LONG-TERM INSTITUTIONAL AND REGULATORYPOLICY ISSUES RELATING TO THE VADOSE ZONE

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ABSTRACT

The United States Department of Energy (DOE) is in the process of developing a vadose zone science and technology roadmap. The *DOE Complex Wide Vadose Zone Science and Technology Roadmap* has followed a rigorous procedure to lead DOE through an understanding of basic science, characterization and monitoring technologies, and simulation of contaminant fate and transport in the vadose zone. This program which is chronologically scaled to include activities through the years 2004, 2010, and 2025 will necessitate long term institutional and regulatory policy changes in order to be effective.

The current regulatory position vis-à-vis the vadose zone seriously needs to be reconsidered to include early alert or vadose zone monitoring. Federal legislation including RCRA and CERCLA needs to be changed to require regulation in the vadose zone as opposed to waiting until the contamination reaches the water table. Issues related to annual funding to cover long term research need to be addressed. A need exists for a universal database and access to a fundamental set of models. These policies will involve multiple agency involvement. A recommendation is made to set up a White House task force to coordinate this multi-agency national approach.

INTRODUCTION

The Father of Hydrology, O.E. Meinzer referred to the vadose zone as "no man's land". Groundwater hydrologists generally have ignored this region, while the soil science/agronomic community has focused on the upper few meters of this zone. However, in the past two decades, the deep vadose zones commonly found at DOE's facilities have led researchers from both disciplines to focus their attention in the complex processes occurring in the vadose zone. For the past two decades, few scientists have ventured into this no man's land, however, the DOE complex wide vadose zone science and technology roadmap will provide the first guidance at the Federal level to develop a path in this un-traveled landscape. The state of knowledge of DOE's vadose zones is extremely limited, in spite of significant expenditures to date. Continuing along this same path is unlikely to be successful in any cost/benefit analysis.

At most of DOE's waste sites complete elimination of unacceptable risks to humans and the environment will not be achieved, now or in the foreseeable future. At many of DOE's sites, radiological and chemical contaminants posing potentially substantial risks are likely to remain on site and may migrate off site. Engineered measures for waste isolation, together with institutional controls and other stewardship measures, will largely be relied upon to prevent unacceptable exposure to these contaminants. The quality of management of residually contaminated waste sites, both in the present and over long term, will determine whether these measures are adequately protective. At most sites, no single element -waste reduction, waste isolation, or stewardship- can be relied on. Long-term institutional management will require an integrated, systems approach that is tailored to the conditions of the site and is revisited over time, as the conditions of the site and its surrounding area change as new technologies become available (1).

DOE recognizes that radiological and chemical risks are likely to persist at many DOE waste sites for very long time periods, and that protecting humans and the environment from these risks is a dauntingly complex task. For society, now and in the future, this tasks challenges not only our scientific and technological capabilities, but also our ability to establish and maintain the institutional arrangements that are fundamental to ensuring this protection (1).

DOE’s Long-Term Stewardship activities will manage potentially harmful residual contamination left on site after cessation of remediation efforts, including:

- maintaining contaminant isolation and measures to monitor the migration and attenuation or evolution of residual contaminants;
- institutional controls;
- conducting oversight and, if necessary, enforcement;
- gathering, storing, retrieving information about residual contaminants and conditions on site, as well as about changing off-site conditions that may affect or be affected by residual contaminants;
- disseminating information about the site and related use restrictions;
- periodically reevaluating how well the total protective system is working;
- evaluating new technological options to reduce or eliminate residual contaminants or to monitor and prevent migration of isolated contaminants; and
- supporting research and development aimed at improving basic understanding of both the physical and sociopolitical character of site environments and the fate, transport, and effects of residual site contaminants (1).

This vadose zone roadmap, through no man's land, although led by DOE has major potential applications throughout America. The roadmap will assist not only with characterization and monitoring improvements but also with more precise simulation and remediation strategies. The roadmap however has a number of roadblocks in the form of institutional and regulatory issues that need to be reconsidered. These issues are discussed under the following headings.

Agency Involvement

Clearly, the DOE has come to realize the philosophical and financial advantages of implementing an early alert monitoring system for contaminated facilities and for monitoring new sites that will have to be constructed during clean-up operations. The same philosophical and financial advantages would be consistent with the needs of several other government agencies and numerous state regulatory bodies. For example the Department of Defense, the Department of Agriculture, the Environmental Protection Agency and the United States Geological Survey, are examples of Federal agencies that would have a substantial interest in participating in this roadmapping activity and implementing the ideas generated by a unique assemblage of scientists. Other agencies including the Nuclear Regulatory Commission, National Atmospheric and Space Association, the National Science Foundation, and the Western Governor's Association, are examples of institutions that clearly should be collaboratively involved in the evolution of the DOE Roadmap.

The interest in monitoring the vadose zone at hazardous waste sites was formally expressed by the EPA in the early 1980's and resulted in the publication of the book entitled: Vadose Zone Monitoring for Hazardous Waste Sites (2). Dan Quail's committee on competitiveness however, felt that vadose zone monitoring was just another level of regulation and therefore squashed any further funding for EPA and other Federal Agencies related to supporting pending Federal involvement.

Regulatory Position

The Federal mandates, including both RCRA and CERCLA are written by Congress and implemented by the Environmental Protection Agency. With one exception, Federal regulations do not have a vadose zone monitoring component. The only Federal guidance on vadose zone monitoring (3) can be found under RCRA and deals with hazardous waste land treatment Part B permits. This report entitled: Permit Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units, EPA/530-SW-86-040 was published in 1986. An interesting component of the EPA Guidance was to recognize that vadose zone monitoring made sense even in shallow environments. As seen in Figure 1, pore- liquid monitoring was required within 30 cm (12 in) of the bottom of the treatment zone (1.5m or 5ft). The guidance of concern however was that the treatment zone and the monitoring had to be conducted at least 1m (3ft) above the seasonal high water mark. Since the treatment zone could be less than 1.5m this concluded that the EPA had specified that a 3 ft vadose zone was sufficient depth to implement a vadose zone monitoring strategy that had environmental benefit.

The philosophical position taken by EPA for the vast majority of the regulations however is directed towards regulating contamination after it reaches the saturated zone through the use of groundwater monitoring wells. This approach clearly is flawed if one thinks in terms of long half-life radioisotopes, or in areas of significant depth to the water table, as is commonly found at many of DOE's sites. This is akin to monitoring a patient in a hospital to tell you when the patient is dead. An example, perhaps of this philosophy can be given with respect to the DOE Fernald Site. At Fernald an extensive vadose zone investigation was conducted which demonstrated that the contamination, at the current time, resided in the vadose zone. Based on that position, DOE went to the EPA and made the case that since the contamination had not reached the groundwater that in-fact this contamination was not regulated.

During the Vadose Zone Science and Technology Solutions Book (4) workshop held at Berkeley, CA, representatives from various DOE facilities were quizzed as to why vadose zone data were not collected. The most common response heard was that since there was not a federal regulatory requirement to investigate contamination migration in the vadose zone, vadose zone activities did not receive a high enough priority relative to the dollars available to conduct investigations. Since vadose zone characterization and monitoring data were not seen as a priority item, the dollars were used for other kinds of activity to satisfy regulatory demands. Further, since there was no regulatory basis for vadose zone investigations, each of the DOE facilities approached the problem in a different manner. This lack of consistency has resulted in a very disjointed DOE vadose zone program.

Further misuse of the regulatory program can be recognized relative to the UMTRA Program. Several years ago the author had been asked to review the vadose zone monitoring program associated with the surface capping barriers placed over many UMTRA sites. The evaluation of the vadose zone monitoring concentrated on the use of neutron probes and the use of tensiometers. I pointed out that over the years, neutron probes had been lost, damaged, returned to the manufacture for calibration, etc. In addition several new probes had been purchased. In every case, there was no long-term calibration standard set up by UMTRA and as such there was no way to compare any of the data collected against a base-line. As a result, the interpretation of the neutron probe data over time could not be utilized. In the case of the use of tensiometers, an evaluation was done related to the use of Bourdon tubes at high altitudes. The Bourdon tubes, which rely upon a vacuum to operate, exhibit a very narrow range of operation at the high altitude of many of the UMTRA sites including those in the Grand Junction area. Corrections for altitude were not been made with any of the tensiometer data provided and as such this information could not be utilized. Upon making this recommendation to UMTRA, prior to joining The IT Group, the author was told that since vadose zone monitoring was not required at these UMTRA sites, that the ongoing vadose zone program would be canceled rather than corrected.

CURRENT FEDERAL AND STATE ENVIRONMENTAL LAWS

Most DOE sites will be subject to either the federal RCRA or CERCLA, or both. Both statutes are of recent origin, and both were amended to clarify that they do apply to federal facilities (RCRA in 1992 through the Federal Facilities Compliance Act and CERCLA in 1986 through the Superfund Amendments and Reauthorization Act). The laws are written to provide general control of situations where hazardous substances on a site require some form of management and remediation. Both laws will likely change in the future.

The significance of state authority over remediation of DOE facilities within their borders cannot be under- estimated. Many states control corrective action programs through their EPA authorized RCRA programs and environmental restoration through their own CERCLA analogues. Federal facilities not on the National Priorities List (NPL) are subject to state laws on remediation and removal actions (CERCLA Section 120[a][4]). Congress also provided states the opportunity in CERCLA Section 120 (e) to participate in the development of remedial investigations and feasibility studies with DOE and EPA at sites on the NPL. Notice must be given to the affected state within six months of a federal facility being placed on the NPL.

In addition to these environmental remediation laws, DOE sites are subject to other older (25 years) major federal environmental statutes such as the Clean Water Act, Clean Air Act, Toxic Substance Control Act, Endangered Species Act, and National Environmental Policy Act. Many states will also have laws patterned after these federal laws, and some provisions of the states' laws may be more stringent than the federal laws. Each of these statutes has it own significant regulatory framework and standards that can become site-specific cleanup levels.

Currently there are no set standards for soil decontamination. The National Council on Radiation Protection and Measurements (NCRP) (5) published screening limits for radionuclides in soil that relate an effective dose to a critical group to a corresponding soil contamination level. The screening levels are consistent with the NCRP recommendation that the maximally exposed individual should not exceed 0.25 mSv per year (25 mrem per year) from any single set of sources. Different screening levels are derived for various land uses from farming to commercial use. However, these limits are stated *not* to be used as cleanup standards on the grounds that they apply to the maximally exposed person and are conservative. A cleanup standard for plutonium in surface soil of 200 pCi/g (7400 Bq/kg) is in use as a de facto standard at NTS. This concentration is estimated to give an exposure of 100 rnrem per year for a full time resident. The USNRC has promulgated cleanup standards for radioactive contamination in soil that are applicable to decommissioning of USNRC-licensed sites. The USNRC ground cleanup standard is based on individual radiation exposures of no more than 25 rnrern/year to an average member of the critical group (10 CFR 20.1402). However, the EPA objects to this standard and recommends a limit of 15 rnrern/year from all pathways, with no more than 4 rnrern/year through the drinking water pathway for decommissioned sites. The appropriate contaminated soil remediation action is determined by the details of the particular situation, both with respect to the degree of health and environmental threats, the availability of practicable remediation technologies, and the financial resources to implement the technologies.

It should be noted that all of these potential standards for soil contamination are for calculated doses, derived by using various models to predict the radiation doses resulting from the contamination. These radiation doses are all very low when compared with typical background radiation doses and variations in background radiation, making the contamination doses extremely difficult to measure. Although the federal agencies involved (DOE, USNRC, EPA, and Department of Defense) have not agreed on standards for soil contamination, they have collaborated on guidance for radiological surveys conducted to demonstrate compliance with such a standard in the report Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (U.S. Department of Defense, U.S. Department of Energy, U.S. Environmental Protection Agency, and U.S. Nuclear Regulatory Commission, 1997).

Funding Cycle

The roadmap approach requires that a long-term strategy be developed to understand and refine basic vadose zone science, simulation, sensor technology, micro drilling technology, etc. This long-term multi year approach is not compatible with the current DOE funding cycles, which are conducted on an annual basis. Fundamental to the roadmapping process is the notion of large integrated field-testing programs. Clearly with the slow migration of contaminants associated with the vadose zone, an annual funding cycle is inconsistent with not only the fundamental roadmap procedure but also the contaminant migration rates in the vadose zone. Further, the lead time for fundamental research to make an impact on DOE environmental programs make take several years. The best example of a successful DOE Science and technology funding program that resulted in a major contribution to DOE's environmental solutions is the following:

In the early 1980's, researchers using DOE S&T funds, at Lawrence Livermore National Laboratory (LLNL) and University of California at Berkeley, evaluated the use of injecting steam into the subsurface to volatilize petroleum and chlorinated hydrocarbons. The research team also evaluated potential control technologies that could be implemented to manage the steam front in the subsurface. The combination of successful technologies ultimately was patented and became known as Dynamic Underground Stripping (DUS) and Hydrous Pyrolysis Oxidation (HPO). The control technology was called cross-borehole Electrical Resistance Tomography (ERT). The first demonstration of this technology occurred in 1994 at the LLNL site, during which a deep gasoline spill was cleaned up, at a removal rate 50 times that attainable using conventional methods. LLNL researchers continued development of the technologies, including Hydrous Pyrolysis/Oxidation, by which contaminants are destroyed in the ground during the thermal treatment.

The first commercial DUS/HPO deployment occurred in 1997 at the Visalia Pole Yard creosote site in California. In the mid-1990's, after 2 decades of pump and treat operations at the Visalia site, a Superfund Remedial Action Plan was implemented to remove the 1.3 million pounds of creosote contained within the subsurface at the site. The Action Plan called for bioremediation enhancement of the $1.4 million per year pump and treat program. The pump and treat action was removing 15-20 gallons of creosote per year. The net present value of the proposed bioremediation-enhanced pump and treat approach was $45 million. As an alternative, DUS was implemented in 1997. After 3 years of operation, all but a tiny fraction of the contaminant remains. The net present value of the DUS deployment is $21 million. Including long-term costs for final removal to cleanup standards and monitoring, the net present value of the project is $25 million -- approximately half the cost of the bioremediation pump and treat technology.

Summary information:

Visalia Creosote Cleanup	
Total Project Cost - $21 million 1996 through 2000	
Unit Cost per Cubic Yard of Soil Treated	
Actual Costs	$57
Predicted repeat cost (lessons learned)	$38
Comparative Cost per Gallon of Creosote Removed	
Pump and Treat	$26,000
DUS	$130
Estimated Time to Remove 1.3 Million Pounds of Creosote	
Pump and Treat	3,250 years
DUS	3 years

For comparison, the LLNL gasoline cleanup (first full-scale DUS deployment) produced comparable efficiencies:

LLNL Gasoline Spill Site	
Total Project Cost - $11 million	
Unit Cost per Cubic Yard of Soil Treated	
Actual Costs	$65
Costs without Research Component	$35
Time to Remove 7,600 gallons of gasoline	
Pump and Treat (estimated)	2,000 years
DUS	1 year (15 weeks actual operations)

Based upon these and ongoing successes, DOE and other federal agencies are planning on widespread use of DUS/HPO at sites throughout America.

While the concept of adding heat to speed remediation was widely endorsed in the early 90's, control and prediction methods were unavailable. Original concerns about the speed with which contaminant is moved (and possible deleterious effects) drove the control technology need and the development of ERT. Early success in remediating the LLNL gasoline spill drove potential users to ask for better predictive models for design purposes. Meanwhile, the successful test at LLNL indicated that there were a number of additional removal mechanisms in addition to simple displacement, which greatly enhanced the efficiency of DUS. One of these was the discovery that contaminants rapidly oxidize at steam temperatures, leading to the addition of HPO (hydrous pyrolysis/oxidation) to the package. This grew from basic research in oil maturation and enhanced oil recovery work funded by DOE, and utilized experimental facilities originally installed for Yucca Mt. Research.

The choice of best monitoring technologies was facilitated by several field tests in which multiple methods were used to track steam; in the original EM 50 demonstration at a clean site, 10 geophysical methods were compared. LLNL and LBNL fielded technologies from defense, oil and gas, and nuclear waste development programs. Field experience led to improvements in all technologies, with ERT and in situ thermocouples developing to the point that operators could use them with confidence. They were both then deployed commercially in the Visalia, Savannah River, and Portsmouth DUS/HPO projects. In each instance, improvements were made in operating methods and the supporting science by the vendors working closely with the developers and EM 50. Other technologies developed during this process included in-line contaminant monitoring, oxygen sensors, tiltmeters for steam location, and noble gas tracers for tracking specific pathways and mixing of steam and contaminant.

An ongoing challenge is to improve the predictive framework; better simulators, better integration of the massive amounts of field data available, and better laboratory treatability tests to feed initial contaminant data into the models. With the price tag for large-scale DUS/HPO cleanups in the vicinity of $50M, improved engineering input and improved prediction of effectiveness and time scale can have very substantial impact on cost. Vendor, academic, and DOE National Laboratory resources need to collaborate in this effort. As more and more types of contaminants are demonstrated to be cleanable by DUS/HPO, this predictive framework needs to evolve and robustly support the difficult decision to commit to the rapid, complete cleanup of the most difficult sites.

Universal Data Base

Currently, each DOE facility maintains it's own standard operating procedures (SOP's). Further, the majority of the DOE facilities do not share their data with other DOE facilities. The first step in this vadose zone sharing of data appears to be Vol. I and Vol. II of the book entitled: Vadose Zone- Science and Technology Solutions, (4) in which numerous case studies from DOE facilities are discussed. For many of these cases, this is the first widespread dissemination of the numerous experiments and results from DOE facilities.

Because data is not shared, there is substantial additional expense associated with maintaining facility specific SOP's and very little opportunities for sharing of information learned. Variable SOP's are inconsistent with the Technology Transfer Act Amendments (6) of 1996 (Figure2), signed by President Clinton, which said: "The law directs that all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments." Although there are numerous consensus standards bodies, the American Society for Testing and Materials has already established a suite of vadose zone monitoring standards (Table 1). Each standard is unanimously voted upon by the 33,000 membership and as such represents major peer review agreement. These ASTM Standards are renewed every five years and as such are much more current than the International Standards Organization (ISO) standards which do not have a renewal procedure. DOE currently is not in compliance with the Technology Transfer Act because consensus standards are not used at the DOE complex for these environmental investigations. Further, DOE can make substantial contributions to all of the cooperating agencies by developing ASTM Standards that could be used outside of the DOE complex.

Universal Model Base

The roadmap participants have recognized the lack of a single universal Model that can be used in the vadose zone. Flow and transport computational capabilities have been developed with very limited success under specified site conditions. The Water Resources Control Board (7) in the State of California in their document entitled: A Review of the State of the art—Predicting Contaminant Transport in the Vadose Zone states " Because the reliability of models for contaminant transport has not been established even for site specific conditions, it appears that direct monitoring of the constituents in the vadose zone remains a necessity into the foreseeable future." Since 1990 simulation of vadose zone transport has improved very modestly. The notion, however, of a reliable solute transport model, which allows all of the supporting models to converge into a solution is not possible at this time. A need however exists for a universal suite of models that all DOE vadose zone researchers can use. The substantial redundancy in modeling capabilities and modeling activities at each of the DOE facilities does not build on a complex wide information base.

Changing the Paradigm

As a part of the complex wide roadmapping activity, it appears that there are substantial policy/ institutional/regulatory roadblocks. These roadblocks need to be seriously evaluated and changes made to allow efficient implementation of the roadmapping procedure. These roadblocks are of national significance. Fundamentally, the author suggests that a major philosophical change needs to be made to the current national regulatory mandates such as RCRA and CERCLA and that a national collaboration of federal agencies will benefit from working on this last frontier in hydrology.

The Department of Energy, for both financial and environmental reasons, should take the lead in developing vadose zone science, simulation, monitoring and characterization methods. These methods are needed both for existing contaminated sites and to insure that future disposal options that will be needed are adequately accepted by the regulatory and public communities. Other agencies, in particular the EPA will benefit from DOE's leadership by providing effective early warning systems for both municipal and hazardous waste landfills.

Strong leadership at the national level of DOE will be needed to make this program successful. Strong programmatic ties between Headquarters and the sites will insure efficient development, prioritization, technology dissemination and regulatory acceptance. Regulatory acceptance is critical, both to effect regulatory changes as well as to move forward on site restoration. Such cooperation will also reduce or eliminate the duplication and lack of activity that is widespread today within the complex.

To insure success of this program at both the national and site level, new paradigms of headquarters/site interactions may be needed. In the past regarding environmental management, programmatic direction and leadership has occasionally oscillated between headquarters and the sites. The reasons for this have been well justified, yet this has led to inefficiencies.

As a suggested starting point, a White House Special Task Force is recommended to lead both the vadose zone and groundwater program in America. Only a Task force at this level has the power to coordinate multi – agency programs, change policy and integrate University participation nationally. In addition to coordinating the vadose zone and groundwater program White House task force could determine long-term institutional stewardship and regulatory policy issues

If stewardship responsibilities are to be vested in a single entity, research might be conducted on the following questions:

- What organization structure would be optimal? For example, would the entity be a private-sector firm with government oversight, a wholly owned government corporation, a government agency, or a quasi-governmental agency? Is an agency such as DOE, with its history of weapons production, more or less suited for a stewardship function than another agency with a different history and culture?
- What would the entity's property-related powers and responsibilities be? For example, could it hold private and public land? Lease property? Convey fee titles? Would it be bound by the existing property disposition protocols applicable to federal land?
- What would the entity's fiscal powers and responsibilities be? For example, could it commingle congressional appropriations with proceeds from leases or property transfers? Could it charge a maintenance and operation fee for federal government lands as well as the privately held lands turned over to it? How would that fee be determined?
- What incentives (or sanctions) would be needed to encourage governmental and private organizations to turn over stewardship of residually contaminated sites to the entity, and to motivate the entity to carry out its responsibilities?
- What roles would individuals and other organizations (e.g., members of affected communities, regulators) have? (1)

REFERENCES

1. Long-Term Institutional Management of U.S. Department of Energy Legacy Sites, National Academy of Sciences, National Academy Press (2000).
2. L.G. Everett and L.G. Wilson, Permit Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units, EPA/503-SW-86-040, EPA Office of Solid Waste (1986).
3. L.G.Everett, L.G.Wilson, E.W.Hoylman, Vadose Zone Monitoring for Hazardous Waste Sites, ndc, Pollution Technology Review No.112 (1984).
4. Looney, Brian B. and Ronald W. Falta Editors, Vadose Zone –Science and Technology Solutions, Vol. I and II, Battelle Press (2000).
5. National Council on Radiation Protection and Measurement. Recommended Screening Levels for Contaminated Surface Soil and Review of Factors Relevant to Site Specific Studies. National Council on Radiation Protection and Measurements (NCRP) Report 129, Bethesda, Md (1999).
6. OMB A-119 Becomes Law, American Society for Testing and Materials News, May, (1996).
7. Water Resources Control Board, A Review of the State of the Art: Predicting Contaminant Transport in the Vadose Zone, 90-17 CWP, July (1990).

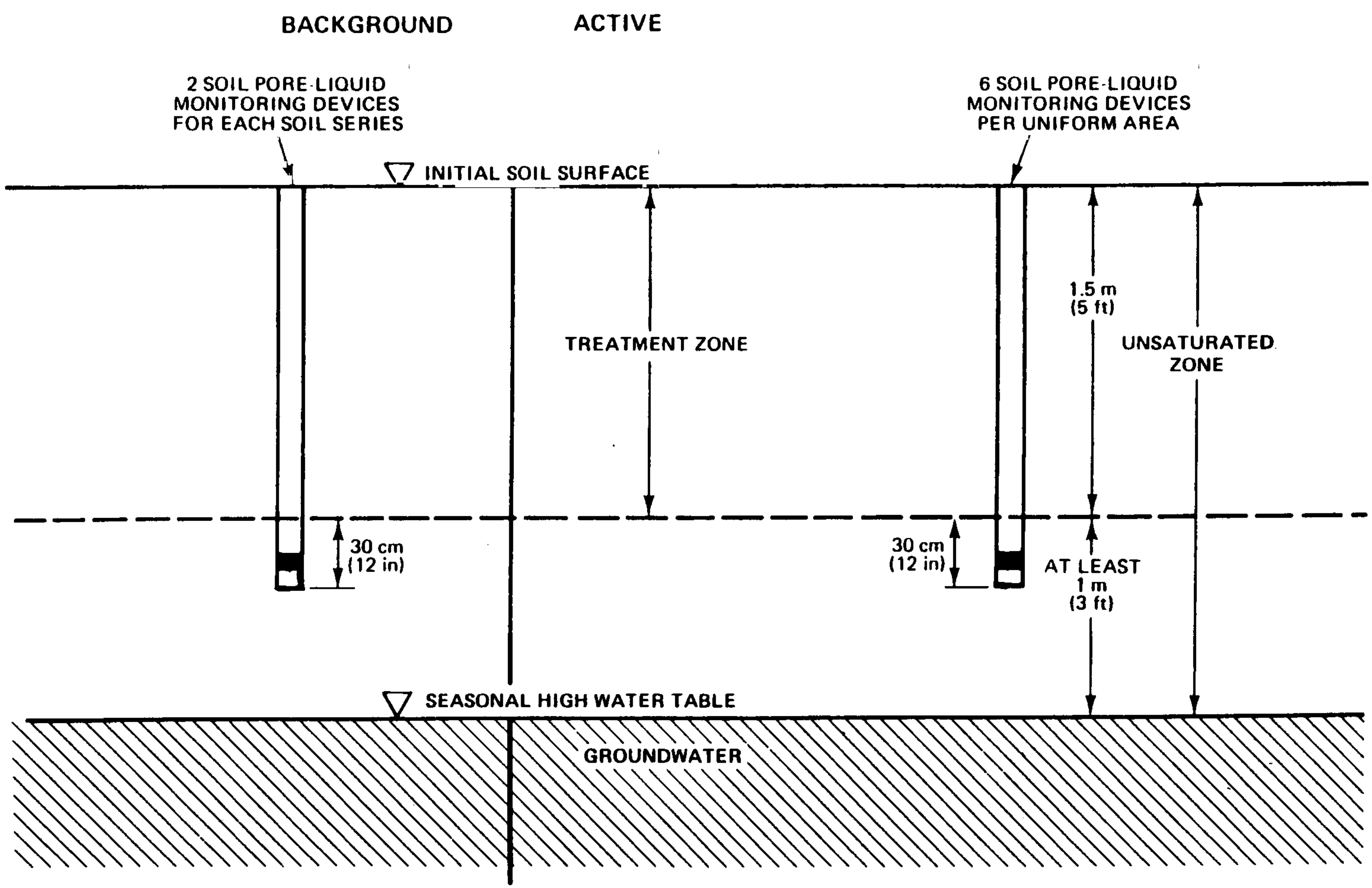

Figure 1 Pore liquid sampling depths (3)

OMB A-119 Becomes Law

A Win-Win Situation for Both the Public and Private Sectors

by Kathleen Kono

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On March 7, 1996, President Clinton signed into law H.R. 2196, the "Technology Transfer Improvements Act of 1995." Contained in the new law (PL #104-113) is a provision (12(d)) that codifies the existing Office of Management and Budget (OMB) Circular A-119 on "Federal Participation in the Development and Use of Voluntary Standards." The law directs that all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments." (See facing page for full text of provision.) This is a very positive step for both the Federal government and the private sector. It will reduce the cost of developing standards; eliminate duplication of effort; provide a single consensus national document for all to follow; and reduce the burden on private industry from having to meet duplicative standards for use in procurement.

Background

OMB Circular A-119, first issued in 1982 and later revised in 1993, had the same purpose as the new law, it just didn't have the force of law. This, in turn, resulted in its being followed by some agencies and not always being followed by others. In a 1994-1995 study conducted by the National Research Council (NRC) of the Academy of Science and Engineering, it was reported that "Current efforts by the U.S. government to leverage the strengths of the private U.S. standards development system, as outlined in OMB Circular A-119 are inadequate. Effective, long-term public-private cooperation in developing and using standards requires a clear division of responsibilities and effective information transfer between government and industry. Improved institutional mechanisms are needed to effect lasting change." One of the recommendations of the NRC's final report titled "Standards, Conformity Assessment, and Trade Into the 21st Century," was that Congress should enact legislation to replace OMB A-119. Last fall an amendment proposing such action was introduced into H.R. 2196 by Representative Constance Morella (R. Md.). With the help of bipartisan support in both the House and the Senate and the endorsement by the White House, the NRC recommendation has become a reality.

The new law requires use of voluntary standards except "when it is inconsistent with applicable law or otherwise impractical." These are rare instances. According to the NRC report, "...adoption of voluntary consensus standards by federal agencies—particularly, but not exclusively, when government personnel have participated in their development—is an effective means of securing public interests. First, although voluntary standards-setting is sometimes criticized for slowness, regulatory standards-setting is even slower. Agencies face stringent due process requirements and opportunities for private interests to delay regulatory action through the legal system, as well as limitations on time and resources for drafting regulations. With the exception of especially hazardous product sectors such as drugs, moreover, agencies have generally been far more effective at influencing corporate design and production of safe products through public information campaigns, including product advisories, and product recalls than through the writing of mandatory standards."

The report goes on to say that "voluntary consensus standards are often equally as stringent in the level of protection they require as mandatory standards would be. It might seem reasonable to expect that private standards developers—industry associations, especially—would seek to set standards at the lowest common denominator of safety. Such standards might allow manufacturers to cut costs, for example. In fact, however, private standards writers have several incentives to set high standards. Forestalling government regulation by develop-

Fig. 2. Technology Transfer Improvements Act of 1995

Table 1 ASTM Vadose Zone Standards

DR. LORNE G. EVERETT, CHAIRMAN

ASTM VADOSE ZONE MONITORING STANDARDS

VADOSE ZONE TERMINOLOGY (FINAL)

SOIL PORE-LIQUID MONITORING (D 4696-92)

SOIL CORE MONITORING (D 4700-91)

MATRIC POTENTIAL DETERMINATION (D 3404-91)

NEUTRON MODERATION (D 5220-92)

SOIL GAS MONITORING (D 5314-93)

HYDRAULIC CONDUCTIVITY (D 5126-90)

DECONTAMINATION OF FIELD EQUIPMENT (D 5088-90)

FREQUENCY DOMAIN CAPACITANCE (Z4302Z)
TIME DOMAIN REFLECTOMETRY (Z6363Z)
DETERMINING UNSATURATED HYDRAULIC CONDUCTIVITY IN POROUS MEDIA
BY OPEN-FLOW CENTRIFUGATION (Z5651Z)

AIR PERMEABILITY DETERMINATION (OUTLINE)
FLUX DETERMINATION (FINAL)
FIELD SCREENING (FINAL)
SOIL MOISTURE DETERMINATION (OUTLINE)
THERMALCOUPLE PSYCHROMETERS (OUTLINE)
WATER CONTENT DETERMINATION (FINAL)
HORIZONTAL APPLICATIONS OF NEUTRON MODERATION (FINAL)

Test Method for
Vadose Zone Borehole Flow Rate Capacity Test (DRAFT)