Review of the
Potential for the Proposed Expanded Taylorsville Road Hardfill Landfill to Pollute Huber Heights Domestic Water Supply

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Huber Heights, Ohio, through its domestic water supply contractor, Earth Tech, has requested that I conduct an evaluation of the potential for an expanded Taylorsville Road Hardfill landfill to pollute the Rip Rap Road Well Field groundwaters that serve as the source for part of Huber Heights' domestic water supply. This review is to focus on the Impact Study report provided by Terran Corp. on behalf of the Taylorsville Road Hardfill landfill. I have reviewed the "Impact Study of Asphaltic Construction Debris on Groundwater Quality" prepared by Terran Corp, dated August, 2002 as well as other documents provided to me by Earth Tech that are pertinent to evaluating the potential for the Taylorsville Road Hardfill landfill to release chemical constituents present in the landfilled wastes to the groundwater underlying the landfill that could be transported to the Huber Heights domestic water supply well field. **I conclude that the Taylorsville Road Hardfill landfilled wastes are a significant threat to release pollutants that can be transported to the Huber Heights domestic water supply well field at sufficient concentrations to impair the use of the groundwaters pumped by this well field for domestic water supply.**

Qualifications to Undertake Review

After obtaining a Master of Science in Public Health degree from the University of North Carolina at Chapel Hill in 1957, and a PhD degree from Harvard University in Environmental Engineering and Environmental Sciences in 1960, I taught and conducted university graduate-level research on water quality evaluation and management for a period of 30 years at several major US universities. I have conducted over $5 million in research on water quality evaluation and management and published over 850 papers and reports on these issues. One of my primary areas of activity is groundwater quality protection from landfilled waste. I have been involved in investigating the potential for landfills to pollute groundwaters since the mid-1960s. I have investigated over 50 landfills in various parts of the US and other countries. Additional information on my qualifications to evaluate the potential for the Taylorsville Road Hardfill landfill to pollute the groundwaters that are used by Huber Heights as part of this community's water supply is appended to these comments. Background information to the comments provided herein is available from my website: www.gfredlee.com.

Approach for Evaluating the Potential for a Landfill to Pollute Groundwater-Based Domestic Water Supply

The evaluation of whether an existing or proposed landfill or landfill expansion can pollute domestic water supply groundwaters causing the waters pumped to be unsuitable for domestic water supply use, is based on three components. These are a) will there be waste constituents deposited in the landfill that can be released from the wastes to the water percolating through the wastes that can pollute the groundwater underlying the landfill; b) is there an hydraulic connection (pathway) between the waters underlying the landfill and existing or potential water supply wells that are used or could be used for domestic water supply; c) are the concentrations of potential pollutants released from the landfill wastes that are transported to water supply wells by the groundwater system sufficient to pose a threat to the health of those who use the water for domestic purposes. Also of concern is whether pollutants derived from the wastes can be detrimental to the use of the groundwaters for domestic water supply through degrading its aesthetic quality such as causing tastes and odors, color, increase total dissolved solids, and/or lead to corrosion or scaling. A review of each of these issues as it relates to the potential for the Taylorsville Road Hardfill landfill to pollute the Huber Heights domestic water supply well field is presented below.

Characteristics of Taylorsville Road Hardfill Landfill

The Taylorsville Road Hardfill (TRH) landfill is an unlined landfill where certain types of construction wastes and demolition debris (C&D) have been deposited. In the past, this landfill has accepted asphaltic roofing shingles and other construction wastes. TRH has requested that Montgomery County permit unrestricted acceptance of all construction and demolition wastes.

The groundwaters underlying the landfill are of high-quality for domestic water supply purposes. Moisture (rainfall) percolating through the TRH deposited wastes has the potential to leach hazardous and non-hazardous but deleterious chemicals from the waste that can pollute groundwaters underlying the landfill.

TRH's proposal to accept all types of construction waste or demolition debris at the Taylorsville Road Hardfill landfill can significantly increase the potential for the groundwaters underlying the TRH landfill to be polluted by hazardous and non-hazardous chemicals. Terran Corp., a consultant to TRH, provided a discussion of the leaching potential of asphaltic roof shingles entitled, "Roof Shingles, PAHs and Groundwater Leaching Potential." A review of that write-up and the background documents referenced therein, shows that asphaltic roof shingles apparently have a low potential to leach certain types of potential pollutants. The focus of the leaching studies that have been conducted was on "Priority Pollutants." The Priority Pollutant list represents about 100 chemicals which were somewhat arbitrarily selected in the 1970s. Only examining a leachate of a waste for Priority Pollutants and closely related chemicals can only show whether the chemicals analyzed for are present in the leachate or not. It does not show that there are no other hazardous or deleterious chemicals leached from the waste, including asphaltic roofing shingles.

It is known that there are about 75,000 chemicals used in the US. Further, asphaltic shingles are an extremely complex mixture of chemicals, many of which have not been identified, are not analyzed for in leaching tests, and for which there are no drinking water regulatory limits (MCLs). The same situation applies to a wide variety of chemicals that can be leached from C&D waste.

The US EPA is continuing to add new hazardous chemicals to the list of drinking-water-regulated chemicals for which there are regulatory limits (MCLs). Every couple of years additional, formerly unrecognized, hazardous chemicals are added to this list. Examining a waste leachate for 100 or so chemicals is inadequate to prove that the wastes are not leaching hazardous and deleterious chemicals that are a threat to a domestic water supply if the leachate is introduced into groundwaters that serve as a basis for the water supply.

An issue of particular concern is that construction and demolition wastes can readily contain containers of solvents used for degreasing, waste oils and other hazardous materials that are incidentally or deliberately disposed of with the C&D waste. Small amounts of some solvents can cause the pollution of large amounts of groundwater above drinking water MCLs.

ICF Inc. (1995a), under contract with the US EPA Office of Solid Waste, conducted a review of the characteristics of leachate generated by construction and demolition (C&D) waste landfills. This was conducted as part of the Agency's developing regulations for C&D landfills. Construction and demolition landfill leachate sampling data were collected from 21 C&D landfills. Data were provided for 305 parameters. Potentially significant concentrations, compared to drinking water MCLs, were found of 1,2-dichloroethane, methylene chloride, cadmium, iron, lead, manganese and total dissolved solids (TDS).

ICF Inc. (1995b) conducted a review of the "damage cases" caused by construction and demolition waste landfills. ICF Inc. (1995b) identified 11 damage cases where there was groundwater contamination by the C&D landfill. Constituents causing groundwaters to exceed the drinking water MCL were iron, manganese, TDS and lead.

According to ICF Inc. (1995a), there were over 1,800 C&D landfills operating in the United States in the mid-1990s. Therefore, only a small number of the C&D landfills have been sampled for groundwater pollution.

The Terran review of leaching from asphaltic roofing shingles mentioned a paper by Weber *et al.* (2002), "Leachate from Land Disposed Residential Construction Waste." Weber *et al.* reported that there are hazardous and deleterious constituents, such as arsenic, that are leached from C&D wastes which are a threat to domestic water supplies.

Hydraulic Connection from the Base of the TRH Landfill to the Huber Heights Domestic Water Supply Well Field

Webster (personal communication 2002) has indicated that a site characterization report prepared by Terran (1997) provided aquifer test data including well drawdown measurements for observation wells within the city well field area and the TRH landfill site.

According to Webster, all of the well field observation points and five of the landfill monitoring wells provide data indicating a direct hydraulic connection between the well field and the landfill site. The pond located on the TRH property boundary between the two sites showed a significant hydraulic connection with 0.5 feet of drawdown produced from the pumping at the well field. The TRH property clearly lies within the groundwater capture zone of the well field. The hydraulic gradient across the TRH landfill site also demonstrates a direct path for potential pollutants to migrate directly to the well field without the influence of pumping. The use of the production wells will provide a steeper hydraulic gradient in the direction of the pumping wells and accelerate the migration of pollutants toward the Huber Heights groundwater water supply source.

Webster further indicated that the velocity of the groundwater leaving the TRH landfill site moving in the direction of the city's water supply wells was also calculated in the report to range from 1.51 to 3.35 ft/day based on the hydraulic gradient, hydraulic conductivity and estimated porosity of the aquifer. Given that the western edge of the TRH landfill is approximately 350 feet from the nearest production well it is physically possible for contamination in the groundwater at the TRH landfill site to reach the production wells within three to four months. Based on the information presented in the Terran (1997) report, contamination in the groundwater over most of the TRH landfill site has the potential of reaching the public water supply system in less than one year.

Based on examination of the information on groundwater hydrology under the Taylorsville Road Hardfill landfill and in the area between the TRH landfill and the Huber Heights well field, I conclude that there is a hydraulic connection between the base of the TRH landfill and the Huber Heights domestic water supply well field. This means that pollutants released from the wastes can be transported to the well field.

Potential for Pollution of the Huber Heights Well Field Groundwater Resources

The geology/hydrogeology of the area under the landfill and between the TRH landfill and the Huber Heights well field is such that there would be rapid transport of waste-derived constituents from the landfill footprint to the well field. Further, the concentration of the potentially hazardous chemicals derived from the TRH wastes could be sufficient to impair the uses of the well field groundwaters for domestic water supply purposes. **It is my professional recommendation that the TRH landfill not be allowed to expand by unrestricted acceptance of all C&D materials.**

It is also recommended that owners of the TRH landfill be required to demonstrate that the existing groundwater monitoring well array for detection of groundwater pollution by waste-derived constituents have a high probability of detecting this pollution near the edge of the TRH landfill footprint. This monitoring program should be conducted in such a way as to be able to be used as an early warning system for when the TRH landfill owners must initiate groundwater remediation to prevent waste-derived constituents from polluting Huber Heights groundwater supply.

Overall Assessment

There can readily be hazardous and deleterious chemicals leached from construction and demolition debris wastes that could be deposited at the Taylorsville Road Hardfill landfill that can be transported from under the landfill to the Huber Heights well field groundwaters. It is readily possible that the concentrations of these waste-derived constituents would be a threat to public health and other beneficial uses of these groundwaters for domestic water supply purposes.

John Geiger, the City of Huber Heights City Engineer, believes that any potential for contamination of its Rip Rap Road Well Field is undesirable and could be devastating. I support that conclusion. Allowing additional material to be buried in the TRH landfill provides a higher risk of accidental contamination. Not only is the drinking water to over 40,000 residents at risk, but also the city would also be tasked with seeking an alternative well field, which would cost millions of additional dollars that are not presently available. Consequently, it is imperative that the Taylorsvillc Road Hardfill landfill be restricted to accepting only the C&D waste materials that it has accepted in the past. It should not be allowed to accept unrestricted C&D waste.

G. Fred Lee PhD, DEE
December 28, 2002

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Dr. G. Fred Lee, DEE

Expertise and Experience in Hazardous Chemical Site and Municipal/Industrial Landfill Impact Assessment/Management

Dr. G. Fred Lee's work on hazardous chemical site and municipal/industrial landfill impact assessment began in the mid-1950s while he was an undergraduate student in environmental health sciences at San Jose State College in San Jose, California. His course and field work involved review of municipal and industrial solid waste landfill impacts on public health and the environment.

He obtained a Master of Science in Public Health degree from the University of North Carolina, Chapel Hill, in 1957. The focus of his masters degree work was on water quality evaluation and management with respect to public health and environmental protection from chemical constituents and pathogenic organisms.

Dr. Lee obtained a PhD degree specializing in environmental engineering from Harvard University in 1960. As part of this degree work he obtained further formal education in the fate, effects and significance and the development of control programs for chemical constituents in surface and ground water systems. An area of specialization during his PhD work was aquatic chemistry, which focused on the transport, fate and transformations of chemical constituents in aquatic (surface and ground water) and terrestrial systems as well as in waste management facilities.

For a 30-year period, he held university graduate-level teaching and research positions in departments of civil and environmental engineering at several major United States universities, including the University of Wisconsin-Madison, University of Texas at Dallas, and Colorado State University. During this period he taught graduate-level environmental engineering courses in water and wastewater analysis, water and wastewater treatment plant design, surface and ground water quality evaluation and management, and solid and hazardous waste management. He has published over 850 professional papers and reports on his research results and professional experience. His research included, beginning in the 1970s, the first work done on the impacts of organics on clay liners for landfills and waste piles/lagoons.

His work on the impacts of hazardous chemical site and municipal/industrial solid waste landfills began in the 1960s when, while directing the Water Chemistry Program in the Department of Civil and Environmental Engineering at the University of Wisconsin-Madison, he became involved in the review of the impacts of municipal solid waste landfills on groundwater quality.

In the 1970s, while he was Director of the Center for Environmental Studies at the University of Texas at Dallas, he was involved in the review of a number of municipal solid and industrial (hazardous) waste landfill situations, focusing on the impacts of releases from the landfill on public health and the environment.

In the early 1980s while holding a professorship in Civil and Environmental Engineering at Colorado State University, he served as an advisor to the town of Brush, Colorado, on the potential impacts of a proposed hazardous waste landfill on the groundwater resources of interest to the community. Based on this work, he published a paper in the Journal of the American Water Works Association discussing the ultimate failure of the liner systems proposed for that landfill in preventing groundwater pollution by landfill leachate. In 1984 this paper was judged by the Water Resources Division of the American Water Works Association as the best paper published in the journal for that year.

In the 1980s, he conducted a comprehensive review of the properties of HDPE liners of the type being used today for lining municipal solid waste and hazardous waste landfills with respect to their compatibility with landfill leachate and their expected performance in containing waste-derived constituents for as long as the waste will be a threat.

In the 1980s while he held the positions of Director of the Site Assessment and Remediation Division of a multi-university consortium hazardous waste research center and Distinguished Professor of Civil and Environmental Engineering at the New Jersey Institute of Technology, he was involved in numerous situations concerning the impact of landfilling of municipal solid waste on public health and the environment. He has served as an advisor to the states of California, Michigan, New Jersey and Texas on solid waste regulations and management. He was involved in evaluating the potential threat of uranium waste solids from radium watch dial painting on groundwater quality when disposed of by burial in a gravel pit. The public in the area of this state of New Jersey proposed disposal site objected to the State's proposed approach. Dr. Lee provided testimony in litigation, which caused the judge reviewing this matter to prohibit the State from proceeding with the disposal of uranium/radium waste at the proposed location.

Beginning in the 1960s, while a full-time university professor, Dr. Lee was a part-time private consultant to governmental agencies, industry and environmental groups on water quality and solid and hazardous waste and mining management issues. His work included evaluating the impacts of a number of municipal and industrial solid waste landfills. Much of this work was done on behalf of water utilities, governmental agencies and public interest groups who were concerned about the impacts of a proposed landfill on their groundwater resources, public health and the environment.

In 1989, he retired after 30 years of graduate-level university teaching and research and expanded the part-time consulting that he had been doing with governmental agencies, industry and community and environmental groups into a full-time activity. A principal area of his work since then has been assisting water utilities, municipalities, industry, community and environmental groups, agricultural interests and others in evaluating the potential public health and environmental impacts of proposed or existing hazardous, as well as municipal solid waste landfills. He has been involved in the review of approximately 65 different landfills and waste piles (tailings) in various parts of the United States and in other countries.

Dr. Anne Jones-Lee (his wife) and he have published extensively on the issues that should be considered in developing new or expanded municipal solid waste and hazardous waste landfills in order to protect the health, groundwater resources, environment and interests of those within the sphere of influence of the landfill. Their over 50 professional papers and reports on landfilling issues provide guidance not only on the problems of today's minimum US EPA Subtitle D landfills, but also on how landfilling of non-recyclable wastes can and should take place to protect public health, groundwater resources, the environment, and the interests of those within the sphere of influence of a landfill/waste management unit. They make many of their publications available as downloadable files from their web site, www.gfredlee.com.

Their work on landfill issues has particular relevance to Superfund site remediation, since regulatory agencies often propose to perform site remediation by developing an onsite landfill or capping waste materials that are present at the Superfund site. The proposed approach frequently falls short of providing true long-term health and environmental protection from the landfilled/ capped waste.

In the early 1990s, Dr. Lee was appointed to a California Environmental Protection Agency's Comparative Risk Project Human Health Subcommittee that reviewed the public health hazards of chemicals in California's air and water. In connection with this activity, Dr. Jones-Lee and he developed a report, "Impact of Municipal and Industrial Non-Hazardous Waste Landfills on Public Health and the Environment: An Overview," that served as a basis for the human health advisory committee to assess public health impacts of municipal landfills.

In addition to teaching and serving as a consultant in environmental engineering for over 40 years, Dr. Lee is a registered professional engineer in the state of Texas and a Diplomate in the American Academy of Environmental Engineers (AAEE). The latter recognizes his leadership roles in the environmental engineering field. He has served as the chief examiner for the AAEE in north-central California and New Jersey, where he has been responsible for administering examinations for professional engineers with extensive experience and expertise in various aspects of environmental engineering, including solid and hazardous waste management.

His work on landfill impacts has included developing and presenting several two-day short-courses devoted to landfills and groundwater quality protection issues. These courses have been presented through the American Society of Civil Engineers, the American Water Resources Association, and the National Ground Water Association in several United States cities, including New York, Atlanta, Seattle and Chicago, and the University of California Extension Programs at several of the UC campuses, as well as through other groups. He has also participated in a mine waste management short-course organized by the University of Wisconsin-Madison and the University of Nevada. He has been and continues to be an American Chemical Society tour speaker, where he is invited to lecture on landfills and groundwater quality protection issues, as well as domestic water supply water quality issues throughout the United States.

SUMMARY BIOGRAPHICAL INFORMATION

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EDUCATION

Ph.D. Environmental Engineering & Environmental Science, Harvard University, Cambridge, Mass. 1960

M.S.P.H. Environmental Science-Environmental Chemistry, School of Public Health, University of North Carolina, Chapel Hill, NC 1957

B.A. Environmental Health Science, San Jose State College, San Jose, CA 1955

ACADEMIC AND PROFESSIONAL EXPERIENCE

Current Position:

Consultant, President, G. Fred Lee and Associates

Previous Positions:

Distinguished Professor, Civil and Environmental Engineering, New Jersey Institute of Technology, Newark, NJ, 1984-89

Senior Consulting Engineer, EBASCO-Envirosphere, Lyndhurst, NJ (part-time), 1988-89

Coordinator, Estuarine and Marine Water Quality Management Program, NJ Marine Sciences Consortium Sea Grant Program, 1986

Director, Site Assessment and Remedial Action Division, Industry, Cooperative Center for Research in Hazardous and Toxic Substances, New Jersey Institute of Technology et al., Newark, NJ, 1984-1987

Professor, Department of Civil and Environmental Engineering, Texas Tech University, 1982-1984

Professor, Environmental Engineering, Colorado State University, 1978-1982

Professor, Environmental Engineering & Sciences; Director, Center of Environmental Studies, University of Texas at Dallas, 1973-1978

Professor of Water Chemistry, Department of Civil & Environmental Engineering, University of Wisconsin-Madison, 1961-1973

Registered Professional Engineer, State of Texas, Registration No. 39906

PUBLICATIONS AND AREAS OF ACTIVITY

Published over 850 professional papers, chapters in books, professional reports, and similar materials. The topics covered include:

- Studies on sources, significance, fate and the development of control programs for chemicals in aquatic and terrestrial systems.
- Analytical methods for chemical contaminants in fresh and marine waters.
- Landfills and groundwater quality protection issues.
- Impact of landfills on public health and environment.
- Environmental impact and management of various types of wastewater discharges including municipal, mining, electric generating stations, domestic and industrial wastes, paper and steel mill, refinery wastewaters, etc.
  Stormwater runoff water quality evaluation and BMP development for urban areas and highways.
- Eutrophication causes and control, groundwater quality impact of land disposal of municipal and industrial wastes, environmental impact of dredging and dredged material disposal, water quality modeling, hazard assessment for new and existing chemicals, water quality and sediment criteria and standards, water supply water quality, assessment of actual environmental impact of chemical contaminants on water quality.

LECTURES

Presented over 750 lectures at professional society meetings, universities, and to professional and public groups.

GRANTS AND AWARDS

Principal investigator for over six million dollars of contract and grant research in the water quality and solid and hazardous waste management field.

GRADUATE WORK CONDUCTED UNDER SUPERVISION OF G. FRED LEE

Over 90 M.S. theses and Ph.D. dissertations have been completed under the supervision of Dr. Lee.

ADVISORY ACTIVITIES

Consultant to numerous international, national and regional governmental agencies, community and environmental groups and industries.

Municipal Solid Waste Landfills and Groundwater Quality Protection Issues Publications

Drs. G. Fred Lee and Anne Jones-Lee have prepared several papers and reports on various aspects of municipal solid waste (MSW) management and hazardous waste management by landfilling, groundwater quality protection issues, as well as other issues of concern to those within a sphere of influence of a landfill. These materials provide an overview of the key problems associated with landfilling of MSW and hazardous waste utilizing lined "dry tomb" landfills and suggest alternative approaches for MSW management that will not lead to groundwater pollution by landfill leachate and protect the health and interests of those within the sphere of influence of a landfill. Copies of many of these papers and reports are available as downloadable files from Drs. G. Fred Lee's and Anne Jones-Lee's web page (http://www.gfredlee.com). Copies of these papers and reports listed below as well as a complete list of their publications on this and related topics are available upon request.

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Examples of Landfills Evaluated by Drs. G. Fred Lee and A. Jones-Lee	
Arizona *(State Landfilling Reg.*)	Verde Valley - Copper Tailings Pile Closure
California *(State Landfilling Reg.)*	Colusa County - CERRS Landfill San Gabriel Valley - Azusa Landfill City of Industry - Puente Hills Landfill North San Diego County, 3 landfills San Diego County - Gregory Canyon Landfill El Dorado County Landfill Yolo County Landfill Half Moon Bay - Apanolio Landfill Pittsburg - Keller Canyon Landfill Chuckwalla Valley - Eagle Mountain Landfill Barstow - Hidden Valley and Broadwell Hazardous Waste Landfills Cadiz - Bolo Station-Rail Cycle Landfill University of California-Davis Landfills San Marcos - San Marcos Landfill Placer County - Western Regional Sanitary Landfill Imperial County - Mesquite Landfill
Colorado (*State Landfilling Reg.)*	Last Chance/Brush - Hazardous Waste Landfill Denver - Lowry Hazardous Waste Landfill Telluride/Idarado Mine Tailings Uranium mine tailing
Florida (*State Landfilling Reg.*)	Alachua County Landfill
Illinois (*State Landfilling Reg.*)	Crystal Lake - McHenry County Landfill Wayne County Landfill
Indiana (*State Landfilling Reg.*)	Posey County Landfill New Haven-Adams Center Landfill (Hazardous Waste)
Michigan (*State Landfilling Reg.*)	Menominee Township - Landfill Ypsilanti- Waste Disposal Inc. (Hazardous Waste-PCB's)
Minnesota	Reserve Mining Co., Silver Bay - taconite tailings Superior FCR Landfill, Wright County
Missouri	Jefferson County - Bob's Home Service Hazardous Waste Landfill
New Jersey (*State Landfilling Reg.*)	Meadowlands – Landfill Fort Dix Landfill Scotch Plains Leaf Dump Radium watch dial painting waste disposal
New York	Staten Island - Fresh Kills Landfill Niagara Falls - Hazardous Waste Landfill Bronx Ferry Point Landfill

Ohio	Clermont County, Ohio - BFI/CECOS Hazardous Waste Landfill
Rhode Island	Richmond – Landfill
South Carolina	Spartanburg - Palmetto Landfill
Texas (*State Landfilling Regulations*)	Dallas/Sachse – Landfill Fort Worth - Acme Brick Hazardous Waste Landfill
Washington (*State Landfilling Reg.*)	Tacoma - 304th and Meridian Landfill
Wisconsin	Madison and Wausau Landfills Copper mine tailings
Ontario, Canada (*Prov. Landfilling Reg.*)	Greater Toronto Area - Landfill Siting Issues Kirkland Lake - Adams Mine Site Landfill Pembroke - Cott Solid Waste Disposal Areas
Manitoba, Canada (*Prov. Landfilling Reg.*)	Winnipeg Area - Rosser Landfill
New Brunswick, Canada (*Prov. Landfilling Reg.*)	St. John's - Crane Mountain Landfill
Mexico (*Haz. Waste Landfilling Reg.*)	San Luis Pontosi - Hazardous Waste Landfill
Puerto Rico	Salinas - Campo Sur Landfill Copper mine tailings
Hong Kong	Three New MSW Landfills
Korea	Yukong Gas Co. - Hazardous Waste Landfill
Belize	Mile 27 Landfill
New Zealand	North Waikato Regional Landfill

Surface and Groundwater Quality Evaluation and Management
and
Municipal Solid & Industrial Hazardous Waste Landfills

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Dr. G. Fred Lee and Dr. Anne Jones-Lee have prepared professional papers and reports on the various areas in which they are active in research and consulting including domestic water supply water quality, water and wastewater treatment, water pollution control, and the evaluation and management of the impacts of solid and hazardous wastes. Publications are available in the following areas:

Landfills and Groundwater Quality Protection

Water Quality Evaluation and Management for Wastewater Discharges

Stormwater Runoff, Ambient Waters and Pesticide Water Quality Management Issues, TMDL Development, Water Quality Criteria/Standards Development and Implementation

Impact of Hazardous Chemicals -- Superfund

LEHR Superfund Site Reports to DSCSOC

Lava Cap Mine Superfund Site reports to SYRCL

Smith Canal

Contaminated Sediment -- Aquafund, BPTCP, Sediment Quality Criteria

Domestic Water Supply Water Quality

Excessive Fertilization/Eutrophication, Nutrient Criteria

Reuse of Reclaimed Wastewaters

Watershed Based Water Quality Management Programs:

Sacramento River Watershed Program

Delta -- CALFED Program

Upper Newport Bay Watershed Program

San Joaquin River Watershed DO and OP Pesticide TMDL Programs

Stormwater Runoff Water Quality Science/Engineering Newsletter