

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE, L.L.C.	)	Docket No. 72-22-ISFSI
	)	
(Independent Spent	)	
Fuel Storage Installation)	)	

JOINT AFFIDAVIT OF TERENCE J. BLASING,  
RICHARD H. KETELLE, AND MICHAEL J. SCOTT  
CONCERNING OGD CONTENTION O, BASIS 5

Terence J. Blasing ("TJB"), Richard H. Ketelle ("RHK"), and Michael J. Scott ("MJS"), being duly sworn, do hereby state as follows:<sup>1</sup>

1(a). (TJB) My name is Terence J. Blasing. I am employed as member of the research staff in the Environmental Sciences Division at Oak Ridge National Laboratory ("ORNL") in Oak Ridge, Tennessee. I am providing this affidavit under a technical assistance contract between the staff of the Nuclear Regulatory Commission ("Staff") and ORNL. A statement of my professional qualifications is attached hereto as Attachment 1.

1(b). (RHK) My name is Richard H. Ketelle. I am employed as a subsurface contamination specialist, with the Bechtel-Jacobs Corporation in Oak Ridge, Tennessee. I am providing this affidavit under a technical assistance contract between the NRC Staff and ORNL. A statement of my professional qualifications is attached hereto as Attachment 2.

1(c). (MJS) My name is Michael J. Scott. I am employed as Staff Scientist, in the Energy Science and Technology Division, at Pacific Northwest National Laboratory ("PNNL") in Richland, Washington. I am providing this affidavit under a technical assistance contract between the NRC

---

<sup>1</sup> Each individual paragraph as to which an affiant is attesting herein is identified by parenthetically listing the affiant's initials after the paragraph number. For paragraphs attributed to all of the affiants, no designation of the affiants' initials appears.

Staff and PNNL. A statement of my professional qualifications is provided as "Attachment 3" to the "Affidavit of Sam A. Carnes, Paul R. Nickens and Michael J. Scott Concerning OGD Contention O, Basis 1," filed simultaneously herewith.

2. This Affidavit is prepared in support of the "NRC Staff's Response To Applicant's Motion For Summary Disposition of OGD Contention O - Environmental Justice" ("Staff Response") filed herewith, concerning the "Applicant's Motion For Summary Disposition of OGD Contention O - Environmental Justice" ("Motion") and the "Statement of Material Facts on Which No Genuine Dispute Exists" ("Statement of Material Facts") attached thereto, filed by Private Fuel Storage, L.L.C. ("PFS" or "Applicant") on May 25, 2001. The statements of material fact set forth by the Applicant with respect to Basis 5 of Contention OGD O are addressed herein as follows: Statement numbers 19-29 (Terence J. Blasing); statement numbers 11, and 15-18 (Richard H. Ketelle);<sup>2</sup> and statement number 29 (Michael J. Scott).

3. As part of our official responsibilities, we assisted the NRC Staff in its evaluation of the potential environmental impacts related to the Applicant's proposed construction and operation of an independent spent fuel storage installation ("ISFSI") on the Reservation of the Skull Valley Band of Goshutes ("Reservation") located in Skull Valley, Utah. Further, we assisted in the preparation of the Staff's "Draft Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Facility on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah," NUREG-1714, issued in June 2000 ("DEIS"), and are currently assisting in the preparation of the NRC Staff's Final EIS ("FEIS") related to this proposed facility.

---

<sup>2</sup> Statement number 11, pertaining to groundwater resources, is addressed herein, although it was included in the Applicant's Statement of material Facts in the section pertaining to sociological impacts.

**Terence J. Blasing**

4. (TJB) As part of my official responsibilities, I reviewed the Applicant's Motion and the Statement of Material Facts attached thereto, in which PFS seeks summary disposition of Contention OGD O. My review included the Declaration of George Carruth, which was attached to the Applicant's Motion. With respect to the Applicant's Statement of Material Facts, I examined those statements which relate to work I have done or am doing with respect to the air quality impact sections of the DEIS and the FEIS. As relevant to Basis 5 of the contention, these portions of the Applicant's Statement of Material Facts are Statement numbers 19 through 29.

5. (TJB) On the basis of my review of the Applicant's Environmental Report ("ER"), the Applicant's Motion, the Declaration of Dr. Carruth, and the DEIS, I am satisfied that Material Facts No. 19-29 in the Statement of Material Facts attached to the Applicant's Motion are correct, except that I believe that Material Facts Nos. 20, 23-25, 27, and 29 should be clarified or corrected in certain minor respects, as set forth in paragraphs 6-11, below.<sup>3</sup>

6. (TJB) Material Fact No. 20 should be modified to read:

20. PFS emissions from construction machinery are expected to will be small. DEIS § 4.3.1.

7. (TJB) Material Fact No. 23 should be modified to read:

23. The cumulative impact of PFS dust emission on the Reservation would not be significant be small. DEIS § 4.3.1.

8. (TJB) Material Fact No. 24 should be modified to read:

24. Air emissions during the operation of the PFSF will consist of exhaust from equipment and will be lower than emissions during construction; thus the cumulative impact of PFS air emissions during operation will be small insignificant. DEIS §§ 4.3.2, 6.3.3.

---

<sup>3</sup> In the following discussion, proposed changes to the Applicant's Statement of Material Facts are indicated by underlining (insertions) or underlining and strikeout (deletions).

9. (TJB) Material Fact No. 25 should be modified to read:

25. The prevailing winds in Skull Valley blow either north-northwest to south-southeast, or south-southeast to north-northwest; in any event, however, cumulative air quality effects include the effects of the proposed PFSF and only those sources that are upwind at any given time; thus it is proper when evaluating cumulative air quality impacts near the PFSF site to consider separately air emission sources to the north of the PFSF, to the south of the PFSF, or the east or west of the PFSF, and to consider each source with respect to wind direction on time scales covered by the regulations (e.g., the 24-hour time for the PM-10 standard). Carruth Dec. ¶ 23.

10. (TJB) Material Fact No. 27 should be modified to read:

27. Because of the large limited distance from the Tooele Army Depot and the Deseret Chemical Depot facilities to the PFSF, the presence of the Stansbury Mountains between those facilities and the proposed PFSF, and the limited level of emissions from those facilities them, the cumulative impact of emissions from Tooele Army Depot and the Deseret Chemical Depot at the Goshute Reservation will be extremely small insignificant. Carruth Dec. ¶¶ 41-46.

11. (TJB) Material Fact No. 29 should be modified to read:

29. Because PFS air quality impacts at the Skull Valley Reservation will be very small, except for PM-10 (fugitive dust) during construction, which would be somewhat larger but still small (DEIS § 4.3.1). Also, because of the great distances of other air pollution sources in the region from the proposed PFSF, the resulting contributions of those other sources to air quality impacts on the Reservation will be extremely small. Accordingly, insignificant and the cumulative air quality impacts at the Reservation from the facilities enumerated in OGD O are insignificant; the cumulative air quality impacts at the Reservation from the PFSF and the enumerated facilities are expected to be small for PM-10 during construction, and very small for other pollutants. will be insignificant. Carruth Dec. ¶ 60.

12. (TJB) Notwithstanding the modifications and corrections set forth above in paragraphs 6-11, I agree with the Applicant's view that the proposed PFSF, in combination with other facilities in the region, would have no more than a small cumulative effect on air quality at the Reservation.

13. (TJB) In addition, notwithstanding the modifications and corrections set forth in paragraphs 6-11 above, I agree with the Applicant's view that the concerns raised by OGD in Basis 5 of Contention OGD O have been addressed satisfactorily, and no genuine dispute of material fact exists with respect to these matters.

**Richard H. Ketelle**

14. (RHK) As part of my official responsibilities, I reviewed the Applicant's Motion and the Statement of Material Facts attached thereto, in which PFS seeks summary disposition of Contention OGD O. My review included the Declaration of George H. C. Liang, which was attached to the Applicant's Motion. With respect to the Applicant's Statement of Material Facts, I examined those statements which relate to work I have done or am doing with respect to the water resources sections of the DEIS and the FEIS. These portions of the Applicant's Statement of Material Facts are in Statement numbers 11, 15, 16, 17, and 18.

15. (RHK) On the basis of my review of the Applicant's ER, the Applicant's Motion, the Declaration of Dr. Liang, and the DEIS, I am satisfied that the statements related to my area of expertise, which are Material Facts Nos. 11, 15, 16, 17, and 18 in the Statement of Material Facts attached to the Applicant's Motion are correct, except as set forth in paragraphs 16-17 below.

16. (RHK) Material Fact No. 16 should be modified to read:

16. The enumerated facilities in OGD O are located at least ~~at least 10~~ 10 miles away from the PFSF, and hazardous materials at those facilities are located at an even greater distance from the proposed PFSF. Carruth Dec. ¶21.

17. (RHK) Material Fact No. 17 should be modified to read:

17. ~~Because of the distance from~~ the facilities enumerated in OGD O are located in different groundwater basins from Skull Valley and are distant from to the PFSF site, the direction of groundwater flow in the Dugway area is to the north or northwest, and the fact that it is highly unlikely that the aquifer under the PFS site and the Reservation is connected to the aquifers under any of the enumerated facilities, emissions into the groundwater at the

enumerated facilities, if any, will not have a significant impact on groundwater quality on the Reservation. Liang Dec. ¶¶13-17.

18. (RHK) Notwithstanding the modifications set forth above in paragraphs 16-17, I agree with the Applicant's view that the proposed PFSF, in combination with other facilities in the region, would not have a cumulative effect on water quality at the Reservation.

**Michael J. Scott**

19. (MJS) As part of my official responsibilities, I reviewed the Applicant's Motion and the Statement of Material Facts attached thereto, in which PFS seeks summary disposition of Contention OGD O. With respect to the Applicant's Statement of Material Facts, I examined those statements which relate to work I have done or am doing with respect to the environmental justice sections of the DEIS and the FEIS, including potential health effects. As relevant to Basis 5 of the contention, that portion of the Statement of Material Facts is in statement number 29.

20. (MJS) On the basis of my review of the Applicant's ER, the Applicant's Motion, and the DEIS, I am satisfied that Material Fact No. 29 in the Statement of Material Facts attached to the Applicant's Motion, as modified in paragraph 11 above, is correct. Accordingly, the proposed PFS project and other sources of air pollutants in the region would together likely have only a small effect on air quality on the Reservation.


21. (MJS) No data has been identified which would indicate that any unique health conditions exist among the Skull Valley Band that may be pertinent to air quality impacts, and there is no evidence that the proposed PFSF would compound any health problems of nearby residents or visitors in the Skull Valley vicinity. In sum, any cumulative impact on air quality on the Reservation would not be high, and would not represent an impact to the Band that would be an environmental justice concern.

22. (MJS) Finally, I am satisfied that the issues raised in Contention OGD O, Basis 5, concerning the environmental justice aspects of cumulative impacts, were considered and

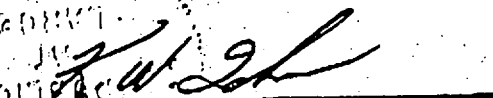
addressed in the DEIS. *See, e.g.*, DEIS §§ 6.2, 6.3.9 ("Environmental Justice"). Thus, the DEIS discusses the particular interrelated environmental and health factors that might make any cumulative impacts on the Goshutes and other low-income and minority groups more likely, disproportionate, and negative. Accordingly, I agree with the Applicant's view that the concerns raised by OGD in Basis 5 of Contention OGD O regarding cumulative impacts on the Skull Valley Band and other low income and minority groups have been addressed satisfactorily, and no genuine dispute of material fact exists with respect to these matters.

- 8 -

23. (TJB) I hereby certify that the foregoing statements in paragraphs 1(a) and 2-13 above are true and correct to the best of my knowledge, information, and belief.

  
Terence J. Blasing

Sworn to before me this  
28th day of June 2001

  
Notary Public

My Commission expires: 11/17/2002



- 9 -

24. (RHK) I hereby certify that the foregoing statements in paragraphs 1(b), 2, 3, and 14-18 above are true and correct to the best of my knowledge, information, and belief.

  
Richard H. Ketelle

Sworn to before me this  
28th day of June 2001


  
Notary Public

My Commission expires: 11/17/2001

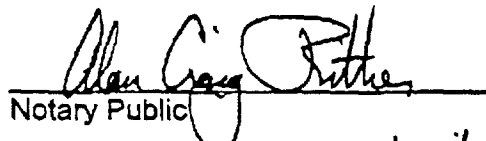
FOR THE VOLUNTARY DEED  
SOUTHERN CIL, INC.  
NEW COTTON FIBER

- 10 -

23. (MJS) I hereby certify that the foregoing statements in paragraphs 1(c), 2, 3, and 19-22 above are true and correct to the best of my knowledge, information, and belief.

  
Michael J. Scott

Sworn to before me this  
27 th day of June 2001

  
Notary Public

My Commission expires: 1/30/05



**BASIS 5 AFFIDAVIT, ATTACHMENT 1**

## **Terence J. Blasing**

### **EDUCATION**

**Ph.D in Meteorology**, University of Wisconsin, Madison, WI, June 1975.

**M.S. in Meteorology**. University of Wisconsin, Madison, WI, June 1968.

**B.S. in Meteorology**. University of Wisconsin, Madison, WI, June 1966.

### **EXPERIENCE**

#### **Research Staff Member**

**January 2001 - present**

CARBON DIOXIDE INFORMATION ANALYSIS CENTER  
ENVIRONMENTAL SCIENCES DIVISION  
OAK RIDGE NATIONAL LABORATORY  
OAK RIDGE TN

Performs research in the general area of analyzing changes in the atmospheric concentrations of radiatively active (greenhouse) gases. Provides up-to-date information on the concentrations of these gases, and on the ways in which these gases enter and leave the atmosphere.

#### **Adjunct Assistant/Associate Professor of Geography**

**1982-present**

THE UNIVERSITY OF TENNESSEE - KNOXVILLE  
KNOXVILLE, TN

Duties include teaching courses in meteorology and climatology, presenting seminars, supervising graduate students, and occasionally advising students on careers in meteorology.

#### **Research Staff Member**

**January 1990 - December 2000**

ENERGY DIVISION  
OAK RIDGE NATIONAL LABORATORY  
OAK RIDGE TN

Performed air dispersion modeling, noise, and visibility assessments for National Environmental Policy Act (NEPA) Documents. Published reports and papers on air pollution and climate change, safety analysis, and related topics. Prepared written material for several Environmental Assessments and Environmental Impact Statements for the Nuclear Regulatory Commission and for the Department of the Army program to destroy unitary chemical warfare agent (Program Manager for Chemical Demilitarization).

**Research Associate/Research Staff Member**  
ENVIRONMENTAL SCIENCES DIVISION  
OAK RIDGE NATIONAL LABORATORY  
OAK RIDGE TN

**September 1977 - January 1990**

Conducted research in climate change and bioclimatology, especially in areas related to atmospheric concentrations of carbon dioxide. Published several papers in refereed professional journals.

**Research Associate**  
LABORATORY OF TREE-RING RESEARCH  
UNIVERSITY OF ARIZONA  
TUCSON AZ.

**September 1971-September 1977**

Conducted research on the use of tree-ring data to reconstruct past climate. Published several papers in refereed professional journals. Supervised graduate students and presented several seminars on the general subject of climate change.

## **BIOGRAPHICAL LISTINGS**

American Men and Women of Science

Who's Who in Technology

## **SELECTED PUBLICATIONS (other than NEPA documents)**

Miller, R. M. and T.J. Blasing. 2001. *Results of Modeling a Proposed CFB Combustor Project at an Existing Power Plant*. Air and Waste Management Association 94th Annual Conference and Exhibition, Orlando FL, June 25-29.

Blasing, T.J. 2001. Climatological Paradox. *Bulletin of the American Meteorological Society* 82(1) Page 7.

Blasing, T.J., G.F. Cada, C.E. Easterly, L.N. McCold, and G.P. Zimmerman, 1998: *Environmental Assessment Renewal of Materials Licenses for ALARON Corp. Northeast Regional Service Facility, Wampum, Pennsylvania*, NUREG/CR-5549, U.S. Nuclear Regulatory Commission.

Blasing, T.J., Wang, J.L., and Lombardi, D.A., 1998: *Temperature Inversions in the Vicinity of Oak Ridge, Tennessee, as Characterized by Tethersonde Data*, ORNL/TM-13357, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Blasing, T.J., R.L. Miller, and L.N. McCold, 1996: Potential Consequences of the Clean Coal Program for Air and Waste Issues. *J. Air Waste Manage. Assoc.*, **46**, 517-529.

Terry, J.W., T.J. Blasing, and 7 others, 1995: *Disposal of Chemical Agents and Munitions Stored at Pueblo Depot Activity, Colorado: Final Phase I Environmental Report*, ORNL/TM-11210, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Socolof, M.L., M.S. Salk, A.H. Curtis, L.K. Mann, V.R. Tolbert, and T.J. Blasing 1995: *Environmental Data and Analysis for the Proposed Management of Spent Nuclear Fuel on the DOE Oak Ridge Reservation*, ORNL/TM-13065, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Lombardi, D.A., T.J. Blasing, C.E. Easterly, and C.B. Hamilton, 1995: *Environmental Resources of Selected Areas of Hawaii: Climate, Ambient Air Quality, and Noise*, ORNL/TM-12861, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

McCold, L.N., G.K. Eddlemon, and T.J. Blasing, 1995: *Environmental Effects of the U.S. Antarctic Program's Use of Balloons in Antarctica*, ORNL/TM-13032, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Ensminger, J.T., and T.J. Blasing, 1995: *The Use of Explosives by the U.S. Antarctic Program*, ORNL/TM-13031, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

### **SELECTED PUBLICATIONS (NEPA Documentation) For the U.S. Nuclear Regulatory Commission**

*Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 11e.(2) Byproduct Material near Clive, Utah*, NUREG-1476, (Docket No. 40-8989, Envirocare of Utah, Inc.), U.S. Nuclear Regulatory Commission, Washington, D.C., August 1993.

*Draft Environmental Impact Statement: Decommissioning of the Shieldalloy Metallurgical Corporation Cambridge, Ohio, Facility*, Docket No. 040-8948, License No. SMB-1507, NUREG 1543, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, July, 1996.

*Draft Environmental Impact Statement: Decommissioning of Babcock and Wilcox's Shallow Land Disposal Area in Parks Township, Pennsylvania*, Docket No. 070-3085, License No. SNM-2001, NUREG-1613 prepared for the U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Rockville, Maryland, by Oak Ridge National Laboratory, Oak Ridge, Tennessee, August, 1997.

*Final Environmental Impact Statement Related to Reclamation of the Uranium Mill Tailings at the Atlas Site, Moab, Utah*, NUREG-1531, Source Material License No. SUA 917, Docket No. 40-3453, Atlas Corporation, prepared for the U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, March 1999.

### **For the U.S. Department of Energy (Oak Ridge National Laboratory Facilities)**

*Environmental Assessment: Construction and Operation of Retrievable Transuranic and Transuranic Mixed Waste Storage Facilities at Oak Ridge National Laboratory, in Oak Ridge, Tennessee*. DOE/EA-0349, U.S. Department of Energy, Washington, D.C., January, 1993.

*Environmental Assessment: Construction and Operation of Class III/IV Solid Low-Level Waste Storage Facilities at Solid Waste Storage Area 7, Oak Ridge National Laboratory, Oak Ridge, Tennessee*. DOE EA/1043, U.S. Department of Energy, Oak Ridge Operations, November 1995.

*Environmental Assessment: Lease of Parcel ED-1 of the Oak Ridge Reservation by the East Tennessee Economic Council*, DOE/EA-1113, U.S. Department of Energy, Oak Ridge Operations, Oak Ridge, Tennessee, April, 1996.

*Final Environmental Assessment: Lease of Land and Facilities Within the East Tennessee Technology Park, Oak Ridge, Tennessee*, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN November 1997.

**BASIS 5 AFFIDAVIT, ATTACHMENT 2**

## **Richard H. Ketelle**

### **EDUCATION**

**M.S. in Geology**, University of Tennessee, Knoxville, 1977. Thesis Title: Characterization of the Mineral and Metal Content of Suspended Sediment, New River Basin, Tennessee.

**B.S. in Geology**, University of Tennessee, Knoxville, 1973.

### **EXPERIENCE**

**Engineering Specialist**  
Bechtel-Jacobs Corporation  
Oak Ridge, Tennessee

**March 2000 to Present**

Responsible for Water Quality Program at the Oak Ridge National Laboratory ("ORNL") site including planning and overseeing surface water and groundwater monitoring for the Environmental Monitoring ("EM") Program at ORNL. Provides technical support to remediation projects and procurement teams for the ORNL site. Provides technical assistance to ORNL Research Reactors Division on release of tritium contaminated process wastewater to groundwater at the High Flux Isotope Reactor site.

**Research Staff**  
Oak Ridge National Laboratory  
Oak Ridge, Tennessee

**1979-March 2000**

*Groundwater Manager*  
Oak Ridge National Laboratory (1996-2000)

Provided oversight of groundwater monitoring activities for ORNL. Assigned as technical lead for the Remedial Investigation Report preparation for the Melton Valley Watershed and participated in preparation of the Melton Valley Proposed Plan and Record of Decision. Also participated in public interactions of the End Use Working Group and the Stewardship Working Group sponsored by the Oak Ridge Reservation Site Specific Advisory Board.

*Group Leader, Applied Geology Group*  
Oak Ridge National Laboratory (1995-1996)

Led technical activities in groundwater investigations for the ORNL Environmental Restoration Program. Groundwater Coordinator for ORNL site.



*Research Staff Member*

Oak Ridge National Laboratory (1993 - 1994)

Technical Lead for groundwater activities for ORNL Environmental Restoration. Lead hydrogeologic analyses for several remedial action projects at ORNL which culminated in construction of groundwater collection and treatment facilities. Contributed to use of advanced groundwater models in risk assessment analyses for site remediation at ORNL.

*Research Associate, Applied Physical Sciences Group*

Oak Ridge National Laboratory (1990-1992)

Directed activities of Applied Physical Sciences Group geologists in preparing report sections for the Gaseous Diffusion Plant Safety Analysis Report Upgrade Program. Participated in groundwater modeling task supporting the Performance Assessment for operating low-level waste disposal facilities in Solid Waste Storage Area 6 at ORNL. Directed site monitoring activities for the proposed future low-level waste sites at Oak Ridge. Advised ORNL Environmental Restoration staff on geologic and hydrogeologic considerations in risk assessment of ORNL facilities.

*Research Associate*

Oak Ridge National Laboratory (1979-1989)

1985-1989: Responsible for geologic and hydrogeologic site characterization studies in DOE's Low-Level Waste Disposal Development and Demonstration Program and the ORNL Remedial Action Program Remedial Action Feasibility Study. Activities included characterization program task planning and performance using both subcontract personnel and ORNL staff. Planned and supervised construction of piezometers and water quality monitoring wells at the ORNL facilities for the purpose of basic site characterization, sampling of selected wells in a contaminant scoping survey, and performance of hydraulic testing in core holes to develop a large-scale understanding of the groundwater flow system at ORNL. Responsible for the performance of the first regional inventory of karst subsidence in East Tennessee.

1982-1985: Performed site characterization of two proposed low-level radioactive waste disposal sites and participated in pathways analyses for both sites. Work at the West Chestnut Ridge Site at Oak Ridge included characterization of thick residual soils, bedrock, and groundwater flow in the karst aquifer. Work at the Ohio site involved characterization of soil and bedrock conditions as well as performance of aquifer tests and participation in the site pathways analysis. Pathways analyses for both of these sites included groundwater contaminant transport analyses and estimation of potential radiological dose to. Participated in preparation of documents pertaining to appropriate techniques for shallow land burial of low level radioactive waste and remedial measures to stabilize shallow land burial facilities. Applied electromagnetic survey techniques to groundwater studies at several sites.

1979-1982: Performed analyses of potential impacts of large-scale synthetic fuel plant construction and operation and participated in preparation of NEPA documents for other DOE sponsored projects.

**Hensley-Schmidt Consultants, Inc.**  
Chattanooga, Tennessee

**1977-1979**

As a geologic consultant, performed coal exploration and reserve estimation on properties in Alabama, Kentucky, Tennessee, and West Virginia. Performed foundation and settlement investigations at several large construction sites.

**Field Assistant**  
U.S. Geological Survey  
Reston, Virginia

**1977**

Participated in field geologic mapping and sampling for mineral resource assessment at areas proposed for designation as National Wilderness Areas in East Tennessee. Gained experience in geologic mapping in the metamorphic rock setting of the Blue Ridge Province of East Tennessee.

## **REGISTRATION**

Registered Professional Geologist in the State of Tennessee No. 555

## **OTHER TRAINING**

2000	Multi-Agency Radiation Survey and Site Investigation Manual training, Washington, D.C.
1993	Dynamic Graphics, Earthvision training course.
1990	Applied Groundwater Modeling, International Groundwater Modeling Center, Butler University, Indianapolis, Indiana.
1984	Geotechnical Applications of Borehole Geophysics, by Jeffrey Daniels.
1984	Project Management, Oak Ridge National Laboratory.
1983	Geotechnical Engineering for Waste Disposal Projects, University of Texas Short Course.
1981	Introductory Soil Mechanics, The University of Tennessee, One Quarter.
1978	Fundamentals of Grouting, University of Missouri Short Course.

## PUBLICATIONS

R.H. Ketelle and G.J. Davies, Hydrogeochemical Responses of Knox Group Springs to Precipitation at Oak Ridge Tennessee. GSA Abstracts with Programs Vo. 31 No. 7 p. 331 October 1999.

J. C. Wang, D. W. Lee, R. H. Ketelle, R. R. Lee, D. C. Kocher, Determining the Operating Limits for Radionuclides for a Proposed Landfill at Paducah Gaseous Diffusion Plant. in Transactions of the American Nuclear Society Vol. 71, 1994.

D. A. Wolf, M. F. Tardiff, R. H. Ketelle, Characterizing Groundwater at Oak Ridge National Laboratory Hazardous Waste Sites. in Proceedings of American Statistical Association for Section on Statistics and the Environment

R. R. Lee, R. H. Ketelle, J. M. Bownds, T. A. Rizk, Aquifer Analysis and Modeling in a Fractured, Heterogeneous Medium. Ground Water Vol. 30, Number 4. 1992.

R. H. Ketelle, R. R. Lee, J. M. Bownds, T. A. Rizk, Model Validation Lessons Learned: A Case Study at Oak Ridge National Laboratory, published in Proceedings of the Eleventh Annual DOE Low-Level Waste Management Conference by National Low Level Waste Management Program, Conf-890854-Vol. 1, p. PA26-PA39, November 1989.

R. R. Lee, R. H. Ketelle, J. M. Bownds, T. A. Rizk, Calibration of a Groundwater Flow and Contaminant Transport Computer Model: Progress Toward Model Validation. ORNL/TM-11294. September, 1989.

D. M. Borders, C. B. Sherwood, J. A. Watts, R. H. Ketelle, Hydrologic Data Summary for the White Oak Creek Watershed May 1987 - April 1988, ORNL/TM-10959, September 1989.

D. A. Lietzke, R. H. Ketelle, R. R. Lee, Soils and Geomorphology of the East Chestnut Ridge Site, ORNL/TM-11364. October 1989.

D. A. Lietzke, R. H. Ketelle, R. R. Lee, Synthesis of Bedrock Geology, Saprolite Weathering and Soil Genesis in Soil and Geologic Mapping, American Society of Agronomy Annual Meeting, Las Vegas, Nevada, October 15-20, 1989.

J. M. Bownds, R. H. Ketelle, R. R. Lee, T. A. Rizk, Advances in Groundwater Modeling at Oak Ridge National Laboratory, in proceeding of the Ninth Oak Ridge National Laboratory Life Sciences Symposium: The Scientific Challenges of NEPA, Knoxville, Tn.. October 24-27, 1989.

R. R. Lee, R. H. Ketelle, J. M. Bownds, T. A. Rizk, Modeling Groundwater Flow and Contaminant Transport at Oak ridge National Laboratory, in proceeding of the Ninth Oak Ridge National Laboratory Life Sciences Symposium: The Scientific Challenges of NEPA, Knoxville, Tn.. October 24-27, 1989.

E. C. Drumm, W. F. Kane, R. H. Ketelle, J. Ben-Hassine, J. A. Scarborough, Subsidence of Residual Soils in a Karst Terrain, ORNL.TM-11525, June 1990.

D. W. Lee, J. S. Baldwin, D. C. Kocher, J. M. Bownds, R. H. Ketelle, R. J. Luxmoore, J. M. Begovich, H. W. Godbee, J. L. Kasten, C. W. Nestor, Review Draft of Performance Assessment for SWSA 6, June 1990.

R. H. Ketelle, R. R. Lee, M. W. Yambert, H. K. Hardee, Supplemental Hydrologic Data Collected at Central Waste Management Division Sites; 9/1/89 - 3/31/90. K/WM-3, June 1990.

R. H. Ketelle, J. G. Newton, and J. M. Tanner, Karst Subsidence in East Tennessee. In Proceedings of the Second Conference on Environmental Problems in Karst Terranes and their Solutions. Sponsored by NWWA, Nashville, Tennessee, November 17-18, 1988.

B. A. Walker et al., Data Package for the Low Level Waste Disposal Development and Demonstration Program Environmental Impact Statement. ORNL/TM-10939, September 1988.

R. R. Lee and R. H. Ketelle, Contaminant Transport Model Validation: The Oak Ridge Reservation, Oak Ridge, Tennessee. ORNL/TM-10972, September 1988.

R. R. Lee and R. H. Ketelle, Subsurface Geology of the Chickamauga Group at Oak Ridge National Laboratory, ORNL/TM-10749, May 1988.

S. H. Stow, D. D. Huff, C. S. Haase, and R. H. Ketelle, Hydrogeologic Characterization Activities on the Oak Ridge Reservation (Tennessee, USA) in support of waste management studies in a humid environment, in Hydrogeology and Safety of Radioactive and Industrial Hazardous Waste Disposal, International Association of Hydrogeologists. BRGM Editions, Orleans, France, 1988.

S. Y. Lee et al., Soil and Surficial Geology Guidebook to the Oak Ridge Reservation, Oak Ridge, Tennessee. ORNL/TM-10803, June 1988.

R. H. Ketelle and D. W. Lee, Identification of Sites for the Low-Level Waste Disposal Development and Demonstration Program. ORNL/TM-10221, 1988.

R. R. Lee and R. H. Ketelle, Stratabound Pathways of Preferred Groundwater Flow: an Example from the Copper Ridge Dolomite in East Tennessee. In Proceedings: "Focus: Conference on Eastern Regional Groundwater Issues." Sponsored by National Water Well Association (NWWA), Burlington, Vermont, July 14-16, 1987.

E. C. Drumm, R. H. Ketelle, W. E. Manrod, and J. Ben-Hassine, Analysis of Plastic Soil in Contact with Cavitose Bedrock. Published in "Proceedings of ASCE Specialty Conference on Geotechnical Practice for Waste Disposal, 1987." Geotechnical Specialty Publication No. 13. June 15-17, 1987, Ann Arbor, Michigan.

R. H. Ketelle and J. G. Newton, Inventory of Karst Subsidence in the Valley and Ridge Province of East Tennessee. In "Karst Hydrogeology: Engineering and Environmental Applications." Proceedings of the Second Multidisciplinary Conference on Sinkholes and the Environmental Impacts of Karst, Orlando, Florida, February 9-11, 1987.

R. H. Ketelle, W. E. Manrod, E. C. Drumm, and J. Ben-Hassine, Soil Mechanics Analysis of Plastic Soil Deformation Over a Bedrock Cavity. In "Karst Hydrogeology: Engineering and Environmental Applications," Proceedings of the Second Multidisciplinary Conference on Sinkholes and the Environmental Impacts of Karst, Orlando, Florida, February 9-11, 1987.

R. H. Ketelle, J. T. Kitchings, R. K. Owenby, and J. E. Caton, Results of Reconnaissance Evaluation of Hazardous Chemical Migration in Ground Water in the Vicinity of Two Low-Level Radioactive Waste Disposal Sites. In "Non-Radiological Groundwater Quality at Low-Level Radioactive Waste Disposal Sites," NUREG-1183, April 1986.

R. H. Ketelle, Results of September 1985 Ground Water Sampling and Analyses Sheffield, Illinois. In "Non-Radiological Groundwater Quality at Low-Level Radioactive Waste Disposal Sites," NUREG 1183, April 1986.

J. B. Cannon, D. G. Jacobs, D. W. Lee, C. C. Gilmore, R. H. Ketelle, F. C. Kornegay, R. D. Roop, W. P. Staub, L. E. Stratton, R. E. Thoma, and J. W. VanDyke, "Shallow Land Burial of Low-Level Radioactive Waste," ORNL/TM-9496, February 1986.

R. H. Ketelle, R. D. Sharp, J. T. Kitchings, and D. W. Parsons, Uranium Mill Tailings Pond Chemical Characterization, Petrotomics Uranium Mill, Shirley Basin, Wyoming. Subcontractors report submitted to U.S. NRC, Denver, Colorado, February 1985.

R. H. Ketelle, F. G. Pin, and C. D. Shackelford, Electromagnetic Exploration of Shallow Subsurface Hydrology at the Petrotomics Uranium Mill Site, Wyoming. Subcontractors report submitted to U.S. NRC, Denver, Colorado, November 1985.

R. H. Ketelle, F. G. Pin, P. T. Singley, and C. D. Shackelford, Evaluation of Shallow Subsurface Seepage at Pathfinder Luck Mc Uranium Mill by Electromagnetic Terrain Conductivity Mapping. Subcontractors report submitted to U.S. NRC, Denver, Colorado, November 1985.

F. G. Pin, J. P. Witherspoon, D. W. Lee, J. B. Cannon, and R. H. Ketelle, Radio nuclide Migration Pathways Analysis for the Oak Ridge, Central Waste Disposal facility on the West Chestnut Ridge Site, ORAL/TM-9231, October 1984.

R. H. Ketelle and D. D. Huff, Site Characterization of the West Chestnut Ridge Site, ORNL/TM-9229, September 1984.

D. W. Lee and R. H. Ketelle, A Methodology for Selecting Low-Level Radioactive Waste Disposal Sites with Application to the Oak Ridge Reservation, A Case Study. Facility Siting and Routing '84: Energy and Environment. Meeting Sponsored by Environment Canada, Banff, Alberta, April 15-18, 1984.

R. D. Roop, W. P. Staub, D. B. Hunsaker, R. H. Ketelle, D. W. Lee, F. G. Pin, and A. J. Witten, Corrective Measures to Stabilize Trench Subsidence in Low-Level Waste Trenches. In Proceedings of the Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, Colorado State University, Ft. Collins, Colorado, February 1-3, 1984.

R. H. Ketelle and F. G. Pin, "Mapping Liquid Hazardous Waste Migration in Ground Water with Electromagnetic Terrain Conductivity Measurements," Presentation at Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, February 1-3, 1984, Fort Collins, Colorado. Published in Proceedings.

F. G. Pin and R. H. Ketelle, "Mapping Subsurface Flow Pathways for Contaminant Migration at a Proposed Low-Level Waste Disposal Site Using Electromagnetic Methods," Presentation at Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, February 1-3, 1984, Fort Collins, Colorado. Published in Proceedings.

R. H. Ketelle and F. G. Pin, "Application of Electromagnetic Terrain Conductivity Measurement Techniques to Contaminant Plume Mapping and Site Characterization," Presented at UCC-ND/Gat Environmental Protection Seminar, December 6-7, 1983. Published in Proceedings of the Seminar.

D. W. Lee, R. H. Ketelle, and L. H. Stinton, "Use of DOE Site Selection Criteria for Screening LLW Disposal Sites on the Oak Ridge Reservation," ORNL/TM-3717, 1983.

R. H. Ketelle and F. G. Pin, "Use of Electromagnetic Terrain Conductivity Measurements to Map Liquid Hazardous Waste Migration in Groundwater," ORNL/TM-8865, November 1983.

F. G. Pin and R. H. Ketelle, "Conductivity Mapping of Underground Flow Channels and Moisture Anomalies in Carbonate Terrain Using Electromagnetic Methods," ORNL/TM-8866, November 1983.

D. W. Lee, R. H. Ketelle, F. G. Pin, and G. S. Hill, "Environmental Pathways Analysis for Evaluation of a Low-Level Waste Disposal Site," IAES International Conference on Radioactive Waste Management, Seattle, Washington, May 16-20, 1983.

R. D. Roop, W. P. Staub, D. B. Hunsaker, Jr., R. H. Ketelle, D. W. Lee, F. G. Pin, and A. J. Witten, "A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches," ORNL/TM-8715, May 1983.

"Environmental Analysis of the Operation of Oak Ridge National Laboratory (X-10 Site)," ORNL/5870 (contributor) November 1983.

R. Blumberg, J. B. Cannon, G. S. Hill, R. H. Ketelle, D. W. Lee, and F. G. Pin, "'GCEP Waste Pathways Analysis Study," K/D-5375, January 1983.

R. H. Ketelle, "Report on Preliminary Site Characterization of the West Chestnut Ride Site," ORNL/NFW-82/21, October 1982.

"Chattanooga Shale: An Assessment of the Resource and Technology for the Recovery of Hydrocarbons and Minerals," ORNL/TM-7920 (contributor) 1982.

Environmental Assessment Aquifer Thermal Energy Storage Program, DOE/EA-0131 (contributor) 1981.

CONOCO Pipeline Gas Demonstration Project (Environmental Impact Statement), contributed sections on Geology, Soils, and Groundwater Hydrology and Quality, 1981.

Memphis Industrial Fuel Gas Demonstration Plant (Environmental Impact Statement) contributed sections on Geology, Soils, Groundwater Hydrology and Quality, and Surface Water Hydrology, 1981.

"Solvent Refined Coal-I Demonstration Facility at Newman, Kentucky, 1981," (Environmental Impact Statement) contributed sections on Geology, Soils, Groundwater Hydrology and Quality, and Surface Water Hydrology, 1981.

R. H. Ketelle and E. K. Triegel, "Interpreting the Factors Related to Groundwater Impact Assessment of Coal Conversion Solid Waste," in *Proceedings of the Third Annual Madison Conference of Applied Research and Practice on Municipal and Industrial Waste*, September 10-12, 1980, Madison, Wisconsin.

R. H. Ketelle, W. R. Wilson, and R. E. Bergenbach, "Stratigraphic Framework and Depositional Environment, Lower Pennsylvanian Rocks, Doran Cave Area, Jackson County, Alabama," *Journal of the Tennessee Academy of Sciences*, 1979.