

**Improved Public Health and Environmental Protection
Resulting from
Superfund Site Investigation/Remediation:
UCD/DOE LEHR Superfund Site
Davis, California**

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Critical Review of Current Regulatory Requirements for US EPA Superfund Site Investigation/Remediation Shows That Current Approaches Are Not Fully Protective of Public Health and the Environment — Deficiencies in:

- Definition of Constituents of Concern - Unregulated Hazardous Chemicals
- Evaluation of Impacts of Stormwater Runoff on Water Quality
- Vadose Zone Transport of Pollutants to Groundwater
- Evaluation of Translocation of Pollutants from Subsurface Soils to Environment
- Remediation by Onsite Landfilling
- Data Reporting and Archiving
- Evaluating the Extent of Groundwater Pollution

LEHR Site Characteristics

Over a 30-yr Period, University of California, Davis (UCD) Conducted Atomic Energy Commission (AEC) Studies Involving Feeding Radium-226 and Strontium-90 to Dogs at the Laboratory for Energy Health Research (LEHR)

LEHR Site is on the University of California, Davis, Campus, in Davis, CA

Radioactive and Other Wastes from These Studies, as well as Campus Wastes, Were Buried in Shallow Pits or Disposed of in Dry Wells at the LEHR Site

The Waste Chloroform Disposal Pits Have Created a Chloroform Plume in the Local Groundwater Systems More Than a Mile Long

Waste Disposal Activities Conducted by the UCD Administration Were Designed to Be Conducted at Lowest Cost – Recalcitrant Polluter Approach

Recognized since the 1950s That Waste Disposed of in This Manner in This Type of Region Would Lead to Groundwater Pollution

- Regulatory Agencies Allowed This Method of Waste Disposal
- State and Local Regulatory Agencies Have a Long History of Allowing Waste Disposal That Leads to Environmental Pollution
- These Approaches Are Still being Used Today

The Few Thousand Dollars Saved at the Time of Waste Generation by Using Inappropriate, Cheaper-Than-Real-Cost Disposal in Local Site Pits and Dry Wells Is Now Costing the Public Tens of Millions of Dollars in Site Cleanup

LEHR Site Regulatory Agency Activity

Remediation Program Managers (RPMs)

US EPA Region IX Lead Agency

State of California Agencies Actively Involved:

Department of Toxic Substances (DTSC) – *State Superfund Agency*

Department of Health Services – *Radiological Issues*

Central Valley Regional Water Quality Control Board – *Water Quality Issues*

RPMs Hold about Monthly Meetings at Which Site Investigation/Remediation Issues Are Reviewed

Davis South Campus Superfund Oversight Committee DSCSOC

DSCSOC Is Recipient of the US EPA Technical Assistance Grant (TAG) for the University of California Davis/Department of Energy National Superfund Site

Julie Roth Is DSCSOC Executive Director

Davis, CA Resident Who Owns Property, and Lives, Next to the LEHR Superfund Site

G. Fred Lee Is the DSCSOC TAG Technical Advisor

DSCSOC Approach

Active Participant in Formulating Site Investigation/Remediation

Participate in RPM Meetings

Pro-Active in Working to Improve the Quality of Science and Engineering Used at the LEHR Site

Background Information on G. Fred Lee

BA Degree, San Jose State College, Environmental Health Sciences, 1955

Master of Science in Public Health, University of North Carolina, 1957

PhD, Harvard University, Environmental Engineering, 1960

Expertise in Aquatic Chemistry, Water Quality, Public Health, and Environmental Engineering

30 years of University Graduate-Level Environmental Engineering Teaching and Research at Several US Universities

Conducted More Than \$5 Million Research

Published 850 Papers and Reports

Full-Time Consultant for 11 years

G. Fred Lee & Associates

Inadequate Definition of Constituents of Concern

75,000 Chemicals Used in the US

In Addition, There Are Many Thousands of Transformation Products That Could Be Hazardous or Deleterious

Superfund Site Investigations Focus on *a Few Hundred* Potentially Hazardous Chemicals (Primarily “Priority Pollutants”) and Largely Ignore the Many Thousands of Chemicals That Could Be Present at Site That Could Be Adverse to Public Health and the Environment

Focus on Chemical Concentrations Rather Than on Chemical Impacts

- Leads to Over-Regulation and Under-Regulation
- Does Not Consider Available Forms of Potential Pollutants

Reliance on Chemical Concentration-Based Approach Leads to Little or No Effort to Find Unknown/Unregulated Hazardous Chemicals

Should Be Using Biological Response Tests to Evaluate Potential Hazards of a Site and the Adequacy of Site Remediation

Mutagens, Teratogens, Carcinogens

Ames Test and Others

Impact on DNA, etc.

US EPA, “*Biological Test Methods*,” Proc. Waste Testing & Quality Assurance, US Environmental Protection Agency Conference, Vol I July (1988)

Is Clean Superfund Site Closure Possible?

Cannot Assume That Because a Water “Meets Standards” That It Is Safe to Consume or Will Not Be Adverse to the Environment

Hazardous Chemical Sites Can Readily Contain Hazardous and Deleterious Chemicals That Will in the Future Be Found to Cause Adverse Impacts on Public Health and/or Environment
e.g., Perchlorate

Need Ongoing – *ad infinitum* – Monitoring and Evaluation to Protect Public Health

Lee, G.F. and Jones, R.A., “*Evaluation of Adequacy of Site Remediation for Redevelopment: Site Assessment at Remediated-Redeveloped ‘Superfund’ Sites,*” **Proc. 1991 Environmental Site Assessments Case Studies and Strategies: The Conference**, NWWA’s Association of Ground Water Scientists and Engineers, Dublin, OH, pp. 823-837 (1991).

Lee, G.F. and Jones-Lee, A., “*Does Meeting Cleanup Standards Mean Protection of Public Health and the Environment?*” **In: Superfund XV Conference Proceedings**, Hazardous Materials Control Resources Institute, Rockville, MD, pp. 531-540 (1994).

Significance of “Non-Hazardous” Chemicals

US EPA Superfund Program Focuses on Control of a Few “Hazardous” Chemicals at a Limited Number of Hazardous Chemical Sites

There Is Wide Variety of So-Called “Non Hazardous” Chemicals at Superfund Sites That Can Be Detrimental to Use of the Site and to Nearby Areas

Groundwaters

- Taste and Odors
- Total Dissolved Solids
- Hardness
- Iron and Manganese Staining
- Unknown/Unregulated Chemicals That Could Aversely Affect Public Health or Environment

US EPA May Not Require the Control of These Chemicals to Eliminate Adverse Impact to the Public and the Environment

May be Covered by ARARS

After Remediation, a TCE-Polluted Groundwater Could Still Contain “Non-Hazardous” Organics That Make the Water Unusable for Consumption

Stormwater Runoff Monitoring

Most Significant Deficiency in Superfund Site Investigations Is Inadequate Stormwater Runoff Monitoring to Assess Impacts of Hazardous/Deleterious Chemicals Derived from Site on the Beneficial Uses of Receiving Waters for Stormwater Runoff

Unreliable Assessment of “No Impact”

Failure to Understand That Drinking Water Standards Values Are Typically Much Higher Than Aquatic Life Protection Standards

Inappropriate Assessment of Water Quality Standards

Ignore Bioaccumulation of Hazardous Chemicals That Render Edible Aquatic Life (Fish) in Receiving Water Hazard for Use as Food

Not Considered in PRGs

Hg in Putah Creek Fish

Inadequate Detection Limits for Analytical Methods

Incorrectly Assume That Analytical Methods Suitable for Drinking Water Evaluation Are Sufficiently Sensitive for Aquatic Life Protection

Fail to Use Appropriate Aquatic Life Toxicity Tests

Attempting to Characterize Stormwater Runoff Based on a Single Sample of a Runoff Event

Stormwater Runoff Monitoring References

Lee, G.F. and Jones-Lee, A., “*Stormwater Runoff Water Quality Evaluation and Management Program for Hazardous Chemical Sites: Development Issues*,” **Superfund Risk Assessment in Soil Contamination Studies: Third Volume**, ASTM STP 1338, American Society for Testing and Materials, pp. 84-98, (1998)

Lee, G.F. and Jones-Lee, A., “*Evaluation of Surface Water Quality Impacts of Hazardous Chemical Sites*,” *Remediation* **9**:87-118 (1999)

Lee, G.F. and Jones, R.A., “*Redevelopment of Remediated Superfund Sites: Problems with Current Approaches in Providing Long-Term Public Health Protection*,” Proc. Environmental Engineering 1991 Specialty Conference, ASCE, New York, pp. 505-510, July (1991)

Translocation of Pollutants from Subsurface Soils to the Environment

US EPA Superfund Site Guidance Does Not Require Investigation of Translocation of Pollutants from Subsurface Soils to the Environment

Terrestrial Plants Can Extract a Variety of Pollutants from Soils through Root Uptake
Bioremediation of Contaminated Soils

Many of These Pollutants Can Be Released to the Environment through Leaves and Flowers
Threat to Animals That Eat Plants
Can Be Present in Stormwater Runoff

Need to Evaluate the Potential for Pollutants in Subsurface Soils to Be Taken Up by
Terrestrial Plant Roots and Released to the Environment through Leaves and Flowers
LEHR Site RPMs Still Have Not Addressed This Issue, Even though This Deficiency in
the Study Program Was Brought to Their Attention by the DSCSOC
Found a Tree Had Roots into a Waste Area Contained and the Roots Contained
Elevated Concentrations of Tritium

Need to Monitor All Site Vegetation for Elevated Concentrations of Potential Pollutants to
Control Translocation Mode of Pollutant Release

Vadose Zone Modeling

LEHR Site RPMs Allowed DOE Contractors to Use a Vadose Zone Model to Estimate Transport of Pollutants That Gave Obviously Erroneous Estimates of the Travel Time from Near-Surface Waste Disposal Areas and Soils to Groundwater

Used Average Moisture Content of the Soils

Ignored Saturated Wetted Front Transport

Significantly Underestimates the Transport of Chemicals in Soils from Surface to Groundwaters and, Therefore, Underestimates the Hazard That Hazardous Chemicals Represent to Public Health and the Environment through Groundwater Pollution

Unreliable Estimates of Pollutant Travel Time

Use of Median Hydraulic Conductivity

Median Pollutant Transport Rates Can Significantly Underestimate When the Public Would Be Exposed to Hazardous Conditions through Drinking Contaminated Well Water

Should Use Worst-Case-Based Assumptions, Based on Adequately Assessed Measured Data

Inadequate Definition of Extent of Groundwater Pollution

Groundwater Pollution by LEHR Site Wastes Has Been Known Since Late 1980's

Full Extent of Groundwater Pollution Not Yet Known

UCD Has Been Very Slow in Defining Groundwater Pollution Plumes

The Highest Priority Should Be Given to Defining the Extent of Groundwater Pollution Plumes to Define Threat to Water Supplies

Inadequate Long-Term Groundwater Monitoring

There Is No Assurance That Monitoring of Superfund Sites Will Be Adequately Conducted for as Long as the Residual Wastes Left at the Site Can Be a Threat to Public Health and the Environment

PRPs Should Be Required to Monitor the Site for as Long as the Residual Hazardous Chemicals Are a Threat

For Private PRPs, Need Dedicated Trust Fund to Ensure Funds Will Be Available for as Long as the Residual Chemicals at the Site Are a Threat

Unreliable Data Reports

Final Site Data Reports Placed in Archives Have Obvious Errors

RPMs Do Not Require That PRPs Correct Obvious Errors

Site Remediation by Onsite Landfilling

Onsite Landfilling, or Landfill Capping, Used as a Site Remediation Approach

At Many Sites, RCRA Subtitle C (Hazardous Waste) and Subtitle D (Non-Hazardous Waste) Landfills, at Best, Only **Postpone** Further Groundwater Pollution – Not Prevent It
Unreliable Monitoring of Groundwaters for Landfill Leachate

Lee, G.F. and Jones-Lee, A., “*Evaluation of the Adequacy of Hazardous Chemical Site Remediation by Landfilling*,” **IN: Remediation Engineering of Contaminated Soils**, Marcel Dekker, Inc., New York, pp. 193-215 (2000)

PRP Approach

Might Be Assumed That a University of California, Davis, Administration Would Be a Leader in Protecting the Environment from Pollution

While UCD Administration Claims to Be an Environmental Leader, in Practice, with Respect to Managing Its Campus Wastes in the Past and Today, the UCD Administration Is a Recalcitrant Polluter

- Does the Least Possible to Just Get by Regulatory Agency Requirements, Which Are Recognized to Be Deficient in Protecting Public Health and the Environment
- UCD Has 4 Campus Landfills That Are All Polluting Groundwaters
It Has Just Gained Approval to Construct a Fifth Campus Landfill, Which Will Also Eventually Pollute Groundwaters
- Rather Than Take a Pro-Active Approach toward Proper Monitoring of Surface and Groundwaters at the LEHR Site to Determine the Full Extent of Pollution, the Current UCD Administration Had to Be Forced to Conduct Proper Site Investigation

Response of PRPs and RPMs to DSCSOC Recommendations

Generally, PRPs Attempt to Ignore DSCSOC

Usually Takes Several Years of Repeatedly Pointing Out Deficiencies in Site Investigation and Remediation before DSCSOC Recommendations Are Implemented

DSCSOC Prepared to Go to US EPA Headquarters, State Regulatory Agency Heads, Legislature, etc., to Achieve Adequate Public Health and Environmental Protection

Pro-Active Approach Requires DSCSOC and TAG Advisor Resources Far in Excess of TAG Funds

Conclusions and Recommendations

TAG Advisors Have Unique Experiences and Perspectives

Rather Than Just Meeting Regulatory Agency's Staff's Interpretation of Regulatory Requirements, TAG Advisors Can Strive for More Comprehensive/Complete Protection of Public Health and Environment Than Provided by US EPA and State Regulatory Agencies

US EPA Should Support Effective Communication among TAG Advisors

- Registry of TAG Groups
Email Network and Web Site Addresses
- Periodic Meetings and Workshops; National and Regional
- Publication of Papers and Reports Discussing Experience
TAG Newsletter
- Directory of Resource Information for TAG Groups

Further Information

DSCSOC Web Site — <http://members.aol.com/DSCSOC/DSCSOC.htm>

G. Fred Lee Web Site — www.gfredlee.com