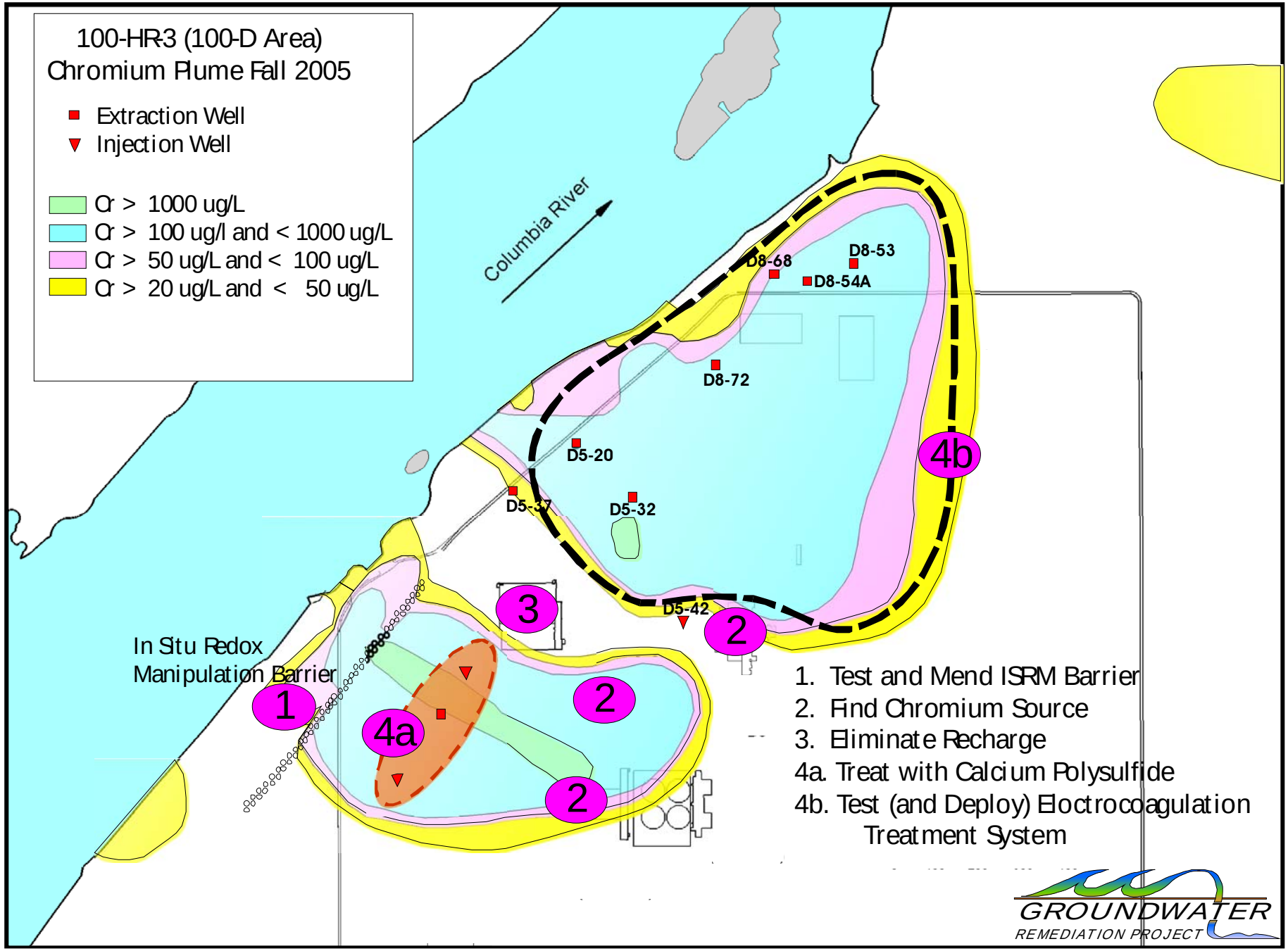
Key Hanford Contaminants Relevant to Congress' Concerns

- Contaminants Currently Entering the River
  - Hexavalent Chromium in the 100 Area
  - Strontium-90 at 100-N
  - Uranium at the 300 Area
  - Tritium from 200 East Area (PUREX)
  - Iodine-129 from 200 East Area (PUREX)
- Contaminants that may reach the River in the future from the 200 Area (Based on mobility, half-life & inventory)
  - Technitium-99
  - Uranium
  - Carbon Tetrachloride

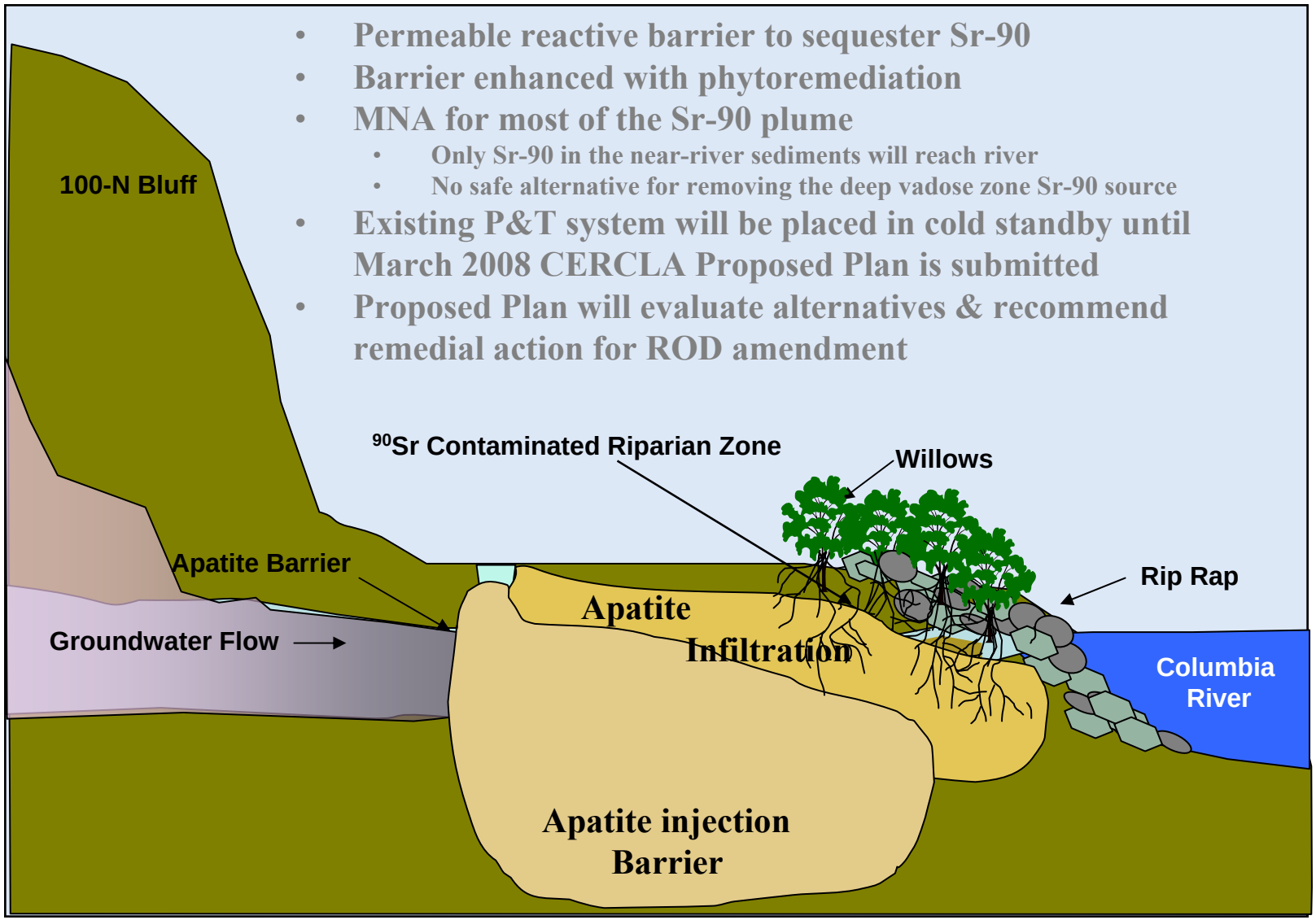
Congressional Mandate is Consistent with Stakeholder Values Articulated by the HAB

- Protect the Columbia River
- Deal realistically and forcefully with groundwater contamination
- Get on with cleanup
- Do no harm during cleanup
- Use the most practicable, timely, available technology, while leaving room for future innovation

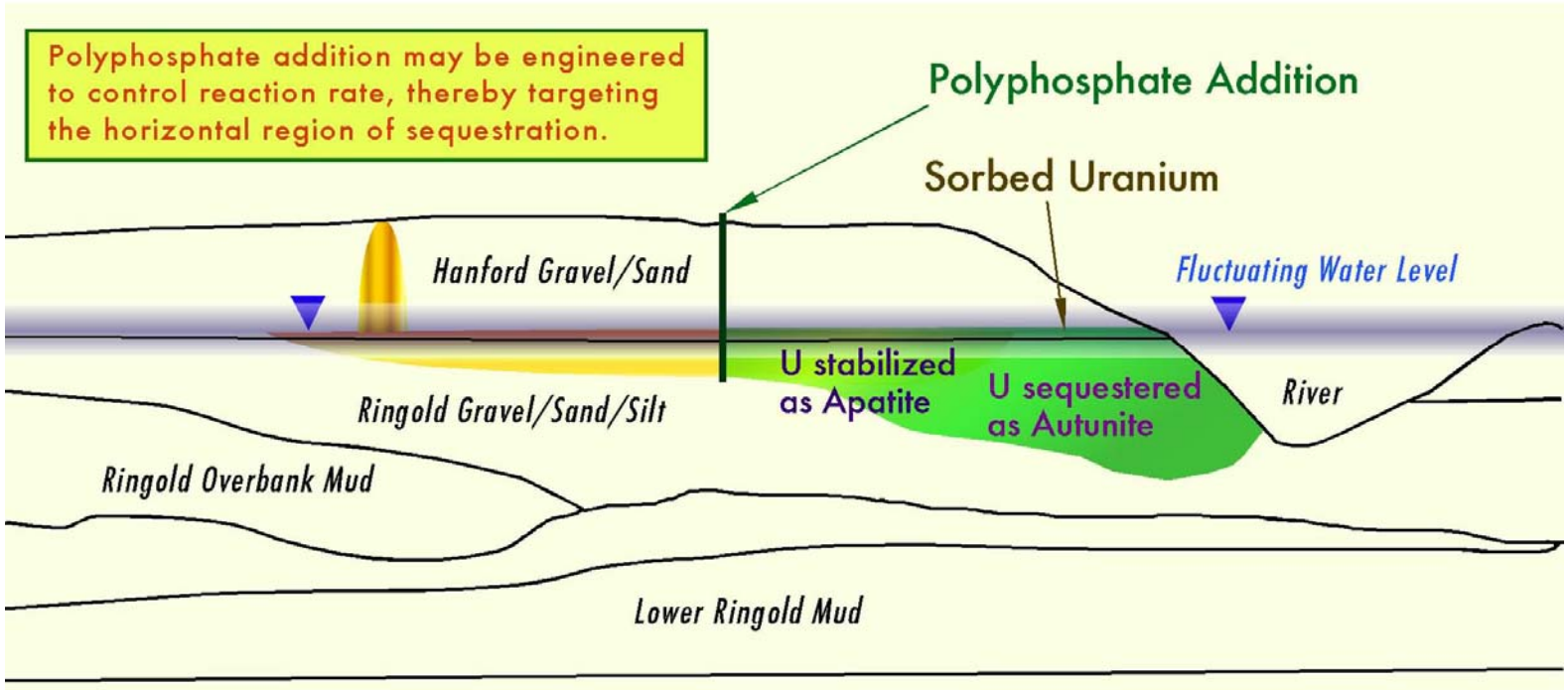

100-HR-3 (100-D Area)
Chromium Plume Fall 2005
Extraction Well
Injection Well
Cr > 1000 ug/L
Cr > 100 ug/l and < 1000 ug/L
Cr > 50 ug/L and < 100 ug/L
Cr > 20 ug/L and < 50 ug/L
Columbia River
D8-68
D8-53
D8-54A
D8-72
D5-20
D5-37
D5-32
D5-42
4b
3
2
2
2
1
4a
In Situ Redox
Manipulation Barrier
1. Test and Mend ISRM Barrier
2. Find Chromium Source
3. Eliminate Recharge
4a. Treat with Calcium Polysulfide
4b. Test (and Deploy) Eloctrocoagulation
Treatment System
GROUNDWATER
REMEDIATION PROJECT

Systems Approach to Address 100-N ^{90}Sr

- Permeable reactive barrier to sequester Sr-90
- Barrier enhanced with phytoremediation
- MNA for most of the Sr-90 plume
  - Only Sr-90 in the near-river sediments will reach river
  - No safe alternative for removing the deep vadose zone Sr-90 source
- Existing P&T system will be placed in cold standby until March 2008 CERCLA Proposed Plan is submitted
- Proposed Plan will evaluate alternatives & recommend remedial action for ROD amendment



300 Area Uranium Plume Deployment of Polyphosphate



- Injection of soluble polyphosphate
- Lateral plume treatment
- Uranyl phosphate mineral (autunite) formation
  - Immediate sequestration
- Apatite formation
  - Sorbent for uranium
  - Conversion to autunite
- Enhancement of MNA

EM SITE SPECIFIC ADVISORY BOARD CHAIRS MEETING

Santa Fe, New Mexico September 6-8, 2006

Groundwater Issues at Sites

Site: Idaho National Laboratory Site EM CAB

Site Examples

- Test Area North pump and treat
- Radioactive Waste Management Complex including lysimeter
- Idaho Nuclear Technology and Engineering Center tank farm soils

Options

- Microbes and other cleaning techniques
- Pump and treat
- Capping the area to prevent infiltration

Mitigating process

Plumes are receding, but not sure all is resolved.

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Groundwater Issues at Sites

Nevada Test Site

Background – Underground Test Area (UGTA) Project

- 828 historical underground nuclear tests released ~132 million curies of radioactivity into subsurface regions – resulting in some on-site groundwater contamination (no offsite groundwater contamination has been detected)
- Independent peer review of groundwater project conducted at request of the CAB
- DOE invited CAB to study issue and provide recommendation for future well siting

CAB Issued Formal Recommendation

- Fund/install system of 3 wells strategically located down gradient of region where major testing occurred; up gradient of the residents of Oasis Valley, Beatty, and Amargosa, NV

Status

- CAB recommended 3 additional wells; DOE provided feedback on recommendation; CAB will carefully analyze

Groundwater Issues at Sites

Nevada Test Site

Ongoing Issues

- DOE addressing Pahute Mesa (region likely posing greatest potential for offsite contaminant migration – due to large detonations taking place at western-most boundary of the NTS); Phase I Pahute Mesa Flow Model complete
  - Stakeholders voice concerns that DOE's strategy allows too much time for characterization and needs earlier information on contaminant location levels and potential for migration
- There is a concern – and a need to know early on: what is in the water traveling towards communities in Nye County…stakeholders need assurance that their water is safe and will remain safe
- Funding must be provided to accomplish what is needed in a timely manner for sufficient data collection and validation of the model.

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Groundwater Issues at Sites

Nevada Test Site

CAB BOTTOM LINE

The key is adopting an accelerated strategy for emplacement of a series of wells up gradient of rural communities that could eventually be used for monitoring and early warning. These wells would provide assurance of groundwater quality to residents as well as providing data for modeling.

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Groundwater Issues at Sites

Northern New Mexico Citizens' Advisory Board

1) **Sole-source Northern NM Aquifer – Essential for Local Survival**
   a. Drinking water source for Los Alamos, Santa Fe & impacts on Albuquerque & downstream through Rio Grande
   b. Long-lived Rad Waste Disposition Above Sole-Source Aquifer

2) **Accelerate RCRA GW Monitoring & Corrective Measures for MDAs**
   a. Drill Fluids Impacted Wells: May Not Detect Trace Constituents
   b. Inadequate Distribution of Wells/Screens to Evaluate Contamination

3) **Funding of New GW Wells & Accelerated Clean Up**
   a. Good Practice & Consent Order will Require Many New Wells
   b. LANL is Behind Curve in Contaminant Characterization
   c. Decisions to be Made Soon on Remediation need Reliable Data
   d. Accelerated Clean Up Will Reduce Costs - Dramatically

Groundwater Issues at Sites

Site: Oak Ridge

1) **Optimization**
   - Oak Ridge has a mature groundwater monitoring system that takes into account radiation, VOCs, and metals

2) **Validation & Modification Strategy**
   - Annually determine if the current monitoring and sampling program is meeting goals
   - Make adjustments to the frequency and approach through a process coordinated with EPA and the state

3) **Alternate Concentration Limits at the East Tennessee Technology Park**
   - EPA has determined that ACLs can only be used in RCRA groundwater decisions, not CERCLA. As a consequence, DOE is pursuing an "Upfront Technical Impracticability Waiver" for select plumes at the park

EM SITE SPECIFIC ADVISORY BOARD CHAIRS MEETING

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Groundwater Issues at Sites

Paducah Gaseous Diffusion Plant Citizens Advisory Board

1) The DOE has agreed to test for more than 150 substances to ensure that a system to treat radioactive materials and other pollutants flowing from a 25-acre landfill behind the PGDP is working correctly.

2) Southwest Plume project delays of over one year due to regulator and DOE disagreement of modeling of TCE degradation factor. DOE model has TCE naturally degrading in the ground, which affects the plume concentration over time.

3) After four years of operating on an expired permit for discharge to the waters of the Commonwealth, a new draft permit was issued Aug. 25. More stringent requirements that went into effect in September 2004 may impact DOE operations.

Groundwater Issues at Sites

Savannah River

- 13 billion gallons of contaminated groundwater at SRS
- 5-10 percent of SRS contaminated by industrial solvents, tritium, metals and other constituents generated by site operations
- All groundwater exists as part of large hydrogeologic system of interconnected aquifers and surface streams
- Groundwater flows at different rates from inches (in clay zones) to several hundred feet (in sand zones) per year toward streams, swamp, and the Savannah River
- Groundwater only impacts 1 of 6 streams on site with tritium contamination above surface water standards
- Most contamination occurs within several major plumes; all of which are under remediation and contained within the site boundary
- No treatment technology for tritium

Groundwater Issues at Sites

Savannah River

Remedial Technologies

Solvent Cleanup Methods (Dynamic Underground Stripping)
Waste Site Capping and Sealing Approaches using grout mixtures
Kaolin Clay caps replaced with Geosynthetic Cap Closure Technology
-prevents rainwater infiltration and more cost effective
Innovative Source Control Techniques (soil fracturing; emulsion injection; and heating technologies)

Natural Remedies
Phytoremediation (natural vegetative process)
Bioremediation (naturally occurring microbes)
Monitored Natural Attenuation (establishing mixing zones)

Groundwater Issues at Sites

Savannah River

Example Issues and Solutions

Radionuclides and metals in groundwater at F Area Seepage Basin

- -Non-effective pump and treat system cost $1 million/month to operate
- -Discharged to a stream

Solution: Subsurface funnel and gate system with base injection within the gates provided for 30% reduction to release to stream after one year with virtually no operational costs

Tritium contaminated groundwater discharging into stream leading to river

- -Causes tritium concentrations in parts of river to be elevated
- -No treatment

Solution: Collection and irrigation of tritiated water prior to reaching stream provided 70% reduction in tritium concentration in stream at very low operating costs