SOAH DOCKET NO. 582-08-2186
TCEQ DOCKET NO. 2006-0612-MSW

IN THE MATTER OF THE APPLICATION OF WASTE MANAGEMENT OF TEXAS, INC., FOR A MUNICIPAL SOLID WASTE PERMIT AMENDMENT PERMIT NO. MSW-249D	§ § § § § § §	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PREFILED DIRECT TESTIMONY

OF

PIERCE L. CHANDLER, JR., P.E.

ON BEHALF OF TJFA, L.P.

FEBRUARY 13, 2009

EXHIBIT TJFA 400

PREFILED DIRECT TESTIMONY OF
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I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME.

A. Pierce L. Chandler, Jr.

Q. PLEASE STATE YOUR BUSINESS ADDRESS AND TELEPHONE NUMBER.

A. My business address is Pierce L. Chandler, Jr., P.E., 1204 Bayshore, Rockwall, Texas, 75087. My telephone number is (972) 740-8827. I reside and office in Rockwall, Texas.

Q. PLEASE DESCRIBE YOUR OCCUPATION.

A. I own and operate my own engineering company, Pierce L. Chandler, Jr., P.E.—a sole proprietorship, which I established in 1997. It is registered with the Texas Board of Professional Engineers, Registered Engineering Firm, Texas No. 566.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I received my Bachelor of Science in Aerospace Engineering from the University of Texas at Arlington in 1967, and my Master of Science in Civil Engineering from Texas A&M University in 1971.

Q. WHAT IS YOUR OCCUPATION?

A. I am a civil engineering and hydrogeology consultant.

Q. PLEASE DESCRIBE THE NATURE OF YOUR PROFESSIONAL WORK.

A. In a professional career spanning over forty (40) years, I have over thirty (30) years of principal engineering experience in siting, investigating, designing, permitting, constructing, operating, and remediating solid waste management facilities—both municipal and hazardous. I have also critically reviewed and evaluated a number of waste management facility designs and operations. I have performed site characterization and design engineering for a number of municipal solid waste ("MSW") projects in the State of Texas, including preparation of permit applications. I also have extensive experience in public infrastructure, earthen dams, electric power generating facilities, and surface mines.

Q. ARE YOU A LICENSED PROFESSIONAL ENGINEER?

A. Yes. I am a licensed professional engineer in the State of Texas.

Q. WHEN DID YOU BECOME A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS?

A. I have been licensed in the State of Texas since February 22, 1972. My professional license number is 33368.

Q. DO YOU HAVE ANY OTHER LICENSES OR REGISTRATIONS?

A. Yes. I am a registered member (RM-531880) of the Society of Mining Engineers.

Q. ARE YOU RECOGNIZED AS A "QUALIFIED GROUNDWATER SCIENTIST," AS THAT TERM IS USED IN BOTH FEDERAL AND STATE ENVIRONMENTAL REGULATIONS?

A. I have been recognized by both the U.S. Environmental Protection Agency ("EPA") and the Texas Commission on Environmental Quality ("TCEQ" or the "Commission") and predecessor agencies as a "qualified groundwater scientist" since the early 1980s. For reference purposes, the term "qualified groundwater scientist" is defined by TCEQ at 30 TEX. ADMIN. CODE § 330.3(120) as:

> a licensed geoscientist or licensed engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training in groundwater hydrology and related fields as may be demonstrated by state registration, professional certifications, or completion of accredited university programs that enable the individual to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action.

Q. WHAT IS YOUR PREVIOUS EMPLOYMENT HISTORY?

A. The following summarizes my employment history: self employed consultant, 1997 through present; Black & Veatch, 1994 through 1997; PRC Environmental Management, 1993 through 1994; HDR Engineering ("HDR"), 1990 through 1993; Harding Lawson Associates, 1987 through 1990; Trinity Engineering Testing Corporation, 1983 through 1987; self-employed consultant, 1982 through 1983; Rone Engineers, 1982 through 1982; Pekor Pump Company, 1976 through 1977, and consultant, 1977 through 1987;

NFS/National Soil Services, 1973 through 1976 and 1977 through 1982; U.S. Army Corps of Engineers Waterways Experiment Station, 1971 through 1972; Center for Dredging Studies at Texas A&M University, 1970 through 1971; and LTV Aerospace Corporation, 1963 through 1970.

Q. APPROXIMATELY HOW MANY SOLID WASTE PROJECTS HAVE YOU WORKED ON IN A PROFESSIONAL CAPACITY?

A. I do not really know relative to "projects," as I have never actually counted them. I have provided professional work products as both a hydrogeologist and engineer at over one hundred (100) solid waste management facilities in both hazardous and non-hazardous waste, including MSW. A "facility" as I am using that term may have included one or more solid waste management units ("SWMUs"). For example, at NAS Cecil Field, the facility included eighteen SWMUs. There could be a large number of "projects" associated with a SWMU over a lifetime from inception through post-closure. For example, for the McKinney Landfill, I had over fifty projects including permit amendments and modifications, Soil Liner Evaluation Reports ("SLERs"), ground water and landfill gas monitoring, *et cetera*.

Q. PLEASE IDENTIFY SOME OF THE MAJOR SOLID WASTE LANDFILL APPLICATIONS ON WHICH YOU HAVE WORKED IN THE STATE OF TEXAS.

A. Most recently, I was the engineer of record, and thus was largely responsible for the design and permit application, for the North Texas Municipal Water District's ("NTMWD") permit application for a new landfill in Collin County, the 121 Regional Disposal Facility ("121 RDF"), a 450-acre MSW landfill. While I was employed by

HDR, I was the engineer of record and hydrogeologist responsible for the conceptual design and the original permit amendment application to expand the landfill and the ground water monitoring system for Waste Management's Skyline Landfill near Dallas, a 670-acre MSW landfill. It should be noted that I left HDR prior to the contested case hearing, and John N. Furlong, P.E., was the engineer of record at the time of the hearing. At the contested case hearings involving the Skyline Landfill, I testified on issues related to land use, design, and hydrogeology. Prior to that I was the engineer of record for a permit amendment application involving the McKinney Landfill, which remediated the existing site and expanded the MSW landfill. For information on other applications, please refer to my résumé.

Q. DO YOU HAVE OTHER EXPERIENCE RELATED TO MSW FACILITIES?

A. Yes, other examples of my MSW-related experience include: peer review on behalf of Waste Management for a permit amendment application to expand Waste Management's Dallas/Fort Worth Landfill (the "DFW Landfill") (a MSW landfill); quality assurance/quality control ("QA/QC") reviewer on behalf of Waste Management for a new Waste Management landfill permit application in Kendall County, Illinois; geotechnical/hydrogeologic characterization for a proposed MSW landfill in Alpine, Texas; engineering drawing preparation for a performance-based liner and leachate collection system design modification as part of a Subtitle D permit modification for the Texas Disposal Systems Landfill and Compost Facility (a MSW landfill) in Travis County, Texas; a regional MSW landfill study in Chambers County, Texas; and a four-county solid waste management plan for a regional MSW landfill serving cities in the Texas panhandle.

Q. HAVE YOU EVER TESTIFIED IN ANY ADMINISTRATIVE OR LEGAL PROCEEDING REGARDING MSW FACILITIES?

A. Yes, I have.

Q. PLEASE IDENTIFY REPRESENTATIVE CASES WHERE YOU HAVE PROVIDED EXPERT TESTIMONY IN AN ADMINISTRATIVE HEARING INVOLVING MSW FACILITIES.

A. The list would include:

- NTMWD's 121 RDF;
- the McKinney Landfill;
- Waste Management's Skyline Landfill;
- the Blue Flats Disposal Landfill;
- the Adobe EcoSystems Landfill;
- Texas Organic Products' composting facility;
- IESI's Jack County Landfill; and
- BFI Waste Industries of North America, Inc.'s ("BFI") Sunset Farms Landfill.

Q. HAVE YOU EVER BEEN DEEMED UNQUALIFIED TO PRESENT YOUR EXPERT TESTIMONY AT AN ADMINISTRATIVE HEARING?

A. No.

Q. HAVE YOU ALSO PRESENTED EXPERT TESTIMONY BEFORE STATE AND FEDERAL COURTS OF LAW?

A. Yes.

Q. HAVE YOU EVER BEEN DEEMED UNQUALIFIED TO PRESENT YOUR EXPERT TESTIMONY AT ANY OF THOSE LEGAL PROCEEDINGS?

A. No, I have not.

Q. HAS YOUR PRIOR PARTICIPATION IN ADMINISTRATIVE OR LEGAL PROCEEDINGS INVOLVING MSW FACILITIES ALWAYS BEEN ON BEHALF OF PARTIES OPPOSING SUCH FACILITIES?

A. Not at all. For example, I provided expert testimony on behalf of the applicant for the first four projects itemized above: NTMWD's 121 RDF, the McKinney Landfill, Waste Management's Skyline Landfill, and the Blue Flats Disposal Landfill. In addition, much of my engineering consulting work for MSW landfill projects that have not resulted in administrative or legal proceedings, has been on behalf of the owner and/or operator of MSW facilities. For example, I have been a peer reviewer and a QA/QC reviewer on behalf of Waste Management for Waste Management's MSW landfill facilities in the Dallas/Fort Worth area and Kendall County, Illinois (the Willow Run Landfill), respectively.

Q. BY WHOM ARE YOU RETAINED FOR YOUR REVIEW AND EVALUATION OF WASTE MANAGEMENT OF TEXAS' ("WMTX" OR "APPLICANT") AMENDMENT APPLICATION (THE "ACL AMENDMENT APPLICATION") TO EXPAND THE AUSTIN COMMUNITY RECYCLING AND DISPOSAL FACILITY, ALSO KNOWN AS THE AUSTIN COMMUNITY LANDFILL ("ACL"), *i.e.*, THE SUBJECT OF THIS PROCEEDING?

A. I have been retained by TJFA, L.P. ("TJFA"), a protestant in this proceeding.

Q. HAVE YOU AUTHORED ANY PUBLICATIONS?

A. Yes. I was a co-author of the two-volume 1998 EPA publication, *Evaluation of Subsurface Engineered Barriers at Waste Sites* (EPA 542-R-98-005, August 1998), published by EPA's Office of Solid Waste and Emergency Response ("OSWER") in 1998.

Q. DID THAT PUBLICATION ADDRESS GROUND WATER PROTECTION MEASURES?

A. Yes. It examined and evaluated available containment methodologies (subsurface engineered barriers) to isolate waste from ground water and surface water and prevent migration of contamination. Volume II of the report contained thirty-six (36) case histories detailing performance of the various containment methods. One of the included case histories was for a MSW landfill in Texas.

Q. HAVE YOU TAUGHT ANY ACADEMIC COURSES?

A. Yes. From 1987 through 1996, I taught graduate level contaminant hydrogeology courses at the University of Texas at Dallas.

Q. IN GENERAL, WHAT WAS THE FOCUS OF THE COURSES YOU TAUGHT?

A. The contaminant hydrogeology courses focused on subsurface investigations and characterizations of the subsurface, including ground water characterization and fate and transport of contaminants in the subsurface. The courses were provided in the context of compliance with federal environmental regulatory requirements.

Q. DO YOU HAVE EXPERTISE IN SUBSURFACE EVALUATIONS?

A. Yes. Beginning in 1973, I have conducted numerous subsurface evaluations using intrusive methodologies, tracer studies, and geophysics. I also supervised subsurface evaluations and trained professional staff in that specialty. I subsequently condensed the training program I had developed and included it in the course I taught for nine years at the University of Texas in Dallas.

Q. PLEASE DESCRIBE YOUR EXPERIENCE IN SUBSURFACE EVALUATIONS?

A. Almost all of the major projects on which I have consulted—public infrastructure, dams, power plants, surface mines, and waste management facilities—have required detailed subsurface investigation and characterization, including hydrogeology. I have planned, conducted, and evaluated numerous subsurface investigations for these projects.

Q. DO YOU HAVE EXPERTISE IN INTERPRETING SOIL BORINGS?

A. Yes. I have extensive experience in planning, executing, and interpreting soil borings and soil boring information.

Q. PLEASE DESCRIBE YOUR EXPERIENCE RELATED TO SOIL BORINGS AND SUBSURFACE CHARACTERIZATION.

A. The great majority of my consulting work over the past thirty-five (35) years has involved soil borings, geophysics, and subsurface characterization. My consulting work includes designing and constructing public infrastructure, dams, power plants, surface mines, and waste management facilities as well as remedial investigations at waste sites. I have worked on approximately twenty-five (25) dams, twenty (20) surface mines, and a number of remediation projects.

Q. IS HYDROGEOLOGIC CHARACTERIZATION IMPORTANT FOR SITES OTHER THAN WASTE SITES?

A. Yes. Hydrogeologic characterization is absolutely critical to the design and operation of dams. Hydrogeologic characterization is also absolutely essential in planning and conducting surface mining. Hydrogeologic characterization is critical for almost any project which requires excavation into the subsurface and/or foundation support from the soil.

Q. DO YOU HAVE EXPERIENCE IN THE DESIGN AND INSTALLATION OF GROUND WATER MONITORING WELL SYSTEMS FOR SOLID WASTE FACILITIES?

A. Yes. Within just the last fifteen (15) years or so, I have designed, supervised the installation of, and provided the certification for the ground water monitoring systems for the Maxwell Creek Landfill (a MSW landfill), the McKinney Landfill (a MSW landfill), the 121 RDF (a MSW landfill), and the Skyline Landfill (a MSW landfill). Over the last thirty (30) years, I have also designed, supervised installation, and evaluated results of ground water monitoring systems at hazardous waste sites and MSW sites for both contamination detection purposes and to determine the magnitude and extent of any ground water contamination. In addition to environmental ground water monitoring wells, I have also designed and supervised installation of piezometers (a type of monitoring well used only for water presence/water level) at solid waste sites to assist in the characterization of ground water. Although not for contaminant detection, I have also designed, supervised the installation of, and reviewed results for the ground water

monitoring systems at a number of dams, *i.e.*, seepage pressure and flow volume monitoring.

Q. DO YOU HAVE ANY EXPERIENCE IN SOIL GAS AND/OR LANDFILL GAS INVESTIGATIONS AT SOLID WASTE MANAGEMENT FACILITIES?

A. Yes. I have approximately twenty (20) years experience in the monitoring and investigation of soil gas contamination, landfill gas migration, and landfill gas emissions to the atmosphere and designing remedial systems. I also have experience in using soil gas as a "tracer" to delineate ground water contamination. I have successfully remediated soil gas contamination at two Resource Conservation and Recovery Act ("RCRA") hazardous waste sites.

Q. DO YOU HAVE EXPERIENCE IN BOTH ASSESSMENT AND REMEDIATION OF CONTAMINATION RELEASES AT SOLID WASTE MANAGEMENT FACILITIES?

A. Yes. I have conducted corrective measures studies, including risk/threat assessments and remedy selection, and I have supervised installation of corrective measures. I have also provided technical review of corrective measure activities at a number of waste management facilities. At the McKinney Landfill, I was responsible for design and supervision of the remediation of the old City of McKinney Landfill and adjacent City of McKinney wastewater treatment plant, which required the exhumation and relocation of over three million (3,000,000) cubic yards of existing waste. Remediation was completely funded through the creation of additional airspace for the disposal of new MSW.

Q. DO YOU HAVE EXPERIENCE INVOLVING THE GEOLOGIC SETTING IN WHICH THE ACL IS LOCATED OR IN SIMILAR GEOLOGIC SETTINGS?

A. Yes. The ACL is located in the "Ozan Formation" of Cretaceous geologic age. The Ozan is commonly referred to as the "lower Taylor Marl." I have provided site characterization and engineering design services for a number of projects in the Taylor Marl. I have also provided services in the similar Cretaceous-age Navarro and Eagle Ford.

Q. WERE ANY OF THESE PROJECTS MSW FACILITIES?

A. Yes. The MSW projects with which I have been involved within the Taylor Marl include: (1) the Maxwell Creek Landfill expansion in Collin County; (2) the Skyline Landfill expansion in Dallas/Ellis counties; (3) the Texas Disposal Systems Landfill and Compost Facility in Travis County; and (4) the Ellis County Disposal Landfill in Ellis County. Other MSW projects in similar geology would include the City of Corsicana Landfill expansion (Navarro), the City of Commerce Landfill (Navarro), the City of Irving Landfill (Eagle Ford) and the DFW Landfill (Eagle Ford).

Q. DID YOU PERFORM SUBSURFACE CHARACTERIZATION FOR ANY OF THESE FACILITIES?

A. Yes. I planned, conducted, and reported the subsurface characterization as part of my work at the Skyline Landfill and the Maxwell Creek Landfill expansions. I supervised the subsurface characterization for the City of Corsicana Landfill expansion and was responsible for the Geology/Geotechnical Report for the City of Commerce Landfill Subtitle D permit modification request.

Q. PLEASE DESCRIBE ANY OTHER WORK EXPERIENCE THAT IS RELATED TO YOUR OPINIONS REGARDING THE ACL AMENDMENT APPLICATION?

A. Clearly, my RCRA hazardous waste management experience would be relevant—investigation, assessment, and/or remediation. My experience in dams, surface mining, and other large infrastructure projects is also directly relevant—particularly as it relates to hydrogeology, subsurface characterization, and slope stability.

Q. HAVE YOU PERFORMED STABILITY ANALYSES FOR MSW LANDFILLS?

A. Yes, both as a design engineer (*e.g.*, the 121 RDF, the Skyline Landfill, and the Blue Flats Disposal Landfill) and also as a peer reviewer (Waste Management's Willow Run Landfill in Kendall County, Illinois). Ever since the Kettleman Hills Landfill slope failure in the late 1980s, there has been significant focus on landfill slope stability.

Q. HAVE YOU PERFORMED STABILITY ANALYSES FOR OTHER CIVIL ENGINEERING PROJECTS?

A. Yes, I have. I provided stability analyses for a number of earthen dams (*e.g.*, Toledo Bend, Lake Tawakoni, Lake Limestone, and Twin Oak) and for large surface mines (*e.g.*, San Miguel, Oxbow, and Pruitt Lake).

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 401?

A. Exhibit TJFA 401 contains both a representative résumé summarizing my experience in various areas of practice and a listing of MSW experience for the last ten (10) years or so.

Q. IS EXHIBIT TJFA 401 A TRUE AND ACCURATE COPY OF YOUR RÉSUMÉ?

A. Yes.

Q. IS EXHIBIT TJFA 401 AN ACCURATE REFLECTION OF YOUR EDUCATION, PROFESSIONAL HISTORY, AND QUALIFICATIONS?

A. Yes. However, it should be noted that the representative résumé is exactly that—it is by no means a complete listing of all of my experience. In addition, the MSW experience list is only for the last ten (10) years or so.

[MOVE TO ADMIT EXHIBIT TJFA 401]

II. BACKGROUND AND OVERVIEW OF APPLICATION

Q. ARE YOU FAMILIAR WITH TCEQ'S RULES CONCERNING THE PERMITTING OF MSW LANDFILLS IN TEXAS—30 TEX. ADMIN. CODE CHAPTER 330—AS SUCH RULES WERE AMENDED AND BECAME EFFECTIVE IN MARCH 2006, i.e., THE "NEW" MSW RULES?

A. Yes.

Q. ARE YOU FAMILIAR WITH THE FEDERAL SUBTITLE D REGULATIONS CONCERNING THE PERMITTING OF MSW LANDFILLS?

A. Yes.

Q. PLEASE IDENTIFY THE AUTHORITIES YOU CONSIDER TO BE ESSENTIAL IN THE DESIGN AND PERMITTING OF MSW LANDFILLS.

A. By "authorities," I assume you mean those references and/or information sources upon which I would rely for the design and permitting of MSW landfills. For general authorities on the federal and state MSW landfill programs, I would rely on the following:

- The federal Subtitle D regulations at 40 C.F.R. Parts 257 and 258.
- The issues of the Federal Register in which the Subtitle D regulations were proposed (*see* 53 Fed. Reg. 33,314, proposing 40 C.F.R. pts. 257 & 258 (Aug. 30, 1988)) and promulgated (*see* 56 Fed. Reg. 50,978, adopting 40 C.F.R. pts. 257 & 258 (Oct. 9, 1991)), with particular emphasis on the preambles, *et cetera*.
- EPA technical guidance specific to Subtitle D regulations, *e.g.*, U.S. EPA, *Solid Waste Disposal Criteria: Technical Manual*, EPA530-R-93-017 (1993, Revised Apr. 1998).
- EPA Subtitle C (hazardous waste) technical guidance specifically referenced by Subtitle D documents, *e.g.*, U.S. EPA, *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document* ("TEGD"), OSWER-9950.1 (1986), and U.S. EPA, *RCRA Ground-Water Monitoring: Draft Technical Guidance*, EPA/530-R-93-001 (1992).
- TCEQ's MSW rules and related technical guidance.
- Texas: Final Authorization and Incorporation by Reference of State Hazardous Waste Management Program, 62 Fed. Reg. 49,163 (Sept. 19, 1997).
- Texas: Final Full Program Adequacy Determination of State Municipal Solid Waste Permit Program, 64 Fed. Reg. 19,494 (Apr. 21, 1999).

For specific technical subjects and industry standards, the authorities that I would consider essential would depend on the particular subject matter and also on the project location.

Q. ARE YOU FAMILIAR WITH THE AUTHORITIES YOU JUST IDENTIFIED?

A. Yes, I am.

Q. HOW DID YOU BECOME FAMILIAR WITH THESE AUTHORITIES?

A. I have worked with MSW landfill projects for over (30) thirty years. As the industry evolved it was important to stay current on regulatory requirements and industry standards in order to provide high-quality work products. In addition, I worked as an advisor to the Texas Municipal League ("TML") during the promulgation of the federal Subtitle D regulations and the related TCEQ MSW rules, which required a review of a large body of published materials and other states' responses. I also have done considerable work in the RCRA Subtitle C hazardous waste program, which was a predecessor to the Subtitle D program.

Q. IS IT YOUR UNDERSTANDING THAT THE "NEW" MSW RULES, THOSE MSW RULES THAT WENT INTO EFFECT IN MARCH 2006, WILL APPLY IN THIS PROCEEDING?

A. Yes.

Q. SO, DO YOU AGREE THAT ANY DISCUSSION OF APPLICABLE TCEQ MSW RULES IN THIS PROCEEDING WILL REFER DIRECTLY TO THE "NEW" MSW RULES THAT WENT INTO EFFECT IN MARCH 2006?

A. Yes.

Q. YOU MENTIONED THE FEDERAL SUBTITLE D REGULATIONS. WOULD YOU BRIEFLY DESCRIBE YOUR UNDERSTANDING OF THESE REGULATIONS?

A. The federal Subtitle D regulations were promulgated under the authority of RCRA, as amended, and the Clean Water Act ("CWA"), as amended, to regulate the disposal of MSW and other non-hazardous wastes as opposed to the disposal of hazardous wastes which was already regulated under RCRA Subtitle C. The federal Subtitle D regulations cover siting, design, operation, monitoring, closure, and corrective action. The focus of the federal Subtitle D regulations was on the protection of ground water and surface water and prevention of explosive gas migration.

Q. IN ADDITION TO THE TCEQ MSW RULES, DO THE FEDERAL SUBTITLE D REGULATIONS APPLY IN TEXAS?

A. Yes. RCRA is a federal statute. Although Texas has an approved program under RCRA, TCEQ's MSW rules can be no less stringent than the federal Subtitle D regulations.

Q. ARE THERE ANY SIGNIFICANT DIFFERENCES BETWEEN THE REQUIREMENTS FOUND IN THE TCEQ MSW RULES AND THE FEDERAL SUBTITLE D REGULATIONS?

A. In many cases it is hard to compare the two sets of regulatory requirements simply because Texas decided to rewrite and reformat the federal version, unlike many other states. As a result, some of the federal regulatory requirements became dispersed in the TCEQ MSW rules. More importantly is how TCEQ staff have interpreted their own MSW rules—often in a manner less stringent that the federal Subtitle D regulations.

Q. DO YOU HAVE AN OPINION ON WHICH SET OF RULES APPLIES SHOULD THERE BE ANY CONFLICTS OR DIFFERENCES BETWEEN THE STATE MSW RULES AND THE FEDERAL RCRA SUBTITLE D REGULATIONS?

A. Yes.

Q. WHAT IS THAT OPINION?

A. If there is a conflict and the state rules, *i.e.*, the MSW rules, are less stringent than their federal counterpart, *i.e.*, the federal Subtitle D regulations, the federal Subtitle D regulations would control; however, there is no conflict where the state rules are more stringent, *e.g.*, thicker soil liner requirements for Class 1 industrial cells at Texas MSW landfills.

Q. MR. CHANDLER, YOU ARE NOT A LAWYER NOR DO YOU HOLD A LAW DEGREE. CORRECT?

A. I am neither a lawyer nor do I hold a law degree.

Q. ON WHAT, THEN, DO YOU BASE YOUR OPINION ON THE APPLICABILITY OF THE FEDERAL AND STATE SUBTITLE D MSW PROGRAMS?

A. I have been a licensed professional engineer working in the environmental field for over thirty (30) years. I have extensive experience in solid waste management—both hazardous and non-hazardous, including MSW. As an environmental professional, I am obligated to comply with applicable rules and regulations. I have done so by periodically reviewing applicable statutes, regulations, preambles, authorizations, guidance documents, and court decisions in addition to interaction with other environmental professionals and regulators. More specific to your question as to the applicability of the

federal versus state Subtitle D MSW programs is the clear language in the preambles to the federal Subtitle D regulations and EPA's authorization of TCEQ's MSW program.

Q. WHAT DO THE FEDERAL SUBTITLE D REGULATIONS SAY REGARDING THIS QUESTION REGARDING APPLICABILITY OF THE FEDERAL VERSUS STATE SUBTITLE D MSW PROGRAMS?

A. The preamble to the federal Subtitle D regulations states:

> Subtitle D of RCRA establishes a framework for Federal, State, and local government cooperation in controlling the management of nonhazardous solid waste. The Federal role in this arrangement is to establish the overall regulatory direction, by providing minimum nationwide standards for protecting human health and the environment, and to provide technical assistance to States for planning and developing their own environmentally sound waste management practices. The actual planning and direct implementation of solid waste programs under subtitle D, however, remain largely State and local functions, and the act authorizes States to devise programs to deal with State-specific conditions and needs. EPA retains the authority to enforce the appropriate standards in a given State.
>
> These subtitle D Criteria establish minimum national performance standards necessary to ensure that "no reasonable probability of adverse effects on health or the environment" will result from solid waste disposal facilities or practices.

56 Fed. Reg. 50,978, 50,979 (Oct. 9, 1991). In addition, the federal Subtitle D regulations at 40 C.F.R. § 258.1, identifies that the purpose of 40 C.F.R. Part 258:

> is to establish minimum national criteria under the Resource Conservation and Recovery Act (RCRA or the Act), as amended, for all municipal solid waste landfill (MSWLF) units and under the Clean Water Act, as amended, for municipal solid waste landfills that are used to dispose of sewage sludge. These minimum national criteria ensure the protection of human health and the environment.

40 C.F.R. § 258.1(a). Finally, EPA's authorization of the State of Texas' MSW program states: "The EPA notes that regardless of the approval status of a State and the permit status of any facility, the Federal criteria will apply to all permitted and unpermitted MSWLFs." 64 Fed. Reg. at 19,494 (Apr. 21, 1999).

In other words, the federal Subtitle D regulations and EPA's approval of the Texas MSW program clearly identify that EPA's Subtitle D regulations establish minimum standards for MSW landfills and state standards, *i.e.*, TCEQ's MSW rules, cannot be less stringent.

Q. YOU REFERRED TO THE PREAMBLE OF THE FEDERAL SUBTITLE D REGULATIONS. TO WHAT ARE YOU REFERRING?

A. The Preamble to the federal Subtitle D regulations is basically the Federal Register notice which promulgated the federal Subtitle D regulations in 1991. The Preamble discusses the purpose of the rulemaking, addresses responses to comments received regarding the rulemaking, and explains the bases for the final rule.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 104?

A. Exhibit TJFA 104, as previously identified in Mr. Hunt's testimony, is a copy of the Federal Register notice for the final promulgation of the federal Subtitle D regulations, 56 Fed. Reg. 50,978, adopting amendments to 40 C.F.R. Part 257 and adopting new 40 C.F.R. Part 258 (Oct. 9, 1991).

Q. IS EXHIBIT TJFA 104 A TRUE AND CORRECT COPY OF THE FEDERAL REGISTER NOTICE OF THE FINAL PROMULGATION OF THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes, it is.

Q. IS EXHIBIT TJFA 104 USEFUL TO YOUR TESTIMONY TODAY?

A. Yes. As previously identified by Mr. Hunt, the federal Subtitle D regulations are the basis of all regulation of MSW landfill facilities today. An understanding of the federal Subtitle D regulations and the background of those regulations, as discussed in the preamble set out in the Federal Register notice, is simply required to design and permit modern, environmentally protective MSW landfills.

[MOVE TO ADMIT EXHIBIT TJFA 104]

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 402?

A. Exhibit TJFA 402 is a copy of the Federal Register notice for EPA's final full program adequacy determination of the State of Texas' MSW permit program, 64 Fed. Reg. 19,494 (Apr. 21, 1999).

Q. IS EXHIBIT TJFA 402 A TRUE AND CORRECT COPY OF THE FEDERAL REGISTER NOTICE OF EPA'S FINAL FULL PROGRAM ADEQUACY DEMONSTRATION OF THE STATE OF TEXAS' MSW PERMITTING PROGRAM?

A. Yes. While it is not a copy of the actual Federal Register notice, it is a true and correct copy of the text of the Federal Register notice that was obtained from Westlaw.

Q. IS EXHIBIT TJFA 402 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING FEDERAL MSW REGULATION?

A. Yes. The Federal Register notice outlines EPA's determination of adequacy for the State's MSW permitting program. It also addresses the relationship between the federal Subtitle D permitting program and the State's permitting program for MSW.

[MOVE TO ADMIT EXHIBIT TJFA 402]

Q. ARE YOU FAMILIAR WITH THE ACL AMENDMENT APPLICATION?

A. Yes. I have reviewed the version of the ACL Amendment Application identified as WMTX's Exhibit APP-202, a six-volume application identified as "Revision 10 – May 2008."

Q. DID YOU REVIEW ANY OTHER MATERIALS OR DOCUMENTS IN THE COURSE OF YOUR REVIEW OF THE ACL AMENDMENT APPLICATION?

A. Yes.

Q. PLEASE IDENTIFY AND DESCRIBE ANY ADDITIONAL MATERIALS OR DOCUMENTS YOU REVIEWED IN ADDITION TO THE ACL AMENDMENT APPLICATION IN THE COURSE OF YOUR ANALYSIS.

A. I reviewed WMTX's experts' pre-filed testimony and much of the information produced by WMTX during the discovery process. I reviewed publications and mappings on the geology and hydrogeology of the area where the ACL is located. I also reviewed federal and state regulatory requirements, technical guidance, published documents, geotechnical

engineering references concerning subsurface characterization and stability, and references specific to landfill slope stability. I have prepared a bibliography and/or reference list attached as Exhibit TJFA 403.

Q. DID YOU CREATE EXHIBIT TJFA 403?

A. Yes, I did.

Q. IS EXHIBIT TJFA 403 AN ACCURATE LISTING OF THE TECHNICAL AND REGULATORY REFERENCES YOU UTILIZED IN YOUR REVIEW OF THE ACL AMENDMENT APPLICATION AND THE DEVELOPMENT OF YOUR PREFILED TESTIMONY?

A. Yes, it is.

Q. IS EXHIBIT TJFA 403 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 403]

Q. EXHIBIT TJFA 403 CONTAINS CITATIONS TO QUITE A NUMBER OF REFERENCES. CAN YOU PLEASE EXPLAIN WHY YOU HAVE INCLUDED EXCERPTS FROM SO MANY TECHNICAL REFERENCES?

A. Yes. The excerpted materials were provided to show that the opinions that I am providing in this proceeding are supported by a consensus of published documents, not

only specific to federal Subtitle D regulatory requirements and MSW landfill technical practice, but also specific to the standard of care for geotechnical engineering.

Q. ARE THE EXCERPTED MATERIALS IDENTIFIED IN EXHIBIT TJFA 403 CRITICAL TO YOUR TESTIMONY?

A. Yes. The excerpted materials identify and define standard industry practice in the areas that I am addressing in my testimony. They corroborate, support, and more fully explain and/or illustrate my professional opinions as expressed in this testimony. Because of the technical nature of the ACL Amendment Application and of my professional opinions regarding deficiencies in the ACL Amendment Application, I believe it is important to provide documentation identifying published consensus and industry standards in the MSW landfill industry.

III. OVERVIEW OF ACL AMENDMENT APPLICATION

Q. WHICH PARTS OF THE ACL AMENDMENT APPLICATION HAVE YOU REVIEWED?

A. I have reviewed the entire ACL Amendment Application; however, I focused on specific parts for purposes of my testimony.

Q. CAN YOU BRIEFLY DESCRIBE YOUR UNDERSTANDING OF THE ACL AMENDMENT APPLICATION?

A. The ACL Amendment Application seeks to expand the existing ACL (*i.e.*, increase the volume of the ACL) through a proposed lateral expansion that will increase the permitted boundary of the entire ACL facility from 288.60 acres to 359.71 acres. The ACL Amendment Application does not propose to increase the permitted maximum elevation of the facility (*see* Exhibit No. APP-200 at 12); however, a "vertical expansion" of the

ACL is proposed where the expansion area abuts an existing disposal area of what is identified in the ACL Amendment Application as the West Hill. Because the existing disposal area which is to be vertically expanded is a pre-Subtitle D area, the new waste of the vertical expansion will be separated from the old, existing waste by a "piggyback" liner system. (*See* Exhibit No. APP-202 at 79.)

Q. SO ARE YOU SAYING THAT WHILE THE ACL AMENDMENT APPLICATION CHARACTERIZES THE EXPANSION OF THE ACL AS A LATERAL EXPANSION, WMTX IS ALSO PROPOSING A VERTICAL EXPANSION OF THE ACL?

A. Yes. The ACL Amendment Application proposes a vertical expansion of the current ACL in that it proposes to construct new waste disposal cells over existing areas where waste has been disposed previously. The ACL Amendment Application proposes to "piggyback" new waste disposal cells over existing pre-Subtitle D disposal areas with a "piggyback" liner system separating the new disposal area from the existing disposal area.

Q. DO THE FEDERAL SUBTITLE D REGULATIONS ADDRESS LATERAL EXPANSIONS OF EXISTING MSW LANDFILLS?

A. Yes. The Subtitle D regulations address "new" landfill units and "lateral expansions" of existing landfill units.

Q. DO TCEQ'S MSW RULES ADDRESS LATERAL EXPANSION OF EXISTING MSW LANDFILLS?

A. Yes, they do.

Q. DO THE FEDERAL SUBTITLE D REGULATIONS ADDRESS VERTICAL EXPANSIONS OF EXISTING MSW LANDFILLS?

A. No. The federal Subtitle D regulations are silent on "vertical expansions." However, most states have promulgated regulations addressing "vertical expansions" over pre-Subtitle D units.

Q. DO TCEQ'S MSW RULES ADDRESS VERTICAL EXPANSIONS OF EXISTING MSW LANDFILLS?

A. Yes. TCEQ addresses the problem of "vertical expansions" in TCEQ's adoption of the 2006 MSW rules.

Q. SINCE YOU HAVE IDENTIFIED THAT THE ACL AMENDMENT APPLICATION IS PROPOSING A VERTICAL "PIGGYBACK" EXPANSION, ARE THE MSW RULES THAT ADDRESS VERTICAL EXPANSIONS APPLICABLE TO THE ACL AMENDMENT APPLICATION?

A. Yes, they are.

Q. BASED ON YOUR EVALUATION OF THE ACL AMENDMENT APPLICATION, DO YOU BELIEVE THAT IT MEETS THE REQUIREMENTS OF THE MSW RULES?

A. No, I do not.

Q. FROM YOUR REVIEW OF THE ACL AMENDMENT APPLICATION, DO YOU HAVE ANY CONCERNS ABOUT PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT IF THE EXPANSION OF THE ACL IS APPROVED?

A. Yes, I have a number of concerns.

Q. WOULD YOU PLEASE IDENTIFY THE MAJOR AREAS OF CONCERN THAT YOU INTEND TO ADDRESS IN YOUR TESTIMONY?

A. My testimony covers the following general subjects:

- Waste management "facility" versus waste management "unit," particularly as related to ground water monitoring, landfill gas monitoring, and leachate recirculation;
- The "unstable area" location restriction;
- Stability analyses contained in the ACL Amendment Application;
- The "Piggyback" vertical expansion;
- The Liner Quality Control Plan;
- Hydrostatic uplift of the liner system;
- Landfill settlement calculations;
- Landfill gas and odors;
- The Closure Plan;
- The Site Operating Plan; and
- Other permit violations.

Q. DO YOU HAVE A PREFERENCE REGARDING THE ORDER IN WHICH YOU WILL PRESENT THE CONCERNS THAT YOU HAVE IDENTIFIED WITH THE ACL AMENDMENT APPLICATION?

A. Yes. I will present the issues in the order in which they arise in the ACL Amendment Application itself.

Q. ARE THE OPINIONS EXPRESSED IN YOUR PREFILED TESTIMONY BASED ON A REASONABLE DEGREE OF ENGINEERING CERTAINTY?

A. Yes.

Q. ARE THE OPINIONS EXPRESSED IN YOUR PREFILED TESTIMONY IN ACCORDANCE WITH THE STANDARD OF CARE REQUIRED OF LICENSED PROFESSIONAL ENGINEERS IN THE STATE OF TEXAS?

A. Yes.

IV. WASTE MANAGEMENT FACILITY VERSUS WASTE MANAGEMENT UNIT PURSUANT TO RCRA

Q. ARE THE TERMS WASTE MANAGEMENT "FACILITY" AND WASTE MANAGEMENT "UNIT" TREATED AS SYNONYMS BY RCRA?

A. No, they are not. Historically, RCRA and specifically RCRA's Subtitle C rules (40 C.F.R. Parts 260 through 266, 268, and 270 through 273) have distinguished between a waste management "facility" and a waste management "unit."

Q. CAN YOU PLEASE IDENTIFY WHAT A WASTE MANAGEMENT "FACILITY" IS?

A. Yes, 40 C.F.R. § 260.20(1) defines "facility" as

> all contiguous land, and structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them). (Emphasis added.)

The underlined portion of the definition is of particular importance.

Q. ARE THERE OTHER REFERENCES TO THE TERM "FACILITY" IN THE FEDERAL SUBTITLE C REGULATIONS?

A. Yes. For example, the title of 40 C.F.R. Part 264 is very specific: "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." Also, the RCRA permitting requirements at 40 C.F.R. § 270.1(b) specifically refer to "facilities":

> *Overview of the RCRA Permit Program.* Not later than 90 days after the promulgation or revision of regulations in 40 CFR Part 261 (identifying and listing hazardous wastes) generators and transporters of hazardous waste, and owners and operators of hazardous waste treatment, storage, or disposal facilities . . . . (Emphasis added.)

Q. WHAT IS A WASTE MANAGEMENT "UNIT"?

A. It is well established in the RCRA hazardous waste programs that a permitted waste facility can have one or more solid waste management units ("SWMUs"). For example, an OSWER Guidance Memorandum states:

> As explained in the July 15, 1985 HSWA Codification Rule, a solid waste management unit is ". . . any unit at a facility from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of solid and/or hazardous waste." This definition was intended to include those types of units which have traditionally been subject to regulatory control under RCRA: container storage areas, tanks, surface impoundments, waste piles, land treatment units, landfills, incinerators, underground injection wells and other physical, chemical and biological treatment units.

Memorandum from Marcia E. Williams, Director, Office of Solid Waste, U.S. EPA, to Hazardous Waste Division Directors, Regions I-X (July 2, 1987). Code of Federal Regulations Title 40, Section 264.90 makes it clear that a "facility" is made up of solid waste management "units": "The owner or operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at a facility . . . ." (Emphasis added.)

Q. WHAT IS THE OSWER GUIDANCE MEMORANDUM TO WHICH YOU REFERRED?

A. The OSWER Guidance Memorandum that I referred to is a Memorandum from Marcia E. Williams, Director of EPA's Office of Solid Waste and Emergency Response, to Hazardous Waste Division Directors in EPA Regions I through X. The memorandum is dated July 2, 1987.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 404.

A. Exhibit TJFA 404 is a copy of the OSWER Guidance Memorandum that I just described.

Q. IS EXHIBIT TJFA 404 A TRUE AND CORRECT COPY OF THE OSWER GUIDANCE MEMORANDUM THAT YOU DESCRIBED?

A. Yes. Exhibit TJFA 404 is a copy of the OSWER Guidance Memorandum that I obtained from EPA's website. Included with the OSWER Guidance Memorandum as part of Exhibit TJFA 404 is a "Document Record Detail," also obtained from EPA's website, which specifies identifying information for the memorandum, including the RCRA Online Number and the date of the memorandum.

Q. ARE DOCUMENTS SUCH AS THE OSWER GUIDANCE MEMORANDUM IN EXHIBIT TJFA 404 COMMONLY RELIED UPON BY PROFESSIONAL ENGINEERS?

A. Yes. OSWER Guidance Memoranda, including the OSWER Guidance Memorandum that is included in Exhibit TJFA 404, are commonly relied upon by professional engineers because they identify EPA's interpretation of the federal Subtitle D regulations.

Q. IS EXHIBIT TJFA 404 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING THE CONCEPT OF "UNIT" VERSUS "FACILITY"?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 404]

Q. YOU HAVE DISCUSSED THE DIFFERENCES BETWEEN A WASTE MANAGEMENT "FACILITY" AND A WASTE MANAGEMENT "UNIT" IN TERMS OF RCRA'S HAZARDOUS WASTE PROGRAMS, ARE THOSE SAME DIFFERENCES TRUE IN THE FEDERAL RCRA SUBTITLE D REGULATIONS FOR MSW LANDFILLS?

A. Yes, but the distinction between the terms "facility" and "unit" are not as clearly defined in the RCRA non-hazardous waste program, specifically 40 C.F.R. Parts 257 and 258—the federal Subtitle D regulations.

Q. IS THE TERM "FACILITY" DEFINED IN THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes. Both 40 C.F.R. § 257.2 and 40 C.F.R. § 258.2 define "facility" as: "all contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of solid waste."

Q. IS THE TERM "UNIT" DEFINED IN THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes, the term "municipal solid waste landfill (MSWLF) unit" is defined in both 40 C.F.R. § 257.2 and 40 C.F.R. § 258.2 as "a discrete area of land or an excavation that receives household waste . . . ." (Emphasis added.) Again, the underlined portion is of particular importance because it stresses that the "unit" is a discrete portion of the overall "facility."

Q. DO THE COMMISSION'S MSW RULES ALSO DISTINGUISH BETWEEN THE TERMS "FACILITY" AND "UNIT"?

A. Yes, TCEQ's MSW rules are even more specific than their federal counterparts, clearly distinguishing between waste management "facility" and waste management "unit."

Q. HOW IS THE TERM "FACILITY" DEFINED IN THE COMMISSION'S MSW RULES?

A. There are actually two defined terms that use the word "facility." First, the MSW rules, at 30 TEX. ADMIN. CODE § 330.3(52), define the term "facility" as: "All contiguous land and structures, other appurtenances, and improvements on the land used for the storage, processing, or disposal of solid waste." Second, the MSW rules, at 30 TEX. ADMIN. CODE § 330.3(89), define the term "municipal solid waste facility (MSW facility)" as:

> All contiguous land, structures, other appurtenances, and improvements on the land used for processing, storing, or disposing of solid waste. A facility may be publicly or privately owned and may consist of several processing, storage, or disposal operational units, e.g., one or more landfills, surface impoundments, or combinations of them." Again, I have drawn attention to the portion of the definition that clearly stresses that the term "facility" is broader than the term "unit," in that a number of "units" can make up a facility. (Emphasis added.)

Q. HOW IS THE TERM "UNIT" DEFINED IN THE COMMISSION'S MSW RULES?

A. The MSW rules, at 30 TEX. ADMIN. CODE § 330.3(90), define the term "municipal solid waste landfill unit" as:

> A discrete area of land or an excavation that receives household waste and that is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined under 40 Code of Federal Regulations §257.2. A municipal solid waste (MSW) landfill unit also may receive other types of Resource Conservation and Recovery Act Subtitle D wastes, such as commercial solid waste, nonhazardous sludge, conditionally exempt small-quantity generator waste, and industrial solid waste. Such a landfill may be publicly or privately owned. An MSW landfill unit may be a new MSW landfill unit, an existing MSW landfill unit, a vertical expansion, or a lateral expansion.

Q. WHY IS THIS REGULATORY DISTINCTION BETWEEN THE TERMS WASTE MANAGEMENT "FACILITY" AND WASTE MANAGEMENT "UNIT" IMPORTANT WITH REGARD TO THE ACL AMENDMENT APPLICATION?

A. The distinction between waste management "facility" and waste management "unit" is important because of WMTX's attempt to eliminate the old industrial waste area, identified in the ACL Amendment Application as the Industrial Waste Unit ("IWU"), (*i.e.*, a waste management "unit") and the old Phase 1 unit, identified in the ACL Amendment Application as the old Travis County Landfill, (*i.e.*, a waste management "unit") from being part of the ACL waste management "facility."

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 203?

A. Exhibit TJFA 203, as previously identified in Dr. Kier's testimony, is a copy of an aerial photograph of the ACL facility and surrounding area that was taken in December 2007.

Q. IS EXHIBIT TJFA 203 A TRUE AND ACCURATE COPY OF AN AERIAL PHOTOGRAPH OF THE ACL AND SURROUNDING AREA?

A. Yes, it is.

Q. DID YOU OR SOMEONE UNDER YOUR CONTROL MAKE THE MARKS ON THE DECEMBER 2007 AERIAL PHOTOGRAPH?

A. No, as previously identified by Dr. Kier, someone under Dr. Kier's supervision and control made the marks on the December 2007 aerial photo.

Q. BASED ON YOUR REVIEW OF THE DECEMBER 2007 AERIAL PHOTOGRAPH, WHAT DO THE MARKINGS ON THE AERIAL PHOTOGRAPH SHOW?

A. The markings on the December 2007 aerial photograph identify the approximate locations of the IWU, the Phase 1 unit, the East Hill MSW unit, and the West Hill MSW unit, all at the ACL, as well as the closed old Travis County Landfill, the BFI Sunset Farms Landfill, and the Applied Materials facility.

Q. TO THE BEST OF YOUR KNOWLEDGE, ARE THE APPROXIMATE LOCATIONS OF THE IWU, THE PHASE 1 UNIT, THE EAST HILL MSW UNIT, THE WEST HILL MSW UNIT, THE CLOSED OLD TRAVIS COUNTY LANDFILL, THE BFI SUNSET FARMS LANDFILL, AND THE APPLIED

MATERIALS FACILITY, AS SHOWN ON THE DECEMBER 2007 AERIAL PHOTO, EXHIBIT TJFA 203, ACCURATE?

A. Yes, based on my review of several years' worth of documents related to the ACL facility and the surrounding area, the markings are accurate.

Q. IS EXHIBIT TJFA 203 USEFUL TO YOUR TESTIMONY TODAY?

A. Yes, Exhibit TJFA 203 is useful to help the Administrative Law Judge understand the different locations and areas involving the ACL and the surrounding vicinity that I am discussing in my testimony.

[MOVE TO ADMIT EXHIBIT TJFA 203]

Q. PLEASE DESCRIBE WHAT YOU MEAN BY WMTX'S ATTEMPT TO ELIMINATE THE IWU AND THE PHASE 1 UNIT FROM BEING PART OF THE ACL FACILITY?

A. As currently written, the ACL Amendment Application attempts to avoid both ground water monitoring and landfill gas monitoring that is required by applicable MSW rules at the facility permit boundary adjacent to the above-referenced waste units, *i.e.*, the IWU and the Phase 1 unit. There is a large gap in both the ground water monitoring and landfill gas monitoring systems along the permit boundary in the eastern half of the south side of the ACL. In essence, WMTX is either ignoring the potential environmental consequences of the referenced waste units and/or is trying to avoid monitoring that area in order to claim ignorance regarding such environmental consequences.

Q. SO ARE YOU SAYING THAT THERE ARE MULTIPLE "UNITS" AT THE ACL "FACILITY"?

A. Yes, there are at least four waste management "units" within the ACL "facility": (1) the East Hill MSW unit; (2) the West Hill MSW unit; (3) the IWU; and (4) the Phase 1 unit (a MSW unit).

Q. WHY IS IT IMPORTANT THAT THERE ARE MULTIPLE "UNITS" AT THE ACL "FACILITY"?

A. The MSW permit for the ACL is issued for the "facility" and thus covers all of the "units" at the "facility." The MSW permit is not issued for an individual "unit" at a "facility." The fact that some units may be considered "closed," or may simply be inactive at this time, while other units are "active" makes no difference. Closed, inactive, and active units can cause ground water contamination, surface water contamination, and/or landfill (explosive) gas migration.

Q. HOW IS THIS ISSUE OF "FACILITY" VERSUS "UNIT" RELEVANT TO THE ACL AMENDMENT APPLICATION?

A. The issue is relevant to several portions of the ACL Amendment Application, including: (1) ground water monitoring; (2) landfill gas migration monitoring; and (3) leachate/condensate recirculation back into a landfill unit. The ground water monitoring system should be designed based on a consideration of all units (active, inactive, and closed) located within the facility—not just the active units. Similarly, the landfill gas monitoring system should be installed around the entire perimeter of the facility, here the ACL, without gaps. In addition, as explained in more detail below, leachate/landfill gas condensate recirculation is only applicable to placing such

leachate/condensate back into the waste management unit from which it was generated, assuming the unit has the required composite liner and leachate collection system for recirculation.

V. THE UNSTABLE AREA LOCATION RESTRICTION

Q. CAN YOU PLEASE DESCRIBE WHAT IS MEANT BY THE "UNSTABLE AREA LOCATION RESTRICTION"?

A. As introduction, the RCRA federal Subtitle D regulations and TCEQ's MSW rules include location restrictions for siting MSW landfill units. Both sets of regulatory requirements contain restrictions on siting MSW landfill units for six types of locations that EPA determined "warranted control, in order to protect human health and the environment." (*See* Exhibit TJFA 104, 56 Fed. Reg. at 51,042). The six location restrictions are for MSW landfill units: (1) in the vicinity of airports; (2) in the 100-year floodplain; (3) in wetlands; (4) in fault areas; (5) in seismic impact zones; and (6) and in unstable areas. The "unstable area" location restriction requires owners and operators of new MSW landfill units, lateral expansions, and existing MSW landfill units located in unstable areas to demonstrate to TCEQ's satisfaction the structural stability of the unit.

Q. HOW IS THE TERM "UNSTABLE AREA" DEFINED FOR PURPOSES OF THE "UNSTABLE AREA LOCATION RESTRICTION"?

A. TCEQ rules, at 30 TEX. ADMIN. CODE § 330.3(167), define "unstable area" as:

> A location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the landfill structural components responsible for preventing releases from a landfill. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

A virtually identical definition is also included in TCEQ's rules at 30 TEX. ADMIN. CODE § 330.559. It should be noted that "unstable area location restrictions" are often, and erroneously, examined only in terms of natural events or forces while "human-induced events or forces" are either ignored or overlooked. This is particularly true with the ACL Amendment Application.

Q. IS THE TERM "STRUCTURAL COMPONENTS," AS USED IN THE DEFINITION OF "UNSTABLE AREA" ALSO DEFINED IN THE MSW RULES?

A. Yes, the term "structural components" is defined, at 30 TEX. ADMIN. CODE § 330.3(152), as: "Liners, leachate collection systems, final covers, run-on/run-off systems, and any other component used in the construction and operation of the municipal solid waste landfill that is necessary for protection of human health and the environment."

Q. IS THE TERM "POOR FOUNDATION CONDITIONS," AS USED IN THE DEFINITION OF "UNSTABLE AREA" DEFINED IN THE COMMISSION'S RULES?

A. Yes, the term "poor foundation conditions" is defined, at 30 TEX. ADMIN. CODE § 330.3(112), as: "Areas where features exist, indicating that a natural or man-induced event may result in inadequate foundation support for the structural components of a municipal solid waste landfill unit."

Q. IS THE TERM "UNSTABLE AREA" ALSO DEFINED IN THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes, as with the Commission's MSW rules, the federal Subtitle D regulations, at 40 C.F.R. § 258.15(b)(1), define the term "unstable area" as:

> . . . a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the landfill structural components responsible for preventing releases from a landfill. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and Karst terranes.

Q. IS THE TERM "STRUCTURAL COMPONENTS," AS USED IN THE FEDERAL SUBTITLE D DEFINITION OF "UNSTABLE AREA" DEFINED IN THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes, the term "structural components" is defined, at 40 C.F.R. § 258.15(b)(2), as: "liners, leachate collection systems, final covers, run-on/run-off systems, and any other component used in the construction and operation of the MSWLF that is necessary for protection of human health and the environment."

Q. IS THE TERM "POOR FOUNDATION CONDITIONS," AS USED IN THE FEDERAL SUBTITLE D DEFINITION OF "UNSTABLE AREA," ALSO DEFINED IN THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes, the term "poor foundation conditions" is defined, at 40 C.F.R. § 258.15(b)(3), as: "those areas where features exist which indicate that a natural or man-induced event may result in inadequate foundation support for the structural components of the MSWLF unit."

Q. IN YOUR PROFESSIONAL OPINION, IS THERE ANY AMBIGUITY IN THE FEDERAL SUBTITLE D REGULATORY REQUIREMENTS AS THEY RELATE TO UNSTABLE AREAS?

A. No. The federal Subtitle D regulations at 40 C.F.R. § 258.15 are self-explanatory and the clear meaning is self-evident.

Q. HAS EPA PROVIDED ANY GUIDANCE ON HOW THE TERM "UNSTABLE AREA" LOCATION RESTRICTION SHOULD BE APPLIED?

A. Yes, starting with EPA's promulgation of the final Subtitle D regulations in 1991, EPA has provided guidance on how the "unstable area" location restriction should be applied.

Q. CAN YOU PLEASE PROVIDE EXAMPLES OF SUCH GUIDANCE?

A. Yes. For example, in interpreting the definition of "unstable area," EPA, in the preamble to the final federal Subtitle D regulations in 1991, wrote: "Unstable areas are characterized by localized or regional ground subsidence, settling (either slowly or very rapidly and catastrophically) of overburden, or by slope failure." (*See* Exhibit TJFA 104, 56 Fed. Reg. at 51,047 (emphasis added)). In addition, the *Solid Waste Disposal Facility Criteria: Technical Manual*, also known as the Federal Subtitle D Technical Guidance, was published by EPA to assist MSW landfill owners and operators in achieving compliance with the federal Subtitle D regulations.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 405.

A. Exhibit TJFA 405 is excerpts from EPA's *Solid Waste Disposal Facility Criteria: Technical Manual* ("*Technical Manual*"), EPA530-R-93-017 (1993, revised April 1998), which I just described. The *Technical Manual* addresses a wide range of issues regarding MSW landfill permitting requirements, including a discussion of location restrictions, including the unstable area location restriction, as well as discussions addressing stability analyses, ground water monitoring, and landfill gas monitoring.

Q. IS EXHIBIT TJFA 405 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE TECHNICAL MANUAL THAT YOU DESCRIBED?

A. Yes. Exhibit TJFA 405 is a true and correct copy of excerpts from the *Technical Manual.*

Q. IS THE TECHNICAL MANUAL CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO MSW LANDFILL DESIGN?

A. Yes, it is. In fact, the *Technical Manual* was specifically produced to assist municipal landfill owners and operators in complying with the federal Subtitle D regulations.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON THE TECHNICAL MANUAL IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 405 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING UNSTABLE AREAS AND STABILITY ANALYSES?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 405]

Q. PLEASE EXPLAIN WHAT THE TECHNICAL MANUAL PROVIDES WITH REGARD TO UNSTABLE AREAS.

A. Chapter 2, Subpart B, Location Criteria of the *Technical Manual* provides specific technical guidance on "unstable areas." (*See* Exhibit TJFA 405, *Technical Manual*, at 45-65.) The section on "unstable areas" specifically discusses the following:

(1) drawdown of ground water increasing overburden pressure "which may cause excessive settlement or bearing capacity failure on the foundation soils";

(2) "a closed landfill as the foundation for a new landfill ("piggy-backing") may be unstable unless the closed landfill has undergone complete settlement of the underlying wastes";

(3) selection of "critical cross sections" for stability; and

(4) recommended minimum values of factors of safety for slope stability analyses, *i.e.*, stability analyses are part of the unstable areas determination.

Q. BASED ON YOUR REVIEW OF THE ACL AMENDMENT APPLICATION, DO YOU BELIEVE THAT IT ADDRESSES THE UNSTABLE AREA LOCATION RESTRICTION AS REQUIRED BY THE MSW RULES AND THE SUBTITLE D REGULATIONS?

A. No, I do not.

Q. PLEASE EXPLAIN WHY YOU DO NOT BELIEVE THE ACL AMENDMENT APPLICATION ADDRESSES THE UNSTABLE AREA LOCATION RESTRICTION IN COMPLIANCE WITH STATE AND FEDERAL REGULATORY REQUIREMENTS?

A. I disagree with the conclusion contained in the ACL Amendment Application that the ACL is not in an unstable area.

Q. SO IT IS YOUR PROFESSIONAL OPINION THAT THE ACL IS IN AN UNSTABLE AREA?

A. Yes, it is.

Q. WHAT IS THE BASIS FOR YOUR OPINION THAT THE ACL IS IN AN UNSTABLE AREA?

A. I have eight (8) reasons as the bases for my opinion that the ACL is in an unstable area:

(1) Excavation at other landfills in the same and similar geologic conditions have experienced slope failures (*i.e.*, instability).

(2) The design described in the ACL Amendment Application includes a significant number of geosynthetic liner/leachate collection system ("LCS") interfaces, which are notorious for low strength and instability.

(3) According to TCEQ correspondence and photographs, the ACL had a liner/LCS slope failure in 1999.

(4) The design described in the ACL Amendment Application includes a potentially unstable "piggyback" liner to separate new waste from older pre-Subtitle D waste.

(5) The foundation of a portion of the expansion area may be unstable because the underlying waste in the existing landfill has not undergone complete settlement.

(6) The design described in the ACL Amendment Application also has a potentially unstable composite cover with geosynthetic components.

(7) According to sworn testimony by Mr. Charles Lesniak of the City of Austin, the BFI Sunset Farms Landfill, which is adjacent to the ACL, has had intermediate cover slope failures. Mr. Lesniak's testimony was

presented on January 30, 2009, in the State Office of Administrative Hearings ("SOAH") proceeding involving BFI's amendment application to expand the Sunset Farms Landfill.

(8) The design described in the ACL Amendment Application includes an "underdrain" below the liner, which is also problematic for stability.

The deficiencies in the ACL Amendment Application are addressed in detail in the discussion under Section VI, STABILITY ANALYSES, below. As a result of the deficiencies in the Stability Analyses, the ACL Amendment Application has failed to show that the required "engineering measures have been incorporated into the MSWLF unit's design to ensure that the integrity of the structural components of the MSWLF unit will not be disrupted," as required by 40 C.F.R. § 258.15(a), the section of the federal Subtitle D regulations which addresses unstable areas. TCEQ's MSW rules at 30 TEX. ADMIN. CODE § 330.559 contain almost identical language.

Q. ARE YOU STATING THAT EPA INCLUDES STABILITY ANALYSES AS PART OF THE DETERMINATION FOR THE UNSTABLE AREA LOCATION RESTRICTION?

A. Yes. As identified above, the *Technical Manual*, Exhibit TJFA 405, identifies stability analyses as part of the unstable areas determination.

Q. YOU HAVE MAINLY ADDRESSED FEDERAL SUBTITLE D REGULATORY REQUIREMENTS WITH REGARD TO UNSTABLE AREAS. DO THE MSW RULES INCLUDE SIMILAR REQUIREMENTS?

A. Yes, 30 TEX. ADMIN. CODE § 330.559, includes language very similar to that of 40 C.F.R. § 258.15.

Q. HAVE RECOGNIZED AUTHORITIES EXPRESSED THE OPINION THAT STABILITY ANALYSES ARE PART OF THE "UNSTABLE AREA" LOCATION RESTRICTION?

A. Yes. For example, Dr. Bob Gilbert of the University of Texas at Austin expressed that opinion in a presentation at the Geosynthetic Clay Liner University (a MSW landfill industry seminar) on September 30, 2008.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 406.

A. Exhibit TJFA 406 is excerpts from Dr. Gilbert's presentation entitled "Shear Strength and Slope Stability" ("Gilbert Presentation") from the Geosynthetic Clay Liner University, September 30, 2008.

Q. IS EXHIBIT TJFA 406 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE GILBERT PRESENTATION?

A. Yes. Exhibit TJFA 406 is a true and correct copy of excerpts from the Gilbert Presentation.

Q. DID YOU ATTEND THE GILBERT PRESENTATION AT THE GEOSYNTHETIC CLAY LINER UNIVERSITY?

A. Yes, I did attend Dr. Gilbert's presentation.

Q. IS DR. GILBERT A RECOGNIZED AUTHORITY ON STABILITY ANALYSES?

A. Yes. Dr. Gilbert, the Hudson Matlock Professor in Civil Engineering at the University of Texas at Austin, is a recognized authority in geotechnical engineering, with technical

interests in slope stability, waste containment, and performance reliability and risk management for geotechnical and geoenvironmental systems.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON RECOGNIZED AUTHORITIES IN DESIGNING MSW LANDFILLS?

A. Yes.

Q. IS EXHIBIT TJFA 406 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

[MOVE TO ADMIT EXHIBIT TJFA 406]

Q. WHAT WAS THE OPINION EXPRESSED BY DR. GILBERT REGARDING UNSTABLE AREAS IN THE GILBERT PRESENTATION?

A. One of Dr. Gilbert's PowerPoint slides specifically noted "RCRA Subtitle D for Municipal Solid Waste Landfills . . . Slope Stability Addressed in Criteria for Siting." (*See* Exhibit TJFA 406, Gilbert Presentation, at slide 1 at 11.) In his oral presentation, Dr. Gilbert further discussed slope stability in the context of the unstable area location restriction, but he also noted that it did not appear that TCEQ had adopted that position.

Q. DID THE GILBERT PRESENTATION INCLUDE OTHER INFORMATION RELATIVE TO THE UNSTABLE AREA LOCATION RESTRICTION?

A. Yes. Dr. Gilbert also had a slide "Cover Slope Failure Lessons – A very common problem that is frequently not reported."

Q. DOES THE CONSENSUS OF PUBLISHED INFORMATION CONCUR WITH THE OPINION THAT STABILITY ANALYSES ARE IMPORTANT TO THE UNSTABLE AREA LOCATION RESTRICTION?

A. Yes, I believe so. Landfill stability analyses and previous slope failures are widely discussed in the published literature and are identified as a major design concern – particularly where geosynthetic materials are used in liner, LCS, and cover systems.

VI. STABILITY ANALYSES

Q. HAVE YOU REVIEWED THE STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. Yes. I have reviewed the various parts of the ACL Amendment Application related to stability issues and the stability analyses, specifically including Part III, Attachment 3, Appendix C of the ACL Amendment Application.

Q. WHAT ARE YOUR GENERAL THOUGHTS BASED ON YOUR REVIEW OF THE STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. In general, it is my professional opinion, that the stability analyses contained in the ACL Amendment Application used: (1) questionable and unconservative inputs; (2) appear to be incomplete; and (3) failed to analyze "most critical" or "worst case" stability conditions. In addition, the stability analyses contained in the ACL Amendment Application are not linked to the unstable area location restriction that was discussed above. Finally, it appears that the stability analyses are, in part, based on operating considerations that were not included as operating requirements in the ACL Amendment Application at Part IV, Site Operating Plan.

Q. HOW WOULD YOU LIKE TO ADDRESS YOUR REVIEW OF THE STABILITY ANALYSES?

A. I would like to address the individual components of the stability analyses:

- Excavated slope stability analyses;
- Sideslope (sidewall) liner system stability analyses;
- Interior waste slope stability analyses;
- Final configuration stability analyses;
- Final cover stability analyses; and
- Piggyback liner stability analyses.

A. <u>Excavated Slope Stability Analyses</u>

Q. WHERE ARE THE EXCAVATED SLOPE STABILITY ANALYSES LOCATED IN THE ACL AMENDMENT APPLICATION?

A. The excavated slope stability analyses are located in Part III, Attachment 3, Appendix C.1 of the ACL Amendment Application. (*See* APP-202 at 979-89.)

Q. DID YOU IDENTIFY PROBLEMS WITH THE EXCAVATED SLOPE STABILITY ANALYSES SET OUT IN THE ACL AMENDMENT APPLICATION DURING YOUR REVIEW?

A. Yes, I did.

Q. CAN YOU PLEASE EXPLAIN WHAT PROBLEMS YOU IDENTIFIED WITH THE ACL AMENDMENT APPLICATION'S EXCAVATED SLOPE STABILITY ANALYSES?

A. Yes. Although a maximum excavation depth of seventy-five (75) feet with a waste surcharge is modeled in the ACL Amendment Application, the soil strength inputs for the clay, claystone, and marl layers appear to be unrealistic and unconservative.

Q. PLEASE EXPLAIN WHAT YOU MEAN BY THE "SOIL STRENGTH INPUTS FOR THE CLAY, CLAYSTONE, AND MARL LAYERS APPEAR TO BE UNREALISTIC AND UNCONSERVATIVE."

A. Specifically, the clay layer was modeled using a shear strength, c = 6,500 pounds per square foot (psf). This appears to correspond exactly to the ACL Amendment Application's average "undrained strength" for Stratum 1A. (*See* APP-202 at tbl. 3.3 at 910.) A review of the unconsolidated undrained shear tests (*see* APP-202 at 1881-97) indicates that the specimens were tested vertically at moisture contents generally below saturation. In addition to the general prohibition against using "average" strength values for stability analyses, the assumed clay strength appears abnormally high and inconsistent with typical values for very high plasticity clays and for Taylor soils. In addition, the assumed clay strengths may not represent seasonal or operational saturation effects.

Q. PLEASE EXPLAIN WHAT YOU MEAN BY THE GENERAL PROHITION AGAINST USING "AVERAGE" STRENGTH VALUES FOR STABILITY ANALYSES.

A. The prohibition against using "average" shear strengths in stability analyses is well documented. Stability failures are associated with the lowest strengths and/or weakest

materials. An analogy against using average strength would be analyzing the strength of a chain by ignoring a few weak links.

Q. YOU IDENTIFY THAT THE PROHIBITION AGAINST USING "AVERAGE" SHEAR STRENGTHS IN STABILITY ANALYSES IS WELL DOCUMENTED. CAN YOU PROVIDE AN EXAMPLE?

A. Yes, a recent reference specific to landfill stability, *Geotechnical & Stability Analysis for Ohio Waste Containment Facilities*, Geotechnical Resource Group (GeoRG), Ohio EPA (Sept. 2004, Revised Sept. 2005 & Oct. 2005) ("GeoRG Manual"), warns against averaging strength values and averaging characteristics of compressible layers. (*See GeoRG Manual* at 3-5.)

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 407.

A. Exhibit TJFA 407 is a copy of *Geotechnical & Stability Analysis for Ohio Waste Containment Facilities*, Geotechnical Resource Group (GeoRG), Ohio EPA (Sept. 2004, Revised Sept. 2005 & Oct. 2005), which I just described—the GeoRG Manual. The GeoRG Manual is a relatively complete design summary to address design problems associated with Subtitle D MSW landfills. Although it was sponsored by the Ohio Environmental Protection Agency ("Ohio EPA"), it was assembled by a "blue-ribbon" panel and the information is generally applicable nationwide.

Q. IS EXHIBIT TJFA 407 A TRUE AND CORRECT COPY OF THE GEORG MANUAL THAT YOU DESCRIBED?

A. Yes. Exhibit TJFA 407 is a true and correct copy of the GeoRG Manual.

Q. IS THE GEORG MANUAL CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO MSW LANDFILL STABILITY?

A. Yes, it is. In fact, the GeoRG represents the accepted standard of practice in the field of landfill stability.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON THE GEORG MANUAL IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 407 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 407]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 408.

A. Exhibit TJFA 408 is Doug Evans' article "Landfill Stability: Let GeoRG Help," which appeared in the May-June 2005 issue of *MSW Management: The Journal for Municipal Solid Waste Professionals.*

Q. WHAT DOES THE EVANS ARTICLE, EXHIBIT TJFA 408, COVER WITH RESPECT TO LANDFILL DESIGN?

A. The Evans article recommends the GeoRG Manual, Exhibit TJFA 407, for application throughout the United States for addressing landfill stability.

Q. IS EXHIBIT TJFA 408 A TRUE AND CORRECT COPY OF THE EVANS ARTICLE?

A. Yes. Exhibit TJFA 408 is a true and correct copy of the Evans article.

Q. IS THIS REFERENCE CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO LANDFILL DESIGN?

A. Yes, it is. *MSW Management* is one of the leading trade magazines in the field.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON THIS REFERENCE IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 408 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 408]

Q. ABOVE YOU STATED THAT THE GEORG MANUAL WARNS AGAINST AVERAGING STRENGTH VALUES AND AVERAGING CHARACTERISTICS OF COMPRESSIVE LAYERS. PLEASE EXPLAIN.

A. Where empirical correlations are used to estimate shear strength, the GeoRG Manual further specifies empirical correlations producing weakest reasonable estimates of shear strength and again warns against averaging. (*See* Exhibit TJFA 407, GeoRG Manual at 4-3). It further notes that saturated undrained shear strengths should be assumed for clay

materials (*see* Exhibit TJFA 407, GeoRG Manual at 4-4 & 4-7) and residual shear strength should be assumed for slopes greater than five percent (5%) or that will be loaded with more than 1440 psf. (*See* Exhibit TJFA 407, GeoRG Manual at 4-16.)

Q. ALSO, CAN YOU PLEASE EXPLAIN WHY YOU BELIEVE THE ASSUMED CLAY STRENGTH APPEARS ABNORMALLY HIGH AND INCONSISTENT WITH TYPICAL VALUES FOR VERY HIGH PLASTICITY CLAYS?

A. In the ACL Amendment Application, Stratum 1A and Stratum 1B have upper range Liquid Limits in the mid 70s to low 80s. (*See* APP-202 at 910-11.) Corresponding upper range Plasticity Indices are in the upper 40s to low 50s. (Stratum II claystone has comparable plasticity characteristics whereas Stratum III marl was not tested.) Boring logs in the ACL Amendment Application at Attachment 4 (*see* APP-202 at 1678-1783) identify the clay and claystone generally as very stiff to hard consistency. Because of the consistency (*i.e.*, "over-consolidated") and very high plasticity, the clays and claystones would not only have lower strengths but also exhibit "strain softening" and/or "residual" strength characteristics as well. Further, the Taylor clays, claystones, and marls also exhibit strength anisotropy based on slide plane orientation.

Q. BEFORE WE GO ON, I BELIEVE THAT YOU HAVE A NUMBER OF EXHIBITS TO INTRODUCE REGARDING SLOPE STABILITY AND LANDFILL DESIGN ISSUES.

A. Yes, I do.

Q. WE ARE GOING TO GO AHEAD AND INTRODUCE MOST OF THOSE HERE, SO THEY WILL NOT INTERRUPT YOUR DISCUSSION LATER IN YOUR TESTIMONY.

A. Okay.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 409.

A. Exhibit TJFA 409 is excerpts from a study, *Evaluation of Soil Shear Strength for Slope and Retaining Wall Stability Analyses with Emphasis on High Plasticity Clays*, by Stephen G. Wright, which reports research sponsored by the Texas Department of Transportation.

Q. WHAT DOES EXHIBIT TJFA 409 ADDRESS?

A. The Wright study addresses the importance of slope stability in Texas relative to soils of high plasticity.

Q. IS EXHIBIT TJFA 409 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE WRIGHT STUDY?

A. Yes. Exhibit TJFA 409 is a true and correct copy of excerpts from the Wright study.

Q. IS EXHIBIT TJFA 409 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON THE WRIGHT STUDY IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 409 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 409]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 410.

A. Exhibit TJFA 410 is excerpts from a publication, *Slope Stability and Stabilization Methods*, by Lee W. Abramson, *et al.* (2002).

Q. WHAT DOES EXHIBIT TJFA 410 ADDRESS?

A. Exhibit TJFA 410 provides examples of stress-strain compatibility and includes correlations of shear strength with plasticity characteristics. Exhibit TJFA 410 also addresses landfill stability, including recommended interface strengths and examples of critical sections.

Q. IS EXHIBIT TJFA 410 A TRUE AND CORRECT COPY OF EXCERPTS FROM ABRAMSON, ET AL.?

A. Yes. Exhibit TJFA 410 is a true and correct copy of excerpts of Abramson, *et al.*

Q. IS EXHIBIT TJFA 410 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 410 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 410 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 410]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 411.

A. Exhibit TJFA 411 is excerpts from a publication, *Soil Strength and Slope Stability*, by J. Michael Duncan and Stephen G. Wright (2005).

Q. WHAT DOES EXHIBIT TJFA 411 ADDRESS?

A. Exhibit TJFA 411 addresses shear strengths of soil and MSW, identifies methods of analyzing slope stability, and includes factors of safety and recommendations.

Q. IS EXHIBIT TJFA 411 A TRUE AND CORRECT COPY OF EXCERPTS FROM DUNCAN & WRIGHT?

A. Yes. Exhibit TJFA 411 is a true and correct copy of excerpts from Duncan & Wright.

Q. IS EXHIBIT TJFA 411 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 411 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 411 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 411]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 412.

A. Exhibit TJFA 412 is excerpts from a U.S. Bureau of Reclamation ("USBR") publication, *Design of Small Dams*, Revised Second Edition (1977).

Q. WHAT DOES EXHIBIT TJFA 412 ADDRESS?

A. Exhibit TJFA 412 addresses stability analysis issues, including a database of USBR testing results on compacted soils as a function of Unified Soil Classification.

Q. IS EXHIBIT TJFA 412 A TRUE AND CORRECT COPY OF EXCERPTS FROM DESIGN OF SMALL DAMS (2ND EDITION)?

A. Yes. Exhibit TJFA 412 is a true and correct copy of excerpts from *Design of Small Dams* (2nd Edition).

Q. IS EXHIBIT TJFA 412 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 412 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 412 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 412]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 413.

A. Exhibit TJFA 413 is excerpts from a USBR publication, *Design of Small Dams*, Third Edition (1987).

Q. WHAT DOES EXHIBIT TJFA 413 ADDRESS?

A. Exhibit TJFA 413 addresses stability analysis issues, including updated databases of USBR testing results on compacted soils as a function of Unified Soil Classification.

Q. IS EXHIBIT TJFA 413 A TRUE AND CORRECT COPY OF EXCERPTS FROM DESIGN OF SMALL DAMS (3RD EDITION)?

A. Yes. Exhibit TJFA 413 is a true and correct copy of excerpts from *Design of Small Dams* (3rd Edition).

Q. IS EXHIBIT TJFA 413 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 413 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 413 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 413]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 414.

A. Exhibit TJFA 414 is excerpts from a U.S. Army Corps of Engineers ("Corps") publication, *Engineer Manual, Engineering and Design—Design and Construction of Levees*, EM 1110-2-1913 (Apr. 30, 2000).

Q. WHAT DOES EXHIBIT TJFA 414 ADDRESS?

A. Exhibit TJFA 414 also addresses stability issues.

Q. IS EXHIBIT TJFA 414 A TRUE AND CORRECT COPY OF EXCERPTS FROM DESIGN AND CONSTRUCTION OF LEVEES?

A. Yes. Exhibit TJFA 414 is a true and correct copy of excerpts from *Design and Construction of Levees.*

Q. IS EXHIBIT TJFA 414 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 414 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 414 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 414]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 415.

A. Exhibit TJFA 415 is excerpts from an EPA publication, *Guide to Technical Resources for the Design of Land Disposal Facilities*, EPA/625/6-88/018 (Dec. 1988) ("*Guide to Technical Resources*").

Q. WHAT DOES EXHIBIT TJFA 415 ADDRESS?

A. Exhibit TJFA 415 addresses stability analyses, including settlement, slope stability, and recommended factors of safety, and final cover design.

Q. IS EXHIBIT TJFA 415 A TRUE AND CORRECT COPY OF EXCERPTS FROM GUIDE TO TECHNICAL RESOURCES?

A. Yes. Exhibit TJFA 415 is a true and correct copy of excerpts from *Guide to Technical Resources*.

Q. IS EXHIBIT TJFA 415 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 415 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 415 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 415]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 416.

A. Exhibit TJFA 416 is excerpts from an EPA publication, *Process Design Manual: Surface Disposal of Sewage Sludge and Domestic Septage*, EPA/625/K-95-002 (Sept. 1995) ("*Process Design Manual*").

Q. WHAT DOES EXHIBIT TJFA 416 ADDRESS?

A. Exhibit TJFA 416 addresses issues related to stability analyses, including unstable areas, slope stability and settlement, and minimum factors of safety.

Q. IS EXHIBIT TJFA 416 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE PROCESS DESIGN MANUAL?

A. Yes. Exhibit TJFA 416 is a true and correct copy of excerpts from the *Process Design Manual.*

Q. IS EXHIBIT TJFA 416 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 416 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 416 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 416]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 417.

A. Exhibit TJFA 417 is excerpts from an EPA publication, *Seminar Publication: Design and Construction of RCRA/CERCLA Final Covers*, EPA/625/4-91-025 (May 1991) ("*RCRA/CERCLA Final Covers*").

Q. WHAT DOES EXHIBIT TJFA 417 ADDRESS?

A. Exhibit TJFA 417 addresses issues related to final cover design and stability analyses, including issues such as potential problems with cover system design, settlement-related tensile strains, interfacial shear, and stresses in geomembrane cover components.

Q. IS EXHIBIT TJFA 417 A TRUE AND CORRECT COPY OF EXCERPTS FROM RCRA/CERCLA FINAL COVERS?

A. Yes. Exhibit TJFA 417 is a true and correct copy of excerpts from *RCRA/CERCLA Final Covers*.

Q. IS EXHIBIT TJFA 417 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES AND FINAL COVER DESIGN?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 417 FOR STABILITY ANALYSIS AND FINAL COVER DESIGN ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 417 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND FINAL COVER DESIGN?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 417]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 418.

A. Exhibit TJFA 418 is excerpts from a Department of the Navy, Naval Facilities Engineering Command, publication, *Soil Dynamics, Deep Stabilization, and Special Geotechnical Construction*, Design Manual 7.3 (Apr. 1983) ("*Soil Dynamics*").

Q. WHAT DOES EXHIBIT TJFA 418 ADDRESS?

A. Exhibit TJFA 418 addresses waste settlement issues and includes empirical compression indices for both primary and secondary consolidation of waste.

Q. IS EXHIBIT TJFA 418 A TRUE AND CORRECT COPY OF EXCERPTS FROM SOIL DYNAMICS?

A. Yes. Exhibit TJFA 418 is a true and correct copy of excerpts from *Soil Dynamics*.

Q. IS EXHIBIT TJFA 418 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO WASTE SETTLEMENT ISSUES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 418 FOR WASTE SETTLEMENT ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 418 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND WASTE SETTLEMENT?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 418]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 419.

A. Exhibit TJFA 419 is excerpts from *Foundation Engineering*, Second Edition, by Ralph B. Peck, Walter E. Hanson, and Thomas H. Thornburn (1974).

Q. WHAT DOES EXHIBIT TJFA 419 ADDRESS?

A. Exhibit TJFA 419 also addresses issues related to stability analyses.

Q. IS EXHIBIT TJFA 419 A TRUE AND CORRECT COPY OF EXCERPTS FROM FOUNDATION ENGINEERING?

A. Yes. Exhibit TJFA 419 is a true and correct copy of excerpts from *Foundation Engineering.*

Q. IS EXHIBIT TJFA 419 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 419 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 419 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 419]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 420.

A. Exhibit TJFA 420 is excerpts from *Fundamentals of Soil Mechanics* by Donald W. Taylor (1948).

Q. WHAT DOES EXHIBIT TJFA 420 ADDRESS?

A. Exhibit TJFA 420 addresses issues such as pressure distributions and settlement for a variety of applied loads analogous to MSW landfill vertical expansions and waste settlement.

Q. IS EXHIBIT TJFA 420 A TRUE AND CORRECT COPY OF EXCERPTS FROM FUNDAMENTALS OF SOIL MECHANICS?

A. Yes. Exhibit TJFA 420 is a true and correct copy of excerpts from *Fundamentals of Soil Mechanics*.

Q. IS EXHIBIT TJFA 420 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES AND VERTICAL EXPANSIONS?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 420 FOR STABILITY ANALYSIS AND VERTICAL EXPANSION ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 420 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND VERTICAL EXPANSIONS?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 420]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 421.

A. Exhibit TJFA 421 is excerpts from *Soil Mechanics in Engineering Practice* by Karl Terzaghi and Ralph B. Peck (1967).

Q. WHAT DOES EXHIBIT TJFA 421 ADDRESS?

A. Exhibit TJFA 421 addresses issues related to stability analyses.

Q. IS EXHIBIT TJFA 421 A TRUE AND CORRECT COPY OF EXCERPTS FROM SOIL MECHANICS IN ENGINEERING PRACTICE?

A. Yes. Exhibit TJFA 421 is a true and correct copy of excerpts from *Soil Mechanics in Engineering Practice.*

Q. IS EXHIBIT TJFA 421 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES, VERTICAL EXPANSIONS, AND WASTE SETTLEMENT?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 421 FOR STABILITY ANALYSIS, VERTICAL EXPANSION, AND WASTE SETTLEMENT ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 421 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES, VERTICAL EXPANSIONS, AND WASTE SETTLEMENT?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 421]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 422.

A. Exhibit TJFA 422 is excerpts from the GSE GundSeal GCL Design Manual (2001) ("GundSeal Manual").

Q. WHAT DOES EXHIBIT TJFA 422 ADDRESS?

A. Exhibit TJFA 422 addresses stability analyses issues, including general guidance on slope stability using geosynthetic components and a discussion of strength selection and recommendations for factors of safety.

Q. IS EXHIBIT TJFA 422 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE GUNDSEAL MANUAL?

A. Yes. Exhibit TJFA 422 is a true and correct copy of excerpts from the GundSeal Manual.

Q. IS EXHIBIT TJFA 422 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 422 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 422 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 422]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 423.

A. Exhibit TJFA 423 is excerpts from "Peak vs Residual Shear Strength for Landfill Bottom Liner Stability Analyses," by Richard Thiel, from the proceedings of the 15th Geosynthetic Research Institute ("GRI") Conference on Hot Topics in Geosynthetics (Dec. 2001).

Q. WHAT DOES EXHIBIT TJFA 423 ADDRESS?

A. Exhibit TJFA 423 addresses stability analysis issues, including topics such as shear strength and strain incompatibility.

Q. IS EXHIBIT TJFA 423 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE THIEL PAPER?

A. Yes. Exhibit TJFA 423 is a true and correct copy of excerpts from the Thiel Paper.

Q. IS EXHIBIT TJFA 423 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 423 FOR STABILITY ANALYSIS ISSUES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 423 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 423]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 424.

A. Exhibit TJFA 424 is excerpts from an EPA publication, *Evaluation of Subsurface Engineered Barriers at Waste Sites*, EPA 542-R-98-0005, dated August 1998. As noted earlier, I was one of the coauthors of this publication.

Q. WHAT DOES EXHIBIT TJFA 424 ADDRESS?

A. Exhibit TJFA 424 addresses subsurface barriers to control leachate, contaminated ground water, and landfill gas migration.

Q. IS EXHIBIT TJFA 424 A TRUE AND CORRECT COPY OF EXCERPTS FROM EVALUATION OF SUBSURFACE ENGINEERED BARRIERS?

A. Yes. Exhibit TJFA 424 is a true and correct copy of excerpts from *Evaluation of Subsurface Engineered Barriers.*

Q. IS EXHIBIT TJFA 424 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO THE DESIGN OF MSW LANDFILLS?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 424 FOR ISSUES RELATED TO THE DESIGN OF MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 424 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR EVALUATION OF DESIGN DETAILS IN THE ACL AMENDMENT APPLICATION?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 424]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 425.

A. Exhibit TJFA 425 is excerpts from an EPA publication, *Interim Final RCRA Facility Investigation (RFI) Guidance*, Volumes I through IV, dated May 1989.

Q. WHAT DOES EXHIBIT TJFA 425 ADDRESS?

A. Exhibit TJFA 425 addresses RCRA facility monitoring and corrective action. It is important in this proceeding related to MSW landfills because it was specifically referenced in the preamble to the final promulgation of the federal Subtitle D regulations. (*See* Exhibit TJFA 104.)

Q. IS EXHIBIT TJFA 425 A TRUE AND CORRECT COPY OF EXCERPTS FROM INTERIM FINAL RCRA GUIDANCE, VOLUMES I THROUGH IV?

A. Yes. Exhibit TJFA 425 is a true and correct copy of excerpts from *Interim Final RCRA Guidance*, Volumes I through IV.

Q. IS EXHIBIT TJFA 425 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO MONITORING AND CORRECTIVE ACTION AT MSW LANDFILLS?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 425 FOR ISSUES RELATED TO MONITORING AND CORRECTIVE ACTION AT MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 425 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR EVALUATION OF DESIGN DETAILS IN THE ACL AMENDMENT APPLICATION?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 425]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 426.

A. Exhibit TJFA 426 is excerpts from an EPA publication, *Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities*, EPA/600/R-93/182, dated September 1993 ("*QA/QC for Waste Facilities*").

Q. WHAT DOES EXHIBIT TJFA 426 ADDRESS?

A. Exhibit TJFA 426 addresses subsurface barriers to control the migration of leachate, contaminated ground water, and landfill gas.

Q. IS EXHIBIT TJFA 426 A TRUE AND CORRECT COPY OF EXCERPTS FROM QA/QC FOR WASTE FACILITIES?

A. Yes. Exhibit TJFA 426 is a true and correct copy of excerpts from *QA/QC for Waste Facilities*.

Q. IS EXHIBIT TJFA 426 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO THE DESIGN OF MSW LANDFILLS?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 426 FOR ISSUES RELATED TO THE DESIGN OF MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 426 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR EVALUATION OF DESIGN DETAILS IN THE ACL AMENDMENT APPLICATION?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 426]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 427.

A. Exhibit TJFA 427 is excerpts from an EPA publication, *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document*, OSWER-9950.1 (1986) ("TEGD").

Q. WHAT DOES EXHIBIT TJFA 427 ADDRESS?

A. Exhibit TJFA 427 addresses RCRA facility monitoring and corrective action. It is important in this proceeding related to MSW landfills because it was specifically referenced in the preamble to the final promulgation of the federal Subtitle D regulations. (*See* Exhibit TJFA 104.)

Q. IS EXHIBIT TJFA 427 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE TEGD?

A. Yes. Exhibit TJFA 427 is a true and correct copy of excerpts from the TEGD.

Q. IS EXHIBIT TJFA 427 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO MONITORING AND CORRECTIVE ACTION?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 427 FOR ISSUES RELATED TO MONITORING AND CORRECTIVE ACTION?

A. Yes, they do.

Q. IS EXHIBIT TJFA 427 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR EVALUATION OF DESIGN DETAILS IN THE ACL AMENDMENT APPLICATION?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 427]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 428.

A. Exhibit TJFA 428 is excerpts from *Ground Control and Improvement*, by Petros P. Xanthakos, Lee W. Abramson, and Donald A. Bruce (1994).

Q. WHAT DOES EXHIBIT TJFA 428 ADDRESS?

A. Exhibit TJFA 428 addresses subsurface barriers to control the migration of leachate, contaminated ground water, and landfill gas.

Q. IS EXHIBIT TJFA 428 A TRUE AND CORRECT COPY OF EXCERPTS FROM XANTHAKOS, ET AL.?

A. Yes. Exhibit TJFA 428 is a true and correct copy of excerpts Xanthakos, *et al.*

Q. IS EXHIBIT TJFA 428 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO SUBSURFACE BARRIERS?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 428 FOR ISSUES RELATED TO SUBSURFACE BARRIERS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 428 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR EVALUATION OF DESIGN DETAILS IN THE ACL AMENDMENT APPLICATION?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 428]

Q. WHY ARE THESE EXHIBITS IMPORTANT TO YOUR EVALUATION OF THE ACL AMENDMENT APPLICATION?

A. All of the exhibits that I have just listed are known authorities relevant to landfill design and operation addressing such issues as stability analyses, vertical expansions, and/or

waste settlement. As such, they are important to any evaluation of the design details for a proposed MSW facility.

Q. CAN YOU PLEASE PROVIDE AN EXAMPLE OF HOW THESE AUTHORITIES ARE IMPORTANT TO YOUR EVALUATION.

A. Yes. For example, the Wright Study indicates a residual soil shear strength of approximately ø = 14°, c = 0 for Taylor clay. (*See* Exhibit TJFA 409, Wright Study.) This is comparable to residual soil shear strengths correlated to very high plasticity clays. (*See* Exhibit TJFA 410, Abramson, *et al.*, and Exhibit TJFA 411, Duncan & Wright.)

Q. YOU ALSO STATED THAT THE ASSUMED CLAY STRENGTH MAY NOT REPRESENT SEASONAL OR OPERATIONAL SATURATION EFFECTS. WHAT DID YOU MEAN BY THIS?

A. Assumed clay shear strengths are so high that they appear to be some form of peak strength based on dry moisture contents. Saturation of the clays, occurring seasonally and/or in response to operational effects, *e.g.*, construction below the water table would typically result in significant strength reduction compared to the assumed values.

Q. DO YOU BELIEVE THAT THE EXCAVATED SLOPE STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION ARE IN CONFORMANCE WITH GENERAL ACCEPTABLE STANDARDS?

A. No. To illustrate how unrealistic the clay layer strengths are in the ACL Amendment Application, I would make use of the classic expression, as identified in many geotechnical engineering texts (*see, e.g.*, Exhibit TJFA 411, Duncan & Wright at 104), for the critical depth of a vertical excavation:

$H_c \approx 4c/\gamma$

where:

H_c = critical depth of vertical cut in feet for factor of safety of 1.0
c = undrained shear strength in psf = 6500 psf per ACL Amendment Application
γ = soil density in pcf = 125 pcf per ACL Amendment Application.

Based on the assumed clay layer shear strengths in the ACL Amendment Application, a vertical excavation slope over 200 feet in height would be stable (factor of safety $\geq$ 1.0). This conclusion is remarkably inconsistent with actual landfill experience in these same and similar soil conditions, *e.g.*, the Skyline Landfill and the City of Irving Landfill, and it is inconsistent with naturally-occurring slopes, *i.e.,* typical hillsides, in these clay materials.

Q. YOU STATE THAT THE ACL AMENDMENT APPLICATION'S CONCLUSIONS ON STABILITY ARE INCONSISTENT WITH ACTUAL LANDFILL EXPERIENCE AND NAME THE SKYLINE LANDFILL AND THE CITY OF IRVING LANDFILL. HOW IS THE INFORMATION INCONSISTENT WITH YOUR EXPERIENCE AT THOSE LANDFILLS?

A. The excavation condition modeled in the ACL Amendment Application is very similar to the landfill excavation at the City of Irving Landfill, *i.e.*, excavation next to a previously landfilled area in geologically similar materials. The excavation at the City of Irving Landfill failed due to landsliding. In addition, the Skyline Landfill experienced an excavation stability failure under similar conditions as proposed in the ACL Amendment Application. It should be noted that the Skyline Landfill slope failure occurred in the same geologic materials present at ACL.

Q PLEASE IDENTIFY THE DIFFERENT TYPES OF FAILURES THAT MAY OCCUR AT A LANDFILL LACKING SUFFICIENT STABILITY?

A. The main types of failures include rotational or circular arc failures and "block" or "wedge" translational failures.

Q. WHAT IS A CIRCULAR ARC FAILURE?

A. Engineers and geologists observed that natural and excavated slopes often appeared to fail (landslide) by rotating with respect to a fixed point above the slope. Early efforts to analyze stability used a circular arc to approximate the slide plane associated with the landslide. Another name for a circular arc slope failure would be a "rotational" slope failure. Illustrative examples of circular arc or rotational slope failures at a landfill abound in the literature.

Q. WERE THE FAILURES THAT YOU DESCRIBED AT THE SKYLINE LANDFILL AND THE CITY OF IRVING LANDFILL CIRCULAR ARC OR ROTATIONAL SLOPE FAILURES?

A. Yes.

Q. DO YOU HAVE AN EXHIBIT THAT ILLUSTRATES THE FAILURES THAT YOU HAVE DESCRIBED AT THE CITY OF IRVING LANDFILL AND THE SKYLINE LANDFILL?

A. Yes. Exhibit TJFA 429 contains photographs that I took of rotational slope failures at the Skyline Landfill and the City of Irving Landfill. At the Skyline Landfill, the slope failure occurred in an excavation slope in the same geologic materials present at the ACL. At the City of Irving Landfill, the slope failure occurred during cell excavation for a lateral

expansion. The initial slope failure involved the excavation slope next to existing waste and the failure plane extended into the existing waste. After the initial failure, the slope around the corner also experienced a slope failure due to the interaction.

Q. PLEASE IDENTIFY WHEN THE PHOTOGRAPHS IN EXHIBIT TJFA 429 WERE TAKEN.

A. The photographs were taken in 1999.

Q. DO THESE PHOTOGRAPHS REPRESENT TRUE AND ACCURATE COPIES OF THE ORIGINALS?

A. Yes, they do.

Q. ARE THESE PHOTOGRAPHS BEING OFFERED FOR THE SOLE PURPOSE OF PROVIDING ILLUSTRATIVE EXAMPLES OF CIRCULAR ARC FAILURES AT LANDFILL EXCAVATIONS?

A. Yes. Photographs 429-D through 429-K reflect photographs that are illustrative of "rotational" or circular arc failures.

Q. WHAT DO PHOTOGRAPHS 429-A THROUGH 429-C REPRESENT?

A. Photographs 429-A through 429-C are illustrative of weathered Taylor Marl.

Q. ARE PHOTOGRAPHS 429-A THROUGH 429-C BEING OFFERED FOR THE LIMITED PURPOSE OF PROVIDING A VISUAL REFERENCE FOR WEATHERED TAYLOR MARL CONDITIONS?

A. Yes.

Q. WILL THE PHOTOGRAPHS CONTAINED IN EXHIBIT TJFA 429 BE AN AID IN THE UNDERSTANDING OF YOUR TESTIMONY?

A. Yes.

[OFFER TO ADMIT EXHIBIT TJFA 429]

Q. ARE YOU AWARE OF ANY OTHER INFORMATION DEMONSTRATING THAT THE ACL AMENDMENT APPLICATION'S CONCLUSIONS ON STABILITY ARE FLAWED?

A. Yes. The U.S.D.A. Natural Resource Conservation Service ("NRCS") (formerly the Soil Conservation Service ("SCS")) Soil Survey of Travis County, Texas, notes that most of the soils in the area of the ACL facility are problematic for excavation, *e.g.*, see the soil ratings for shallow excavations. In addition, during the site visit of the ACL on December 10, 2008, I observed and photographed several locations exhibiting linear tension cracks along the top of slopes in the older areas of the ACL. Such cracking is typically a precursor of slope movement.

Q. PLEASE EXPLAIN WHAT YOU MEAN BY "LINEAR TENSION CRACKS."

A. Linear tension cracks are essentially what their name implies—they are relatively long continuous cracks of noticeable aperture occurring in the soil and appearing on the crest of, and parallel to the crest of, a slope. The position and linearity is in contrast to typical, randomly oriented desiccation cracks found in high-plasticity soils. It should also be noted that at the time of the December 10, 2008 site visit to the ACL, the tension cracks were conspicuous due to their large aperture or width, especially when compared to typical desiccation cracks observed in the soil cover.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 430.

A. Exhibit TJFA 430 is a photograph dated December 10, 2008.

Q. DID YOU TAKE THE PHOTOGRAPH INCLUDED IN EXHIBIT TJFA 430?

A. Yes, I did take the photograph during a site visit of the ACL on December 10, 2008.

Q. DOES THE PHOTOGRAPH MARKED AS EXHIBIT TJFA 430 REPRESENT A TRUE AND ACCURATE COPY OF THE ORIGINAL?

A. Yes, it does.

Q. WHAT DOES THE PHOTOGRAPH IN EXHIBIT TJFA 430 SHOW?

A. As I have identified beneath the photograph in Exhibit TJFA 430, it shows a "tension crack" on the north side of the IWU at the top of the slope.

Q. DOES THE PHOTOGRAPH MARKED AS EXHIBIT TJFA 430 FAIRLY AND ACCURATELY DEPICT A TENSION CRACK ON THE NORTH SIDE OF THE IWU AT THE TOP OF THE SLOPE AS IT APPEARED ON THE DAY YOU TOOK THE PHOTO?

A. Yes, it does.

Q. WILL THE PHOTOGRAPH IN EXHIBIT TJFA 430 BE USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY TENSION CRACKS AT THE ACL?

A. Yes.

[OFFER TO ADMIT EXHIBIT TJFA 430]

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE EXCAVATED SLOPE STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. In summary, the excavation stability analyses appear to be flawed and unreliable for design purposes and/or demonstrating compliance with the unstable area location restriction. Because of the unconservative and non-representative soil shear strength inputs, the obtained factors of safety have little relevance. There is no question that slides can, and do, occur in excavations in Taylor and similar geologic formations. The ACL Amendment Application should have recognized this potential problem and included operational requirements/restrictions to minimize any impact, *e.g.*, (1) timely excavation, lining, and waste backfilling; (2) restriction of surcharges and water ponding at top of excavation; and (3) frequent monitoring of the top of excavation for "early warning" tension cracking and/or unusual seepage exiting from the slope.

B. Sideslope (Sidewall) Liner System Stability Analyses

Q. WHERE ARE THE SIDESLOPE (SIDEWALL) LINER SYSTEM STABLITY ANALYSES LOCATED IN THE ACL AMENDMENT APPLICATION?

A. The sideslope (sidewall) liner system stability analyses are located in Part III, Attachment 3, Appendix C.2 of the ACL Amendment Application. (*See* APP-202 at 991-93.)

Q. DID YOU IDENTIFY PROBLEMS WITH THE SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY ANALYSES SET OUT IN THE ACL AMENDMENT APPLICATION DURING YOUR REVIEW?

A. Yes, I did.

Q. CAN YOU PLEASE EXPLAIN WHAT PROBLEMS YOU IDENTIFIED WITH THE ACL AMENDMENT APPLICATION'S SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY ANALYSES?

A. Yes. Not only are the assumed geosynthetic interface shear strengths in the ACL Amendment Application unusually and unconservatively high compared to various published values, *et cetera*, they are also inconsistent with assumed values used for other stability analyses of waste slopes, final waste configuration, and the final cover system in the ACL Amendment Application. It could be inferred from the analyses that the sideslope shear strength inputs are higher because they are for "low normal stress" conditions (*see* APP-202 at 991); however, that does not explain the significant differences.

Q. SO ARE YOU SAYING THAT THE DIFFERENT STABILITY ANALYSES INCLUDED IN THE ACL AMENDMENT APPLICATION ARE INCONSISTENT WITH ONE ANOTHER?

A. Yes. I have created a table that demonstrates the inconsistencies.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 431.

A. Exhibit 431 is a table, identified as Table 1, which summarizes the shear strength inputs used in the various stability analyses in the ACL Amendment Application.

Q. DID YOU CREATE TABLE 1, EXHIBIT TJFA 431?

A. Yes, I did.

Q. WHAT WAS THE SOURCE OF THE INFORMATION THAT YOU HAVE SET OUT IN TABLE 1, EXHIBIT TJFA 431?

A. The source of the information is the ACL Amendment Application itself. The source pages from the ACL Amendment Application are noted on Table 1.

Q. DOES TABLE 1, EXHIBIT TJFA 431, ACCURATELY SUMMARIZE THE SHEAR STRENGTH INPUTS USED IN THE VARIOUS STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. Yes, it does.

Q. IS TABLE 1, EXHIBIT TJFA 431, USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO

UNDERSTAND YOUR TESTIMONY TODAY, SPECIFICALLY REGARDING STABILITY ANALYSES?

Q. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 431]

Q. WHAT DOES TABLE 1, EXHIBIT TJFA 431, SHOW?

A. Table 1 demonstrates that there is no consistency in shear strength input between the various analyses. Further, there is no explanation in the ACL Amendment Application regarding the inconsistencies.

Q. PLEASE EXPLAIN WHAT TABLE 1, EXHIBIT TJFA 431, SHOWS WITH REGARD TO THE STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION.

A. Table 1 clearly shows that inconsistent shear strengths were assumed for the same materials in different analyses contained in the ACL Amendment Application. It should be noted that there is no explanation in the ACL Amendment Application regarding the inconsistencies.

Q YOU ALSO STATED ABOVE THAT THE GEOSYNTHETIC INTERFACE SHEAR STRENGTHS IN THE ACL AMENDMENT APPLICATION FOR THE SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY ANALYSES WERE UNUSUALLY AND UNCONSERVATIVELY HIGH COMPARED TO VARIOUS PUBLISHED VALUES, *ET CETERA*. PLEASE EXPLAIN THAT STATEMENT.

A. Although the assumed shear strengths for the sideslope liner system place the critical interface strength above the liner, the assumed strengths are significantly higher and

unconservative relative to published values and correlations in the literature for MSW landfill design. I have also created a table to demonstrate this.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 432.

A. Exhibit 432 is a table, identified as Table 2, which summarizes the shear strength inputs used in the various stability analyses in the ACL Amendment Application.

Q. DID YOU CREATE TABLE 2, EXHIBIT TJFA 432?

A. Yes, I did.

Q. WHAT WAS THE SOURCE OF THE INFORMATION THAT YOU HAVE SET OUT IN TABLE 2, EXHIBIT TJFA 432?

A. The source of the information is the ACL Amendment Application itself, Exhibit TJFA 410, Abramson, *et al.*, and Exhibit TJFA 411, Duncan & Wright.

Q. DOES TABLE 2, EXHIBIT 432, ACCURATELY SUMMARIZE THE SHEAR STRENGTH INPUTS USED IN THE VARIOUS STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION, AS WELL AS THE INFORMATION FROM ABRAMSON, ET AL., AND DUNCAN & WRIGHT?

A. Yes, it does.

Q. IS TABLE 2, EXHIBIT 432, USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY, SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 432]

Q. WHAT DOES TABLE 2, EXHIBIT TJFA 432, SHOW?

A. Table 2 shows a comparison of published shear strengths to the shear strength values used in the sideslope (sidewall) liner system stability analyses in the ACL Amendment Application.

Q. PLEASE EXPLAIN WHAT TABLE 2 SHOWS WITH REGARD TO THE SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION.

A. As shown in Table 2, the assumed shear strength input values are at, or above, the upper range of published values.

Q. DOES THE ACL AMENDMENT APPLICATION EXPLAIN WHY THE ASSUMED SHEAR STRENGTH INPUT VALUES ARE AT OR ABOVE THE UPPER RANGE OF PUBLISHED VALUES?

A. No, the ACL Amendment Application does not provide a justification or rationale for the arbitrary use of such high and unconservative shear strength values. It should also be noted that the selected shear strength in the ACL Amendment Application was for "peak" strength and not for "residual" strength as commonly applied to sideslope stability analyses.

Q. WHAT IS THE SIGNIFICANCE OF USING UNCONSERVATIVE SHEAR STRENGTH VALUES IN STABILITY ANALYSES?

A. All things being equal, the stability (*i.e.*, resistance to movement or sliding) of a slope or landfill is proportional to the shear strength inputs – the lower the value of the shear strength inputs, the lower the resistance to movement. As a result of using unconservative shear strength inputs, the factors of safety obtained from the stability analyses in the ACL Amendment Application may be misleading and create a false sense of adequacy.

Q. WHAT METHODOLOGY DID THE ACL AMENDMENT APPLICATION USE TO ESTIMATE SIDESLOPE (SIDEWALL) STABILITY?

A. The sideslope stability analyses were conducted using an infinite slope analysis procedure and a complicated trigonometric formula; however, if the zero terms are dropped, the formula simply becomes the classic equation for infinite slopes found in any basic geotechnical engineering textbook:

$$\text{factor of safety} = \text{tangent (shear strength angle, } \phi) \div \text{tangent (slope angle, } \beta)$$
$$= \text{tangent } \phi \div \text{tangent } \beta$$

Q. WHAT IS THE SIGNIFICANCE OF USING AN INFINITE SLOPE METHODOLOGY?

A. The infinite slope methodology provides a very quick and to-the-point analysis for slope stability. Since the sideslopes are nominally 3H:1V (β = 18.4°), all interface shear strengths would have to be higher than ϕ = 18.4° and/or the liner stability would depend on the tensile strength of the geosynthetic components and appropriate anchoring to

obtain reasonable factors of safety against sliding (*i.e.*, greater than 1.5). A quick review of Exhibit TJFA 432, Table 2, shows that temporary sideslope liner stability can be achieved for the short term by relying on the "peak" strengths of the clay liner; however, saturation and/or movement would significantly reduce the clay liner strength to a lower value.

Q. DO YOU HAVE ANY OTHER CONCERNS REGARDING THE SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. Yes. The sidewall liner stability analyses completely ignored the potential instability resulting from the use of the hydrostatic pressure relief underdrain system installed under the sidewall liner system at various locations as shown at Part III, Attachment 3E-5 of the ACL Amendment Application. (*See* APP-202 at 1127.) The underdrain design, in effect, places a low-strength interface between the clay liner and the subgrade. In addition, the underdrain increased the potential for saturation of the surface of the high plasticity subgrade and/or the underside of the clay liner.

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. In summary, the sideslope liner stability analyses have failed to show that the liner will be stable if reasonable, commonly used shear strength input values are used.

Q. ARE YOU AWARE OF ANY SIDESLOPE (SIDEWALL) LINER SYSTEM STABILITY PROBLEMS AT THE ACL?

A. I am indeed. In early 1999, a constructed sideslope liner system experienced a stability failure wherein the leachate collection system ("LCS") and protective cover slid off the underlying geomembrane liner.

Q. HOW ARE YOU AWARE OF THIS STABILITY FAILURE AT THE ACL?

A. Documents produced by WMTX during the discovery process in this proceeding identify that a stability failure occurred at the ACL in early 1999.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 433.

A. Exhibit TJFA 433 includes a copy of a letter from Mr. Rusty Fusilier, P.E, Project Manager, and Mr. Steven M. Hamilton, R.E.P., Vice President, both of SCS Engineers, to Mr. Jerry Allred, Team Leader, MSW Permits Section, Permits Division, TNRCC, dated July 26, 1999. It also includes a copy of a report entitled "Austin Community Recycling and Disposal Facility, Repair Report for a Portion of the Sidewall Drainage Layer for Cell WD-3" ("SCS Repair Report"), prepared for WMTX by SCS Engineers, which is dated July 1999. The SCS Repair Report is signed and sealed pursuant to the Texas Engineering Practice Act by Mr. Willis R. Fusilier, Jr. (July 21, 1999) and Mr. J. Brian Dudley (July 21, 1999). The SCS Repair Report includes a narrative section, an Attachment 1, identified as "Repair Area Photographs, an Attachment 2, identified as Field Observation Report Sheets, and an Attachment 3, identified as Protective Cover Thickness Record Drawing. The photographs show the slope stability failure as it existed prior to any remediation and establish that the failure occurred on or about January 5, 1999. The July 26, 1999 letter and SCS Repair Report were Bates labeled by WMTX.

The July 26, 1999 letter is Bates labeled as WM-053084 through WM-053085, and the SCS Repair Report is Bates labeled WM-053104 through WM-053117.

Q. IS EXHIBIT TJFA 433 A TRUE AND CORRECT COPY OF THE JULY 29, 1999 LETTER AND THE SCS REPAIR REPORT?

A. Yes. Exhibit TJFA 433 is a true and correct copy of the July 26, 1999 letter and the SCS Repair Report, as they were produced by WMTX.

Q. IS EXHIBIT TJFA 433 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND PREVIOUS STABILITY FAILURES AT THE ACL?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 433]

Q. WHAT INFORMATION WAS PROVIDED TO TNRCC THROUGH THE JULY 26, 1999 LETTER AND THE SCS REPAIR REPORT?

A. The July 26, 1999 letter states: "The repair report documents repairs to the Cell WD-3 liner system performed during January 1999. These repairs were necessary to address damage to a portion of the geonet and geotextile components of the liner system caused by heavy rainfall late last year." (*See* Exhibit TJFA 433, July 26, 1999 Letter at 1.)

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 434.

A. Exhibit TJFA 434 is a copy of a letter from Mr. Jerry Allred, Team Leader, MSW Permits Section, Waste Permits Division, TNRCC, to Mr. Jack Steele, Area Manager,

Waste Management, Inc., dated September 9, 1999. The letter was Bates labeled by WMTX as WM-053081 through WM-053083 (although WM-053082 is a blank page).

Q. IS EXHIBIT TJFA 434 A TRUE AND CORRECT COPY OF THE SEPTEMBER 9, 1999 LETTER?

A. Yes. Exhibit TJFA 434 is a true and correct copy of the September 9, 1999 letter, as produced by WMTX.

Q. IS EXHIBIT TJFA 434 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND PREVIOUS STABILITY FAILURES AT THE ACL?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 434]

Q. WHAT DOES EXHIBIT TJFA 434 REPRESENT?

A. In Exhibit TJFA 434, the September 9, 1999 letter, TNRCC raises questions about the adequacy of WMTX's explanation regarding the stability failure or slide. Specifically, the September 9, 1999 letter states:

> The slide, however, raises questions regarding the adequacy of the design of the sideslope liner system, as the analyses done for the 1995 permit modification indicate that the slope configuration (i.e. 2 ft of cover soil over goetextile-topped geonet and textured geomembrane) should have had a factor of safety 1.3 against sliding for the 20-ft height of cover soil which was constructed. Please re-analyze the stability of the design section and indicate whether any changes (such as lowering the 20-ft incremental cover placement or replacing the single-sided geonet with a double-sided geocomposite) are being planned for future cells. (*See* Exhibit TJFA 429, Sept. 9, 1999 Letter at 1.)

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 435.

A. Exhibit TJFA 435 is a copy of a letter from Mr. Jack Steele, Area Manager, WMTX, to Mr. Jerry Allred, Team Leader, MSW Permits Section, Permits Division, TNRCC, dated September 23, 1999. The letter was Bates labeled by WMTX as WM-053067 through WM-053068.

Q. IS EXHIBIT TJFA 435 A TRUE AND CORRECT COPY OF THE SEPTEMBER 23, 1999 LETTER?

A. Yes. Exhibit TJFA 435 is a true and correct copy of the September 23, 1999 letter, as produced by WMTX.

Q. IS EXHIBIT TJFA 435 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND PREVIOUS STABILITY FAILURES AT THE ACL?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 435]

Q. WHAT DOES EXHIBIT TJFA 435 REPRESENT?

A. Exhibit TJFA 435, the September 23, 1999, was WMTX's letter in response to TNRCC's September 9, 1999 letter. In the September 23, 1999 letter, WMTX informed TNRCC that it would not complete the reanalysis of slope stability as requested by TNRCC, citing weather conditions as the cause of the slide.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 436.

A. Exhibit TJFA 436 includes copies of two (2) letters: (1) a letter from Mr. Jerry Allred, Team Leader, MSW Permits Section, Permits Division, TNRCC, to Mr. Jack Steele, Area Manager, Waste Management, Inc., dated October 4, 1999; and (2) a letter from Mr. Jerry Allred, Team Leader, MSW Permits Section, Waste Permits Division, TNRCC, to Mr. Jack Steele, Area Manager, Waste Management, Inc., dated January 24, 2000. The letters were Bates labeled by WMTX: (1) the October 4, 1999 letter as WM-053064 through WM-053065; and (2) the January 24, 2000 letter as WM-053062.

Q. IS EXHIBIT TJFA 436 A TRUE AND CORRECT COPY OF THE TWO LETTERS?

A. Yes. Exhibit TJFA 436 is a true and correct copy of the October 4 1999 letter and the January 24, 2000 letter, as produced by WMTX.

Q. IS EXHIBIT TJFA 436 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND PREVIOUS STABILITY FAILURES AT THE ACL?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 436]

Q. WHAT DOES EXHIBIT TJFA 436 REPRESENT?

A. The October 4, 1999 letter is TNRCC's response to WMTX's September 23, 1999 letter. In the October 4, 1999 letter, TNRCC again instructs WMTX to make certain determinations regarding the slope failure, or in the alternative provide a determination

regarding whether the rainfall event involved exceeded the 25-year storm. In the January 24, 2000 letter, TNRCC reminds WMTX that an assessment as to whether the rainfall event that premeditated the slope failure in January 1999 exceeded the 25-year storm event still needed to be completed.

Q. BASED ON YOUR REVIEW OF THE MATERIALS RELATED TO THE SLOPE FAILURE DID WMTX COMPLETE TNRCC'S REQUESTED DETERMINATIONS?

A. No. During my review of the correspondence between TNRCC and WMTX, I could not find that WMTX had ever completed the requested reanalysis of slope stability, or in the alternative, the determination regarding the severity of the storm event.

Q. DOES THE FACT THE ACL HAS PREVIOUSLY EXPERIENCED A SIDEWALL SLOPE FAILURE UNDERSCORE YOUR OPINION AS TO THE INADEQUACY OF THE STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. Yes.

C. <u>Interior Waste Slope Stability Analyses</u>

Q. WHERE ARE THE INTERIOR WASTE SLOPE STABLITY ANALYSES LOCATED IN THE ACL AMENDMENT APPLICATION?

A. The interior waste slope stability analyses are located in Part III, Attachment 3, Appendix C.3 of the ACL Amendment Application. (*See* APP-202 at 995-1026.)

Q. WHAT IS THE PURPOSE OF THE INTERIOR WASTE SLOPE STABILITY ANALYSES?

A. The interior waste slope stability analyses represent stability at an intermediate stage of filling. These analyses examined filling cells WD-7, WD-8, WD-11, WD-12, and WD-13.

Q. PLEASE DESCRIBE WHAT ANALYSES WERE CONDUCTED AS PART OF THE INTERIOR WASTE SLOPE STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. The interior waste slope stability analyses were actually done for two different configurations: (1) a "benched" interior waste slope over a liner system with smooth geomembrane; and (2) a constant 3H:1V waste slope over a liner system with textured geomembrane. In addition, one of the scenarios of the benched-slope-smooth-geomembrane configuration included the "piggyback" sidewall liner, which will be discussed more later in my testimony. (*See* APP-202 at 1022 & 1026.) The smooth geomembrane stability analyses had factors of safety less than 1.5 (*see* APP-202 at 996) even using unconservative shear strength in puts. The textured geomembrane stability analysis had factors of safety greater than 2.

Q. DID YOU IDENTIFY PROBLEMS WITH THE INTERIOR WASTE SLOPE STABILITY ANALYSES SET OUT IN THE ACL AMENDMENT APPLICATION DURING YOUR REVIEW?

A. Yes, I did.

Q. PLEASE EXPLAIN WHAT EXHIBIT TJFA 432, TABLE 2, SHOWS WITH REGARD TO THE INTERIOR WASTE SLOPE STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION.

A. As shown in Exhibit TJFA 432, Table 2, the assumed shear strength input values are at, or above, the upper range of published values.

Q. CAN YOU PLEASE EXPLAIN WHAT PROBLEMS YOU IDENTIFIED WITH THE ACL AMENDMENT APPLICATION'S INTERIOR WASTE SLOPE STABILITY ANALYSES?

A. Yes. The strength parameters utilized in the interior waste slope stability analyses were based largely on Golder-proprietary databases that were included in Part III, Attachment 3, Appendix C.3 of the ACL Amendment Application. Very little information is provided; however, the geocomposite-soil interface and the textured geomembrane-soil interface shear strengths represented a wide variety of soils. For example, for the textured geomembrane-soil interface, only three (3) of twenty-four (24) tests were actually CH classification clay; however, the entire data base (*see* APP-202 at 1003-05) was used to develop a design strength. Since, in all probability, the soil components in the liner system are local, very high plasticity clays, *i.e.*, "CH clays," the data base appears non-representative and unconservative. Very high plasticity clays represent the lowest end of soil and soil/geosynthetic interface shear strengths. (*See, e.g.*, Exhibit TJFA 410, Abramson *et al.*, and Exhibit TJFA 411, Duncan & Wright.) It should be noted that if the ACL Amendment Application had relied on Golder test results for interfaces identified as "clay liner," "clay," and/or "CH" interfaces with textured geomembrane, a non-linear lower-bound strength envelope is obtained with secant effective strength values in the range of 12° to 16°. These values are much more in line

with values as shown in Exhibit TJFA 432, Table 2. Unfortunately, the more representative data is ignored in the ACL Amendment Application. The stability analyses that included smooth geomembrane-soil interfaces had the lowest factors of safety, *i.e.*, less than 1.5. However, the strength input for this interface was based on a single test involving a "red clayey silt" soil. (*See* APP-202 at 1006.) Based on local soil types and the information provided in Exhibit TJFA 432, Table 2, the assumed interface strength is unconservative and non-representative. As previously noted, all things being equal, the stability (*i.e.*, resistance to movement or sliding) of a slope or landfill is proportional to the shear strength inputs – the lower the value of the shear strength inputs, the lower the resistance to movement, *i.e.*, lower factors of safety.

Q. DOES THE ACL AMENDMENT APPLICATION REQUIRE THE LANDFILL EXPANSION TO BE CONSTRUCTED IN ACCORDANCE WITH THE CONDITIONS MODELED IN THE STABILITY ANALYSES?

A. No. Although the interior waste slope stability analyses showed that (1) either benching the interior waste slope during filling (*i.e.*, effectively flattening the slope) and/or (2) incorporating textured geomembrane in the floor liner system was required to obtain the factors of safety given in Appendix C.3, neither the ACL Amendment Application liner design (*see* APP-202 at 917 & 946) nor Part IV, Site Operating Plan, has any such requirement. Further, Appendix E, Liner Quality Control Plan (*see* APP-202 at 1087-1128), does not specify any interface shear strength requirements and, in fact, the discussion of stability does not specify any requirements at all (*see* APP-202 at 1113-14). In other words, the conditions set out in the interior waste slope stability analyses in the ACL Amendment Application have not been incorporated into the ACL Amendment Application as enforceable requirements and thus would not be required for the

construction and operation of the expansion area of the ACL. In simple terms, the expansion of the ACL could be constructed without adequate stability against sliding and subsequent damage to liner and leachate collection systems regardless of the actual stability calculations.

Although analyses were not provided for non-benched waste slopes over smooth geomembrane floor liner, it is reasonable to infer that the factor of safety would be less. It is also reasonable to assume that, in the absence of enforceable ACL Amendment Application requirements for benched slopes, non-benched slopes could be constructed over smooth geomembrane liner. Note also that smooth geomembrane is already present in existing composite floor liner systems, *i.e.*, cell WD-7. (*See, e.g.*, APP-202 at 996.)

Q. DID YOU IDENTIFY OTHER PROBLEMS WITH THE INTERIOR WASTE SLOPE STABILITY ANALYSES?

A. Yes, I did. The stability analyses that included smooth geomembrane-soil interfaces (identified above as "(1) a 'benched' interior waste slope over a liner system with smooth geomembrane") had the lowest factors of safety, *i.e.*, less than 1.5 (*see* APP-202 at 996) even using unconservative shear strength inputs.

Q. WHY DO YOU SAY THAT THE STABILITY ANALYSES THAT INCLUDED SMOOTH GEOMEMBRANE SOIL INTERFACES UTILIZED UNCONSERVATIVE SHEAR STRENGTH INPUTS?

A. The strength input for the smooth geomembrane-soil interface was based on a single test involving a "red clayey silt" soil. (*See* APP-202 at 1006.) Based on soil type and the information provided in Exhibit TJFA 432, Table 2, the assumed interface strength is unconservative and non-representative.

Q. WHAT IS YOUR CONCERN WITH THE FACT THAT THE STABILITY ANALYSES FOR THE SMOOTH GEOMEMBRANE-SOIL INTERFACE HAD A FACTOR OF SAFETY OF LESS THAN 1.5?

A. I have several concerns with the low factor of safety. First, EPA has identified recommended minimum factors of safety for MSW landfill stability analyses in the *Technical Manual* identified above as Exhibit TJFA 405. The recommendations in the *Technical Manual* are reproduced below in the following table:

Recommended Minimum Values of Factor of Safety
(U.S. EPA, *Technical Manual*, 1993, 1998)

Table 2-4

Recommended Minimum Values of Factor of Safety
for Slope Stability Analyses

Consequences of Slope Failure	Uncertainty of Strength Measurements	
	Small[1]	Large[2]
No imminent danger to human life or major environmental impact if slope fails	1.25 (1.2)*	1.5 (1.3)
Imminent danger to human life or major environmental impact if slope fails	1.5 (1.3)	2.0 or greater (1.7 or greater)

[1] The uncertainty of the strength measurements is smallest when the soil conditions are uniform and high quality strength test data provide a consistent, complete, and logical picture of the strength characteristics

[2] The uncertainty of the strength measurements is greatest when the soil conditions are complex and when available strength data do not provide a consistent, complete, and logical picture of the strength characteristics

* Numbers without parentheses apply for static conditions and those within parentheses apply to seismic conditions

Source: EPA Guide to Technical Resources for the Design of Land Disposal Facilities.

(*See* Exhibit TJFA 405, *Technical Manual* at 55.) As included in the ACL Amendment Application, the stability analyses were not based on "high quality strength data" or on reasonable worst case published data. Even setting aside the unconservative quality of the assumed strength inputs, the stability analyses in the ACL Amendment Application would be required to show factors of safety of 2.0 or greater. (*See* Exhibit TJFA 405, *Technical Manual*, and Exhibit TJFA 411, Duncan & Wright.) That is simply not the case

as the intermediate waste slope analyses show, specifically with the factor of safety of less than 1.5 for the smooth geomembrane stability analyses.

Considering that (1) the "uncertainty of strength measurement" is not only large but also unconservative and (2) the "consequence of slope failure" is also large due to potential disruption of the primary protective features of the landfill (*i.e.*, the liner and LCS), a factor of safety of less than 1.5 appears inadequate relative to the information in the above table from the EPA *Technical Manual.*

Q. DO YOU HAVE ADDITIONAL CONCERNS WITH THE INTERIOR WASTE SLOPE STABILITY ANALYSES?

A. Yes, I would also like to note that while the ACL Amendment Application does not include analyses for non-benched waste slopes over smooth geomembrane floor liner, it is reasonable to infer that the factor of safety would be less. It is also reasonable to assume that, in the absence of ACL Amendment Application requirements for benched slopes, non-benched slopes could be constructed over smooth geomembrane liner.

Q. ARE YOU SAYING THAT WHILE THE ACL AMENDMENT APPLICATION CONTAINS STABILITY ANALYSES FOR BENCHED WASTE SLOPES OVER SMOOTH GEOMEMBRANE FLOOR LINER, IT DOES NOT SPECIFICALLY REQUIRE WMTX TO CONSTRUCT BENCHED SLOPES IF THE EXPANSION AREA IS EVER CONSTRUCTED OVER SMOOTH FLOOR LINER?

A. Correct. There is no requirement in the portions of the ACL Amendment Application that address the design and construction of the expansion area itself for benched waste slopes, as opposed to non-benched slopes, to be constructed over smooth geomembrane liner. Thus, WMTX could, pursuant to the ACL Amendment Application, construct non-

benched slopes over smooth geomembrane floor liner that had an even lower factor of safety than what is considered in the ACL Amendment Application.

Q. WHY DO YOU HAVE SUCH STRONG CONCERNS REGARDING THE LOW FACTOR OF SAFETY?

A. The damage to a landfill liner and/or cover system is considered a major environmental impact due to the potential for release to ground water, surface water, and/or the atmosphere and the increased potential for combustion.

Q. ARE THERE REFERENCES THAT SUPPORT YOUR OPINIONS REGARDING THE POTENTIAL DAMAGE CAUSED BY A LOW FACTOR OF SAFETY?

A. Yes. For example, a lecture by Gordon P. Boutwell, "Slides Happen – Landfill Stability Analyses," identifies that due to strain incompatibility between waste and liner/LCS system components, sufficient movement can occur to damage liner/LCS components before the slide plane is fully developed in the overlying waste mass. (*See* Boutwell at Fig. 8 at 11.).

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 437.

A. Exhibit TJFA 437 is a copy of the lecture "Slides Happen – Landfill Stability Analyses," which was presented by Mr. Gordon P. Boutwell, Ph.D., P.E., as the 2002 Aleksandar Vesic Memorial Lecture, and was presented to the North Carolina Section of the American Society of Civil Engineers on October 3, 2002.

Q. WHAT DOES EXHIBIT TJFA 437 ADDRESS?

A. Exhibit TJFA 437 addresses the relationship between stability analyses and landfill slides.

Q. IS EXHIBIT TJFA 437 A TRUE AND CORRECT COPY OF THE BOUTWELL LECTURE?

A. Yes. Exhibit TJFA 437 is a true and correct copy of the Boutwell lecture.

Q. IS EXHIBIT TJFA 437 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 437 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 437 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 437]

Q. ARE THERE OTHER EXAMPLES OF SLIDE FAILURE IN THE LITERATURE?

A. Yes. For example, Exhibit TJFA 407, the GeoRG Manual, identifies an example of a slope failure. Specifically, Exhibit TJFA 407 identifies the following example: If the slide plane (failure surface) never fully develops and "daylights" at the surface, the owner/operator of a MSW landfill could be unaware that a liner/LCS stability failure occurred. (*See* Exhibit TJFA 407, GeoRG Manual at 1-1.)

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE INTERIOR WASTE SLOPE STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. In summary, the interior wastes slope stability analyses, together with the absence of operating/construction permit requirements, do not provide any realistic assurance that the interior slopes will be stable and that the liner system will not be disrupted.

Q. ARE YOU AWARE OF ANY INTERMEDIATE CONDITION STABILITY PROBLEMS AT THE ACL?

A. I am not personally aware of any intermediate condition stability problems at the ACL.

Q. ARE YOU AWARE OF INTERMEDIATE CONDITION STABILITY PROBLEMS AT THE BFI SUNSET FARMS LANDFILL ADJACENT TO THE ACL.

A. Yes. Mr. Charles Lesniak, representing the City of Austin, recently testified that the BFI Sunset Farms Landfill has had multiple slope failures of the intermediate cover. Mr. Lesniak provided this testimony on January 30, 2009, at the SOAH proceeding involving BFI's amendment application to expand the Sunset Farms Landfill.

Q. HOW DOES THE FACT THE ADJACENT MSW LANDFILL HAS PREVIOUSLY EXPERIENCED INTERMEDIATE CONDITION SLOPE FAILURES AFFECT YOUR OPINION AS TO THE INADEQUACY OF THE ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. The information simply underscores my opinion that the analyses in the ACL Amendment Application are inadequate.

D. <u>Final Configuration Stability Analyses</u>

Q. WHERE ARE THE FINAL CONFIGURATION STABLITY ANALYSES LOCATED IN THE ACL AMENDMENT APPLICATION?

A. The final configuration stability analyses are located in Part III, Attachment 3, Appendix C.4 of the ACL Amendment Application. (*See* APP-202 at 1028-50.)

Q. DID YOU IDENTIFY PROBLEMS WITH THE FINAL CONFIGURATION STABILITY ANALYSES SET OUT IN THE ACL AMENDMENT APPLICATION DURING YOUR REVIEW?

A. Yes, I did.

Q. CAN YOU PLEASE EXPLAIN WHAT PROBLEMS YOU IDENTIFIED WITH THE ACL AMENDMENT APPLICATION'S FINAL CONFIGURATION STABILITY ANALYSES?

A. Yes. Final configuration stability analyses typically, and in the ACL Amendment Application, show higher factors of safety than the interior waste slope stability analyses. This increased factor of safety is due both to flatter (4H:1V) slopes and the "buttressing"

effect of the excavation sidewall. That said, though, a translational or "block" failure analysis, which was included in the ACL Amendment Application, of the final configuration of cell WD-13 showed a factor of safety of 1.578. (*See* APP-202 at 1034.) Considering the quality of shear strength data, *i.e.*, non-representative and unconservative, used in the analyses as detailed in Exhibit TJFA 432, Table 2, and further described with regard to interior waste slopes, above, the final configuration would not appear to conform to EPA's recommendations for factor of safety, as set out above in the table reproduced from the *Technical Manual*, Exhibit TJFA 405.

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE FINAL CONFIGURATION STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. In summary, the final configuration stability analyses indicate marginal stability using questionable input data. In my professional opinion, protection of human health and the environment requires a more detailed and realistic assessment of stability than that provided in the ACL Amendment Application. There is no doubt that a properly designed landfill with similar geometry, fill heights, excavation depths, and slopes can be shown to be stable. However, the materials and interfaces chosen for the ACL liner/LCS system appear to be lacking in necessary strength

E. <u>Final Cover Stability Analyses</u>

Q. WHERE ARE THE FINAL COVER STABLITY ANALYSES LOCATED IN THE ACL AMENDMENT APPLICATION?

A. The final cover stability analyses are located in Part III, Attachment 3, Appendix C.5 of the ACL Amendment Application. (*See* APP-202 at 1052-54.)

Q. DID YOU IDENTIFY PROBLEMS WITH THE FINAL COVER STABILITY ANALYSES SET OUT IN THE ACL AMENDMENT APPLICATION DURING YOUR REVIEW?

A. Yes, I did.

Q. CAN YOU PLEASE EXPLAIN WHAT PROBLEMS YOU IDENTIFIED WITH THE ACL AMENDMENT APPLICATION'S FINAL COVER STABILITY ANALYSES?

A. Yes. The stability analyses are essentially "infinite slope analyses" with a "passive wedge" or buttress added at the bottom of the slope. For a 4H:1V ($\beta = 14°$) slope and a critical interface shear strength, $ø = 21°$, the obtained factor of safety was 1.55. However, it appears that the buttress provided a negligible contribution to stability. If a purely "infinite slope analysis" had been conducted, the resulting factors of safety would have been:

factor of safety = tangent (shear strength of angle, ø) ÷ tangent (slope angle, β) =

= tangent ø ÷ tangent β = 1.54

The results indicate a "pure" infinite slope calculation is more than adequate to estimate final cover slope stability. Regardless, from the comparison of published shear strength values with the ACL Amendment Application values (*see* APP-202 at 1052) summarized in Exhibit TJFA 432, Table 2, it would appear that the critical interface shear strength, $ø = 21°$ used in the ACL Amendment Application's final cover analyses is unconservative.

It should also be noted that an infinite slope analysis is analogous to the classic problem of a block sliding down an inclined plane or wedge. The tangent of the interface

shear strength angle is equivalent to the coefficient of friction between the block and the wedge. In the analog, the frictional force resisting the sliding of the block is simply the product of the weight of the block times the cosine of the slope angle β times the tangent of the interface shear angle ø. The driving force trying to push the block down the slope is simply the product of the weight of the block times the sine of the slope angle β. Because the factor of safety is simply the ratio of resisting force divided by the driving force, the analog factor of safety can be expressed mathematically as:

factor of safety = (weight x cosine β x tangent ø) ÷ (weight x sine β).

Since cosine β ÷ sine β = 1/tangent β, the analog factor of safety equation simplifies to:

factor of safety = tangent ø ÷ tangent β.

Q. WHY DO YOU CONCLUDE THAT THE CRITICAL INTERFACE SHEAR STRENGTH USED IN THE FINAL COVER SYSTEM ANALYSES IS UNCONSERVATIVE?

A. Based on published data summarized in Exhibit TJFA 432, Table 2, it appears that the textured geomembrane/clay liner interface would be the critical shear strength. The published range for that critical interface is ø = 9° to 15°, *i.e.*, much lower strength than the ACL Amendment Application's assumed strength of ø = 21°. If the published range of critical interface strength is used in an infinite slope analyses for a 4H:1V (β = 14°) final cover slope, factors of safety from 0.635 to 1.075 result. Based on published data given in Exhibit TJFA 432, Table 2, for the critical interface strength, it is reasonable to assume that the final cover design is either unstable, or lacks necessary stability, as proposed in the ACL Amendment Application. As noted by Dr. Gilbert in his 2008

presentation, referenced above as Exhibit TJFA 406, final cover stability failures are common but rarely reported.

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE FINAL COVER STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. In summary, the final cover stability analyses appear flawed as to input and provide unrealistic and unconservative estimates of final cover stability.

F. <u>Piggyback Liner Stability Analyses</u>

Q. WHERE ARE THE PIGGYBACK LINER STABLITY ANALYSES LOCATED IN THE ACL AMENDMENT APPLICATION?

A. The piggyback liner stability analyses are continued in Part III, Attachment 3, Appendices C.6 and C.7 of the ACL Amendment Application. (*See* APP-202 at 1056-74.) I say "continued" because the analyses contained in Appendices C.6 and C.7 are in addition to one of the scenarios of the benched-slope-smooth-geomembrane configuration that included the "piggyback" sidewall liner (*see* APP-202 at 1022 & 1026) for the interior waste slope stability analyses in Appendix C.3.

Q. WHAT WAS THE PURPOSE OF THE ANALYSES INCLUDED IN APPENDICES C.6 AND C.7?

A. The additional calculations in Appendix C.6 were to "evaluate the stability of the piggyback liner and the underlying waste . . . per TCEQ's comment." (*See* APP-202 at 1056.) The additional calculations in Appendix C.7 are a quasi "infinite slope analysis" modified to include construction equipment working downslope. As discussed previously, the shear strength inputs are non-representative and unconservative. (*See*

Exhibit TJFA 432, Table 2.) The ACL Amendment Application's calculations confirm working equipment downslope is a destabilizing practice, *i.e.*, the factor of safety was reduced from 2.1 to 1.6 as a consequence of working equipment downslope. Regardless, the general concept of construction equipment working downslope over a liner/LCS/cover system is generally recognized as a flawed procedure in numerous instances in published literature. In addition, such practice has also been problematic in excavation in high plasticity clays, *e.g.*, the Skyline Landfill.

Q. WHAT DOES THE TERM "PIGGYBACK" REFER TO?

A. A "piggyback" vertical expansion is just what the term implies—an expansion of a landfill by adding, *i.e.*, "piggybacking," new waste fill over an existing waste fill. The piggybacked, or vertical expansion, area is usually separated from the underlying MSW landfill by a "separatory liner system." However, the vertical expansion is effectively being placed over an existing landfill which will serve as its "foundation," as that term is defined in solid waste rules. As will be discussed later in my testimony, the existing MSW landfill is an "unstable area" to the extent that it serves as a "foundation." Comprehensive design, analysis, and construction are required to ensure the safety of a "piggyback" vertical expansion.

Q. DID THE ACL AMENDMENT APPLICATION ADEQUATELY CHARACTERIZE CONDITIONS IN THE EXISTING LANDFILL DISPOSAL AREAS?

A. No, it did not.

Q. IS CHARACTERIZATION OF THE EXISTING LANDFILL DISPOSAL AREAS RELEVANT TO THE PROPOSED "PIGGYBACK" VERTICAL EXPANSION?

A. Yes. The existing landfill disposal areas contain solid waste and voids filled either with leachate and/or landfill gas. The significant loads imposed by the piggyback expansion will result in significant settlement of the existing waste through a decrease in void volume. The result is a greatly increased risk of leachate and/or landfill gas release to the environment. An analogy would be stepping on a wet sponge—as the sponge is compressed, water is released.

Q. SHOULD A PRUDENT PIGGYBACK LANDFILL DESIGN INCLUDE CHARACTERIZATION OF THE EXISTING LANDFILL DISPOSAL AREAS?

A. In my opinion, a comprehensive characterization of those existing waste disposal areas over which the piggyback liner is proposed to be constructed was required by the prevailing standard of care.

Q. IS YOUR OPINION REGARDING THE NEED FOR A COMPREHENSIVE CHARACTERIZATION SHARED BY OTHERS IN THE INDUSTRY?

A. Yes, it is.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 438.

A. Exhibit TJFA 438 is excerpts from *Geotechnical Aspects of Landfill Design and Construction* by Xuede Qian, Robert M. Koerner, and Donald H. Gray (2001).

Q. WHAT DOES EXHIBIT TJFA 438 ADDRESS?

A. Exhibit TJFA 438 includes an entire chapter on vertical landfill expansions. Specifically, it discusses settlement of existing waste due to vertical expansion, considerations for vertical landfill expansions including expansions over unlined landfills, and stability analyses of vertical expansions. (*See* Exhibit TJFA 438, Qian, *et al.* at 544-59 & 572-73.)

Q. IS EXHIBIT TJFA 438 A TRUE AND CORRECT COPY OF THE EXCERPTS FROM QIAN, ET AL.?

A. Yes. Exhibit TJFA 438 is a true and correct copy of the excerpts from Qian, *et al.*

Q. IS EXHIBIT TJFA 438 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO LANDFILL DESIGN AND STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 438 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 438 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING LANDFILL DESIGN AND STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 438]

Q. DOES EXHIBIT TJFA 438 CONTAIN ANY ILLUSTRATIVE EXAMPLES OF A VERTICAL OR "PIGGYBACK" LANDFILL?

A. Yes. A graphic illustration of vertical expansion and "piggyback" landfill can be found in Exhibit TJFA 438, Qian, *et al.* at page 545.

Q. IS THERE ANY OTHER PUBLISHED INFORMATION ON TECHNICAL CONSIDERATIONS FOR DESIGNING A "PIGGYBACK" VERTICAL EXPANSION?

A. Yes.

Q. PLEASE IDENTIFY SOME OF THESE REFERENCES.

A. The *Technical Manual*, discussed above, Exhibit TJFA 405, also addresses "piggyback" vertical expansions.

Q. WHAT DOES EXHIBIT TJFA 405, THE TECHNICAL MANUAL, ADDRESS RELATING TO PIGGYBACK VERTICAL EXPANSIONS?

A. The *Technical Manual* discusses that a piggyback landfill may be unstable until the existing landfill "has undergone complete settlement." (*See* Exhibit TJFA 405, *Technical Manual* at 48.)

Q. ARE THERE ANY OTHER REFERENCES RELATED TO THE TOPIC OF PIGGYBACK VERTICAL EXPANSIONS?

A. Yes, *Barrier Systems for Waste Disposal Facilities* by Kerry R. Rowe, *et al.* (2004).

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 439.

A. Exhibit TJFA 439 is excerpts from *Barrier Systems for Waste Disposal Facilities* by Kerry R. Rowe, *et al.*, Second Edition (2004).

Q. WHAT DOES EXHIBIT TJFA 439 ADDRESS?

A. In Exhibit TJFA 439, Rowe, *et al.* discuss design requirements for vertical expansions due to highly variable waste settlements, *et cetera*. (*See* Exhibit TJFA 439, Rowe, *et al.* at 455.)

Q. IS EXHIBIT TJFA 439 A TRUE AND CORRECT COPY OF EXCERPTS FROM ROWE, ET AL.?

A. Yes. Exhibit TJFA 439 is a true and correct copy of excerpts from Rowe, *et al.*

Q. IS EXHIBIT TJFA 439 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO LANDFILL DESIGN AND STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 439 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 439 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 439]

Q. ARE THERE OTHER REFERENCES THAT ADDRESS THE ISSUES SURROUNDING PIGGYBACK VERTICAL EXPANSIONS?

A. Yes. Exhibit TJFA 407, the GeoRG Manual.

Q. HOW IS EXHIBIT TJFA 407 OF INTEREST AS IT RELATES TO PIGGYBACK VERTICAL EXPANSIONS?

A. The GeoRG Manual was specifically designed to address certain landfill failures, including vertical expansions, and has specific references to "separatory liner systems" and design requirements. (*See* Exhibit TJFA 407, GeoRG Manual at 6-1, 6-5, & 6-6.)

Q. ARE THERE ANY OTHER AUTHORITATIVE REFERENCES?

A. Yes, *Designing with Geosynthetics* by Robert M. Koerner, Fifth Edition (2005).

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 440.

A. Exhibit TJFA 440 is a copy of excerpts from *Designing with Geosynthetics* by Robert M. Koerner, Fifth Edition (2005).

Q. WHAT DOES EXHIBIT TJFA 440 ADDRESS WITH RESPECT TO VERTICAL EXPANSIONS?

A. In Exhibit TJFA 440 Koerner addresses requirements for "piggyback landfills," *i.e.*, new landfill over an existing one. (*See* Exhibit TJFA 440, Koerner at 374 & 558-59.)

Q. IS EXHIBIT TJFA 440 A TRUE AND CORRECT COPY OF THE EXCERPTS FROM KOERNER?

A. Yes. Exhibit TJFA 440 is a true and correct copy of the excerpts from the Koerner book.

Q. IS EXHIBIT TJFA 440 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO LANDFILL DESIGN AND STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 440 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 440 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 440]

Q. DO ALL OF THE REFERENCES THAT YOU JUST DISCUSSED, EXHIBITS TJFA 405, TJFA 407, TJFA 438, TJFA 439, AND TJFA 440, SUPPORT YOUR OPINION THAT A COMPREHENSIVE CHARACTERIZATION OF THOSE EXISTING WASTE DISPOSAL AREAS OVER WHICH THE PIGGYBACK LINER IS PROPOSED TO BE CONSTRUCTED WAS REQUIRED BY THE PREVAILING STANDARD OF CARE?

A. Yes, they do.

Q. CAN ANY CHARACTERISTICS OF THE EXISTING WASTE AT THE ACL BE INFERRED FROM INFORMATION IN THE ACL AMENDMENT APPLICATION?

A. No. Necessary information such as waste density, moisture content, leachate levels, and any internal "layering" was not provided in the ACL Amendment Application.

Q. WERE THE DESIGN CONSIDERATIONS AND PROCEDURES IN THE REFERENCES IDENTIFIED ABOVE CONSIDERED IN THE DEVELOPMENT OF THE ACL AMENDMENT APPLICATION?

A. No. It does not appear that the above standard industry references were used.

Q. DID YOU IDENTIFY PROBLEMS WITH THE PIGGYBACK LINER STABILITY ANALYSES SET OUT IN THE ACL AMENDMENT APPLICATION DURING YOUR REVIEW?

A. Yes, I did.

Q. CAN YOU PLEASE EXPLAIN WHAT PROBLEMS YOU IDENTIFIED WITH THE ACL AMENDMENT APPLICATION'S PIGGYBACK LINER STABILITY ANALYSES?

A. Yes. Appendix C.6 calculations assumed a shear strength between clay liner and underlying waste of ø = 28°. Such a selection was indicated as "conservative," but no reference was provided in the ACL Amendment Application to support that assertion. As summarized in Exhibit TJFA 432, Table 2, the chosen shear strength appears to correspond to the shear strength used for "protective cover soil" in the previous analyses. Assuming that the protective cover soil and clay liner soil were obtained from on-site, the very high plasticity characteristics would indicate that the selected strength was anything but conservative. (*See* Exhibit TJFA 432, Table 2.)

Q. PLEASE EXPLAIN WHY THE SELECTED STRENGTH SHOULD NOT BE CONSIDERED CONSERVATIVE?

A. The critical strength used in the ACL Amendment Application's calculations was ø = 28°. This value is higher than "peak strength" for high plasticity clays typical of the immediate area of the facility and **much** higher than "residual strength" for high plasticity clays. (*See* Exhibit TJFA 432, Table 2.) Note that "residual strength" would be applicable due to the slope and loading of the "piggyback liner." (*See* Exhibit TJFA 407, GeoRG Manual at 4-16 & 8-7.) Since the assumed strength used in the stability analyses

is higher than the range of published values for comparable, high-plasticity clays, the assumed strength is unconservative.

Q. WHAT OTHER PROBLEMS DID YOU IDENTIFY WITH THE PIGGYBACK LINER STABILITY ANALYSES?

A. Regardless of the strength choice utilized, the piggyback stability analyses contained in Appendix C.6 are essentially worthless simply because only the waste/clay liner interface was considered in the analyses. Note that earlier in Appendix C.3, one of the scenarios of the benched-slope-smooth-geomembrane configuration included the "piggyback" sidewall liner. (*See* APP-202 at 1022 & 1026.) Appendix C.3 assigned low strengths to the geosynthetic interfaces of the "piggyback liner." (*See* APP-202 at 995.) However, the much lower strength geosynthetic interfaces for interior waste slope stability analyses in Appendix C.3 (*see* APP-202 at 995) were not included and/or were ignored in the Appendix C.6 piggyback liner stability analyses. Not surprisingly, it should be noted that the Appendix C.3 piggyback liner stability analysis factor of safety was 1.463 (*see* APP-202 at 1022) whereas the Appendix C.6 factors of safety were much higher. If the geosynthetic interfaces had been included, *i.e.*, more representative shear strengths had been used, the factors of safety would have been much less.

Q. ARE YOU SAYING THAT THE "PIGGYBACK LINER" WAS ANALYZED TWICE AND GOT TOTALLY CONTRADICTORY RESULTS?

A. Yes, Appendix C.3 analyzed the "piggyback liner" system as part of the interior waste slope stability analyses (*see* APP-202 at 1022 & 1026) and obtained marginal factors of safety. Appendix C.6 reanalyzed the "piggyback liner" system using a single, unconservative interface shear strength totally different from, and higher than, strengths

used in Appendix C.3. Not surprisingly, the Appendix C.6 calculations gave unrealistically high factors of safety for essentially the same condition that had marginal factors of safety in the Appendix C.3 calculations.

It is not at all clear why the ACL Amendment Application essentially analyzed the piggyback liner multiple times except perhaps to provide an analysis specific to the piggyback liner in response to TCEQ questions. Regardless, the interior waste slope analyses in Appendix C.3 suggest that the piggyback liner system lacks adequate stability as analyzed.

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE PIGGYBACK LINER STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION?

A. In summary, the piggyback liner stability analyses made no effort to analyze the actual proposed piggyback liner system and ignored all but the strongest interface strengths. The fact that the piggyback liner stability analyses yielded higher factors of safety than interior slope analyses that included the piggyback liner system raises serious questions about the technical inputs and consistency of all the stability analyses in the ACL Amendment Application.

G. <u>Conclusions Regarding Stability Analyses</u>

Q. BASED ON YOUR REVIEW OF THE STABILITY ANALYSES DISCUSSED ABOVE, DO YOU BELIEVE THAT THE STABILITY ANALYSES INCLUDED IN THE ACL AMENDMENT APPLICATION MEET THE REQUIREMENTS OF THE MSW RULES?

A. No. Based on my review of all of the stability analyses contained in the ACL Amendment Application, it is my professional opinion that the geotechnical engineering

stability analyses contained in the ACL Amendment Application do not appear to meet the requirements of several of TCEQ's MSW rules, including, for example:

- 30 TEX. ADMIN. CODE § 330.61(j)(4).
- 30 TEX. ADMIN. CODE § 330.339(a).
- 30 TEX. ADMIN. CODE § 330.339(e).
- 30 TEX. ADMIN. CODE § 330.559.
- 30 TEX. ADMIN. CODE § 330.15(h).
- 30 TEX. ADMIN. CODE § 330.305(d).
- 30 TEX. ADMIN. CODE §§ 330.337(c) and (e).

Q. PLEASE EXPLAIN HOW THE STABILITY ANALYSES IN THE ACL AMENDMENT APPLICATION FAIL TO MEET THE REQUIREMENTS OF THE MSW RULES THAT YOU HAVE IDENTIFIED.

A. Briefly,

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE §§ 330.61(j)(4) and 330.559 because it fails to identify and provide data on unstable areas, *i.e.*:

> a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of a landfill's structural components responsible for preventing releases from the landfill . . . . Owners or operators of . . . lateral expansions located in an unstable area shall demonstrate that engineering measures have been incorporated into the landfill unit's design to ensure that the integrity of the structural components of the landfill unit will not be disrupted.

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE §§ 330.339(a) & 330.339(e) because it does not provide calculations using accepted engineering procedures to show "all

constructed liners shall be keyed into an underlying formation of sufficient strength to ensure stability of the constructed lining."

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.15(h) because it does not ensure that there will not be a discharge of solid wastes or pollutants adjacent to or into waters of the State.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.305(d) because it does not provide effective erosional stability to top dome surfaces and external embankment side slopes during all phases of landfill operation, closure, and post-closure care.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.337(c) and (e) because WMTX has failed to ensure that the liner will be stable during the filling and operation of the ACL.

Q. OTHER THAN FAILING TO MEET APPLICABLE REQUIREMENTS OF THE STATE MSW RULES AND THE FEDERAL SUBTITLE D REGULATIONS, DO YOU HAVE PROFESSIONAL CONCERNS REGARDING THE STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. Yes. The stability analyses contained in the ACL Amendment Application suggest a general unfamiliarity with the current geotechnical engineering standard of care for landfill stability analyses. Since the general use of geosynthetic components began over twenty (20) years ago, there have been a number of landfill stability failures that breached the liner or containment and released contamination into the environment. As a

result of the failures—beginning with the Kettleman Hills Landfill in California—a general consensus has been established regarding proper landfill stability analysis. This consensus can be found in the industry references that I have identified above as Exhibits TJFA 405, TJFA 407, TJFA 438, TJFA 439, and TJFA 440, as well as other industry publications.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 441.

A. Exhibit TJFA 441 is a copy of "Kettleman Hills Waste Landfill Slope Failure. I: Liner-System Properties," an article by James K. Mitchell, Raymond B. Seed, and H. Bolton Seed, that appeared in the *ASCE Journal of Geotechnical Engineering*, Volume 116, No. 4, in April 1990.

Q. WHAT DOES EXHIBIT TJFA 441 ADDRESS?

A. Exhibit TJFA 441 addresses the slope failure of the Kettleman Hills Landfill in California.

Q. IS EXHIBIT TJFA 441 A TRUE AND CORRECT COPY OF MITCHELL, ET AL.?

A. Yes. Exhibit TJFA 441 is a true and correct copy of the Mitchell, *et al.*

Q. IS EXHIBIT TJFA 441 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO LANDFILL DESIGN AND STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 441 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 441 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND SLOPE FAILURES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 441]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 442.

A. Exhibit TJFA 442 is a copy of "Kettleman Hills Waste Landfill Slope Failure. II: Stability Analyses," an article by Raymond B. Seed, James K. Mitchell, and H. Bolton Seed, that appeared in the *ASCE Journal of Geotechnical Engineering*, Volume 116, No. 4, in April 1990.

Q. WHAT DOES EXHIBIT TJFA 442 ADDRESS?

A. Exhibit TJFA 442 also addresses the Kettleman Hills' landfill failure.

Q. IS EXHIBIT TJFA 442 A TRUE AND CORRECT COPY OF SEED, ET AL.?

A. Yes. Exhibit TJFA 442 is a true and correct copy of the Seed, *et al.*

Q. IS EXHIBIT TJFA 442 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO LANDFILL DESIGN AND STABILITY ANALYSES?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 442 IN DESIGNING MSW LANDFILLS?

A. Yes, they do.

Q. IS EXHIBIT TJFA 442 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING STABILITY ANALYSES AND SLOPE FAILURES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 442]

Q. PLEASE DESCRIBE THE GENERAL ENGINEERING CONSENSUS ON WHAT SHOULD BE INCLUDED IN A PROPER STABILITY ANALYSIS FOR VERTICAL EXPANSIONS OF LANDFILLS?

A. The following list summarizes components of a proper stability analysis for a landfill:

- Analyze both rotational, circular arc, and translational failure paths.
- Design with lowest interface strength above the LCS and/or final cover drainage system to force movement above containment layers.
- Use residual interface strengths on slopes greater than 5% that are loaded with more than 1440 psf.

- Recognize that efficiency (*i.e.*, strength) of the soil/geosynthetic interface is less than soil shear strength alone.
- Recognize strength envelopes are generally non-linear.
- Use strain-compatible shear strengths along the slip plane.
- Analyze the highest and steepest sections—usually the interim slope.
- Analyze sections with minimum "passive" resistance—usually the interim slope.
- Use secant angle strength, *i.e.*, no cohesion, on interface strengths.
- Use either site-specific laboratory strength testing or conservative correlations.
- Identify "critical layers," including slip layers, within the waste mass.
- Refrain from use of "average" properties.
- Evaluate strength anisotropy.
- Discuss stability-related precautions—fill sequence, equipment operation, *et cetera*.

Q. DID THE STABILITY ANALYSES CONTAINED IN THE ACL AMENDMENT APPLICATION INCORPORATE ANY OF THE ABOVE REFERENCED COMPONENTS OF A PROPER STABILITY ANALYSIS?

A. Only a few, *e.g.*, circular arc and translational analyses, were included from the above list. Most of the other practice considerations appear to have been ignored. Based on these omissions, WMTX has failed to adequately demonstrate that the landfill design contained in the ACL Amendment Application will possess sufficient stability to be protective of human health and safety and the environment.

Q. IN THE RECENT SOAH PROCEEDING INVOLVING BFI'S AMENDMENT APPLICATION TO EXPAND THE SUNSET FARMS LANDFILL, BFI WAS CRITICAL OF YOUR RELIANCE ON MANUAL CALCULATIONS IN FORMING SOME OF YOUR OPINIONS. IS THAT A VALID CRITICISM?

A. Absolutely not. As a quick reference to some of the excerpted materials I have provided will show, manual calculations are a vital part of any stability analysis.

Q. PLEASE EXPLAIN.

A. Probably the foremost authority on slope stability is the U.S. Army Corps of Engineers (the "Corps"). The Corps' latest reference on slope stability addresses the importance of manual calculations.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 443.

A. Exhibit TJFA 443 is excerpts from the Corps' *Engineer Manual, Engineering and Design – Slope Stability*, EM 1110-2-1902 (Oct. 31, 2003) ("Corps' Slope Stability").

Q. IS EXHIBIT TJFA 443 A TRUE AND CORRECT COPY OF CORPS' SLOPE STABILITY?

A. Yes. Exhibit TJFA 443 is a true and correct copy of excerpts from Corps' Slope Stability.

Q. IS EXHIBIT TJFA 443 CONSIDERED TO BE AUTHORITATIVE IN THE FIELD OF ENGINEERING AS RELATED TO SLOPE STABILITY?

A. Yes, it is although the publication is specifically focused on Corps' projects such as dams, *et cetera*.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 443 WHEN ADDRESSING SLOPE STABILITY ISSUES?

A. Yes, they do and particularly when looking at slope stability in a global sense.

Q. IS EXHIBIT TJFA 443 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING SLOPE STABILITY ISSUES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 443]

Q. PLEASE DESCRIBE WHAT CORPS' SLOPE STABILITY DISCUSSES WITH REGARD TO MANUAL CALCULATIONS.

A. Corps' Slope Stability provides:

> The historical U.S. Army Corps of Engineers' approach to verification of any computer analysis [of slope stability] was to perform hand calculations . . . of at least simplified version of the problem. . . . While verification of stability analysis results is still required, it is no longer required that results be verified using graphical hand calculations. (*See* Exhibit TJFA 443, Corps' Slope Stability at 4-1 & 4-2.)

Corps' Slope Stability documents that all stability analyses should be verified by an alternate method, *i.e.*, different computer program, manual calculations, chart solutions, *et cetera*. It also shows that the historic method of verification was based on hand calculations. Graphical hand calculations are what the name suggests—drawing the physical situation (*e.g.*, slope, dam, or infinite slope to scale) and breaking the "model" into discrete parts, blocks or slices for analyses, *i.e.*, "graphical" analyses.

Q. ARE THERE OTHER REFERENCES THAT AGREE THAT MANUAL CALCULATIONS ARE A VITAL PART OF A STABILITY ANALYSIS?

A. Yes, Exhibit TJFA 411, discussed above, also identifies that manual calculations are an essential part of stability analyses, particularly as a means of verifying computer solutions. (*See* Exhibit TJFA 411, Duncan & Wright at 103-06 & 232.)

Q. PLEASE IDENTIFY WHY YOU BELIEVE MANUAL CALCULATIONS ARE IMPORTANT?

A. The bigger picture answer is that an approximate solution (even manual calculations) to the right problem is far superior to an exact solution to the wrong problem. No solution can be any better that the quality of the input data or the realism of the modeled conditions. Simply put, the old adage for stability calculations is "garbage in = garbage out." Neither manual nor computer solutions have the edge. In fact, depending on the condition being analyzed, a manual or chart solution may be just as rigorous as a computer solution. In addition, simple manual solutions can often be used to demonstrate that more complex computer solutions are not needed, *e.g.*, infinite slope analyses for veneer-type conditions.

Q. IN YOUR STABILITY ANALYSES FOR DAMS, DID YOU USE BOTH COMPUTER SOLUTIONS AND MANUAL SOLUTIONS?

A. Yes and, at a minimum, critical computer solutions were always verified by manual solutions.

Q. SO YOU ARE NOT ADVERSE TO COMPUTER SOLUTIONS FOR STABILITY ANALYSES?

A. I am not. However, it is my opinion that focusing on the quality of the input data and the realism of modeling the actual landfill design(s) is much more important than the method of solution – manual or computer.

V. LINER QUALITY CONTROL PLAN

Q. DID YOU REVIEW THE LINER QUALITY CONTROL PLAN INCLUDED IN THE ACL AMENDMENT APPLICATION?

A. Yes, I reviewed the Liner Quality Control Plan that is included in the ACL Amendment Application at Part III, Attachment 3, Appendix E.

Q. DID YOU IDENTIFY DEFICIENCIES WITH THE LINER QUALITY CONTROL PLAN DURING YOUR REVIEW?

A. Yes, I identified a number of deficiencies with the Liner Quality Control Plan. First, and most importantly, in my professional opinion, the Liner Quality Control Plan included as Appendix E simply does not meet the requirements of TCEQ's MSW rules. Specifically, the Liner Quality Control Plan does not meet the requirements of 30 TEX. ADMIN. CODE Chapter 330, Subchapter H, Liner System Design and Operation.

Q. PLEASE EXPLAIN WHY YOU ARE OF THE OPINION THAT THE LINER QUALITY CONTROL PLAN DOES NOT MEET THE REQUIREMENTS OF THE APPLICABLE MSW RULES.

A. I have identified the following deficiencies that keep the Liner Quality Control Plan from meeting the requirements of the MSW rules:

- The ACL Amendment Application does not include a discussion with conclusions about the suitability of the soils and strata for the uses for which they are intended, specifically use for soil liner and protective cover.
- The ACL Amendment Application does not show that compacted soil liners can be constructed from on-site soils.
- The ACL Amendment Application does not show that compacted soil liners will be constructed in accordance with the Executive Director of TCEQ's most recent guidelines, *i.e.*, the *Liner Construction and Testing Handbook* (July 1, 1994), as required by 30 TEX. ADMIN. CODE § 330.339(a)(2) and (c).
- The ACL Amendment Application does not ensure that maximum clod size in the soil liner will be one inch in diameter, as required by 30 TEX. ADMIN. CODE § 330.339(g).
- The ACL Amendment Application does not limit the liner soil material to "contain no rocks or stones larger than one inch in diameter or that total more than 10% by weight" as required by MSW rules at 30 TEX. ADMIN. CODE § 330.339(h), as well as 30 TEX. ADMIN. CODE §§ 330.339(c)(5)(D) and 330.339(g).

Q. DOES THE ACL AMENDMENT APPLICATION ADDRESS SUITABILITY OF ON-SITE SOILS AND STRATA FOR LINER/COVER SYSTEM USE?

A. Not really. The ACL Amendment Application at Attachment 3, Section 4.0, Geotechnical Analyses, provides:

> Engineering analyses performed include: settlement analysis; stability analyses of excavated slopes, protective cover, interior waste slopes, and

> the final-filled landfill. These calculations described in Section 4.3 of this report, along with the geotechnical properties of the subsurface described in Section 4.2 of this report, demonstrate that the soils at the site location are suitable for the intended purpose. (*See* APP-202 at 906.)

Attachment 3, Section 4.2, Geotechnical Summary, further provides:

> Based on prior cell liner construction at the site, the Stratum I soil has been successfully used and demonstrated to be suitable for a compacted soil liner having a hydraulic conductivity less than 1x10-7 cm/s. Since the requirements of the final cover soil layer permeability are not greater than the cell liner, the Stratum I soil should be suitable for use in final cover construction as well. From the laboratory permeability tests on soil samples of Stratum II, these soils should also be suitable for use in the construction of the liner system and final cover system . . . . (*See* APP-202 at 913.)

However, neither statement is included in the Liner Quality Control Plan. Further, the earlier statements do not specifically state that Stratum II is suitable, nor are soil uses other than liner described. In addition, the Closure Plan, discussed in more detail below, will not allow on-site soils to be used as the 24-inch protective cover/erosion layer.

Q. YOU ALSO STATED THAT THE ACL AMENDMENT APPLICATION DOES NOT DEMONSTRATE THAT THE COMPACTED SOIL LINERS WILL BE CONSTRUCTED IN ACCORDANCE WITH THE EXECUTIVE DIRECTOR'S MOST RECENT GUIDELINE. PLEASE EXPLAIN WHAT YOU MEANT BY THAT STATEMENT.

A. The Executive Director of TCEQ's most recent guideline is the July 1994 *Liner Construction and Testing Handbook.* Instead of addressing the Executive Director's 1994 *Liner Construction and Testing Handbook*, the ACL Amendment Application references only a draft TCEQ document entitled "Liner Construction and Testing" dated May 23, 2001. (*See* APP-202 at 1091.) It should also be noted that TCEQ currently has no "liner guidance" or "liner guideline" posted on the TCEQ webpage due to changes resulting from the March 2006 adoption of the new MSW rules. Regardless, though,

conformance with the Executive Director's "most recent guideline" continues to be a regulatory requirement of 30 TEX. ADMIN. CODE § 330.339 (a)(2) and (c). Thus, conforming to the Executive Director's most recent guideline—the 1994 Liner Construction and Testing Handbook—is a regulatory requirement that must be met by WMTX in the ACL Amendment Application.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 444.

A. Exhibit TJFA 444 is a copy of Executive Director of TCEQ's, then TNRCC, 1994 *Liner Construction and Testing Handbook* (July 1, 1994).

Q. IS EXHIBIT TJFA 444 A TRUE AND CORRECT COPY OF THE 1994 LINER CONSTRUCTION AND TESTING HANDBOOK?

A. Yes. Exhibit TJFA 444 is a true and correct copy of the TCEQ's (TNRCC's) 1994 *Liner Construction and Testing Handbook.*

Q. WAS EXHIBIT TJFA 444 DEVELOPED BY TCEQ AS A GUIDANCE DOCUMENT FOR MSW LANDFILL DESIGN?

A. Yes, it was.

Q. IS EXHIBIT TJFA 444 A CURRENTLY APPLICABLE TCEQ GUIDANCE DOCUMENT?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 444 WHEN DESIGNING MSW LANDFILLS PURSUANT TO THE MSW RULES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 444 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING THE LINER QUALITY CONTROL PLAN?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 444]

Q. HOW DOES THE LINER QUALITY CONTROL PLAN IN THE ACL AMENDMENT APPLICATION FAIL TO CONFORM WITH EXHIBIT TJFA 444, THE 1994 LINER CONSTRUCTION AND TESTING HANDBOOK, THE EXECUTIVE DIRECTOR'S MOST RECENT GUIDELINE?

A. Similar to the regulatory requirements for maximum clod and rock size referenced above, the 1994 Liner Construction and Testing Handbook also has clod and rock size and percentage requirements. (*See* Exhibit TJFA 420 §§ 2.1 & 2.3.2.3.)

Q. IN YOUR LIST ABOVE, YOU ALSO NOTED THAT THE ACL AMENDMENT APPLICATION DOES NOT CONTROL CLOD SIZE IN THE SOIL LINER AND DOES NOT LIMIT THE LINER SOIL MATERIAL AS REQUIRED BY THE MSW RULES. PLEASE EXPLAIN.

A. As stated above, the Liner Quality Control Plan controls neither clod size nor rocks/stones in compacted soil liner as required by the MSW rules and/or technical guidelines. While the Liner Quality Control Plan does have a one-inch maximum clod size for pre-qualification laboratory testing (*see* APP-202 at 1092) and it has a processing requirement "to reduce clod size to the smallest size necessary to achieve the required coefficient of permeability (≤ one inch in diameter)" (*see* APP-202 at 1094), neither rock nor stone size and/or percentage appears to be addressed in the Liner Quality Control Plan. In addition, the regulatory-enforceable parts of the Liner Quality Control Plan, *i.e.*, the QA/QC testing requirements and reporting, are silent on clod size and rocks/stones. (*See* APP-202 at tbl. 3E.2 at 1097.) Table 3E.2 only has a requirement for "Percent Finer Than #200 Sieve," *i.e.*, the only size requirement is in the range of "face powder." There is simply no test verification of larger grain size required.

Q. WHY IS THIS FAILURE TO ADDRESS CLODS AND/OR ROCKS AND STONES IMPORTANT TO THE CONSTRUCTION OF THE ACL EXPANSION?

A. Considering that the compacted soil liner is being used as a component of a composite liner and final cover, the failure to address clods and/or rocks and stones could have serious consequences relative to damage to the geosynthetic membrane component of the composite liner system. As noted in 30 TEX. ADMIN. CODE § 330.339(h) "rock content shall not be a detriment to the integrity of the overlying membrane." The simple reason for the rock requirement is that stones in the compacted soil liner can easily puncture the

overlying geomembrane liner—effectively negating the containment feature of the geomembrane and the containment synergy of the "composite liner." As a consequence, the environmental protection of the liner and/or cover system could be compromised.

Q. HAVE YOU PERSONALLY OBSERVED CONDITIONS AT THE ACL?

A. Yes, as previously mentioned, I went on a site visit of the ACL on December 10, 2008.

Q. AT THAT TIME WHAT WERE YOUR OBSERVATIONS REGARDING CLODS AND ROCKS AT THE ACL?

A. During the December 10, 2008 site visit, there was an appreciable amount of large gravel and/or cobble size rock larger than one inch present in the final cover of older units of the ACL. The source of the rock is probably remnants of high terrace gravels typical of the Austin area. The presence of such rock indicates that it could be a major problem if the Liner Quality Control Plan does not specifically address its presence.

Q. BASED ON YOUR REVIEW OF THE LINER QUALTITY CONTROL PLAN DISCUSSED ABOVE, DO YOU BELIEVE THAT THE LINER QUALITY CONTROL PLAN INCLUDED IN THE ACL AMENDMENT APPLICATION MEETS THE REQUIREMENTS OF TCEQ'S MSW RULES?

A. No. Based on my review of the Liner Quality Control Plan contained in the ACL Amendment Application, it is my professional opinion that the Liner Quality Control Plan contained in the ACL Amendment Application does not appear to meet the requirements of several of TCEQ's MSW rules, including, for example:

- 30 TEX. ADMIN. CODE § 330.63(d)(4)(G).
- 30 TEX. ADMIN. CODE § 330.63(e)(5).

- 30 TEX. ADMIN. CODE § 330.339(a)(2).
- 30 TEX. ADMIN. CODE § 330.339(b)(2).
- 30 TEX. ADMIN. CODE § 330.339(c).
- 30 TEX. ADMIN. CODE § 330.339(g).
- 30 TEX. ADMIN. CODE § 330.339(h).

Q. PLEASE EXPLAIN HOW THE LINER QUALITY CONTROL PLAN IN THE ACL AMENDMENT APPLICATION FAILS TO MEET THE REQUIREMENTS OF THE MSW RULES THAT YOU HAVE IDENTIFIED.

A. Briefly,

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.63(d)(4)(G) because the Liner Quality Control Plan is not prepared in accordance with 30 TEX. ADMIN. CODE Chapter 330, Subchapter H, Liner System Design and Operation.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.63(e)(5) because the Liner Quality Control Plan does not include a discussion with conclusions about the suitability of the soils and strata for the uses for which they are intended, specifically use for soil liner and protective cover.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.339(a)(2) because the Liner Quality Control Plan does not show that compacted soil liners will be constructed in accordance with the Executive Director of TCEQ's most recent guidelines, the July 1994 Liner Construction and Testing Handbook, Exhibit TJFA 420.

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.339(b)(2) because the Liner Quality Control Plan does not show that compacted soil liners can be constructed from on-site soils.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.339(c) because the Liner Quality Control Plan does not show that compacted soil liners will be constructed in accordance with the Executive Director of TCEQ's most recent guidelines, the July 1994 Liner Construction and Testing Handbook, Exhibit TJFA 420.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.339(g) because the Liner Quality Control Plan does not ensure that maximum clod size will be one inch in diameter and in "all cases soil clods shall be reduced to the smallest size necessary to achieve the coefficient of permeability reported by the [pre-qualification] testing laboratory and to destroy any macrostructure . . . ."
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.339(h) because the Liner Quality Control Plan does not limit the liner soil material to "contain no rocks or stones larger than one inch in diameter or that total more than 10% by weight. Rock content shall not be a detriment to the integrity of the overlying geomembrane."

VI. HYDROSTATIC UPLIFT OF THE LINER SYSTEM

Q. DID YOU IDENTIFY ANY OTHER PROBLEMS WITH THE LINER QUALITY CONTROL PLAN?

A. Yes, I did.

Q. PLEASE DESCRIBE WHAT OTHER PROBLEMS YOU IDENTIFIED WITH THE LINER QUALITY CONTROL PLAN.

A. The additional problem that I identified is related to the underdrain system details and stability. In general, while this is addressed in the Liner Quality Control Plan, it is a liner system and leachate collection system stability issue.

Q. WHAT IS THE "UNDERDRAIN SYSTEM"?

A. The ACL Amendment Application proposes an "underdrain system" to provide "short-term stability against hydrostatic uplift of the liner system." The Liner Quality Control Plan indicates that "short-term stability against uplift of the liner system will be provided by an underdrain system installed below the liner. Long-term stability against uplift of the sidewall and floor liner systems is provided by the weight of the protective cover, waste material, and cover system components, collectively referred to as ballast." (*See* APP-202 at 1111.)

Q. CAN YOU PLEASE DESCRIBE THE "UNDERDRAIN SYSTEM" AS YOU UNDERSTAND IT BASED ON YOUR REVIEW OF THE ACL AMENDMENT APPLICATION?

A. Yes. A plan view of the area where an underdrain system will be installed is shown on Figure ATT3E-5. (*See* APP-202 at 1127.) The underdrain system is to consist of a 16-oz/yd^2 non-woven geotextile "blanket" installed on the sidewall under the liner system

components. The blanket is to drain into a "toe drain" with an embedded pipe at the toe of the sidewall. (*See* APP-202 at 1114.) Details of the underdrain system are shown on Figure ATT3E-6. (*See* APP-202 at 1128.)

Q. DOES THE ACL AMENDMENT APPLICATION DESCRIBE HOW THE UNDERDRAIN SYSTEM WILL BE MAINTAINED?

A. No. The Liner Quality Control Plan, in Section 5.7, Slope Stability of Sidewall Liners, states that the underdrains "will be maintained and operated until sufficient ballast is in place to resist the uplift pressures below the liner system." (*See* APP-202 at 1115.) However, neither the Liner Quality Control Plan nor the Site Operating Plan indicates how the underdrains will actually be operated or maintained. The only operational information is found later in the Liner Quality Control Plan, which states that any underdrain "system must remain operational and pumped (if necessary) until approval of the [Ballast Evaluation Report] is received from the TCEQ." (*See* APP-202 at 1115.) In other words, the ACL Amendment Application fails to describe how the underdrain system will be operated or maintained in order to ensure the stability of the ACL as well as to protect human health and the environment.

Q. WHAT PROBLEMS HAVE YOU IDENTIFIED WITH THE UNDERDRAIN SYSTEM?

A. Underdrain systems have a history of problems and unintended consequences. The potential problems that I have identified with the underdrain system described in the ACL Amendment Application include:

- In addition to serving as a drainage medium, an underdrain can also function as a distribution medium to route water into areas that are

typically dry, *i.e.*, distribute hydrostatic pressure over a larger area, saturate soils over a large area, and serve as an "inlet" for surface water which can overload the underdrain system. All of these can "destabilize" a liner system. In fact, such an underdrain system can actually cause a hydrostatic uplift failure.

- Geosynthetic component/soil interface strengths are lower than soil strengths due to the inefficiency of contact, *i.e.*, placing a geosynthetic drainage component between clay soils is a reduced strength interface. Neither the underdrain, nor the interface of the underdrain, was modeled in the general slope stability analyses. As a consequence, the sidewall stability modeled in Part III, Attachment 3, Appendix C.2 of the ACL Amendment Application does not reflect actual proposed construction nor does it recognize potential saturation of the compacted clay liner.
- Absent monitoring systems embedded in the underdrain system, hydrostatic pressures can, and do, buildup due to pump failure, damage due to slope movement, blockage of part of the system, *et cetera*. Liner system stability failures can, and do, occur as a result of this buildup. Also, similar drainage layers in final cover systems cause slope failures all the time. (*See, e.g.*, Exhibit TJFA 438, Qian, *et al.* at 497-498, including Fig. 13.11.) It should also be noted that the sidewall liner system slope failure that occurred at the ACL in 1999, as described above, is analogous to an underdrain related slope failure. In the 1999 slope failure, hydrostatic pressure apparently built up in the LCS and literally "floated" the entire LCS and protective cover off the geomembrane liner. (*See* Exhibits TJFA 433 – 436.)

- After the underdrain system is no longer needed for hydrostatic uplift stability, there is no effective way to decommission the underdrain system. If the sidewall liner and/or the edge of the floor liner system is breached, the underdrain system provides a permeable conduit to distribute the contaminated leachate to ground water over a large area. This can make a leachate release hard to identify and/or locate, particularly in a ground water flow system dependent on secondary structure. Landfill gas releases can be similarly affected.

Q. DO YOU BELIEVE THAT THE HYDROSTATIC UPLIFT STABILITY OF THE LINER MEETS THE REQUIREMENTS OF THE MSW RULES?

A. No, I do not believe that the hydrostatic uplift stability of the liner meets TCEQ's MSW rules. Specifically, the hydrostatic uplift stability of the liner fails to meet the requirements of 30 TEX. ADMIN. CODE §§ 330.337(b)&(b)(3), 330.337(c), and 330.337(e).

Q. PLEASE EXPLAIN HOW THE HYDROSTATIC UPLIFT STABLITY OF THE LINER AS ADDRESSED IN THE ACL AMENDMENT APPLICATION FAILS TO MEET THE REQUIREMENTS OF THE MSW RULES THAT YOU HAVE IDENTIFIED.

A. Briefly,

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.337(b)&(b)(3) because WMTX has failed to demonstrate that the liner system will not undergo uplift from hydrostatic forces during its construction and WMTX has failed to provide evidence

that the soil surrounding the ACL is so poorly permeable that ground water cannot move sufficiently to exert force that would damage the liner.

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.337(c) because WMTX has failed to ensure that the liner is stable during the filling and operation of the landfill through a suitable combination of dewatering and/or ballast.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.337(e) because there is no indication in the ACL Amendment Application that prior to excavating any unit below the seasonal high water table, WMTX plans to perform a preliminary foundation evaluation to consider stability, settlement, and constructability.

Q. CAN YOU SUMMARIZE YOUR OPINION ON THE PROPOSED UNDERDRAIN SYSTEM ?

A. Yes. Neither the Liner Quality Control Plan nor the Site Operating Plan included in the ACL Amendment Application indicates how the underdrains will actually be operated, monitored, or maintained. The only operational information is found later in the Liner Quality Control Plan, which states that any underdrain "system must remain operational and pumped (if necessary) until approval of the [Ballast Evaluation Report] is received from the TCEQ." (*See* APP-202 at 1115.) In other words, the ACL Amendment Application fails to describe how the underdrain system will be operated, monitored, and maintained in order to ensure the stability of the ACL against hydrostatic uplift as well as to protect human health and the environment.

VII. LANDFILL SETTLEMENT CALCULATIONS

Q. ARE LANDFILL SETTLEMENT CALCULATIONS CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. Yes, the landfill settlement calculations are included in Part III, Attachment 3, Appendix F of the ACL Amendment Application.

Q. WHAT SPECIFICALLY IS CONTAINED IN APPENDIX F.1?

A. Appendix F.1 contains site-specific elevation data for the waste fill in the piggyback area for the 1998 through 2006 timeframe. It appears that some fourteen (14) different survey locations were used to generate nine (9) years of data; however, the complete data set was not used and the remaining data that was used is questionable. (*See* APP-202 at tbl. 2 at 1213.)

Q. WHY DO YOU DESCRIBE THE REMAINING DATA AS "QUESTIONABLE"?

A. Although the discussion of the settlement data indicates that "waste filling at the piggyback area was essentially complete by 1996" (*see* APP-202 at 1212), the data in Table 2 (*see* APP-202 at 1213) show that significant additional fill was placed over five (5) of the fourteen (14) points in the 2005-2006 timeframe. In addition, forty (40) of the 126 data points were not used for analysis according to the footnote of Table 2. (*See* APP-202 at tbl. 2 at 1213.) However, an analysis of the actual data plots appears to indicate that even more data points were neglected.

Elevation data (converted to non-dimensional strain as a function of waste thickness) from each survey location that was actually plotted was plotted versus logarithm of time as a separate plot for each location. Interestingly, the strain versus log time was plotted on a Cartesian scale where the x-axis was log time and the y-axis was

strain—not a typical semi-logarithmic plot of strain (linear scale) plotted versus time on a logarithmic scale. The purpose of the plotting was to obtain the regression slope of the plotted data and assume that the slope represented the "modified secondary compression index." Many of the data plots have a significant upward curve in the data with increasing time, *e.g.*, points 1, 7, 10, 12, and 14. Such a curved relationship, *i.e.*, strain increasing non-linearly with respect to log time, is readily observed in published data. (See, *e.g.*, Exhibit TJFA 438, Qian, *et al.* at 199-204 & 441 and Exhibit TJFA 440, Koerner at 565.) In fact, Qian notes that the slope is time dependent—flatter at small time and steeper at larger times—similar to the ACL Amendment Application data plots. The ACL Amendment Application "linear" regression analyses appear to ignore this upward trend in the data. This weighting of the regression fit to the short-time data is unconservative with respect to predicting long-term settlement. Regardless, the actual ACL Amendment Application data plots show significantly fewer data points per location than claimed in Appendix F.1. No explanation is provided for the difference between the actual data obtained and the data actually plotted.

Q. CAN YOU PLEASE DESCRIBE THE DIFFERENCE BETWEEN THE ACTUAL DATA OBTAINED AND THE DATA ACTUALLY PLOTTED?

A. Yes, I have created a table that summarizes the data plotting.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 445.

A. Exhibit TJFA 445 is a table, identified as Table 3, which summarizes the differences between the actual data set and the data actually plotted.

Q. DID YOU CREATE TABLE 3, EXHIBIT TJFA 445?

A. Yes, I did.

Q. WHAT WAS THE SOURCE OF THE INFORMATION THAT YOU HAVE SET OUT IN TABLE 3, EXHIBIT TJFA 445?

A. The source of the information is the ACL Amendment Application itself.

Q. DOES TABLE 3, EXHIBIT TJFA 445, ACCURATELY SUMMARIZE THE DIFFERENCES BETWEEN THE ACTUAL DATA SET AND THE DATA ACTUALLY PLOTTED?

A. Yes, it does.

Q. IS TABLE 3, EXHIBIT TJFA 445, USEFUL IN YOUR TESTIMONY TODAY, AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE IN UNDERSTANDING YOUR TESTIMONY TODAY SPECIFICALLY REGARDING LANDFILL SETTLEMENT CALCULATIONS?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 445]

Q. WHAT DOES TABLE 3, EXHIBIT TJFA 445, SHOW?

A. Table 3 demonstrates that there is no consistency in the use of the data set. Although there were as many as nine (9) data points for each of the fourteen (14) survey location points, as few as three (3) data points were used to represent a survey point. Further, there is no explanation in the ACL Amendment Application regarding the inconsistencies. Based on the data plots, it appears that only sixty-nine (69) of the

available 126 data points (*i.e.*, nine (9) years of survey data times fourteen (14) survey locations equals 126 data points) were plotted for regression analyses purposes. Using slightly over half of the available data points does not appear reasonable.

Q. DID YOU IDENTIFY ANY OTHER PROBLEMS WITH THE DATA USED AS PART OF THE LANDFILL SETTLEMENT CALCULATIONS?

A. Yes. A second oddity is the variance between maximum vertical strain at the fourteen (14) location points which ranged from 0.022 to 0.05. Typically, non-dimensional strain data should have been in the same range and a single plot of the data should have sufficed. Regardless of the methodology used, the ACL Amendment Application's "modified secondary compression index" does not compare well with published values. The ACL Amendment Application indicates a value of 0.032. (*See* APP-202 at 1221.) As identified in Exhibit TJFA 438, Qian, *et al.* gives a range of 0.03 to approximately 0.1. (*See* Exhibit TJFA 438, Qian, *et al.* at 451.) It should be noted that the lower the compression index, the lower the settlement. As such, it would appear that the ACL Amendment Application's data interpretation would significantly under-predict settlement.

Q. WHAT SPECIFICALLY IS CONTAINED IN APPENDIX F.2 OF THE ACL AMENDMENT APPLICATION?

A. Appendix F.2 contains the landfill settlement calculations. The continuing secondary settlement of the existing waste under "self weight" was estimated by extrapolating the April 1998 through February 2006 data to the end of the post-closure period in year 2057.

Q. WHAT CONCERNS DO YOU HAVE WITH THE LANDFILL SETTLEMENT CALCULATIONS CONTAINED IN APPENDIX F.2?

A. I have several concerns with the landfill settlement calculations. First, the ACL Amendment Application asserts that extrapolation "to longer time periods will overestimate the settlement." (*See* APP-202 at 1235.) However, as noted above, the data set was misrepresented and appears to have been misinterpreted to obtain unconservative estimates of the modified secondary compression index. In addition, extrapolation of data from an eight-year period to a future almost fifty-year period seems unscientific.

Second, the primary settlement resulting from additional waste filling was calculated using procedures from Qian, *et al.* (*see* Exhibit TJFA 438, Qian *et al.* at 449); however, the lower bound of Qian's range for the modified primary compression index was used for the calculation. As noted previously, use of the lower bound results in the lowest calculated settlement.

Third, setting aside the data set and choice of parameters discussions, the most important part of the settlement calculations are the actual calculated settlements and the comparison to published information for landfill settlement.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 446.

A. Exhibit TJFA 446 is a table, identified as Table 4, which summarizes representative points from the ACL Amendment Application settlement calculations.

Q. DID YOU CREATE TABLE 4, EXHIBIT TJFA 446?

A. Yes, I did.

Q. WHAT WAS THE SOURCE OF THE INFORMATION THAT YOU HAVE SET OUT IN TABLE 4, EXHIBIT TJFA 446?

A. The source of the information is the ACL Amendment Application itself.

Q. DOES TABLE 4, EXHIBIT TJFA 446, ACCURATELY SUMMARIZE REPRESENTATIVE POINTS FROM THE ACL AMENDMENT APPLICATION SETTLEMENT CALCULATIONS?

A. Yes, it does.

Q. IS TABLE 4, EXHIBIT TJFA 446, USEFUL IN YOUR TESTIMONY TODAY, AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE IN UNDERSTANDING YOUR TESTIMONY TODAY SPECIFICALLY REGARDING LANDFILL SETTLEMENT CALCULATIONS?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 446]

Q. PLEASE DISCUSS THE SETTLEMENT CALCULATIONS.

A. The settlements were calculated assuming new construction beginning in December 2010 and post-closure ending in 2057—a period of forty-six (46) years or approximately 17,000 days. The ACL Amendment Application's calculated settlements as a percent of total waste thickness are in the mid single digit range at the end of the post-closure period. The settlement calculation results appear remarkably inconsistent with, and unconservative relative to, typical published municipal waste settlements. (*See, e.g.*, Exhibit TJFA 438, Qian, *et al.* at 204 & 441.)

Q. PLEASE EXPLAIN HOW THE RESULTS OF THE SETTLEMENT CALCULATIONS IN THE ACL AMENDMENT APPLICATION ARE INCONSISTENT WITH PUBLISHED AND ACCEPTED MUNICIPAL WASTE SETTLEMENTS.

A. The actual landfill settlement data (compiled from two different sources) given in Qian, *et al.* (*see* Exhibit TJFA 438, Qian, *et al.* at 204 & 441) show that long-term settlements ($\geq$ 1,000 days) are in the double digit range whereas the ACL Amendment Application calculates even longer-term settlements in the single digit range as shown in Exhibit 446, Table 4.

Q. WHAT ARE YOUR GENERAL CONCLUSIONS REGARDING THE SETTLEMENT CALCULATIONS IN THE ACL AMENDMENT APPLICATION?

A. In general, the landfill settlement calculations appear unconservative and inconsistent with published information. As a result, the settlement calculations are misleading and are not useful in predicting effects on "piggyback" liner design, the final cover design, and the landfill gas collection system.

Q. WHY ARE THE SETTLEMENT CALCULATIONS IMPORTANT TO THE DESIGN AND POSSIBLE FUTURE CONSTRUCTION OF THE EXPANSION OF THE ACL?

A. As a general comment, landfill settlement is not uniform. Over time, significant settlement of landfilled waste will occur, both as a result of consolidation (*e.g.*, reduction of voids) and as a result of biologic decomposition and degradation. The amount and time rate of settlement is highly variable due to waste stream variability, *et cetera*. In

addition, localized settlements are common. This is all of particular importance because underestimating landfill settlement can have serious consequences relative to the "piggyback" liner design, the final cover design, and the landfill gas collection system.

Q. HOW IS THE ISSUE OF LANDFILL SETTLEMENT IMPORTANT TO THE PIGGYBACK LINER DESIGN?

A. Under current MSW rules, when new waste is "piggybacked" onto an existing pre-Subtitle D area, the new waste is separated from the underlying old waste by a "separatory liner system." However, the new waste is effectively being placed over a "foundation" that is unstable as that term is defined in the Subtitle D regulations and the MSW rules, as discussed above.

Q. ARE THERE DESIGN REQUIREMENTS FOR "PIGGYBACK" VERTICAL EXPANSIONS?

A. Yes, comprehensive design, analysis, and construction are required to ensure the success of a piggyback vertical expansion. Design requirements are contained in the following exhibits addressed above: TJFA 405, *Technical Manual*; TJFA 407, the GeoRG Manual; TJFA 438, Qian, *et al.*; TJFA 439, Rowe, *et al.*; and TJFA 440, Koerner.

Q. DOES THE ACL AMENDMENT APPLICATION CONTAIN AN EVALUATION OF THE EFFECT OF SETTLEMENT ON THE PIGGYBACK LINER SYSTEM?

A. Yes, a piggyback liner strain analysis is contained in Part III, Attachment 3, Appendix F.3 of the ACL Amendment Application.

Q. DID YOU IDENTIFY PROBLEMS WITH THE PIGGYBACK LINER STRAIN ANALYSIS CONTAINED IN APPENDIX F.3?

A. Yes, I did.

Q. PLEASE DESCRIBE THE PROBLEMS THAT YOU HAVE IDENTIFIED WITH THE PIGGYBACK LINER STRAIN ANALYSIS.

A. Since the waste settlements calculated in Appendix F.2 appear to be non-representative and unconservative, the liner strains calculated in Appendix F.3, based on those settlement calculations, are also problematic. Even using unconservatively low estimates of waste settlement, some of the calculated strains in the liner system were unusually large, *e.g.*, 0.58%. (*See* APP-202 at 1248.)

Q. CAN YOU EXPLAIN WHAT YOU MEAN BY STRAIN AND WHY IT IS IMPORTANT?

A. Yes. An analogy would be a trampoline. When a person steps on a trampoline both the cover and springs around the perimeter stretch. This stretching is also called "strain." For a liner system, the liner may be relatively fixed or anchored around the perimeter; however, if the waste settles under the middle of the liner and creates a void, the liner may stretch to adapt to the void. Unfortunately, clay liner does not stretch very well—unlike geosynthetic components.

Q. PLEASE EXPLAIN WHY YOU BELIEVE THE CALCULATED STRAINS IN THE LINER SYSTEM WERE UNUSUALLY LARGE.

A. On page 1249 the ACL Amendment Application asserts that the clay liner (critical liner component) has a minimum allowable tensile strain of 0.8 ~ 1.0%. (*See* APP-202 at

1249.) Qian, *et al.* differs, identifying that a compacted clay liner has a maximum allowable tensile strain between 0.1% and 1.0% and an average allowable strain of 0.5%. (See Exhibit TJFA 438, Qian *et al.* at 469). In an earlier section, Qian indicates a reported range of 0.1~4%. The most common reference, *Design and Construction of RCRA/CERCLA Final Covers*, identified above as Exhibit TJFA 417, indicates that compacted clay soils can withstand maximum tensile strains between 0.1% and 1.0% and recommends that the lower limit (0.1%) be used for design (page 22).

Q. IN YOUR PROFESSIONAL OPINION ARE THE CALCULATED STRAINS IN THE ACL AMENDMENT APPLICATION PROBLEMATIC?

A. Yes. Based on the cited references, it would appear that the calculated strains in the ACL Amendment Application are problematic even for the unconservative settlement results. If more realistic settlements had been calculated, the strains would be even larger. Tensile strain is a technical word for elongation or stretching of a material expressed as a percent of the original length. Clay soil does not stretch, it simply pulls apart. If a compacted clay liner is stretched more than a fraction of a percent, it no longer functions as an impervious liner. Settlement calculations showing that the clay liner will pull apart indicate that redesign is needed.

Q. WHAT IS YOUR CONCLUSION REGARDING THE LANDFILL SETTLEMENT CALCULATIONS AND THE INTEGRITY OF THE PIGGYBACK LINER?

A. It would appear that settlements that would impair the integrity of the compacted soil liner component of the piggyback liner would violate the requirements of 30 TEX. ADMIN. CODE §§ 330.61(j)(4) and 330.559. The failure to calculate realistic long-term waste settlements, *i.e.*, "human-induced events," resulted in underestimation of liner

strains. Regardless, the liner strains calculated in the ACL Amendment Application appear to exceed commonly used limits for strain. If clay liner strain limits are exceeded, the clay liner will no longer provide the required containment function, *i.e.*, "impairment of the integrity of some or all of a landfill's structural components responsible for preventing releases from the landfill."

Q. PLEASE EXPLAIN HOW THE LANDFILL SETTLEMENT CALCULATIONS INCLUDED IN THE ACL AMENDMENT APPLICATION FAIL TO MEET THE REQUIREMENTS OF THE MSW RULES THAT YOU HAVE IDENTIFIED.

A. Briefly,

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE §§ 330.61(j)(4) and 330.559 because it fails to identify and provide data on unstable areas, *i.e.*:

> a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of a landfill's structural components responsible for preventing releases from the landfill. . . . Owners or operators of . . . lateral expansions located in an unstable area shall demonstrate that engineering measures have been incorporated into the landfill unit's design to ensure the integrity of the structural components of the landfill unit will not be disrupted.

VIII. LANDFILL GAS MANAGEMENT PLAN

Q. DID YOU REVIEW THE LANDFILL GAS MANAGEMENT PLAN INCLUDED IN THE ACL AMENDMENT APPLICATION?

A. Yes, I did review the Landfill Gas Management Plan ("LGMP") included as Part III, Attachment 6 of the ACL Amendment Application.

Q. DID YOU IDENTIFY ANY DEFICIENCIES IN THE LGMP PLAN DURING YOUR REVIEW?

A. Yes, I identified several deficiencies in the LGMP.

Q. WHAT DEFICIENCIES DID YOU IDENTIFY IN THE LGMP?

A. I identified the following deficiencies:

- That LGMP includes some monitoring requirements that are potentially lethal.
- The LGMP allows recirculation of the condensate without regard to the unit of the ACL that produced the condensate.
- The perimeter monitoring system has a large gap in coverage.
- The large gap in coverage in the perimeter monitoring system is adjacent to an area that has a documented history of offsite migration of landfill gas.

Q. LETS START WITH YOUR COMMENT ON THE MONITORING REQUIREMENTS. WHY DO YOU STATE THAT THE LGMP INCLUDES SOME MONITORING REQUIREMENTS THAT ARE POTENTIALLY LETHAL?

A. In two separate sections, the LGMP indicates that supplemental monitoring (in addition to permanently installed continuous monitors) of on-site buildings/structures and/or monitoring in response to continuous monitoring alarms will use a "Landtec GEM 500 or equivalent." (*See* App-202 at 3155 & 3156.)

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 447.

A. Exhibit TJFA 447 is excerpts from the GEM-500 Operation Manual, CES-Landtec (2003).

Q. IS EXHIBIT TJFA 447 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE GEM-500 OPERATION MANUAL?

A. Yes. Exhibit TJFA 447 is a true and correct copy of excerpts from the GEM-500 Operation Manual.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 447 IN UNDERSTANDING THE LIMITATIONS OF THE GEM-500?

A. Yes, they do.

Q. IS EXHIBIT TJFA 447 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING LANDFILL GAS ISSUES?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 447]

Q. SO YOUR CONCERN IS WITH THE TYPE OF MONITOR SPECIFIED?

A. Yes. Whenever the Landtec GEM-500 is turned on, a warning screen containing the following appears:

Warning! – Do not use
in confined spaces.
Unit NOT certified
intrinsically safe.

In other words, when used in a confined space, there is an explosion risk. In case the operator is untrained and unfamiliar with the term "intrinsically unsafe" as related to explosive gas concentrations, the *GEM-500 Operation Manual* points out the warning "is a reminder that the GEM-500 is not to be used in areas such as vaults, excavations, or other confined spaces," including buildings and/or enclosed structures, as specified in the LGMP. The *GEM-500 Operation Manual* continues: "An explosion could result causing serious injury or death." (See Exhibit TJFA 447, GEM-500 Operation Manual at 4.) The LGMP is advocating a procedure with potentially lethal consequences, *i.e.*, an explosion in a building or enclosed structure. That is hardly protective of human health, and thus is not compliant with 30 TEX. ADMIN. CODE § 330.15(a)(3).

Q. YOU ALSO LISTED THAT THE LGMP ALLOWS RECIRCULATION OF THE CONDENSATE WITHOUT REGARD TO THE UNIT OF THE ACL THAT PRODUCED THE CONDENSATE. PLEASE EXPLAIN YOUR CONCERN.

A. The LGMP states: "Liquids [condensate] from the gas system may be recirculated in the landfill . . . . Liquids from gas system may be recirculated over areas that are designed and constructed with a composite liner system and a leachate collection system that meets the requirements of 30 TAC 330.331(a)(2)." (*See* APP-202 at 3159-60.)

Q. WHAT IS YOUR CONCERN WITH THE ABOVE STATEMENT FROM THE LGMP?

A. The language identified is a violation of the Subtitle D regulations. The requirements of 40 C.F.R. § 258.28 make it clear that only leachate and/or gas condensate derived from a specific unit can be recirculated back into that same unit if that unit has a composite liner system and a LCS conforming to 40 C.F.R. § 258.49(a)(2).

Q. DO TCEQ'S MSW RULES CONTAIN A SIMILAR REQUIREMENT?

A. The applicable MSW rule, 30 TEX. ADMIN. CODE § 330.177, is a little ambiguous and could be interpreted, if read by itself, to allow the recirculation from any landfill unit into a unit with a Subtitle D composite liner and LCS. But, since TCEQ rules can be no less stringent than the federal Subtitle D regulations, 30 TEX. ADMIN. CODE § 330.177 must be read in conformance with 40 C.F.R. § 258.28, and thus only leachate and/or gas condensate derived from a specific unit can be recirculated back into that same unit where that unit has a composite liner system and a LCS. Thus, the requirement quoted above from the LGMP is in violation of both the federal Subtitle D regulations and the MSW rules because it does not adequately restrict the recirculation of landfill condensate.

Q. PLEASE DESCRIBE THE LANDFILL GAS MONITORING SYSTEM AS IDENTIFIED IN THE ACL AMENDMENT APPLICATION.

A. The ACL contains a number of solid waste management units, which are identified as the East Hill, the West Hill, the IWU, and the Phase 1 unit (now referred to in the ACL Amendment Application as the old Travis County Landfill). (*See* APP-202 at 3169.) The perimeter landfill gas monitoring system is shown on Figure ATT6-2 (*see* APP-202 at 3169) with an expanded Figure ATT6-5 (*see* APP-202 at 3172) showing the gap in perimeter coverage. According to the LGMP contained in the ACL Amendment Application, approximately the eastern half of the south side of the ACL is not being monitored for gas migration.

Q. IS THIS AREA ON THE EASTERN HALF OF THE SOUTH SIDE OF THE ACL WHAT YOU WERE REFERRING TO WHEN YOU STATED THAT THE

LANDFILL GAS MONITORING SYSTEM HAD A LARGE GAP IN COVERAGE?

A. Yes, it is.

Q. APPROXIMATELY HOW LARGE IS THIS GAP IN COVERAGE IN THE LANDFILL GAS MONITORING SYSTEM?

A. The gap represents approximately 3,000 feet of the permit boundary for the ACL. (See APP-202 at 3149-50.)

Q. ARE THERE DRAWINGS IN THE ACL AMENDMENT APPLICATION THAT IDENTIFY THIS GAP IN COVERAGE IN THE LANDFILL GAS MONITORING SYSTEM?

A. Yes. Specifically, Figures ATT6-2 and ATT6-5 both show this gap in coverage in the landfill gas monitoring system. (*See* APP-202 at 3169 & 3172.) Both of these figures are included with my testimony as an Attachment for ease of reference.

Q. DOES THE ACL AMENDMENT APPLICATION EXPLAIN THE GAP IN COVERAGE?

A. The LGMP in the ACL Amendment Application contains a number of "justifications" for not monitoring along this approximately 3,000 feet of the permit boundary.

Q. WHAT "JUSTIFICATIONS" ARE IDENTIFIED IN THE ACL AMENDMENT APPLICATION?

A. Among the many "justifications" are the closed Travis County Landfill and the "absence of off-site receptors."

Q. DO YOU BELIEVE THAT THESE ARE VALID JUSTIFICATIONS BASED ON THE REGULATORY REQUIREMENTS FOR LGMP AND LANDFILL GAS MONITORING SYSTEMS?

A. No, in my professional opinion these justifications do not comply with applicable regulatory requirements.

Q. PLEASE EXPLAIN.

A. None of the justifications provided in the LGMP are recognized in the MSW rules or in the corresponding federal Subtitle D regulations at 40 C.F.R. § 258.23. EPA, in the proposal, promulgation, and technical guidance for the federal Subtitle D regulations, has been remarkably consistent in its requirements for monitoring for explosive gas at the facility property boundary. It is abundantly clear that the ACL Amendment Application's "gap" in the perimeter gas monitoring system is not supported by the clear history of the regulatory requirements of Subtitle D. In fact, the Subtitle D history would confirm that the ACL Amendment Application's "gap" is a zone representing high gas migration potential that should be monitored.

Q. PLEASE EXPLAIN HOW THE HISTORY OF THE FEDERAL SUBTITLE D REGULATORY REQUIREMENTS CONFIRMS THAT THE ACL AMENDMENT APPLICATION'S "GAP" IS A ZONE REPRESENTING HIGH GAS MIGRATION POTENTIAL THAT SHOULD BE MONITORED.

A. First, the 1988 proposed federal Subtitle D regulations, 53 Fed. Reg. 33,314, 33,337 (Aug. 30, 1988), provided the following regarding monitoring along the property boundary:

> Site-specific factors to be considered when determining the type and frequency of monitoring are discussed in an Agency guidance manual (Ref. 12). Factors to be considered in determining the type and frequency of monitoring include: soil conditions, hydrogeologic conditions surrounding the disposal site, hydraulic conditions surrounding the disposal site, and the location of facility structures and relative to property boundaries. These factors control the rate and extent of gas migration and are discussed further in the guidance manual (Ref. 12)...
>
> For monitoring along property boundaries, at least two monitoring points should be located along the property boundaries closest to residences or other potentially affected structures. The exact location of these points should take into account any gas-permeable seams. In selecting the sampling points, some of the factors to consider include dry sand or gravel pockets, alignment with an off-site point of concern, proximity of the waste deposit, areas where there is dead or unhealthy vegetation that might be due to gas migration, and areas where underground construction may have created a natural path for gas flow (e.g., utility lines).

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 448?

A. Exhibit TJFA 448 is excerpts from the Federal Register notice for the proposal of the federal Subtitle D regulations, 53 Fed. Reg. 33,314, proposing amendments to 40 C.F.R. Part 257 and proposing a new 40 C.F.R. Part 258 (Aug. 30, 1988).

Q. IS EXHIBIT TJFA 448 A TRUE AND CORRECT COPY OF EXCERPTS FROM THE FEDERAL REGISTER NOTICE FOR THE PROPOSAL OF THE FEDERAL SUBTITLE D REGULATIONS?

A. Yes, it is a true and correct copy of the excerpts.

Q. IS EXHIBIT TJFA 448 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING REGULATORY REQUIREMENTS FOR MSW LANDFILL PERMITTING?

A. Yes. The regulatory requirements established by the federal Subtitle D regulations are really the backbone of all regulations of MSW landfill facilities today. An understanding of the background of those regulations, as discussed in the preamble set out in the Federal Register notice for the rule proposal, is necessary to understand sound MSW landfill design and permitting.

[MOVE TO ADMIT EXHIBIT TJFA 448]

Q. ARE THERE OTHER WAYS THE HISTORY OF THE FEDERAL SUBTITLE D REGULATORY REQUIREMENTS CONFIRMS THAT THE ACL AMENDMENT APPLICATON'S "GAP" IS A ZONE REPRESENTING HIGH GAS MIGRATION POTENTIAL THAT SHOULD BE MONITORED?

A. Yes. Second, the preamble to the 1991 promulgation of the federal Subtitle D regulations, 56 Fed. Reg. 50,978, 51,051-052 (Oct. 9, 1991), (*see* Exhibit TJFA 104) provided the following:

> The decomposition of solid waste (in particular, household waste) produces methane, an explosive gas. The accumulation of methane in MSWLF structures can result in fire and explosions that can injure or kill employees, users of the disposal site, and occupants of nearby structures, and can damage containment structures and thereby cause the emission of toxic fumes. For this reason, EPA established an explosive gas criterion in § 257.3-8 of the original subtitle D Criteria to control the concentration of methane in facility structures and at the property boundary. Specifically, § 257.3-8 required that the concentration of methane generated by the MSWLF not exceed 25 percent of the lower explosive limit (LEL) in facility structures (excluding gas control or recovery system components) and that it not exceed the LEL itself at the property boundary. EPA expanded this requirement in § 258.23 of the proposed rule by requiring the owner or operator to conduct subsurface and facility structure gas

> monitoring at least quarterly to ensure methane control. In addition, EPA proposed that if methane exceeds the limits specified, the owner or operator must take necessary steps to ensure protection of human health and immediately notify the State of the level detected and the steps taken to protect human health. Such steps could include evacuation and ventilation of affected buildings. The Agency also proposed that the owner or operator submit a remediation plan to the States within 14 days of the methane limits having been exceeded. This plan must describe the nature and extent of the problem and the proposed remedy.
>
> The proposal listed site-specific factors that control the rate and extent of gas migration, which should be considered to determine the type and optimal frequency of monitoring (which in some instances may be more than quarterly). These factors include: soil conditions, hydrogeologic conditions surrounding the disposal site, hydraulic conditions surrounding the disposal site, and the location of facility structures relative to property boundaries . . . .
>
> Catastrophic results may occur if methane levels remain unchecked; therefore, the Agency believes for safety reasons it is necessary to retain the minimum quarterly frequency for methane monitoring in the final rulemaking. The Agency believes that methane monitoring is critical because it provides an early warning of potential methane build-up that may lead to explosions, and that quarterly monitoring accounts for the seasonal variations in subsurface gas migration patterns.

Q. ARE THE REQUIREMENTS DISCUSSED IN THE TWO PREAMBLES THAT YOU JUST QUOTED ALSO INCLUDED IN THE FINAL RULE ITSELF?

A. Yes, the requirements discussed in detail in the two Federal Register preambles quoted above are contained in 40 C.F.R. § 258.23 of the federal Subtitle D regulations.

Q. ARE THERE OTHER EPA DOCUMENTS THAT SUPPORT YOUR CONCLUSION THAT THE ACL AMENDMENT APPLICATON'S "GAP" IS A ZONE REPRESENTING HIGH GAS MIGRATION POTENTIAL THAT SHOULD BE MONITORED?

A. Yes, EPA further interpreted and explained the requirements of 40 C.F.R. § 258.23 in the Technical Manual (*see* Exhibit TJFA 405), where it stated:

Migration of landfill gas is caused by concentration gradients, pressure gradients, and density gradients. The direction in which landfill gas will migrate is controlled by the driving gradients and gas permeability of the porous material through which it is migrating. Generally, landfill gas will migrate through the path of least resistance.

* * *

While geomembranes may not eliminate landfill gas migration, landfill gas in a closed MSWLF unit will tend to migrate laterally if the final cover contains a geomembrane and if the side slopes of the landfill do not contain an effective gas barrier. Lateral gas migration is more common in older facilities that lack appropriate gas control systems. The degree of lateral migration in older facilities also may depend on the type of natural soils surrounding the facility.

* * *

Gas Monitoring

The owner or operator of a MSWLF unit/facility must implement a routine methane monitoring program to comply with the lower explosive limit (LEL) requirements for methane. . . .

The number and location of gas probes is also site-specific and highly dependent on subsurface conditions, land use, and location occurrence of precipitation during sampling, and design of facility structures. Monitoring for gas migration should be within the more permeable strata. Multiple or nested probes are useful in defining the vertical configuration of the migration pathway.

Q. WHAT ARE YOUR CONCLUSIONS BASED ON THESE ACCEPTED INDUSTRY GUIDANCE DOCUMENTS?

A. The gap shown in the perimeter landfill gas monitoring system appears to be in direct contradiction to state and federal regulatory requirements as well as inconsistent with site conditions and previous history. Simply put, the area identified in the ACL Amendment Application as the closed Travis County Landfill, previously identified as the Phase 1 unit, may represent not only a landfill gas source but also a landfill-gas-permeable structure capable of allowing landfill gas to readily migrate to the "facility property boundary."

Q. DO YOU HAVE OTHER CONCERNS WITH THE "JUSTIFICATIONS"?

A. Yes. The justifications do not appear to be based on fact. Figure ATT6-5 (*see* APP-202 at 3172) is an enlarged map of the "gap" in the perimeter landfill gas monitoring system. Contrary to the LGMP's assertion of an "absence of off-site receptors," there is a flea market approximately 300 feet south of the ACL permit boundary and outside the "gap" area.

Q. DO YOU HAVE OTHER CONCERNS WITH THE LOCATION OF THE "GAP" IN THE LANDFILL GAS MONITORING SYSTEM?

A. Yes, the gap is adjacent to an area near the southeast corner of the ACL where off-site migration of explosive concentrations of landfill gas was addressed by corrective measures as shown on Figure ATT6-5. (*See* APP-202 at 3172.)

Q. PLEASE EXPLAIN.

A. In March 2005, explosive gas concentrations above the lower explosive limit ("LEL") were detected in perimeter gas migration probe P-10. P-10 is at the eastern end of the current, and proposed, "gap" in the perimeter gas monitoring network. Details of the resultant corrective action to address the explosive concentration of landfill gas are detailed in Part III, Attachment 6, Appendix E of the ACL Amendment Application. (*See* APP-202 at 3255-65.) The corrective action included both a horizontal gas cut-off trench ("HCT") and a horizontal gas collection trench ("HGCT") in the immediate vicinity of P-10. Although both the HCT and HGCT were extended westward toward the "gap," all of the investigation of gas migration was immediately adjacent to P-10. (*See* APP-202 at 3262.) In the absence of any other explanation, it appears that there was no effort to look at related gas migration in the "gap" area. The 2005 Corrective Action and the proposed

LGMP ignores the fact that what is now identified as the Travis County Landfill unit inside the ACL facility is, in all probability, much more gas transmissive than native soil and could represent a "funnel" to route landfill gas generated inside the ACL facility across the permit boundary.

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE LANDFILL GAS MANAGEMENT PLAN IN THE ACL AMENDMENT APPLICATION?

A. In summary, the ACL facility has a documented history of explosive gas migration across the permit boundary and yet an extensive portion of the permit boundary adjacent to the documented migration area has never been monitored, nor will it be monitored under the plan proposed in the ACL Amendment Application. The LGMMP proposed in the ACL Amendment Application is neither protective of human health and the environment nor does it appear to comply with the following regulatory requirements: 30 TEX. ADMIN CODE §§ 330.15(a)(3), 330.15(e)(6), 330.177, 330.371(a)(2), and 330.371(b)(1)(A)-(E). In addition, the LGMP does not comply with federal Subtitle D regulations set out at 40 C.F.R. § 258.23.

Q. PLEASE EXPLAIN HOW THE LANDFILL GAS MANAGEMENT PLAN IN THE ACL AMENDMENT APPLICATION FAILS TO MEET THE REQUIREMENTS OF THE MSW RULES AND SUBTITLE D REGULATIONS THAT YOU HAVE IDENTIFIED.

A. Briefly,

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE § 330.15(a)(3) due to explosion risk and threat to off-site receptors in close proximity.

- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE §§ 330.15(e)(6) and 330.177 regarding failure to restrict liquid recirculation to the same Subtitle D generating unit.
- The ACL Amendment Application fails to meet the requirements of 30 TEX. ADMIN. CODE §§ 330.371(a)(2) and 330.371(b)(1)(A)-(E) because the perimeter landfill gas monitoring system is not designed to detect concentrations of methane gas at the facility boundary and it does not take into account site conditions.
- The ACL Amendment Application fails to meet the requirements of 40 C.F.R. § 258.23(a)(2) or and 258.23(b)(1)(i)-(iv) because the perimeter landfill gas monitoring system is not designed to detect concentrations of methane gas at the facility boundary and it does not take into account site conditions.

IX. CLOSURE PLAN

Q. DID YOU REVIEW THE CLOSURE PLAN CONTAINED IN THE ACL AMENDMENT APPLICATION?

A. Yes. I reviewed the Closure Plan found at Part III, Attachment 7 of the ACL Amendment Application.

Q. WHAT CONCERNS DID YOU IDENTIFY BASED ON YOUR REVIEW OF THE CLOSURE PLAN IN THE ACL AMENDMENT APPLICATION?

A. The Closure Plan has some serious contradictions relative to the rest of the ACL Amendment Application. The following contradictions are the most serious:

(1) Upper portions of some interior final side slopes on the "East Hill" may be as steep as 3H:1V in addition to the traditional, flatter 4H:1V sideslopes. (*See* APP-202 at 3271 & 3281.) Such steeper final slopes were not analyzed for slope stability in Part III, Attachment 3, Appendix C. In addition, 3H:1V cover slopes were not analyzed for erosion loss.

(2) The sideslopes contain both numerous "add-on berms" (*see* APP-202 at 3279-82) and landscaping benches. This has implications for both slope stability and for erosion stability.

(3) The Final Cover Quality Control Plan, Part III, Attachment 7, Appendix A of the ACL Amendment Application, requires the use of soil cover materials from SCS Hydrologic Soil Groups A, B, or C. (*See* APP-202 at 3316.) However, erosion calculations were only for Hydrologic Soil Group D soils, and the drainage runoff calculations used runoff curve numbers typical of Hydrologic Soil Group D soils. In essence all of the cover design calculations were based on one type of soil typical of the immediate area whereas the Final Cover Plan requires a different type of soil that would probably require importation to the ACL.

Q. YOU IDENTIFIED THAT THE SLOPES OF 3H:1V WERE NOT ANALYZED FOR STABILITY IN PART III, ATTACHMENT 3, APPENDIX C OF THE ACL AMENDMENT APPLICATION, NOR WERE THEY ANALYZED FOR EROSION LOSS. PLEASE EXPLAIN WHY THIS IS OF CONCERN TO YOU.

A. The steeper 3H:1V final cover slopes are described in the Closure Plan and shown on Figure ATT7-1C (*see* APP-202 at 3281) for the final cover slopes adjacent to the IWU. Since slope stability is a function of both slope height and slope steepness, the steeper

slopes should have been addressed in the Part III, Attachment 3, Appendix C stability analyses, but that was not done. This is particularly problematic because these steeper slopes have not been factored into the stability analyses, resulting in them being even less protective than addressed above. In addition, the erosion calculations in Part III, Attachment 2, Appendix F of the ACL Amendment Application (*see* APP-202 at 885-96) were only done for 4H:1V slopes. Increasing the slope to 3H:1V will significantly increase erosion loss. In essence, the ACL Amendment Application seeks a permit by "bait and switch" tactics—analyzing stability and erosion for slopes that are actually flatter than proposed.

Q. YOU ALSO MENTIONED THAT THE "ADD-ON BERMS" AFFECT THE EROSION STABILITY. PLEASE EXPLAIN.

A. The add-on berms affect the erosion calculations. Although the add-on berms may reduce slope lengths, the berms create a convex slope between berms. As the ACL Amendment Application's own erosion reference shows (*see* APP-202 at 895) convex slopes increase erosion loss. While the ACL Amendment Application includes this reference, notes attached to the erosion calculations indicate that the convex slope created by the general final cover slope and the outside slope of the add-on berms was not included in the calculations. (*See* APP-202 at 888-889.)

Q. SO HOW DO THE ADD-ON BERMS AFFECT SLOPE STABILITY?

A. The add-on berms affect final cover slope stability in a number of ways, including:

- They require more construction activity atop the composite cover.
- They increase infiltration into the final cover system—particularly if ponding occurs.

- They add localized weight above the composite cover.

Q. YOU ALSO STATED THAT DIFFERENT CALCULATIONS IN THE ACL AMENDMENT APPLICATION WERE BASED ON DIFFERENT SCS HYDROLOGIC SOIL GROUP SOILS. PLEASE EXPLAIN WHY THIS IS IMPORTANT.

A. First, let me explain what the differences between these various soil groups are.

The Final Cover Quality Control Plan ("FCQCP"), Part III, Attachment 7, Appendix A of the ACL Amendment Application (*see* APP-202 at 3316) identifies that SCS Hydrologic Soil Group A, B, and/or C soils are required for construction of the 24-inch protective/erosion layer of the final cover system. To avoid any misinterpretation, the FCQCP specifically details the infiltration properties associated with the Hydrologic Group A, B, and C soils and specifically references the USDA's Soil Conservation Service Technical Release 55 (Urban Hydrology for Small Watersheds, 2nd Edition, USDA SCS (1986)). (*See* APP-202 at 3316.)

Erosion calculations in Part III, Attachment 2, Appendix F of the ACL Amendment Application (*see* APP-202 at 885-96) were only for Hydrologic Soil Group D soils. The erosion calculations state that the erosion factor, K = 0.32, was based on Ferris and Heiden soils and obtained from the USDA. (*See* APP-202 at 888-90.) Another USDA publication, the SCS National Engineering Handbook, Section 4, Hydrology (USDA SCS, Apr. 1972) indicates on pages 7.12 – 7.13 that both the Ferris and Heiden soils are in Hydrologic Group D. Similar verification of the Hydrologic Group can also be found in the newer NRCS (formerly the SCS) Soil Survey for Travis County, Texas. In addition, the drainage runoff calculations in the ACL Amendment Application used runoff curve numbers typical of Hydrologic Soil Group D soils (*see*

APP-202 at Part III, Attachment 2, Appendix A). ACL Amendment Application Table 1B.1 has runoff SCS Curve Numbers ranging from 85 to 98. These curve number values are typical of Hydrologic Group D soils, *i.e.*, practically impervious equals high runoff. These high curve numbers are typical of Hydrologic Soil Group D values for runoff curve numbers given in TR-55 (USDA SCS 1986).

Q. SO WHY IS THIS DISCUSSION REGARDING HYDROLOGIC SOIL GROUPS A, B, AND C VERSUS HYDROLOGIC SOIL GROUP D VALUES IMPORTANT?

A. In essence all of the cover design calculations for erosion and drainage were based on one type of soil typical of the immediate area of the ACL, whereas the Final Cover Plan requires a different type of soil that would probably have to be imported to the ACL.

Q. CAN YOU DETAIL YOUR CONCERNS?

A. Yes. Simply put, this is another example of either contradiction and/or "bait and switch" in the ACL Amendment Application. In summary, my concerns are:

- The Closure Plan requires a very large amount of protective cover soil of a type that is not available on-site.
- All of the surface drainage calculations for the completed ACL facility were based on a soil type with totally different run-off characteristics from the soil type required by the Closure Plan.
- All of the cover soil erosion calculations for the completed ACL were based on a soil type with totally different erosion characteristics from the soil type required by the Closure Plan.
- The erosion and drainage calculations contained in the ACL Amendment Application do not represent WMTX's actual proposed construction.

X. SITE OPERATING PLAN

Q. DID YOU REVIEW PART IV, SITE OPERATING PLAN ("SOP"), OF THE ACL AMENDMENT APPLICATION?

A. Yes, I did.

Q. HAVE YOU PREPARED SITE OPERATING PLANS FOR OTHER MSW LANDFILLS?

A. Yes, I have prepared SOPs for other MSW landfills, including: the McKinney Landfill, the 121 RDF, the Skyline Landfill, and the City of Mason Landfill.

Q. ARE YOU FAMILIAR WITH THE IMPACT OF THE CASE BFI WASTE SYSTEMS OF NORTH AMERICA v. MARTINEZ ENVIRONMENTAL GROUP, 93 S.W.3D 570 (TEX. APP.—AUSTIN 2003) ON SITE OPERATING PLANS STATEWIDE?

A. Yes. I have provided comments on several occasions and attended various TCEQ stakeholders meetings involving the rulemaking that revised TCEQ's Site Operating Plan ("SOP") rules and required all MSW landfills to revise their SOPs in response to *BFI Waste Systems of North America v. Martinez Environmental Group.* The *Martinez* case found that the SOP involved lacked sufficient specificity to be an enforceable permit document. The revised SOP rules that were subsequently promulgated by TCEQ in 2004 require detailed, specific requirements throughout SOPs. In fact, portions of a revised SOP that I had prepared were used as "example language" during the rulemaking and were subsequently included in TCEQ's *Guide for Preparing Site Operating Plans for Municipal Solid Waste Facilities*, RG-420, April 2005.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 449.

A. Exhibit TJFA 449 is a copy of the Executive Director of TCEQ's April 2005 *Guide for Preparing Site Operating Plans for Municipal Solid Waste Facilities*, RG-420.

Q. IS EXHIBIT TJFA 449 A TRUE AND CORRECT COPY OF THE 2005 GUIDE FOR PREPARING SITE OPERATING PLANS FOR MUNICIPAL SOLID WASTE FACILITIES?

A. Yes. Exhibit TJFA 449 is a true and correct copy of the TCEQ's *Guide for Preparing Site Operating Plans for Municipal Solid Waste Facilities*.

Q. WAS EXHIBIT TJFA 449 DEVELOPED BY TCEQ AS A GUIDANCE DOCUMENT REGARDING THE DEVELOPMENT OF SOPs?

A. Yes, it was.

Q. IS EXHIBIT TJFA 449 A CURRENTLY APPLICABLE TCEQ GUIDANCE DOCUMENT?

A. Yes, it is. It should be noted that, although the guidance cites to pre-2006 regulations, the document is still carried on TCEQ's website as applicable guidance as of December 30, 2008.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON EXHIBIT TJFA 449 WHEN DESIGNING SOPs FOR MSW LANDFILLS PURSUANT TO THE MSW RULES?

A. Yes, they do.

Q. IS EXHIBIT TJFA 449 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING SOPs?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 449]

Q. HAVE YOU REVISED ANY SOPs IN RESPONSE TO THE TCEQ'S "CALL-IN," WHICH REQUIRED ALL EXISTING MSW LANDFILLS TO REVISE THEIR SOPs TO COME INTO COMPLIANCE WITH THE REVISED 2004 SOP RULES?

A. Yes, I revised two SOPs as part of the call-in process: for the 121 RDF and for the City of Mason Landfill.

Q. DID YOU REVIEW THE ACL AMENDMENT APPLICATION'S PART IV SOP IN THE CONTEXT OF THE REVISED 2004 SOP RULES AND HOW THOSE RULES HAVE BEEN APPLIED TO OTHER MSW LANDFILLS?

A, Yes, I did.

Q. DO YOU HAVE ANY OPINIONS REGARDING PART IV, SOP, OF THE ACL AMENDMENT APPLICATION?

A. Yes. I have a number of opinions. As a general summary:

- The SOP does not appear to meet all of the requirements of 30 TEX. ADMIN. CODE §§ 330.65(c), 330.125(e) and (f), 330.127(4) and (5), 330.129, 330.133(c), and 330.177, relating to training of landfill

employees, fire protection, unloading of prohibited waste, and leachate and gas condensate recirculation.

- The SOP does not appear to meet all of the requirements of 30 TEX. ADMIN. CODE §§ 30.201(a), 30.212, and 30.213(a), relating to personnel operating licenses, as specifically referenced by 30 TEX. ADMIN. CODE § 330.125(f).
- The SOP does not appear to meet all of the requirements of 30 TEX. ADMIN. CODE §§ 335.586(a), (c), (d), & (e), relating to training of landfill employees, as specifically referenced by 30 TEX. ADMIN. CODE §§ 330.125(e) and 330.127(4).
- The SOP does not appear to conform to the recommendations of TCEQ's *Guide for Preparing Site Operating Plans for Municipal Solid Waste Facilities*. (*See* Exhibit TJF 449.)
- A number of the individual sections of the SOP do not appear to have the detail or specificity required for verification of compliance—particularly as the standards have been applied since the SOP rules were revised in response to the *Martinez* case.
- Various sections of the SOP contradict each other as well as other information in various attachments to Part III of the ACL Amendment Application.
- The SOP does not appear to provide sufficient guidance on operation to adequately protect human health or the environment.

Q. CAN YOU PROVIDE SPECIFIC EXAMPLES OF YOUR GENERAL OPINIONS?

A. Yes. I will provide my opinions regarding the SOP using a more or less section-by-section basis in the following discussion:

Section 2.0 – Personnel, 30 TEX. ADMIN. CODE § 330.127(1) (*see* APP-202 at 3378-80). Section 2.0 indicates that the site manager "will be licensed pursuant to 30 TAC Chapter 30. Subchapter F." However, Section 2.0 fails to specify the level of license required for the site manager. A quick reference to 30 TEX. ADMIN. CODE Chapter 30, Subchapter F, and specifically 30 TEX. ADMIN. CODE § 30.213(b), notes that the licensing requirements of 30 TEX. ADMIN. CODE § 30.213(a) for the site supervisor/manager can be superseded by the facility's permit. If not superseded by the facility-specific permit requirements, 30 TEX. ADMIN. CODE § 30.213(a) requires a Class A license for the site supervisor/manager. The ACL Amendment Application SOP does not specify that the ACL site manager will be required to have a Class A license. Similarly the SOP does not indicate any license level for either gate attendants and/or equipment operators, in spite of the fact that both of these personnel categories are primarily responsible for excluding the receipt and disposal of prohibited wastes. I will address this topic again below with my discussion of Sections 4.1 and 4.2. Thus, based on the SOP that is to govern operation of the ACL, the gate attendants and equipment operators would not have to have the training necessary to be able to identify and stop the disposal of prohibited wastes.

Section 3.0 – Equipment, 30 TEX. ADMIN. CODE § 330.127(2) (*see* APP-202 at 3381-82). Table 2, Equipment List (*see* APP-202 at 3382), of the SOP does not specify the size or type of all equipment, *e.g.*, "excavator/loader," as required by 30 TEX. ADMIN. CODE § 330.127(2). In addition, although the equipment list in Table 2 matches the

requirements of Section 4.3, Fire Protection Plan, the Fire Protection Plan and related calculations, which are included in Appendix H to the SOP, are contradictory and seriously underestimate equipment requirements. I will discuss the Fire Protection Plan in more detail below.

Section 4.1 – Personnel Training, 30 TEX. ADMIN. CODE § 330.127(4) (*see* APP-202 at 3383-84). Based on the ACL Amendment Application SOP, personnel training could potentially rely exclusively on "on-the-job training." (*See* APP-202 at 3383 & 3387.) On-the-job training is not formal, often is not consistent from employee to employee, and is not quantifiable. There are also no specific requirements for the person providing the training. Such a lack of requirements does not meet the appropriate standard of care for a large Type I MSW landfill. Typically a large Type I MSW landfill will be supervised by a manager with a Class A license, and the personnel on the organization chart responsible for excluding prohibited waste will have Class C licenses. Licensing, as acknowledged by TCEQ's SOP rules, is one method to demonstrate to the public that minimum training standards are being met. Because the ACL Amendment Application contains no specific references to the levels of licenses to be required for the ACL's operational personnel, there is no way for WMTX to demonstrate that minimum training standards are being met.

In addition, based on the SOP in the ACL Amendment Application, the "site manager" is required to be "experienced" without any specificity as to what "experienced" means. Such a description is not enforceable and thus does not meet the requirements of TCEQ's SOP rules post the *Martinez* case. To meet the regulatory requirements of TCEQ's revised SOP rules, there must be some recitation of qualifying experience, *e.g.*, number of years of experience as a landfill supervisor, educational

requirements, training requirements, *et cetera*, that the industry and general public would agree are qualifications to run a major landfill operation. The ACL Amendment Application fails to meet this straightforward regulatory requirement and thus cannot demonstrate that its operational personnel will have the experience necessary to protect human health and the environment.

Section 4.2 – Prohibited Waste Detection and Prevention Program, 30 TEX. ADMIN. CODE § 330.127(5) (*see* APP-202 at 3384-88). The SOP in the ACL Amendment Application indicates that the site manager "will randomly select no less than five incoming loads per week for random inspection . . . . the equipment operator will visually inspect the contents of the load and document the presence of any prohibited waste observed." (*See* APP-202 at 3387.) Although the frequency of random inspections is not specified by TCEQ rule, TCEQ's guidance recommends that random inspections occur each day of operation. (See Exhibit TJFA 449, *SOP Guidance* at 14.) Considering that the ACL proposes to operate on a 24 hour/6 day per week basis, five (5) random inspections per week seems weak, if not basically non-existent. In addition, the SOP fails to identify that such random inspections should occur during daylight hours. Night-time operation makes visual observation of any incoming load problematic, especially in cases where there is inadequate training of operational personnel, as can be expected based on the lax training requirements addressed above.

Section 4.3 – Fire Protection Plan, 30 TEX. ADMIN. CODE § 330.129 (*see* APP-202 at 3388-92). Texas Administrative Code Title 30, Section 330.127 has specific requirements for the SOP:

> The owner or operator shall maintain a source of earthen material in such a manner that it is available at all times to extinguish any fires.

> The source must be sized to cover any waste received for disposal not covered with six inches of earthen material. Sufficient on-site equipment must be provided to place a six-inch layer of earthen material to cover any waste not already covered with six inches of earthen material within one hour of detecting a fire. A site operating plan must contain calculations demonstrating the adequacy of the earthen material and to demonstrate that the type and number of equipment listed in the site operating plan will be able to transport the volume of earth required.

The Fire Protection Plan in the ACL Amendment Application is self contradicting as to how the regulatory requirements will be met and is further contradicted by the calculations in Appendix H to the SOP. Section 4.3.2 of the SOP asserts that a "stockpile of earthen material will be maintained on the site within 1,000 feet of the working face, and equipment will be available on highest priority basis for use in placing earthen material to smother any fire that may occur." (*See* APP-202 at 3389.) Under the heading *Landfill Working Face*, Section 4.3.2 asserts that the "facility's firefighting equipment is capable of placing a six-inch layer of earthen material . . . within one hour of detecting a fire." (*See* APP-202 at 3389.) There is also a "Table 4. Earthen Stockpile Sizing for Fire Control," included in the SOP, which provides stockpile sizes for a [single] working face up to 60,000 square feet. (*See* APP-202 at 3389.) However, the very next page contains the contradictory information that "soil stockpiled for daily cover in the vicinity of the working face will be used to extinguish the fire while additional soil as needed will be loaded onto earth moving equipment and carried to the area from the soil borrow area and spread to a minimum thickness of six inches as soon as possible following detection of the fire." (*See* APP-202 at 3390 (emphasis added).)

The concept of a single working face, as described in the Fire Protection Plan, is further contradicted by Section 4.5 of the SOP, Unloading of Waste, which indicates that up to five working faces may be open at one time; however, the total area will not exceed 60,000 square feet. (*See* APP-202 at 3393.)

Appendix H (*see* APP-202 at 3459-67) to the SOP contains even further contradictory information. The calculations in Appendix H are based on a single 60,000 square foot working face and an average dozing distance of 100 feet, which would require the stockpile to be immediately adjacent, and parallel, to the length of the 200 x 300-foot active face. (*See* APP-202 at 3461.) However, the conclusions on page 3461 of the ACL Amendment Application acknowledge that a stockpile adequate to cover the working face may not always be available and that additional soil could be obtained from a nearby "earthen material borrow area" in addition to spreading material from "stormwater run-on/run-off control berms."

Regardless of soil availability issues, the Appendix H calculations appear to be flawed and unrealistic. The calculations are generally based on the theoretical efficiency of earth-moving equipment, *e.g.*, a Caterpillar D8's production with an excellent operator pushing material over an average dozing distance of 100 feet is 850 cubic yards per hour (*See* Caterpillar Performance Handbook, Edition 37, pages 1-42 to 1-47, Caterpillar, 2007.) In the calculation in Appendix H, a single correction of 120% for pushing from a loose material stockpile was used in the calculations to increase the theoretical production. There were no negative corrections for operator skill, sticky-wet material, grade or slope, or job efficiency, nor were any allowances made for pushing distances averaging more than 100 feet. If an "average operator" was using the equipment and all other aspects were equal, production would be 75% of theoretical, *i.e.*, the combined production of 1,632 cubic yards per hour would be reduced to 1,224 cubic yards per hour, which is less than the required 1,278 cubic yards per hour. The various contradictions need to be resolved and consistent calculations need to be provided to meet the regulatory requirements. Until that occurs, the Fire Protection Plan contained in the SOP is not protective of human health and the environment.

Section 4.5 – Unloading of Waste, 30 TEX. ADMIN. CODE § 330.133 (*see* APP-202 at 3393-94). In contradiction to the single working face described in Section 4.3 and Appendix H of the SOP, Section 4.5 of the SOP asserts that there may be up to five, separate active working faces. (*See* APP-202 at 3393.) This multiple working face aspect was not addressed in the fire protection calculations, *et cetera*, and would, in all probability, negatively affect those calculations and related equipment needs.

Section 4.13 – Odor Management Plan, 30 TEX. ADMIN. CODE § 330.129 (*see* APP-202 at 3399-3401). The SOP fails to mention odor potentially produced from liquid waste solidification, leachate recirculation, and utility gas vents. While aeration of the leachate pond may prevent odor from anaerobic decomposition, aeration may strip volatile organic constituents ("VOCs") present in the leachate and release them to the atmosphere. VOCs can significantly contribute to odor. The spray application of leachate can similarly introduce odors. The failure of the Odor Management Plan to address these potential sources of significant odors at the ACL renders it noncompliant with the requirements of TCEQ's revised SOP rules.

Section 4.13 –Leachate and Gas Condensate Recirculation, 30 TEX. ADMIN. CODE §§ 330.65(c) and 330.177 (*see* APP-202 at 3415). The SOP asserts that in "disposal cells containing a standard Subtitle D liner system (*i.e.*, a compacted clay/geomembrane composite) and leachate collection system, leachate and gas condensate may be recirculated back into the waste." Without quibbling with the over-simplification of the actual liner and leachate collection system requirements for recirculation, it should be noted that the assertion is incorrect and non-compliant with regulatory requirements. As

previously pointed out in the discussion related to the Landfill Gas Management Plan contained in Part III, Attachment 6 of the ACL Amendment Application, the Subtitle D regulatory requirements of 40 C.F.R. § 258.28 make it abundantly clear that only leachate and/or gas condensate derived from a specific unit can be recirculated back into that same unit and only if that unit has a composite liner system and leachate collection system conforming to 40 C.F.R. § 258.49(a)(2). Since TCEQ rules can be no less stringent than the federal Subtitle D regulations, the federal requirements are definitive. Thus, the leachate and gas condensate recirculation described in Section 4.13 of the SOP is in violation of federal Subtitle D regulations and MSW rules.

XI. ADDITIONAL REGULATORY VIOLATIONS

Q. DO YOU HAVE ANY OTHER REMAINING CONCERNS REGARDING THE ACL AMENDMENT APPLICATION?

A. Yes, I actually have two (2) additional concerns: (1) it appears that WMTX is proceeding with construction of the lateral expansion prior to receiving an amended permit for that expansion; and (2) previous Liner Evaluation Reports ("LERs") filed with TCEQ show evidence of gaps in the liner system coverage and an unpermitted lateral expansion.

Q. WHAT EVENTS OR INFORMATION LED TO YOUR FIRST CONCERN?

A. Based on observations that I made during the site visit in which I participated on December 10, 2008, it appears that WMTX is in violation of relevant requirements of 30 TEX. ADMIN. CODE § 330.7(a) in that it is constructing certain portions of the proposed expansion of the ACL prior to potential approval of the ACL Amendment Application.

Q. WHAT DID YOU OBSERVE DURING THE SITE VISIT ON DECEMBER 10, 2008?

A. I observed that there were what appeared to be constructed sedimentation and detention ponds in the expansion area of the ACL.

Q. WHAT DO YOU MEAN WHEN YOU REFER TO THE "EXPANSION AREA" OF THE ACL?

A. As I identified above, the ACL Amendment Application seeks, in part, a lateral expansion of the existing ACL facility; thus, thus it proposes to increase the area of land within the permitted boundary of the facility. The ACL Amendment Application proposes to permit new areas of land (as part of what would be Permit No. MSW-294D) that are not currently permitted as part of Permit No. 249-C. I am referring to those areas that are not currently permitted by Permit No. MSW 249-C as the "expansion area" of the ACL. This area is shown on Figures 1.3 and 2 in the ACL Amendment Application. (*See* APP-202 at 112 & 664.)

Q. WHAT DOES 30 TEX. ADMIN. CODE § 330.7(a) PROVIDE:

A. While 30 TEX. ADMIN. CODE § 330.7(a) contains a number of restrictions on the storage, processing, removal, and disposal of MSW, the last sentence of the rule is of particular importance with regard to my observations on the day of the site visit. The last sentence of Section 330.7(a) provides:

> No person may commence physical construction of a new municipal solid waste (MSW) management facility, a vertical expansion, or a lateral expansion without first having submitted a permit application in accordance with §§330.57, 330.59, 330.61, 330.63, and 330.65 of this title (relating to Permit and Registration Application Procedures) and *received a permit from the commission* . . . . (Emphasis added.)

Q. IN WHAT WAY DO YOU BELIEVE WMTX HAS VIOLATED 30 TEX. ADMIN. CODE § 330.7(a)?

A. Based on my observations from December 10, 2008, it seems clear that WMTX has not only commenced, but has also completed construction and is currently using "structural components" of the lateral expansion that is proposed in the ACL Amendment Application prior to receiving a permit from TCEQ for that lateral expansion.

Q. WHAT ARE "STRUCTURAL COMPONENTS" AND WHAT IS THEIR SIGNIFICANCE?

A. The MSW rules, at 30 TEX. ADMIN. CODE § 330.3(152) define the term "structural components" as follows: "Liners, leachate collection systems, final covers, run-on/run-off systems, and any other component used in the construction and operation of the municipal solid waste landfill that is necessary for protection of human health and the environment." From the definition, it is clear that TCEQ's MSW rules consider "structural components" as essential elements of a MSW landfill.

Q. DO THE FEDERAL SUBTITLE D REGULATIONS HAVE A SIMILAR DEFINITION AND MEANING FOR THE TERM "STRUCTURAL COMPONENTS"?

A. Yes, 40 C.F.R. § 258.15(b)(2) has almost the identical definition, in which it provides: "*Structural components* means liners, leachate collection systems, final covers, run-on/run-off systems, and any other component used in the construction and operation of the MSWLF that is necessary for protection of human health and the environment."

Q. IN YOUR OPINION, WHAT STRUCTURAL COMPONENTS OF THE LATERAL EXPANSION PROPOSED IN THE ACL AMENDMENT APPLICATION HAS WMTX ALREADY CONSTRUCTED AND IS CURRENTLY USING?

A. WMTX has already constructed and is currently using sedimentation and detention ponds which are part of the "run-on/run-off systems," *i.e.*, "structural components," of the proposed lateral expansion. In other words, WMTX has constructed and appears to be using ponds which are described in the ACL Amendment Application and are shown throughout the ACL Amendment Application as being located in the "expansion area" of the ACL.

Q. WHY IS IT YOUR OPINION THAT THE SEDIMENTATION AND DETENTION PONDS ARE "STRUCTURAL COMPONENTS" OF THE PROPOSED LATERAL EXPANSION DESCRIBED IN THE ACL AMENDMENT APPLICATION?

A. I am of that opinion for a number of reasons. First, sedimentation and detention ponds are classically, and typically, used as part of "run-off" control systems, *i.e.*, the very definition of "structural components."

Second, the sedimentation and detention ponds are described and detailed in the ACL Amendment Application at Attachment 2, Surface Water Drainage Report, as part of the proposed landfill lateral expansion. Drainage analysis is unequivocally equated to run-on/run-off systems.

Third, the ponds are identified as "proposed sedimentation and detention ponds" at numerous locations within Attachment 2, Facility Surface Water Drainage Report, of the ACL Amendment Application, including, for example:

- *Section 3.2 – Stormwater Detention and Sedimentation Ponds Analysis* (*see* APP-202 at 599) refers to a "proposed sedimentation and detention pond (see Figure ATT2-2) located at the northwestern corner" (*i.e.*, in the "expansion area" of the ACL), as opposed to the "two existing sedimentation ponds, referred to as 'north pond' and 'south pond.'"
- *Section 3.3 – Discharge Structure Analysis for Detention and Sedimentation Ponds* (*see* APP-202 at 600) refers to the "proposed sedimentation and detention pond" as "proposed" as opposed to the "existing north and south ponds."
- Figure ATT2-2 (*see* APP-202 at 615) titled "Post-Development Drainage Plan" shows the ponds as "proposed sedimentation and detention ponds" and shows the ponds in the "expansion area" of the ACL.
- Enlarged Figure ATT2-2 (*see* APP-202 at 616) titled "Post-Development Drainage Plan" shows the ponds as "proposed sedimentation and detention ponds" and shows the ponds in the "expansion area" of the ACL.
- Figure ATT2-7 (*see* APP-202 at 621) titled "Drainage Control Details V" shows the ponds as "proposed sedimentation and detention ponds" and shows the ponds in the "expansion area" of the ACL.

Fourth, the ponds are not shown in any documentation in the ACL Amendment Application that describes existing conditions. For example, Figure ATT2-1B (*see* APP-202 at 614) titled "Pre-Development Drainage Plan" does not show the ponds.

Fifth, Parts I & II of the Application at Section 3.4, Ground and Surface Water Statement, indicate that "the new portion of the western hill [landfill unit] to be created by the proposed expansion will be routed to a detention pond located along the west-central portion of the permit boundary . . . . The proposed detention pond will be

equipped with a controlled outlet structure. . . ." (See APP-202 at 31.) This again demonstrates that the ponds are located in the "expansion area" of the ACL and are not located in the area currently permitted as part of Permit No. MSW-249-C.

Q. WHY DO YOU BELIEVE WMTX HAS ALREADY CONSTRUCTED, AND IS CURRENTLY USING, SEDIMENTATION/DETENTION PONDS WHICH ARE PART OF THE "RUN-ON/RUN-OFF SYSTEMS," I.E., "STRUCTURAL COMPONENTS," OF THE PROPOSED LATERAL EXPANSION?

A. Prior to preparation of my prefiled testimony, I reviewed the ACL Amendment Application to understand the scope of the proposed landfill expansion. In addition, I reviewed recent aerial photographs of the ACL facility prior to the December 10, 2008 site visit to view the ACL facility.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 450?

A. Exhibit TJFA 450 is an aerial photograph dated April 30, 2006.

Q. DO YOU RECOGNIZE THIS EXHIBIT?

A. Yes, I recognize Exhibit TJFA 450.

Q. HOW ARE YOU ABLE TO DO SO?

A. I recognize the area shown in the aerial photo because I am familiar with the ACL and the surrounding vicinity based on my review of multiple documents through the years related to the ACL facility.

Q. DOES THE PHOTOGRAPH FAIRLY AND ACCURATELY DEPICT THE ACL AS IT APPEARED ON THE DAY THAT IT WAS TAKEN?

A. To the best of my knowledge, yes.

Q. IS THE AERIAL PHOTOGRAPH IDENTIFIED AS EXHIBIT TJFA 450 EITHER FROM YOUR PERSONAL KNOWLEDGE OR FROM AVAILABLE INFORMATION COMMONLY AND REASONABLY RELIED UPON BY PROFESSIONAL ENGINEERS?

A. It is common and reasonable for professional engineers to rely upon aerial photographs to understand conditions at the time the aerial photograph was taken.

Q. DOES THE COPY OF THE AERIAL PHOTOGRAPH IN EXHIBIT TJFA 450 REPRESENT A TRUE AND ACCURATE COPY OF THE ORIGINAL?

A. Yes.

[MOVE TO ADMIT EXHIBIT TJFA 450]

Q. WHAT DID YOU ASCERTAIN FROM YOUR REVIEW OF THE AERIAL PHOTOGRAPHS IDENTIFIED AS EXHIBITS TJFA 203 AND TJFA 450?

A. I was surprised to note from the aerial photographs that the "sedimentation and detention ponds" at the northwest corner of the ACL facility, *i.e.*, in the "expansion area," which are proposed in the ACL Amendment Application as part of the run-off controls for the landfill expansion, appeared to have already been constructed. Based on the available aerial photos that I reviewed, the ponds were constructed between April 30, 2006, and December 4, 2007.

Q. WHAT DID YOU OBSERVE DURING YOUR VISIT TO THE ACL ON DECEMBER 10, 2008?

A. The December 10, 2008 site visit allowed me to confirm that the ponds had indeed been constructed and in fact apparently were being used for the intended purpose detailed in the ACL Amendment Application.

Q. PLEASE IDENTIFY WHAT HAS BEEN MARKED AS EXHIBIT TJFA 451.

A. Exhibit TJFA 451 is three photographs dated December 10, 2008. The photographs are numbered 105 through 107.

Q. DID YOU TAKE THE PHOTOGRAPH INCLUDED IN EXHIBIT TJFA 451?

A. No, I did not. The photographs were taken by someone under the supervision and control of myself and Dr. Kier during the site visit of the ACL on December 10, 2008.

Q. DO THE PHOTOGRAPHS MARKED AS EXHIBIT TJFA 451 REPRESENT TRUE AND ACCURATE COPIES OF THE ORIGINAL PHOTOGRAPHS?

A. Yes, they do.

Q. WHAT DO THE PHOTOGRAPHS IN EXHIBIT TJFA 451 SHOW?

A. The photographs in Exhibit TJFA 451 depict the following:

- Photograph 105 – Northwest side of the ACL looking approximately west. Newly constructed pond in background.
- Photograph 106 – Northwest side of the ACL looking approximately west. Two newly constructed ponds in background.

- Photograph 107 – Northwest to west side of the ACL looking approximately west. Two newly constructed ponds in background.

In general, the three photographs depict sedimentation and detention pond that I have described as being constructed outside of the current permit boundary and in the "expansion are," as shown in the ACL Amendment Application.

Q. DO THE PHOTOGRAPHS MARKED AS EXHIBIT TJFA 451 FAIRLY AND ACCURATELY DEPICT THE NEWLY CONSTRUCTED PONDS AS YOU DESCRIBED IN YOUR PREVIOUS RESPONSE AS THEY APPEARED ON THE DAY YOU WITNESSES THE PHOTOGRAPHS BEING TAKEN?

A. Yes, they do.

Q. WILL THE PHOTOGRAPHS IN EXHIBIT TJFA 451 BE USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING THE NEWLY CONSTRUCTED PONDS?

A. Yes.

[OFFER TO ADMIT EXHIBIT TJFA 451]

Q. ARE OTHER PARTS OF THE PROPOSED EXPANSION AREA OF THE ACL CURRENTLY BEING USED?

A. Yes, but not specifically for the lateral expansion of a landfill unit. Based on my observations from the December 10, 2008 site visit, the western portion of the expansion area is currently being used for container storage, soil stockpiling, and temporary access for construction equipment for excavation of disposal cell WD-8 and/or WD-9, which are

authorized by the current permit, Permit No. MSW-249C. None of these other current uses could be considered part of the proposed lateral expansion of a landfill unit.

Q. DOES THE ACL AMENDMENT APPLICATION PROVIDE ANY EXPLANATION FOR THE EARLY CONSTRUCTION OF THE SEDIMENTATION AND DETENTION PONDS?

A. Perhaps, in a somewhat contradictory way. Parts I & II, of the ACL Amendment Application, at *Section 2.3 – Sequence of Site Development*, includes a Table 2-1, Schedule of Development. (*See* APP-202 at 14-17.) In that table, under "Pre-expansion Activities," Schedule Item 1.4 states: "Excavation of future sedimentation/detention pond area commences. This area will serve as a soil borrow area and as a sediment trap for construction of the temporary access road north of cells WD-6 through WD-9 (see Figure 2-1-6A)." Figure 2-1-6A, Operational Fill Sequence II (*see* APP-202 at 132), shows the temporary access road and contains the following Note 5:

> The sedimentation/detention pond will be partially excavated druing *[sic]* consturction *[sic]* of the temporary access road and serve as a temporary sediment trap /detention area. The amount of excavation will depend on the amount of clay required for temporary access road construction.

Interestingly, Figure 2-1-6A shows only a small portion of both ponds as being constructed. However, the recent aerial photographs and the December 10, 2008 site visit confirm that both ponds have been completed. More interestingly, Figure 2-1-6A shows surface water run-off from the west hill landfill unit being re-routed into the "temporary sediment trap /detention area."

Q. BY BUILDING THESE PONDS PRIOR TO APPROVAL OF THE ACL AMENDMENT APPLICATION, HAS WMTX MODIFIED THE EXISTING, PERMITTED DRAINAGE PLAN?

A. WMTX has certainly modified the existing, permitted drainage plan by constructing additional, new drainage "structural components," i.e., the sedimentation and detention ponds. I do not know whether construction of the ponds would have modified the existing, permitted drainage plan relative to peak discharge, maximum velocity, and/or discharge volume. Visual observation of the ponds cannot provide that type of technical information. What is clear from visual observation is that the ponds are constructed outside of the current permit boundary, so while construction of the ponds may or may not alter the discharge characteristics of the drainage plan itself, such construction is in violation of the existing permit, Permit No. MSW-249C, and the MSW rules for two reasons: (1) the ponds are not included as part of the structural components of the currently permitted drainage plan; and (2) the construction of the ponds is occurring outside the permit boundary as currently authorized by TCEQ.

Q. WHAT IS THE BASIS FOR YOUR SECOND REGULATORY CONCERN?

A. A review of Liner Evaluation Reports ("LERs") for previous liner construction at the ACL facility indicated that the liner constructed in the post-Subtitle D era in the East Hill area had "gaps" in the liner coverage. The LERs also appeared to show that liner was constructed outside of the permitted footprint of the waste management unit, *i.e.*, a "lateral expansion" for which a permit amendment was never sought.

Q. HOW DID YOU ARRIVE AT THE CONCLUSIONS RELEVANT TO YOUR SECOND REGULATORY CONCERN?

A. In 2002, I was asked to review available LERs for the ACL in an attempt to assess the nature and extent of the various liner systems that had been used. The purpose was to develop a map showing the different liner systems that had been used, *e.g.*, something similar to the Site Layout Plan in the ACL Amendment Application (*see* APP-202 at fig. 2-1-1 at 121) but with more specificity and detail as to liner type, installation date, and regulatory status.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 452.

A. Exhibit TJFA 452 is excerpts from "Soil Liner Evaluation Report, Permit No. MSW-249C, for Recompacted Soil Liner, Cell WD – 4, Austin Community Recycling & Disposal Facility, Austin, Texas" ("WD-4 SLER"). The WD-4 SLER was developed by SECOR International, Inc. for Waste Management and is dated January 2001. It is also dated as received by "Solid Waste Mgmt.," apparently at TNRCC, on January 23, 2001.

Q. IS EXHIBIT TJFA 452 A TRUE AND CORRECT COPY OF THE EXCERPTS FROM THE WD-4 SLER?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON DOCUMENTS LIKE EXHIBIT TJFA 452 WHEN REVIEWING LANDFILL DESIGN ISSUES?

A. Yes, they do. Because LERs are signed and sealed by either a licensed professional engineer or a registered professional land surveyor, as appropriate, it is not unusual for professional engineers to rely upon the information contained in them.

Q. IS EXHIBIT TJFA 452 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR ANALYSIS OF THE LERS FILED BY WMTX FOR THE ACL?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 452]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 453.

A. Exhibit TJFA 453 is excerpts from "Geomembrane Liner Evaluation Report, Permit No. MSW-249C, for Flexible Membrane Liner, Cell WD – 4, Austin Community Recycling & Disposal Facility, Austin, Texas" ("WD-4 GMLER"). The WD-4 GMLER was developed by SECOR International, Inc. for Waste Management and is dated February 2001. It is also dated as received by "Solid Waste Mgmt." at TNRCC on February 14, 2001.

Q. IS EXHIBIT TJFA 453 A TRUE AND CORRECT COPY OF THE EXCERPTS FROM THE WD-4 GMLER?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON DOCUMENTS LIKE EXHIBIT TJFA 453 WHEN REVIEWING LANDFILL DESIGN ISSUES?

A. Yes, they do. Because LERs are signed and sealed by either a licensed professional engineer or a registered professional land surveyor, as appropriate, it is not unusual for professional engineers to rely upon the information contained in them.

Q. IS EXHIBIT TJFA 453 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR ANALYSIS OF THE LERS FILED BY WMTX FOR THE ACL?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 453]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 454.

A. Exhibit TJFA 454 is excerpts from "Liner Evaluation Report, Cell WD-4 Tie-in, TNRCC Permit No. MSW-249C," as prepared for the Austin Community Recycling & Disposal Facility, by RJR Engineering, Ltd., L.L.P. ("WD-4 Tie-in LER"). The WD-4 Tie-in LER is dated April 2001, and is stamped as received on May 4, 2001.

Q. IS EXHIBIT TJFA 454 A TRUE AND CORRECT COPY OF THE EXCERPTS FROM THE WD-4 TIE-IN LER?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON DOCUMENTS LIKE EXHIBIT TJFA 454 WHEN REVIEWING LANDFILL DESIGN ISSUES?

A. Yes, they do. Because LERs are signed and sealed by either a licensed professional engineer or a registered professional land surveyor, as appropriate, it is not unusual for professional engineers to rely upon the information contained in them.

Q. IS EXHIBIT TJFA 454 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR ANALYSIS OF THE LERS FILED BY WMTX FOR THE ACL?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 454]

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 455.

A. Exhibit TJFA 455 is excerpts from "Liner Evaluation Report, Permit No. MSW-249-C, Cell WD-5" ("WD-5 LER") as prepared for the Austin Community Recycling & Disposal Facility, by RJR Engineering, Ltd., L.L.P. The WD-5 LER is dated July 2001, and is stamped received by TNRCC MSW Permit Section on July 17, 2001.

Q. IS EXHIBIT TJFA 455 A TRUE AND CORRECT COPY OF THE EXCERPTS FROM THE WD-5 LER?

A. Yes, it is.

Q. DO PROFESSIONAL ENGINEERS COMMONLY RELY UPON DOCUMENTS LIKE EXHIBIT TJFA 455 WHEN REVIEWING LANDFILL DESIGN ISSUES?

A. Yes, they do. Because LERs are signed and sealed by either a licensed professional engineer or a registered professional land surveyor, as appropriate, it is not unusual for professional engineers to rely upon the information contained in them.

Q. IS EXHIBIT TJFA 455 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR

TESTIMONY TODAY SPECIFICALLY REGARDING YOUR ANALYSIS OF THE LERS FILED BY WMTX FOR THE ACL?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 455]

Q. DID YOU DEVELOP THE MAP THAT YOU DESCRIBED ABOVE?

A. I did indeed. The map detailed the following areas: pre-reporting landfill areas, pre-Subtitle D *in situ* bottom liner areas, pre-subtitle D compacted soil liner areas, post-Subtitle D design standard composite liner areas, and post-Subtitle D performance-based liner areas. The map also included a depiction of the individual cell designations and the approximate date of regulatory approval to place waste.

Q. PLEASE DESCRIBE WHAT HAS BEEN IDENTIFIED AS EXHIBIT TJFA 456.

A. Exhibit TJFA 456 is a map detailing the areas that I just described above.

Q. DID YOU CREATE THE MAP THAT IS EXHIBIT TJFA 456?

A. Yes, I developed the map in collaboration with Dr. Kier.

Q. WHAT ROLE DID YOU PLAY IN THE DEVELOPMENT OF THE MAP THAT IS EXHIBIT TJFA 456?

A. Based on my review of the LERs for the ACL, I developed a base map and notes describing my findings. Dr. Kier then added color to the base map and the handwritten notes that appear on it.

Q. WHAT DOCUMENTS DID YOU REVIEW IN ORDER TO DEVELOP THE MAP INCLUDED IN EXHIBIT TJFA 456?

A. I reviewed all of the LER documents that were available for the ACL facility, specifically included the LER documents that are attached hereto as Exhibits TJFA 452 through 455.

Q. IS EXHIBIT TJFA 456 AN ACCURATE REPRESENTATION OF THE BASE MAP AND NOTES THAT YOU DEVELOPED BASED ON YOUR REVIEW OF THE LERS?

A. Yes, it is.

Q. IS EXHIBIT TJFA 456 USEFUL IN YOUR TESTIMONY TODAY AND/OR IN ASSISTING THE ADMINISTRATIVE LAW JUDGE TO UNDERSTAND YOUR TESTIMONY TODAY SPECIFICALLY REGARDING YOUR EVALUATION OF THE LERS THAT YOU HAVE BEEN DISCUSSING?

A. Yes, it is.

[MOVE TO ADMIT EXHIBIT TJFA 456]

Q. WHAT DOES THE MAP SHOW RELATIVE TO YOUR CONCERNS?

A. While I was conducting the review of the various LER documents and related correspondence, I noted that the record drawings attached to the LERs for several supposedly contiguous LER areas—Cell WD-4, the Cell WD-4 Tie-in, and Cell WD-5 constructed in the east end of the East Hill waste management unit in 2001—did not actually fit together. As can be seen from the Exhibit TJFA 456, there is a gap between Cells WD-4 and the WD-4 Tie-in, and Cell WD-4 is offset to the east relative to Cell

WD-5. In addition, the surveyed location for Cell WD-4 extended beyond the permitted footprint boundary of the waste management unit.

Q. WHAT DO YOU MEAN BY THE TERM "RECORD DRAWINGS"?

A. "Record drawings" refer to those drawings that are included in a LER that are required to be signed and sealed by either a licensed professional engineer or a registered professional land surveyor.

Q. CHANGING DIRECTION FOR A MOMENT, ARE YOU FAMILIAR WITH THE LINER EVALUATION REPORTING REQUIREMENTS OF TCEQ AND ITS PREDECESSOR AGENCIES?

A. Yes I am. I have personally supervised liner construction and QA/QC, and reported liner evaluations for MSW landfills since the mid-1980s. I have been the "professional of record," as that term is defined by TCEQ, for LERs on numerous occasions through the years. I am familiar with the development of the regulatory requirements and related guidance.

Q. IN YOUR EXPERIENCE, WAS IT NOT A REQUIREMENT OF TCEQ'S MSW RULES TO PAY CLOSE ATTENTION TO CELL BOUNDARIES, DETAILS OF TIE-IN OF CONTIGUOUS CELLS, MAPS DOCUMENTING PREVIOUS LER AREAS, *ET CETERA*?

A. Yes, it was, and it continues to be the requirement.

Q. CAN YOU SUMMARIZE YOUR REGULATORY CONCERNS RELATIVE TO THE ACL AND THE LERS?

A. Yes. Exhibit TJFA 451 graphically illustrates the area of my concerns—the gap between contiguous cells and the unpermitted lateral expansion of the waste management footprint.

Q. PLEASE EXPLAIN.

A. The gap between cells WD-4 and WD-4 Tie-in appears to be a violation of old (*i.e.*, pre-1996 revisions) 30 TEX. ADMIN. CODE §330.200(a) (which corresponds to current 30 TEX. ADMIN. CODE § 330.331(a)). Similarly, the extension of cell WD-4 beyond the eastern boundary of the permitted limit of waste appears to be a violation of old 30 TEX. ADMIN. CODE §330.4(a) (which corresponds to current 30 TEX. ADMIN. CODE § 330.7(a)) in that a permit amendment to enlarge the waste unit's permitted footprint was never obtained. The gap would also appear to be a violation of federal Subtitle D regulatory requirements at 40 C.F.R. 258.40(a). More significantly, failure to meet the requirements of 40 C.F.R. § 258.40(a), *i.e.*, the federal Subtitle D criteria, would make the requirements of 40 C.F.R. § 258.1(g) and (h) relevant.

Q. SINCE THE CELLS IN QUESTION WERE CONSTRUCTED IN 2001, WELL INTO THE POST-SUBTITLE D ERA, DO YOU REALLY BELIEVE THAT A LINER "GAP" EXISTS AND THAT ONE OF THE CELLS WAS PARTIALLY CONSTRUCTED OUTSIDE THE PERMITTED WASTE FOOTPRINT BOUNDARY.

A. I do not know; I can only base my opinion on what is set out in the record drawings in the LERs that were submitted to TCEQ. The record drawings from the various LERs clearly

show such construction occurred, and it appears that the record drawings were appropriately signed and sealed and approved by TCEQ.

Q. ARE THERE ANY OTHER RAMIFICATIONS OF THE APPARENT LER PROBLEMS?

A. I can think of several. Assuming the LERs are correct and the liner gap is there, that has implications relative to ground water monitoring, *et cetera*. Leachate and/or condensate recirculation should not occur over that part of the waste management unit. The waste footprint on the east side should be corrected to match the LER documentation.

XII. SUMMARY AND CONCLUSIONS

Q. IN SUMMARY, MR. CHANDLER, DO YOU HAVE AN OPINION ON WHETHER THE ACL AMENDMENT APPLICATION IS IN COMPLIANCE WITH TCEQ'S MSW RULES?

A. Yes. It is my opinion that the ACL Amendment Application has failed to adequately demonstrate compliance with numerous TCEQ MSW rules as discussed in detail above.

Q. BASED ON YOUR OPINION THAT THE ACL AMENDMENT APPLICATION FAILS TO COMPLY WITH THE RULES YOU HAVE ENUMERATED, DO YOU BELIEVE THE ACL AMENDMENT APPLICATION, IF APPROVED, WOULD ADEQUATELY PROTECT HUMAN HEALTH AND THE ENVIRONMENT?

A. No, I do not believe the ACL Amendment Application, if issued as Permit No. MSW-249D, would be protective of human health and the environment.

Q. DO YOU BELIEVE THAT IF THE ACL AMENDMENT APPLICATION IS APPROVED, THE ACL CAN BE CONSTRUCTED AND OPERATED IN COMPLIANCE WITH STATE LAW AND MSW RULES?

A. No, I do not.

Q. MR. CHANDLER, IN YOUR PROFESSIONAL OPINION, SHOULD THE ACL AMENDMENT APPLICATION BE APPROVED?

A. No, it should not be approved for all of the reasons that I have discussed above.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes. However, I would like to reserve my rights to supplement or amend my testimony as appropriate and as permitted by the Administrative Law Judge.