Redefining Baselines

Savannah River
- **Resonant Sonic Drilling** combines rotary power with mechanically generated vibrations
- **Recirculating Wells** treat waste plumes in situ without disturbing surrounding groundwater

Hanford
- **Passive Soil Vapor Extraction** employs atmospheric pressure to remove contaminant vapors
- **Enhanced Sludge Washing** will pretreat tank waste and avoid $5 billion in disposal costs

Idaho
- **Advanced Tensiometers** accurately monitor water movement at waste disposal sites
- **Soft-Sided Waste Containers** cost less and hold more than plywood or metal boxes

Oak Ridge
- **Gunite Scarifying End Effector** cleans hard-to-remove sludge and residue from tank walls

Rocky Flats
- **Smart Sampling** generates precise contaminant maps using geostatistical simulation

Miamisburg, Ohio
- **Water Solidification** absorbs and contains contaminated aqueous waste

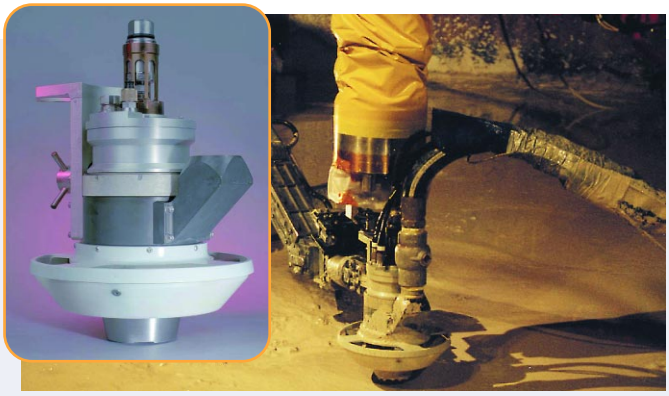
Argonne National Laboratory
- **Phytoremediation** uses plants to extract low levels of contaminants from soils

Brookhaven National Laboratory
- **Diamond Wire Saw Cutting** segments complex metal structures from the outside

Resonant Sonic Drilling virtually eliminates spreading of contaminants during subsurface characterization

Waste placed in **Soft-sided Waste Containers** takes up less space in landfills

Diamond Wire Saw Cutting reduces worker exposure to contaminated materials



Gunite Scarifying End Effector attaches to a robotic arm to dislodge tank waste

Solutions

Resonant Sonic Drilling [#55]

Used to access the subsurface for installation of monitoring or remediation wells and for collection of subsurface materials for environmental restoration, this system combines mechanically generated vibrations and rotary power to efficiently penetrate the soil. This method uses no drilling fluids and minimizes waste generation. It is the baseline for projects at both Savannah River and Idaho.

Recirculating Wells [#65]

Treatment of VOC-contaminated groundwater with above ground systems can be costly and create additional waste. Recirculating-well systems treat radioactive and hazardous waste plumes in situ. Contaminated ground water is extracted in one part of the well, treated by in-well modules, and reinjected into the aquifer, all without bringing the water to the surface.

Passive Soil Vapor Extraction (Barometric Pumping) [#56]

Barometric pumping employs atmospheric pressure fluctuations to carry contaminant vapors within the vadose zone to be exhausted at the surface or captured in a well bore. PSVE has demonstrated high performance as a polishing technology following conventional VOC extraction. Reduced power and maintenance requirements result in lower costs.

Enhanced Sludge Washing [#233]

This improved tank waste pretreatment process uses caustic leaching and chromium oxidation to remove aluminum, chromium, phosphorous and sulfate, reducing by 60% the volume of tank sludges requiring expensive treatment and off-site disposal as high-level waste. Almost $5 billion in cost avoidance is included in the Hanford baseline from planned use of this technology.

Advanced Tensiometer [#2122]

This instrument measures how tightly water is held to soil in the unsaturated zone, a region that extends from the earth's surface to the aquifer. The breakthrough design helps investigators determine the direction and rate of water movement, at depths and with accuracies not possible before, to monitor waste disposal sites and help plan effective remediation.

Soft-Sided Waste Containers [#2240]

Low level waste containers, made of multiple layers of polypropylene, are compact and light enough to be moved by hand when empty, but hold more and cost less than the plywood or metal boxes. They accept larger pieces of debris, and trap less void space reducing future settling in landfills.

Gunite Scarifying End Effector [#2384]

This remotely operated tool is attached to the end of a robotic manipulator arm and lowered into hazardous waste tanks to dislodge, cut, and remove hard cake, sludge, and other waste material using high pressure waterjets. It can also clean and decontaminate the tank walls and any residual hardware that remains in the tank.

Smart Sampling [#162]

Geostatistical simulation is used to generate maps or 3-dimensional pictures to precisely define areas requiring contaminant removal or treatment. Evaluation of risk levels and cost alternatives allow real time decisions as excavation proceeds and helps minimize the total cost of the remediation.

Water Solidification [#2312]

Waterworks SP-400 is a polymer-based absorbent that can be used to contain and solidify contaminated aqueous waste. Benefits include a high liquid to absorbent ratio, no mechanical mixing required to promote the absorption process, little to no volume increase in the waste form after addition of the absorbent, and a very high retention in the form of the gel-like material.

Phytoremediation [#2188]

Low concentrations of certain heavy metals and radionuclides can be cost-effectively removed from contaminated surface soil using phytoextraction. Specific plant species are planted to "uptake" and accumulate contaminants for later harvesting and disposal. Although slower than aggressive approaches like soil excavation and disposal, this process is much less costly especially for large areas.

Diamond Wire Saw Cutting [#2389]

Large radioactive steel structures and highly reinforced concrete walls found in decommissioned research reactors can now be dismantled using diamond wire technology. The saw safely and cost-effectively segments heat exchangers, tanks, and other objects while significantly reducing worker exposure to highly contaminated and radioactive materials.