving the community from the very beginning. The Board needs to reflect on what type of role they want to play in the decision-making on future use of the site.

**Mark Johnson, Tri-State Building Trades**, stated that he is a representative for the Tri-state Union Construction Council. He would like to ask the Board to think about how to maximize the number of jobs that can be created. The Tri-State Building and Construction Trades Council request that Recommendation 09-01 be modified. His group would like to continue doing the construction work at the plant site, he submitted a copy of their recommendation, and encouraged the Board to approve it.

**Final Comments from the Board:**

**Roberts** asked for any further comments from the Board.

**Brushart** stated that much has been said tonight about the importance of public participation. The question is how to get the public involved? What the Board is looking for is to get as much of the community involved as possible and hopes the Voinovich Group with their strategy can help get the community involved.

**Minter** stated he wants to stress the idea for the Board to have a plan and consider what the future processes will be but not excluding or including any options. Having a plan does seem to help from time to time.

**Bandy** stated that she agrees and that the Board knows this is a start of a long process. She would like to see us have a display with the nine criteria of the CERCLA process. This would be good tool that can keep the Board on track to go through criteria and operate under the law and this will hopefully build some public trust.

**Halstead** stated that he would like to thank Maria Galanti for her diligence for reviewing the information and was very impressed that she looks at the finer details.

**Halstead** motioned to adjourn the meeting, **Motion seconded.**

- **Motion carried, Meeting adjourned**

**Next Meeting Thursday, May 6, 2010, at 6:00 p.m.**



U.S. DEPARTMENT OF  
**ENERGY**

**Deputy Designated Federal Official  
(DDFO) Presentation  
Portsmouth EM  
Site-Specific Advisory Board  
May 6, 2010**



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# Agenda



- American Recovery and Reinvestment Act (ARRA) Projects Update
  - ❖ X-533 Switchyard Demolition
  - ❖ X-701B Groundwater TCE Source Removal
  - ❖ X-633 Cooling Tower Complex D&D
  - ❖ Uranium Management Center
  - ❖ X-760 Chemical Engineering Building D&D
- Director's Final Findings and Orders for D&D Project (DFF&O)
- Forthcoming SSAB Discussions and Upcoming Events



# X-533 Switchyard Demolition



**Pictured is the monthly progress at the X-533 project as viewed from south side of the X-611 Water Treatment Plant**



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# X-533 Switchyard Demolition



- Demolished maintenance building (X-533C) structure and slab
- Asbestos abatement substantially completed
- Demolished 79 of 160 Towers; Removed 245 of 850 Tower Foundations



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# X-701B Groundwater TCE Source Removal



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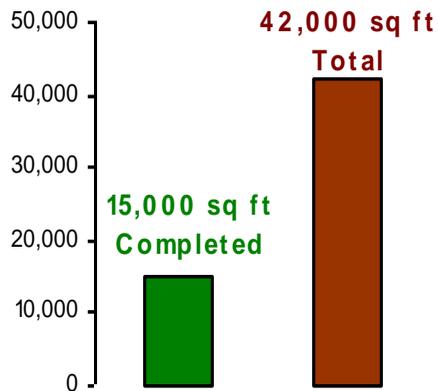
safety ❖ performance ❖ cleanup ❖ closure

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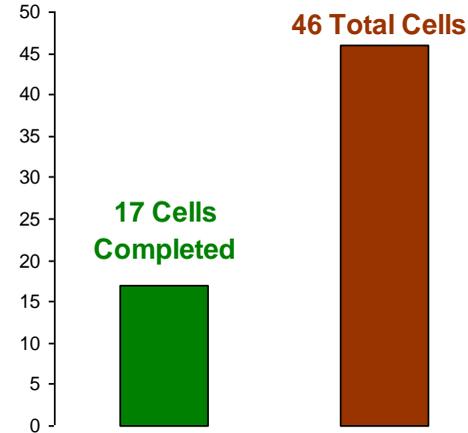
# X-701B Groundwater TCE Source Removal



## X-701B Groundwater TCE Source Removal Soil Treated



## X-701B Groundwater TCE Source Removal Cells Treated



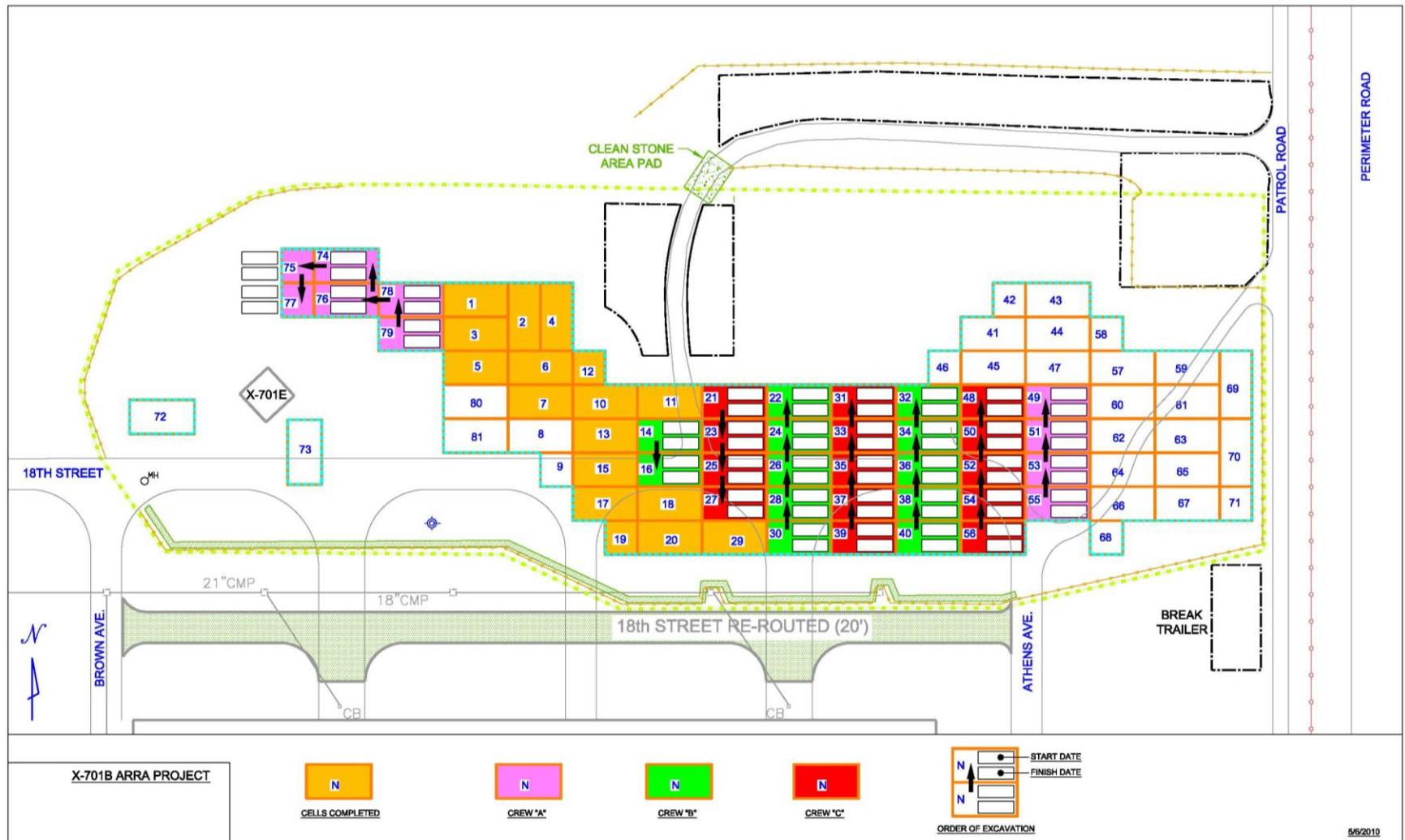
- Project mixes sodium persulfate oxidant directly into 42,000 sq ft source area of TCE contaminated soils; oxidant chemically breaks down contamination; application to depth of 30 ft



# X-701B Groundwater TCE Source Removal



## X-701B Cells



# X-633 Cooling Tower Complex



Photo taken March 23, 2009

**Pictured is the monthly progress at the X-633 project as viewed from south side of the X-611 Water Treatment Plant**

- Tower C and D have been demolished
- Waste being disposed at the Pike County Landfill



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# X-633 Cooling Tower Complex



Demolition of Tower C

April 22, 2010



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# X-633 Cooling Tower Complex



- Demolition of Tower D - April 19, 2010



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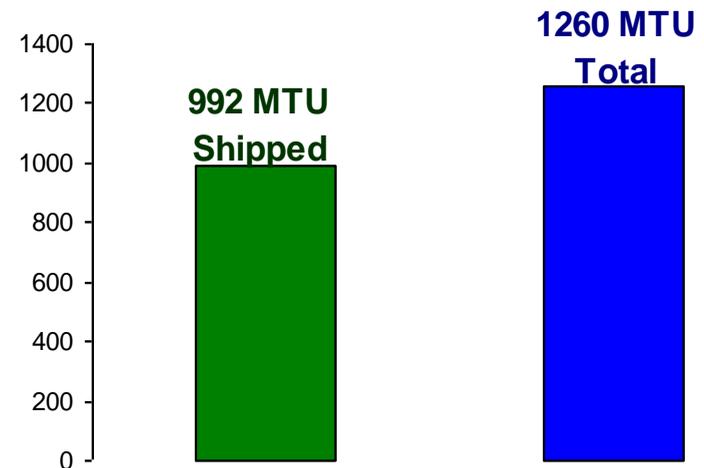
# Uranium Management Center



Uranium Management Center  
Lots for Disposition



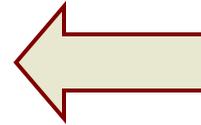
Uranium Materials Center  
Metric Tons of Uranium for Disposition



- Repackaging/disposition of surplus uranium material
  - ❖ ~1260 metric tons total
- 6 of 15 Lots dispositioned
  - ❖ ~ 992 metric tons shipped to Nevada Test Site



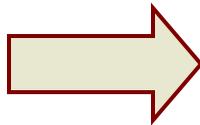
# Uranium Management Center



September 2009  
Before T-Hoppers  
Shipped



April 26, 2010  
After T-Hoppers  
Shipped



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# X-760 Chemical Engineering Building D&D



- X-760 Action Memorandum and Responsiveness Summary was conditionally concurred by Ohio EPA on May 4, 2010
- Asbestos abatement completed
- Phase 1 utility isolation completed on March 1, 2010



# X-760 Chemical Engineering Building D&D



- Loose equipment 90% completed



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# Director's Final Findings & Orders



- *Director's Final Findings and Orders for Removal Action and Remedial Investigation and Feasibility Study and Remedial Design and Remedial Action for the Portsmouth Gaseous Diffusion Plant (Decontamination and Decommissioning Project (hereinafter DFF&Os)*
- Issued April 13, 2010
- Enforceable agreement between Ohio EPA and DOE governing D&D of the Portsmouth GDP
- DOE entered into DFF&Os under DOE authorities, including CERCLA and Atomic Energy Act; DFF&Os recognize DOE as CERCLA Lead Agency authority
- DFF&Os found on web at:
  - ❖ <http://www.epa.ohio.gov/portals/30/remedial/docs/dffo/DOEPort.pdf>



# Director's Final Findings & Orders



- Requirements:
  - ❖ Engineering Evaluation/Cost Analysis (EE/CA) and removal actions for certain structures and buildings
  - ❖ Remedial Investigation /Feasibility Study (RI/FS) and Remedial Design/Remedial Action (RD/RA) for certain process buildings and complex structures
  - ❖ Site-wide waste disposition evaluation
- Evaluation of D&D waste disposition, including consideration of on-site cell, under CERCLA
- Removal of facilities under CERCLA
- Flexibility to “bundle” facilities; minimize documents and maximize use of resources for actual cleanup
- Milestones focus on major project activities at identified key points of project execution
- Robust public participation in the CERCLA decisions



# Forthcoming SSAB Discussions and Upcoming Events



- Next SSAB Subcommittee Meetings (FLU and D&D) are next Tuesday evening, May 11, 2010
  - ❖ Future Land Use
    - Land Use Options
  - ❖ D&D Committee
    - Waste Disposition Options
- Next SSAB Board Meeting – July 1, 2010
- Next public update meeting being scheduled for June 2010





U.S. DEPARTMENT OF  
**ENERGY**

**DOE Federal Coordinator Presentation  
Portsmouth EM  
Site-Specific Advisory Board  
May 6, 2010**

**Greg Simonton**



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# Near-Term Shipping Campaigns at PORTS



- A transportation and logistics team composed of DOE, LPP, USEC, UDS, WEMS and ACP has been formed to address the coordination and management of waste, equipment and recyclable material during the next several months during the American Recovery and Reinvestment Act (ARRA) projects.
- The public and facility employees are being notified of the increase in traffic and updates as required.
- Major waste shipments from the ARRA projects will begin in April 2010 and continue through August 2010.



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# Near-Term Shipping Campaigns at PORTS



- The majority of trucks will enter and exit from the North Entrance.
- The North Entrance will be open extended hours during the shipping campaign beginning in mid-April 2010 and open 24 hours a day once the West Main Gate is closed for renovations in May.
- The SW Contractors Road will be modified to include installation of a new gate further inside the entrance and removal of existing concrete barriers and poles to facilitate use for future truck shipments and support future D&D work.



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# Risk Assessment and Risk-Based Cleanup

Portsmouth Site-Specific Advisory Board  
March 4, 2010

Presented by:

Rich Bonczek, Portsmouth/Paducah Project Office

# What is Risk Assessment?

## ***A process used to:***

- Organize information
- Analyze information

***Provides estimates of harm from exposure to a agent.***

***We do risk assessments every day when selecting how to act or react!***

# An Every Day Risk Assessment!

## Let's Buy a Lottery Ticket

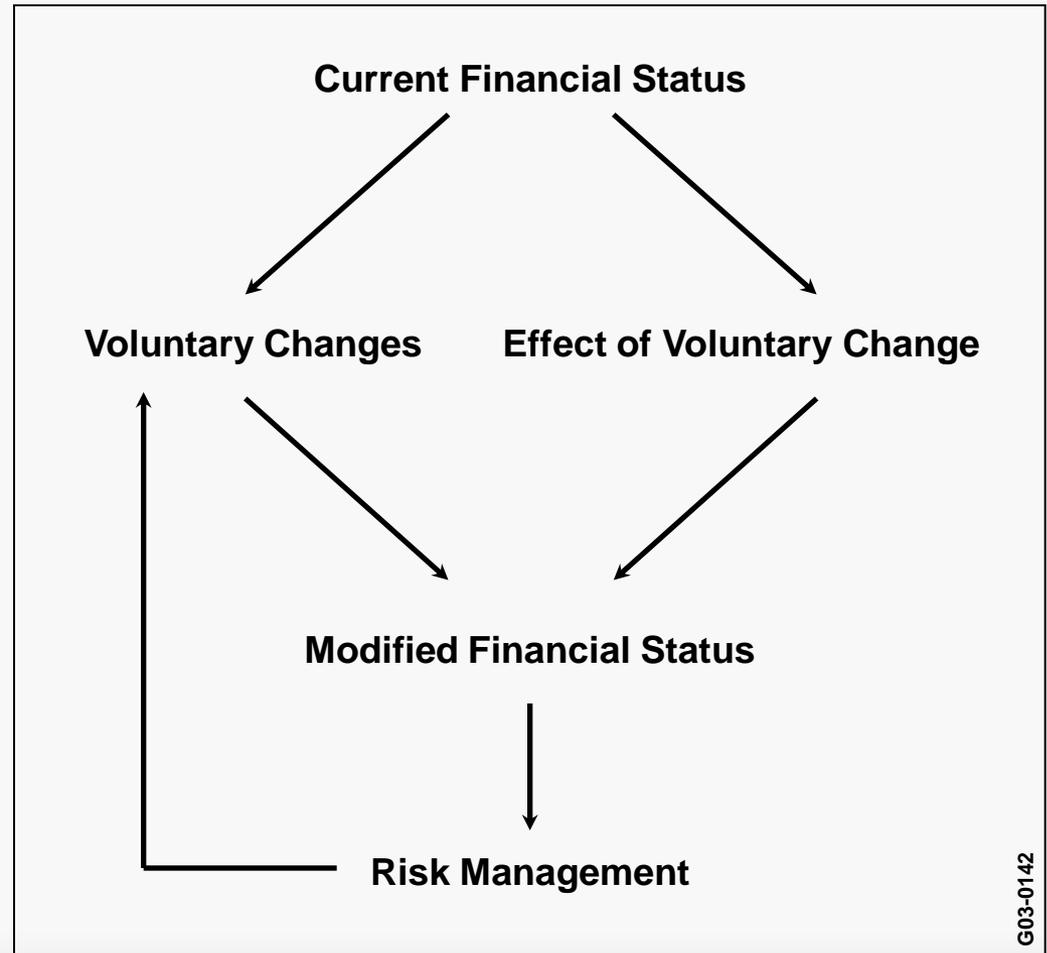
**Expectation is to win!**

**How much to spend?**

**What is the chance of winning?**

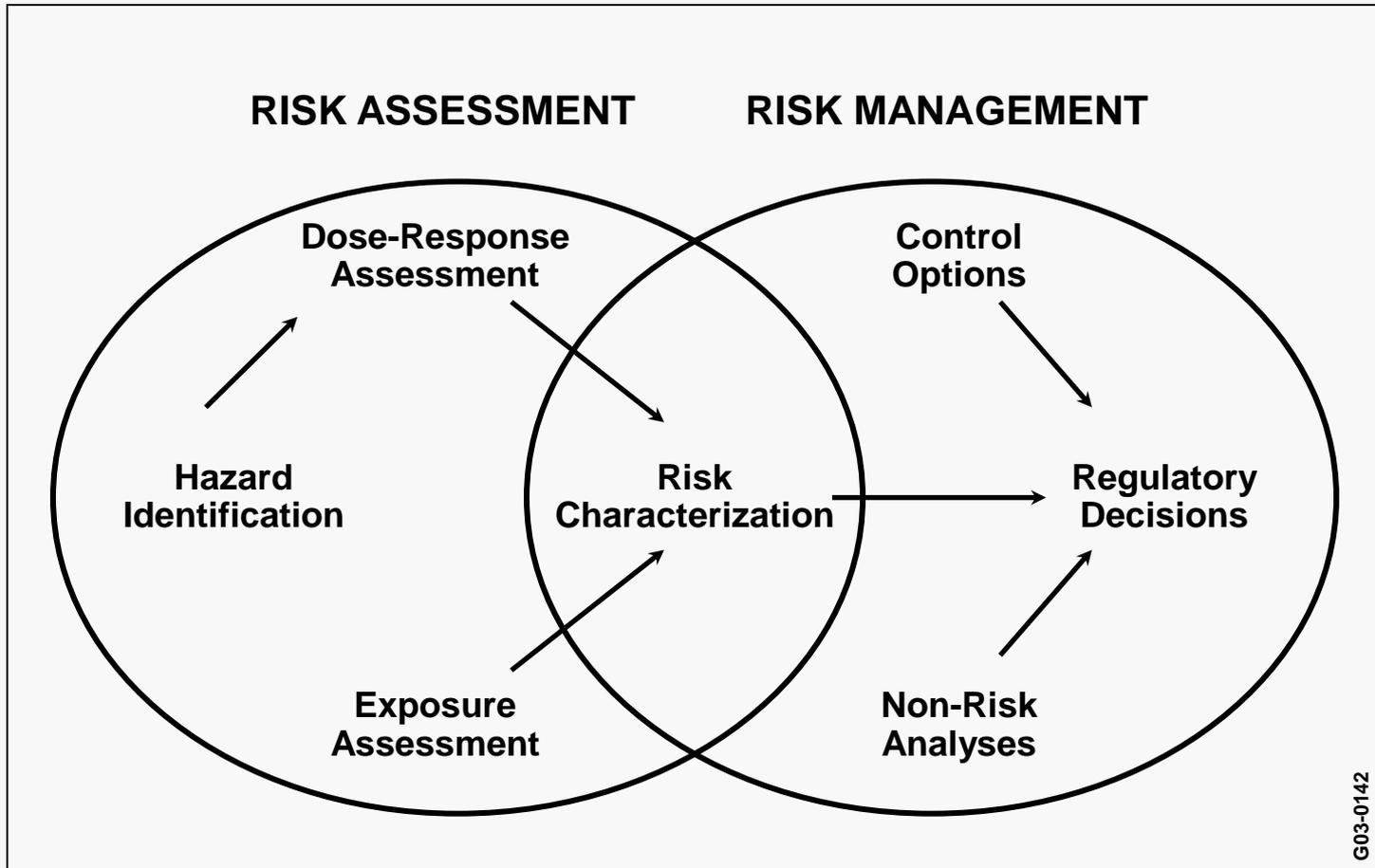
**Can you increase your chances of winning?**

**Once result is obtained, resulting risk is managed!  
(Buy another ticket?)**



# Can You Paradigm?

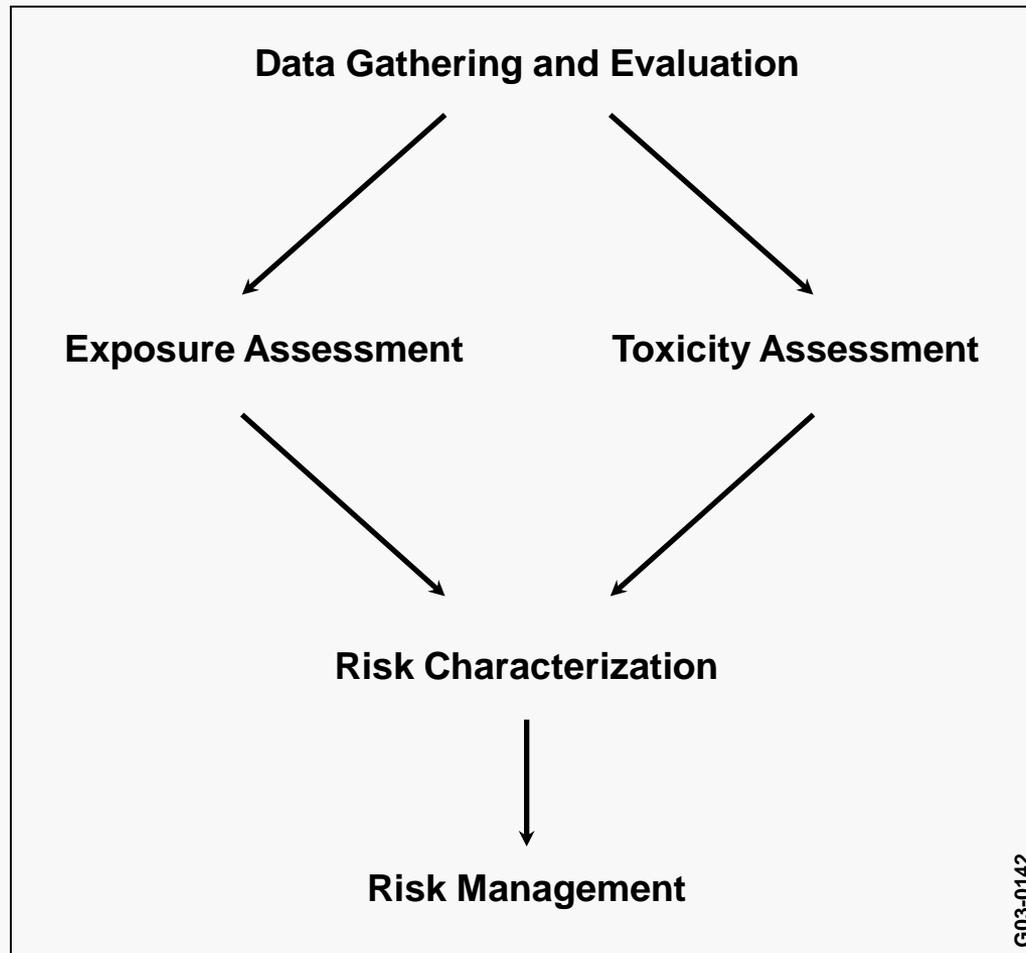
How is this similar to the everyday example?



**National Academy of Sciences Risk Paradigm**

# EPA's Risk Assessment Paradigm

**Let's Flip It and Simplify!**

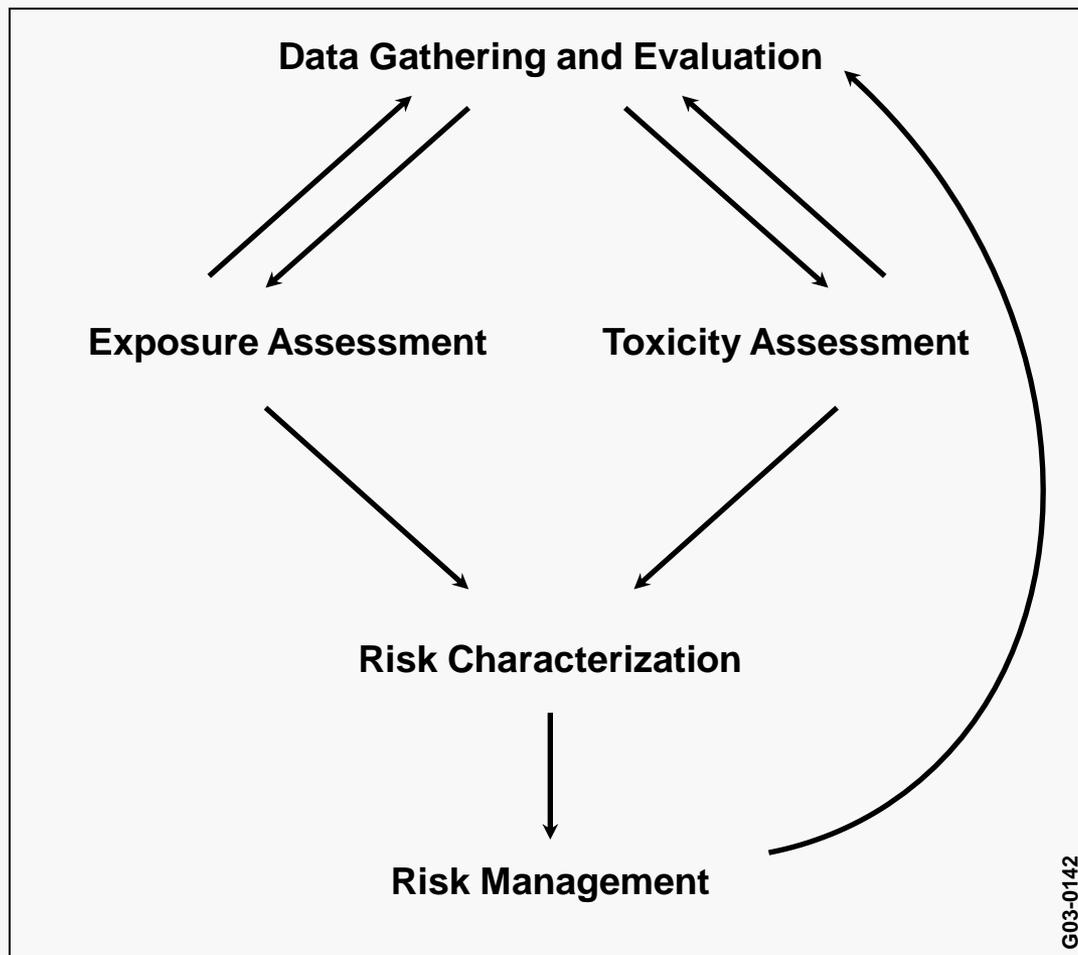


**EPA Environmental Risk Paradigm (from "RAGS")**



# EPA's Risk Assessment Paradigm

**Add Some Feedback Loops!**



**EPA Environmental Risk Paradigm (from "RAGS")**



# The Parts Defined!

## ***Data Gathering and Evaluation:***

Demonstrate the presence of a harmful agent

==> How much is there?

## ***Exposure Assessment:***

Calculate projected rate of contact by receptor

==> What is the dose or intake?

## ***Toxicity Assessment:***

Demonstrate relationship between level of exposure and injury

==> What harm does the agent cause?

## ***Risk Characterization:***

Calculate measure of expected effect by integration toxicity and exposure assessments

==> What is the risk?

# The Parts Defined!

## *Risk Management*

- ***Control Options:***

Actions that may be taken to reduce effects

==> Methods to reduce risk?

- ***Non-risk Inputs:***

Consideration of social and economic consequences

- ***Regulatory Decision:***

Response action decision

==> What is done!

***Risk Management is where the "rubber meets the road!"***

# Some Additional Detail on Parts

## ***Data Gathering and Evaluation – Analyze Contamination***

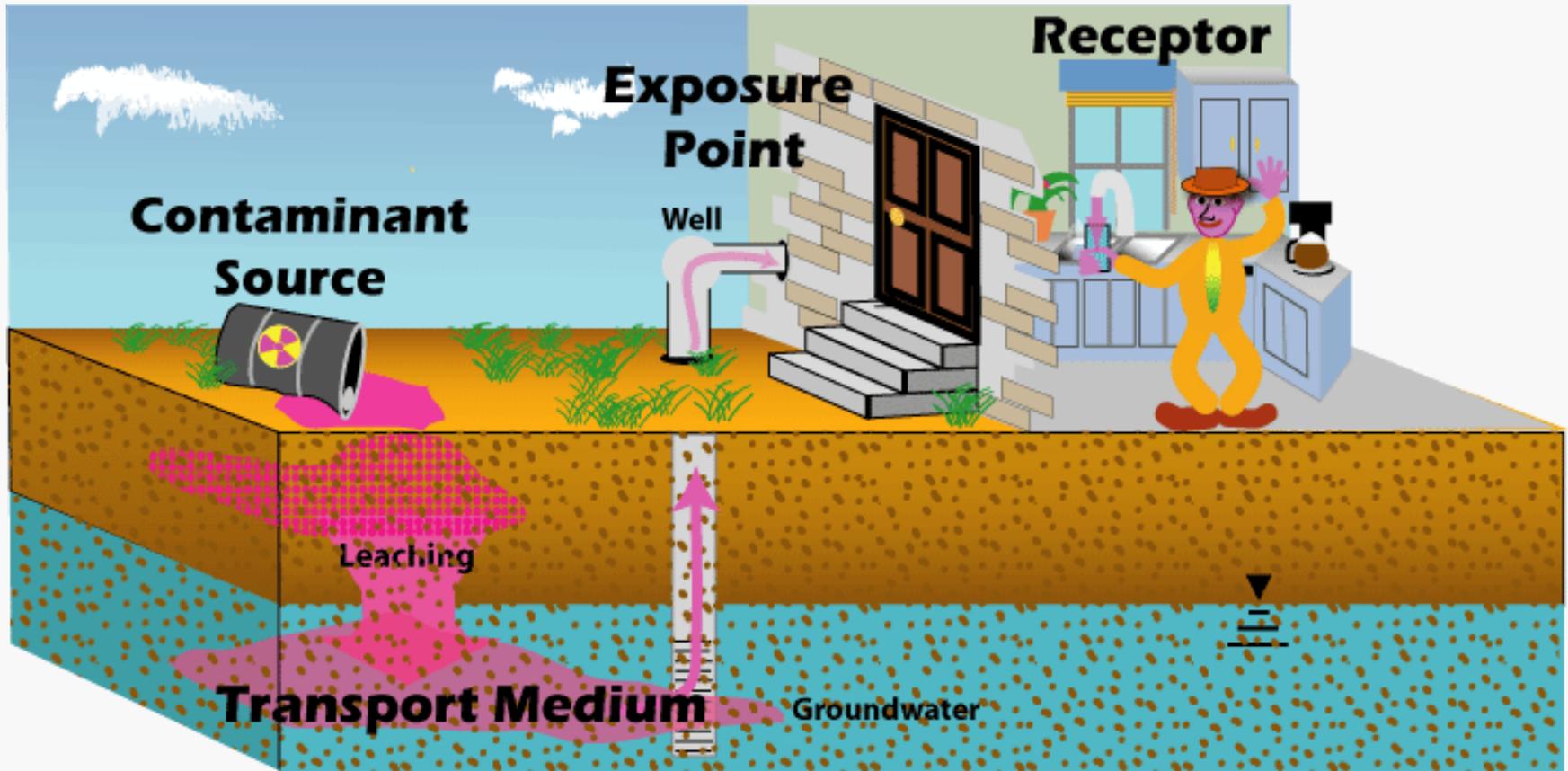
- Is sampling of sufficient quality and representative of site conditions?
- Is contamination present in samples? (Compare to background)
- Is contamination present at concentrations that could cause harm? (Above *de minimis* levels)
- End up with “Contaminants of Potential Concern” or “COPCs”

## ***Exposure Assessment – Estimate Dose***

- Develop conceptual site model
  - How could exposure occur?
  - Who may be exposed?
- Calculate dose or intake by integrating contaminant concentrations and rate of exposure

$$\text{Intake} = \text{Concentration} \times \left[ \frac{\text{Contact Rate} \times \text{Exposure Frequency}}{\text{Body Weight}} \times \frac{1}{\text{Averaging Time}} \right]$$

# An Example Conceptual Site Model



# Some Additional Detail on Parts

## *Toxicity Assessment – Assess Potential Health Effects*

- **Cancer effects:**
  - Potential for cancer to occur in response to exposure to a contaminant.
  - Toxicity value is called a slope factor.
- **Non-cancer effects:**
  - Potential for injury to occur in response to exposure to a contaminant.
  - Toxicity value is called a reference dose (RfD).

# Some Additional Detail on Parts

## ***Risk Characterization - Calculating cancer risk***

- Integrate contaminant intake with slope factor.
- Results are in terms of probability

$$\text{Cancer Risk} = \text{Slope Factor} \times \text{Intake}$$

## ***Risk Characterization - Calculating hazard***

- Integrate contaminant intake with reference dose.
- Results reported as fractions or multiples of reference dose.

$$\text{Hazard} = \frac{\text{Intake}}{\text{Reference Dose}}$$

# Interpretation of Risk Results

## ***Benchmarks for Cancer Risk***

- $<1 \times 10^{-6}$  (probability is less than 1 in 1 million)  
Cancer risk is at *de minimis* levels; cleanup likely not needed.
- $>1 \times 10^{-4}$  (probability is greater than 1 in 10 thousand)  
Cancer risk is at an elevated level; cleanup likely needed.
- $>1 \times 10^{-6}$  but  $< 1 \times 10^{-4}$  (probability is greater than 1 in 1 million but less than 1 in 10,000)  
Cancer risk is in “gray area;” evaluate options for cleanup.

$10^{-6}$  to  $10^{-4}$  is called, “EPA’s acceptable risk range for site-related exposures to carcinogens.”

# Comparison of Cancer Risks

Cancer-causing Agent or Situation	Approximate Lifetime Risk of Cancer	Scientific Notation
Exposure to Sun (skin cancer)	1 in 3	3E-01
Cigarette smoking (pack a day or more)	8 in 100	8E-02
Natural radon in indoor air in home	1 in 100	1E-02
Outside radiation (radon and cosmic rays)	1 in 1,000	1E-03
Second-hand cigarette smoke	7 in 1,000	7E-03
Human-made chemicals in indoor air in home	2 in 10,000	2E-04
Outdoor air in industrialized area	1 in 10,000	1E-04
Human-made chemicals in drinking water*	1 in 100,000	1E-05
Human made chemicals in food	1 in 100,000 or less	$\leq 1E-05$
a) 2 oz. peanut butter per week from aflatoxin	8 in 100,000	8E-05
b) One meal per year of small lake trout from Lake Michigan	1 in 100,000	1E-05
Chemical exposure at most uncontrolled hazardous-waste sites	1 in 10,000 to 1 in 1,000,000	1E-04 to 1E-06

From U.S. EPA Region 5 report *Environmental Risk: Your Guide to Analyzing and Reducing Risk* (EPA 905/9-91/017, October 1991). Available at <http://www.epa.gov/reg5oopa/reisk/htm>.

# Interpretation of Risk Results

## ***Benchmarks for Hazard***

- $< 1$  (hazard is below threshold level)  
Hazard is at *de minimis* levels; cleanup likely not needed.
- $> 1$  (hazard is above threshold level)  
Hazard is at an elevated level; evaluate options for cleanup.

# Identifying the Problems

## ***Contaminants of Concern (COCs)***

- COPCs that have an unacceptable level of risk or hazard within a scenario that has an unacceptable level of risk or hazard are COCs.
- Cleanup goals are developed for COCs during risk management.

## ***Cleanup Goals***

- Specific to the cleanup action that is selected.
- Integrate exposure and concentration.

# Putting It All Together – An Example

## ***Site Description***

- Spill of solvent (trichloroethene) occurred.
- Over time, trichloroethene migrated to groundwater.
- Trichloroethene detected in groundwater at the spill site and in neighboring wells.
- Trichloroethene detected in soils at spill areas.

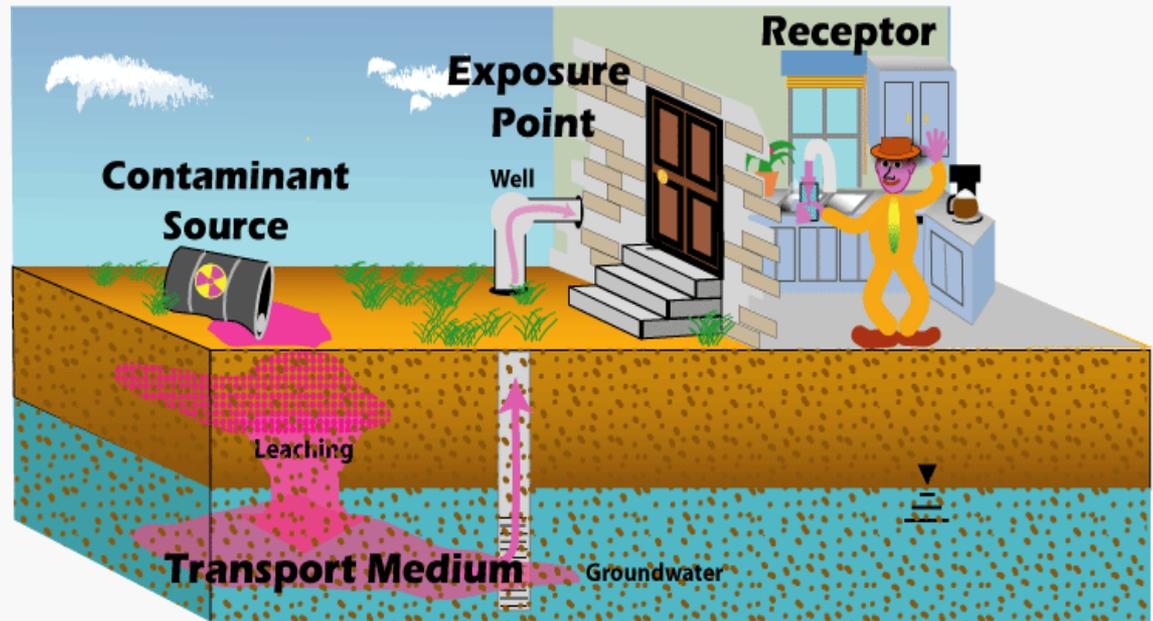
## ***Sampling Shows (Data Gathering and Evaluation)***

- Trichloroethene in groundwater (at well) averages 30 micrograms/liter.
- Trichloroethene in soil (at source) averages 200 milligrams/kilogram.

# Putting It All Together – An Example

**Receptor is adult that:**

- **Drinks from the well**
- **Contacts contaminated soil**



**Some “exposure parameters:”**

- **Water ingestion – 2 liters/day**
- **Incidental soil ingestion – 100 mg/day**
- **Days per year exposed – 350 days/year**
- **Years exposed – 30 years**
- **Body weight of adult – 70 kg (154 lbs)**

**Trichloroethene toxicity factors**

- **Slope Factor =  $0.322 \text{ [mg/(kg X day)]}^{-1}$**
- **Reference Dose =  $0.0003 \text{ mg/(kg X day)}$**

(Source 2010 Paducah Risk Methods Document)

# Putting It All Together – An Example

## *Use Equations for Intake, Cancer Risk, and Hazard Calculation*

$$\text{Intake} = \text{Concentration} \times \left[ \frac{\text{Contact Rate} \times \text{Exposure Frequency}}{\text{Body Weight}} \times \frac{1}{\text{Averaging Time}} \right]$$

$$\text{Cancer Risk} = \text{Slope Factor} \times \text{Intake}$$

$$\text{Hazard} = \frac{\text{Intake}}{\text{Reference Dose}}$$

# Putting It All Together – An Example

## *Cancer Risk and Hazard Results*

### **Exposure to Drinking Water**

- **Cancer Risk =  $1.1 \times 10^{-4}$**
- **Hazard = 3**

### **Exposure to Soil (Incidental Ingestion)**

- **Cancer Risk =  $3.7 \times 10^{-5}$**
- **Hazard = 0.9**

**Trichloroethene is a COC for Soil and Groundwater**

**Risk Management would determine appropriate actions to address this risk and hazard.**

- **Reduce Trichloroethene Concentrations**
- **Reduce Rates of Exposure**

# Resources

- EPA's Superfund Risk Assessment Page:  
[http://www.epa.gov/oswer/riskassessment/risk\\_superfund.htm](http://www.epa.gov/oswer/riskassessment/risk_superfund.htm)
- EPA's Soil Screening Guidance:  
[http://rais.ornl.gov/calc\\_start.shtml](http://rais.ornl.gov/calc_start.shtml)
- EPA's Regional Screening Tables:  
[http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)
- DOE's Risk Assessment Information System:  
<http://rais.ornl.gov/>