UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
SAN ANTONIO DIVISION

AQUIFER GUARDIANS IN URBAN AREAS, and TEXANS UNITING FOR REFORM AND FREEDOM,	)	
Plaintiffs,	)	
v.	)	**Civ. No. SA-08-CA-0154-FB**
US FEDERAL HIGHWAY ADMINISTRATION, AMADEO SAENZ, JR., Executive Director, Texas Department of Transportation, and TERRY BRECHTEL, Executive Director, Alamo Regional Mobility Authority,	)	
Defendants.	)	

DECLARATION OF D. LAUREN ROSS PH.D., P.E.

Qualifications

1. My name is D. Lauren Ross. I am a licensed engineer in the State of Texas. Exhibit A, attached to this declaration describes my experience and credentials that form the basis for the expert opinions that I offer here.
2. I have a Bachelor of Science degree in civil engineering from the University of Texas with highest honors, awarded in 1977, a Master of Science degree in civil engineering from Colorado State University awarded in 1982, and a Doctor of Philosophy degree in civil engineering from the University of Texas awarded in 1994.
3. As an environmental engineer, I serve as a consultant to cities, organizations, private individuals and entities regarding aquifer and surface water quality in the Edwards Aquifer Region. I am a recognized expert on water quality, surface water, groundwater and soil pollution transport, environmental monitoring, and statistical analysis of environmental

monitoring data. I have served as an expert witness in legal proceedings, some of which are identified in my resume.

4. The opinions that I give in this affidavit are based on facts that are true and correct to the best of my personal knowledge and/or are facts that an engineer well-versed in water quality matters would reasonably rely upon in forming an opinion. My opinions are specifically based upon: first-hand observations of the Edwards Aquifer Recharge and Contributing Zones, including subsurface observations of water and sediment migration through karst; my experiences as a water quality consultant; and my review of hundreds of published scientific studies on relevant subjects including the Edwards Aquifer, groundwater protection in karst aquifers, pollutant fate and transport, and the impacts of development, non-point source pollutants, and construction activities on water quality. I have consulted for the City of Austin, the City of San Antonio, and the City of Sunset Valley on storm water and water quality engineering issues.

5. In reaching the following conclusions, I have relied on scientific theories that find wide acceptance among experts in the field of stormwater and water quality engineering. These theories have been instrumental in deriving the conclusions of many peer-reviewed papers and are widely used in developing practices to reduce water, stream, and aquifer pollution resulting from development.

6. My opinions specifically address information presented in these documents:

   - Federal Highway Administration and Alamo Regional Mobility Authority, *Categorical Exclusion for Proposed US 281 North at Loop 1604 Interchange Improvements,* June 2009, revised February 2010.
   - Jacobs Engineering, *US Highway 281/Loop 1604 Interchange Water Pollution Abatement*

Plan (WPAP), sealed by Erin N. Sobotik, September 1, 2010, revised October 8, 2010, November 8, 2010, and November 29, 2010.

Background

7. The proposed project is to expand the existing interchange at U. S. Highway 281 and Loop 1604 by adding four direct connectors between the two roadways, The project also includes widening existing roads and bridges, merge and diverge lanes, auxiliary lanes, ramp modifications, sidewalks and pedestrian bridges. The project would extend for six miles along Loop 1604 from Bitters Road to Redland Road; and three miles along U. S. Highway 281 from Bitters Road to Redland Road.
8. The proposed project would add 15.4 acres of impervious area directly to the ground surface. The elevated roads would contribute an additional 10.69 acres of pavement. The total paved area proposed by the project would be 26.1 acres. Although there are some water quality differences between elevated impervious areas and those constructed directly on the ground, in terms of their impacts of water quality, 26.1 acres conservatively encompasses the range of water quality impacts expected from the proposed project.
9. The proposed highway project would be constructed primarily over the Edwards Aquifer Recharge Zone. The recharge zone is that area where karst limestone that contains the Edwards Aquifer is exposed at the surface. This limestone is crossed by faults and solution features where water enters and flows through the rock, dissolving out large caverns as well as smaller openings.
10. The Edwards Aquifer Transition Zone underlies 1.1 miles of Highway 281 proposed to be included in this project. The transition zone is an area generally southeast of the recharge zone where the Edwards Formation is overlain by faulted and fractured limestone that have

cave and sinkhole openings. Similar to the recharge zone, water on the land surface of the transition zone recharges the Edwards Aquifer.

11. Water travels through the dissolved openings of the Edwards Aquifer very quickly compared to flow in a porous media aquifer. Dye trace studies have measured water travel rates through the Edwards Aquifer as high as thousands of feet per day.[1]Furthermore, water flowing through the aquifer receives little to no filtration to restrain pollutants as they move through this aquifer. Pollution from highway construction and operation, as well as from businesses and subdivisions that rely upon available highway transportation, flows into local streams and moves from there into recharge features of the Edwards Aquifer, and into the drinking water supply for the City of San Antonio.

12. Karst features are present in the vicinity of the proposed project. The geological assessment included as part of the proposed project's Water Pollution Abatement Plan (WPAP) identified 36 features within the project area. These features included 14 caves, 3 solution cavities, 1 solution-enlarged fracture, 10 faults, 4 manmade features, and 6 non-karst depressions. Of these 36 features, 17 were classified as sensitive, based on Texas Commission on Environmental Quality criteria.[2]

13. Complex and unknown flow pathways within the Edwards Aquifer make it difficult to trace well contamination back to a specific source. Nevertheless there is convincing evidence that the San Antonio Edwards Aquifer has been contaminated by pollution from human sources similar to those that would be generated by construction and operation of the proposed

[1] Hauwert, Nico M., David A. Johns and Thomas J. Aley. *Preliminary Report on Groundwater Tracing Studies within the Barton Creek and Williamson Creek Watersheds*, Barton Springs/Edwards Aquifer. Barton Springs/Edwards Aquifer Conservation District and City of Austin Watershed Protection Department, 1998, Declaration of George Veni for No. Civ. SA-05-CA-1170-XR, December 13, 2005; and Deposition of Geary Schindle, page 25.

[2] Geologic Assessment Table included with the Supplemental Geologic Assessment Information sealed by Thomas Mathews October 6, 2010.

highway expansion.

14. A report by Paul Buszka[3] documents the presence of pollution in the San Antonio Edwards Aquifer based on data from 1976 to 1984. Many of the compounds detected are uniquely human in origin. Some of the pollutants detected, including herbicides, pesticides, and nutrients are not likely to have originated from point source discharges. They likely entered the aquifer from nonpoint sources, similar to pollution that originates from the roadway construction, operation, or indirect effects. Buszka concluded thatthe aquifer is most susceptible to contamination by pollutants that originate on the Edwards Aquifer Recharge Zone, where the proposed roadway project would be sited.

15. The proposed upgrade of U. S. Highway 281 at this interchange would cross four streams. The proposed upgrade of Loop 1604 at this interchange would cross nine streams. Construction would include additions to existing bridges at two of the stream crossings: Panther Creek and Mud Creek.

16. The proposed highway interchange project would drain into Panther Springs Creek and three of its unnamed tributaries; West Elm Creek and one of its tributaries; Mud Creek; and two unnamed tributaries to Lorence Creek. All of these tributaries are within the watershed of Salado Creek. The watershed of Salado Creek supplies about 10% of the total San Antonio Edwards Aquifer recharge.[4]

Failure to Accurately Characterize the Project's Direct Impacts on Water Resources

17. The Categorical Exclusion states that *"None of the streams crossing the proposed project have regularly flowing water or offer riparian habitat"*[5]Most of the streams over the outcrop

[3] Buszka, Paul. *Relation of Water Chemistry of the Edwards Aquifer to Hydrogeology and Land use, San Antonio Region, Texas,* U. S. Geological Survey Water-Resources Investigations Report 87-4116, 1987.
[4] Environmental Assessment, May 2007, p. 113.
[5] Categorical Exclusion, p. 10.

of Edwards Formation limestone transmit significant quantities of flow to the subsurface and are, therefore, dry for much or most of the year, depending on local weather. Furthermore, at least several of the streams in the vicinity of the proposed project are located within residential subdivisions. The lack of regularly flowing water, and their location within residential subdivisions does not, however, preclude their importance as riparian habitat. On the contrary, urban stream corridors exactly like those in the vicinity of the project are significant habitat for both aquatic and terrestrial species. The effect of the proposed project on the riparian habitat must be evaluated, and not summarily dismissed based on a false premise of the absence of such a resource.

18. The Categorical Exclusion states: *"The 19.8 acres represents approximately .003 percent of the 768,925 acre recharge zone of the San Antonio Segment of the Edwards Aquifer. This .003 percent increase in impervious cover is negligible when considering the size and extent of the recharge zone."*[6]No individual project is likely to add enough impervious cover to represent a significant percentage of the entire area of the recharge zone. Furthermore, impervious cover as a percentage of total recharge area is not the basis of any regulatory assessment of a project. Presenting the impervious cover as a fraction of the total recharge area falsely discounts the potential impact of the project on local surface water, aquifer, and drinking water supplies.

19. The WPAP describes 15.4[7] acres of grade level impervious cover and an additional 10.7 acres of elevated impervious cover for a total of 26.1[8] acres of impervious cover resulting from the proposed project. The Categorical Exclusion states, however, that the project would add 19.8 acres of impervious cover to the project area. Impervious area is a simple measure.

[6]Categorical Exclusion, p. 36.
[7] WPAP Permanent Stormwater Control Section, p. 2.
[8] WPAP Appendix B Load Calculations.

It provides a fundamental basis for assessing the long-term water quality and quantity consequences of a proposed development. Impervious area is used by TCEQ as a basis for design of permanent storm runoff treatment systems. By failing to accurately present the proposed impervious area by a factor of 25%, the Categorical Exclusion undermines a fundamental basis for its conclusion of no significant environmental impacts.

20. The 26.1 acres of impervious area proposed by the project is the equivalent area of approximately 140 single family residences or 280,000 square feet of commercial development with associated parking. Either of these equivalent levels of impervious development would have potentially significant consequences, in terms of water quality degradation. Furthermore, the equivalent impervious area for highway development is potentially more damaging to water quality. Highway runoff pollutant loads are among the highest source loads. Highways also present a more significant threat for damage from accidents and associated materials spills. The Categorical Exclusion fails to properly characterize this potentially significant environmental consequence.

21. The Categorical Exclusion states that the proposed project *"would not entail major earthwork"*.[9] The Categorical Exclusion fails to quantify the anticipated volume of earthwork for the proposed project, even though these cut-and-fill calculations are an ordinary part of preliminary roadwork project design. Furthermore, whether the project entails "major" volumes of cut-and-fill is not as significant to assessing the potential for erosion and sediment pollution of downstream waterways as is the area of clearing and vegetation removal. These cleared areas are a primary source of significant impacts to downstream waterways. By discussing the lack of major earthwork, by not quantifying "major," and by failing to describe and quantify areas that would be cleared, the Categorical Exclusion is

[9] Categorical Exclusion, p. 37.

misleading and fails to provide pertinent information necessary to assess whether significant environmental consequences to water quality are likely from the proposed project.

22. The Categorical Exclusion states: *"The project does not cross any public water supply reservoirs."*[10] San Antonio relies on the Edwards Aquifer for its public drinking water supply and does not, therefore, have any surface water reservoirs. The San Antonio Edwards Aquifer is itself the reservoir for this significant drinking water supply. This Categorical Exclusion statement is misleading as to the potential impacts of the proposed project to a public water supply reserves.

23. The Categorical Exclusion presents significant conclusions relevant to the risk of water quality degradation without substantiation: *"Effects to water quality, if any, are expected to be temporary and minor."*[11] The Categorical Exclusion fails to quantify the mass of pollutants expected from the proposed project. Methods to calculate pollution loads are widely used by several entities, including those with jurisdiction over some or all of the Edwards Aquifer. These entities include the Texas Commission on Environmental Quality (TCEQ), the Lower Colorado River Authority, the City of Austin, and the University of Texas Center for Research in Water Resources. Despite the widespread availability of scientifically-based methods, the Categorical Exclusion fails to estimate direct, indirect, and cumulative pollution loads associated with the proposed highway expansion. By characterizing the potential pollution effect as "minor" rather than providing readily available estimates of the actual pollution that would be generated by the project, the Categorical Exclusion fails to adequately characterize potentially significant water quality impacts of the proposed project.

[10] Categorical Exclusion, p. 37.
[11] Categorical Exclusion, p. 37.

24. Determining whether amounts of recharge are "minor" requires information derived from a dye trace study regarding the volume of recharge and the vulnerability of local wells to pollution entering features in the project area. A conclusive determination of the risk of karst features to water quality must be based on dye trace studies specific to such features. The Categorical Exclusion offers no information regarding either of these factors. Absent such a basis, the Categorical Exclusion statement that the "*effects to water quality, if any, are expected to be temporary and minor"* is unfounded and biased.

25. The Categorical Exclusion fails to identify the range of pollutants that would be generated by the proposed project. These pollutants include toxic and carcinogenic chemicals such as lead, zinc, cadmium, chromium, nickel, manganese, bromide, cyanide, polychlorinated biphenyls, nitrogen, phosphorous, pesticides, asbestos, and petroleum-based organic chemicals. [12]

26. Although TCEQ Edwards Aquifer Rules require storm runoff treatment, the regulations fail to require complete removal of pollution from storm runoff. Up to 20% increase in pollution from a site is allowed under TCEQ Edwards Rules. The Categorical Exclusion fails to either mention or quantify the environmental consequences from the allowed 20% pollution increase.

27. TCEQ Edwards Rules only require removal of total suspended solids, even though this parameter fails to represent the range of pollutants from highway runoff. While many pollutants in highway and construction runoff are associated with the sediment portion, there are significant environmental consequences from pollutants that are not. Exhibit B illustrates a construction site with a fuel leak that bypassed storm runoff treatment systems by floating on the surface and migrating into an apparent Edwards Aquifer recharge feature. The

[12] Young, Kenneth, Stuart Stein, Pamela Cole, Traci Kammer, Frank Graziano, Fred Bank. *Evaluation and Management of Highway Runoff Water Quality*. Federal Highway Administration, Report No. FHWA-PD-96-032, December 1995.

Categorical Exclusion fails to discuss this aspect of potentially significant environmental consequences from the proposed project.

28. The Categorical Exclusion presents significant conclusions relevant to the risk of altering the floodplain without substantiation: *"The highway facility would permit the conveyance of a 100-year flood, inundation of the roadway being acceptable, without causing significant impacts to the roadway or floodplains upstream or downstream."*[13] The Categorical Exclusion presents no information that quantifies potential flood plain impacts or criteria that would serve as a basis to qualify an impact as being "significant."

29. The effect of development on stream flow hydrographs is a well-known and accepted basis for the civil engineering design of storm water runoff conveyance systems. When soil within a contributing watershed is paved, runoff from the paved area is rapid; soil storage and base flow are depleted. Over the recharge zone of the Edwards Aquifer these changes in the stream flow hydrograph have an additional consequence of decreasing the volume of recharge to the Edwards Aquifer.[14] The Categorical Exclusion fails to discuss or quantifythese decreases that would result from the proposed project. The Categorical Exclusion also fails to describe or quantify aquifer recharge that would be lost by the proposed sealing of the two known sensitive karst features on the project site.Nor does it estimate recharge losses from increased impervious cover on adjacent land that would respond to the availability of additional transportation by accommodating more dense residential and commercial construction. The Categorical Exclusion also does not evaluate whether any nearby wells in the unconfined zone of the Edwards Aquifer would be disproportionately affected by diminishing local recharge.

[13] Categorical Exclusion, p. 38.
[14] Barrett, Michael, Ann Quenzer, and David Maidment. *Water Quality and Quantity Inputs for the Urban Creeks Future Needs Assessment.* University of Texas at Austin Center for Research in Water Resources, January 1998.

30. The pollution reduction requirements of Texas Administrative Code Title 30 Part 1 Chapter 213 are limited to total suspended sediment generated on-site by the proposed development. The addition of 15.4 acres of impervious area built on the ground for the proposed highway expansion, however, would also increase the volume of storm water runoff from the site and downstream erosion. Suspended sediment from ongoing stream bank erosion attributable to added impervious cover is generally greater than the sediment generated by the completed project. Nevertheless, the Categorical Exclusion fails to mention or account for this pollution load.

31. The Categorical Exclusion presents no description of the proposed construction-phase pollution controls. Instead it makes general statements like *"The project would use TCEQ-approved erosion (temporary vegetation) and sedimentation (silt fences and rock berms) controls during construction to minimize temporary impacts."*[15] The Categorical Exclusion relies on this broad language without, however, consideration of the historical implementation efficacy of these best management practices (BMPs).

32. I am familiar with numerous construction sites regulated by Texas Administrative Code Title 30 Part 1 Chapter 213(regulations identicalto those that would apply to the proposed project) where there was significant construction-phase discharge of pollutants. For example:

    - I investigated the construction site for the Lowe's home supply center on Brodie Lane, Austin, Texas within the Edwards Aquifer Recharge Zone and subject to 30 TAC Chapter 213 requirements. Exhibit B contains my photographs from July 1, 2004 following a relatively normal rainfall of 1.35 inches. These photographs show a failed silt fence, water flowing onto exposed Edwards Limestone rock, and a storage tank that leaked fuel outside of the containment structure and into the rock

[15] Categorical Exclusion, p. 37

construction entrance and within the storm water flow area.

- Exhibit C shows my photograph of failed construction-phase erosion/ sedimentation controls at a project called the Shops at the Galleria within the Edwards Aquifer contributing zone and subject to 30 TAC Chapter 213 requirements. During a site visit on October 14, 2004, I found that required sediment ponds were inadequately sized, revegetation had not begun on areas where construction was completed, a required sediment pond, based on construction plans, had never been constructed, and silt fence was improperly installed and breached.
- Exhibit D shows dried sediment in a streambed downstream from the Advanced Micro Devices construction site, which was subject to 30 TAC Chapter 213 requirements. I had inspected this drainage prior to this storm runoff event and it was clean. The source of the observed sediment in the creek is the AMD construction site.

Based on my experience inspecting similar construction sites, these examples are typical, rather than unusual. Despite legal language to the contrary, application of TCEQ Edwards Aquifer Rules has not prevented the pollution of surface water during site construction in the past; and there is no evidence that it would be more effective on the proposed highway construction site. Reliance on these rules alone, without a description of specific control mechanisms or any assessment of their effectiveness, significantly underestimates the environmental degradation potential of the proposed highway construction.

33. The Categorical Exclusion states that the proposed highway expansion would cross nine streams or tributaries. Pollution from roadway construction across streams is particularly difficult to control. Confined space within the right-of-way combines with relatively large runoff events to make it difficult to construct effective sediment control basins. By failing to

describe these crossings in terms of their area, length of slope, and grade, the Categorical Exclusion fails to characterize significant construction-phase pollution potential. In the absence of temporary slope stabilization or sediment basins, the proposed silt fence and rock berms would certainly fail at these crossings during rain events that occur frequently in Central Texas.

Limitations and Failuresof the Project Water Pollution Abatement Plan

34. The Categorical Exclusion makes several references to the preparation and approval of the proposed project'sWater Pollution Abatement Plan, developed in accordance with Edwards Aquifer Rules as a safeguard against project impacts.[16] For example: "*A water pollution abatement plan would be prepared for the proposed project; therefore, engineered features for water quality improvement would be in place to offset any potential increase in roadway total suspended solids in runoff from added impervious cover. No impacts to surface water quality adversely affecting Edwards Aquifer recharge would be anticipated from roadway runoff.*" These statements are false in that they overstate the impact of complying with Edwards Aquifer Rules. The permanent water quality controls presented in the Water Pollution Abatement Plan are designed to removed only 80% of the increase in TSS produced due to the additional impervious cover proposed by the project. Twenty percent of the increased load is still allowed to leave the site, not to mention pollutants not covered by this regulation (petroleum products, nutrients, metals, pesticides, etc.). Further, the Water Pollution Abatement Plan submitted for this project which received approval by the TCEQ on December 7, 2010 has numerous deficiencies which keep it from fully implementing the limited safeguards outlined by the Edwards Aquifer Rules. The deficiencies of the WPAP are outlined below:

[16] Categorical Exclusion, pp. 42, 61, 62, 92.

- My review of the Water Pollution Abatement Plan (WPAP) for a portion of the proposed highway expansion indicates that the temporary construction-phase controls for the proposed roadway expansion are minimal, even though the WPAP anticipates that 100% of the existing vegetated right-of-way would be disturbed by construction activities. The WPAP proposes only silt fence and rock berms for sediment control. Based on research funded by the Texas Department of Transportation, both field and laboratory measurements indicate that silt fences and rock berms are not effective to contain sediment. More effective measures are temporary slope stabilization and sediment basins. The WPAP, however, proposes neither of these measures. But the Categorical Exclusion makes no mention of the potential failure of these minimal erosion control measures.
- There is very little supporting information regarding the design of the temporary BMPs. Though it is stated that the temporary BMPs were designed to accept the total flow and meet TCEQ guidelines, there is no information to support the claim that these guidelines were actually satisfied and temporary BMPs would function to protect the aquifer.
- Items 23 and 25 of the WPAP application ask the applicant to describe the area to be disturbed and revegetated. In response the applicant states that it is *"difficult to accurately predict"* what areas would be disturbed.[17] It should not be difficult to predict this and it is important the area disturbed be clearly defined and be kept to a minimum to limit erosion and waterway pollution.
- The sequence of construction does not give estimates for the length of time each area would be open and subject to erosion. The sequence of construction also breaks the

[17] WPAP application, p. 6.

project down into many parts but does not indicate whether these parts would be implemented sequentially or simultaneously. The total area vulnerable to erosion at any given time is an important factor in assessing the potential threat of construction phase contamination to the aquifer.

- The geologic assessment gives no estimate of soil hydraulic conductivity. The geologist states that because the site has been disturbed previously and is a mixture of different soils, there is no published value for the hydraulic conductivity. However, 30 TAC §213.5(b)(3)(E) requires a *"narrative description of soil units, a soil profile, and hydrologic characteristics"*. If there is no published value for the conductivity, testing must be done of the project area soils in order to meet this requirement.
- In the WPAP application, the increased ten-year flows at 11 of the 13 stream crossings on the site are reported. These flows were reportedly calculated using the Rational Method, however, not enough information is given regarding the application of this method to be able to verify their assumptions and validate the results.
- Permanent Stormwater Section Item 13 of the proposed project's WPAP mentions erosive velocities in some locations of the project area, but gives no information as to where those locations are, or what the flow in those locations are, as a basis for validating the effectiveness of proposed reinforcement. Erosive flow in receiving streams is a significant pollution source that is not accounted for in TCEQ regulations.
- In the Permanent Stormwater Section of the WPAP, the applicant discusses hazardous material traps included in the project. This discussion states that some spills would be intercepted by the AquaLogic systems and thus be contained prior to removal, but

others would be released into creeks in the project area and would require boom and vacuuming to remediate. There is no description, however, of areas that would be intercepted by AquaLogic systems or the likelihood of spill discharges bypassing interception. Given that spilled waste reaching the creek would have a potentially significant damaging impact on the aquifer, it is necessary to know the likelihood of this outcome to assess the overall project impact.

- The applicant has not submitted *Attachment E - Request to Seal Features*, or this attachment is unlabeled, misplaced and does not include the items listed in the Permanent Stormwater Section Item 9. What follows below Item 9 is a description of all sensitive features including the two features to be sealed, but it does not describe why no *"reasonable and practicable"* alternative exists to sealing these two features.
- Permanent Stormwater Section Item 13 asks the applicant to describe measures that would be used to minimize *"changes in the way in which water enters a stream as a result of the construction and development"*. In response the applicant states that the *"existing 10-yr flow for the culverts will not be increased."* However, in the WPAP application form, the applicant described increases in the ten-year flow to 11 of the 13 crossings in the project, as determined using the Rational Method.
- On December 14, 2005 construction activities similar to those proposed in the Categorical Exclusion (construction associated with clearing a right-of-way along Highway 281) broke a sewer line near the intersection of Evans Road and Highway 281. The sewer break was not completely repaired until about January 10, 2006 and resulted in the release of an estimated 5,200 gallons of raw sewage to the Edwards Aquifer Recharge Zone. Nevertheless, the WPAP spill response action states only

that no spills are anticipated and the contractor would be responsible for containment, cleanup and disposal. The Categorical Exclusion fails to present the potential for this significant environmental consequence.

- Permanent Stormwater Section Item 7 in the WPAP describes the AquaLogic Systems as providing over 10,000 gallons of storage capacity to contain potential hazardous spills. In Item 8 of the same section, the AquaLogic systems are described as having a 179,000 gallon capacity, almost 18 times the capacity stated earlier. Assessing potential risk of aquifer contamination from the proposed project requires the storage capacity of these units to be accurately and consistently reported.
- In the maintenance section of the WPAP, inspections of roadways and roadsides are scheduled to occur "*on a regular basis, most of which are visited on a weekly basis.*" It does not describe which systems would be visited on a weekly basis and what the frequency of inspection would be for the remaining areas. Additionally, problem areas noted during these inspections (areas with absence of vegetation, accumulation of brush or sediment or significant erosion) would be scheduled for repair on a *"priority basis"*. Given that this maintenance is critical to the continued functioning of these BMPs and thus protection of the aquifer, specific inspection schedules and maximum length of time between noting and repairing various problems must be included in the maintenance plan to achieve a reliable level of environmental protection.

Failure to Accurately Characterize the Project's Indirect Impacts on Water Resources

35. The Indirect Impact Analysis Section of the Categorical Exclusion states: *"the proposed*

project has the potential to influence the location, timing, and intensity of development within the indirect effects study area."[18] It goes on to state that *"The segments of Salado Creek within or downstream of the RSA are not considered impaired; however, could be affected by future increases in impervious cover in currently undeveloped areas of the RSA"* and *"that impairment of surface water quality can be prevented if impervious cover is limited to 15%, in general."* If future development might be intensified due to the project, thus producing higher impervious cover, and degradation in water quality is correlated to increased impervious cover, the conclusion that the project's cumulative impacts on the Edwards Aquifer *"would not be considered substantial"*[19] is incorrect.

36. The Indirect Impact Analysis Section of the Categorical Exclusion states:*"Because construction projects in the Edwards Aquifer Recharge Zone would be subject to the Edwards Aquifer Rules, TPDES, and the City of San Antonio Ordinance #81491, this threat [degradation of water quality within the Edwards Aquifer] would be minimized and abated"* and *"Because construction projects in the Edwards Aquifer Recharge Zone within the indirect effects study area would be subject to the Edwards Aquifer Rules and TPDES, the release of any potential contaminants from the project site would result in insignificant effects."*[20] Each of the regulatory frameworks listed in the Categorical Exclusion has significant limitations in its ability to protect aquifer quality and limit environmental damage. These limitations include:

- TCEQ Edwards Aquifer Rules which:
    - Do not limit impervious cover, a factor that must be limited to achieve no

[18] Categorical Exclusion, p. 68.
[19] Categorical Exclusion, p. 93.
[20] Categorical Exclusion, p. 69.

water quality impact.[21]

- Only limit release of total suspended solids. The rules do not regulate other pollutants effecting water quality such as metals, nutrients and pesticides among others. Nor does it regulate the hydraulic impacts of development which can increase pollution generated offsite, and effect recharge to the aquifer.
- Do not prevent the release of increased total suspended solids. It requires only that 80% of the increased load from a project be removed, allowing the remaining 20% to flow offsite.
- Even were the TCEQ Edwards Rules adequate to eliminate significant water quality degradation from the proposed project, the level of enforcement and on-going inspection to maintain the controls significantly limits their effectiveness.

- Texas Pollution Discharge Elimination System: only relates to construction phase pollution. As sited in Point 30 above, there is ample evidence that construction sites complying with these regulations still release pollution into the aquifer.
- City of San Antonio Ordinance #81491: This ordinance does not apply to development designated as "Category 1" (development that was initiated before the effective date of the ordinance). As is evidenced by this statement: *"In an update by San Antonio Water System on January 14, 1998, the Water System noted that from January 23, 1995, to the end of 1997, 29.25 percent (23,958 acres) of development within the recharge zone was redesignated from Category*

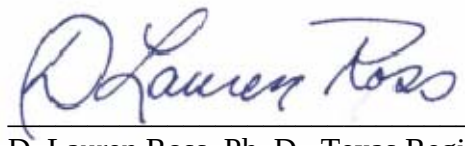
[21] Schueler, Thomas, The Importance of Imiperviousness in *The Practice of Watershed Protection*, Thomas Schueler and Heather Holland, Editors, Center for Watershed Protection, 2000.

2 or 3 to Category 1"[22], areas required to comply with this ordinance, and therefore its effectiveness to prevent environmental damage and preserve water quality, are significantly limited.

37. This declaration presents my opinions based on my review to date. I may perform additional investigations and supplement this declaration.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated this 17th Day of December 2010.



D. Lauren Ross, Ph. D., Texas Registered Profession Engineer No. 56647

17 December 2010

[22] Categorical Exclusion, p. 84.

Exhibit A

Resume for D. Lauren Ross, Ph. D., P. E.

Dr. Lauren Ross is an environmental engineer and owner of Glenrose Engineering, Inc. in Austin, Texas. Her areas of expertise include water quality protection and engineering design, groundwater transport, solid waste management and disposal, and environmental monitoring. Her clients represent a diverse community of developers, businesses, industrial manufacturers, governments, lawyers, state regulatory agencies, universities, environmental and community organizations and private individuals.

Education

Ph. D. Civil Engineering, University of Texas at Austin; 1993.
M. S. Civil Engineering, Colorado State University, Fort Collins, Colorado; 1982.
B. S. Civil Engineering, University of Texas at Austin; 1977, ***magna cum laude***

Registration and Certification

Registered Professional Engineer: State of Texas
OSHA 40-hour Hazardous Waste Health and Safety Training

Relevant Experience

- **Water Quality Protection**
- **Groundwater and Soil Pollution Transport**
- **Solid and Hazardous Waste Management and Disposal**
- **Statistical and Risk Analysis**
- **Environmental Monitoring**
- **Litigation**

Environmental Assessment

- Baseline and impact assessment for wastewater line remediation project including evaluation of soils, geology, topography, and flow regimes.
- Environmental Assessment evaluation for a proposed project to convert an inactive crude oil pipeline, largely constructed in 1950, into active service as a high-pressure fuel transmission line. Work included: evaluating historical spill records; calculating statistical failure probabilities for different pipeline reaches and spill sizes; predicting time and concentrations of toxic and carcinogenic constituent migration through and discharge from a karst limestone aquifer; and evaluating the Operational Reliability Assessment performed for the pipeline.

Water Quality and

- Gravity-flow retention and re-irrigation water pollution control system for a large hospital complex within the contributing watershed of the karst Barton Springs Aquifer.

Engineering Design

- Design of an innovative bioretention water quality control system for a municipal complex located on the Barton Springs Edwards Aquifer Recharge Zone and permitting under Texas Commission on Environmental Quality Edwards Aquifer protection rules.
- Design of an innovative pervious pavement storm runoff detention and treatment system for a proposed parking lot to be located on the Northern Edwards Aquifer Recharge Zone and permitting under stringent City of Austin and Texas Commission on Environmental Quality water quality protection rules.

Exhibit A

Resume for D. Lauren Ross, Ph. D., P. E.

Wet pond design and detention basin retrofit to treat storm water from existing residential and commercial development in the Oak Springs neighborhood in East Austin.

Combined wet pond and bioretention design for commercial storm runoff.

Combined wet pond and retention/irrigation design for an existing 162-acre residential development over the sensitive Barton Springs recharge zone in the City of Austin, Texas.

Municipal engineer responsible for all water quality design, review, inspection, rules, and ordinances for the City of Sunset Valley, Texas since 1994.

Flood Control and Water Quality

- Analyzed nonpoint pollution sources and structural and non-structural retrofit controls for recharge and contributing zone of a sensitive karst aquifer.
- Analyzed nonpoint pollution sources and structural and non-structural retrofit controls as water quality engineer for the City of Sunset Valley, Texas.
- Technical consultant to the City of Austin on implementation of the 1991 Comprehensive Watersheds Ordinance and associated water quality monitoring system.
- Analyzed storm water conveyance and flooding potential, designed regional detention basin to protect natural ecological systems for Armand Bayou Master Drainage Study.
- Estimated long-term groundwater yields based on rainfall rates, soil type, and river losses for Chisumbanje region of Zimbabwe, Africa.
- Evaluated land use, soils, agricultural and silvicultural practices to assess non-point pollution potential in the San Jacinto River Basin.
- Designed storm water drainage for subdivisions and regional water detention facilities.

Ground Water

- Groundwater contamination study, waste evaluation, sampling, and analysis for petroleum refinery.
- Closed landfill study: field investigation, compiled and reviewed historical records, assessed potential environmental consequences, installed, sampled, and evaluated data from monitoring wells.
- Conducted geologic assessment, designed and installed groundwater monitoring well system for municipal landfills.
- Designed a system to limit methane and leached organic chemical migration from a closed municipal landfill into a karst limestone sole-source drinking water aquifer.

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Resume for D. Lauren Ross, Ph. D., P. E.

- Developed groundwater management alternatives to limit withdrawal and related land subsidence.

Solid Waste

- Investigated waste metal migration in soil for petroleum land treatment unit.
- Investigated geologic setting and groundwater contamination and designed recovery well system for groundwater remediation at a commercial RCRA waste storage impoundment.
- Designed petroleum waste land treatment units: baseline soil and groundwater characterization; monitor well system design and installation; lysimeter systems; and land treatment demonstrations to determine maximum waste capacity and loading rates.
- Developed sampling procedures and in-place treatment for RCRA waste at electrical generation power plants.
- Managed and prepared technical phases of Industrial Solid Waste Permit Applications under RCRA and Texas Natural Resource Conservation Commission regulations for waste management facilities: land treatment units, surface impoundments, container storage areas.
- Designed closure plans for RCRA waste impoundments to store, treat and dispose of inorganic acids, spent pickle liquor, and organic chemicals.

Litigation

- Groundwater contamination investigation for drinking water supply contaminated by sulfide gas migration in the annulus of a poorly cemented exploratory petroleum boring.
- Groundwater contamination investigation of brine contamination from review of well logs, oil production salt-water disposal practices, and local geologic data.
- Technical evaluation of a proposed salt dome cavern placement and deep well injection of hazardous waste.
- Technical support for municipal ordinance regulating development to limit non-point source pollution of streams, springs, and karst limestone aquifer.

Teaching

- Semester Course in Statistics for Environmental Monitoring; University of Texas at Austin; Fall 1995.
- Land Development Seminar; Travis County Bar Association, 12 July 1996.
- Water Quality Protection Programs to Reduce Nonpoint Source Pollution, a presentation to the Barton Springs/Edwards Aquifer Conservation District's Watershed Management: Challenges and Innovations--A Nonpoint Source Pollution Conference, 25 July 1996.

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Resume for D. Lauren Ross, Ph. D., P. E.

- Presenter at Emerging Issues in Groundwater Regulation panel discussion, Key Environmental Issues in U.S. EPA Region VI conference, hosted by U.S. EPA and the American Bar Association, May 12-13, 1997.
- Short Courses in Statistics for Environmental Monitoring; University of Texas Continuing Engineering Studies Program: Spring 1995, Fall 1995, Spring 1996, Spring 1997, Spring 1998.
- Short Courses in Statistics for Environmental Monitoring; Louisiana Department of Environmental Quality. Focus on surface water sampling considerations, trend analysis and methods to assess the achievement of data quality objectives.

Statistics

- Evaluated surface and groundwater measurements for normality, differences in mean, spatial variability, and time series analysis. Techniques used include Student's t-test, Wilcoxon test, parametric and non-parametric ANOVA, Fourier series decomposition, Shapiro-Wilkes test, and Chi-squared tests.
- Geostatistical analysis and kriging of groundwater transmissivity data.
- Statisticallybased sampling design including optimum sample number, stratified random sampling, and assessment of monitoring parameters to achieve efficient sampling designs.

Field/ Laboratory

- Field supervision of auger drilling, rotary-bit drilling, well installation, shelby-tube core and split-spoon sampling, and soil type identification using the Unified Soils Classification System.
- Sampling of groundwater monitoring systems and hazardous wastes, including volatile organic constituents, dioxins, and other collection-sensitive parameters.
- Laboratory experiments to measure unsaturated hydraulic conductivity, water content versus soil water pressure, and other geophysical soil properties.

Reports and Publications

What Would You Drink if the Well Ran Dry? Nolan County Water and the Proposed Tenaska Coal-Fired Power Plant, for Lone Star Chapter of the Sierra Club, November 2010.

A Unique Water Quality Retrofit Project in Austin, Texas, with Scott Muchard, Rebecca Batchelder, and Tom Franke, StormCon; The North American Surface water Quality Conference & Exposition, August 5, 2010, San Antonio, Texas.

Engineering Analysis of Jeremiah Ventures L.P. Propose Wastewater Irrigation Areas, submitted to City of Austin, December 2009.

Pease Park Water Quality and Stream Restoration: Preliminary Engineering Report, with PBS&J, Inc, for City of Austin, August 2009.

Fort Branch Watershed Management Area Reaches 6 and 7; Final Environmental Assessment, for City of Austin, August 2009.

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Tannehill Branch Wastewater Line Environmental Assessment, for City of Austin, August 2009.

Water Quality and Quantity Impacts from Proposed South Texas Plant Expansion, submitted to Sustainable Energy and Economic Development (SEED) Coalition, April 2009.

City of Sunset Valley Environmental Monitoring Program: Air Quality, submitted to the City of Sunset Valley, Texas, November 2008.

Recommendations to Stabilize Construction at Ranches at Hamilton Pool, submitted to Brad Rockwell, attorney, October 2008.

Williamson Tributary 2 Water Quality Retrofit: Preliminary Design, prepared for the City of Austin, October 2008.

Twin Oaks Community: Conceptual Design for Tofu Wastewater Treatment, submitted to Twin Oaks Intentional Community, June 2008.

City of Sunset Valley Surface Water Quality Monitoring Program, for the City of Sunset Valley, Texas, June 2008.

Storm Sewer Retrofit Alternatives to Improve Water Quality in Fort Branch Creek Reaches 6 and 7, for City of Austin, December 2007.

Lundelius-McDaniel Water Quality Retrofit Project: Phase I Environmental Assessment for HDR Engineering, Inc., September 2007.

Effects of Four Corners Power Plant Coal Combustion Waste Disposal on Surface and Groundwater Quality, submitted to Lisa Evans, Earth Justice Attorney, August 2007.

Preliminary Review of the McCarty Road Landfill Proposed Major Permit Amendment, submitted to Monica Jacobs, Attorney, August 2007.

Surface Water and Sediment Sample Results Associated with the Walsh Cresson ranch and Walsh West Ranch, submitted to Mary Sahs, attorney, May 2007.

Biofiltration Water Quality Control Design Standards, submitted to the City of Sunset Valley, Texas, 2007.

Review of Proposed XTO Energy, Inc. Centralized Landfarm Facility, Jack County, Texas, submitted to Robert Thompson, Ph.D., July 2006.

Carson Creek Watershed Flood Mitigation Project: Impacts on Erosion and Water Quality, submitted to PBS&J, Inc, December 2005.

Water, Mud, Mold, and More: Toxic Chemicals and Staying Safe When Returning to Coastal Louisiana, Common Ground Relief, December 2005.

West Lamar Wastewater Replacement Line: Phase I Environmental Assessment, prepared for City of Austin, December 2005.

Lundelius-McDaniels Water Quality Retrofit Project Preliminary Engineering Report, submitted to City of Austin with HDR Engineering, Inc., October 2005.

Surface Water and Sediment Sample Results Associated with the Diamond Shamrock Three Rivers Refinery Wastewater Irrigation Fields, submitted to: Ms. Mary Sahs, attorney, September 2005.

Diamond Shamrock Three Rivers Refinery Wastewater Irrigation Water Balance submitted to: Ms. Mary Sahs, attorney, June 2005.

Intrawell Comparisons for Arsenic and Benzene Concentration Measurements in Maxwell Landfill Monitoring Well 4. Submitted to: Robert S. Kier Consulting, Inc., June 2005.

Groundwater Sampling Protocols: Ruby Ranch Subdivision. Submitted to Neighbors Organized in Defense of the Environment. May 2005.

Oak Springs Detention Pond Retrofit for Water Quality, for the City of Austin, February 2005.

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TR-20 Computer Simulations to Determine Runoff Detention Stage/Storage/Discharge Relationships Meeting Specified Erosion Control Criteria for City of Austin, January 2005.

Potential for Surface and Groundwater Contamination at the Waste Management of Texas, Inc. Westside Landfill, submitted to Mary K. Sahs, attorney, September 2004.

Recommendations for Edwards Aquifer Authority Water Quality Regulations. Presented to the Edwards Aquifer Authority Water Quality Task Force in San Antonio, Texas, 17 February 2004.

Tanglewood Forest Regional Detention Pond: Phase I Environmental Assessment, prepared for City of Austin, October 2003.

Effects of Impervious Cover Limits to Improve Water Quality, submitted to City of Sunset Valley, January 2003.

EcoCreto ™ Pervious Pavement Water Quality & Flood Control Design. January 2003.

Sampling at the Alcoa Sandow Lignite Mine. For Neighbors for Neighbors, Inc. December 2002.

Preliminary Review of Northern Hays and Southwestern Travis Counties Water Supply System Project Environmental Impact Study; October 2001, 15 January 2002.

Water Quality Design Calculations Wells Branch Church of Christ Austin, Texas for EcoCreto, Inc. September 2001.

Product Pipeline Hazards over Karst Aquifers. American Society of Civil Engineering Environmental and Pipeline Engineering Convergence 2000. July 23 – 26, 2000, Kansas City, Missouri.

Review of the Environmental Assessment of the Proposed Longhorn Pipeline System. January 2000.

Comments on the Final Environmental Assessment of the proposed Longhorn Pipeline System. January 2001.

Water Fights: Citizens Struggle to Shape a City in Central Texas. 1999. From *Under the Blade: The Conversion of Agricultural Landscapes,* Westview Press, Boulder, Colorado.

Hydrogeologic Setting and Potential Contamination of Barton Springs from a Longhorn Pipeline Discharge. September 1998.

Watershed Protection Utility Master Plan: Integrated Solutions Regulatory Inventory. Prepared for the City of Austin. August 1998.

Watershed Protection Utility Master Plan: Integrated Solutions Regulatory Protocols. Prepared for the City of Austin. July 1998.

Statistical Analysis of Soil Samples for Quanex Land Treatment Unit. December 1997. Prepared Quanex Gulf States Tube Division.

A Scientific Basis for Edwards Aquifer Protection, prepared for the American Bar Association Conference: Key Environmental Issues in U.S.EPA Region VI, May 1997. P

Robert Mueller Municipal Airport Phase II Environmental Assessment Work Plan. April 1997. With Geomatrix, Inc., prepared for the City of Austin.

Water Quality Protection Programs to Reduce NPS Pollution. July 1996. Presented at Barton Springs/Edwards Aquifer Conservation District Conference: Watershed Management: Challenges and Innovations.

Water Quality Ordinance Amendments to the City of Sunset Valley Land Development Code. April 1996. Prepared for the City of Sunset Valley.

Soil and Water Quality Monitoring Plan for the City of Austin Municipal Golf Courses. January 1996. Prepared for the City of Austin.

D. C. Reed Estate Water Quality Protection Zone Monitoring Program. January 1996.

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Soil Monitoring Plan for Utility Trench Segment through SWMU 216. January 1996. Prepared for the City of Austin.

Waller Creek Flood Control Master Plan. December 1995. Prepared with Loomis and Associates for the City of Austin.

Barton Springs Water Protection Efforts Challenged. August/September 1995. *Nonpoint Source News-Notes,* published by U. S. EPA.

Statistical Methods for Environmental Monitoring. 5 to 7 April 1995. Lecture notes for Continuing Engineering Studies Short Course, University of Texas at Austin.

"Don't Mess with Texas" Litter Survey. April 1995. Prepared for GSD&M Associates, Inc. With Capitol Environmental Services.

*Long Term Viability of the Edwards Aquifer for the City of Sunset Valley Water Supply.*February, 1995. Report prepared for the City of Sunset Valley.

Character and Magnitude of Degradation in the *Barton Springs Zone.* December 1994. Report prepared for Loomis and Associates as part of the Barton Springs Zone Retrofit Project, Austin, Texas.

Report on Septic Systems in the *Barton Springs Zone.* December 1994. Report prepared for Loomis and Associates as part of the Barton Springs Zone Retrofit Project, Austin, Texas.

"Don't Mess with Texas" Litter Survey Work Plan. October 1994. Report prepared for GSD&M Associates, Inc. With Capitol Environmental Services.

Statistical Analyses to Establish Constituent Action Limits for Detection Monitoring: Industrial Waste Control Site, Sebastian County, Arkansas. June 1994. Prepared for IT Corporation.

Review of Environmental Information Document for Proposed Lacey Pig Operation. April 1994. Letter report prepared for Mr. Michael J. Hobbs.

Barton Creek and Barton Springs: Petition to Texas Natural Resource Conservation Commission for Designation as Outstanding National Resource Waters. April 1994. (with others).

Base Flow in Barton Creek and Statistical Analysis of Water Quality Data for Barton Creek and Barton Springs, Austin, Texas. March 1994.Report prepared for Loomis, Santos and Associates.

Statistical Analysis: Background Sampling Investigation at Bergstrom Air Force Base, Texas. January 1994. Prepared for Southwest Laboratories.

Multivariate Statistical Analysis of Environmental Monitoring Data. November 1993. Petroleum Hydrocarbons Conference sponsored by the National Ground Water Association and American Petroleum Institute, Houston, Texas.

An Environmentalist's Perspective on Pump-and-Treat Groundwater. 1993. In *Ground Water Monitoring and Remediation,* Vol. XIII, No. 4.

The Importance of the SOS Water Quality Ordinance to the Protection of the Barton Springs Segment of the Edwards Aquifer. September 1993. Prepared for the Texas Natural Resource Conservation Commission.

Statistical Analyses to Establish Constituent Action Limits for Detection Monitoring. June 1993. Report prepared for IT Corporation for IWC Site in Fort Smith, Arkansas.

Multivariate Statistics for Environmental Monitoring Data. May 1993. Doctoral Dissertation for the University of Texas at Austin.

Statistical Analyses to Establish Constituent Action Limits for Detection Monitoring. May 1993. Prepared for IT Corporation.

Statistical Analysis of Phase I and Phase II Background Soil Measurements. February 1993. Report prepared for Quanex Corporation.

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Sampling Recommendations to Detect Chromium Contamination in Soils. 16 August 1993.Letter report to Mr. Phil Bullock, Southwest Laboratories.

Recommendations for Sampling: West Dallas Lead Project. August 1992. Prepared for International Technology Corporation.

Implementation Strategy for the Pollution Reduction Standard of the SOS Water Quality Referendum. July 1992. Prepared for Save Our Springs Coalition (SOS).

Statistical Determination of Background Values for Groundwater Based on Student's T-Test, Tolerance Interval and Mann-Whitney Analysis. September 1991. Prepared for Quanex Corporation.

Phase I Environmental Site Assessment: Jollyville/360 Tract; 9401 Capitol of Texas Highway; Austin, Texas. June 1991. (with others).

Statistical Analysis: Koch East Plant Soil Samples. May 1991. (with others).

Soil Metal Evaluation Final Report. October 1990. Prepared for Chevron USA, Inc. (with others).

Review of Hydrogeology and Potential Contamination of Ramada Inn Site. September 1990. Report prepared for Capitol Environmental Services.

Malone Service Company Compliance Plan. October 1989. Prepared as part of a RCRA hazardous waste facility permit application.

Malone Service Company Geology Report. October 1989. Prepared as part of a RCRA hazardous waste facility permit application.

HST3D Groundwater Model to Predict Waste Migrations. November 1988.Report for Union Carbide Corporation.

Statistical Issues in Monitoring Groundwater Quality. Fall 1987. (with others). Prepared for Texas Water Commission.

Land Treatment of Sugar Cane/Ethanol Process Waste. May 1987. (with others).

Phase 1: Feasibility Study for the Development of Groundwater for Irrigation in the Chisumbanje Area. January 1987. Prepared for the Zimbabwe Regional Water Authority. (with others).

Morton Thiokol, Inc. RCRA Hazardous Facility Part B Permit Application. 1985. (with others).

Air Products Company RCRA Hazardous Facility Part B Permit Application. 1985. (with others).

Quanex Corporation: Gulf States Tube Division RCRA Hazardous Facility Part B Permit Application. 1985. (with others).

Union Carbide Corporation RCRA Hazardous Facility Part B Permit Application. 1985. (with others).

Koch Refining Company RCRA Hazardous Facility Part B Permit Application. 1984. (with others).

Evaluation of Proposed Waste Disposal in Salt Caverns in the Boling Dome. February 1985. Prepared for the County of Wharton, Texas. (with others).

Closure Plans for Two Cooling Tower Blow-Down Impoundments. 1984. Prepared for Houston Lighting and Power.

Landfills in the Vicinity of Austin, Texas. November 1984. Prepared for the City of Austin. (with others).

Maximizing the Statistical Performance of Groundwater Monitoring Systems. November 1984. Prepared for Petroleum Hydrocarbons and Organic Chemicals in Groundwater Conference, sponsored by the National Water Well Association.

Applicability of Student's t-test to Groundwater Monitoring. April 1984. American Geophysical Union Conference, Fort Collins, Colorado.

An Analytical Model to Predict Soil Water Profiles. June 1982. Master's Thesis, Colorado State University, Fort

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Collins, Colorado.

Groundwater Management Options for the Harris/Galveston Coastal Subsidence District. 1979. (with others).

Armand Bayou Master Drainage Study. August 1979. Espey Huston and Associates, Inc. (with others).

Non-Point Source Pollution Assessment for the San Jacinto Watershed. 1978. Espey Huston and Associates.

Exhibit B

Construction-Phase Control Failure: Lowe's Home Improvement Center, Austin, Texas
July 1, 2004

Silt fence failure following rain event.

Exhibit B

Construction-Phase Control Failure: Lowe's Home Improvement Center, Austin, Texas
July 1, 2004

Storm runoff from construction site entering subsurface without filtration.

Exhibit B

Construction-Phase Control Failure: Lowe's Home Improvement Center, Austin, Texas
July 1, 2004

Leaking fuel storage system.

Exhibit B

Construction-Phase Control Failure: Lowe's Home Improvement Center, Austin, Texas
July 1, 2004

Leaked fuel on the stabilized construction entrance rock.

Exhibit C

Construction-Phase Control Failure: Shops at the Galleria, Bee Caves Texas
February 25, 2004

Failed silt fence.

Exhibit D

Construction-Phase Control Failure: Shops at the Advanced Micro Devices, Austin, Texas
Photographs by Stefan Wray

Sediment in stream bed downstream from a construction site

Sediment in stream bed downstream from a construction site

Exhibit D

Construction-Phase Control Failure: Shops at the Advanced Micro Devices, Austin, Texas
Photographs by Stefan Wray

Sediment in stream bed downstream from a construction site