

**Restoration Advisory Board Meeting**  
 April 10  
 7 p.m.  
 Hill AFB Officers' Club

## Base expands Sunset groundwater treatment system



This was the scene in Nov. 1994 as the original Aeration Curtain was installed along Main Street in Sunset. Construction of the new system is expected to continue until July.

**H**ILL AFB IS CONSTRUCTING a new groundwater treatment system along Main Street in Sunset. The system will be an expanded version of the Aeration Curtain installed in November 94 as a pilot test (see the March 95 issue of EnviroNews).

The state-of-the-art treatment system will remove dissolved solvents from underground water. The contaminated groundwater, discovered in 1990, originates from the Army's locomotive maintenance facility located on the base's west side and has contaminated approximately 90 acres of groundwater off base. The contaminated water is not used for drinking water.

The original Aeration Curtain consisted of a series of pipes that were installed inside a large trench. The pipes blew air through contaminated groundwater, creating a curtain of bubbles that captured the contaminants and carried them to the top of the water table. An extraction system then removed the vapors from the soil.

The Aeration Curtain proved very effective at cleaning up the water. "Groundwater flowing into the system had contaminant levels at 800 parts per billion of TCE (trichloroethene, a degreasing solvent once used at Hill)," said project manager

Mark Wheeler. "It flowed out of the system at about five parts per billion of TCE." At five parts per billion, the groundwater would meet state drinking water standards for TCE.

The original system was removed in January to make room for the larger system. The new system, designed to intercept and treat a much larger section of groundwater, will be installed in an underground trench 400 feet long and 30 feet deep—350 feet longer than the original.

The trench will be placed in the narrow section of land between Main Street and Interstate 15 in Sunset. While this may seem like an unusual place to install a groundwater treatment system, Wheeler said it is the best place for several reasons.

Since the highest levels of contamination have already left the base, he said he had to look for a suitable off-base location. "East of Main Street was the best spot we could find," Wheeler said. "It's flat, easy to access and the groundwater depth is just right." The only disadvantage is its proximity to Main Street and I-15, which creates tight conditions for workers and inconveniences motorists traveling through the area, he said.

Once installed, a small shed housing the system's blowers, vacuums and electrical systems will be the only visible evidence of the treatment system. In addition, the base will relandscape the roadside and repair any damage done to the streets.

The construction should have only a minor impact on traffic flow. Although the right lane of a 600-foot-long section of northbound Main Street at about 1800 North will be closed, traffic will be diverted into the left lane and left-turn lane. The diverted section of road will gradually shrink until construction is completed in July.

The Aeration Curtain is not the final cleanup action to be done in Sunset. A plan to clean up the entire site will be proposed to the public early in 1997. ❁

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Vegetative Uptake Study

Study shows garden vegetables are safe

**T**HE RESULTS of a recently completed University of Iowa study may finally ease the concerns of residents using contaminated groundwater to irrigate their gardens.

Many of the area’s residents use water from shallow wells or springs to irrigate crops, gardens and fruit trees. When told some of this irrigation water was contaminated, many residents were naturally concerned that they would no longer be able to eat their homegrown fruits and vegetables.

Unfortunately, Hill environmental experts had little scientific information to ease the residents’ concerns. All Hill’s engineers could say was that they didn’t think the vegetables would be affected, but that they really weren’t sure. Until now, that is.

The study showed that while traces of contaminants were found in some of the vegetables, the amounts were extremely low. So low that scientists

who evaluated the results said they pose no risk.

**The study**

Because of the high level of concern expressed by residents, Hill contracted with the University of Iowa’s Hazardous Substance Research Center to conduct a study to scientifically answer the following questions:

- ❑ Do plants absorb solvents from groundwater?
- ❑ If so, do plants store solvents in their tissues?
- ❑ If so, how much, and does it pose a threat?
- ❑ If not, where do the solvents go?

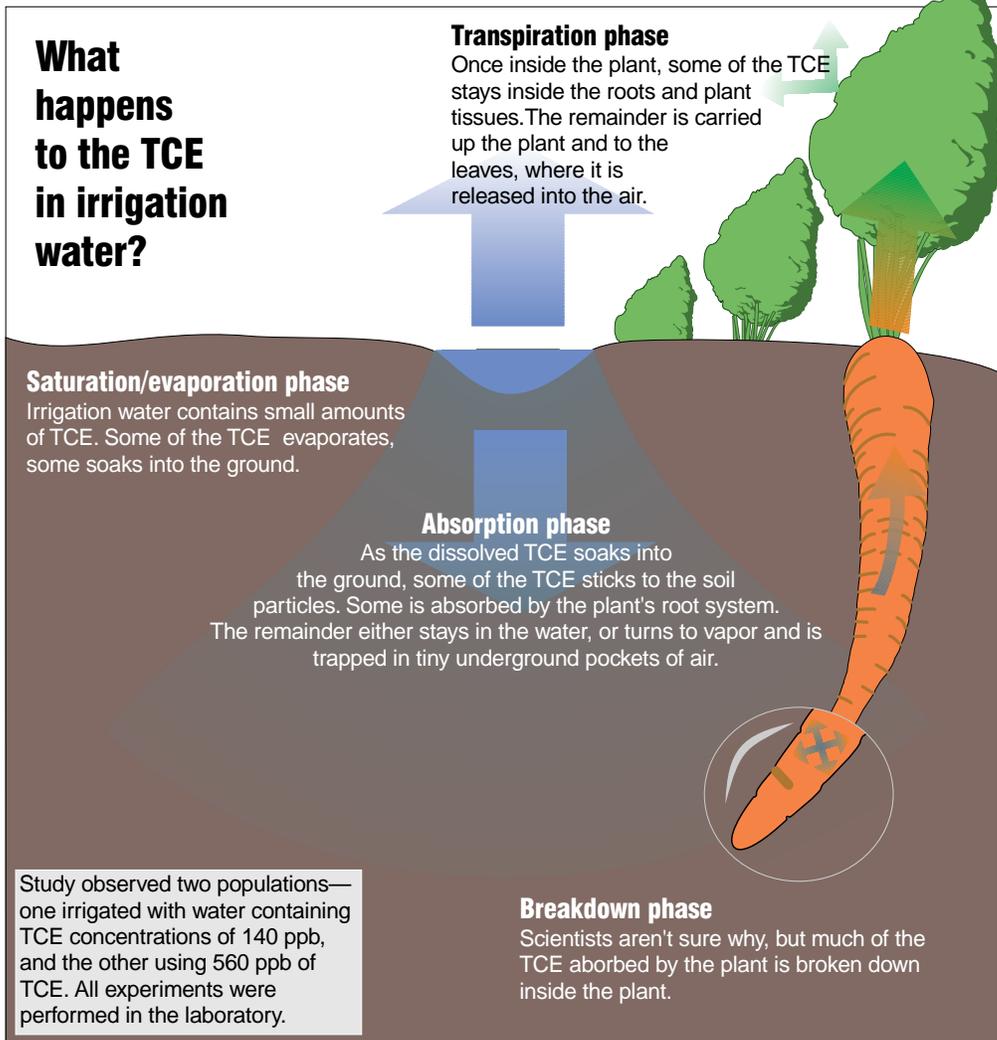
In the course of the experiment, scientists actually grew common garden vegetables and watered them with contaminated water. Different types of vegetables were grown—carrots, spinach and tomatoes. Once mature, the vegetables were harvested and carefully analyzed to see how

much of the solvent was in the vegetables. The soil and air was also analyzed to determine how much of the solvent never reached the vegetables or passed through the vegetables into the air.

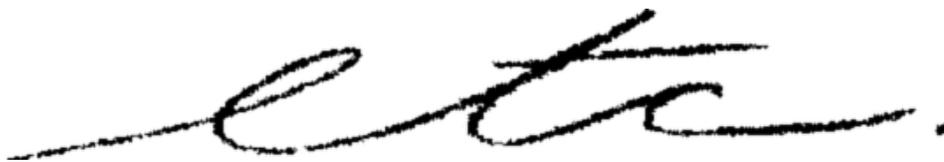
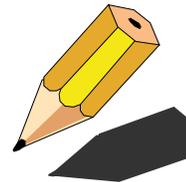
Scientists grew several sets of vegetables, each of which was given water with varying levels of contamination. Scientists carefully measured how much contaminants were put in the water. At the conclusion of the experiment, the amount of solvent in the plant, air and soil was measured to ensure it was all accounted for.

Like all good scientific studies, the experiments were conducted where conditions could be controlled and duplicated. To make it as accurate as possible, researchers used soil taken from a garden in Sunset.

Since trichloroethene, or TCE, is the most common contaminant of concern, scientists used water containing various concentrations of TCE. Group A received contaminated water with 140 parts per



See “Vegetable study” continued on page 5



## ENVIRONMENTAL NEWS, NOTES & HAPPENINGS

### Environmental information available on-line



Attention "Net Surfers!" Hill AFB environmental information is now available via the Internet and can be viewed by or downloaded to any computer with World Wide Web access.

Hill's recently revamped environmental home page now includes information about all of Hill's environmental programs including environmental compliance, hazardous waste management, pollution pre-

vention, natural resource management, cultural resource management and environmental cleanup.

The Environmental Cleanup section will include both the current and back issues of EnviroNews. In addition, this section will make available fact sheets, news releases, the Administrative Record index, the Environmental Community Relations Plan, Operable Unit information, Restoration Advisory Board meeting minutes and much more.

Accessing the Web site is easy and can be accessed by either PC or Macintosh® computers using most Internet browsers. If you don't have an internet account, most major on-line services (CompuServe®, America Online® and others) offer World Wide Web access as part of their basic services.

The Internet address for Hill's Environmental home page is <http://esoh-www.hill.af.mil>.

### Government shutdown pushes back schedules

The delay in finalizing a federal budget has had tremendous impact all over the country, and Superfund cleanups have not been immune.

The Environmental Protection Agency has been particularly hard hit by the lack of funding, and most EPA employees have been furloughed at least once during the budget negotiations.

Among the furloughed employees was our EPA project manager, Rob Stites, who works out of the Region 8 office in Denver. Stites, who missed several days during

the shutdown, said that many reports that he reviews will be delayed significantly because of the furlough. This means cleanup schedules set by the Federal Facility Agreement will be pushed back.

Stites said although Continuing Resolutions prevent furloughs, the agency as a whole is not given its full funding. As a result, some of the work done by EPA contractors will go undone, as the contractors cannot be paid.

While Hill's program will not be severely impacted, work at other sites will.

EnviroNews is a publication of the Environmental Management Directorate, Hill AFB, UT, designed to keep the public informed of hazardous waste cleanup and other environmental activities at the base. Unless otherwise credited, all stories, photographs and graphics are produced by the editor. For questions, comments or to be added to the mailing list please write to:

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**D**eciding how to clean up a hazardous waste site can be a very difficult decision. Environmental engineers face choices ranging from doing nothing to digging up every molecule of contamination and hauling it away. In reality, the final decision usually ends up somewhere in between.

Before recommending a cleanup plan, Superfund requires the responsible party to evaluate all possible cleanup alternatives using nine criteria specified in the law. Most of these criteria are technical in nature, but the final two criteria—state and community acceptance—have the power to change the course of a proposed action.

This article explains how cleanup decisions are made and how you can be involved in those decisions.



## Part Two: Remedy selection and community involvement

**O**NCE INVESTIGATIONS are completed at a Superfund site, the complicated process of selecting a cleanup plan begins.

Choosing the right cleanup plan for a site depends on many factors and often must be selected from among dozens of possible alternatives. These alternatives can range from doing nothing to digging up the entire site and hauling it away for disposal. In reality, the final alternative is usually somewhere between these extremes.

To select the best alternative, engineers must thoroughly evaluate each alternative. Superfund helps with this process by specifying nine criteria by which all alternatives must be evaluated. This evaluation is detailed in a Feasibility Study Report, which is available in the Administrative Record.

### The criteria

The first two criteria are called *threshold criteria*, meaning that the chosen alternative must provide protection to people and the environment and comply with all laws, standards and regulations that apply to the site or cleanup method.

Each potential alternative is then compared against the others using *balancing criteria*. Many alternatives are ruled out at this stage because they are impossible to put in place or are too expensive. Others may be eliminated because they won't accomplish the cleanup goals or sufficiently reduce or contain the contamination.

Because environmental cleanup budgets are shrinking, cost is becoming a more important factor than in years past.

This doesn't necessarily mean the cheapest alternative will be chosen, but it does mean that if a more expensive alternative is chosen, it must provide significantly better protection than less costly choices.

The two final criteria must also be met for a plan to be implemented. State and federal regulators must agree that the preferred alternative will accomplish cleanup goals and meet the threshold criteria. The responsible party must consider and evaluate all of the public's comments before they make a final decision. The response is published with the Record of Decision.

It's at this stage that community participation and involvement becomes very important. When the evaluation process is complete, the party responsible for cleanup (in our case, the Air Force), presents its preferred alternative in a Proposed Plan. The Proposed Plan outlines the preferred alternative and briefly states why this alternative was chosen over other potential choices. The Proposed Plan is mailed out to everyone on the site's mailing list and is made available to the general public. A public comment period is held, which allows any-

one to formally submit their thoughts on the proposal. A public meeting is also held to allow the public to discuss the proposal personally with those who made the selection.

Public comment, while not the deciding factor, can and often does influence the final decision. However, the final decision-making authority is shared by the Air Force, EPA and Utah Department of Environmental Quality, with the Air Force as the lead agency.

Superfund Evaluation Criteria	
Threshold Criteria	<ol style="list-style-type: none"> <li>1. Overall protection of human health and the environment.</li> <li>2. Comply with applicable or relevant appropriate requirements.</li> </ol>
Balancing Criteria	<ol style="list-style-type: none"> <li>3. Short-term effectiveness.</li> <li>4. Long-term effectiveness and permanence.</li> <li>5. Reduction of toxicity, mobility or volume through treatment.</li> <li>6. Implementability.</li> <li>7. Cost.</li> </ol>
Acceptance Criteria	<ol style="list-style-type: none"> <li>8. State (regulatory) acceptance.</li> <li>9. Community acceptance.</li> </ol>

*Editor's note: This is part two of the series. Part Three will discuss how Superfund is being improved and how Hill is streamlining cleanup at the base.*

## Vegetable study [continued from page 2]

billion of TCE (actual concentrations in Sunset irrigation wells are about 50 ppb). Group B received water contaminated with 560 ppb of TCE, ten times the amount found in Sunset.

### Conclusions

The tests showed that plants watered with TCE-contaminated water are not a health risk. In scientific terms, a person eating 80 grams (about three ounces) of raw fresh vegetables from the garden for 150 days a year for 30 years would have a one in 20 million chance of contracting cancer from those vegetables—20 times lower than what the EPA considers to be a significant risk.

Scientists expected to see that small amounts of TCE would remain in the plant, that some would evaporate into the air and that some would remain in the soil. To a certain extent, their conclusions were correct—with one surprising exception. Instead of storing the TCE inside their tissues, the plants broke down the TCE into its base elements (carbon, hydrogen and chlorine). Scientists theorize that those elements combined with other chemicals in the plant to form totally different compounds. While they aren't sure what these compounds are, they believe that they are less toxic than TCE.



The soil used in the experiment was taken from a garden in Sunset.

The study showed only a portion of the TCE ever reached the plant tissues. Most of it evaporated before it ever reached the roots. Some remained in the soil. Still more was transpired by the plant (essentially was released by the plant through normal biological processes). Typically, less than half the TCE ever reached the plant, with the plant retaining less than one percent of the total TCE introduced into the test cells.

In reality, the study could not and did not take into account conditions that most home gardeners experience. For example, the study did not consider different irrigation techniques such as spraying or flooding, which would allow even more TCE to evaporate.

The study only tested three vegetables—spinach, carrots and tomatoes. Researchers acknowledged this and other limitations in the report by emphasizing the results should not be applied to other chemicals, plants or environmental conditions.

### What does this mean?

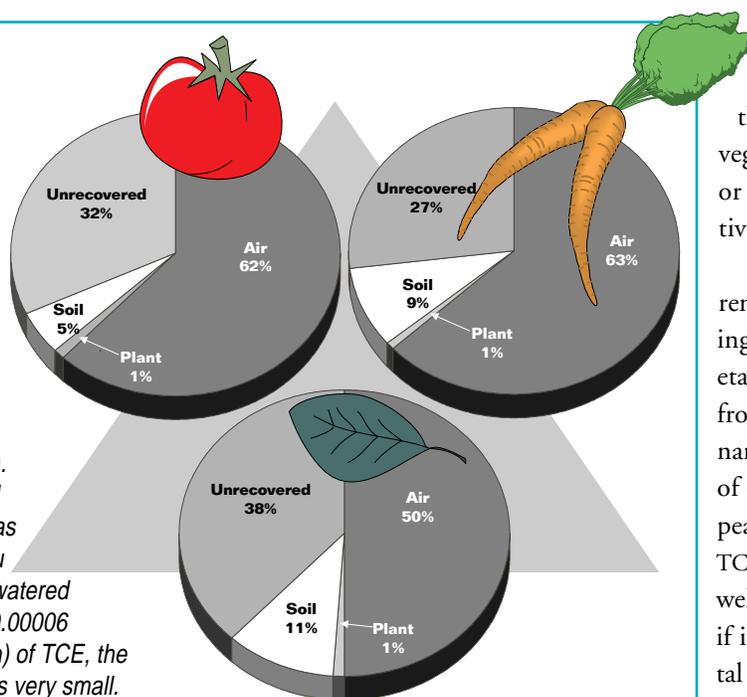
With all the scientific jargon cleared away, the study basically says vegetables irrigated with contaminated water contain some TCE, but not enough to pose a danger to anyone eating them.

Most of the TCE either evaporates into the air or is broken down inside the plant. A risk assessment based on the results of the study confirms the vegetables are safe. Furthermore, cooking or canning the vegetables would effectively remove all the TCE from them.

Perhaps the most important point to remember is that very few people are using contaminated water to irrigate vegetables or crops. If you irrigate with water from the Davis—Weber Canal or culinary water, you need not worry about any of these issues. That water has been repeatedly tested and shows no traces of TCE. If you irrigate with water from a well, spring or field drain and aren't sure if it's safe, please call Hill's Environmental Management Directorate, and we'll come and test it for you. 🌱

### Study results

After the vegetables were harvested, scientists accounted for all the TCE introduced into the test cell. The results are shown on the charts. While the results varied, the general trend is clear. More than 90 percent of the TCE either evaporates or is broken down inside the plant (recorded as "Unrecovered"). Only one percent of the total mass of TCE in the water was found in the plant. When you consider these plants were watered with a solution of less than 0.00006 percent (560 parts per billion) of TCE, the amount of TCE in the plant is very small.



# Operable Unit Update

**Operable Unit 1** Landfills 3 and 4, Chemical Pits 1 and 2, Fire Training Areas 1 and 2 and South Weber



Project Manager: Kevin Bourne 777-8790, ext. 356

After lengthy discussions with the South Weber Landfill Coalition and other technical experts, Hill has decided to postpone the Interim Containment Action, which was proposed last fall.

Meanwhile, the Remedial Investigation, including the Baseline Risk Assessment, is complete and available for public review at the Davis County Library in Layton.

**Operable Unit 2** Chemical Pit 3 and South Weber



Project Manager: Steve Hicken 777-8790, ext. 364

After a delay of nearly a year, the Record of Decision for the site will be signed in April. Meanwhile, the designs for cleanup systems called for in the ROD are underway and should be completed later this spring.

Construction of the first phase of the cleanup—an underground containment wall—will begin this summer. A groundwater collection trench will be installed next spring.

**Operable Unit 3** Industrial Wastewater Treatment Plant; Berman Pond; Ponds 1, 2 and 3; Bldg. 514 (Soils only)



Project Manager: Andrew Gemperline 777-8790, ext. 365

The design has begun for work at the three sites requiring remedial actions—Berman Pond, RVMF and the Sodium Hydroxide Tank Site. Engineers have decided to use asphalt to cap Berman Pond. The money saved by using asphalt will be used to clean up other sites.

Additional field work to better define the former pond boundaries has allowed the base to keep several of the large trees growing near the South Gate.

**Operable Unit 4** Landfills 1&2, North Gate dump, South Weber and Riverdale



Project Manager: Dan Adkins 777-8790, ext. 387

The clay cap and drainage system at Landfill 1 is finished and operational.

Engineers have nearly completed the design for the first phase of site's groundwater treatment facility. Initially this system will treat contaminated groundwater extracted by the horizontal drains, which were installed in 1993. The treatment system will use an air stripper to remove contaminants from the groundwater.

**Operable Unit 5** Tooele Army Rail Shop, Bamberger Pond, Sunset and Clinton.



Project Manager: Mark Wheeler 777-8790, ext. 360

Engineers are designing Phase 3 of the groundwater cleanup at the site. This phase will consist of an underground extraction trench. The trench will be installed along 300 West in Sunset. Construction is scheduled for the Summer of 1997.

For more information regarding current activities at OU-5, please see page 1.

**Operable Unit 6** Bldg. 1915, MAMS 2000 Area, Roy Gate Pond and Riverdale



Project Manager: Steve Hicken 777-8790, ext. 364

Construction work for the groundwater treatment system in Craigdale is continuing. The next phase is to install protective vaults around the well heads. This will be completed this spring. Immediately following the vault installation, the system will be operational.

The Feasibility Study, which had been delayed, is now scheduled to be completed by the end of May.

**Operable Unit 7** Bldgs. 220 and 225 (Soils only)



Project Manager: Steve Hicken 777-8790, ext. 364

With the Record of Decision signed, all efforts at OU-7 are focused on implementing the provisions of the plan.

Engineers are planning and designing the monitoring system that will be installed beneath the former plating shop at Bldg. 225. The plans will be finalized in August, with installation slated for next January.

**Operable Unit 8** Base industrial complex (groundwater only) and Layton



Project Manager: Howie Aubertin 777-8790, ext. 359

Tests performed over the winter show that previous estimates overstated the volume of contaminated groundwater leaving the base. However, more tests are scheduled for this summer to confirm the conclusion and further characterize the groundwater flow near the South Gate.

Several monitoring wells are scheduled to be installed this spring in Layton to further define the amount and location of off-base contamination.

**Operable Unit 9** Entire base except for current Operable Units



Project Manager: Darrin Wray 777-8790, ext. 369

OU-9 is currently in the Site Inspection phase. To date, no significant areas of contamination have been located. However, the sample results have not been received for the areas of highest concern.

Phase I of the Site Inspection has just been completed in the North Area. The data from soil and groundwater samples will be used to determine a need for a second phase. This information is due to be received later this spring.