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October 23, 2006

Louisiana Department of Environmental Quality
Public Participation Group
Post Office Box 4313
Baton Rouge, LA 70821-4313

Attn: Ms. Soumaya Ghosn

Re: AI Number 1036

Please find attached my comments on Louisiana Department of Environmental Quality's Decision for Utilization of Gentilly Landfill "Type III" for the Disposal of Hurricane Generated Debris. If there are questions on these comments please contact me.

G. Fred Lee. PhD, PE (TX), DEE

Comments on the Louisiana Department of Environmental Quality's Decision for Utilization of Gentilly Landfill "Type III" for the Disposal of Hurricane Generated Debris," Dated August 28, 2006

Comments Submitted by
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October 23, 2006

On August 28, 2006, C. Brown of the Louisiana Department of Environmental Quality (LDEQ) issued a "Decision for Utilization of Gentilly Landfill 'Type III' for the Disposal of Hurricane Generated Debris," which provides LDEQ's *"…justification for authorizing the continued operation and utilization of the Gentilly Landfill "Type III" (Gentilly or facility) in Orleans Parish, Louisiana for the disposal of hurricane generated construction and demolition (C&D) debris"* and allows the city of New Orleans to increase/expand the allowed hurricane debris (Katrina wastes) that can be deposited at the Gentilly Landfill "Type III" C&D landfill to 50,000 cubic yards per day. This expansion is primarily designed to accept demolition wastes from the removal of structures within the city that are no longer usable. The LDEQ Decision of August 2006 states, *"The LDEQ will provide public notice of this decision and an opportunity for public comment."* The comments provided herein are being submitted in response to the request for public comment.

These comments are based on my January/February 2006 review of the characteristics of the Old Gentilly landfill, a site visit to the new Gentilly class III C&D landfill developed on top of the Old Gentilly landfill, my familiarity with potential impacts of landfilled C&D wastes on public health and the environment, my over 40 years of professional experience devoted to evaluating the potential impacts of landfills on groundwater and air quality/resources in the vicinity of landfills, and the literature pertinent to landfill impact evaluation and management. As part of my reviewing the existing Old Gentilly landfill, I have conducted reviews of various reports on this landfill, including recently completing a detailed review of the NISTAC (2006) report. As discussed in Lee (2006a), I support the conclusions and recommendations set forth in the NISTAC report, based on the content of it and my independent review of the documents upon which the NISTAC report is based. The only deficiency in the NISTAC report is its failure to discuss the types of pollutants that have been found at other landfills where C&D wastes have been deposited, as well as information from the literature that demonstrates that C&D wastes contain a variety of hazardous and deleterious chemicals that are a threat to the environment when inadequately managed.

As part of developing disposal facilities for city of New Orleans Katrina wastes, LDEQ expanded the scope of the definition of C&D debris to include (see LDEQ Decision, beginning on page 6):

- "*Nonhazardous waste generally considered not water-soluble, including but not limited to metal, concrete, brick, asphalt, roofing materials, sheet rock, plaster,*

lumber from a construction or demolition project, and other building or structural materials;
- *Furniture, carpet, and painted or stained lumber contained in the demolished buildings;*
- *The incidental admixture of construction and demolition debris with asbestos-contaminated waste (i.e., incidental asbestos-contaminated debris that cannot be extracted from the demolition debris); and*
- *Yard waste and other vegetative matter."*

It is well known that the acceptance of organic wastes, such as yard wastes, in C&D landfills where plasterboard/wallboard is also accepted, can lead to hydrogen sulfide development that is a significant threat to public health and the environment. These issues are discussed in Lee and Jones-Lee (2006). They state on page 50,

> *"An issue of particular concern at C&D waste landfills is the management of hydrogen sulfide emissions from the landfill. Wallboard (which is composed of calcium sulfate), in the presence of decomposable organic matter and water, can produce large amounts of hydrogen sulfide, where the sulfate in wallboard is reduced by bacteria to sulfide. The US EPA (2005) is developing a guidebook on managing hydrogen sulfide at C&D waste disposal facilities. This guidance discusses the potential for hydrogen sulfide generated from the decomposition of wallboard in C&D landfills to not only cause an airborne nuisance to nearby individuals, but, at high concentrations, also a health threat. This guidance discusses approaches that can be used to minimize hydrogen sulfide production at C&D landfills."*

Also, the allowing of yard wastes and soils of the area to be deposited in the Gentilly Type III landfill will introduce pesticides and herbicides into the landfilled wastes, some of which will be present in leachate generated in this landfill that can ultimately pollute the groundwaters underlying it.

Further, according to the LDEQ Decision (page 6),

> *"Although the Emergency Declaration and Order has expanded the scope of C&D debris for hurricane generated debris, the material otherwise included is not considered to be a threat to the environment."*

This statement reflects LDEQ's technically invalid approach to assessing the potential threat that landfilled conventional C&D wastes, much less LDEQ's expanded definition of C&D wastes, can represent to public health and the environment. Of particular concern is the landfilling of City of New Orleans Katrina C&D wastes in an inadequately sited, designed, operated, monitored, closed landfill, such as locating a C&D landfill on top of the Old Gentilly landfill.

Previous Experience on C&D Landfill Impact Review

I first became involved in evaluating the potential impacts of municipal solid waste landfills on groundwater quality in the 1960s while I held the position of Professor of Water Chemistry and Director of the Water Chemistry Program at the University of Wisconsin, Madison. Appended

to these comments is a summary of my academic background and professional experience that is pertinent to evaluating the potential impacts of landfills. As indicated, I have extensive expertise and experience in evaluating the potential for wastes, when placed in a landfill, to generate leachate that can pollute groundwaters. I have been involved in reviewing the potential impacts of over 80 landfills located in various parts of the US and in other countries.

My previous experience in evaluating the potential impacts of landfilled conventional C&D wastes began in the 1980s, where on behalf of Richmond, Rhode Island, I was asked to review the potential threat that a proposed C&D waste landfill represented to Richmond's domestic water supply. I testified at a state of Rhode Island administrative hearing that the proposed C&D landfill was a significant threat to generate leachate that could cause groundwater pollution and thereby pollute (make unusable) Richmond's domestic water supply wells.

In 2002 the water utility for Huber Heights, Ohio, requested that I conduct a review of the potential impacts on the quality of their groundwater supply by a proposed expansion of the Taylorsville Road Hardfill facility. This facility is a C&D landfill, which is situated above an aquifer system that is hydraulically connected to the city's water supply wells. A report on these findings is provided by Lee (2002). This report summarizes studies that were conducted for the US EPA by ICF on the characteristics of C&D waste landfill leachate. ICF (1995a,b) reported that C&D waste landfills have been found to generate leachate that contains hazardous and deleterious chemicals that are a threat to groundwater resources.

In 2006 I was asked to review the potential impacts of constructing two C&D landfills in Morrow County, Ohio, with particular emphasis on the potential for these landfills to pollute the groundwaters underlying the landfill which are hydraulically connected to adjacent properties' water supply wells. I found that, based on the design of these two landfills and their proposed location, the placement of C&D wastes in these landfills represented a significant threat to groundwater quality and nearby property owners' domestic and agricultural water supply. A report summarizing these findings and presenting recommendations is available as Lee (2006b).

In February 2006, at the request of the Louisiana Environmental Action Network (LEAN), I prepared an affidavit on the potential public health and environmental problems of the placement of city of New Orleans Katrina C&D wastes in a new landfill to be constructed on top of the Old Gentilly landfill. This affidavit was submitted to LDEQ. A report containing the key information from the affidavit is available as Lee (2006c). The report based on the affidavit is attached as Appendix A to these comments. Further information on my qualifications to make these comments is contained in Appendix B.

Pollution Potential of C&D Landfills

My 2006 affidavit contained information derived from the US EPA (ICF 1995a,b) reports and a report by the Ohio EPA (2005) on the characteristics of conventional C&D waste landfill leachate. Subsequently, LDEQ attorneys deposed me on the information contained in the affidavit, in which I reaffirmed what is known in the literature and what is obvious from a knowledge of the characteristics of C&D wastes and their potential when contacted by water to leach chemicals that are a threat to groundwaters underlying a C&D landfill and, where the

groundwaters are discharged to surface waters, are a threat to aquatic life and other beneficial uses of the surface waters near the landfill.

Based on the current information, it is inappropriate to place large amounts of C&D Katrina wastes in a new C&D waste landfill on top of the Old Gentilly landfill. This approach could readily lead to significant additional pollution that is a threat to public health and the environment.

There is increasing evidence that components of conventional C&D wastes can readily contain hazardous chemicals. An example is the recent finding of polybrominated diphenyl ethers (PBDEs) as widespread environmental pollutants that are accumulating in human breast milk and wildlife (Renner 2000). PBDEs are carcinogens that have been used as fire retardants in some household furniture. PBDEs are a group of hazardous chemicals like PCBs that are part of the substantial arena of unregulated hazardous chemicals that are being found as widespread pollutants. There can be little doubt that LDEQ's expanded definition of C&D wastes, which includes furniture and other household materials that would be present in demolition wastes, will include PBDEs.

The situation with respect to finding PBDEs as widespread environmental pollutants is part of the growing recognition that the current regulatory approach for potentially hazardous chemicals considers only a few of the many thousands of chemicals that can be present in wastes which are a threat to public health, groundwater resources and the environment. In the affidavit submitted to LDEQ on the inappropriateness of constructing the Type III C&D waste landfill on top of the Old Gentilly landfill, I provided a discussion and references to the US EPA's recent discussion of the unregulated chemicals that can be present in wastes that are a threat to public health and the environment. Daughton (2002, 2004) of the US EPA has indicated that there are over 22 million organic and inorganic substances, with nearly 6 million commercially available. The current water quality regulatory approach addresses less than 200 of these chemicals. PBDEs are just one example of these types of chemicals. It is because of this situation that regulatory agencies need to take a much more protective approach toward the landfilling of wastes than has generally been followed in the past. This is especially true for C&D wastes, since regulatory agencies, like LDEQ, assume, without proper testing and evaluation, that C&D wastes are "inert" and do not release hazardous and deleterious chemicals in leachate formed from water coming into contact with the wastes.

In addition, recently it has become more widely recognized that construction and demolition wastes can contain appreciable quantities of recognized pollutants, such as PCBs. For many years PCBs were used in sealants in concrete joints and wooden structures. This means that construction and demolition wastes can contain PCBs. This issue has been recognized in Europe, Australia and other countries. There are a number of papers and reports on this issue from other countries, which provide additional information on the presence of PCBs in various types of structures. Of particular concern are the publications by Åstebro et al. (2000), BUWAL (date unknown) and CFMEU (date unknown). A comprehensive review of what was known in 2004 about PCBs in structures as a diffuse source of PCBs for the environment has been developed by Kohler et al. (2005).

An issue of increasing concern about waste wood is the potential for treated wood to leach arsenic, copper and chromium. Townsend and his associates at the University of Florida have conducted a number of studies on the leaching of these chemicals from treated wood (Townsend et al. 1998, Khan et al. 2004). They have found that the chemicals are somewhat leachable over a long period of time and represent a threat to groundwater quality.

Since the issues of recognized pollutants (such as PCBs) and unrecognized pollutants (such as PBDEs) in C&D wastes, as well as the studies by ICF and the Ohio EPA, were all brought to the attention of LDEQ in February 2006, it is of great concern that LDEQ would now, in August 2006 state,

> *"Although the Emergency Declaration and Order has expanded the scope of C&D debris for hurricane generated debris, the material otherwise included is not considered to be a threat to the environment."*

It is clear that LDEQ, as part of an effort to accommodate city of New Orleans Katrina C&D wastes in a less-than-real-cost disposal practice, is ignoring the literature developed by a number of sources which clearly indicates that landfilled conventional C&D wastes, much less the expanded definition of C&D wastes that LDEQ is using, can readily be a significant threat to cause environmental pollution.

Location of Gentilly C&D Landfill

While city of New Orleans Katrina C&D wastes can and should be landfilled in a properly sited, designed, operated, monitored and ultimately closed landfill(s), the Gentilly Type III landfill that has been approved by LDEQ on top of the Old Gentilly landfill is significantly deficient in meeting the needed landfill requirements for protection of public health and the environment. My independent review of the characteristics of the Old Gentilly landfill, as well as the NISTAC (2006) review, shows that this landfill was located in a wetlands area, with a high groundwater table over an unstable geological strata. The humus layers under the landfill are subject to deformation with increased load on them. Placing 130 feet of C&D wastes on top of the Old Gentilly landfill will represent a significant additional load on the underlying strata for the Old Gentilly landfill.

The fact that the Old Gentilly landfill is unlined and does not have a leachate collection system means that any leachate that has been and continues to be generated and passes through the Old Gentilly landfill will ultimately pollute the groundwaters of the area. The apparent failure to detect significant groundwater pollution by the Old Gentilly landfill reflects the inadequacy of the LDEQ-allowed groundwater monitoring at this landfill. LDEQ's allowing the clay cover for the Old Gentilly landfill to serve as the bottom liner for the new Type III landfill ignores the fact that leachate generated in this new Type III landfill for the Katrina C&D wastes will readily pass through this landfill's clay liner (the cap for the Old Gentilly landfill) into the Old Gentilly landfill and then ultimately into the groundwaters underlying it. Lee and Jones-Lee (2006) have discussed and provided references to the literature on the significant potential problems associated with landfill clay liners and clay caps in serving as reliable barriers for water/leachate penetration through them. While clay liners can, if properly constructed, delay the penetration of water/leachate through them, they will not prevent it.

There can be no doubt that, ultimately, hazardous and deleterious chemicals produced from the leaching of the Katrina C&D wastes in the new Type III landfill will, in time, pollute the groundwaters underlying and near the landfill. Since the shallow groundwaters associated with this landfill are connected to the surface waters, there is also no doubt that, ultimately, surface water pollution will occur from pollutants leached from the Katrina C&D wastes. A number of these pollutants can readily be threats to aquatic life and human health through consumption of aquatic life collected from the surface waters of the region. NISTAC correctly concluded that the deposition of city of New Orleans Katrina C&D wastes in the Gentilly Type III landfill could lead to significant environmental pollution that would require remediation. The cost of this remediation could be assessed to those who have approved the disposal of the city of New Orleans Katrina C&D wastes in what is clearly an inappropriate landfill to receive such wastes.

Beginning on the bottom of page 6 and continuing on page 7, the LDEQ Decision states,

> *"The Gentilly landfill was constructed over a previously closed municipal landfill. This 'piggyback' concept, i.e., the placement of one landfill on top of another, has been practiced not only in Louisiana but also throughout the country."*

LDEQ fails to discuss the significant problems with the so-called "piggy-backing" of one landfill on top of another. Such piggy-backing leads to an unstable situation with respect to the integrity of the liner for the top landfill as a result of the fact that the lower landfill is not a stable base upon which to develop a reliable landfill liner. For clay lined landfills such as the Gentilly Type III landfill, this will likely lead to more rapid failure to prevent leachate from passing through the liner than normally occurs.

The LDEQ Decision states on page 8,

> *"The Solid Waste Regulations require that construction and demolition debris landfills be constructed over an area with low permeable soils. The existing cover system of the closed municipal landfill at Gentilly, meets this requirement. In fact, during the consideration of Standard Permit P-0375, the department did not receive any public comment that placement of waste on top of the closed landfill would cause any adverse environmental impact."*

This statement indicates that LDEQ has an inappropriate approach to protecting the public's health, welfare and interests, where it evidently relies on the public to evaluate potentially significant problems with a proposed landfill design. LDEQ should be evaluating the adequacy of a proposed landfill design to protect public health, groundwater resources and the environment from constituents associated with the wastes for as long as the wastes placed in the landfill will be a threat to have releases of hazardous or deleterious chemicals that can pollute the environment. Clearly, LDEQ failed to properly evaluate the characteristics of the city of New Orleans Katrina C&D wastes to release pollutants in leachate that can pollute the groundwater resources under and near the Old Gentilly landfill.

Page 7 of the LDEQ Decision discusses the monitoring that was done in the vicinity of the Old Gentilly landfill, where LDEQ states,

> *"The data from these samples, as well as from the City's groundwater monitoring plan for Gentilly, demonstrate that there has been no adverse environmental impact from the old landfill."*

If LDEQ had conducted a detailed review of the adequacy of the past (and, for that matter, more recent) monitoring of groundwaters in the vicinity of the Old Gentilly landfill, they would have concluded, as did NISTAC, that there is an inadequate number of groundwater monitoring wells to detect preferential flow pathways for transport of leachate from the old landfill, and that the location of the city's monitoring well screens ignored the potential for shallow groundwater pollution by the landfill.

At the bottom of page 8 of the Decision, LDEQ states,

> *"The Gentilly Type III landfill is appropriate for the disposal of hurricane generated C&D debris. The facility meets all the technical requirements for a Type III landfill, as demonstrated by the issuance of the permit."*

An independent critical review would indicate that the LDEQ did not properly evaluate the characteristics of the city of New Orleans Katrina C&D wastes with respect to their pollution potential and the ability of the proposed Gentilly Type III landfill to properly manage the pollutants that will be associated with leachate generated within that landfill. Meeting the "technical requirements" of a permit does not necessarily mean that a proposed landfill will comply with the overall performance standard of the regulations of protecting public health and the environment for as long as the wastes in the landfill will be a threat. The above-quoted statement is circular and self-serving on the part of LDEQ in an attempt to justify the past and proposed continued disposal of city of New Orleans Katrina C&D wastes on top of the Old Gentilly landfill.

Louisiana Regulations Governing Landfilling

The state of Louisiana, LAC Title 33 Environmental Quality, Part VII Solid Waste (http://www.deq.louisiana.gov/portal/Portals/0/planning/regs/title33/33v07.doc), Subpart 1 Solid Waste Regulations, Chapter 1 General Provisions and Definitions, §101 Scope and Purpose, states, in part,

> *"Therefore, the Department of Environmental Quality has formulated these rules and regulations to:*
> *A. establish standards governing the storage, collection, recovery and reuse, and disposal of solid waste;*
> *B. implement a management program that will protect the air, groundwater, and surface water, and the environment from pollution from solid wastes and thus eliminate the potential threat to human health from such pollution;"*

Item B is clearly an overall performance standard that any LDEQ permit for a particular landfilling situation must achieve.

Chapter 1 General Provisions and Definitions, §115 Definitions includes,

> *"Landfill—a facility for the disposal of solid waste, other than landfarm(s) or surface impoundment(s), that disposes of solid waste by placing it on or into the land surface and usually also compacting and covering with suitable cover material to a depth and at a frequency sufficient to control disease vectors and odors and* ***in a manner that protects human health and the environment.****"* [Emphasis added.]

This definition further establishes that LDEQ has the responsibility, as part of permitting any landfill, **to protect human health and the environment**. This requirement overrides any technical requirements set forth in permitting a particular landfill. It is my experience that often "technical requirements," as interpreted by regulatory agency staff, can be deficient in complying with the overall performance standards established in the regulations, of protecting human health and the environment for as long as the wastes in the landfill will be a threat. This is the situation that has developed with LDEQ's permitting of the Gentilly Type III landfill. It is inappropriate for LDEQ to "justify" the permitting of the Gentilly Type III landfill based on meeting all of the technical requirements for permitting, without conducting a detailed review of whether this landfill will fully protect human health and the environment for as long as the wastes allowed to be deposited in it are a threat to release chemicals that can be adverse to the environment.

Chapter 1 General Provisions and Definitions, §315 Mandatory Provisions includes,

> *"P. Contamination of the Waters of the State. No person(s) shall cause, allow, or permit solid waste to be disposed of in such a manner that it enters the waters of the state. This does not apply to discharges into waters of the state in accordance with state or federal wastewater-discharge permits."*

The waters under and near the Old Gentilly landfill that will be polluted by the leachate generated within the Gentilly Type III C&D landfill are waters of the state and, therefore, this landfill will, in time, be in violation of one of the state of Louisiana's minimum Mandatory Provisions for landfilling of wastes.

With reference to the siting of the Gentilly Type III landfill on top of the Old Gentilly Landfill, Subchapter D Minor Processing and Disposal Facilities, §719 Standards Governing All Minor Processing and Disposal Facilities (Type III) states (on page 67),

> *"3. Environmental Characteristics. Facilities located in or within 1,000 feet of swamps, marshes, wetlands, estuaries, wildlife-hatchery areas, habitat of endangered species, archaeologic sites, historic sites, publicly owned recreation areas, and similar critical environmental areas shall be isolated from such areas by effective barriers that eliminate probable adverse impacts from facility operations."*

The Old Gentilly landfill was located in a swamp/wetlands area and, therefore, the Gentilly Type III landfill, located on top of the Old Gentilly landfill, is in violation of this siting requirement. However, LDEQ is attempting to address this deficiency by requiring the construction of a berm to prevent surface water runoff from the landfill from entering the nearby wetlands areas. LDEQ, however, has not addressed the hydraulic connection between waters under the Old Gentilly landfill, through shallow waters to surface waters in the adjacent wetlands. There can be no doubt that pollutants in leachate from the Gentilly Type III landfill will, in time, pass through the Old Gentilly landfill into the shallow groundwater underlying the landfill. This groundwater then will transport these pollutants to the surface waters of the region.

In addition, surface waters from the landfill, which will be polluted by landfilled wastes, are being collected in ponds inside the berm. These ponds are not lined, with the result that they will recharge shallow groundwaters of the area. There can be little doubt that the shallow groundwater underneath the ponds is connected to surface waters in the nearby wetlands. This is another reason why the permitting of the Gentilly Type III landfill will be in violation of the environmental characteristics requirements set forth in the above-quoted regulation.

Subchapter D Minor Processing and Disposal Facilities, §721 Construction and Demolition Debris and Woodwaste Landfills and Processing Facilities (Type III), C. Facility Operations, 1. Facility Limitations, includes (on page 68),

> *"f. The disposal of liquid waste, infectious waste, residential waste, industrial waste, commercial waste, friable asbestos, and putrescible waste shall be strictly prohibited and prevented."*

LDEQ's expanded definition of C&D wastes includes yard waste. Some components of yard waste are putrescible, and, therefore, the deposition of yard waste in the Gentilly Type III landfill could be in violation of this prohibition against putrescible waste. Further, the putrescible components of yard waste can serve as a source of energy for bacteria, which can convert the calcium sulfate in wallboard that is deposited in the landfill into hydrogen sulfide, which can be an environmental threat.

Subchapter D Minor Processing and Disposal Facilities, §721 Construction and Demolition Debris and Woodwaste Landfills and Processing Facilities (Type III), E. Facility Post-Closure Requirements states, in part,

> *"1. The time-frame of post-closure care may be lengthened, if necessary, to protect human health or the environment in accordance with LAC 33:I.Chapter 13."*

LAC 33:I Chapter 13 Risk Evaluation/Corrective Action Program, §1301 Scope, states, in part,

> *"C. No provision of this Chapter shall be construed to limit the department's authority to require additional remediation based upon site-specific conditions in order to protect human health and the environment."*

This chapter pertains to remediation of groundwater pollution at a landfill site and, therefore, would be applicable to the Gentilly Type III landfill. Since it may be a number of years before the pollution of the groundwaters by the Gentilly Type III C&D landfilled wastes becomes evident, it will be important that an ongoing *ad infinitum* monitoring program be conducted to determine when this pollution occurs. When it is detected it will be necessary that LDEQ's requirements for remediation be implemented, in order to clean up the pollution to the extent possible.

The key issue that will need to be addressed is a source of funding that will ensure that the ongoing monitoring and eventual Superfund-like remediation is implemented. It is important to note that the city of New Orleans, which developed and then was responsible for the Old Gentilly landfill, did not comply with regulatory requirements for proper closure of that landfill after it stopped accepting wastes. In order to avoid a similar situation with respect to the Gentilly Type III landfill, LDEQ should require that New Orleans, as the responsible party for the Gentilly Type III landfill, establish a dedicated trust fund of sufficient magnitude to address the needed remediation of the polluted groundwaters and surface waters that will occur at this site. Failure to do this could readily lead to more environmental pollution, without proper implementation of state of Louisiana regulatory requirements for landfilled wastes.

Protecting Human Health and the Environment

On page 13 of the Decision, LDEQ states as part of justifying the selection of Gentilly landfill for management of New Orleans Katrina C&D wastes,

> *"The landfill option has proven to be reliable, expedient, protective of human health and welfare and the environment, and economically feasible."*

Again, this is another self-serving statement. LDEQ cannot make such a statement with respect to the Gentilly Type III landfill being "protective of human health and welfare and the environment" for as long as the wastes that have been and could continue to be placed in this landfill are a threat to public health and the environment. The wastes in this landfill will be a threat to release pollutants for a very long period of time – effectively, forever. It is only over extended periods of time that the full magnitude of the error that LDEQ made in assessing the pollution potential of the city of New Orleans Katrina C&D wastes and the inappropriate siting, design, operation and closure of the Gentilly Type III landfill will become evident. At that time the liability that will accrue to New Orleans and others that have approved/allowed city of New Orleans Katrina C&D wastes to be deposited in that landfill will be able to be fully assessed. With respect to economic feasibility, it appears that LDEQ is opting for the near-term cheapest method possible for disposal of city of New Orleans Katrina C&D waste, ignoring the long-term liabilities and costs of eventually having to remediate the environmental pollution that will occur from this approach for managing the wastes.

On page 17 of the Decision, LDEQ states,

> *"In the LDEQ's experience, a C&D facility can **safely** dispose of up to fifty-thousand (50,000) cubic yards a day."* [Emphasis added.]

This reference to "safely" disposing of 50,000 cubic years per day does not pertain to environmental protection.

On the top of page 19 of the Decision, LDEQ states,

> *"A seventeen (17) acre area of Gentilly has not been closed in accordance with regulatory requirements. Though not in operation, this area has been scheduled for final closure. The final closure cover system will include (from top to bottom), compacted Class II subgrade, a geosynthetic clay liner (GCL) and a minimum 12-inch thick vegetated granular protective layer. At the same time, this component system will serve as an alternate liner for the disposal of construction demolition debris associated with the facility."*

Geosynthetic clay liners (GCL), while permitted by regulatory agencies as supplemental landfill liners and as a low-permeability layer in a landfill cover, are known to have significant problems in maintaining the initial low permeability that can be achieved through proper construction. Lee and Jones-Lee (2006) have reviewed the literature and provided a summary of key issues pertinent to the use of GCL in landfills. In certain environments, GCL systems can develop cracks which will allow rapid transport of water/leachate through them. Further, in attempting to use GCL as the liner for the upper Gentilly Type III landfill, there are significant potential problems associated with the lack of a firm, stable base upon which to construct the GCL. This can be an additional cause of failure of the liner to maintain its design characteristics.

The third paragraph on page 19 of the LDEQ Decision states,

> *"To address financial assurance concerns, a trust fund has been established for the benefit of the Louisiana Department of Environmental Quality for the payment of the closure costs of the Gentilly Landfill. The operator of the Gentilly landfill, pursuant to a contract with the City of New Orleans, is responsible for the closure of the landfill. The operator has deposited funds in this trust, which is based upon the amount of cubic yards of waste taken in by the landfill as of May 31, 2006."*

This so-called "financial assurance" trust fund is designed to only provide funds for closure of the Gentilly Type III landfill. No mention is made of the source of the funds that will be needed to monitor and maintain this closed landfill over the effectively infinite period of time that the wastes in this landfill will be a threat to pollute the environment. These issues need to be addressed as part of permitting the landfill, where an assured source of funding is available for post-closure monitoring and maintenance for as long as the wastes in the landfill will be a threat, and, most importantly, to fund the Superfund-like cleanup that will be needed when the Type III landfill begins to pollute the groundwaters of the region.

Groundwater Monitoring

LDEQ Administrative Order No. 1036 dated April 3, 2006, settlement between LEAN and LDEQ required a significantly improved groundwater monitoring program for detection of pollution of groundwater by the Gentilly Type III C & D Landfill, over that which has existed for the Old Gentilly Landfill. I reviewed the existing groundwater monitoring program for the Old

Gentilly Landfill, as did NISTAC (2006) and found (as did NISTAC) that the program was unreliable for detecting groundwater pollution by the Old Gentilly Landfill. Since the groundwater pollution that could arise from the Gentilly Type III C&D Landfill will occur as a result of leachate generation in that landfill that will pass through the Old Gentilly Landfill into the underlying groundwaters, the groundwater monitoring program that has existed for the Old Gentilly Landfill will also be significantly deficient in detecting groundwater pollution by the Gentilly Type III Landfill.

As part of the LEAN LDEQ litigation settlement, in August 2006 Metroplex Core (2006a) (Metroplex) submitted to Amid/Metro Partnership, a "Groundwater Installation and Monitoring Plan for the Gentilly Landfill 'Type III.'" This monitoring plan is an attachment to the LDEQ Decision. Metroplex states,

> *"This facility monitoring plan has been submitted in accordance with LDEQ Administrative Order No. 1036, and provides the location of monitor wells, well details, sampling procedures and frequencies, analytical parameters, monitoring data evaluation, and reporting procedures for site groundwater at the Gentilly Landfill 'Type III'. This monitoring plan will be instituted to provide an early warning of chemical changes in groundwater quality at the facility."*

I understand that LDEQ has approved this monitoring plan for the Gentilly Type III C&D landfill. This approval is subject to further review of public comments on it. I have conducted a detailed review of this monitoring plan and conclude that it is significantly deficient compared to the groundwater monitoring that will need to be conducted to reliably detect groundwater pollution by leachate-associated constituents developed within the Gentilly Type III landfill. A discussion of many of these deficiencies is presented below.

As discussed elsewhere in these comments, LDEQ has the responsibility, as part of permitting any landfill, **to protect human health and the environment**. A key component of protection of human health and the environment from landfilled wastes is the development and implementation of a groundwater/surface water monitoring program that will reliably detect when the landfill containment system fails to prevent release of contaminants from the landfill.

A review of the Louisiana Title 33 Environmental Quality, Part VII Solid Waste, Subpart 1 Solid Waste Regulations, Chapter 7 Solid Waste Standards, Subchapter B Landfills, Surface Impoundments, Landfarms shows that it apparently does not contain explicit groundwater monitoring requirements for Type III landfills. However, §709 Standards Governing All Solid Waste Disposal Facilities (Type I and II), E. Groundwater Monitoring (presented below) sets forth the requirements for groundwater monitoring for Type I and II landfills. While not identified as such in the LDEQ regulations, these requirements should also apply to Type III landfills, since the overall performance standards for landfilling of wastes set forth in Title 33, Part VII, Subpart 1, Chapter 1 General Provisions and Definitions, §115 Definitions includes, as part of the definition of "Landfill" that landfilling of solid wastes shall be done "… *in a manner that protects human health and the environment."*

The Louisiana LAC Title 33 regulations for groundwater monitoring for Type I and II landfills state,

E. Groundwater Monitoring

1. Groundwater Monitoring System

a. At each facility, a groundwater-monitoring system must be installed that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer (and the uppermost water-bearing permeable zone which will yield sufficient quantities of water for sampling if different from the uppermost aquifer and if deemed necessary by the administrative authority for adequate groundwater monitoring at the facility) that:

i. represent the quality of the background groundwater that has not been affected by leakage from a unit; and

ii. represent the quality of groundwater passing the relevant point of compliance. For the purposes of these regulations, the relevant point of compliance is the vertical surface which is located no more than 150 meters downgradient from the unit(s) being monitored and extends down into the uppermost aquifer underlying the facility and any other permeable zones being monitored. The relevant point of compliance must be on property owned or controlled by the permit holder and must be selected and subject to the approval of the administrative authority based on at least the following factors:

(a). hydrological characteristics of the facility and the surrounding land;

(b). volume and physical and chemical characteristics of the leachate;

(c). quantity, quality, and direction of flow of groundwater;

(d). proximity and withdrawal rate of the groundwater users;

(e). availability of alternative drinking water supplies;

(f). existing quality of the groundwater, including other sources of contamination and their cumulative impacts on the groundwater, and whether the groundwater is currently used or reasonably expected to be used for drinking water;

(g). public health, safety, and welfare effects; and

(h). practicable capability of the owner or operator.

b. Location of Wells

i. Enough monitoring wells must be located hydraulically upgradient of the facility to yield samples that represent background groundwater quality as required in Subparagraph E.1.a of this Section.

ii. A minimum of one upgradient well per zone monitored is required.

iii. Monitoring wells other than upgradient of the facility may be sampled for background groundwater quality if:

(a). hydrologic conditions do not allow the permit holder to determine which wells are hydraulically upgradient; or

(b). sampling at other wells will provide an indication of background groundwater quality that is more representative than sampling of upgradient wells.

iv. Enough monitoring wells must be located hydraulically downgradient from the facility to yield samples that are representative of the groundwater passing the relevant point of compliance. At least two downgradient wells per zone monitored must be provided. The downgradient wells must be screened in the same zone as the upgradient wells. Spacing between downgradient wells shall not exceed 800 feet.

v. The number, spacing, and depths of monitoring wells shall be determined based upon site-specific technical information that must include thorough characterization of:

(a). aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and

(b). saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer; including, but not limited to: thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.

As discussed below, Metroplex, in their proposed groundwater monitoring plan, has followed groundwater monitoring requirements for Type I and II landfills for such issues as maximum monitoring well spacing and length of well screens. This groundwater monitoring plan proposed by Amid/Metro Partnership and apparently approved by LDEQ includes eleven groundwater monitoring wells around the perimeter of the landfill. Three of these wells (MW 1, 2 and 3) are listed as upgradient and the remaining eight are "downgradient." While the text states that Figure 1 provides the "proposed monitoring well locations," a review of Figure 1 shows that only some of the monitoring well locations are shown. However, in the discussion of the surface water monitoring program presented in another attachment to the LDEQ Decision, Figure 5 shows both the surface water sampling points and the proposed groundwater monitoring wells.

A review of Figure 5 shows that the eight downgradient groundwater monitoring wells are spaced about 800 feet apart across the north side of the landfill, which is the maximum spacing allowed between downgradient monitoring wells for Type I and II landfills. Basically, Metroplex is proposing and LDEQ is apparently approving the least number of monitoring wells that could be developed if the Gentilly Type III landfill were a Type I or II.

The expected characteristics of the pollution of groundwaters underlying the Old Gentilly landfill by the Gentilly Type III landfill requires, as part of a site-specific evaluation, much closer groundwater well spacing than proposed by Metroplex. Gentilly Type III C&D landfill leachate will not pass through the liner for that landfill (which is the cap for the Old Gentilly Landfill) evenly, due to differential permeability at various locations in the liner/cap. This will lead to pollution plumes of limited lateral dimension underlying the Old Gentilly Landfill from the Gentilly Type III landfill. This, coupled with the complex hydrogeology of the strata underlying Old Gentilly Landfill, will make the proposed eight "downgradient" monitoring wells highly unreliable for detecting initial groundwater pollution by the Gentilly Type III landfill. Many

more monitoring wells will need to be used in order to have any significant likelihood of detecting initial pollution of the groundwaters by the Gentilly Type III landfill.

In accordance with LDEQ guidance on developing groundwater monitoring for Type I and II landfills quoted above, a site-specific evaluation of the hydrogeology of the landfill area should be used to develop the groundwater monitoring well array. As discussed by Lee and Jones-Lee (2006), this site-specific evaluation will need to include detailed characterization of the hydrogeology of the underlying groundwaters, and the associated pollution plumes that could arise from the pollutants in leachate generated within the Gentilly Type III landfill. Based on this evaluation, monitoring wells would need to be located around the perimeter of the Old Gentilly Landfill so that there is at least a 95 percent probability of detecting Gentilly Type III landfill leachate when it first reaches the location of groundwater monitoring.

Metroplex, on page 2-2, section 2.2 Monitor Well Details, states that, *"… the first water bearing strata is located approximately 20-feet to approximately 35-feet below ground surface."* Figure 2 of the Metroplex plan shows "Typical Monitoring Well Construction Detail," which shows the position of the typically 10-foot-long screens as "sand layer beneath humus layer."

As quoted above, the regulations for groundwater monitoring for Type I and II landfills require,

> *"At each facility, a groundwater-monitoring system must be installed that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer (and the uppermost water-bearing permeable zone which will yield sufficient quantities of water for sampling if different from the uppermost aquifer and if deemed necessary by the administrative authority for adequate groundwater monitoring at the facility) …".*

A review of the previous studies of the position of the groundwater table underlying the Old Gentilly Landfill shows that it is between two and six feet below the ground surface (NISTAC 2006). As NISTAC indicated and as is expected, the humus layer is quite permeable and can allow horizontal transport of pollutants that exit the bottom of the Old Gentilly Landfill. The shallow groundwater in the vicinity of the Old Gentilly Landfill can be polluted by the lateral transport of pollutants in the shallow groundwater originating under the Old Gentilly Landfill.

The screening of the proposed Gentilly Type III landfill monitoring wells from 20 to 35 feet below the ground surface in the sand layer beneath the humus layer is an inappropriate location for well screens for protection of human health and the environment associated with the Gentilly Type III landfill. While the sand layer could be a layer that could be used for domestic water supply, this is not an environmental pollution issue with respect to the Gentilly Type III landfill. The environmental pollution issue associated with both the Old Gentilly Landfill and the Gentilly Type III C&D landfill is the pollution of surface waters that then are a threat to aquatic life, wildlife and human health. Metroplex/LDEQ's proposed groundwater monitoring program could readily fail to detect polluted groundwaters that are exiting the footprint of the Old Gentilly Landfill with the proposed monitoring well screen locations.

Page 2-5, in section 2.3.2 Sampling Frequency and Analytical Parameters, states, *"Ground water sampling will be conducted for a 3 year period."* Three years of groundwater monitoring is grossly inadequate. As discussed elsewhere in these comments, the Gentilly Type III landfill, with its 130 feet of C&D wastes, has the potential to generate leachate for a very long period of time. For adequate public health and environmental protection, groundwater monitoring should be required for as long as the wastes in the landfill are a threat to generate leachate that can pollute groundwaters and surface waters.

While information is lacking on the permeability of the liner/cap, if it is of low permeability, then based on Darcy's Law calculations it could take several years for leachate generated in the Gentilly Type III landfill to penetrate through it. Only monitoring for three years could readily fail to detect the pollution from the Gentilly Type III landfill that will eventually occur.

Attachment 2 of the Metroplex plan presents the analytical parameters for groundwater monitoring. Table 2 presents Appendix 1 to Part 258 – Constituents for Detection Monitoring. While Metroplex proposes to monitor for Table 2 constituents for years 1 and 2 only, the monitoring for these constituents should continue annually until such time as the wastes in the Gentilly Type III landfill are no longer a threat to pollute groundwaters and surface waters.

Table 3 lists other water quality parameters for monitoring. Ammonia and total organic carbon should be added to this list. Further, it should be understood that new monitoring parameters can be added as new information is developed on unrecognized pollutants that are present in C&D wastes. The sampling and analysis of Table 3 water quality parameters, including the additions mentioned above, should be continued until the wastes are no longer a threat to generate leachate that could pollute groundwaters.

Surface Water Monitoring

Beginning on the bottom of page 19 of the Decision, LDEQ presents its monitoring/sampling plan for surface waters, where it states,

> ***"Surface Water Monitoring / Sampling Plan***
> *Any potential discharge/impact of groundwater to surrounding surface water bodies will be monitored by three surface water sampling ports (see attached map for sampling locations). These ports will consist of eight foot long slotted PVC pipes, screened between three feet to eight feet below the ground surface which will intercept the shallow perched water at the site.*
>
> *These ports will be sampled quarterly for three years for the indicator parameters in accordance with the Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards for the Landfills Point Source Category. A list of indicator parameters is provided in the attachment."*

This monitoring program is inadequate for protection of aquatic life and public health associated with the release of bioaccumulatable chemicals from the Gentilly Type III landfill. Chemical analytical methods are not necessarily sufficiently sensitive to detect the concentrations of these chemicals in water that can bioaccumulate in edible organisms to levels that are a hazard to those

who use the organisms as food. A credible surface water monitoring program should include an *ad infinitum* monitoring of aquatic life in the vicinity of the landfill, to determine if potentially hazardous chemicals are accumulating in the organisms' edible tissue. Three years of monitoring is grossly deficient compared to the time that the Gentilly Type III landfill has the potential to release hazardous chemicals to the groundwaters that can enter surface waters of the area.

Appended to the LDEQ Decision is the Sampling Protocols and Analysis Plan for Shallow Surface Water Sampling Ports (Metroplex 2006b). This presents the details of Metroplex's proposed surface water monitoring. As stated in this document,

> *"The following procedures will be used in the collection of surface water samples from the three shallow surface water sampling ports:*
>
> 1. *Samples will be obtained from three locations, as indicated on the attached figure.*
> 2. *Sampling will be obtained quarterly for a period of three years;*
> 3. *The sampling locations will be Cased Sampling Ports, consisting of PVC pipe with screened interval from 3 to 8 feet below existing grade;…"*

The "attached figure" mentioned in number 1 is Figure 2, which shows the location of the three surface water sampling ports. As discussed above, the pollution of the shallow groundwaters underlying the Old Gentilly Landfill by the Gentilly Type III landfill will not occur evenly over the footprint of the Old Gentilly Landfill. To assume that three so-called "surface water" sampling ports is adequate to detect areas of surface water that are polluted by leachate developed within the Type III landfill is naïve at best. The limited lateral dimension plumes of pollution that will occur under the Old Gentilly Landfill in the shallow groundwaters will initially pollute a limited area of shallow groundwater at some locations around the perimeter of the landfill. Many more sampling ports for detection of the pollution of shallow groundwaters will be needed than are proposed by Metroplex.

The previous review of the shallow groundwater flow direction (NISTAC 2006) has indicated that this direction is not adequately defined. There is need to conduct an intensive groundwater table location survey to define groundwater table elevations around the landfill, which can be used to define shallow groundwater flow direction. It will likely be necessary to make these measurements over several years and then periodically confirm the groundwater flow direction. This information is needed to begin to define the position of the sampling ports.

Item 2 states that, *"Sampling will be obtained quarterly for a period of three years."* As discussed above for groundwater monitoring, the monitoring of shallow groundwater will need to be conducted for a very long period of time – i.e., until the wastes in the Gentilly Type III landfill are no longer a threat. Metroplex describes the sampling locations as *"… Cased Sampling Ports, consisting of PVC pipe with screened interval from 3 to 8 feet below existing grade."* This approach to sampling the waters that can pollute surface waters near the Old Gentilly Landfill is not adequate. Sampling of the shallow groundwater at the perimeter of the Old Gentilly Landfill must be conducted with nested sampling ports located at frequent intervals

around the Old Gentilly Landfill perimeter. The sampling should be designed to detect narrow bands of polluted water at various depths in the shallow groundwater.

Metroplex's list of monitoring parameters for this sampling is extremely limited, and fails to include many of the parameters that could be derived from the Gentilly Type III landfill and could be important as pollutants for surface waters. A full suite of all potential pollutants, including VOCs, Priority Pollutants, and other compounds that are a threat to cause toxicity to aquatic life or to bioaccumulate to excessive levels in edible organisms should be monitored periodically for as long as the wastes in the Gentilly Type III landfill are a threat to generate leachate that could pollute groundwaters/surface waters.

In addition, aquatic organisms that inhabit the shallow groundwaters near the Old Gentilly Landfill should be sampled to determine their body burden for a variety of potentially hazardous chemicals. This sampling should be continued until such time as the Gentilly Type III landfill is no longer a threat to generate leachate that can pollute nearby surface waters.

Landfill Gas Migration

Previous studies of the area near the Old Gentilly Landfill detected landfill gas, which contained methane and other VOCs (see NISTAC 2006 for a summary). The acceptance of vegetative wastes at the Gentilly Type III landfill could lead to landfill gas formation within this landfill, which could lead to pollution of the near-surface soils and water table surface groundwaters around the Old Gentilly Landfill. Gas monitoring probes should be installed around the perimeter of the Old Gentilly Landfill to determine if the Gentilly Type III landfill is contributing landfill gas and other VOCs to the soils in these areas. Also, the groundwater monitoring should consider the fact that landfill gas can pollute the surface layer of the groundwater at the water table.

Conclusion

The Metroplex proposed groundwater and surface water monitoring programs for detection of pollution by the Gentilly Type III landfill are inadequate and need to be redeveloped in accordance with guidelines developed by LDEQ, in order to meet regulatory requirements of protecting human health and the environment. LDEQ made a significant error in originally permitting the deposition of C&D wastes on top of the Old Gentilly Landfill. This location is a highly unsuitable site for a landfill, which will be difficult to reliably monitor. Allowing more C&D wastes to be deposited in Gentilly Type III will compound the magnitude of the environmental pollution problems that will occur and thereby require that a very long period of highly effective groundwater monitoring be implemented to detect releases of pollutants from the Gentilly Type III landfill.

Overall, the LDEQ has unreliably assessed the potential for the city of New Orleans Katrina C&D wastes to generate leachate in the Gentilly Type III landfill that will pass through the Old Gentilly landfill into the underlying groundwaters. Chemicals in this leachate will pollute the groundwaters and potentially the surface waters of the area with hazardous and deleterious chemicals. The management of New Orleans Katrina C&D wastes should be conducted in landfills that can be reliably monitored and maintained to protect public health and the environment for as long as the wastes placed in the landfill are a threat.

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October 23, 2006

Appendix A

Summary of Findings on the Environmental Impacts of the Proposed C&D Landfill on Top of the Closed Gentilly Landfill[1]

My name is G. Fred Lee. I am the President of G. Fred Lee and Associates, a firm which specializes in addressing advanced aspects of water and wastewater management, water pollution control, and solid and hazardous waste management. I have a BA from San Jose State College, an MSPH (Master of Science in Public Health) from the University of North Carolina, and a PhD in Environmental Engineering from Harvard University, which I obtained in 1960. For 30 years, I held university graduate-level teaching and research positions at several major US universities focusing on water quality and solid and hazardous waste impact evaluation and management. During this time I conducted over $5 million in university research and published over 500 papers/reports on this research. A summary of my professional background pertinent to preparation of this report is attached as Exhibit 1. One of my special areas of interest is the siting, design and potential impacts of landfills, including municipal solid waste landfills and so-called "construction and demolition debris" landfills. As Exhibit 1 shows, I have often written and lectured on topics related to landfill design and impacts, and have testified in state court on these subjects.

II.

I have been supplied with several documents concerning the Gentilly Landfill site in Eastern New Orleans. These include the following:

Closure Plan dated March 1983,

Permit application for the Gentilly Landfill "Type III", Orleans Parish, Louisiana, September 2004,

Declarations of Emergency from the Louisiana Department of Environmental Quality,

Site Inspection Report for Gentilly Landfill, Orleans Parish, Louisiana, Prepared by Ecology and Environment for Louisiana Department of Environmental Quality, Baton Rouge, LA, June (1997),

January 20, 2006, LDEQ decision documents re the Gentilly landfill,

Limited Scope Phase I and Baseline Phase II Environmental Site Assessment prepared for Phillips and Jordan,

[1] Reference as Lee, G. F., "Summary of Findings on the Environmental Impacts of the Proposed C&D Landfill on Top of the Closed Gentilly Landfill," Submitted to Louisiana Department of Environmental Quality, Baton Rouge, LA, February (2006).

LDEQ Fourth Amended Declaration of Emergency,

LDEQ inspection dated October 2005 noting methane levels too high for open burning,

LDEQ letter to Corps of Engineers regarding asbestos disposal,

Correspondence from Gentilly Operator noting deviations from permit conditions,

Draft memorandum dated January 22, 2006 from NISTAC to Ken Sessa, FEMA.

Of particular note is that the Gentilly Type III landfill that is currently in use at this site for debris from New Orleans is sited over a former municipal waste landfill, which operated from the early 1960's until the mid-1980's. The municipal solid waste stream deposited in the former landfill contains a wide variety of known and yet-to-be-identified hazardous and otherwise deleterious chemicals that are a threat to public health and the quality of surface and groundwater. Common household items such as batteries, fluorescent bulbs, and cleaning fluids contain such hazardous chemicals. Among the waste components in municipal solid waste are a variety of heavy metals and organic compounds that are a threat to human health when ingested in drinking water and to aquatic life and wildlife.

The historic Gentilly landfill apparently had a cap consisting of approximately eighteen inches to two feet of silty clay, covered with topsoil. Lee and Jones-Lee (2005) have recently reviewed the potential problems with clay caps for landfills in preventing precipitation from entering landfilled wastes. The clay cap for the existing Gentilly landfill and the cap proposed for the Gentilly Type III C&D Landfill will not be effective barriers for preventing water from entering the C&D landfill and leachate (soluble waste components) generated in this landfill from entering the older Gentilly municipal solid waste landfill. Once water enters the landfill, it interacts with waste components to produce leachate containing hazardous and toxic substances. According to the records, the Gentilly Landfill waste was simply placed on the ground, so there is no liner to collect leachate and thereby prevent leachate escaping to the environment. Drs. G. Fred Lee and Anne Jones-Lee's website (www.gfredlee.com) contains several papers/reports discussing the potential impacts of groundwater pollution by municipal solid waste landfills.

The information summarized in the draft NISTAC report and the report prepared for Phillips and Jordan show groundwater contamination of the sort associated with municipal waste landfills. The very shallow groundwater aquifers at the site show levels of arsenic, lead and petroleum hydrocarbons in excess of Louisiana screening standards. Historically, even the deeper aquifer shows contamination with arsenic in particular that is above screening levels.

The NISTAC report expresses concern that the number of groundwater monitoring wells is insufficient to properly characterize the impacts of the closed landfill on groundwater. This is an accurate observation. The six wells that are present are not adequate to determine impacts to groundwater. Particularly troubling is that there does not appear to have been an accurate assessment of the number of wells that should be located downgradient of the landfill in the direction of groundwater flow. According to the reports this direction is generally north at the site.

The available documentation for the site characterizes the groundwater and surface water at the site as contiguous. Groundwater is found at as little as four feet below the surface of the landfill area. Historical groundwater monitoring, however, was only at a depth of approximately 28-30 feet. The temporary wells installed by the EE&G indicate that this was a significant oversight, since petroleum hydrocarbons were found in the shallow aquifer.

It is significant that the groundwater is so shallow, because according to the 1983 closure plan for the landfill, leachate is expected to simply enter the shallow groundwater and exit the site into adjacent ditches as surface water (1983 Closure Plan 2-5). At some point this groundwater will simply exit the site as contaminated surface water.

According to the documentation, the cap on the old MSW landfill is to serve as the liner for the new construction and demolition debris landfill. As noted above, such caps are not impermeable, and will allow penetration of water. According to the documents, the new construction and demolition landfill is to have a minimum of twelve inches of silty clay soils as a cap on the debris. Such a cap will let a substantial amount of precipitation enter the landfill, especially in an area like south Louisiana that receives approximately 60-80 inches of rain per year.

There are only two places for this water to go; either it will go sideways once it encounters the cap of the old landfill, and exit the landfill as surface runoff, or it will go through the cap and enter the old landfill. Once in this landfill, it will eventually exit the landfill into shallow groundwaters, and eventually enter surface waters as explained in the 1983 closure plan.

I have reviewed the definition of construction and demolition debris in the Louisiana regulations. This includes non-water soluble materials such as lumber, shingles, sheet rock and plaster, but the definition specifically excludes asbestos-contaminated waste, white goods (i.e., appliances), furniture, trash or treated lumber. However, the Emergency Declarations permit other materials, including furniture and other waste to be placed in Type III (C&D) landfills.

There are two points that are significant here. First, even landfills accepting only traditional construction and demolition debris can have adverse impacts on water quality through leaching of pollutants. 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. The ICF report was developed 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 maximum contaminant levels (MCLs), were found of 1,2-dichloroethane, methylene chloride, cadmium, iron, lead, manganese and total dissolved solids (TDS).

The Ohio Environmental Protection Agency (Ohio EPA 2005) recently characterized the contaminated leachate production from several C&D landfill sites. This report found that

leachate from construction and demolition landfills contains a number of contaminants at levels above LDEQ screening levels.

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 a 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 second point that is significant in the context of the Gentilly Landfill is that it is accepting mixed hurricane debris from New Orleans. This includes furniture, treated lumber and incidental waste mixed in with boards, bricks and other debris. Even modest amounts of items such as furniture, household wastes, contaminated sediment, or other wastes mixed in with construction debris can greatly increase the likelihood of contaminated leachate and water pollution. As an example is the recent finding that some household furniture is treated with polybrominated diphenyl ethers (PBDEs) as a fire retardant. PBDEs are carcinogens that are being found as widespread environmental pollutants that are accumulating in human breast milk and wildlife (Renner 2000). There is increasing concern that the current approach for examining landfill leachate and leachate-polluted groundwaters determines only a small number of the very large number of potential pollutants that can be present in landfill leachate. Daughton (2002, 2004a.b) of the US EPA has published several reports and papers on the inadequacies of current water quality monitoring in detecting potential pollutants.

It is also noteworthy that the two summaries of inspection reports I have examined indicate that items such as televisions, lawnmowers, and household appliances have been placed in the Gentilly landfill. These items are typically segregated even from municipal solid waste. This type of waste very clearly can produce contaminated leachate that would be very problematic in the long run.

The Gentilly Type III landfill site is in a location that makes it particularly susceptible to discharging polluted leachate to surface waters. Because the type III landfill is located on top of a municipal solid waste landfill with at best a two-foot clay cap, it is likely to add to the pollutant burden of the leachate from the closed landfill. The type of waste going into the Gentilly type III landfill is better suited to disposal in a Class II landfill, or at a minimum, a Class III landfill that is situated in an area with less readily available ground and surface water. Continued placement of waste in the Gentilly landfill has a high probability of causing significant environmental pollution.

G. Fred Lee, PhD, $PE_{(TX)}$, DEE
February 14, 2006

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Appendix B

Dr. G. Fred Lee, PE(TX), DEE
AAEE Board Certified Environmental Engineer

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 1,100 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.

Dr. Lee's expertise includes surface and ground water quality evaluation and management. This expertise is based on academic course work, research conducted by Dr. Lee and others and consulting activities. He has served as an advisor to numerous governmental agencies in the US and other countries on water quality issues. Further, he has served on several editorial boards for professional journals, including *Ground Water*, *Environmental Science and Technology*, *Environmental Toxicology and Chemistry*, etc. Throughout his over-45-year professional career, he has been a member of several professional organization committees, including chairing the American Water Works Association national Quality Control in Reservoirs Committee and the US Public Health Service PCBs in Drinking Water Committee.

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 85 different landfills and waste piles (tailings) in various parts of the United States and in other countries, including 12 hazardous waste landfills, eight Superfund site landfills and five construction and demolition waste landfills. He has also served as an advisor to a hazardous waste landfill developer and to IBM corporate headquarters and other companies on managing hazardous wastes.

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 120 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 2004 Dr Lee was selected as one of two independent peer reviewers by the Pottstown (PA) Landfill Closure Committee to review the adequacy of the proposed closure of the Pottstown Landfill to protect public health, groundwater resources and the environment for as long as the wastes in the closed landfill will be a threat.

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 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.

Throughout Dr. Lee's 30-year university graduate-level teaching and research career and his subsequent 16-year private consulting career, he has been active in developing professional papers and reports that are designed to help regulatory agencies and the public gain technical information on environmental quality management issues. Drs. Lee and Jones-Lee have provided a number of reviews on issues pertinent to the appropriate landfilling of solid wastes. Their most comprehensive review of municipal solid waste landfilling issues is what they call the "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," which was originally developed in 1992, and redeveloped and updated in the fall of 2004. Between the two versions they have published numerous invited and contributed papers that provide information on various aspects of municipal solid waste landfilling, with emphasis on protecting public health and the environment from waste components for as long as they will be a threat. The "Flawed Technology" review has been periodically updated, including the most recent update in March 2006, which can be found on their website at
http://www.members.aol.com/apple27298/SubtitleDFlawedTechnPap.pdf.

This review provides a comprehensive, integrated discussion of the problems that can occur with minimum-design Subtitle D landfills and landfills developed in accord with state regulations that conform to minimum Subtitle D requirements. The "Flawed Technology" review contains a listing of the various reviews that Drs. Lee and Jones-Lee have developed, as well as peer-reviewed literature. Over 40 peer-reviewed papers are cited in "Flawed Technology" supporting issues discussed in this review.

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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

Diplomate, American Academy of Environmental Engineers, Certificate No. 0701

PUBLICATIONS AND AREAS OF ACTIVITY

Published over 1,100 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 760 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). Recent papers and reports on landfilling issues are listed below. Copies of the papers and reports listed below as well as a complete list of publications on this and related topics are available upon request.

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Landfills Evaluated by G. Fred Lee and Anne Jones-Lee

Arizona *(State Landfilling Regulations)*	Verde Valley - Copper Tailings Pile Closure Mobile – Southpoint Landfill
California *(State Landfilling Regulations)*	Colusa County - CERRS Landfill San Gabriel Valley - Azusa Landfill (Superfund Site) 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 Mountain View – Mountain View Landfill Barstow - Hidden Valley (Hazardous Waste) Mohave Desert - Broadwell Landfill (Hazardous Waste) Cadiz - Bolo Station-Rail Cycle Landfill University of California-Davis Landfills (4) (3 Superfund Site) San Marcos - San Marcos Landfill Placer County - Western Regional Sanitary Landfill Placer County – Turkey Carcass Disposal Pits Imperial County - Mesquite Landfill Los Angeles County - Calabasas Landfill and Palos Verdes Landfill Contra Costa County – Concord Naval Weapons Station Tidal LF (Superfund) Nevada County - Lava Cap Mine Area Landfill (Superfund Site) Sylmar - Sunshine Canyon Landfill Roseville - Roseville Landfill San Diego County – Campo Landfill
Colorado (*State Landfilling Regulations*)	Last Chance/Brush – (Hazardous Waste Landfill) Denver - Lowry (Hazardous Waste Landfill) Telluride/Idarado Mine Tailings
Delaware	Various MSW landfills – Evaluate past disposal of industrial wastes
Florida	Alachua County Landfill
Georgia	Meriwether County – Turkey Run Landfill Hancock County – Culverton Plantation Landfill
Illinois (*State Landfilling Regulations*)	Crystal Lake - McHenry County Landfill Wayne County Landfill Kankakee County – Kankakee Landfill Peoria County – Peoria Waste Disposal (Hazardous Waste)
Indiana (*State Landfilling Regulations*)	Posey County Landfill New Haven-Adams Center Landfill (Hazardous Waste)
Louisiana	New Orleans vicinity - Gentilly Landfill
Michigan (*State Landfilling Regulations*)	Menominee Township - Landfill Ypsilanti- Waste Disposal Inc. (Hazardous Waste - PCB's)
Minnesota	Reserve Mining Co., Silver Bay - taconite tailings Wright County - Superior FCR Landfill
Missouri	Jefferson County - Bob's Home Service (Hazardous Waste)

New Jersey	Fort Dix Landfill (Superfund Site) Cherry Hill – GEMS (Superfund Site) Lyndhurst - Meadowlands Landfill Scotch Plains Leaf Dump
New York	Staten Island - Fresh Kills Landfill, Niagara Falls Landfill – (Hazardous Waste), New York City – Ferry Point Landfill
North Dakota	Turtle River Township - Grand Forks Balefill Facility Landfill
Ohio	Clermont County - BFI/CECOS Landfill (Hazardous Waste) Huber Heights - Taylorville Road Hardfill Landfill (C&DD) Morrow County – Washington and Harmony Townships C&DD Landfills
Pennsylvania	Pottstown – Pottstown Landfill
Rhode Island	Richmond – Landfill (C&D)
South Carolina	Spartanburg - Palmetto Landfill
Texas	Dallas/Sachse – Landfill Fort Worth - Acme Brick Landfill (Hazardous Waste) City of Dallas - Jim Miller Road Landfill Pasadena – Mobil Mining and Minerals industrial waste pile
Vermont	Coventry, Vermont - Coventry Landfill
Washington	Tacoma - 304th and Meridian Landfill
Wisconsin	Madison and Wausau Landfills
INTERNATIONAL LANDFILLS	
Belize	Mile 27 Landfill
Ontario, Canada (*Prov. Landfilling Regulations*)	Greater Toronto Area - Landfill Siting Issues Kirkland Lake - Adams Mine Site Landfill Pembroke - Cott Solid Waste Disposal Areas
Manitoba, Canada	Winnipeg Area - Rosser Landfill
New Brunswick, Canada	St. John's - Crane Mountain Landfill
Nova Scotia, Canada	Sydney Tar Ponds and Coke Ovens Site
England	Mercyside Waste Disposal Bootle Landfill
Hong Kong	Three New MSW Landfills
Ireland	County Cork - Bottlehill Landfill County Clare - Central Waste Management Facility, Ballyduff
Korea	Yukong Gas Co. - Hazardous Waste Landfill
Mexico (*Haz. Waste Landfilling Reg.*)	San Luis Pontosi Landfill- (Hazardous Waste)
New Zealand	North Waikato Regional Landfill
Puerto Rico	Salinas - Campo Sur Landfill

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

http://www.gfredlee.com

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 Newsletter

G. Fred Lee Advisory Services

G. Fred Lee & Associates was organized in the late 1960s to cover the part-time consulting activities that Dr. Lee undertook while a full-time university professor. In 1989, when Dr. Lee retired from 30 years of graduate-level teaching and research, he and Dr. Anne Jones-Lee, who was also a university professor, expanded G. Fred Lee & Associates into a full-time business activity. Examples of governmental agencies, consulting firms, citizens groups, industries and others for whom G. Fred Lee has served as an advisor include the following:

U.S. Environmental Protection Agency - Various Locations
Vison, Elkins, Searls, Connally & Smith, Attorneys - Houston, TX
International Joint Commission for the Great Lakes
U.S. Public Health Service - Washington, DC
Attorney General, State of Texas - Austin, TX
Madison Metropolitan Sewerage District - Madison, WI
Great Lakes Basin Commission - Windsor, Ontario
U.S. Army Environmental Hygiene Agency - Edgewood Arsenal, MD
City of Madison - Madison, WI
Council on Environmental Quality - Washington, DC
National Academies of Sciences and Engineering - Washington, DC
Water Quality Board State of Texas - Austin, TX
U.S. General Accounting Office - Washington, DC
U.S. Army Corps of Engineers - Vicksburg, MS
Tennessee Valley Authority - Various locations in Tennessee Valley
National Oceanic & Atmospheric Administration - Various locations
Organization for Economic Cooperation & Development - Paris
Attorney General, State of Illinois - Chicago, IL
State of Texas Hazardous Waste Legislative Committee - Austin
State of New Mexico Environmental Improvement Agency - Santa Fe
New York District Corps of Engineers - New York, NY
San Francisco District Corps of Engineers - San Francisco, CA
Wisconsin Electric Power Company - Milwaukee, WI
WAPORA - Washington, DC
Reserve Mining Company - Silver Bay, MN
United Engineers - Philadelphia, PA
Automated Environmental Systems - Long Island, NY
Procter & Gamble Company - Cincinnati, OH
Inland Steel Development Company - Chicago, IL
Kennecott Copper Corporation - Salt Lake City, UT
U.S. Steel Corporation - Pittsburgh, PA
Nekoosa Edwards, Inc. - WI
Zimpro, Inc. - Rothschild, WI
FMC Corporation - Philadelphia, PA
Acme Brick Company - Forth Worth, TX
Monsanto Chemical Company - St. Louis, MO
Gould, Inc. - Cleveland, OH
Illinois Petroleum Council - Chicago, IL
Inland Steel Corporation - Chicago, IL

Industrial Biotest Laboratories - Northbrook, IL
Wisconsin Pulp & Paper Industries - Upper Fox Valley, WI
Thilmany Pulp & Paper Company - Green Bay, WI
Chicago Park District - Chicago, IL
Nalco Chemical Company - Chicago, IL
Boise Cascade Development Company - Chicago, IL
Foley & Lardner, Attorneys - Milwaukee, WI
Timken & Lonsdorf, Attorneys - Wausau, WI
Strasburger, Price, Kelton, Martin & Unis, Attorneys - Dallas, TX
Rooks, Pitts, Fullagar & Poust, Attorneys - Chicago, IL
Jones, Day, Cockley & Reaves, Attorneys - Cleveland, OH
Sullivan, Hanft, Hastings, Fride & O'Brien, Attorneys - Duluth, MN
Hinshaw, Culbertson, Molemann, Hoban & Fuller, Attnys - Chicago, IL
Colorado Springs - Colorado Springs, CO
Mayer, Brown & Platt, Attorneys - Chicago, IL
Pueblo Area Council of Governments - Pueblo, CO
Platte River Power Authority - Fort Collins, CO
Linquist & Vennum, Attorneys - Minneapolis, MN
Norfolk District Corps of Engineers - Norfolk, VA
Spanish Ministry of Public Works - Madrid, Spain
The Netherlands - Rijkswaterstaat - Amsterdam, The Netherlands
U.S. Department of Energy - Various locations in US
King Industries - Norwalk, CT
Attorney General, State of Florida - Tallahassee, FL
State of Colorado Governor's Office - Denver, CO
Cities of Fort Collins, Longmont, and Loveland - CO
E.I. DuPont - Wilmington, DE
Allied Chemical Company - Morristown, NJ
Outboard Marine - Waukegan, IL
Amoco Oil Company - Denver, CO
Appalachian Timber Services - Charleston, WV
Mission Viejo Development - Denver, CO
Fisher, Brown, Huddleston & Gun, Attorneys - Fort Collins, CO
Tom Florczak, Attorney - Colorado Springs, CO
Wastewater Authority - Burlington, VT
Tad Foster, Attorney - Pueblo, CO
Holmes, Roberts & Owen, Attorneys - Denver, CO
Center for Energy and Environment Research - Puerto Rico
City of Brush - Brush, CO
Rock Island District Corps of Engineers - Rock Island, IL
Santo Domingo Water Authority - Dominican Republic
Ministry of Public Works and Environment - Buenos Aires, Argentina
Neville Chemical - Pittsburgh, PA
Fike Chemical Company - Huntington, WV
Stauffer Chemical Company - Richmond, CA
Adolph Coors Company - Golden, CO

Water Research Commission - South Africa
Grinnell Fire Protection Systems - Lubbock, TX
City of Lubbock Parks Department - Lubbock, TX
National Planning Council - Amman, Jordan
City of Olathe - Olathe, KS
City of Lubbock - Lubbock, TX
US AID - Amman, Jordan
Buffalo Springs Lake Improvement Association - Buffalo Springs, TX
Union Carbide Company - Charleston, WV
Canadian River Municipal Water Authority - Lake Meredith, TX
Mobil Chemical Company - Pasadena, TX
Unilever Ltd. - Rotterdam, The Netherlands
Brazos River Authority - Waco, TX
U.S. Army Construction Engineering Research Laboratory - Champaign, IL
James Yoho, Attorney - Danville, IL
Zukowsky, Rogers & Flood, Attorneys - Crystal Lake, IL
State of California Water Resources Control Board - Sacramento
Public Service Electric & Gas - Newark, NJ
Health Officer - Boonton Township, NJ
Scotland & Robeson Counties - Lumberton, NC
International Business Machines Corporation - White Plains, NY
Newark Watershed Conservation & Development Authority - NJ
State of Vermont Planning Agency - Montpelier, VT
CDM, Inc. - Edison, NJ
Attorney General, State of North Carolina - Raleigh, NC
City of Vernon - Vernon, NJ
Ebasco Services - Lyndhurst, NJ
Kraft, Inc. - Northbrook IL, with work in Canada, FL and MN
USSR Academy of Sciences - Moscow, USSR
Tillinghast, Collins & Graham, Attorneys - Providence, RI
City of Richmond, RI
Idarado Mining Company - Telluride, CO
Levy, Angstreich, Attorneys - Cherry Hill, NJ
Newport City Development - Jersey City, NJ
Orbe, Nugent & Collins, Attorneys - Ridgewood, NJ
Schmeltzer, Aptaker & Shepard, Attorneys - Washington, DC
CP Chemical - Sewaren, NJ
Dan Walsh, Attorney - Carson City, NJ
William Cody Kelly - Lake Tahoe, NV
NJ Department of Environmental Protection - Trenton, NJ
Hufstedler, Miller, Kaus & Beardsley, Attorneys - Los Angeles, CA
Main San Gabriel Basin Watermaster - CA
Metropolitan Water District of Southern California - Los Angeles, CA
San Diego Unified Port District - San Diego, CA
Delta Wetlands - CA
Simpson Paper Company - Humboldt County, CA

City of Sacramento - CA
Northern California Legal Services - Sacramento, CA
Rocketdyne - Canoga Park, CA
RR&C Development Co. - City of Industry, CA
American Dental Association - Chicago, IL
Emerald Environmental - Phoenix, AZ
Clayton Chemical Company - Sauget, IL
Stanford Ranch - Rocklin, CA
Public Liaison Committee - Kirkland Lake, Ontario
Miller Brewing Company, Los Angeles, CA
ASARCO Inc., Tacoma, WA
CALAMCO, Stockton, CA
Yunkong Gas Company, South Korea
Sutherlands, Pembroke, Ontario
Silverado Constructors, Irvine, CA
Agricultural Interests in Puerto Rico
City of Winnipeg, Manitoba
Strain Orchards, Colusa, CA
Davis South Campus Superfund Oversight Committee, Davis, CA
Monterrey County, California Housing Authority, Salinas, CA
CROWD, Tacoma, WA
Newport Beach, CA
SOLVE, Phoenix, AZ
Sports Fishing Alliance, San Francisco, CA
Caltrans (California Department of Transportation)
Citizens Group near St. John's, New Brunswick
Colonna Shipyards, Norfolk, VA
Clermont County, OH
Wright County, MN
Waikato River Protection Society, New Zealand
Drobac & Drobac, Attorneys, Santa Cruz, CA
Phelps Dunbar, L.L.P., Houston, TX
Walters Williams & Co, New Zealand
Environmental Protection Department, Hong Kong
NYPRIG New York City, NY
DeltaKeeper, Stockton
City of Stockton, CA
Central Valley Regional Water Quality Board, Sacramento, CA
Carson Harbor Village, Carson, CA
Sanitary District of Hammond, IN
South Bay CARES, Los Angeles, CA
Memphremagog Regional Council, Quebec, CANADA
Mobile, AZ
Pottstown Landfill Closure Committee, Pottstown, PA
Grand Forks County Citizens Coalition, Grand Forks, ND
Sunshine Canyon Landfill, Sylmar, CA
Meriwether County, GA
Hancock County, GA

Louisiana Environmental and Action Network, Baton Rouge, LA
OUTRAGE and POWER, Kankakee, IL
John Cobey et al., Morrow County, OH
Heart of Illinois Sierra Club and Peoria Families Against Toxic Waste, Peoria, IL
Sierra Club of Canada, Cape Breton Group, Nova Scotia
Backcountry Against Dumps, Boulevard, CA