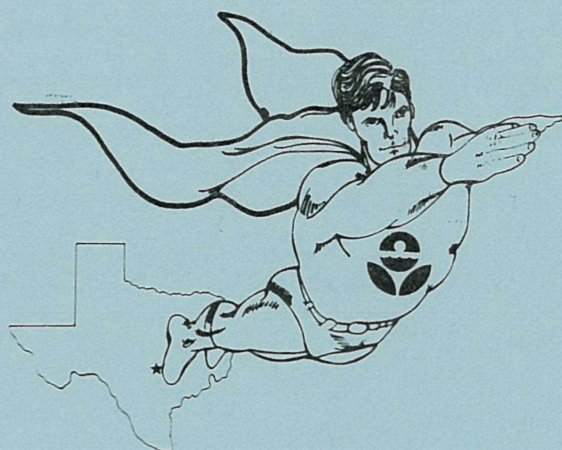
3rd Annual TEXAS ENVIRONMENTAL SUPERCONFERENCE



"SUPERPUND"

Thursday, August 1, 1991
and
Friday, August 2, 1991

Four Seasons Hotel
98 San Jacinto Blvd.
Austin, Texas

Third Annual

TEXAS ENVIRONMENTAL SUPERCONFERENCE

"Superpund"

THURSDAY, August 1, 1991

8:00 **Registration**

8:45 **Welcoming Remarks** - Jeff Civins
Kelly, Hart & Hallman

I. BASIC SCIENTIFIC, TECHNICAL AND LEGAL CONCEPTS IN ENVIRONMENTAL LAW

– "Finding a Happy Medium"
Moderator: Carol Batterton
Texas Water Commission

9:00 - 9:30 **Air Pollution** – "Errors of Emission"
Art Bedrosian
Principal Consulting Scientist
TRC Environmental Consultants, Inc.
Austin, Texas

9:30 - 10:00 **Water Pollution** – "Dishonorable Discharges"
Lial Tischler, PhD
Tischler/Kocurek
Round Rock, Texas

10:00 - 10:30 **Groundwater Contamination** – "Pump It Up"
Bob Chapin
Senior Program Director
Jones & Neuse, Inc.
Austin, Texas

10:30 - 10:45 **–BREAK–**

10:45 - 11:15 **Sampling and Analysis** – "Playing the Numbers"
Robert A. Saar, PhD
Vice President
Geraghty & Miller, Inc.
Albuquerque, New Mexico

11:15 - 12:00 **Basics of Administrative, Discovery and Evidentiary Law and the New TWC Procedural Rules** – "Hearing Aids"
John Vay
General Counsel
Texas Water Commission
Austin, Texas

12:00 - 1:30 **–LUNCHEON–**

II. SOLID & HAZARDOUS WASTE

Moderator: Al Axe
Brown Maroney & Oaks Hartline

1:30 - 2:10 **The Hazardous Waste Moratorium and Other Policy Issues** – "Burning Issues"
Jim Haley
Director, Legal Division
Texas Water Commission
Austin, Texas

2:10 - 2:40 **Waste Minimization and Recycling** – "Waste Watchers"
Priscilla Seymour
Unit Head - Waste Minimization Unit
Hazardous & Solid Waste Division
Texas Water Commission
Austin, Texas

2:40 - 3:00 **NORM** – "Nuclear Families"
Jack Hendrick
TN Technologies
Round Rock, Texas

3:00 - 3:30 **Risk Assessment Cleanup Levels** – "Risky Business"
Mark J. Stine
Closure Coordinator
Hazardous & Solid Waste Division
Texas Water Commission
Austin, Texas

3:30 - 3:45 **–BREAK–**

III. AIR

Moderator: Carla Reid
Simon EEI, Inc.

3:45 - 4:25 **TACB Implementation of the 1990 Clean Air Act** – "Southwest Air"
Herb Williams
Special Projects Coordinator
Texas Air Control Board
Austin, Texas

4:25 - 5:00 **Key Issues for Industry and the Public** – "Air Grievances"
David Graham
Dow Chemical Company-Texas Operations
Freeport, Texas

Jim Marston
The Environmental Defense Fund
Austin, Texas

5:00 - 5:15 **Questions & Answers**

5:15 **–RECEPTION– Cash Bar**

FRIDAY, August 2, 1991

IV. WATER QUALITY

Moderator: Jeff Civins
Kelly, Hart & Hallman

8:45 - 9:30 **Stormwater Regulations** – "Pulling in the Rains"
Susan Zachos
Kelly, Hart & Hallman
Austin, Texas

9:30 - 10:15 **Petroleum Storage Tanks Cleanups, PST Fund, and Financial Assurance** – "Tanks a Lot"
Dan McClellan
Principal/Sr. Scientist
EnecoTech
Austin, Texas

10:00 - 10:15 –BREAK–

V. POTPOURRI

10:15 - 11:00 **New Legislation** – "Pick Acts"
Lisa Anderson
Brown Maroney & Oaks Hartline
Austin, Texas

11:00 - 12:00 **Professional Malpractice and Ethical Considerations** –
"Deeds: The Good, the Bad & the Ugly"
Charles Jordan
Carrington, Coleman, Sloman & Blumenthal
Dallas, Texas

Davis Ford
Davis Ford & Associates
Austin, Texas

12:00 - 1:30 – LUNCHEON –

Moderator: Cindy Smiley
Jones, Day, Reavis & Pogue

1:30 - 2:00 **Community Right-to-Know** – "Let My People Know"
Joe Curtis
Director of Environmental Affairs
Baker Hughes, Inc.
Houston, Texas

2:00 - 2:30 **State Superfund** – "Hazardous Substance Abuse"
Steve Dickman
Legal Division
Texas Water Commission
Austin, Texas

2:30 - 3:00 **Insurance** – "A Matter of Policy"
Tom Alleman
Vial, Hamilton, Koch & Knox
Dallas, Texas

3:00 - 3:15 –BREAK–

3:15 - 5:00 **On the Firing Line - Q & A – "Without a Reg to Stand On"**

Moderator: Teresa Salamone
Geraghty & Miller

Harless Benthul
Regional Counsel
U.S. Environmental Protection Agency-Region VI

Bobbie Barker
Deputy Director
Texas Water Commission

Brian Berwick
Assistant Attorney General
State Attorney General

Jim Braddock
Director-Legal Division
Texas Air Control Board

Michelle McFaddin
Assistant Director, Legal Enforcement
Railroad Commission of Texas

Don Thurman
Associate Commissioner for Environmental & Consumer Health Protection
Texas Department of Health

I. BASIC SCIENTIFIC, TECHNICAL AND LEGAL CONCEPTS IN ENVIRONMENTAL LAW

Air Pollution - *"Errors of Emission"*

Basic Concepts in the Science of Air Pollution Control
Art Bedrosian
TRC Environmental Consultants, Inc.
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Water Pollution - *"Dishonorable Discharges"*

Lial Tischler, Ph.D.
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Basics of Hydrogeologic Investigations
Bob Chapin
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Sampling and Analysis - *"Playing the Numbers"*

Matrix Madness and Dilution of Surety: Coping with Laboratory Uncertainties
Robert A. Saar, Ph.D.
Geraghty & Miller, Inc.
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Basics of Administrative, Discovery and Evidentiary Law, and the New TWC Procedural Rules - *"Hearing Aids"*

John Vay
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BASIC CONCEPTS IN THE SCIENCE OF AIR POLLUTION CONTROL

Prepared for:

Third Annual
Texas Environmental Superconfernece

Prepared by:

Arthur V. Bedrosian
Principal Consulting Scientist

Thursday, August 1, 1991

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A TRC Company

BASIC CONCEPTS IN THE SCIENCE OF AIR POLLUTION CONTROL

by: Arthur V. Bedrosian
Principal Consulting Scientist
TRC Environmental Consultants, Inc.

Air pollution from naturally occurring causes, such as volcanic eruptions and fires, has been with us since the birth of our planet. Since the industrial revolution, mankind has actively sought ways to reduce industrial emissions; but only since the creation of the U.S. Environmental Protection Agency and the amendments to the Clean Air Act in 1970 has our awareness and knowledge of air pollution developed into the profession we have today. This paper will present to non-technical readers and newcomers to the field of air pollution an overview of some of the methods and techniques typically used by engineers and scientists in the many aspects of the air pollution profession. This paper will not try to present the myriad of local, state, and federal regulations which create the framework within which the technical professional operates. Frankly, as the legal implications of environmental regulations become increasingly more complex, regulatory interpretations are best left to the environmental attorney.

Nor is this paper intended to serve as an all inclusive primer or do-it-yourself manual for the technical aspects which abound. These areas are best left to the scientists and engineers who work with these matters daily. What this paper will do is briefly present readers with a general understanding of what constitutes a condition of "air pollution" as well as who causes the pollution, where is it most prevalent, and when is it most likely to occur. The paper will explore in more detail what is typically done to abate the air pollution condition when it is detected.

Most importantly, the paper will describe the methods of analysis or technical tools used by air pollution scientists and engineers to ascertain if problems exist, to determine the extent and magnitude of a problem, and to abate or solve the problem. The technical tools discussed will include mathematical dispersion modeling techniques, physical simulation of plume behavior, tracer studies, property line sampling, source sampling, continuous emissions monitoring, ambient air monitoring, and baseline studies. Also described will be the emission control analysis philosophies known as BACT, RACT, MACT, and LAER which are used to compare the overall effectiveness of various emission abatement alternatives. The paper will describe how and when the scientific analyses are then used to regulate pollution sources, to demonstrate compliance, and to prepare state and federal permit applications.

A CONDITION OF AIR POLLUTION

An appropriate, if not somewhat oversimplified, definition of air pollution is the presence in the atmosphere of unwanted material. The most basic air quality standards are the National Ambient Air Quality Standards (NAAQS) which were first established by the EPA and have subsequently been adopted by the states. The NAAQS (Table 1) are considered to be the cornerstone of the EPA's air quality compliance standards and include carbon monoxide, nitrogen dioxide, ozone, respirable particulate matter, sulfur dioxide, and lead. Later the EPA established the New Source Performance Standards (NSPS), the National Emissions Standards for Hazardous Air Pollutants (NESHAPS), and recently the list of 189 toxic pollutants. While the NAAQS were established to define a region's air quality "wellness", the NSPS were designed to be minimum performance standards for industrial process equipment. The NESHAPS established acceptable levels of emissions for hazardous air pollutants and have been absorbed into the list of 189 toxic compounds

TABLE 1
NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	PRIMARY STANDARD*		SECONDARY STANDARD**	
		ug/m^3	ppm	ug/m^3	ppm
Carbon Monoxide	8-Hour Average[1] 1-Hour Average[1]	10,000 40,000	9 35	Same[2] Same	
Lead	3-Month Average	1.5	--	Same	
Nitrogen Dioxide	Annual Average	100	0.05	Same	
Ozone	1-Hour Average[3]	235	0.12	Same	
Particulate Matter: PM10	Annual Arithmetic Mean[4] 24-Hour Average[3]	50 150	-- --	50 150	-- --
Sulfur Dioxide	Annual Average 24-Hour Average[1] 3-Hour Average[1]	80 365 --	0.03 0.14 --	-- -- 1300	-- -- 0.50

* Primary standards define levels of air quality which the U.S. Environmental Protection Agency's (EPA) Administrator judges necessary to protect the public health with an adequate margin of safety.

** Secondary standards define levels of air quality which the EPA Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

1 Not to be exceeded more than once per year.

2 Same as primary standard.

3 Not to be exceeded more than an average of once per year in three years.

4 This is an expected annual value (see 40CFR, Part 50, Appendix K).

which were an integral part (Title III) of the Federal Clean Air Act Amendments of 1990. The Prevention of Significant Deterioration (PSD) provisions include Class I,II, and III increments which can not be exceeded by new sources. All new sources or modifications must use atmospheric dispersion modeling to demonstrate compliance with these increments to prove that they will not be contributing to the deterioration of our nation's air quality.

Air pollution has been with us since the beginning of time, and in its naturally occurring forms will most assuredly be with us until the end of time. The most visible of these natural forms, volcanic eruptions and forest fires, have resulted in the introduction of countless tons of pollutants of all types into the atmosphere. Estimates indicate that a single strong volcanic eruption can throw into the atmosphere as much as 100 billion cubic yards of fine particles. These particulates and corresponding gases can rise as high as 70,000 feet into the atmosphere and take several years to return to earth. It is known that the 1883 eruption of Krakatoa in Java introduced so much fine particulate matter into the atmosphere that the eruption seriously interfered with the amount of solar energy reaching the surface of the earth. The effect was a change in our planet's heat budget which resulted in a general cooling. It took several years for the particles to settle; but by that time, a blanket of particulate was distributed over the entire planet.

Forest fires occur everyday all over the globe. The United States Forest Service reported that during the 10-year period covering 1954-1963 the United States experienced 1,200,000 fires which burned 6,000,000 acres of forests. The global number must be even more staggering. Each of these events results in the introduction of countless tons of particulate matter and gases into the atmosphere.

While these natural mechanisms exist, the unfortunate fact is that the major sources of pollutants are found in places where the greatest concentrations of people exist. Human activity including heating and cooking fires, agricultural operations, industrial operations, and transportation are among the most dominant mechanisms for the introduction of pollutants into the atmosphere. It would take a book to list all of the activities and industrial processes which emit pollutants into the atmosphere. History documents many man-made air pollution disasters which have been the result of accidental releases such as in Bopal, India or closer to home the 1976 ammonia tanker truck crash in Houston, Texas.

Air pollution can be even more insidious, however. Naturally occurring meteorological conditions, such as, periods of little or no wind when combined with temperature inversions can produce air stagnations or periods of time with poor atmospheric dispersion characteristics. These conditions tend to assist in the ground level buildup of pollutants which might be in the atmosphere. In 1930 in Belgium's highly industrialized Meuse Valley a naturally occurring meteorological temperature inversion resulted in a prolonged condition of atmospheric stagnation which trapped locally produced industrial pollutants and resulted in the deaths of sixty-three people. A similar smog condition occurred in Donora, Pennsylvania in 1948. During the five-day period many people became ill and required hospitalization. Twenty people died. The most tragic of these naturally occurring air pollution episodes had to be the dense smog in London, England in December, 1952. This five-day event is believed to have been either directly or indirectly responsible, for four thousand deaths.

The potential to emit pollutants exists for virtually every act of combustion, every chemical change, every transfer of particulate matter. People produce pollution. The more people, the more pollution. That is, unless people take the time to identify the polluting mechanisms and enact the steps to control or abate the pollution. This is where the air pollution professional comes in. The air pollution professional is by degree and practice a scientist or engineer. This typically includes (but is certainly not limited to) chemical, mechanical, environmental, and civil engineers as well as chemists, physicists, and meteorologists. While many environmental attorneys also have science or engineering degrees, they practice law and necessarily have a legal view of the technical issues. In most cases, both the legal and technical viewpoints are necessary. While the environmental attorney's first priority is to stay current with legal and regulatory matters, it is the air pollution professional's first priority to stay current with changes and developments in technical matters.

THE TECHNICAL TOOLS

Up to this point, we have discussed in very basic terms what air pollution is, where it is found, and what conditions cause it. What we will discuss now is how the air pollution professional knows that a condition of air pollution truly exists and how the magnitude of the problem is quantified.

These days most people are aware that in order to construct or operate a facility which emits or has the potential to emit pollutants into the atmosphere one must obtain pre-approval from appropriate regulatory authorities. Existing facilities are required at a minimum to self-monitor their operations by performing and submitting detailed emissions inventories and by complying with a complex set of federally enforceable environmental reporting requirements. The regulatory context of the established requirements might include permits, litigation support, or environmental baseline studies. Regardless of the reason technical data might be needed, the tools used by the air pollution professional typically fall into four main categories: mathematical computation, source sampling, atmospheric dispersion modeling, and ambient monitoring.

Mathematical Computation

In order to determine if the Prevention of Significant Deterioration (PSD) rules apply to a new source or modification, prepare a permit application, submit an emissions inventory, or prepare emissions data to support an attorney's legal position, one must be able to quantify the facility's expected emissions. The air pollution professional looks for representative emission factors which best describe the type of pollutants released by the facility. The most universally accepted source for emission factors is the U.S. Environmental Protection Agency's (EPA) "Compilation of Air Pollutant Emission Factors". This publication (better known as AP-42) covers virtually all industry types and the factors are respected and used by every pollution control agency in the country. Typically, the AP-42 emission factors tend to be conservative in nature. That is to say, if EPA had any doubts as to whether a particular process emission should be one value or a slightly higher value, EPA has chosen the higher value. Nonetheless, AP-42 is an excellent reference. Most regulatory agencies will also accept emission factors provided by equipment manufacturers with the stipulation that these factors are supported by substantiating test data.

Regulatory authorities work with a variety of facilities which emit pollutants into the atmosphere; and although they might not have formal publications which document emissions from different industries, the agencies often can be a helpful resource in directing the air pollution professional to people who have documented emission factors. For instance, while AP-42 has little or no information concerning emission factors from wastewater treatment facilities, EPA has several publications which provide factors speciated by compound for each step of the wastewater treatment process. They even have a PC based Lotus 1-2-3 spreadsheet which will do the necessary computations.

During the Texas Air Control Board's (TACB) recent emissions inventory workshop, the agency provided a workbook which provided guidance on how the upcoming emissions inventory would be performed. The workbook also provides guidance on some types of emission factors.

Source Sampling

The most direct way to determine facility emission rates is to base the calculations on actual sampled data. Source sampling is a general term for a wide variety of data collection techniques including, stack sampling, continuous emissions monitoring, and property line sampling. Stack sampling is just what the name implies: the determination of a stack's emission rate by direct measurement of the exhaust gas stream. Most regulatory agencies require stack sampling data be submitted by virtually all newly permitted sources in order to demonstrate compliance with the appropriate regulations. To assure accurate sampling results, the process operating conditions and throughput rates during sampling must be representative of the facility's maximum operating conditions.

Continuous emissions monitoring (CEM) is another way of determining a stack's actual emission rate. While the stack sampling techniques involve hands-on sampling, continuous emissions monitoring is performed by instrumentation which relies on sensors positioned in the subject stack. The instrumentation is routinely calibrated and data are collected on a continuous basis. Another difference is that while stack sampling methods require that time be allowed for laboratory analysis of the samples before results are known, CEM results are available on a real-time basis.

Property line sampling involves the collection of emissions data at a subject facility's property line as opposed to from the stack itself. Texas regulates the property line emissions of facilities as well as the stack emissions.

Other types of commonly used source sampling include the use of hand held volatile organics analyzers in order to quantify volatile organic compounds which typically leak from flanges and valves in petrochemical facilities. These monitored data are superior to emissions estimates derived through mathematical emissions factors. Often the emissions factors tend to be too conservative thereby resulting in higher expected emissions than actual sampling.

A technique known as grab sampling can be utilized to obtain samples at specific locations. The technique requires that a calibrated pump be used to inflate over a known period of time a bag made of some non-reactive material. A quantity of this known sample is then injected into a mass spectrometer/gas chromatograph for analysis. This technique is used for measuring and categorizing volatile organic compounds. A similar sampling technique utilizes a metal canister to collect gaseous emissions directly from stacks. These samples are then laboratory analyzed.

Atmospheric Dispersion Modeling

The mathematical computation and source sampling techniques discussed thus far are tools for characterizing and quantifying the emissions which a source could release. Such analyses are essential in the development of permitting strategies, determining if a facility is major or minor with respect to the PSD regulations, or to determine if a problem exists. The air pollution professional reaches for a very different tool in order to determine the extent and magnitude of a problem. Possibly the most powerful and important tool available to air pollution engineers and scientists is the mathematical dispersion model. Dispersion modeling is the tool which explains how a facility's emission rate can be translated into a downwind concentration.

When a gas is released into the atmosphere, it expands both horizontally and vertically as it moves away from its point of release. Although the amount of gas released remains the same, the concentration of the gas becomes increasingly more dilute. Wind and turbulence enable the gas to diffuse in the atmosphere, but it is the characteristics of the emission source itself which establishes just how the wind will affect the gaseous release. Emissions sources are typically characterized as either point, line, volume, or area sources. The emissions releases can be further grouped as either instantaneous or continuous sources. An explosion,a puff release, or a passing automobile would be an instantaneous release. An emission from a smoke stack or a busy freeway would be a continuous release.

Just by looking up at the sky we can see that the atmosphere is in constant random three-dimensional motion. Vertical turbulence is driven by the fact that the atmosphere typically cools with height. The faster the temperature drops with height, the greater the turbulence factor. Conversely, the slower the temperature drops with height, the lessor the turbulence factor. More specifically, when temperature decreases with height at a rate higher than 5.4 degrees F per 1000 feet, the atmosphere is considered to be unstable. In instances where the temperature increases at a lower rate with height, turbulence is reduced. When temperature increases with height, an inversion is said to occur and turbulence is very much reduced, and the atmosphere is considered to be stable.

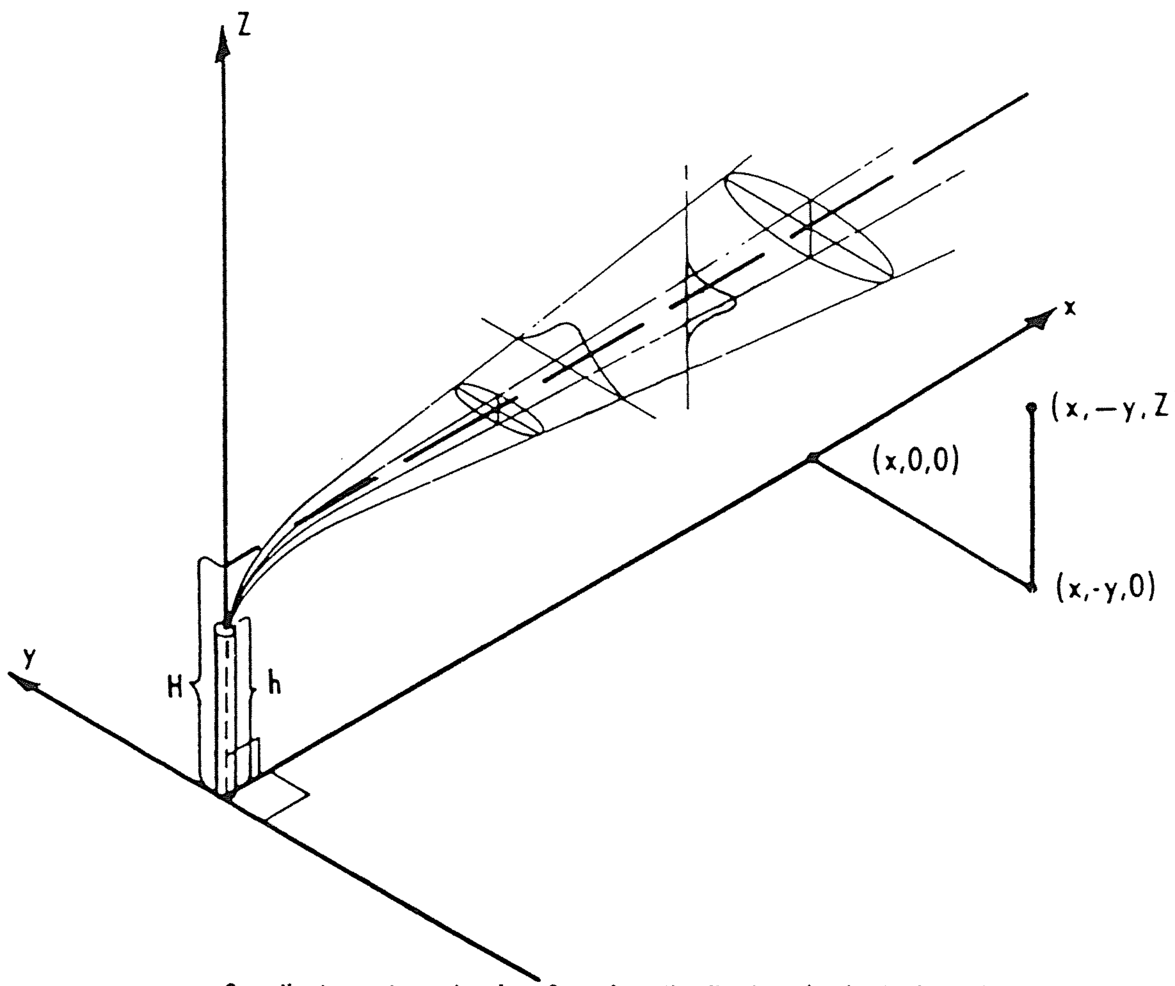
Horizontal turbulent diffusion occurs over a much larger area than vertical turbulence. Horizontal diffusion can occur over the entire surface of the planet. The main driving mechanism for horizontal turbulence is the wind. Winds are produced by atmospheric pressure gradients, but truly steady-state winds almost never occur. The reason for this is that the winds themselves are driven by the rotation of the earth and by surface friction. While both the vertical and horizontal components are critical, the physical forces which act upon the horizontal component of the atmosphere are several orders of magnitude greater than those which act upon the vertical component.

One of the underlying basic assumptions of atmospheric diffusion is that an ideal gas will disperse throughout the atmosphere in a statistically normal or Gaussian distribution pattern (Figure 1) in both the horizontal and vertical directions. Gaussian models are the most commonly used variety and are relatively accurate out to a range of approximately 50 kilometers.
Most regulatory compliance activities such as compliance with the NAAQS, with PSD increments, and defining areas of impact do not require modeling beyond this distance.

These are the physical mechanisms which atmospheric dispersion modeling experts have learned to simulate in mathematical terms. The advent of the computer has further enhanced the realm of dispersion modeling by enabling the tedious and complicated mathematical equations to be iterated repeatedly for multi-source, large receptor grid modeling scenarios. Modeling runs that ten years ago would have taken several days can now be performed in a matter of hours. The time needed for a single modeling run is directly proportional to the number of sources being modeled and to the number of points in the receptor grid.

As a function of their complexity, conservativeness, and accuracy, most dispersion modeling efforts are considered to be either of the screening or refined variety. In general, all dispersion models, screening or refined, require at least three major databases as inputs: source emissions data, meteorological data, and physical surroundings data (which includes nearby structures and receptor grid data). Screening models provide reasonably accurate but somewhat conservative results. They tend to require very few input parameters so they are easy and quick to set up and run. Screening modeling also tends to be low cost so multiple runs can be executed in trial and error

Figure 1



Coordinate system showing Gaussian distributions in the horizontal and vertical.

Source: U.S. Environmental Protection Agency, 1970

fashion to, for instance, estimate an ideal height for a new smoke stack or to get a rough idea of a facility's area of impact.

For compliance purposes or for preparing permit applications, the air pollution professional will use the more accurate and somewhat more complicated refined model. Refined models typically require more precise meteorological data, more source input information, and larger better defined receptor grids. Where screening models usually have a built-in limited meteorological data base which is designed to provide worst-case results, refined models require actual measured meteorological data which is representative of the emission source being modeled. When available, data collected by the National Weather Service (NWS) should be used. In rural or remote areas, NWS data is often not available and on-site meteorological data must be collected before modeling can be performed.

In order to provide consistency to industry and regulatory control agencies alike, the EPA created the User's Network For Applied Modeling of Air Pollution (UNAMAP) and in 1978 first published its "Guideline on Air Quality Models." By this time in its development, the air pollution industry became aware that modeling could not accurately or effectively be "cookbooked." It was also clear that one model would not be sufficient to simulate all emission scenarios, all geographical conditions, and all receptor conditions. EPA therefore provided a listing of preferred models (Table 2) for use in simple terrain. Simple terrain is terrain which is below the emission release point. Today's most commonly used simple terrain refined model is the Industrial Source Complex Model (ISC). This model exists in either the short term version or the long term version (ISCST/LT). The ISCST/LT is an extremely versatile model which can be run in either the screening or refined modes. It can be set up to give averaging periods such as 1-, 3-, 8-, or 24-hours as well as annual averages. Input parameters include: emission rate, stack height, stack diameter, stack temperature, stack gas velocity, and location coordinates. The emission sources can be input as any combination of point, line, area, or volume sources. It will accept either hourly meteorological data or annual joint frequency distributions of wind speed, direction and atmospheric stability category. These joint frequency distributions are known as stability arrays or STAR decks. In the screening mode, ISCST/LT requires no external meteorological data but rather will run on a built-in data file of twenty-hours of worst-case data. ISCST/LT also allows the user to construct polar or cartesian coordinate output grids (Figure 2) plus it allows discreet and elevated receptors to be located.

For complex terrain, that is to say, terrain which exceeds the height of the emission release point, EPA recommends the use of the following sophisticated screening modeling techniques: COMPLEX I, Valley, RTDM, and SHORTZ/LONGZ. While the complex terrain models are screening models, they are very sophisticated screening models and require skill in order to set up a truly representative modeling run.

Pollutants such as ozone and its precursors, oxides of nitrogen (NOx) and volatile organic compounds (VOC), are referred to as photochemically reactive and require the use of specialized models. To be representative, photochemical modeling must consider the chemical reactions of the various precursors. These models also tend to be regional in scope so the receptor grids can be very large, often covering thousands of square miles. EPA recommends that photochemical modeling be performed with the Urban Airshed Model which is considered to be an acceptable refined approach. Originally, such modeling was crudely performed using proportional rollback modeling which was little more than the name suggests, a mathematical proportioning. Empirical models such as the Empirical Kinetic Modeling Approach (EKMA) were developed to fill the gap between the oversimplified rollback approach and the input data intensive Urban Airshed Model.

Table 2

Preferred Models for Selected Applications in Simple Terrain

Short Term (1-24 hours)	Land Use	Model*
Single Source	Rural	CRSTER
	Urban	RAM
Multiple Source	Rural	MPTER
	Urban	RAM
Complicated Sources**	Rural/Urban	ISCST
Buoyant Industrial Line Sources	Rural	BLP
Long Term (monthly, seasonal or annual)		
Single Source	Rural	CRSTER
	Urban	RAM
Multiple Source	Rural	MPTER
	Urban	CDM 2.0 or RAM*
Complicated Sources**	Rural/Urban	ISCLT
Buoyant Industrial Line Sources	Rural	BLP

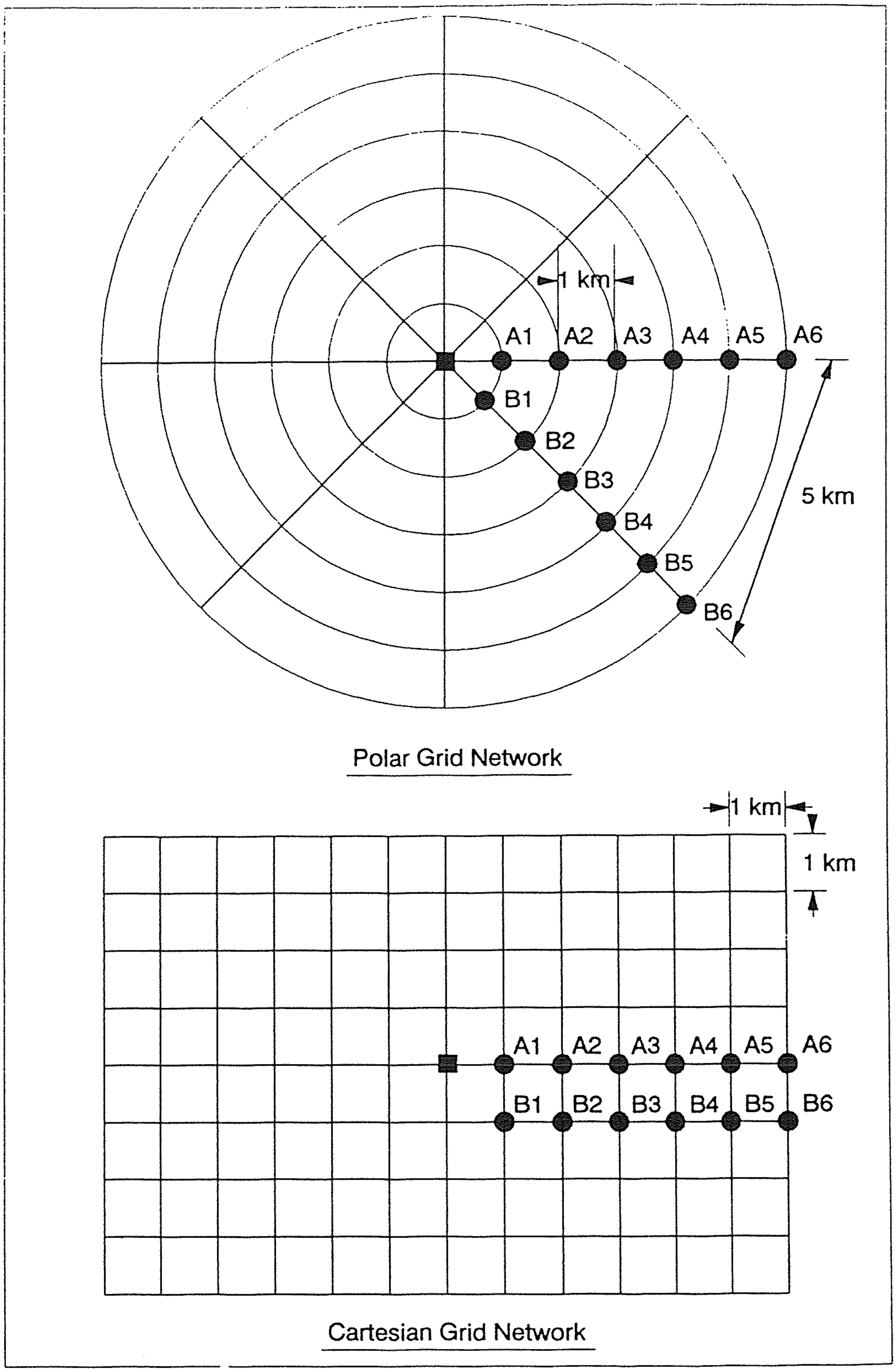
*Several of these models contain options which allow them to be interchanged. For example, ISCST can be substituted for CRSTER and equivalent, if not identical, concentration estimates obtained. Similarily, for a point source application, MPTER with urban option can be substituted for RAM. Where a substitution is convenient to the user and equivalent estimates are assured, it may be made. The models as listed here reflect the applications for which they were originally intended.

**Complicated sources are sources with special problems such as aerodynamic downwash, particle deposition, volume and area sources, etc.

***If only a few sources in an urban area are to be modeled, RAM should be used.

Source: U.S. Environmental Protection Agency, 1986

Figure 2



Examples of Polar and Cartesian Grid Networks.

Source: U.S. Environmental Protection Agency, 1990

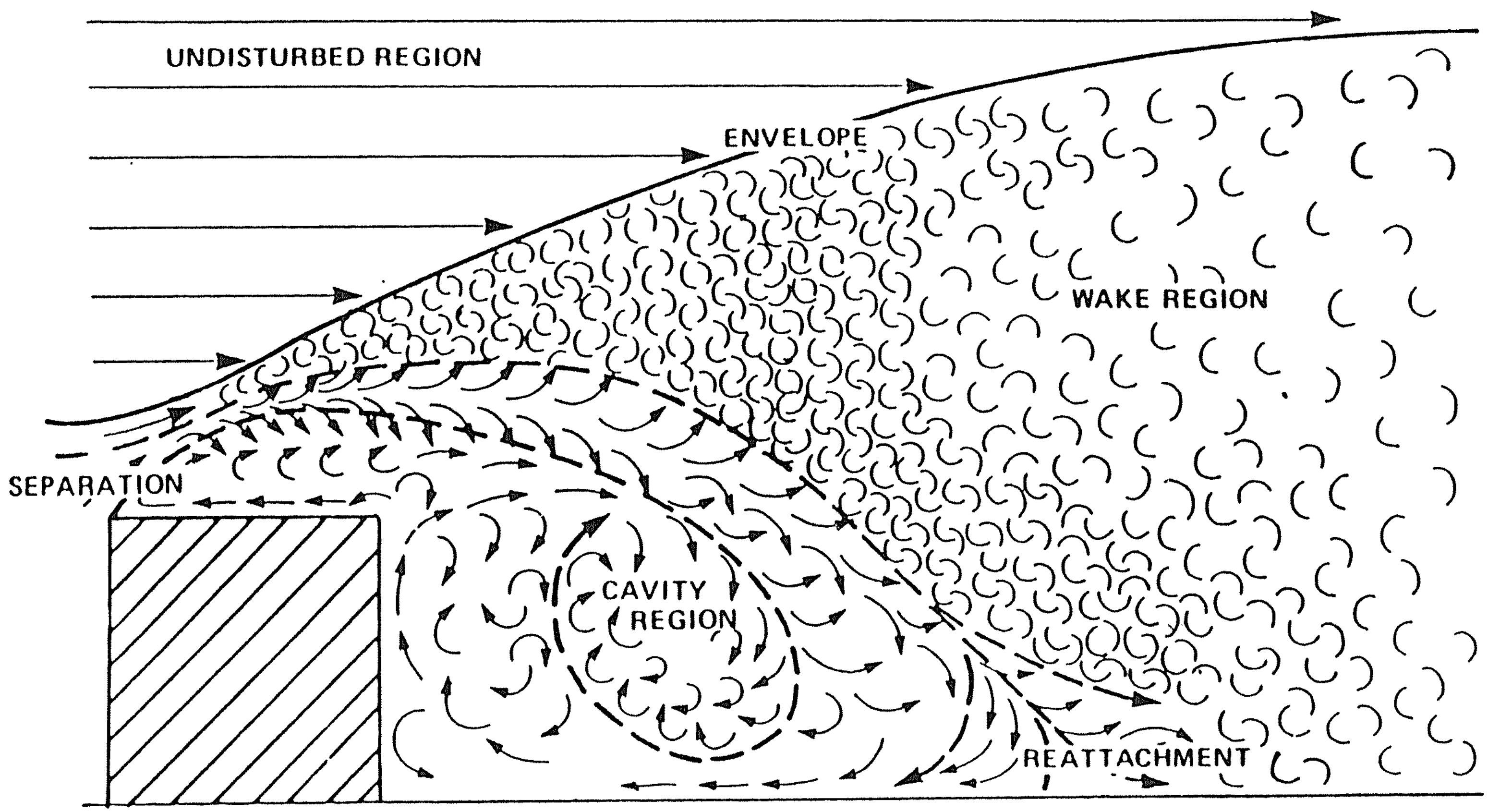
The 1990 Federal Clean Air Act Amendments have brought a greater emphasis on toxic pollutants. The dispersion models which have been discussed up to now have assumed that the released material is a lighter than air ideal gas. Toxic releases often involve compounds that are heavier than air, therefore these types of releases tend to involve more complex source dynamics and chemistry than releases of conventional pollutants. Dense gas simulation models require a more detailed characterization of the release. Not all the toxic release models currently available treat these initial characterizations in the same manner. Dense gas models must also be capable of representatively portraying the diffusion of a heavier than air cloud as it moves downwind if the model is going to give acceptable results in the near field as well as at greater distances. This requires that the model be able to address the chemical as well as the physical mechanisms that would occur in this type of release. A number of these types of models are currently available, including: DEGADIS and SLAB which are public domain models and AIRTOX, CHARM, FOCUS, SAFEMODE, and TRACE which are proprietary.

This paper is intended to be a basic overview of the scientific tools available to the air pollution professional, so it would not be complete without some discussion of Good Engineering Practice (GEP) stack height determination, the concept of stack downwash, and wake/cavity effects. All the modeling just discussed must take into consideration the EPA's provisions for calculating the ideal maximum allowable stack height for dispersion calculation purposes. EPA requires that a stack be modeled at its actual height or at GEP, whichever is shorter. If the modeled stack is found to be less than the height defined by the EPA formula for determining GEP, then the air quality impacts associated with cavity or wake effects due to nearby structures must be determined. Figure 3 provides a conceptualized view of the turbulence which results from the presence of structures. What this means is that if the stack is not tall enough, the resulting emissions are expelled into a zone of atmospheric turbulence created by the nearby structure or into the wake of the structure. These emissions rather than rise, disperse, and travel downwind are abruptly brought toward the ground near the stack and before any dispersion has occurred. Plume's which are trapped in the structure's cavity zone tend to become flattened in the vertical extent and widened in the horizontal. Resulting concentrations at receptors can be reduced due to this plume distortion. Downwash effects occur when stack plumes are influenced by nearby structures such that the emissions are directed by the wake effects. When the plume is in the aerodynamic wake, it is brought down prematurely and pollutant concentrations tend to be higher than the plume's unhindered maximums would have been. In its wind direction dependent form, Schulman-Scire downwash, can involve a complicated set of calculations to identify and characterize. Several commercial software packages are currently available to assist the air pollution professional in these analyses; although these packages are not always accurate and require review.

Fluid modeling which is also called physical wind tunnel modeling involves the creation of a physical model of the stacks, structures, and terrain features which need to be modeled. This physical model is then placed in a wind tunnel and the atmospheric effects are physically simulated and measured. This type of modeling is often used in situations where mathematical simulations are inadequate. These situations can include the modeling of emissions sources in complex terrain, in areas for which little or no meteorological data exists, or for complex groupings of structures and topography which cannot be adequately simulated mathematically. Fluid modeling is an especially powerful tool for evaluating and describing cavity and wake effects.

Another powerful tool for determining the dispersion characteristics of a stack is the tracer study. By injecting into the subject stack a non-reactive tracer material, usually sulfur hexafluoride (SF6), the stack's resulting plume can be accurately tracked. In this way its downwind distance of travel as well as its horizontal spread and density can be determined. Again, this

Figure 3



Diagrammatic outline of the envelope and cavity regions in the wake of a building (vertical section).

Source: U.S. Environmental Protection Agency, 1985

technique is a substitute for mathematical dispersion modeling. Tracer studies have been effective tools in calibrating models, determining complex cavity and downwash effects, and characterizing long-range plume transport mechanisms.

With so much of this presentation dedicated to the tool known as mathematical dispersion modeling, it must now be all too obvious that this is a powerful tool which is heavily relied upon by the air pollution professional. The question which should now be asked is: how accurate is mathematical modeling? In addition to accuracy, there is the question of uncertainty. That is, when we set up a modeling run we put in all the data we know about the source and the atmosphere; but what about the factors, such as turbulent wind velocity, which we cannot quantify or simulate? Even with a perfect model, there are likely to be factors which will introduce uncertainty into the results. EPA suggests that uncertainty alone may be responsible for a range of variation in concentrations of up to plus or minus 50%. With regard to model accuracy, atmospheric scientists agree that models are more accurate for estimating longer time-averaged concentrations than for estimating short-term concentrations at specific locations. It is also agreed that models are reasonably reliable in estimating the magnitude of the highest concentrations occurring sometime, somewhere within the modeled area. That is, while errors in highest estimated concentrations of plus or minus 10 to 40% are found to be typical; the time and site at which these modeled concentrations occur correlate poorly with the time and site of the actual observed concentrations. Still, modeling is the preferred tool for estimating the maximum expected concentrations which would occur somewhere in the area of impact.

Ambient Monitoring

While modeling is the preferred tool for determining emission limitations, there are instances for which no truly representative mathematical model exists. For existing sources which are not adequately represented by a refined mathematical model, monitoring data can serve as the basis for emission limits as long as the source meets a set of criteria established by EPA with regard to the non-availability of other more representative data. Once it has been established that ambient monitoring is the preferred tool, the air pollution professional will investigate to ascertain if there exists any nearby monitoring network data of sufficient quality to be used in lieu of establishing a new monitoring site or sites. Should it be found that no such data exists, a protocol which outlines the purpose, rationale, location, and methods for the proposed program would need to be prepared and submitted for approval by the appropriate regulatory agencies. The EPA has criteria which must be adhered to for every aspect of a monitoring program, including: monitor siting, types of monitors and instruments used, types and locations of the monitoring probes, instrument operating conditions, operating schedules, methods for data reduction and validation, quality assurance, and data reporting.

CONTROL TECHNOLOGIES

We have discussed the criteria that constitute a condition of air pollution and the tools used by air pollution experts to identify pollution problems and quantify impacts. The topic remaining to be discussed is that of what can be done to eliminate or abate the air pollution problem. It is not within the scope of this paper to try to explain the complex engineering principles which form the bases for the design of the control technologies which are used throughout the world. Instead, the focus of this section will be to discuss how and when the air pollution professional applies BACT, RACT, LAER, and the recently conceived MACT.

The air pollution professional must understand not only which control devices are available, but also what degree of emission control must be applied to the project at hand. The EPA has coined the acronyms LAER, BACT, RACT, and MACT to describe control philosophies which must be addressed in permitting or modifying industrial facilities. Lowest achievable emission rate (LAER) applies to major new sources or modifications in nonattainment areas. LAER is the most stringent emission limitation contained in the implementation plan of a state or the most stringent emission limitation achieved in practice by a type of industrial source. Determination of LAER does not consider economic, energy, or environmental factors.

The BACT analysis is an important step in the PSD review process. Any major source or major modification subject to PSD must conduct an analysis to ensure the application of best available control technology (BACT). Subsequently, many state permitting programs now require the submission of a BACT analysis. Because BACT is a provision of the PSD review process, it applies to construction proposed within areas which are classified as attainment or unclassifiable with respect to the NAAQS. EPA's implementation of the BACT provisions is by means of the top-down process. This process requires that applicants evaluate all available control technologies. The applicant then eliminates any control options that are not technically feasible for use on this type of source and identifies the top or most effective emission control technology with less effective controls ranked in descending order. The economic, energy, and environmental impacts of each control technology is then determined. Those technologies with unacceptable impacts are then eliminated from consideration. The most stringent remaining control establishes the BACT emission limit for the facility.

As defined under the 1990 Federal Clean Air Act Amendments (FCAAA), existing sources subject to control technique guidelines (CTG) and all VOC and NOx sources with the potential to emit 50 tons per year or greater in ozone nonattainment areas are subject to meet the reasonably available control technology (RACT) provisions. Like BACT, RACT is an advancing control technology which changes with time and for which economics are considered. The control techniques specified as RACT vary with location and with regulatory agency.

Title III, the air toxics provisions of the FCAAA, requires that EPA set a new control standard by industry category or subcategory. This new standard called maximum achievable control technology (MACT) is defined as "the maximum degree of reduction in emissions of the hazardous air pollutants subject to this section (including a prohibition on such emissions, where achievable) that the Administrator, taking into consideration the cost of achieving such emission reductions, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing sources in the category or subcategory to which such emission standard applies". EPA estimates that there will be over 750 categories and subcategories. Each will have its own MACT.

With these control requirements in mind, the air pollution professional adapts the most commonly used abatement devices to achieve the levels of compliance mandated by the regulatory agencies. The most commonly used categories of air pollution abatement devices are the various forms of wet scrubbers, electrostatic precipitators, baghouses, inertial separators, flares, incinerators, absorbers, and adsorbers. In addition to these major groups of control devices, process adjustments, operating curtailments, and fuel restrictions are also widely used techniques for achieving compliance.

CONCLUDING REMARKS

In order to be effective as introductory material to be used by non-technical persons, this paper has exposed the reader to a quick sampling of the many tools used by the air pollution professional in the preparation of environmental and scientific products. Many of the concepts presented are complex and intertwined. Things are not always what they seem to be in the field of air pollution. For example, for the past five years, the EPA and TACB have been negotiating whether Culberson County in far west Texas should be reclassified as nonattainment for ozone. The irony here is that there is not much in the way of people, cars, or industry out there. EPA's basis for wanting to reclassify the county was some ambient monitoring data collected by the National Parks Service at Guadalupe Mountains National Park on the Texas-New Mexico border. After a five year struggle, and more than three years of monitored ozone data which shows compliance, the EPA is just now agreeing to allow Culberson County to keep its classification as "unclassifiable". Take nothing for granted. Not all permits are created equal. An applicant may obtain a permit which contains special provisions which cannot be met. Monitoring and modeling results typically do not coincide. With the proliferation of software, anyone can purchase and run dispersion models, but only modelers know enough about the subtleties of the mathematical codes to recognize and compensate for non-standard circumstances.

The science and engineering of air pollution has matured dramatically since EPA was created twenty-one years ago. Air pollution professionals are more knowledgeable with respect to changing technology than ever before. Just as regulatory matters have become more complex and require specialization, so do the permits, modeling studies, and emission control analyses which those regulations mandate.

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Water Pollution —
Dishonorable Discharges

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Introduction

Before you play the game, you need to know the rules. This paper is a primer on water quality and pollution control, and it's intended to provide the basic rules of the water pollution control game. It's pretty basic information, so if you already have a working knowledge of water quality and pollution control, there may not be much new information here for you. For the novice, you must recognize that water quality and its protection is a complex subject that involves many of the natural science and engineering disciplines, so this primer can only provide you with a rudimentary understanding of the principal concepts and definitions.

The paper is organized into three principle sections: (1) water quality fundamentals; (2) treatment technologies; and (3) laws and regulations.

Water quality fundamentals

Water quality is a generic term that is used to describe the physical , chemical, and biological properties of water. To make sense, the term must be related to the intended use or uses of the water. Typical water uses include:

- drinking water supply;
- protection and propagation of aquatic life;
- contact and non-contact recreation;
- industrial water supply;
- water for livestock; and
- irrigation water.

There are differences in water quality requirements between various uses. For example, water for certain industrial uses does not need to be of drinking water quality. Similarly, the inorganic salt content of water used for recreation is relatively unimportant, but inorganic salts can be important pollutants in water used for irrigation. The concentrations of natural salt in ocean waters would represent unacceptable water quality for drinking water, water for most industrial uses other than cooling, livestock water, and irrigation water. Naturally occurring water quality can be, and often is, unacceptable for many desirable water uses. A perfect example of this is the high, naturally-occurring salt content of certain tributaries of the Brazos River.

Pollutants

Pollutants are physical, chemical, and biological properties of water that can limit its uses. It is important to recognize that with one major exception — synthetic organic chemicals — water *pollutants* are naturally-occurring constituents and properties of all surface and ground water bodies. A constituent or property that is considered desirable at a certain level for a particular water use may be a pollutant if found in water that is used for another purpose. It is simply a case of being in the wrong place at the wrong time. The ocean is again a good example — the salinity of sea water is essential to the growth and propagation of marine life, yet this same level of salts in a fresh water environment would be fatal to most fresh water aquatic life. Thus, in the fresh water environment, salinity is a pollutant while in the ocean it is a necessity.

Water quality is characterized using a number of different constituents and properties, and all of these can be pollutants under the right circumstances. As part of its statutory framework, the Clean Water Act classifies pollutants into three categories — conventional pollutants; nonconventional pollutants, and toxic pollutants. Although these categories have little scientific or technical meaning, they are widely used because of their regulatory connection and they will be used here to identify and define a number of important water quality characteristics.

Conventional pollutants

The term *conventional pollutant* was coined by Congress to identify those pollutants that are removed by *conventional* secondary wastewater treatment plants. The term is a misnomer, since many nonconventional and toxic pollutants are also removed by secondary treatment plants. The following constituents in wastewater are referred to as conventional pollutants.

BOD

Biochemical oxygen demand (BOD) is a measure of the amount of biologically degradable organic (carbonaceous) matter in water. It measures the amount of organic matter in water as the amount of oxygen required by adapted microorganisms to degrade the organic matter. The standard test requires 5-days of incubation at 20 °Celsius (C) and was developed over 100 years ago. The result is reported as BOD_5, BOD5, or sometimes just BOD.

Organic matter in water is expressed as oxygen equivalents so that it can be related to the impacts of these substances on water quality. When organic matter in water is biologically degraded, dissolved oxygen is removed from the water by the microorganisms that are degrading the substances. Since dissolved oxygen must be present to support aquatic life, the amount of oxygen demanding substances must be low to prevent oxygen depletion and consequent damage to the aquatic life.

During the 5-day test not all of the organic matter in a water sample is biodegraded. To determine the total amount of biodegradable matter in a sample, long-term BOD tests are run. The sample is incubated for 20 days or more and the results are reported by identifying the incubation period, e.g, 20-day BOD (BOD_{20}) or by designating it as ultimate BOD (BOD_u).

The standard BOD test will measure the biodegradation of ammonia and organic nitrogen, in addition to carbonaceous (organic) materials. This is referred to as nitrogenous BOD. The standard BOD test can be modified so that it measures only carbonaceous BOD. This approach is necessary when data is needed for water quality modeling, for example.

Since the test is a biological assay of the degradable organic matter in a water sample, the measurements are subject to many operating variables. For example, if the microorganisms are not adapted to the organic chemicals in the sample, then the measured BOD will be lower than the true BOD. The test conditions must be carefully controlled to obtain precise and reliable measurements. There is no way to measure the accuracy of the test, since the true amount of biodegradable organic matter cannot be measured by any other means.

Many efforts have been made to replace the BOD test with an analytical method that has better precision and accuracy and does not require 5 days to run. No acceptable alternative has ever been adopted, however, because of the fact that the BOD test is a standardized method for measuring only the amount of organic material that can be biologically degraded. Other analytical methods all have the tendency of measuring nonbiodegradable wastewater constituents, which is the principle objective of the BOD test.

TSS

Total suspended solids (TSS) represents the organic and inorganic particulate matter in a water sample. It is measured by a standard filtration procedure. TSS can have a variety of water quality effects. Organic TSS can biodegrade and exert a BOD. Both organic and inorganic TSS can, when present in excessive amounts, clog the gills of fish and shellfish and coat the bottom of water bodies, killing the aquatic life that lives in the sediments.

Like the BOD test, the TSS test measures a wide range of different materials. Very small particles (such as colloids) can pass through the filter used in the test and will not be measured. The accuracy of the TSS test is a function of the characteristics of the particulate matter in the water — the *true* TSS cannot be measured.

oil and grease

Oil and grease is a characteristic that is defined by the analytical method rather than by its water quality impacts. The test is intended to measure the presence of substances that are typically thought of as oils and greases — petroleum materials and animal fats that float on and coat the water surface and thus cause adverse water quality effects such as reducing the natural reaeration of water by the air.

The test procedure involves extracting the water sample with a solvent, evaporating the solvent, and weighing the residue. Alternatively, the amount of material extracted by the solvent can be measured with infrared spectrometry and the spectra can be compared to a standard oil sample. Although the solvents used effectively extract petroleum and animal materials from the water, they also extract a variety of other substances that do not behave like oil and grease in water (e.g., chlorophyll, sulfur compounds).

Oil and grease is not widely used to assess the quality of natural waters. However, it is routinely used to regulate the quality of effluent discharges.

pH

pH is the logarithm of the reciprocal of the hydrogen ion concentration in water. It is a measure of alkalinity and acidity. At neutral pH (pH = 7), the hydrogen and hydroxyl ions are balance. The range of the pH scale is from 0 to 14, with 0 being the most acid and 14 being the most alkaline.

Natural waters typically have pH values in the range of 6 to 9.5, and most aquatic life can survive and propagate in this range. Most treated effluents that are discharged to natural waters are required to have a pH value in the range of 6-9. Wastewater before it is treated often has a wider pH range, and some treatment processes are designed and operated at highly acid and highly alkaline pH values. After such treatment steps the pH of the treated water must be adjusted to the appropriate range for discharge.

pH is usually measured with direct-reading electochemical instruments. These readings are very accurate and precise if the instrument is calibrated correctly. Litmus paper, which changes color as a function of pH, is occasionally used for screening purposes. It is much less accurate than a pH meter and is never acceptable for regulatory reporting of effluent and ambient water quality.

fecal coliforms

Fecal coliforms are a genera of bacteria that are common inhabitants of the digestive tract of warm-blooded animals. They are used as an indicator of the potential presence of domestic wastewater (sewage), which may contain pathogenic microorganisms (organisms that cause disease in humans). The fecal coliforms are not pathogens themselves.

Fecal coliforms are measured by bacteriological tests of water samples. The test is used to identify surface waters that are acceptable for recreation and shellfish harvesting, and to control the quality of treated effluents that contain human waste.

Fecal coliform data must be interpreted with care. High fecal coliform numbers in a surface water can be due to the presence of large numbers of water fowl or due to runoff from fields used to graze livestock. In such cases, the presence of fecal coliform bacteria does not indicate the presence of human pathogens and the test results thus have little meaning.

Nonconventional pollutants

The term *nonconventional pollutant* is even more meaningless than the term conventional pollutant. It is a catch-all category used by Congress for any water quality constituent that is not designated as conventional or toxic.

There are a great many nonconventional pollutants that are used in water quality and effluent characterization. Only a few of the more important are identified here.

COD

Chemical oxygen demand (COD) is a measure of the total amount of organic matter in a water sample — it measures organic compounds that are not biodegradable under the conditions of the BOD test as well as the biodegradable organics. It does not measure nitrogenous substances and ammonia. It is performed by oxidizing the organic compounds in a sample with a strong dichromate acid solution at high temperature. The COD test will not oxidize all carbon-containing compounds and will also measure some chemicals that are not carbonaceous.

COD is used as a measure of treatment system performance. The test can be performed in several hours, and thus provides results that can be used for plant operation (the BOD test, which requires waiting 5 days for a result, is not a useful operational method). COD is not used to characterize water quality, since it has no direct correlation with any observed water quality effects.

ammonia

Ammonia nitrogen is a toxic pollutant and can exert a biological oxygen demand. It is classified as a nonconventional pollutant, however. Ammonia can be released by the biological degradation of nitrogenous compounds such as proteins. Ammonia is rapidly depleted in natural waters by biological processes. It is oxidized by bacteria to nitrates and nitrites and is taken up by green plants as an essential nutrient. Ammonia is highly toxic to certain species of fish. Its toxicity is related to the pH and temperature of the water.

temperature

Temperature can be a pollutant. Aquatic life in a particular water body will be adapted to survive in the typical temperature range resulting from ambient air temperatures. Higher or lower temperatures due to man-made conditions can prevent growth and propagation and may even cause lethality.

total organic carbon

Total organic carbon (TOC) is another measure of the amount of organic (carbonaceous) material in water. TOC, like COD, will measure both biodegradable and nonbiodegradable organic matter. The TOC test is even more rapidly performed than COD and is a useful operational tool for wastewater treatment. It is a more specific method than COD because it measures all of the carbon in a sample (by direct combustion) and does not measure the presence of any non-carbon substances.

TOC is used as a measure of the carbon concentration in natural waters. However, it does not have any direct correlation with positive or negative water quality effects.

inorganic chemicals

There are a number of inorganic chemicals that can be pollutants under the right circumstances. These may be measured and reported as the chemical itself (e.g., sodium chloride), or as the individual cations and anions (sodium, chloride) that make up the chemical.

Other measures of the inorganic constituents in water are total dissolved solids (TDS), salinity, and hardness. These are measures of the total amount of dissolved certain inorganic salts that are present in a water sample. TDS measurements actually include the dissolved organic constituents, but these are generally a negligible fraction of the total in natural waters. Hardness is the concentration of calcium and magnesium.

Toxic pollutants

The term toxic pollutants is also somewhat of a misnomer. Essentially any chemical can be toxic if taken in a large enough dose. Again, a good example of this is sodium chloride; common table salt. At high dosages sodium chloride is toxic to humans, and high concentrations of salt are toxic to fresh water aquatic life. Ammonia is a good example of a pollutant that is actually quite toxic to aquatic life, but is typically not listed as a toxic pollutant. The toxicity of a chemical is a function of dose and exposure time; therefore a substance can be nontoxic at low concentrations even if exposure is continuous and highly toxic in even a very short time period when the maximum acceptable dose is exceeded.

The Congressional definition of a toxic pollutant, as the term is used in the Clean Water Act, is a specific chemical substance that has been identified as exhibiting toxicity at relatively low concentrations. This definition must be viewed with some scepticism, however, since highly toxic chemicals such as mercury and and low toxicity chemicals such as phenol are all considered toxic pollutants under this definition.

organic chemicals

There are a number of specific organic chemicals that are considered toxic pollutants. A few examples are benzene, 2,3,7,8-tetrachlorodibenzo-p-dioxin (dioxin), polychlorinated biphenyls (PCB), phenol, and vinyl chloride.

Some of the toxic organic chemicals are synthetic and cannot occur in nature. Examples of synthetic organic chemicals are certain chlorinated chemicals such as trichloroethene, trichloroethane, vinyl chloride, and PCBs.

Other toxic organic chemicals can occur naturally as the result of chemical and biological processes. For example, polynuclear aromatic hydrocarbons (PAHs), a class of complex hydrocarbons that are considered to be toxic, are synthesized by some plants and bacteria and are formed by forest and brush fires. Benzene, toluene, and the PAHs are naturally-occurring components of crude petroleum.

inorganic chemicals

The heavy metals and heavy metal salts are considered toxic pollutants. The principal metals of concern are usually: arsenic, cadmium, copper, chromium, lead, mercury, selenium, silver, and zinc. These metals are toxic to aquatic life and to humans.

It is important to remember that all of the metals are naturally occurring and many will be found in measurable concentrations in soils, rocks, and surface water sediments. The amount of dissolved metals, which are the toxic form of metals in water, is generally very small because the metals tend to be tightly bound to inorganic anions and complex organic molecules. If a metal is in the dissolved form because it was discharged in that form or because the chemistry of the water favors dissolution, then the metal may be toxic to the resident aquatic life.

Arsenic, cadmium, and mercury are the most toxic metals to humans in the context of water quality. This is because these metals can accumulate to high concentrations in the tissues of edible aquatic life, which when consumed by humans can cause illness and even death. The other heavy metals do not bioaccumulate in aquatic life to levels that will affect human health.

Certain metals, like copper, silver, and zinc, represent minimal danger to humans through aqueous exposure, but are highly toxic to certain aquatic life forms.

persistent toxics

A persistent toxic is one that is not readily converted to a nontoxic form in a natural water body. Many chlorinated organic chemicals (e.g., dioxin, PCBs) are considered persistent toxics because natural biodegradation and chemical reactions that break down these substances are very slow. It is important to understand that the definition of a persistent organic toxic is subjective — the degradation rate of a chemical in a natural water body is a function of the biology and chemistry of that body as well as the chemical composition of the substance. Virtually every known organic substance is chemically and biologically degradable. Some chemicals, such as benzene, are so rapidly biodegraded that they are virtually never found in natural water bodies. Other organics, such as the PCBs, will biodegrade, but do so very slowly and may persist for decades.

Metals are persistent since there are no natural processes that will transmute one element to another (the radionuclides excepted). However, as mentioned earlier metals react with other inorganic and organic chemicals which typically render them stable and nontoxic. In this context, many metals can be considered to not be persistent toxics (they are persistent elements, they are just rendered nontoxic).

Certain metals, with mercury being the prime example, can be biologically transformed from a stable, nontoxic form to a toxic form. In surface water sediments, elemental mercury and mercury compounds can be transformed biologically into methyl (organic) mercury. This organic mercury can then be taken up by aquatic organisms into the food chain, and can accumulate in edible fish and shellfish to levels that endanger human health. Thus, in such a case the metal is a persistent toxicant since it can revert from a nontoxic to a toxic form.

bioaccumulative toxics

There are certain organic chemicals and metals that tend to accumulate in the tissues of aquatic life. These chemicals are termed bioaccumulative pollutants. There are several important concepts involved:

bioconcentration — the uptake by aquatic life of a toxic pollutant that is dissolved in the water column. This uptake is primarily through the skin and gills.

bioaccumulation — this includes not only uptake of a toxicant by bioconcentration, but also uptake from ingestion of contaminated food.

biomagnification — this is the tendency for the tissue concentration of a chemical to increase as the chemical moves higher in the food chain (i.e., the concentration of the toxicant in the tissue of a carnivore is greater than the concentration in its food).

Chemicals that tend to bioaccumulate are those that are very insoluble in water and tend to be soluble in organic solvents. They usually accumulate in fatty tissues. Organic chemicals that have a tendency to bioaccumulate include dioxin, PCBs, DDT, and hexachlorobenzene. Metals that bioaccumulate include arsenic, cadmium, mercury, and selenium.

Assessment of water quality

As mentioned at the beginning of this section, water quality must be assessed in the context of water use. For most surface waters, the key water uses that will define acceptable water quality will be aquatic life protection and protection of human health. With respect to human health protection, the key exposure routes are drinking water and ingestion of edible fish and shellfish.

sampling programs

The local governments, the states, the U.S. Environmental Protection Agency (EPA), and other federal agencies collect samples of surface water and analyze them to define water quality and trends. These analyses can be part of a systematic, ongoing monitoring program or they can be special studies designed specifically to address a particular problem and study area. All states, and the U.S. Geological Survey (USGS), operate water quality monitoring networks that are designed to provide long-term records of water quality trends. These data are used to determine the compliance of surface waters with water quality standards and to provide the basic data needed to administer water pollution control programs.

Water quality data collection is expensive. Because of this, the number of routinely monitored sampling stations is usually small compared to the size of the surface water systems being monitored. Traditionally, monitoring was primarily for the conventional and nonconventional pollutants, dissolved oxygen, and some of the heavy metals. Monitoring for toxic organic chemicals, which is expensive compared to the monitoring of conventional and nonconventional pollutants, has only recently become widespread. In addition, metals data collected in the past several years suggests that metals analyses performed in earlier years probably are inaccurate and overestimate the amount of metals that are present in surface waters. It has been found that contamination of samples with metals during sample preservation and analysis occurs very frequently and that extraordinary care must be taken during sample collection and analysis to avoid this problem.

water quality models

Water quality models are used to predict the response of water quality characteristics to changes in physical, chemical, and biological conditions. A water quality model is a mathematical (or sometimes physical) representation of a natural system that is designed to simulate the important physical, chemical, and biological reactions and interrelationships in that system in order to predict the water quality that will result when one or more of the input conditions is changed.

The most common use of models is to predict improvements in or degradation of water quality due to wastewater discharges. Historically, water quality models have been used most often for simulating the dissolved oxygen balance in the stream. The amount of BOD and ammonia, both of which biodegrade in natural waters and use up dissolved oxygen, that can be tolerated without the dissolved oxygen concentration dropping below acceptable levels can be estimated with the water quality model. The maximum amount of BOD and ammonia that can be discharged to a surface water without dropping the dissolved oxygen concentration below the acceptable level can then be allocated to the various effluent dischargers. This process is known as *waste load allocation.* The same type of waste load allocation can be performed for any type of pollutant that affects a water quality constituent that is important to satisfying the designated water uses.

To use a water quality model it is necessary to have site-specific data to *calibrate* it. Calibration is the development of site-specific physical, chemical, and biological variables in the model that must be derived from data sets collected from the receiving water to be modeled. For example, data on the travel time of pollutants in a river is needed — this has to be a known function of stream flow. In an estuary, tidal amplitudes and phases and dispersion coefficients are needed. For substances such as BOD, site-specific biodegradation rates must be estimated from available data. After a water quality model is considered to be calibrated, which is usually done with two or more separate data sets, the model should then be verified by testing its predictive accuracy on one or more water quality data sets that were not used in the calibration of the model. Calibration and verification is often an iterative process until the best overall predictions of observed water quality are obtained. Once the model is verified, it is ready to be used in a predictive mode. A water quality model that is not calibrated and verified with site-specific data cannot be used to make quantitative projections of water quality.

Water quality models are available for a number of different water quality characteristics and constituents including temperature, dissolved inorganic salts, heavy metals, and specific organic compounds. There are models that can simulate storm water runoff, including flow rates and pollutant quantities, from urban and rural watersheds. Models for toxics such as heavy metals and specific organic chemicals are still infrequently used. This is because a considerable amount of site-specific physical, chemical, and biological data on the fate of these substances in the water body of interest is required to calibrate the models so that they can provide reliable predictions without too much uncertainty in the results.

There are also mixing zone models whose purpose it to estimate how rapidly effluent is diluted in the receiving water. Mixing zone models are used to design *effluent diffusers* which are used to enhance rapid mixing of an effluent in the receiving water.

Models are very useful tools for analyzing water quality impacts resulting from different hydrologic conditions and waste loads. It must be remembered when using water quality modeling results that these predictions are only as good as the data that were used to calibrate the models. It is always appropriate to perform sensitivity analyses with any model to determine how much uncertainty there is in the model predictions due to the basic data inputs and assumptions used in the simulation.

Treatment technologies

A number of methods are available to remove pollutants from wastewaters. These methods can be classified into three broad categories: (1) physical treatment; (2) chemical treatment; and (3) biological treatment. It also appropriate to discuss the technologies that have spawned the latest buzz words — pollution prevention. Before launching into a discussion of these treatment technologies, it's appropriate to define the wastewaters that are treated by them.

Wastewater is called many different names — sewage, aquas negras, abwasser — but it's all the same stuff. Basically, it's water that has been used to satisfy some beneficial need, and as a result it has either had pollutants added to it or the pollutants in it have been concentrated. The addition of pollutants could be as simple as adding heat to cooling water, or it can be as complex as the pollutants from a pulp and paper mill, which contain the tannins and lignins that are dissolved from the wood fiber during the manufacture of paper. Types of wastewater include:

- sanitary wastewater, sanitary sewage — these are wastes generated by humans fulfilling their basic needs: water from toilets, baths, washing of clothing, food preparation, etc. Also called domestic or sanitary sewage. Most commercial establishments generate primarily sanitary wastewaters. Sanitary sewers, not to be confused with sanitary sewage, also carry industrial wastewaters.

- industrial wastewater — water used for a variety of manufacturing purposes; subcategories include:

  Δ cooling waters — once-through and recycled;

  Δ process wastewater — water that has come into contact with manufacturing raw materials, intermediates, byproducts and products. This includes contaminated storm water from process areas and contact cooling water;

  Δ water treatment wastewaters — wastes generated by the treatment of the water supply for use in the production process. This includes regeneration of demineralizers and blowdown from surface water treatment; and

- Δ steam condensates, boiler blowdown, and other miscellaneous noncontact wastewaters.

- Storm water — storm water from urban areas is now to be regulated if it is discharged through point sources. Such storm water has often been termed as *nonpoint source* wastewater but this is a misnomer, since stormwaters from urban areas typically are discharged through ditches and pipes, making them clearly point sources. Storm water from industrial activity that is not *process* water is also regulated.

- Combined sewer overflows (CSOs) — in many older cities, particularly in the northeast U.S., the sanitary sewer systems also carry storm water. When large runoff events occur, these combined sewers discharge a mixture of storm water and sanitary sewage without treatment.

These examples are not all-inclusive, but they provide an idea of the wide range of potential sources of wastewaters.

Physical treatment

Physical treatment processes remove pollutants from wastewater by means of physical processes such as gravity, filtration, and evaporation. Typical physical process include the following:

- clarifiers, sedimentation basins, settling tanks — these are common terms for treatment processes that remove suspended solids from wastewater by gravity. They function by slowing the velocity of wastewater to nearly quiescent conditions, which allows particles that are denser than water to settle to the bottom of the tank or clarifier. The captured solids form a deposit on the bottom of the tank or basin and are often referred to as sludge. Most clarifiers and sedimentation tanks have mechanical mechanisms that continuously remove the sludge as it accumulates. Sedimentation basins and some tanks may not have integral sludge removal mechanisms — in such systems the sludge is removed intermittently by draining the tank. In conventional terminology, a *primary clarifier* is used to remove suspended solids from untreated wastewater. A *secondary clarifier* is used to remove the solids generated by biological treatment. A lamella separator is a type of clarifier with inclined plates installed in it to enhance sedimentation.

- screening — coarse and fine screens that remove large, bulky solids from wastewater. Typically used as the first step in domestic sewage treatment; rarely used for industrial waste treatment.

- grit chambers — a type of small clarifier used to remove dense, sand-type particles.

- oil/water separator — a gravity separator (tank/basin) that removes oils and grease by slowing the flow of water sufficiently to allow these substances to separate and float to the surface, where they are skimmed off mechanically. Can be thought of as a reverse clarifier (oils are usually less dense than water). Usually also includes the ability to capture suspended solids that sink. Types of oil/water separators include: API separators, parallel plate interceptors (PPI), and corrugated plate interceptors (CPI).

- air flotation — serves the same function as a clarifier or oil/water separator, except that removal of suspended solids and oils is enhanced by attaching very fine air bubbles to the suspended solids and/or oil globules to make them much less dense than water and rise to the surface faster. Air is introduced by dissolving it in the wastewater under pressure or by agitation.

- filtration — used to remove fine suspended solids by agglomeration and entrapment in the pore spaces of filter media. Filters may be tanks filled with granular media (sand, coal, garnet) or may have a filter media such as cloth, very fine screens, or diatomaceous earth filter media. Filters are often used for *tertiary treatment* following other treatment processes.

- stripping — volatile substances (certain organics, ammonia, hydrogen sulfide) are removed by stripping (volatilizing) these compounds from wastewater using air, nitrogen,and steam. This is usually done in a column (tower), which is a tall, small diameter tank in which the water to be stripped is added at the top and removed at the bottom, and the stripping gas is brought in at the bottom and removed at the top. The stripping steam or gas, which contains concentrated pollutant that has been stripped, must usually be treated or the material removed from the wastewater must be recovered.

- activated carbon — this process removes organic substances by physical-chemical sorption to the carbon media in a bed, tower, or is can be added to the wastewater as a powder. The carbon can be regenerated (the pollutants removed) by heating it (with steam or in a furnace) or by using a solvent. The removed organics must be treated or recovered. The regenerated carbon is then reused in the treatment process. Typically carbon is used to remove organics that cannot be treated effectively by biological treatment, chemical treatment, or stripping. Activated carbon has been successfully used to remove trace amounts of some metals from wastewaters, although the mechanism is not well-understood.

- ion exchange — a physical-chemical process in which inorganic cations and anions are reversibly sorbed to a natural or synthetic resin. Used to remove calcium and magnesium cations (hardness) and sulfate and carbonate anions from industrial process waters. Demineralization removes essentially all inorganic ions (sodium, chloride, etc.) when very pure water is needed (such as for high pressure steam generation). Specialty resins preferentially remove heavy metals such as chromium and mercury. Eventually, the resin becomes exhausted and must be regenerated. The pollutants that have been removed by the ion exchange resin are then transferred to a small volume of regenerant wastewater, which must be further treated and disposed of. The regenerated resin is then placed back in wastewater treatment service.

Chemical treatment

Chemicals can be added to wastewater to precipitate other inorganics as solids, to improve the performance of clarifiers and air flotation units by agglomerating small particles into larger, more dense particles that settle better, and to oxidize organic and inorganic chemicals. Common chemical treatment processes include:

- metals precipitation — lime, sodium hydroxide, and other alkali chemicals are used to immobilize heavy metals (e.g., cadmium, copper, lead, zinc) as insoluble precipitates, which are removed in clarifiers.

- coagulation — the use of chemicals to agglomerate (flocculate) small suspended solids or oil globules into larger suspended particles that have greater density differences compared to water than the original solids and thus settle (or float) more efficiently. This process enhances sedimentation or flotation.

- oxidation — the use of oxidizing chemicals (chlorine, chlorine dioxide, ozone, hydrogen peroxide, potassium permanganate) to oxidize organic substances and some metals (iron, for example). The oxidation products of organic substances may have lower BODs and/or may be less toxic than the original chemicals. The common treatment process for cyanides is chemical oxidation which forms nitrogen gas and carbon dioxide. Oxidants are also used for odor control. Oxidized iron (ferric iron) is less soluble than reduced (ferrous) iron and thus can be removed more effectively by precipitation.

- reduction — a chemical process in which a chemical reducing agent is used to reduce the valance of a metal. Used to reduce hexavalent chromium to the trivalent form, which will precipitate more effectively and is less toxic.

Biological treatment

Microorganisms, principally bacteria, can degrade virtually every organic chemical known — either naturally-occurring or synthetic. As a practical matter, however, some chemicals are so slowly degradable that they are considered not amenable to biological treatment — these are often referred to as *refractory* organics.

The key to successful biological treatment is adaptation (acclimation) of the microorganisms in the treatment process to the organic chemicals in the wastewater. Acclimation is a process of natural selection and if the proper conditions for biological growth are maintained, then acclimation is usually just a matter of time.

Biological treatment processes can be aerobic (in the presence of free oxygen) or anaerobic (in the absence of oxygen). Certain microorganisms are facultative — they can grow and degrade organics in either aerobic or anaerobic conditions. In general, aerobic biodegradation is a much faster process than anaerobic biodegradation, and the end products of aerobic degradation tend to be more completely degraded (often to carbon dioxide and water). Anaerobic processes are slower, and produce lower-energy organic substances and methane. Anaerobic processes are often used to pretreat wastewaters with very high BOD since they don't require the mechanical addition of oxygen (which is expensive) and generate methane which can be used to heat the process, which speeds up the anaerobic biodegradation. The anaerobic effluent is then aerobically treated to remove the remaining BOD.

Biological treatment systems can be divided into two basic classes: (1) suspended growth systems, and (2) fixed growth systems. In suspended growth systems the active microorganisms are suspended in the wastewater by the mixing action of either or both the air/oxygen introduced into the wastewater and mechanical mixing provided by mixing equipment or pumps. The bacteria in suspended growth systems agglomerate (flocculate) into particles that will settle from the wastewater when the mixing is terminated (as in a secondary clarifier).

In a fixed growth system, the microorganisms are attached to a solid media, which is contacted by the wastewater. When the microorganisms on the solid media accumulate to a critical thickness, they slough off the media in large particles which can then be removed from the wastewater in a secondary clarifier.

Suspended growth systems are most effective when the microorganisms adapted to the organic substances in a specific wastewater have a high growth rate. Such organisms flocculate well and are easily removed in the secondary clarifier and recycled back to the aeration tank. Thus, high microorganism concentrations can be maintained in the aeration tank and high rates of BOD removal are possible.

Fixed growth systems work well when the microorganisms are slow-growing, either because of the characteristics of the pollutants being treated or because the concentration of organics in the wastewater is low. Such wastes are not conducive to treatment in suspended growth systems since the microorganisms do not flocculate and settle well and will wash out of the system with the effluent. If the microorganisms can attach themselves to a solid media, they will not wash out of the treatment unit and can provide effective removal of the pollutants in the wastewater.

Examples of common biological treatment processes include:

Suspended growth systems

- activated sludge — a high-rate, aerobic system in which the microorganisms are suspended in the wastewater in a treatment tank or basin by the same mechanical process that adds the oxygen to maintain aerobic conditions. High concentrations of microorganisms are maintained in the aeration tank by removing them from the treated wastewater in a secondary clarifier and recycling the high concentration solids from the clarifier (the activated sludge) to the influent end of the aeration tank. There are many process variations of activated sludge (contact stabilization, complete-mix, plug flow, step aeration, pure oxygen), but all operate on the same principle. The activated sludge system generates excess biological growth which must be removed from the system and disposed of. This *sludge wasting* is done on a continuous or semi-continuous basis. The excess sludge can be biologically digested to decrease its volume, dewatered, and landfilled, landfarmed, or incinerated.

- aerated lagoon — an aerobic treatment system which operates at a lower mixing/aeration rate than activated sludge and which has no microorganism recycle. The biological solids in the effluent from the lagoon are removed by settling in a quiescent impoundment or in a clarifier. These systems have low microorganism concentrations in the aeration basin/impoundment and thus require longer wastewater residence times in the treatment system to accomplish the same level of treatment as activated sludge systems. Their advantage is that their usage of electrical power is much less than that required by activated sludge systems.

- PACT® — a combination of activated sludge treatment and activated carbon. Powdered activated carbon is added directly to the aeration basin and becomes intimately mixed with the microorganisms. It is recycled with the activated sludge. The carbon serves two purposes: (1) it provides a solid media for fixed growth of microorganisms and (2) it removes slowly degradable and toxic organic substances that are not effectively degraded by the activated sludge. Although it has never been proven, it has been hypothesized that the powdered activated carbon is biologically regenerated to some extent. If small quantities of carbon are added to the activated sludge, then the excess carbon and sludge from the treatment system are disposed of in the same method as excess activated sludge. In systems that use high dosages of powdered carbon, the carbon is regenerated and returned to the system.

- waste stabilization ponds — low rate biological systems that use natural reaeration processes and long hydraulic residence times to remove organic pollutants and nitrogen from the wastewater. Symbiotic growth of algae (microscopic aquatic plants that generate oxygen) and natural reaeration provide oxygen for the bacteria that degrade the organics. These treatment systems are very inexpensive to operate and are used by many small municipalities.

- anaerobic suspended growth systems — anaerobic systems are often used to biologically pretreat wastewaters with high BOD concentrations, especially if the organic substances are highly biodegradable. In the suspended growth systems, a mixer is provided to keep the biological solids in suspension. These systems generally produce significant amounts of methane gas, which is used to heat the anaerobic reactor. Anaerobic bacteria degrade organic substances most efficiently at high temperatures. Excess methane is often used to replace natural gas for heating at the treatment plant and is sometimes used to generate electricity or steam.

Fixed growth systems

- trickling filter — a tower or tank that is packed with natural (rock) or synthetic media (plastic) over which thin films of wastewater are passed. Aerobic microorganisms growing on the surface of the media remove the pollutants from the wastewater as it flows over the media surfaces. A secondary clarifier removes suspended particles of biomass that slough off the media.

- rotating biological contactor (RBC) — a fixed media system in which the aerobic microorganisms are attached to large rotating plastic discs that are partially immersed in the wastewater being treated. Wastewater adheres to the biomass on the disc when the disc is submerged, and a thin film of wastewater clings to the disc as it comes out of the wastewater and is exposed to the air.

Oxygen is supplied to the microorganisms as the discs are exposed to the air and they degrade the organics and ammonia in the wastewater. Multiple discs are arranged on a rotating shaft and there is usually one shaft per RBC tank (referred to as a stage). Multiple RBC tanks are operated in series to achieve high levels of wastewater treatment.

- anaerobic filter — a closed tank system packed with a synthetic media to allow fixed growth of anaerobic bacteria. Since anaerobic bacteria grow slowly, fixed growth systems allow the accumulation of high concentrations of anaerobic bacteria in the treatment unit. These systems generate methane, as described earlier in the discussion of suspended growth anaerobic systems.

Pollution prevention

Pollution prevention is the new *buzz word* among the regulators and environmentalists. However, the concept and its application is nothing new to those involved in environmental management; the advantages of the waste management approaches broadly referred to as pollution prevention have been described in environmental engineering textbooks and publications for decades.

The pollution prevention concept is that if pollutants and wastes can be controlled or eliminated at or near their sources, then treatment and discharge of pollutants can be reduced or even eliminated. The principle approaches to pollution prevention include:

- process change — change the manufacturing process to reduce or eliminate pollutants and waste generation. Materials substitution is one type of process change — a toxic chemical is replaced by a less toxic or nontoxic chemical.

- product substitution — discontinue manufacture of products whose production generates large amounts of wastes or highly toxic wastes and replace them with products that have more desirable waste generation characteristics.

- recycle/reuse — recycle and reuse the wastes generated by a process, either in the process that generated them or in another manufacturing process. In the simplest form, this consists of recycling treated wastewater for cooling water, for example.

- source treatment — remove pollutants by applying treatment processes at the point of generation (the manufacturing process), where treatment is often more effective.

- waste minimization — this is a catch-all category that includes such activities as better housekeeping in manufacturing areas, returning product samples collected for quality control testing to the product rather than discarding them to the sewer, and similar steps that reduce the amount of pollutants discharged to the sewer.

As stated earlier, all of these pollution prevention steps are well understood and have been applied for many years to reduce waste loadings. However, many of these steps fall into the *easier said than done* category, and economics is typically the major factor determining when they are used. For example, there are few manufacturing firms that are so altruistic that they will abandon manufacture of a product if it is their major source of revenue and profit. If it is less expensive to treat wastewaters to remove pollutants at the end of the pipe than it is to change the manufacturing process, then end-of-pipe treatment will be selected. As environmental regulations become increasingly strict, and end-of-pipe treatment becomes more expensive, pollution prevention practices will be increasingly applied.

Residuals management

No description of wastewater treatment is complete without a discussion of the residuals generated by the treatment processes. Physical, chemical, and biological treatment processes remove pollutants from the wastewater, but in most cases generate some form of residual that will require treatment and disposal. The form of the residuals is a function of the type of treatment process that generates them. A few examples are:

- sludges — these are mixtures of high concentrations of solids in water. They may flow like a liquid or may be as thick as a paste. They are generated by physical, chemical, and biological processes and their physical and chemical characteristics are a function of the process that generates them and the wastewater that is being treated. For example, the sludge generated by the removal of metals from wastewaters contains the metals in a concentrated, but immobilized, form. Biological sludges (waste activated sludge, for example) consist principally of the bacteria and microorganisms that degrade the organic substances in the wastewater that was treated — the organic chemicals in the wastewater will generally not be present in the sludge since they are biodegraded by the bacteria. Many different forms of treatment and disposal are available for sludges, depending upon the characteristics of the particular sludge that must be managed. Ultimately, some solid residues must be disposed of by landfilling or some method of reuse.

- wastewaters — treatment processes such as ion exchange and steam stripping remove the target pollutants from a large volume wastewater stream and concentrate them in a low volume wastewater stream, which presumably should be easier to treat and dispose of.

- oils/greases — these materials, which are skimmed from the surface of physical treatment units, are usually recycled into the production process. Petroleum refineries, for example, recover oils from oil/water separators and separator sludges and add them back to the refinery crude oil charge.

- air emissions — some processes, such as air stripping, transfer volatile pollutants into an air stream. These air emissions must be controlled by treatment when they are significant. When activated carbon is regenerated by thermal processes, the organic substances sorbed on the carbon are released and combusted, which creates air emissions.

This is only a brief overview of the residuals generated by wastewater treatment systems. Residuals management is an environmental field in and of itself, and is governed by other environmental statutes and regulations including the Clean Air Act (CAA) and Resources Conservation and Recovery Act (RCRA). The increasing emphasis on multimedia waste management assures that selection of treatment methods for wastewater will include thorough consideration of the effects of such selection on other media.

Laws and regulations

In 1972, the basic statutory structure of all existing water quality management programs was enacted by Congress over the president's veto. The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) established federal primacy over water quality management in the United States. Prior to 1972, each state had its own water quality management program (if any), and there was little consistency between states.

The FWPCA set up a regulatory framework in which the U.S. Environmental Protection Agency (EPA) is required to establish the minimum acceptable national requirements for water quality and wastewater management. States, to which EPA may delegate the responsibility to administer and manage many of the statutory requirements of the FWPCA, can set more restrictive requirements than the national standards established by EPA, but can not set less restrictive requirements.

The FWPCA has been reauthorized and amended a number of times since 1972. The key changes came in 1977 (when it was renamed the Clean Water Act — CWA) and in 1987 (Water Quality Act of 1987 — WQA). Both of these amendments emphasized increased controls on toxic pollutants. The 1987 amendments required the states and EPA to identify *toxic hot spots* [the so called §304(l) listings] and to establish control strategies to remedy these problems by 1993. The CWA is currently being reviewed by Congress for reauthorization and amendment, which will probably occur in 1992.

The following discussion summarizes key aspects of the CWA and their implementation by EPA and the states. The summary is focused on those aspects of the CWA that are most closely related to the permitting of dischargers — other portions of the CWA dealing with subjects such as research, grants for the construction of treatment works, and education are not discussed.

Permits

The National Pollutant Discharge Elimination System (NPDES) permit is the key instrument for implementing the regulatory programs of the CWA. NPDES permits are required for *point source* discharges to surface waters (CWA §§301, 402). A point source discharge is:

- a discharge of pollutants;
- from a discrete conveyance (a pipe, ditch, etc.); and

- includes landfill leachate collection systems (WQA, §507).

In the WQA Congress specifically required that NPDES permits be issued for storm water runoff that is discharged from point sources. There are few exemptions from the NPDES permit requirements — the most significant is probably return flows from agricultural operations.

NPDES permits contain the following provisions:

- effluent limitations — these specify the pollutants, and the amount of such pollutants, that may be discharged by the permittee. Typically, there are two sets of numerical permit limits for each pollutant (a short-term maximum and a longer-term average allowable discharge rate). Pollutants are supposed to be limited on the basis of allowable mass discharges (pounds per day) whenever this is possible.

- monitoring provisions — these specify the frequency at which the permittee must sample and analyze the effluent for each pollutant controlled by the NPDES permit. Self-monitoring is the primary enforcement vehicle of the NPDES permit system. Permittees must routinely analyze their effluents, using analytical methods that have been approved by EPA (at 40 CFR 136), and report the results to EPA and the states on discharge monitoring reports (DMR). DMRs are usually submitted monthly.

- compliance schedules — many permits will establish a schedule for compliance with specific permit limits and conditions. Since new conditions and permit limits are often added to a permit at renewal to reflect changes in standards and regulations, a permittee may not be able to comply with the new permit limits immediately when the permit becomes effective. A compliance schedule gives the permittee time to make the necessary changes in its discharge to comply with the new permit limits.

- standard provisions — also known as *boilerplate* provisions. These are the same in all of the NPDES permits issued by a particular permitting authority (state or EPA) and specify standard procedures such as sampling and analysis methods, notification requirements, penalties, and bypassing provisions.

- special provisions — this is an optional section in most permits.

It will include requirements that are specific to the permittee and can include special sampling requirements (such as for fish tissue in receiving waters) and permit-specific interpretations of numerical permit limits and other permit conditions.

Permits must be renewed every 5 years, or sooner if the discharge is expected to change substantially. A substantial change includes the addition of new pollutants to the wastewater or the increase in the discharge of a permitted pollutant.

EPA can issue general NPDES permits to cover an entire class of dischargers. This is done when the characteristics of the wastewater are sufficiently similar between dischargers so that it is practical to establish a generic set of permit limits and conditions. An example of a general NPDES permits are the permits issued to off shore oil production facilities. EPA plans to use general NPDES permits for many types of storm water discharges.

The EPA regulations on NPDES permits and applications are published at 40 CFR 122.

NPDES permit limits for specific pollutants are to be calculated using technology-based standards and water quality standards, and the more restrictive of the two are to be applied (CWA, §§301, 302). EPA regulations at 40 CFR 125 provide detail on the criteria for setting NPDES permit limits.

Technology-based limits

The CWA specifies that EPA establish nationally applicable technology-based standards for municipal and industrial wastewaters. These standards represent the minimum acceptable level of treatment that is allowed, based on a technical and economic analysis of pollutant control technologies that are available for a specific type of wastewater (CWA §304).

Secondary treatment is identified as the minimum acceptable level of treatment for municipal wastewaters (domestic sewage). Secondary treatment for municipal treatment plants (referred to in the CWA as publicly owned treatment works — POTW) consists of biological treatment, usually but not always preceded by primary treatment. The secondary treatment standards are published at 40 CFR 133.

Technology-based treatment standards for industrial dischargers are more complicated. The standards are established by industrial categories (petroleum refineries, pulp and paper mills, chemical plants) which are further disaggregated into subcategories. This is done so that the wastewater generation and treatability characteristics are properly accounted for in the technology analysis. The technology standards for direct dischargers are referred to as effluent limitations guidelines and are as follows:

- best practicable control technology currently available (BPT) — this is equivalent to secondary treatment for POTWs and addresses the conventional pollutants (BOD, TSS, oil and grease, pH, coliforms).

- best conventional pollutant control technology (BCT) — this standard addresses additional removal of conventional pollutants from industrial treatment — over and above BPT-level treatment. For BCT to be applicable to an industrial category, EPA must perform a cost-effectiveness test to demonstrate that the incremental cost increase for additional conventional pollutant control does not exceed the corresponding incremental cost for a typical POTW to remove additional conventional pollutants beyond secondary treatment.

- best available technology economically achievable (BAT) — this is the level of treatment required for toxic and nonconventional pollutants. In spite of the use of the term *economics* in the title, economic cost-effectiveness carries little weight in the decision as to which technology is specified as BAT.

- best available demonstrated technology (BADT) — also known as new source performance standards (NSPS). These are standards for conventional, nonconventional, and toxic pollutants that apply to plants that are constructed after adoption of the effluent limitations guidelines for the industrial category to which the plant belongs. These standards are more restrictive than BPT, BCT, and BAT wherever possible, since it is presumed that if a plant is designed from scratch to meet a specific set of environmental standards, pollution prevention and advanced treatment techniques can be constructed into the new plant. An incentive to do this is built into the BADT standards —

the permit limits for conventional and nonconventional pollutants will not be made more restrictive for 10 years after initial permit issuance.

EPA must consider a number of factors when it develops technology-based limits for industrial categories. These requirements are specified at CWA §304. The Agency is supposed to review and update its effluent limitations guidelines every 5 years. Because of the enormous effort involved for each such set of guidelines, EPA has virtually never met this schedule.

In addition to standards for direct industrial dischargers, there are technology standards for indirect industrial dischargers (dischargers to POTWs). These are referred to as pretreatment standards and are designed to prevent industrial pollutants from interfering with or passing-through POTWs without sufficient treatment. The general pretreatment regulations are published at 40 CFR 403.

In addition to the general pretreatment standards, their are *categorical* pretreatment standards that are equivalent to the effluent limitations guidelines for direct dischargers. These include pretreatment standards for existing sources (PSES) and pretreatment standards for new sources (PSNS). They are published for each subcategory, but only regulate the discharge of those pollutants that are incompatible with treatment at a POTW. Thus, for example, pretreatment standards do not regulate BOD and TSS.

The industrial effluent guidelines and categorical pretreatment standards are published at 40 CFR §§401-464. These technology-based standards are binding on permit writers, i.e., they cannot set permit limits that are less stringent than the effluent limitations guidelines. Variances from the technology-based standards are available in very limited circumstances. The best known variance is the *fundamentally different factors variance* [CWA §301(n)]. Basically, the applicant must prove that its plant is fundamentally different from the plants in the same industrial category that were used to set the effluent limitations guideline for that category, and that this fundamental difference prevents compliance with the national standard. EPA has issued only a handful of such variances since the effluent guidelines program was started in 1974.

For some industrial categories, EPA has not adopted any effluent limitations guidelines. In such cases, the permit writer develops the technology-based permit limits based upon *best professional judgement* (BPJ). These are case-by-case permit limits which take into account the characteristics of the permit applicant's wastewater, the performance of existing treatment equipment, and the availability of other treatment technologies that could treat the waste. Often, the permit writer will use data from another industrial facility which he/she believes treats wastewater with similar characteristics and treatability — this is termed *technology transfer*. In most cases, if the permittee has a well-designed and well-operated treatment system, the BPJ permit limits will be based on a statistical analysis of the past treatment system performance.

Water quality-based limits

Water quality-based permit limits are calculated to assure that the water quality standards applicable to the surface water to which the effluent is discharged will be achieved. States must establish water quality standards pursuant to CWA §303 to assure that all designated water uses can be achieved at all times in the surface waters of the state. EPA must approve these standards. These water quality standards include conventional, nonconventional, and toxic pollutants. The WQA requires that all waters of the U.S. be designated as fishable and swimmable, unless a detailed analysis of a water body determines that these uses cannot be achieved (a use attainability analysis).

Water quality standards are established by each state and should reflect the differences in water quality and ambient environmental conditions in each state. Even within a state, there will often be significant differences in water quality standards for different water bodies. For example, water quality standards to protect fresh water aquatic life are much different than the standards to protect marine aquatic life. Also, warm water aquatic life has different sensitivity to toxic chemicals and dissolved oxygen than does cold water aquatic life. Thus, water quality standards are inherently site-specific and a site-specific analysis of water quality must be made for each surface water body to assure that the applicable water quality standard is met.

Most states provide for mixing zones, which are small areas immediately adjacent to an effluent discharge where the water quality standards do not have to be achieved. These areas allow for rapid mixing and dilution of the effluent and the receiving water, which takes place quickly enough so that aquatic life is not exposed to harmful conditions. Two mixing zone definitions are typically used:

- zone of initial dilution (ZID) — a small area of a receiving water adjacent to the discharge where the standards to protect aquatic life from acute toxicity do not have to be met; and

- regulatory mixing zone, mixing zone — a slightly larger area than the ZID, in which the chronic aquatic life standard does not have to be achieved.

In both cases, the size of the mixing zone is established to assure that no acute or chronic aquatic life toxicity is possible due to the effluent discharge.

Toxic pollutants that are controlled to protect human health are also usually allowed a mixing zone. In this case, the mixing zone is provided for to account for the fact that the exposure assumptions used to derive the human health-based water quality criteria cannot be satisfied in the mixing zone, and that some dilution of the toxicant will occur before human exposure is possible.

When a permit is to be issued, the permitting authority must make an analysis of whether or not the permitted discharge could jeopardize the achievement of a water quality standard in the receiving waters. If there are multiple discharges of the same pollutants into a receiving water, all of these sources must be considered in the analysis of water quality impacts. These analyses of water quality impacts may be done by simple dilution calculations or with sophisticated water quality models. The type of analysis performed depends upon the complexity of the water quality problem and the sophistication and resources of the regulatory agency that is responsible for performing the analysis.

If the analysis shows that the water quality standards in a specific surface water segment will not be jeopardized by discharges that meet all specified technology-based standards, it is referred to as an *effluent limited* segment. If the water quality impact analysis shows that the water quality standards will not be achieved when all dischargers are meeting the applicable technology-based standards, the segment is *water quality limited.*

Dischargers to a water quality limited segment must have permit limits that are established to assure that the water quality standards will be met under critical hydrologic conditions. These water quality-based permit limits are established through a waste load allocation process, in which the amount of pollutant that can be discharged without exceeding the water quality standards is allocated to each discharger of that pollutant. The waste load allocation analysis was described earlier, under the topic of water quality modeling.

As stated earlier, the water quality-based permit limits are compared to the technology-based limits for the same pollutant, and the more restrictive of the two is used in the NPDES permit.

BASICS OF
HYDROGEOLOGIC INVESTIGATIONS

THIRD ANNUAL TEXAS ENVIRONMENTAL SUPERCONFERENCE
AUGUST, 1991

ROBERT CHAPIN

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INTRODUCTION.

My objective is to briefly touch upon the major technical, hydrogeologic terms and procedures that lawyers will encounter in the normal practice of environmental law. The ultimate purpose of a hydrogeologic investigation is to define the rate and extent of groundwater contamination and then, if necessary, design and implement remedial action. The three basic steps to conduct such an investigation are data collection, data reduction, and data interpretation. At any point in any one of these three phases, the person conducting the study can make mistakes. While entire papers can be and are presented on each individual step, I will briefly discuss the procedures and concepts involved and point out some of the technical problems that can effect the final analysis of the extent of contamination.

Perhaps the most frustrating part of this process to people who are not technically oriented is that the technical experts cannot accurately predict what we will find once we start digging. For example, in many areas from Houston to Beaumont we find a saturated sand at about thirty feet below the surface of the ground, give or take ten feet. However, I have planned several investigations around this "fact" only to have the drilling crew report that they drilled to fifty feet and did not find any sand. The variability and unpredictability of subsurface investigations become even more pronounced in the Austin area where wells completed at the same depth thirty feet apart may not intercept the same fracture system in the limestone and may contain water with radically different chemical constituents.

GROUND WATER.

The fundamental starting point in this discussion is to define groundwater. The most commonly accepted, classical definition is subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated. Groundwater commonly occurs in an aquifer, which is a saturated, permeable geologic unit that can transmit significant quantities of water under ordinary hydraulic gradients. However, the question arises when ground water is ground water, but not in an aquifer, what does it mean regulatorily.

Those of us who are trained to argue can see that the regulatory and technical loopholes begin immediately. Recognizing what is saturation, where is the water table, and what are significant quantities of water, can alter decisions that can affect thousands of dollars and the direction of complicated remedial or corrective actions. An administrative judicial officer at the United States Environmental Protection Agency (EPA) ruled last winter that detection monitoring was required under the Resource Conservation and Recovery Act (RCRA) only in the uppermost aquifer at a regulated unit. In the case in question, a landfill had installed monitor wells in a very shallow glacial till that was not the uppermost aquifer. When contamination was detected in the shallow zone, EPA had insisted that the company begin corrective action. The company argued successfully that since the zone was not the uppermost aquifer, they had not violated any RCRA regulations. Indeed, the source of contamination in such shallow zones may not be from a regulated unit at all.

DATA COLLECTION.

The collection of subsurface data is probably the phase of hydrogeologic work most familiar to the practitioners here today. The collection of data involves the physical act of drilling and sampling, as well as the measurement and observation of the materials that are encountered. This phase begins with the drilling of boreholes in order to take soil and/or groundwater samples. The three drilling methods commonly used are solid stem or hollow stem augers, mud rotary, and air rotary.

The hollow stem augers commonly used are continuous flight, spiral, open blade types. The auger stem is turned by a rotary drive head mounted on a hydraulic system that moves the augers up and down. Soil samples are obtained by using the hydraulic system to push a tube ahead of the advancing augers into the sediments. This method of drilling is preferred for the installation of monitor wells because no other fluids are introduced into the borehole that could alter the chemistry of the water to be sampled. However, augers are limited to drilling through formations that consist of soft sediments such as sand and clay and to depths of less than 150 feet. If large gravel deposits or hard rocks are encountered, another method must be used. Also, if a highly saturated, well-sorted sand is encountered, the auger flight may not carry the material upward to the surface, and drilling may stop. In this case, when the bottom plug is pulled to install the well inside the augers prior to pulling them up, the drill stem may act like a large syringe and draw the loose, flowing sands up inside the hollow augers and prevent installation of the well.

Mud rotary is the more traditional alternative drilling method. In this method, a borehole is advanced by means of a rotating drill bit and by removing the cuttings by continuously circulating a drilling fluid as the bit penetrates the formation. The bit is attached to the lower end of a string of drill pipe. The drilling mud is pumped down through the drill pipe and out through nozzles in the bit. The mud fluid flows upward in the space between the drill stem and the sides of the borehole to the surface. The drilling mud serves an additional purpose by keeping the borehole from collapsing by counteracting the pressure from the groundwater in cohesionless sands. This method is the traditional drilling seen at the movies with John Wayne standing under a gushing oil well. The downside of this drilling method for the investigation of contamination is that all the mud and any water that was introduced with it must be removed before representative groundwater can be sampled. In addition, the mud can seal off small zones that produce water slowly, but may be of interest in characterizing where the contamination is.

Air rotary uses compressed air at about 100 pounds per square inch as the drilling fluid, rather than drilling mud. Air is circulated through the drill pipe, out through the ports in the drill bit, and upward in the annular space around the drill pipe. The high velocity of the air carries the cuttings to the surface and blows them out into the surrounding formation. This type of drilling can only be done in consolidated materials, such as limestones and sandstones. In the right type of conditions, air rotary can be much faster than any other type of method. Also, the driller can observe how much water is being blown out of the well with the cuttings and estimate where the water-bearing zone is located. The disadvantage to this method is that volatile organic compounds of interest can be blown out of the well also. In addition, the lubricating oil in the air compressor can be blown into the well to give false positive at low detection levels for the constituents of oil and gas.

No matter which drilling method is used, the prime consideration for the investigation is to minimize the potential for cross contamination. All drilling equipment and tools must be decontaminated between each hole. Sampling equipment must be decontaminated between each sample. The geologist handling the samples to log them for lithology and other characteristics and to put the samples into the jars to send to the laboratory should change his plastic gloves between each sample. All these precautions are to ensure that contaminants are not carried over from one location to another, or one sample to another.

Well installation. Once the desired depth has been reached, the next step is to install the well. Usually, shallow wells of less than 50 feet for investigatory purposes will be two-inch diameter. With increasing depth, the well diameter will increase to four, six, or eight inches. Well materials can be polyvinyl chloride (PVC), stainless steel, fiberglass, or teflon, depending on the nature and concentration of the contaminant of concern. For example, some solvents will cause PVC to deteriorate over time and begin to contribute its own constituents to the mix of compounds being sampled and analyzed. The well will consist of solid casing and screen that allows the groundwater to enter the well. The well screen should be set to slightly above the top of the zone of saturation. This setting will allow for fluctuations in the water level with seasonal changes in the amount of rainfall and streamflow that enter the subsurface aquifer. Also, if any free-phase hydrocarbons are floating on the top of the water table, these lighter than water components can enter the well from above the water table.

A sand pack is added around the outside of the well screen between the screen and the side of the borehole. This sand pack should be graded so that the grains of sand are of uniform size and should be cleaned to remove any impurities. The sand pack acts to increase the effective radius of the well by creating a zone of more highly permeable material in which groundwater can accumulate. The sand also serves to protect the well by filtering out silt and clay that could plug up the screen or actually fill up the inside of the well.

Bentonite pellets are added on top of the sand pack. Bentonite is a particularly pure form of clay with a distinctively high capacity to swell when hydrated. The pelletized form sinks quickly and uniformly through the water column on the outside of the well casing and swells to form a relatively impermeable seal on top of the sand. A cement-bentonite slurry is then pumped down to the top of the pellets and rises to the surface to completely seal the well off from any contaminants that might enter the well from above.

Finally, a surface pad of concrete is poured around a steel housing for the length of well casing that sticks up above the ground. This steel well cover and cement pad serve to prevent any potentially contaminated rainfall runoff or surface spills from entering the well, and to partially protect the well from destruction caused by vehicles or heavy machinery.

Mistakes and/or material failures can occur at any one of these steps in well installation and can compromise the integrity of the well and thus the reliability of the data generated from the well. An entire industry exists to correct such mistakes in oil and gas production wells and municipal and domestic water supply wells, all of which are generally deeper and more expensive than monitor wells. The degree of scrutiny given to the groundwater data and the relative inexpensiveness of the wells usually result in a decision to pull, plug, and replace defective monitor wells. However, the nature of the well concealed beneath the ground can make diagnosing well construction and completion problems difficult. Leakage of cement into the well screen may result in a pH of the water in the very basic range. Improperly sized sand pack may allow silt and clay into the well so that a clear water sample can never be obtained. A material defect in the well casing or a poor cement job can allow water from the surface or other zones above the screen to enter the well. The resulting mixture may have a chemical composition unlike either of the originating water-bearing zones and drive the project team crazy until the problem is ascertained. I have inspected regulated units where the entire monitor well system is not capable of detecting a release as required in the Permit because of improper installation.

The next step is **well development** where the well is bailed by hand, pumped out, surged, or jetted with air to remove any mud or silt that may have been entrained in the sand pack or within the well screen and to orient the sand grains in the sand pack to allow for the maximum water flow into the well. The well should be developed until the water is relatively free of sediment, and simple indicators of water quality such as temperature, conductivity, and pH have stabilized over time to indicate that true formation waters are entering the well. This process can range from three to ten or even fifteen well volumes of water. The result of improper development will be more apt to result in false positive detection of contaminats in groundwater sample analyses, with the obvious legal ramifications.

DATA COLLECTION.

The first critical field parameters to be measured are the location and elevation of the top of the well casing and of the ground next to the well. Accurate surveys are essential in order to later calculate the rate and direction of the flow of the groundwater. In many areas along the Gulf Coast, the change in elevation of the water table from well to well across the entire site may be less than one foot. Therefore, surveyed elevations are routinely reported to the nearest one hundredth of a foot.

Then, the depth of the water or fluid level below the top of the well casing is also measured to 0.01 foot. This measurement can be done with an electric line that registers a current when the probe at the end of the line encounters water, or with a steel tape coated with a water sensitive paste that changes color when wet. The thickness of a floating free-phase hydrocarbon layer can be measured with an interphase probe that reacts differentially to the hydrocarbon and to water. The depth to water in each well is then subtracted from the surveyed elevation to calculate the elevation of the water level, from which the direction of flow is derived. The importance of the degree of water level measurement accuracy increases with the decrease in water level variability at a given site. Inaccurate water level readings can lead to errors in the direction of aquifer flow, the rate of groundwater movement and miscalculations of aquifer characteristics.

Knowing the depth of the well and the height of the water column in the well, we can calculate the volume of water contained in the well. Before the well can be sampled for chemical analyses, at least three well volumes of water must be removed or purged from the well in order to ensure that a representative sample of the water in the aquifer is obtained. A great deal of research has shown that the water that remains stagnant in the well above the top of the screen can undergo a variety of chemical changes that can mislead an investigator if the well is not purged properly. In one instance, the chemical quality of a municipal supply well in the Panhandle that was only used to supplement the water supply in the summer took up to 45 minutes of pumping to stabilize. Therefore, the pH, conductivity, and temperature of the water must be monitored frequently. If these indicator parameters have not stabilized over the three well volumes purged from the well, then purging must continue through however many well volumes are necessary for the indicators to remain constant. The field personnel responsible for this activity should maintain a log of the measurements of the indicator parameters to document that this crucial step was performed correctly. Otherwise, the reliability of the chemical analyses of the water samples can be questioned.

Once we are reasonably sure that water in the well is representative of the water in the aquifer, the water can be sampled. Both purging and sampling can be accomplished with hand bailers, electric submersible pumps lowered to the water, or with bladder pumps or jet ejector systems powered by a compressed air source at the surface. The choice of equipment will depend on the diameter and location of the well, the depth to water, and the chemical constituents of interest. While two-inch diameter submersible pumps have become more efficient in the last few years, their pumping capacities are still only one to two gallons per minute. This rate may be sufficient for the silty, clayey, shallow sands on the Gulf Coast, but may not be enough in gravel or limestone aquifers farther inland. Systems that use air to lift the water to the surface are not recommended in situations where volatile organic compounds are of interest because these constituents may vaporize before being sampled, leading to false negative readings.

The final measurements commonly taken in the field are those taken for pump tests or slug tests. In a pump test, water is pumped out of the well for an extended period of time, usually from 12 hours to as much as 3 or 4 days. In a slug test, a known volume or slug of water is either withdrawn or introduced into the well "instantaneously", or as fast as possible. In both kinds of tests a stress is placed on the aquifer, and the resulting change in the elevation of the water level in the well and adjacent wells is measured over time. The depth versus time relationship is used to calculate the aquifer characteristics discussed later. While the pump test will provide the most complete and accurate set of data, the length of the test means that personnel must be in the field continuously for an extended period of time and that a relatively large quantity of water must be disposed of. Both of these considerations can be costly, particularly if the water quality prevents the direct discharge of the produced water. Since slug tests can be run on several wells in a single day and only a few gallons of water are involved, these tests are usually run where the aquifer is shallow and not highly permeable, and where two inch diameter wells have been installed.

At any step in any of these field operations, things can go wrong, and mistakes can be made. When we are called upon to serve as expert witnesses in cases, the first order of business is to review all of the reports and field log books that have been made available. We are searching for those small errors or lack of documentation or inconsistencies in reporting or in the data collection, reduction and interpretation that will call into question the larger conclusions that were drawn on the data. We question whether the wells were properly installed so that perched water cannot enter the well screen, whether the wells were properly purged to ensure the representative quality of the water, whether enough water level measurements were taken to correctly draw the graphs, or whether the pump test was run long enough to reach the steady state conditions assumed in the subsequent calculations.

The single biggest concern in any field work is cross contamination, that contaminants found in one area or well will be introduced into another by the actions of the investigators. Rigorous decontamination procedures must be followed at all times to ensure that all the drilling and sampling equipment have been thoroughly cleaned between each borehole or each sample. The success of these decontamination procedures should be documented with standard quality assurance/ quality control samples. These samples are: equipment blanks where distilled water is run over and/or through the cleaned drilling and sampling equipment and into a sample bottle to be analyzed for the same chemicals as the water and soil samples; trip blanks which are sample bottles filled with distilled water that accompany the field samples to and from the laboratory to ensure that no chemicals enter the samples in transit; and duplicate samples which ensure that the taking, handling, shipping, and analyzing of the samples will produce relatively the same resulting concentration of chemicals. If any of these QA/QC samples indicate a problem, the field effort may have to be redone since the reliability of the data becomes questionable. I know of one investigation where a $750,000 field effort was completely redone because the laboratory missed the holding times for the majority of the samples by a few days and the data were not legally defensible.

DATA REDUCTION

Data reduction involves the calculation of chemical and physical characteristics of the aquifer. The chemical characteristics are usually compiled into tables to demonstrate what constituents were detected and onto maps of the site to show the lateral extent of concentrations of the constituents of concern. Additionally, chemical concentrations may be superimposed onto logs of the soil borings or cross sections drawn from a series of logs to depict the vertical penetration of the chemicals. If enough chemical data have been generated, a statistical evaluation may be conducted on the data to compare the concentrations of chemicals downgradient of the site to background concentrations in unaffected areas. The statistical methodology is dependent on the quality and quantity of the data that have been generated and cannot always be specified in advance. For many years, facilities were locked into inappropriate statistical methods by the terms of their operating permits, but the regulatory agencies are beginning to show more flexibility in this area after reviewing statistics from which no conclusions can be drawn.

The physical reduction of the field data in its most basic form begins with the generation of the boring and monitor well installation log by the field geologist. In this log, the geologist compiles all of the observations and descriptions of the geologic materials encountered at each drilling location. The geologist may generate cross sections drawn from lining up a series of these logs in a semblance of a straight line to depict how the subsurface geology changes across the site. Normally two cross sections are drawn at right angles to each other to provide a three dimensional view of the geology.

The geologist will also draw a map of the elevation of the water levels in the aquifer. This map resembles the topographic map of the surface of the ground. As with surface water, the groundwater will flow downhill, from areas of higher elevation to lower areas. Therefore, this map will depict in what direction(s) the groundwater will flow. The gradient is calculated as the difference in elevation from the highest water level elevation measured to the lowest known point along the direction of flow.

The geologist uses the data of water level elevations over time generated during the pump or slug test to generated a variety of graphs and/or charts depending on the type of aquifer, the field test conducted, and the amount and quality of the data. These data and graphs are used to calculate the physical characteristics of the aquifer. In each type of calculation, it is important to understand the assumptions that underlie the methodology. For instance, most of the methods assume that the aquifer is homogeneous and isotropic, that is, it consists of the same materials and has the same characteristics in all directions including vertically. While few aquifers actually are found like this, these basic assumptions usually are accurate enough for the amount of data generated. However, some calculation methods are only valid if the aquifer is confined. Some of these methods have been adapted for use in unconfined or water table aquifers. If a particular data reduction technique is applied in a situation that violates the basic assumptions, then the conclusions drawn about how water moves through the aquifer may be invalid.

The following aquifer characteristics are of most interest:

- **Hydraulic conductivity (K)** is the capacity of the aquifer to transmit water of a prevailing viscosity and density through a unit cross-sectional area (i.e., one square foot). The hydraulic conductivity is equal to the transmissivity divided by the aquifer thickness. Hydraulic conductivity values are expressed in gallons per day per square foot (gpd/ft^2). This term is different than **permeability** in that permeability is totally dependent on the characteristics of the water-bearing formation, the size and arrangement of the particles in an unconsolidated formation and the size and character of the surfaces of the crevices, fractures, or solution openings in a consolidated formation.

- **Transmissivity (T)** is the rate at which water of a prevailing density and viscosity is transmitted through a vertical section of the fully saturated thickness of an aquifer which has a unit width (i.e., one foot wide) and a unit hydraulic gradient (i.e., one foot per foot). Therefore, transmissivity is a function of the properties of the liquid, the porous media (the aquifer), and the thickness of the aquifer. Transmissivity values are expressed in gallons per day per foot (gpd/ft).

- **Flow velocity (V)** is the rate at which the ground water moves through the aquifer. The velocity is calculated as the product of the hydraulic conductivity times the flow gradient divided by the porosity of the aquifer. Therefore, how fast water flows through the aquifer depends on the slope of the water level, the characteristics of the water, and the characteristics of the aquifer.

- **Coefficient of storage (S)** of an aquifer is the volume of water released form storage, or taken into storage, per unit surface area of the aquifer per unit change in the elevation of the water level. In water table aquifers, S is the specific yield, the quantity of water that a unit volume of the aquifer will give up when drained by gravity. In confined aquifers, S is the result of the compression of the aquifer and the expansion of the contained water when the pressure is reduced during pumping. It is a dimensionless term.

These terms define the hydraulic characteristics of a water-bearing formation. Transmissivity indicates how much water will move through a formation, and the coefficient of storage indicates how much water can be removed by pumping or draining the aquifer. Using these calculated values, we can make some important predictions at a given site, including:

- **Specific capacity**, or the amount of water a well will yield per unit of drawdown, and

- **Drawdown** in the aquifer, or how much lower the water level will be at various distances from a pumping well, or at any time after pumping commences.

Once again, the legal practitioner should be aware of what these terms mean and some of the assumptions behind them to look for clues when the terms are misapplied or used incorrectly. As mentioned earlier, these are basic concepts in data reduction. Once these characteristics have been determined about the aquifer, other processes may be used such as simple data manipulation and presentation to highly complex three dimensional transport modeling. With this in mind, a simple error made back in the field can now snowball into weeks of faulty data reduction.

DATA INTERPRETATION

The last step in any hydrogeologic investigation is the interpretation of the data. The goals remain the same: to state how much contamination is there, how far has it gone, how much farther is it likely to go, how likely is it that another well or surface water will be impacted, and how do we clean it up.

We begin with the maps of the elevation of the water level and of the concentrations of the contaminants of concern. Both these maps can be thought of as descriptions of the subsurface topography. Water and contaminants will flow "downhill" from areas of higher elevation of concentration to "lower" areas. We can determine the area of contamination by direct inspection of the map. If the monitor wells and soil borings have gone as planned, we know the depth to which the contaminants reach. By making assumptions about the porosity of the geologic material that forms the matrix of the aquifer, we can multiple the area by the depth, factor in the concentration and the porosity, and provide an estimate of the amount of material that must be removed from the aquifer. Of course this does not account for the chemicals that are adsorbed directly onto the sand, silt, or clay particles that make up the formation, nor does it account for the amount of contaminants that may be in the soils above the water level. Estimates can be made of these volumes based on the concentrations found in the soils themselves and the adsorptive capacity of the soils and the degree to which certain contaminants tend to be adsorbed. All these estimates of degrees of uncertainty associated with them that can only be resolved once the clean up begins.

Using the map of the water level, the gradient, the aquifer characteristics, and the velocity calculated previously, we can estimate how far and how fast the contaminants are likely to travel. If we know the number of years the likely source of the contaminants has been present, we can estimate how fast they have moved in the past based on the known extent of the contamination established during the investigation.

However, the two ways of calculating travel time are not likely to agree because the underlying assumptions in the two methods are different. When we use the gradient and the aquifer characteristics, we generally assume that the gradient measured today has remained constant over time. This can be a misleading assumption where a leaking pond has been closed out and the gradient has become less steep over time. In this instance, we might underestimate travel times. When we use the extent of contamination, we assume that the ground water and the contamination have been moving uniformly at an average velocity over the years. This assumption can either over or underestimate travel times.

We also generally assume that the contaminants have the same physical properties as the groundwater. Actually, the contaminants can differ in viscosity, or can tend to be adsorbed, or can tend to disperse rather than move as a single front, or can undergo physical, chemical, or biological changes while moving with the groundwater. Some extremely sophisticated computer models do exist that can account for some or all of these variations from the assumption that the contaminants move as the water does. However, only a very few Superfund sites have the quantity or quality of data on the characteristics of both the aquifer and the chemicals to conduct this kind of modeling.

These uncertainties inherent in the calculation of how much, how far, and how fast also affect the estimate of how long an aquifer clean up will take. The main purpose in all that has been done so far has been to discover if an aquifer restoration program is necessary and then design and implement the remedial action. Usually this has involved pumping the groundwater to the surface, treating it with the method appropriate for the chemical constituents and their concentration and the flow rate of the system, and reinjecting the treated water back into the ground to enhance the gradient and speed up the process. Some relatively simple and inexpensive computer models exist to design the system, to predict how long the system will need to operate to reach a desired clean up standard, and to estimate the cost of installing and operating the system.

In October of 1989, the Superfund Technology Support Centers for Ground Water, a research group of the Environmental Protection Agency, evaluated the performance of pump-and-treat systems. The paper stated that in most remedial actions, the level of contamination measured in the monitor wells may be dramatically reduced in a moderate period of time, but that low levels of contamination usually persist. After the initial period of maximum decrease in concentrations, large volumes of water are treated to remove small amounts of contaminants. Remediation can then continue indefinitely, or be prematurely terminated. The contaminant levels can then increase as adsorbed, residual contaminants begin to show up in the monitor wells. The report concluded that larger amounts of money should be spent to characterize sites more completely and to use more sophisticated modeling before remediation so that the cost and time estimates will be more reliable.

The hottest topic in groundwater remediation at present is bioremediation. In this approach, the groundwater is treated above ground or in situ with bacteria that are adapted to eating the contaminants of concern and produce less harmful byproducts. Nutrients such as oxygen are added to the aquifer with the reinjected water to enhance the natural biological activity that is occurring. However, the limiting factors for the success of bioremediation projects are still geological in nature. The permeability of the formation and the amount of clay still influence how far and how fast this treatment system will work.

The uncertainties associated with these factors mean that the answers sought by inquiring minds are still "maybe" and "it depends". The process of hydrogeological investigation and remediation will remain a time consuming and relatively costly endeavor with some residual reliance on the tried and true method of trial and error.

MATRIX MADNESS AND THE DILUTION OF SURETY:

COPING WITH LABORATORY UNCERTAINTIES

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MATRIX MADNESS AND THE DILUTION OF SURETY: COPING WITH LABORATORY UNCERTAINTIES

INTRODUCTION

In the ground-water business, we start with two strikes against us. First, we can't see what we are doing. The ground-water flow and associated contamination are below the surface, and a limited number of wells and borings is the major source of information. Second, even if satisfied with the subsurface characterization, we cannot see the chemicals that are being measured. Sophisticated electronic analysis instrumentation serves as our submicroscopic eyes.

Billions of dollars have been spent on environmental chemical data during the 1980s. How much of these data are worthy and reliable? Often, we may never know, especially in closed cases and in active cases where ignorance or quality assurance lapses make fallacious data difficult to detect. Nonetheless, the effort to ferret out incorrect laboratory data must be pressed tirelessly because so much is at stake: the average remedial program in the United States Superfund program costs $25 million. Other cleanups outside the Superfund program are comparably expensive.

This paper discusses the current state of laboratory practice as applied to the analysis of environmental samples (soil and water), and includes recommendations to increase the reliability and therefore the value of the data.

LABORATORY UNCERTAINTY IN THE CONTEXT OF THE WHOLE PROJECT

Although the focus of this paper is on laboratory practice and uncertainty, other causes of variability are substantial, and, according to some studies (Doctor, et al. 1985) may predominate. Variability in environmental data can be divided into five areas:

1. Actual Variability in the Environment: Most geologic systems are layered or otherwise inhomogeneous. The mineral content of the layers can be very different, and as rock components slowly dissolve, the quality of the water also varies depending on depth and location.

In addition, hydraulic properties can vary from foot to foot in an aquifer. Variations in these properties substantially alter the rate of ground-water flow and hence, the length of time the water is in contact with minerals that can alter its chemistry. Furthermore, different rocks and minerals have varying surface areas and reactivities toward contaminants that are artificially introduced into an aquifer. Some rocks or soils allow the contaminants to move with little attenuation; others adsorb contaminants strongly.

Finally, the hydraulic condition of an aquifer can change through time. For example, rainfall and ground water may be chemically quite different. In the eastern U.S. during the spring snowmelt and before the heart of the growing season, substantial recharge reaches the water table; water chemistry reflects rain chemistry more than at any other time of the year. In the late summer during the active growing season, the water table drops and the base ground-water flow predominates. Therefore, it is not surprising that the water quality changes through the year.

2. Variability Introduced by the Monitoring System: Water, drilling muds, oxygen, and other foreign materials may enter the subsurface during installation and development of monitoring wells. As a result, water chemistry may be changed from what existed before drilling. Although Werner Heisenberg was not a ground-water scientist, his Uncertainty Principle for physics is derived, in part, from the fact that "the process of measuring the system alters the system."

Even with careful well-installation procedures, some impact on ground-water chemistry is expected, and samples taken immediately after well installation may not reflect native conditions. A waiting period after well installation and before sampling appears to be the most practical solution to the trauma of monitoring-system installation. For example, in its field procedures manual, the state of New Jersey specifies a 2-week waiting period after well installation before the first samples are taken (New Jersey Department of Environmental Protection 1990).

3. Variability Introduced During Sampling: Although sampling methods are prescribed in numerous guidance documents (for example, New Jersey Department of Environmental Protection 1990; USEPA 1986a) and in field sampling plans associated with Superfund and comparable projects, two generic problems arise during sampling. First, no matter how carefully sampling is performed, ground water is subject to trauma resulting from the change of pressure, the presence of oxygen, and other factors.

Second, the required protocols may not be followed. Depending on the nature of the malfeasance, the data user may be presented with the following quandary: when comparing data through time, is it better for a procedure to be wrong, but consistently so, or for the required procedure to be followed with varying degrees of faithfulness during a sequence of sampling events? The answer is not simple. However, generally, it depends on the nature of the protocol deviation and on the chemicals of interest.

Several studies have shown that a major sector of data variability can be traced to who did the sampling. In an ideal world (for the data user), all samples for a multi-year program would be obtained by the same trained persons and analyzed by one competent laboratory. In reality, changes in both the sampling staff and the laboratory are unavoidable.

4. Variability Introduced During Analysis: Most of the remainder of this paper focuses on this cause of variability. During analysis, uncertainty is present in two types: the first is the inherent limitation of the analysis system with respect to precision and accuracy. The second is variation resulting from the improper operation of instruments or lapses in the analyst's performance or judgement.

5. Variability Introduced After Analysis (Data Management): Even the most careful field and laboratory program can be totally undermined by incompetent data management, both within and outside the laboratory. Examples cited below illustrate how damaging this sector of variability can be.

LABORATORY PERFORMANCE

Most laboratories doing RCRA and Superfund work are commercial operations that must balance scientific and business demands. Although your samples are the most important ones from your perspective, they are no different from hundreds of other samples from the laboratory's point of view. Therefore, a laboratory's average or usual performance is the proper basis for judging proficiency. Any organization can "shine its shoes" on the day of an audit or during the period when official performance evaluation samples are being analyzed. Unfortunately, most samples are not analyzed on such days.

Laboratory performance is measured by its ability to:

1. Detect the presence of chemicals (identification), and

2. Measure the concentrations of the identified chemicals (quantitation).

While these may appear to be basic tasks, they are far from trivial. Myriad chemicals exist and can be tested by many different methods. As discussed below, the theory behind analysis is often thwarted by the complicated mixture of materials in real-world environmental samples and the constraints of a commercial operation.

Chemical Identification

Most regulations such as those associated with the Safe Drinking Water Act have numerical standards for one or more chemicals. We are so focused on whether the samples have concentrations above or below the standards that we sometimes forget to assess the data from a more basic point of view: have the correct chemicals been identified, regardless of concentration?

Different methods have varying degrees of reliability with respect to chemical identification. Identification is generally not a problem for metals and other inorganic materials. Therefore, this discussion focuses on organic chemicals. For example, gas chromatography (GC), which is used for the analysis of many organic chemicals, can provide improper compound identification if only one chromatographic column is used.

Laboratory Example No. 1 demonstrates this GC problem. In this case, three pairs of identical sample vials (six bottles in all) were collected in the field from one well at the same time. Laboratory A received two pairs of vials, which were labeled as if they came from two different wells. As such they were blind replicates. Laboratory B received the final pair of vials. Only one analysis was requested of Laboratory B so blind labeling was not an issue.

LABORATORY EXAMPLE NO. 1[a]

Chemical	Laboratory A Replicate 1	Laboratory A Replicate 2	Laboratory B
1,1-dichloroethane	240	<15	260
trans-1,2-dichloroethene	<15	<15	450
1,1,1-trichloroethane	140	<15	140
trichloroethene	300	300	300
cis-1,2-dichloroethene	450	440	NR[b]

Notes: [a] Concentrations in micrograms per liter (μ/L) or parts per billion (ppb).
[b] NR: not reported.

In the ideal case (as for trichloroethene in the example), the same results would have been reported for all three samples. However, the results for four out of the five compounds in this example are far from ideal. For instance, the compound 1,1-dichloroethane is present in one replicate analyzed by Laboratory A and absent in the other replicate. Small differences in analytical conditions or operator interpretation apparently caused the qualitatively different results.

Gas chromatography is a powerful and important analytical method that should not be dismissed because of results such as those shown above. Although the tendency is to favor combined gas chromatography/mass spectroscopy (GC/MS), GC alone has several advantages. First, greater surety of chemical identification arises when the sample is run through two different GC columns. Although the analysis time for GC/MS and GC with two runs is comparable, the equipment investment for GC is far lower. The two-column analysis is standard procedure for some methods and regulatory programs. Second, as discussed further below, GC detection limits are generally lower than those for GC/MS. Some regulatory programs related to drinking water and polychlorinated biphenyls, for example, require very low detection limits.

Chemical identification can also be a problem when an unusual chemical is involved. Most commercial laboratories are geared to identify and quantify common lists of chemicals such as the USEPA Priority Pollutants or the RCRA Appendix IX to 40 CFR 264. GC/MS is calibrated only for the listed chemicals. For any others that may be present, the computer operating the GC/MS instrument attempts to match the pattern of extra spectral peaks with the patterns for any of 50,000 or more chemicals that are stored in memory. The degree of the match between the spectrum for the unknown chemical in a sample and the most similar spectra in the GC/MS computer memory varies. The user should be aware that an element of uncertainty exists in the identification of these extra peaks, even when a good match is found. If identification of the chemical is important, the analysis should be run again after the GC/MS instrument has been standardized with a pure known specimen of the suspected chemical.

Finally, the dilution of a sample may mask the presence of a chemical. A sample with one or more chemicals at high concentration cannot be injected straight into most instruments without damaging some part of the inner workings. A water sample may be diluted 10, 100, or 1000 times or more, so the instrument sees the trace concentrations it was designed to measure. However, a problem arises when the chemical of interest is at a relatively low concentration, and the chemical at high concentration that necessitated dilution is of little interest.

Furthermore, there is no easy way to determine exactly the correct degree of dilution. Laboratory Example No. 2 shows that a sample and its replicate collected at one well at the same time were diluted differently by the laboratory. The "replicate" was diluted to a greater degree than the "sample." To the data user, the "sample" contains seven chemicals, and the "replicate" contains only four chemicals. The difference is one of identification, not just of quantitation.

LABORATORY EXAMPLE NO. 2[a]

Chemical	Sample	Replicate
1,1,1-trichloroethane	4,200	8,000
1,1-dichloroethene	410	<500
1,1-dichloroethane	190	<500
trans-1,2-dichloroethene	440	<500
trichloroethene	34,000	55,000
benzene	110	100
tetrachloroethene	450	670

Note: [a] Concentrations in micrograms per liter (μ/L) or parts per billion (ppb).

Chemical Quantitation

The second of two determiners of laboratory performance is the ability to report concentrations for those chemicals identified. All analytical methods are limited in their ability to determine the correct concentration (the method's accuracy), and to report the same result upon repeated analysis (the method's precision). Data for method accuracy and precision are published in standard references (for example, 40 CFR 136 and USEPA 1986b). Analytical uncertainties vary from between $\pm$ 5 and 10 percent for metals and other well-controlled analyses to above $\pm$ 30 percent for some organic analysis methods that require extraction before analysis.

In its effort to determine drinking water standards for volatile organic compounds, the USEPA conducted an interlaboratory performance test on compounds designated for regulation. Laboratory example No. 3 shows data for four such compounds. Vinyl chloride shows an order of magnitude range of results as reported by the 24 participating laboratories. It is clear that with this type of laboratory variability, it is difficult to regulate vinyl chloride at 1 microgram per liter (μ/L) as originally proposed or even at 2 μ/L, as finally adopted.

LABORATORY EXAMPLE NO. 3[a]

Chemical	"True"	Range	Labs w/ ± 20 % Variance
vinyl chloride	1.5	0.53- 5.66	19 of 24
trichloroethene	5.53	3.4 - 9.13	7 of 38
benzene	5.8	3.3 - 11.9	12 of 37
p-dichlorobenzene	776	420 -1160	14 of 32

Note: [a] Concentrations in micrograms per liter (μ/L) or parts per billion (ppb).

Another example showing variation in concentration results concerns the pesticide and fuel additive ethylene dibromide (1,2-dibromoethane). Nine qualified laboratories were each sent nominally equivalent water samples for analysis. The results ranged from 0.050 μ/L to 0.137 μ/L. Although the concentrations are well below a part per billion, the method is designed to measure such low concentrations. The range of results (over two and one half fold) is sobering.

DATA MANAGEMENT PROBLEMS

Errors in data management are the most insidious. Although laboratory reporting systems are becoming increasingly computerized, much hand work remains, especially for nonstandard analyses. In cases where little laboratory documentation is required, the transposition of numbers or the incorrect naming of a chemical on data sheets may not be detectable. The only hope is that another analysis will be performed in the future without the same mistake. Salvation comes if the data user is astute and questions the conflicting results.

RECOMMENDATIONS

Although the information presented above portrays a bleak data picture, several steps can be taken to fight back. First and foremost, collect enough data. The precise amount required is not generally known, but the greater the inhomogeneity of the system (spatially and temporally), the more data you must collect to characterize it. The more complex the site geology, the greater the number of wells that may be needed to perform proper monitoring. You should conduct multiple rounds of sampling to characterize changes at the site through time and provide redundancy in the data base for systems that are slowly changing. Finally, you should collect a sufficient number of quality control samples, especially blindly labeled field replicates. The cost associated with these additional samples is a wise investment.

Second, require the production of detailed QA/QC documentation for both field and laboratory activities. Then, have this information critically reviewed by QA personnel specifically trained in formal data validation. With such procedures, you have a good chance of discovering errors reflected in the documentation.

Third, place the data into an historical data base for the site and monitor the database as it grows. You can detect many errors by recognizing the disparity between new and existing data when they are placed side by side. Computing costs are diminishing; the dollars committed to data base management are well spent.

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II. SOLID & HAZARDOUS WASTE

The Hazardous Waste Moratorium and Other Policy Issues - "Burning Issues"

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Waste Minimization and Recycling *- "Waste Watchers"*

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NORM *- "Nuclear Families"*

NORM: An Objective Industrial Review
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Risk Assessment Cleanup Levels *- "Risky Business"*

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Source Reduction and Waste Minimization Program

at the Texas Water Commission

by

Priscilla Lee Seymour, Ph.D., Texas Water Commission

I. Introduction

The State of Texas has a statutory policy for waste management with an established hierarchy of preferred waste management methods to protect public health and the environment. It is public policy that in the generating, treating, storing and disposing of hazardous waste, the following methods are preferred to the extent economically and technologically feasible, in the order listed: (1) minimization of waste production; (2) reuse or recycling of waste, or both; (3) treatment to destroy hazardous characteristics; (4) treatment to reduce hazardous characteristics; (5) underground injection; and (6) land disposal.[1] Under treatment to destroy hazardous characteristics, on-site destruction is preferred, but it is to be evaluated in the context of other relevant factors such as transportation hazard, distribution of risk, quality of destruction, operator capability, and site suitability.[2]

(NOTE: The opinions contained herein are solely those of the author and do not necessarily reflect those of the Texas Water Commission.)

In 1987 over 300 million tons of hazardous waste were generated nationally by industry; Texas industries generated 65.8 million tons of that volume. The 200 largest generators, by volume, in Texas generated over 99.89% of that total and represent primarily five SIC code groups of industries: chemical manufacturers, petroleum refiners, primary metals, electronic equipment, and transportation equipment. Of the waste generated in Texas, approximately 57 million tons is managed on-site. The most common method of waste management in Texas is aqueous treatment (58%) followed by injection (21%), discharge (10%), storage (8%), recovery (1%) and other(2%). [3]

The figures above indicate that industry has more to accomplish to move to the top of the preferred waste management hierarchy, minimization of waste production (source reduction). The Texas Water Commission (TWC) is charged with implementing this hierarchy to the maximum extent that is technologically and economically feasible.

II. Development of the Texas Water Commission Program

The Legislature, by statute, required the Texas Water Commission to establish a waste minimization and reduction group to assist in developing waste minimization and reduction programs. This group is also required to provide incentives for the use of these programs so as to make the programs economically and technologically feasible.[4] In October, 1989 the TWC formed the Waste Minimization Unit which is located in the Hazardous and Solid Waste Division.

The Waste Reduction Advisory Committee (WRAC) was also established by statute to advise the TWC on the development of state programs to promote waste reduction and minimization and to more effectively implement the preferred waste management hierarchy. Other charges to the Committee include: advising on the development of public awareness programs on hazardous wastes, particularly on household hazardous wastes; and advising on development of assistance programs to local governments for the development of waste management strategies to assist small quantity generators.[5] The Committee was appointed in December, 1989 and made formal recommendation to the TWC in October, 1990. They recommended that the State set as a primary goal the elimination of the generation of hazardous waste. To attain the goal, they suggested that the State: (1) encourage and provide incentives for research leading to source reduction; (2) support continued education of the regulated community and the public on the benefits of source reduction and the available opportunities to achieve them; (3) encourage appropriate changes in public consumption and lifestyle to encourage use of products not resulting in unnecessary waste generation; (4) provide incentives for industry to implement source reduction and to remove disincentives; (5) revise the hazardous waste fee structure to encourage source reduction; (6) allocate sufficient resources to regulatory officials to allow promotion of source reduction and successful implementation of programs; and (7) adopt requirements for mandatory source reduction planning for generators with annual reporting on progress to demonstrate due diligence of implementation.[6] The staff of the waste minimization unit were charged by the Commission to implement these recommendations to the full extent feasible in the development of the waste minimization unit programs.

All program areas in the waste minimization unit are currently designed to address the implementation of the preferred waste management hierarchy and the WRAC recommendations. The programs will be expanded to incorporate the new areas of source reduction and waste minimization assistance outlined in S.B. 1099. In addition, the program coordinates and assists existing agency programs to incorporate waste reduction policies and pollution prevention initiatives of the TWC and the U.S. Environmental Protection Agency (EPA).

III. New Legislation - S.B. 1099, Policy

The Waste Reduction Advisory Committee recommendations were used as a blue print for developing new Subchapter N: Pollution Prevention, Chapter 361, Texas Health and Safety Code in Article 2, S.B. 1099 in the 72nd Legislature.

Under Article 2 of S.B. 1099, the 72nd Legislature established that it is the policy of the state to reduce pollution at its source and to minimize the impact of pollution to reduce risk to public health and the environment and continue to enhance overall environmental quality. This act focuses on source reduction as the primary goal and secondarily on waste minimization for those wastes, pollutants and contaminants that cannot be source reduced. [7] The targets for reductions are all TRI (Toxic Release Inventory) chemical releases and hazardous waste generated.

The Texas Air Control Board and the Texas Water Commission are required to develop state wide plans to achieve the policies of the statute. The TWC shall develop its plan to reduce the releases of pollutants and contaminants into water and establish reasonable goals for the reduction of the volume of hazardous wastes generated in the state and the amount of pollutants and contaminants. This is to be accomplished through the use of source reduction and waste minimization to the maximum extent that is technologically and economically feasible.[8] To avoid duplication of effort, the TACB and the TWC will through joint rule develop a common list of pollutants and contaminants and the level of releases of those pollutants and contaminants subject to planning.[9]

IV. Facility Planning and Reporting under S.B. 1099

This act requires that all facilities reporting under Sec. 313, Title III, Superfund Amendments and Reauthorization Act of 1986 and all hazardous waste generators develop facility wide plans for source reduction and waste minimization.[10] These plans will remain at the facility for use by the facility and for inspection by TWC and TACB personnel. An Executive Summary of the plan will be developed based upon rules developed by the TWC and the TACB and will be made available to the public. Facilities will be required annually to report on their implementation progress in achieving their planning goals and to provide a current Executive Summary of their plan.[11] Any changes to the plan will be required to be noted in this report. These reports will be open to the public.

Facilities will be required to prepare plans and annual reports based upon a schedule to be determined by the TWC and the TACB in joint rules.[12] The TWC will develop, through rule,

simplified planning and reporting requirements for small quantity simplified planning and reporting requirements for small quantity generators.[13]

The basic content of the plans is established in the statute and requires that the plans include at a minimum: a survey that identifies all activities that generate hazardous waste and/or result in the release of pollutants and contaminants; based on the survey, a prioritized list of source reduction and waste minimization projects; an explanation for each project to be undertaken including a discussion of economic and technical considerations, and environmental and human health risks considered; an estimate of the type and amount of reductions expected; a schedule for the implementation of each project; source reduction and waste minimization goals for the facility including incremental goals; an explanation of employee awareness and training programs for source reduction and waste minimization; certification by an officer of the company that has the authority to commit the resources necessary to implement the plan, that the plan is complete and correct; an executive summary of the plan; and identification of cases where another pollutant or contaminant may be released through the implementation of a reduction project or where a project may shift a release to another medium.[14]

There are additional items that may be included in the plan by the facility. These items include discussion of events that affect achievement of reduction goals, such as: previous efforts undertaken to achieve reductions; the effect of regulatory change; the effect of events the person could not control; description of particular projects that have reduced waste generation or reduced releases of pollutants or contaminants; and specific operational decisions that have affected reduction efforts.[15]

The requirements of the annual report on progress will be determined through joint rule making by the TACB and the TWC and will include at a minimum: an assessment of progress toward the facility's goals for source reduction and waste minimization; the amount of hazardous waste generated and/or the amount of releases of pollutants and contaminants in the previous year and a comparison to the amounts generated or released in the designated base year (selected by the TACB and TWC); and any modification to the plan.[16] The annual report may include any of the additional information that may be included as additional items in the facility plan as listed above.

The TWC and the TACB may review the plan and annual report for completeness under the terms of the statute and any rules adopted. Failure to have a plan or to submit a report in accordance with the statute and rules is a violation under Chapter 361 of the Texas Health and Safety Code and is subject to the penalties under that chapter.

The TWC and the TACB are required to develop incentives to promote implementation of source reduction and waste minimization. These incentives include: recommendations to the governor for awards to recognize efforts in source reduction and waste minimization; an opportunity through joint rules for a facility to be exempted from the planning requirements on meeting appropriate criteria for completion of source reduction and waste minimization planning; and expedited review of permit amendment applications necessary to implement source reduction or waste minimization projects for consideration of only those directly-affected parts of the permit.[17]

V. Rules Development Under Article 2, S.B. 1099 - Task Force 21

The TWC and the TACB are required to develop several joint rules for the implementation of source reduction and waste minimization planning. Two of these rules are to be adopted no later than January 1, 1992. Specifically, by January 1st, the agencies must establish schedules for facility implementation of plans and requirements for source reduction and waste minimization plans.[18] Other required rules are: establishing exemptions from the planning criteria when completion of the plan is met; annual report requirements; simplified planning requirements for small quantity generators; and development of list of pollutant and contaminants and the level of release subject to planning.

In order to meet the deadlines for adopting rules under both Article 1 (new permitting requirements) and Article 2 of S.B. 1099, the TWC appointed Task Force 21: Waste Management for the Future, to assist staff with examining the complex policy issues. Task Force 21 is composed of 16 members from a variety of backgrounds including: environmental groups, industry, county government, local government, environmental consultants, public groups, business associations, attorneys, and state legislators. The TWC staff is working closely with the Task Force to examine all the related issues, and are in the process of developing draft rules. Proposed draft rules on Article 2 should be available by September, 1991.

VI. Pollution Prevention Council - S.B. 1099

Article 2, S.B. 1099 creates a Pollution Prevention Council to coordinate designated agencies' activities in source reduction and waste minimization to ensure consistency of programs and to reduce duplication or conflict. The agencies to be represented on the Council are Texas Water Commission, Texas Air Control Board, Texas Department of Health and the Railroad Commission of Texas. The members appointed to this council will coordinate source reduction and waste minimization efforts within their agency and will report to their agency's executive director or deputy director.

VII. Office of Pollution Prevention - S.B. 1099

The Office of Pollution Prevention is established under S.B. 1099 at the TWC to assist generators of hazardous waste and owners of facilities that release pollutants and contaminants in reducing the volume and toxicity of their waste and/or releases. Specific activities that may be undertaken by this office are: distribute information on source reduction technologies and procedures; compile and distribute a list of consultants and university researchers who can assist with source reduction and waste minimization; sponsor and conduct workshops and conferences on reduction and minimization; facilitate and promote the transfer of technologies and procedures for reduction and minimization; develop model plans and internal audit procedures for source reduction and waste minimization for classes of industry; provide on-site assistance and audits to facilities as resources allow; distribute information on tax benefits available for implementing source reduction and waste minimization projects; develop training programs for state and local regulatory personnel and industry; establish procedures for prioritizing assistance; develop data base necessary for setting program priorities and evaluating progress; produce a biennial report on progress; participate in state, federal and industrial networks involved in source reduction; and participate in and support waste exchange programs.

The majority of these elements are already implemented in the current waste minimization unit. The additional areas will be implemented as resources become available.

VIII. The Waste Minimization Unit

The programs within the unit are grouped into one of three categories: planning, training or technical assistance. The programs were developed to meet the diversity of needs, both within the regulated community and the Commission. The waste minimization program also is developing methods to measure the success of the various services offered and to identify areas where generators need additional assistance to implement source reduction. For example, on the 1988 Texas Water Commission Waste Minimization Report, facilities were asked what were the primary factors that have delayed or prevented implementation of source reduction opportunities. In examining the responses of the 25 largest generators (who account for approximately 94% of the hazardous waste generated) the four most frequent responses were: (1) source reduction is not economically feasible; (2) technical limits of the production process; (3) concern that product quality may decline as a result of source reduction; and (4) lack of technical information on source reduction techniques applicable to their specific production process. The smaller generators varied only in the order of their selections: (1) technical limits on the production process; (2) lack of technical information in source reduction techniques applicable to their specific production process; (3) concern that product quality may decline as a result of source reduction; and (4) source reduction is not economically feasible. The results of these responses are being used to establish the focus of the training and technical assistance program areas.

IX. Planning Program

The planning program was developed to examine the current status of waste generation and implementation of the hierarchy and to determine the future direction of the program. Specific projects undertaken within the unit over the past year have included: (1) development of a waste reduction and minimization program plan and ongoing strategic planning; (2) preparing the state's capacity assurance plan; (3) preparing special studies on waste minimization; (4) conducting a survey of the 200 largest hazardous waste generators in Texas for developing projections on source reduction trends; and (5) providing support and information to the Waste Reduction Advisory Committee.

Current special studies and planning projects underway within the waste minimization unit include: (1) examining economic issues of source reduction and reuse/recycling; (2) determining the current status of waste generation and waste minimization planning by generators; (3) developing standards for waste minimization planning and reporting for use in the permitting and enforcement processes at TWC; (4) developing reporting and measurement criteria to determine program effectiveness and progress by generators; and (5) developing rules for implementation of S.B. 1099.

X. Training Program

The training program is being developed to meet the needs of both the regulated community and the TWC staff. This program is supported in part by the Source Reduction and Recycling Technical Assistance (SRRTA) grant, a federal grant administered by EPA. The program emphasizes teaching the principles of waste reduction and minimization, identification of waste streams, conducting on-site audits, materials and waste accounting systems, waste minimization plan preparation, options analysis, goal setting and implementation. The training seminars will be delivered throughout the state to generators; to TWC permit, enforcement and inspection personnel; and to the River Authority personnel.

An additional aspect of the training program is an outreach and information program on the requirements of the RCRA and state hazardous and solid waste program. This program is being implemented through: information bulletins on regulatory or commission changes of importance to the regulated community; development of assistance manuals on regulatory requirements; seminars held throughout the state; and sponsoring an annual hazardous waste trade fair. To date the staff have: developed an information bulletin, the "waste note", and completed two mailouts; in conjunction with the Texas Chemical Council sponsored a hazardous waste workshop; sponsored the TWC Hazardous Waste Trade Fair and Conference; and a conference on hazardous waste management and international border issues - On the Border. Under planning is a second conference with the Texas Chemical Council, the 1992 TWC Hazardous Waste Trade Fair and Conference, a second regional conference in 1991 and additional "waste notes".

XI. Technical Assistance Program

The technical assistance program is the third program area and also is supported in part by the SRRTA grant. A manual is being developed for waste reduction and minimization assessment and planning for use by generators and should be available by fall, 1991. This manual will assist facilities in assessment, evaluation, and implementation of a waste reduction program. It incorporates the new requirements under S.B. 1099, including a plan outline and audit procedure. The manual is offered as an educational and informational "tool box". This approach will assist large generators, as well as medium and small generators that do not have the staff or technical background for establishing a waste minimization program.

The manual will offer a series of worksheets with step by step explanations along with references, suggestions, and advice on where to obtain technical assistance. The manual will also contain an array of case studies to demonstrate that minimization and reduction techniques are being implemented and are profitable. The purpose of the manual is to provide generators with the tools to develop a successful facility waste reduction plan and program that will meet the requirements of S.B. 1099. The manual will be used in outreach waste reduction training to generators as well as during on-site audits by TWC.

On-site technical assistance is provided to a limited number of generators upon request. It consists of assistance with on-site assessments, evaluations and recommendations. The on-site assistance program began in June, 1991 and to date four on-site visits have been completed with three additional sites scheduled for August.

To assist with technical information transfer, the staff is developing a case study book with cases of successful waste reduction and minimization projects provided by Texas facilities.

This book will be distributed as part of the technical assistance outreach program. The unit staff have developed a working relationship with other states' assistance programs for the exchange of technical information and program development assistance.

Technical information transfer to generators is also being accomplished through development of a technical information library and database. The staff are collecting information on successful reduction projects, available technologies, current and ongoing research, and product and services vendors. This clearinghouse of technical information will be used to assist the regulated community. A larger clearinghouse project is underway with TWC and the Gulf Coast Hazardous Substance Research Center at Lamar University. This project will develop a referral network to assist generators with technical questions, exchange information on new technologies and to identify research needs. At this time a librarian has been added to the staff at GCHSRC and the clearing house is expected to be operational by December, 1991.

The Resource Exchange Network for Eliminating Waste (RENEW) is an industrial solid and hazardous waste materials exchange within the technical assistance program. This exchange was established under the direction of the 70th Legislature and is part of the Solid Waste Disposal Act. The purpose of RENEW is to provide for the exchange, between interested persons, of information concerning: (1) particular quantities of industrial solid or hazardous waste available in Texas for recovery; (2) persons interested in acquiring certain types of industrial solid or hazardous waste for purposes of recovery; and (3) methods for the treatment and recovery of industrial or hazardous waste.[19]

A bimonthly catalog is published by the Commission listing materials for exchange and products and services available. This catalog is sent to over 2000 subscribers. Since the program began in 1988, RENEW has received over 350 listings of materials wanted and materials available. On these listings, over 1600 inquiries have been made by persons interested in obtaining the materials. These inquiries have resulted in 27 reported successful exchanges. These exchanges have resulted in a total economic benefit to the participants of over $303,000 and in over 430 tons of material exchanged.[20]

To further enhance the recycling technical assistance, available information is being gathered on industrial recycling for the 1991 Industrial Solid Waste Recyclers Directory. Questionnaires were sent to recyclers to obtain information about the types of materials they handle for listing in the directory. The directory will be available in August, 1991. The directory will include not only information on materials accepted for recycling and the recycling systems used by these companies but also will include information on the products they market that are made from recycled materials. This information will be added to the technical information database. Additional research will be undertaken by staff to gather information on recycling technologies, and to examine barriers to recycling and market development.

The unit also provides technical assistance within the agency to assist agency personnel with implementation into existing programs of the agency goal of waste reduction.

VI. Future Directions

The planning, technical assistance and training projects currently underway will continue in the next year with expansions to accommodate increased needs and demands and implementation of S.B. 1099. The source reduction and waste minimization program at the TWC is a dynamic program designed to meet the generators needs as they are identified and the regulatory changes occurring at both the federal and state level.

The unit is coordinating with other state media programs, such as the water and air regulatory programs to include the new multi-media expanded approach established under S.B. 1099. The unit also coordinates with the developing federal programs, such as EPA's 33/50 reduction program, and with other states to enhance the state program. Through this coordination, the Texas program can avoid "reinventing the wheel" and bypass many of the mistakes made in earlier programs. We can also learn from the accomplishments of other programs.

Endnotes

1. Texas Solid Waste Disposal Act, TEX. HEALTH AND SAFETY CODE ANN. Chapter 361 (Vernon Supp. 1990), Section 361.023
2. ibid.
3. Texas Water Commission, 1989 Capacity Assurance Plan for the State of Texas, LP 89-05, October 1989 and Texas Water Commission Annual Waste Summary forms submitted by generators.
4. Section 361.0216, Texas Solid Waste Disposal Act
5. Section 361.0215, Texas Solid Waste Disposal Act.
6. Texas Water Commission Special Agenda, October 4, 1990.
7. Sec. 361.432, Article 2, S.B. 1099, 72nd Legislature.
8. Sec. 361.433, Article 2, S.B. 1099, 72nd Legislature.
9. Sec. 361.433(c), Article 2, S.B. 1099, 72nd Legislature.
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14. Sec. 631.435, Article 2, S.B. 1099, 72nd Legislature.

15. Sec. 361.435(b), Article 2, S.B. 1099, 72nd Legislature.

16. Sec. 361.436, Article 2, S.B. 1099, 72nd Legislature.

17. Sec. 361.439(c), Article 2, S.B. 1099, 72nd Legislature.

18. Sec. 2.07, Article 2, S.B. 1099, 72nd Legislature.

19. Section 361.028 of the Texas Solid Waste Disposal Act

20. Texas Water Commission, Resource Exchange Network for Eliminating Waste, 1990 Annual Report, February 1991, LP 91-02.

NORM: AN OBJECTIVE INDUSTRIAL REVIEW

Presented For:
The Texas Environmental Superconference
August 1, 1991

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GRAPHICS:

1. INTRODUCTION

Naturally occurring radionuclides are ubiquitous in the environment, existing in soil, air, water, plants and animals. Naturally Occurring Radioactive Material (NORM) concentrations vary widely from levels of less than one to several thousand picocuries per gram (pCi/g). The NORM distribution on earth varies depending upon the location [23, 26].

The naturally occurring radionuclides are present deep in the earth's crust. The primary NORM radionuclides include uranium, potassium, actinium and thorium, and their decay products which include radium and radon gasses. Many industrial activities change the chemical properties or physical state of naturally occurring radioactive material and the potential exposure pathways to humans, during production of non-nuclear material. Technologically Enhanced Natural Radioactive material (TENR) is an acronym used to describe NORM waste resulting from these processes. Sources of technologically enhanced NORM include: oil and gas production, phosphate mining, power generation producing coal ash, metal mining, and drinking water treatment. During operation of these processes, the naturally occurring radioactive material is brought to the surface in the form of sludges, scales in pipes, residues in the material, and radon gas present in natural gas or water [27].

There are only a few regulations to guide handling or disposal of NORM contaminated materials, except for uranium mill tailings, which are regulated by the NRC and Agreement States. The lack of regulations, concern over potential health risks, and protection of workers and the environment prompted the Conference of Radiation Control Program Directors (CRCPD) to initiate and propose guidelines for the regulation of NORM. In 1989, Louisiana became the first state to regulate NORM. The Texas Department of Health has currently submitted proposed draft NORM regulations [5, 16].

The Louisiana regulations and the Texas proposed regulations require industries to be licensed to extract, mine, beneficiate, process, use, transfer or dispose of NORM contaminated equipment or materials, unless exempted from regulation [5, 16]. Potential health risks to workers who handle NORM contaminated equipment, water, or soil, as well as risks to the environment, are largely undefined.

2. CONSTITUENTS OF NORM

Radioactive materials are either man-made or naturally occurring. Examples of man-made radioactive materials are Cesium-137 (Cs-137) and Cobalt-60 (Co-60). Naturally occurring radionuclides are present in the rocks and minerals within the earth's crust; there are three important naturally occurring radioactive series: uranium series U-238; actinium series U-235 and thorium series Th-232.* Figures 1a through 1c detail the decay series of U-235, U-238 and Th-232. These naturally occurring radioactive materials have several common characteristics: (1) the first member of each series is very long lived; the half-life of U-238 is 4.5 billion years, (2) each series has a gaseous member which is a different isotope of the element radon, (3) the final decay product in each series is a stable isotope of lead [4].

* In this document, "uranium" includes U-238 and U-235.

Uranium series U-238, which makes up 99.3% of the naturally occurring uranium, contains two important radionuclides: Ra-226 and Rn-222. Radium is usually found in plasters, gypsum bearing material, concrete, and rock. Ra-226 concentration in natural soil is about 1.0 pCi/g [23].

Isotopes of radium are slightly soluble in water, and under some conditions, can be brought to the surface with liquid production streams. Radium nuclides may remain dissolved at dilute levels, or may precipitate because of chemical, pressure and temperature changes which occur as the fluids are separated and processed. Ra-226 has a half-life of 1,600 years; the long half-life is an important factor in formulation of radioactive waste disposal plans.

Ra-226 not only produces an external radiation field, but more importantly, has a gaseous daughter, Rn-222, which diffuses out of the soil and enters the surrounding air or water. Rn-222 can build up in enclosed spaces. High radon concentrations exist in potable water; in the United States about 25% of drinking water supplies have Rn-222 concentrations in excess of 2000 pCi/l. Five percent of potable water supplies have Rn-222 concentrations greater than 10,000 pCi/l. Radon gas is released from the water by heating or by agitation. Water containing 1000 pCi/l of Rn-222 could produce Rn-222 vapor phase concentrations of 1 pCi/l indoors [23].

Radon gas decays into solid isotopes. Two of the Rn-222 decay products (Po-214 and Po-218), when deposited in the lungs, can damage cells lining the air ways [26]. Radon gas is also present in natural gas and natural gas products. Originating in underground formations, it becomes dissolved in organic petroleum fractions.

Of the other radioactive isotopes found in nature, Potassium-40 (K-40) is the most important. K-40 can be found in plants, animals and man. It is widely distributed in nature with volume concentrations ranging from about 0.1% in limestone to as much as 3.5% [3]. For example, a 150 pound man contains approximately 17 milligrams of Potassium-40. The average annual radiation dose received from this amount of Potassium-40 is approximately 20 millirem to tissue and 25 millirem to the bones [27].

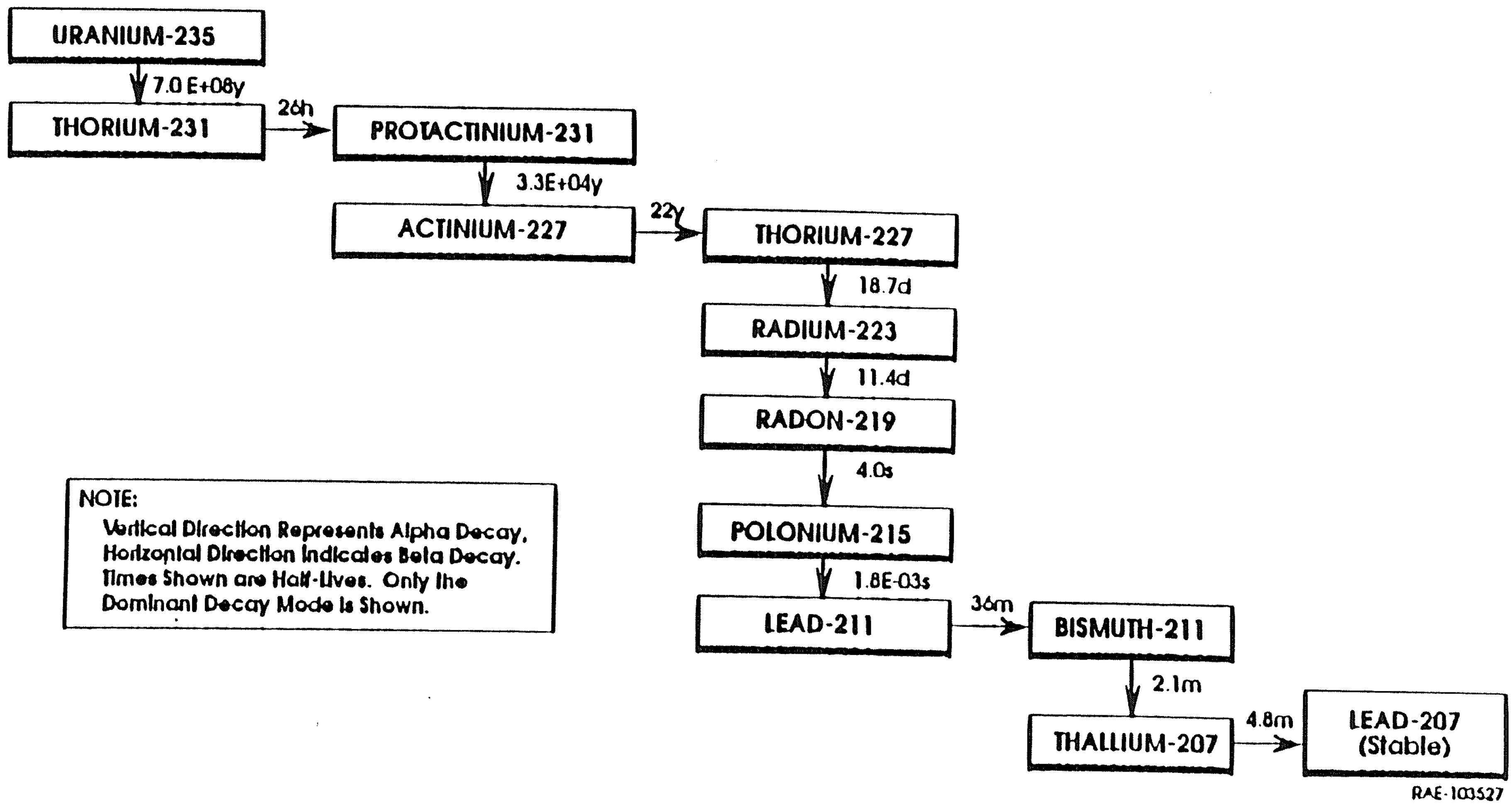


FIGURE 1a: ACTINIUM SERIES DECAY CHAIN[4]

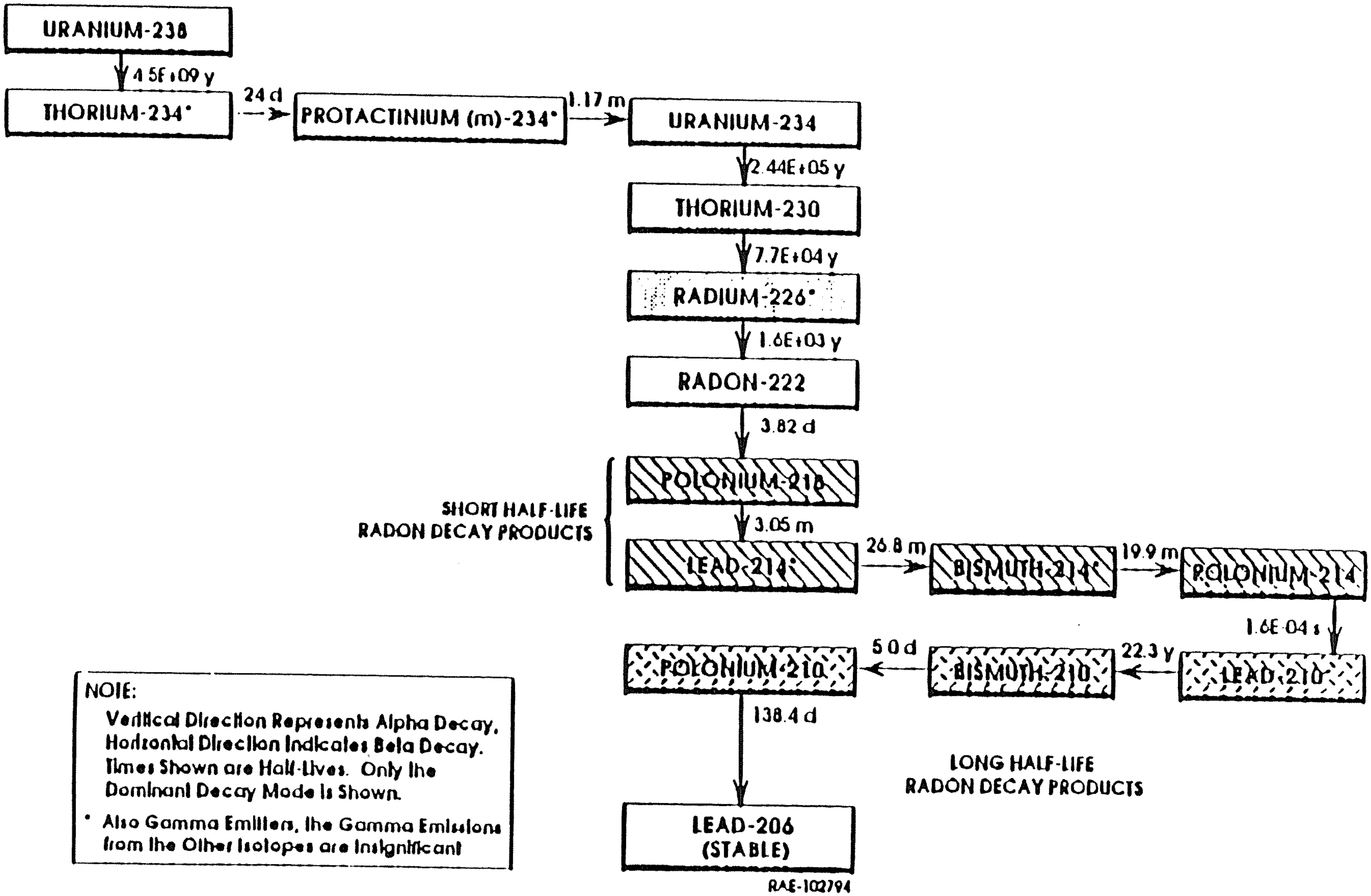


FIGURE 1b: URANIUM DECAY CHAIN[4]

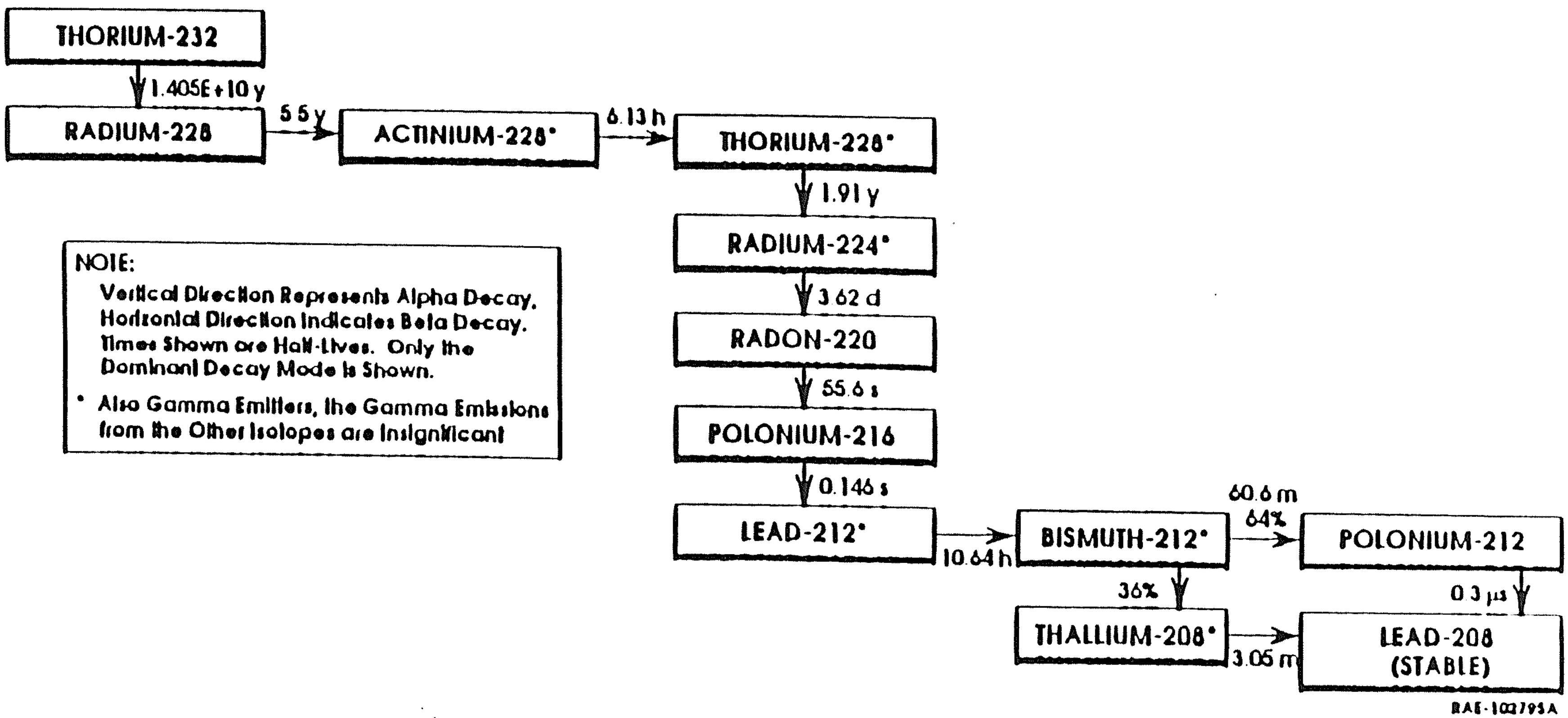


FIGURE 1c: THORIUM DECAY CHAIN [4]

3. INDUSTRIAL SOURCES OF NORM

Naturally Occurring Radioactive Material is a byproduct of various non-nuclear technological processes. NORM is usually present in the form of dissolved solids in the earth's crust, or in gases in the reservoir formation. NORM is entrained in process material when it is pumped to the surface. NORM may remain dissolved in the process material, or precipitate on the production equipment or in the sludge.

The following discussion is designed to present the primary industrial sources of NORM waste, their estimated waste generation rate, and its approximate Ra-226 concentration. Table 1 summarizes these data.

Inspection of the available data shows that the primary concerns regarding NORM waste should not include health risks from exposure. Although the volume generation of NORM contaminated waste is large, levels of radioactivity are very low [4]. Because of the bulk quantities involved, NORM contaminated material is often considered for reclamation programs. Hence, the potential risks from NORM include its incorporation in consumer products, and possible enhancement of radionuclide concentration through the reclamation process. For example, use of NORM contaminated building materials may increase vapor phase radon concentrations in some structures.

Future application of certain NORM waste may also be limited by the presence of non-radioactive yet chemically hazardous compounds. Leachate from the purification of uncommon metals contains not only radionuclides but heavy metals as well [4, 7]. Improper disposal of NORM waste may pose environmental problems and increase health risks associated with NORM exposure if radionuclide concentrations in soil, air, and water become significantly enhanced. Quantification of NORM risks awaits further study [4, 8, 10, 12, 13].

Uranium mill tailings are not considered in this article as they are regulated by the NRC and agreement states [21].

The following are examples of industrial sources of NORM:

3.1 Petroleum Industries

In petroleum industries, NORM waste is found in the form of radium coprecipitated with silicates or carbonates in sludges accumulated in production equipment; and in the form of scales coprecipitated in barium sulfate on tubing or pipes. The average radon emanation fraction for scale and sludge is 0.10 - 0.20 [2, 25]. The emanation fraction is the percent of radon formed which actually diffuses into the air from soil void spaces. Emanation is a flux, usually measured in atoms/(cm^2-sec) [25]. Ra-226 concentrations in the petroleum industries can be as high as 40,000 pCi/g, however the typical concentration is 155 pCi/g. It is estimated that the petroleum industry generates about 360,000 cubic meters or 0.63 million metric tons of such waste every year [4].

During the production of natural gas, radon gas mixes with the natural gas and is pumped to the surface. Since radon gas has a 3.8 day half-life, the only remaining radionuclide in gas plant equipment is Lead (Pb-210), which has a half-life of 22 years. Thin layers of Pb-210 are found on the inside surfaces of gas plant production equipment; these accumulations have an average thickness of 0.004 inches. This residue affects disposal of gas plant equipment [17, 26].

3.2 Rare Earth Mineral Processing Plants

Rare earth minerals are found in monazite sands, zircon sands, ilmenite and tantalite. The compounds of rare earth materials are used for many products which include red phosphorus for color televisions, glass polishing powder, and glass composition for cameras, microscopes and magnets. The rare earth mineral processing waste contains an average Ra-226 concentration of 35 pCi/g. The rare earth mineral industries generate about 1 billion metric tons of waste every year [4].

3.3 Water Treatment Plants

Groundwater contains NORM. The main radionuclide found in groundwater is Ra-226, which is water-soluble and can be convectively transported. During the filtration of drinking water, radium and uranium are deposited in the sludges, spent ion exchange resins, and charcoal beds. The average Ra-226 concentration in water treatment waste is estimated at 16 pCi/g. The estimated water treatment waste generated annually is 0.26 million metric tons [4].

3.4 Phosphogypsum Mining

Phosphate products are produced from mining phosphate rocks. Small traces of uranium, thorium and their decay product radium exist in phosphate rocks. Phosphate rocks are used for production of phosphoric acid and elemental phosphorus. The Ra-226 concentration in the phosphate rocks can be as high as 60 pCi/g.

Phosphogypsum is a byproduct material produced during phosphoric acid manufacture. When the phosphogypsum fertilizer is produced, most of the radium is retained in the phosphogypsum waste stream and only very small amounts mix with the fertilizer [21]. The EPA estimates that annual phosphogypsum waste generation is 40 million metric tons [4].

Production of elemental phosphorus also produces a waste containing NORM, which is called slag. Slag is produced when phosphate rock is processed in high temperature furnaces; it is used as an aggregate in construction of buildings and roads. Ra-226 concentrations in slag are as high as 60 pCi/g. The average concentration is assumed to be 33 pCi/g [4].

3.5 Coal and Lignite Power Plants

Coal and lignite contain small quantities of naturally occurring radionuclides. Coal ash is produced by burning coal to generate electricity. Coal ash consists of fly ash, bottom ash and boiler slag. Approximately 27% of all ash is used as an additive in concrete; the remainder is disposed of in land fills. Concentrations of Ra-226 in coal ash may be as high as 20 pCi/g; the average concentration is approximately 3.7 pCi/g. Utilities generate about 43 million metric tons of coal ash waste per year [4].

3.6 Geothermal Energy Production Waste

Geothermal power production is a relatively small source of NORM. Contaminated wastes result from the treatment of spent brines. The estimated waste volume for geothermal power production is 70,000 metric tons per year. The estimated average Ra-226 concentration in this waste is 160 pCi/g [4].

3.7 Conclusion

Based on the estimated NORM waste inventories and Ra-226 concentrations, the following conclusions can be made:

1. The annual waste volume generated, and therefore the total activity of the waste, is largest in mineral processing plants.

2. The average Ra-226 concentration is highest in waste from geothermal power industries.

3. The total NORM concentration in waste piles is minimal compared to the total NORM waste volume. Consequently, exposure from waste piles containing NORM is very small.

4. Based on estimated exposure rates, it can be concluded that the exposure rates from NORM waste are generally lower than the NRC specified limit of 2 mrem/h for unrestricted areas, depending on the size of the waste pile.

TABLE 1: ANNUAL NORM WASTE INVENTORY AND CONCENTRATION [4]

MATERIAL	ANNUAL WASTE INVENTORY [a]	AVERAGE Ra-226 CONCENTRATION	EXPOSURE RATE [b]
Phosphate Waste	40.00 mil MT	33.0 pCi/g	60.0 uR/h
Coal & Lignite Waste	43.00 mil MT	3.7 pCi/g	6.7 uR/h
Petroleum Waste	0.63 mil MT	155.0 pCi/g	282.1 uR/h
Mineral Processing	1.00 bil MT	35.0 pCi/g	63.7 uR/h
Water Treatment Waste	0.26 mil MT	16.0 pCi/g	29.1 uR/h
Geothermal Waste	0.07 mil MT	160.0 pCi/g	291.2 uR/h

a Units are: bil., billion; mil., million; MT, metric ton which equals 1000 kG or 1.1 short ton.

b An empirically derived conversion factor for uranium decay series is 1.82 uR/h per pCi/g.

4. HEALTH RISKS ASSOCIATED WITH NORM EXPOSURE

4.1 Sources of NORM With Respect to Health Risks

With respect to NORM exposure and the possibility of ensuing health risks, sources of NORM which should be considered are foods, consumer products, and industrial processes along with their waste.

Radium-226 in soils is absorbed by plants, progressing through the food chain as the plant material is eaten by humans or animals intermediate in the chain, such as livestock. Ra-226 emits an alpha particle during its decay to Rn-222; Table 2 shows the alpha activity observed in various foods. The Brazil nut plant absorbs radium and barium preferentially over calcium; most plants absorb calcium preferentially to radium, which in turn is absorbed more readily than uranium and thorium [23]. Drinking water may have a relatively high concentration of radium, ranging from 0.01 to 1 pCi/l in fresh water to about 100 pCi/l in mineral waters. Rn-222 may also be present in these waters. As mentioned previously, some drinking water in the United States may contain radon concentrations of 10,000 pCi/l. In addition, radium concentrations in water used for drinking and washing foods may be elevated by leaching of radionuclides from NORM contaminated soils and subsequent transport to water supplies by surface water, groundwater, and vapor phase movement [4].

Examples of consumer products containing NORM are Cloisonne jewelry, dentures, camera lenses, natural gas, peat moss, lawn fertilizers, wool insulation, and gas lamp mantles [19].

Industrial sources of NORM were discussed in Section 3. Generally, these industries (petroleum, rare earth mineral processing, water treatment, phosphogypsum mining, coal and lignite power plants, and geothermal energy production) generate NORM waste which after disposal or application, is transported through the environment. Transport modes include convective transport by surface and groundwater, and convective vapor phase transport [4].

TABLE 2: ALPHA ACTIVITY IN VARIOUS FOODS [23]

Food	Maximum Observed Alpha Activity (pCi/g)
Brazil nuts	14.0
Cereals	0.06
Teas	0.04
Organ meats	0.015
Flours	0.014
Peanuts, peanut butter	0.012
Chocolate	0.008
Cookies	0.002
Milk (Evaporated)	0.002
Fish	0.002
Cheeses	0.0009
Eggs	0.0009
Vegetables	0.0007
Meat (Muscles)	0.0005
Fruits	0.0001

4.2 NORM Exposure Pathways, Scenarios, and Results

An exposure pathway may be defined as '...(a) single exposure route, like inhalation of dust, ingestion of contaminated food or water, or direct gamma (radiation exposure)' [7]. A scenario is '...a combination of pathways based on how a person enters and/or interacts with the facility or the waste' [7]. Figure 2 illustrates the pathways which together create a scenario designed to simulate the exposure of an individual who works on a NORM site and ingests contaminated food and water [17]. Figure 3 shows Rn-222 vapor and groundwater phase exposure routes [17]. Total exposure to NORM (primarily radium and its decay products) is thus the summation of all pathways involved in the scenario; however, one pathway may be the dominant factor in the received dose equivalent [1].

Individual external doses caused by NORM exposure are small. The danger is not in external exposure to gamma radiation but in internal exposure caused by inhalation of Ra-226 particulates and Rn-222, as well as ingestion of foodstuffs and liquids contaminated with NORM, with inhalation posing the greatest risk [1, 4, 7, 8, 10, 12, 18, 24]. This has been verified by actual measurements of NORM migratory pathways and extensive modeling. For example, actual measurements of radium concentrations in fly ash leachate showed that the level of radium-226 was lower than in upgradient groundwater; the measured concentrations were 0.13 and 0.22 pCi/l, respectively [1].

In humans, 80-85% of the radium inhaled and ingested is deposited in the bones. On the average, 40 pCi of Ra-226 or 20 pCi of Ra-228 deliver a dose of 3.5 mrad/year to the osteocytes via alpha and gamma emission [18, 24]. In radium dial painters, the threshold skeletal dose for incidence of bone sarcomas was 1,000 rad. The risk coefficient for Ra-226 and Ra-228 was calculated to be in the range of six to fifty-three bone sarcomas per million persons per rad average skeletal dose. In the epithelium of the nasal passages, dose from Ra-226, Rn-222, and Rn-220 produces a risk coefficient for nasal carcinoma development of 64 carcinomas per million person per rad [15].

Most of the vapor phase radiation is due to Rn-222; a small contribution to airborn radiation is also contributed by Rn-220. Vapor phase concentrations of Ra-226 and Rn-222 are approximately 1.89×10^{-8} pCi/l and 1.080 pCi/l, respectively [14]. These isotopes, as decay products of Ra-226 and Ra-224, are electrostatically attracted to dust particles with diameters usually less than 0.025 micrometers [23]. During their decay, these radionuclides emit alpha, beta, and gamma radiations. Particulate Ra-226 may also be deposited in the lungs [18]. The dose equivalent from Rn-222 in lung epithelial tissue is approximately 2.0 mrem/year; in the alveoli, the dose from its progeny is about 100 mrem/year. The segmental bronchioles may receive upwards of 520 mrem/year [23]. NCRP estimates that average annual dose to lung bronchial epithelium from Rn-222 and its daughters is 2400 mrem/year [2]. Biological monitoring of radium dial painters in the 1920's showed that these individuals, who inhaled and ingested significant quantities of Ra-226, had increased incidences of lung and bone cancers compared to the population at large [18]. In 1975, Moghissi and Carter calculated that the average vapor phase radon concentration in dial painting plants was 10 pCi/l. A model introduced in 1972 by Harley and Pasternack predicted that a 168 hour/week continuous exposure to airborne radon at 1 pCi/l would deliver 1,520 mrem/year to the segmental bronchioles [6].

Lead-210 (Pb-210) is not as widely discussed as Ra-226 and its daughters from a NORM aspect; however, its role in posing a health risk when inhaled or ingested should not be overlooked. Pb-210 is in the decay series of Ra-226 (see Figure 1a). Once inside the body, Pb-210 migrates to the liver and emits alpha, beta, and gamma radiations during its decay [18, 23].

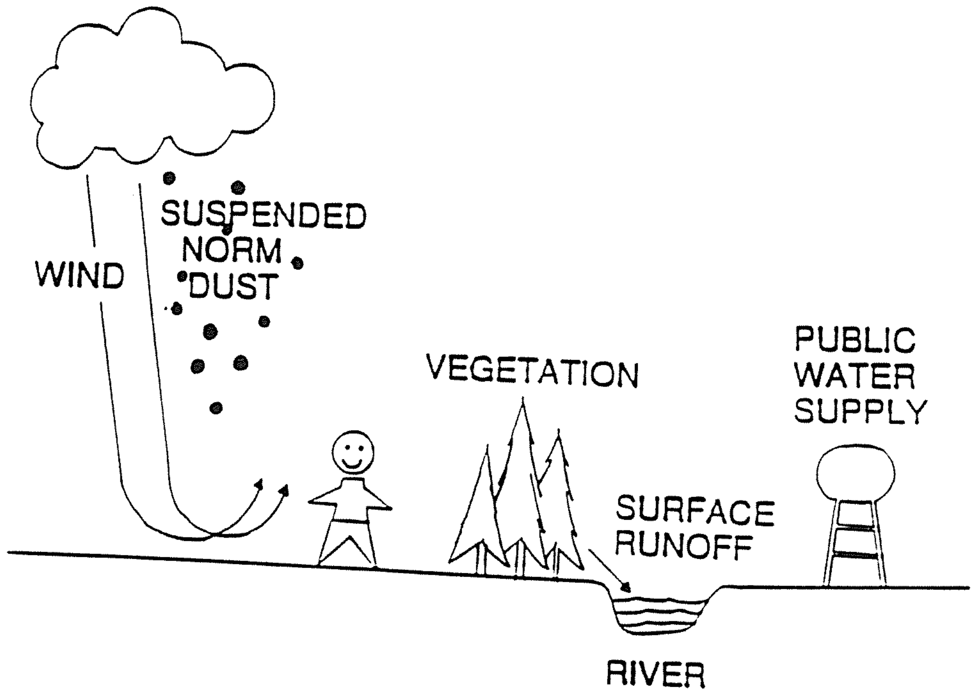


Figure 2: NORM Exposure Pathways 17

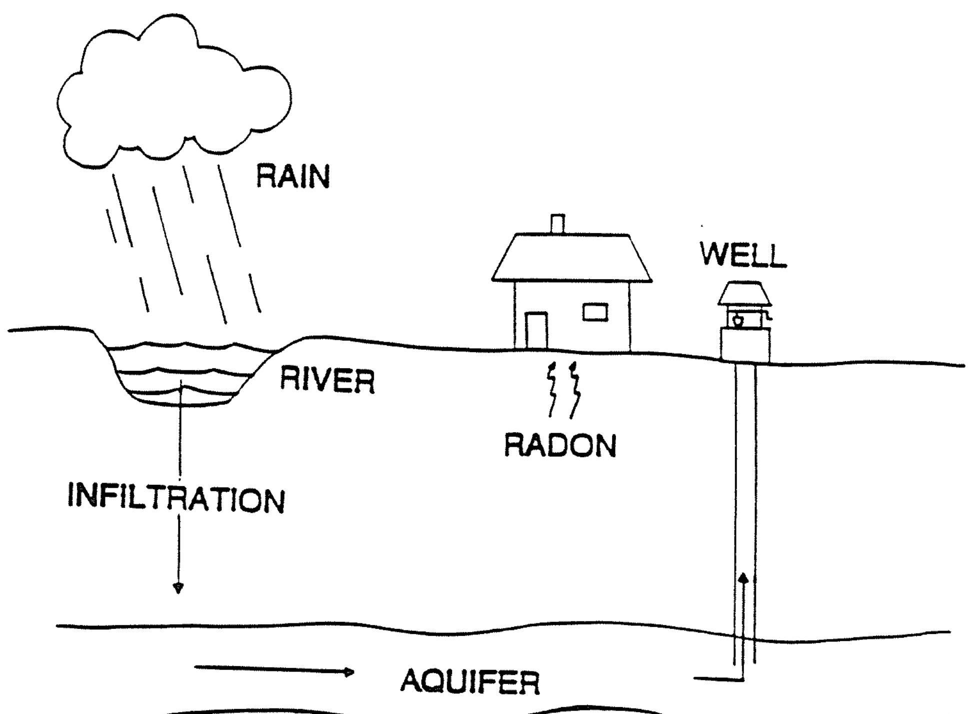


Figure 3: Radon Exposure Pathways 17

4.3 Radiation Levels Associated with NORM

On the average, an individual in the United States receives an annual full-body dose equivalent of 300-500 mrem from natural background; 20-40 mrem are from external gamma exposure caused by airborne Rn-222; 130-250 mrem result from Rn-222 deposited in the lungs. The remainder of the dose is from various sources such as ingestion of radiation-bearing food and water, exposure to radioactive building materials, and cosmic radiation [17]. Assuming an adult life span of 18-70 years, the loss of life expectancy from this exposure is about 8 days [17]. Table 3 shows the percentage contributions of various radiation sources to the total average annual effective dose equivalent [10a].

Industrial exposures to NORM are generally low-level. In a pipe cleaning yard, an employee working full time without personal protective equipment could potentially inhale or ingest more radiation per year than would be received annually by the average nuclear worker from all external or internal sources [19]. The average nuclear industry worker has an annual occupational whole body dose equivalent of about 650 mrem, equivalent to an additional loss of life expectancy of one day [17]. In 1989, 99% of all oil equipment surveyed emitted less than the NRC standard of 2 mrem/hour for unrestricted, no risk areas. However, some pipes in Louisiana were found to have emission rates of about 8 mrem/hour, the equivalent of one bone X-ray for osteoporosis testing [19]. The study on coal ash and ash products, conducted by Radian Corporation, concluded that '...under the most conservative (highest air particulate concentrations) utility scenario presented, a 25 mrem annual dose would have to involve fly ash containing 125 pCi of Ra-226 per gram. For a contract worker exposed to typical outage conditions with fly ash at 5 pCi/g, the calculated dose is less than 1 mrem/year. The typical dose rate for a utility worker was found to be 0.4 mrem/year [1]. It should be noted that the radium concentration of 125 pCi/g mentioned above is orders of magnitude in excess of those measured to date [1].

TABLE 3: ESTIMATED WHOLE BODY RADIATION DOSES FROM NATURAL SOURCES[22]

		Dose (Millirem/Year)
External Radiation		
Cosmic-ray dose rate in U.S.	at sea level	35
	at 5,000 ft.	44 to 60
	at 10,000 ft.	85
Gamma rays inside a brick-and-concrete building from earth and buildings	at sea level	91 to 261
Gamma rays from earth in the open	Coastal	15 to 35
	Plateau	75 to 140
Radon in air (breathing)		22 to 40
Internal Radiation		
Solid radon deposited in lungs		130 to 250
K40		20
C14		1
Radon and its decay products		2
Average total natural whole body dose rate		110 to 540

4.4 Models Used to Evaluate NORM Exposure Risks

Two of the most widely used models for evaluation of NORM exposure risks are IMPACTS-BRC and PATHRAE. IMPACTS-BRC was developed for calculation of total body exposures; This model is used by the NRC. The code is written in FORTRAN, and may be implemented on a personal computer. A built-in data base contains information on 85 radionuclides, along with regional rainfall and wind speed information. Simulation of 9 different scenarios is possible: (1) moving radioactive waste to a disposal site, (2) digging a foundation on a contaminated site, (3) living in a ranch-style house on the site, (4) groundwater migration of radionuclides, (5) exposure of radioactive waste at the surface, (6) exposure to workers at the radioactive waste disposal facility, (7) incineration of radioactive waste, (8) recycling of glass and metal, and (9) leachate accumulation and overflow in the landfill [7].

In contrast to IMPACTS-BRC, PATHRAE allows the user to create scenarios by combination of various appropriate pathways. Five on-site and five off-site scenarios are available. The on-site pathways address groundwater contamination migration to a stream and to a well; contamination caused by erosion of the waste site cover, contamination of facility overflow, and inhalation of radioactive dust. The five off-site pathways address ingestion of contaminated food, absorption of waste by edible plants, direct gamma exposure, inhalation of radioactive dust, and inhalation of radon [4, 7].

Both models have drawbacks. Simulation is limited to the available scenarios or pathway combinations, which may not always faithfully represent the actual situation. The most conservative estimates for exposure are always used [7, 9]. For example, in the transportation scenario, IMPACTS-BRC assumes that all the waste transported is at the highest reported concentration, even if that concentration were measured in a 'hot spot' [7].

Table 4 shows PATHRAE calculated exposures from direct gamma exposure, dust inhalation and radon inhalation for workers at NORM storage or disposal sites. Also included for comparison are average whole body effective dose equivalents for some representative daily activities. Table 5 shows the calculated health effects of NORM exposure by industry on the U.S. population. The two waste sectors with the largest health effects (excess fatal cancers resulting from one year of exposure) are the coal ash and mineral processing areas [3].

The PATHRAE simulations which did not include radon inhalation, estimated that workers at NORM storage or disposal facilities incurred the highest health risk from direct gamma exposure. Doses and health risks from dust inhalation were calculated as 100 to 1000 times less than those resulting from gamma exposure. This differs from the current belief that dust inhalation is of significant concern when addressing health risks associated with NORM exposure. Health risks incurred from radon inhalation were always at least 100 times greater than those for gamma exposure [4].

TABLE 4

Worker Doses and Health Effects From Storage or Disposal of Diffuse NORM [4, 14]

INDUSTRY	DIRECT GAMMA EXPOSURE Dose (mrem/yr)/ Health Effects *	DUST INHALATION Dose (mrem/yr)/ Health Effects *	RADON INHALATION Health Effects *
Uranium Overburden	6.5E+01/ 2.5E-05	2.8E-02/ 4.3E-09	1.8E-02
Phosphate Waste	9.9E+01/ 3.8E-05	1.2E-02/ 1.9E-09	1.2E-02
Phosphate Fertilizer	6.2E-03/ 2.4E-09	1.7E-05/ 2.7E-12	
Coal Ash	1.6E+01/ 6.3E-06	1.1E-02/ 1.6E-09	1.4E-04
Water Treatment Sludge-Fertilizer	2.3E+00/ 8.8E-07	1.3E-04/ 2.0E-11	
Water Treatment Sludge-Landfill	8.0E-01/ 3.1E-07	4.8E-05/ 7.6E-12	1.2E-04
Mineral Processing Waste	1.5E+02/ 5.9E-05	6.9E-02/ 1.1E-08	2.7E-02
Oil & Gas Scale/Sludge	6.5E+02/ 2.5E-04	4.0E-02/ 6.3E-09	2.1E-02
Geothermal Waste	6.7E+01/ 2.6E-05	2.5E-02/ 3.8E-09	9.3E-02
Medicine	70.0 - 150.0		
Government	60.0 - 120.0		
Industry	120.0 - 240.0		
Nuclear fuel cycle	360.0 - 600.0		
Uranium mines	115.0		
Collective avg.	230.0		

TABLE 5

Summary of Cumulative Health Effects in The United States From One Year of Exposure [4]

Waste Sector	Number of Sites for 20-Year Inventory	Health Effects[a]
Uranium Overburden	1.4E+01	2.4E-01
Phosphate Waste	1.5E+01	5.2E-01
Phosphate Fertilizer	9.4E+05	9.2E-01
Coal Ash	1.3E+03	1.2E+01
Water Treatment Sludge--Fertilizer	4.4E+02	7.0E-02
Water Treatment Sludge--Landfill	2.3E+02	1.8E-03
Mineral Processing Waste	6.7E+02	1.7E+00
Oil & Gas Scale/Sludge	1.0E+01	5.6E-02
Geothermal Waste	2.0E+00	1.5E-02

[a] The number of excess fatal cancers (70-year lifetime risk) expected in the total U.S. population as a result of one year of exposure.

4.5 Conclusions

The statements listed below are a result of interviews conducted during June, 1991. In general, the sentiment of the co-authors of this paper is represented by the views expressed by these radiation control officials, health physicists, and environmental engineers. The views of the co-authors of this paper are in no way meant to represent those of Baker Hughes, Inc.

NORM is a built-in health risk. Unless levels of NORM are increased artificially, exposures to NORM are harmless. The assumptions used by EPA to generate their risk tables are unrealistic, because worst-case scenarios are always used [9]. ....Allen Eggleston, Environmental Consultant

Ra-226 in the levels associated with cleaning pipe scale is inhaled in concentrations greater than would normally be encountered. Although there are no data linking NORM to any health risk at the present time, inhalation of radioactive particulates and isotopes should be of concern, and great care should be taken to provide all workers with the correct personal protective equipment [8]. .....Richard Braken, Louisiana Department of Environmental Quality, Nuclear Energy Division.

Because there are no data linking NORM exposure to health risks, it is difficult to say whether NORM exposure is a definite concern. The calculated risks are based on extrapolation from higher exposure levels. Nevertheless, NORM disposal and exposure should be regulated, because of the potential risks resulting from inhalation of NORM particulates and Rn-222 [13]. ..... Charles West, Tennessee Department of Public Health, Division of Radiological Health.

In the normal working environment, NORM exposures result in dose equivalents less than the proposed regulatory limit of 25 mrem/year; however, inhalation of NORM particulates and Rn-222 is of concern to many regulators. External gamma exposures are not of great significance. Although 25 mrem/year as a regulatory limit may seem low, one must realize that this stems from the petroleum industry attempting to address and identify possible exposure risks from NORM [10]. ....Ralph Heyer, Texas Bureau of Radiation Control.

NORM exposure and health risk potential are largest in industrial processes involving routine contact with contaminated materials. For example, daily removal of pipe scale utilizing the dry process would expose an individual to a larger amount of NORM than the wet process. The groundwater contamination exposure pathway is probably not as important as some of the other NORM exposure routes [11]. ....Ruth McBurney, Texas Bureau of Radiation Control.

5. NORM REGULATIONS

The NORM issue has attracted much attention over the past few years. While most radioactive material has been regulated from the beginning of its existence, NORM (except for byproduct material from uranium production) has not.

Even though the environmental and health risk effects associated with the handling and disposal of NORM waste are largely undefined, many state agencies feel potential risks are great enough to necessitate NORM regulations. Since NORM is not regulated by the NRC, the regulating of NORM has been left to the discretion of each state. In order to ensure national uniformity, the Conference of Radiation Control Program Directors (CRCPD) was established. This organization, made up of state regulatory representatives, designated a task force to assess potential health risks and to establish recommendations and guidelines for NORM regulation. In 1984, the CRCPD developed Suggested State Regulations for Control of Radiation (Part N of SSRCR). Each state agency has the option to use and/or modify these suggested regulations. In addition to the CRCPD, the EPA and individual states have performed health effect studies of exposure received from NORM in various industries [21]. Figure 4 details the regulatory control pathway.

In 1989, Louisiana became the first state to pass NORM regulations [13, 20]. The Texas Bureau of Radiation Control is in the process of finalizing NORM regulations. Draft Two of the Texas Proposed Regulations, Part 46, was submitted to industries for review in February, 1991. Ohio is also considering NORM regulations [11].

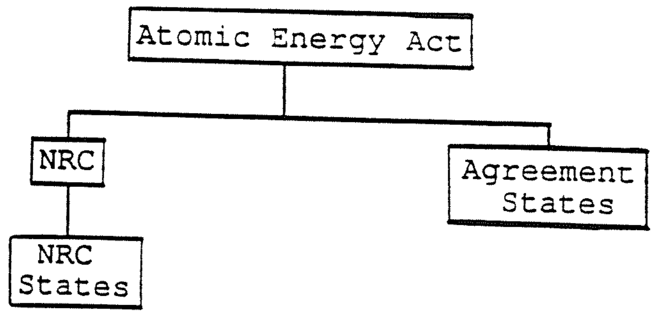
Louisiana and Texas NORM regulations establish radiation protection standards for the possession, use, transfer or disposal of NORM; and require persons receiving or possessing NORM contaminated material be licensed [5, 16]. The proposed Texas regulations address licensing of property and equipment in more detail than the Louisiana regulations. Louisiana regulations are more specific with respect to sampling and screening procedures [20]. The Texas Bureau of Radiation Control has developed an interim policy for naturally occurring radioactive material in pipe scale, until the NORM regulations are finalized. The policy establishes radiation protection procedures for handling, storing, and disposing of naturally occurring radioactive material found in pipe scale or soil contaminated by the cleaning of pipe scale [16].

Part N of the CRCPD's suggested regulations set the allowable radium concentration in soil, averaged over 100 square meters, at 5 pCi/g above background, averaged over the first 15 cm. of soil below the surface, and 15 pCi/g averaged over 15 cm. thick layers of soil more than 15 cm. below the surface. Some NORM is exempted from regulation, including natural potassium compounds (not enriched in K-40), Brazil nuts (which contain radium in concentrations greater than 5 pCi/g), phosphate and potash fertilizer, phosphogypsum for agricultural purposes, and building materials such as red brick, containing NORM which are not technologically enhanced [3]. Table 6 compares Ra-226 concentrations from a regulatory standpoint.

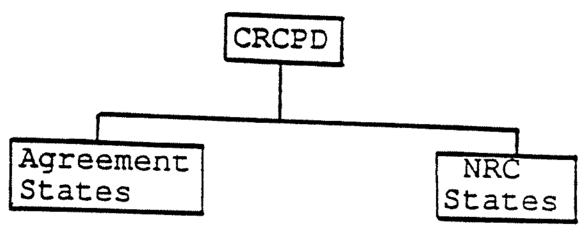
Potential health risks to humans and risks to the environment resulted in promulgation of NORM regulations. These regulations will increase operation costs for many industries, whether or not concern is warranted.

Figure 4: Regulatory Control Pathway

Regulation Of Special Nuclear Material (U-233, U-235 & Plutonium), Radioactive Source Material (Uranium), and Byproduct Material



Regulations Of Technologically Enhanced NORM (except for Uranium and Thorium)



NORM Risk Assesments

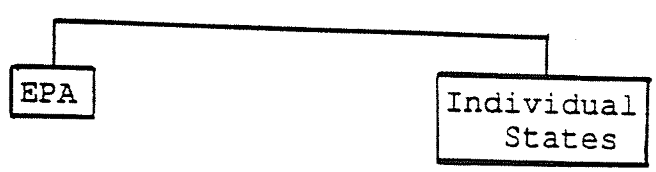


TABLE 6: REPRESENTATIVE CONCENTRATIONS OF Ra-226 FROM A REGULATORY STANDPOINT [5, 16]

Regulatory Document	Application	Concentration Above Which Regulation Applies
Part 46 Texas Bureau of Radiation Control: Licensing of NORM	Application for General License to mine, extract, receive, process, own, use, possess or dispose of NORM as well as a specific license to manufacture and distribute any material or product containing NORM.	5.0 pCi/g (5.0×10^{-12} Ci/g)
Part 21 Texas Regulations For Control of Radiation: Near Surface Waste Disposal	Maximum concentration for near surface disposal	1.0×10^{5} pCi/g (1.0×10^{-7} Ci/g)
	Classification of Class A Waste	$<1.0 \times 10^{4}$ pCi/g (1.0×10^{-8} Ci/g)
	Classification of Class C Waste	$>1.0 \times 10^{4}$ pCi/g (1.0×10^{-8} Ci/g)
49 CFR	Classification of a radioactive material for transportation purposes	2,000 pCi/g (2.0×10^{-9} Ci/g)
10 CFR Part 31	Reportable concentration of removable radioactive material for leak testing	5,000 pCi (5.0×10^{-9} Ci)
For Comparison:	Average leak test swab wetted weight is 0.5 g	
	Specific activity of leak test swab if 5,000 pCi removed.	1.0×10^{4} pCi/g (1.0×10^{-8} Ci/g)

6. NORM WASTE AND DISPOSAL

NORM wastes are generally produced from technological processes not designed for recovery or use of the radioactive material. One of the major problems for industries producing NORM waste is disposal. NORM waste has low levels of radioactivity; however, the constituent radionuclides have a very long half-life, thus the waste can remain radioactive for long periods of time. In addition to the long half-life, NORM waste is inherently a larger volume material than other types of radioactive waste, causing additional disposal costs to be incurred.

In past years, NORM wastes have been disposed of in uranium mill tailing impoundments. Due to current closures of these impoundments, at present there are no disposal facilities in Texas and many other states. Utah has the only site available for disposal of NORM waste; it will not accept NORM with concentration levels in excess of 2000 pCi/g [20].

Some NORM waste has been taken to low level disposal sites. This is not economically feasible, due to the large volume of waste involved, and the high disposal cost/pound ratio [18]. Since concentrations of Ra-226 in NORM waste are very low, NORM waste can be disposed of in many ways at lower costs to generators. Following a safety analysis report for the disposal of NORM in Texas, it was reported that about 45% of waste generated in Texas could be disposed using small quantity surface disposal at a cost of $1.5 million per year. About 67% of the NORM waste could utilize land farming, at a cost of $23 million per year, and 89% could utilize on-site burial at $45 million per year; and 88% could utilize sanitary landfills at $3.6 million per year. However, cost of disposal in the low level waste site is much higher. The respective costs are $9.1 million, $42.9 million, $55.0 million, and $55.7 million. Disposal in a byproduct (tailings) impoundment is suitable for more waste (95%), but costs $19.2 million per year [26].

In May, 1990 the American Petroleum Institute (API) performed a radiological analysis on various disposal methods for four types of waste from oil and gas industries, including sludges, scale, production equipment and gas plant equipment. The waste disposal alternatives considered included: landspreading; landspreading with dilution; surface pipe non-retrieval; burial at unrestricted sites; disposal at commercial oil field waste sites; disposal at licensed NORM disposal sites; disposal at licensed low-level radioactive waste sites; burial in surface mines; placement into wells being plugged and abandoned; injection into inactive wells; hydraulic fracturing into unused formations; and injection into salt domes. As a result of this analysis, it was concluded that many of these waste disposal methods are suitable to all four types of waste forms [17].

Currently in Texas, a study is being performed to determine concentrations of NORM which could be safely disposed of in sanitary landfills [3]. In Texas, 93% of the NORM waste is produced in the petroleum industry and rare earth mineral processing accounts for most of the remainder of the NORM waste volume. However, the activity distribution of the petroleum industry waste is only 12% of the total NORM activity and most of the NORM contains less than 10 pCi/g of Ra-226; only 5% exceeds 2000 pCi/g [26].

7. CONCLUSIONS

Regulatory concentration ceilings for NORM exposure and waste disposal are, at first glance, very low. At the present time, no quantitative data concerning risks associated with NORM disposal are available. In order of decreasing importance, these risks include: (1) Elevation of radionuclide and, if applicable, entrained hazardous chemical concentration in consumer products from reclamation of NORM waste; (2) Enhancement of environmental radionuclide concentrations in soil, air, and water from improper NORM waste disposal; and (3) Greater probability of health risks from NORM exposure as radionuclide concentrations in the environment and number of exposure routes increase.

Despite the lack of quantitative data, existing and pending regulations will require industry to comply with stringent NORM contaminated waste disposal procedures. Compliance will also require increasing employee personal protective equipment and training. Industry will bear the compliance cost whether or not the procedures are actually necessary.

Actual quantification of NORM risks awaits further study. Areas of investigation should include: (1) Health risks associated with low level exposure to radiation; (2) Enhancement of radionuclide and hazardous chemical concentrations in recycled NORM containing material; (3) Cost of NORM waste reclamation, storage, and disposal; and (4) Environmental impact of NORM waste storage disposal and processing [4, 8, 10, 12, 13].

References for NORM article

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OUTLINE OF DEVELOPMENT OF RISK ASSESSMENT POLICY AT THE TEXAS WATER COMMISSION

by

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for the

Third Annual Texas Environmental Superconference
State Bar of Texas
Four Seasons Hotel
Austin, Texas

August 1-2, 1991

I. RISK ASSESSMENT WORKGROUP PROGRESS REPORT.

A. Schedule of Implementation of Risk Assessment Rules.

Consensus exists on fundamental structure of rules. Current efforts revolve around amount of detail to place in rules, as opposed to use of preamble and technical guidance.

B. Basic Structure of Risk Assessment Performance Standards.

1. Definition of "remove", "decontaminate" and "control". Concept of "permanent" reduction of risk to human health and the environment.

2. Three-tier structure of cleanup levels and accompanying post-closure care requirements.

3. Proposed modification of deed recordation requirements.

C. Requirements for Industry Submittal of Risk Assessment.

1. Traditional "clean closure": background levels for naturally occurring constituents; non-detectable levels for other constituents.

2. "Cookbook" approach using existing tables and standardized exposure scenarios, or "risk-assessment-made-easy".

3. Traditional approach through hazard identification, dose-response evaluation, exposure assessment and risk characterization.

II. NEW PERSPECTIVES ON RISK ASSESSMENT.

A. Science Advisory Board Report to EPA Administrator.

B. Region 6 Comparative Risk Study.

C. Proposed Texas Comparative Risk Study.

III. REFERENCES.

A. Selected EPA Risk Assessment References.

B. Comparative Risk Studies References.

SELECTED EPA RISK ASSESSMENT REFERENCES

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3. Executive Office of the President of the United States, Office of Budget and Management, Regulatory Program of the United States Government, Part I Overview, Current Regulatory Issues in Risk Assessment and Risk Management, April 1, 1990-March 31, 1991, 13-25.

4. U.S. Environmental Protection Agency, Science Advisory Board, Reducing Risk: Setting Priorities and Strategies for Environmental Protection (Washington, D.C.: EPA, September, 1990; SAB-EC-90-021).

   Appendix A: Report of the Ecology and Welfare Subcommittee (EPA-SAB-EC-90-021A).

   Appendix B: Report of the Human Health Subcommittee (EPA-SAB-EC-90-021B).

   Appendix C: Report of the Strategic Options Committee (EPA-SAB-EC-90-021C).

5. Reilly WK, Administrator, U.S. Environmental Protection Agency, Aiming Before We Shoot: The Quiet Revolution in Environmental Policy, Address to National Press Club, Washington, D.C., September 26, 1990 (Washington, D.C.: EPA, Office of the Administrator (A-107), September, 1990; 20Z-1011).

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7. U.S. Environmental Protection Agency - Region 6, Office of Planning and Analysis, Region 6 Comparative Risk Project: Overview Report (Dallas, Texas: EPA, November, 1990).

   Appendix A: Ecological Report.

   Appendix B: Human Health Report.

   Appendix C: Risk Management and Economic Report.

The Ten Recommendations

1. EPA should target its environmental protection efforts on the basis of opportunities for the greatest risk reduction. Since this country already has taken the most obvious actions to address the most obvious environmental problems, EPA needs to set priorities for future actions so the Agency takes advantage of the best opportunities for reducing the most serious remaining risks.

2. EPA should attach as much importance to reducing ecological risk as it does to reducing human health risk. Because productive natural ecosystems are essential to human health and to sustainable, long-term economic growth, and because they are intrinsically valuable in their own right, EPA should be as concerned about protecting ecosystems as it is about protecting human health.

3. EPA should improve the data and analytical methodologies that support the assessment, comparison, and reduction of different environmental risks. Although setting priorities for national environmental protection efforts always will involve subjective judgments and uncertainty, EPA should work continually to improve the scientifc data and analytical methodologies that underpin those judgments and help reduce their uncertainty.

4. EPA should reflect risk-based priorities in its strategic planning processes. The Agency's long-range plans should be driven not so much by past risk reduction efforts or by existing programmatic structures, but by ongoing assessments of remaining environmental risks, the explicit comparison of those risks, and the analysis of opportunities available for reducing risks.

5. EPA should reflect risk-based priorities in its budget process. Although EPA's budget priorities are determined to a large extent by the different environmental laws that the Agency implements, it should use whatever discretion it has to focus budget resources at those environmental problems that pose the most serious risks.

6. EPA — and the nation as a whole — should make greater use of all the tools available to reduce risk. Although the nation has had substantial success in reducing environmental risks through the use of government-mandated end-of-pipe controls, the extent and complexity of future risks will necessitate the use of a much broader array of tools, including market incentives and information.

7. EPA should emphasize pollution prevention as the preferred option for reducing risk. By encouraging actions that prevent pollution from being generated in the first place, EPA will help reduce the costs, intermedia transfers of pollution, and residual risks so often associated with end-of-pipe controls.

8. EPA should increase its efforts to integrate environmental considerations into broader aspects of public policy in as fundamental a manner as are economic concerns. Other Federal agencies often affect the quality of the environment, e.g., through the implementation of tax, energy, agricultural, and international policy, and EPA should work to ensure that environmental considerations are integrated, where appropriate, into the policy deliberations of such agencies.

9. EPA should work to improve public understanding of environmental risks and train a professional workforce to help reduce them. The improved environmental literacy of the general public, together with an expanded and better-trained technical workforce, will be essential to the nation's success at reducing environmental risks in the future.

10. EPA should develop improved analytical methods to value natural resources and to account for long-term environmental effects in its economic analyses. Because traditional methods of economic analysis tend to undervalue ecological resources and fail to treat adequately questions of intergenerational equity, EPA should develop and implement innovative approaches to economic analysis that will address these shortcomings.

U.S. Environmental Protection Agency, Science Advisory Board, Reducing Risk: Setting Priorities and Strategies for Environmental Protection (Washington, D.C.: EPA, September, 1990; SAB-EC-90-021).

III. AIR

TACB Implementation of the Clean Air Act - "Southwest Air"

"The Friendy Skies?"
Clean Air Act Amendments of 1990
Issues for Texas
Herb Williams
Texas Air Control Board
Austin, Texas

Key Issues for Industry and the Public - "Air Grievances"

David Graham
Dow Chemical Company
Freeport, Texas

Jim Marston
The Environmental Defense Fund
Austin, Texas

1991 TCAA Amendments

Four Versions

- HB 1604 - Saunders

  Passed by House, Regular Session

- SB 35, Article 2 - Parker/Brooks

  Passed by Senate, Regular Session

- SB 2, Article 2 - Parker/Brooks

  Passed by Senate, First Called Session

- House Substitute for SB2, Article 2

  Passed by House, First Called Session

  Passed by Senate, First Called Session

Title I - Nonattainment

Inspection/Maintenance Program

- Additional Authority Granted
- Registration Enforcement
- Other County Opt-In
- Decentralized or Centralized (Decentralized Preferred)
- Pretamper for Covert Audits
- Centralized Re-inspections
- Study I&M for Diesel Vehicles

Stage II Prohibition Removed

Title III - Air Toxics

Authority to Permit

- Hazardous Waste Management Facilities
- Solid Waste Management Facilities

Title V - Operating Permits

Authority to Issue

Consider Prior Compliance
(5 Years)

5 Year Renewal

Notice & Comment Hearing

Annual Emissions Fee & CPI Escalation

General Revenue Fund

- All Fees
- Mobile Source Fee - $2.00/Inspection

Small Business Stationary Source
Assistance Program

Criminal Penalties

Adequate Personnel & Funding

- Fee Cap Raised to $75,000

Title VII - Enforcement

Criminal Penalties

- Knowing Violation of Rule
  $1,000-$50,000 and/or 180 Days in Jail

- Knowing Failure to Pay Fee
  Twice Fee and/or 90 Days in Jail

- Knowing False Material Statement
  $500-$100,000 and/or 1 Year in Jail

- Knowing Failure to Notify
  $500-$100,000 and/or 1 Year in Jail

- Knowing Tampering With Monitoring Device
  $500-$100,000 and/or 1 Year in Jail

- Reckless Emission That Endangers Another
  $1,000-$100,000 and/or 1 Year in Jail

- Knowing Emission That Endangers Another
  $1,500-$150,000 and/or 5 Years in T.D.C.

- Knowing Emission With Knowledge of Endangerment
  $2,500-$250,000 and/or 10 Years in T.D.C.

Additional Provisions

International Border Area Provision

Permitting

- General Permits
- Single Permits for Multiple Facilities
- Consolidate Permits
- Preconstruction Review
- Consider Prior Compliance
  (5 Years)
- 5 Year Renewal

Public Participation
30 Day Notice on Agreed Orders & Settlements

Emergency Rulemaking Authority

House Committee Substitute for SB2

Texas Natural Resources
Conservation Commission

Includes:

- Texas Water Commission
- Texas Air Control Board
- Texas Department of Health
  Environmental Programs
- Texas Water Well Drillers Board
- Texas Board of Irrigators

Organization

- 3 Member Commission
- Executive Director
- Transitional Deputy Directors
  - Air Quality
  - Water
  - Waste Management
  - Administration

Southwest Air

"The Friendly Skies?"

Clean Air Act Amendments of 1990

Issues For Texas

Federal Sanctions If State Fails To Act

- Severe Growth Limits in Nonattainment Areas
- Withhold State Highway Funds
- Withhold State Air Program Grant
- EPA to Implement Air Program in Texas

1990 Clean Air Act Amendments

Title I - Nonattainment

Title II - Mobile Sources

Title III - Hazardous Air Pollutants

Title IV - Acid Rain

Title V - Permits

Title VI - Stratospheric Ozone

Title VII - Enforcement

Title VIII - Miscellaneous Provisions

Title IX - Research

Title X - Disadvantaged Business

Title XI - Employment Transition Assistance

Title I - Nonattainment Ozone

Key Provisions

- Nonattainment Classifications
- Major Source Definition
- % Reductions
- Prescribed Measures
- Sanctions

Nonattainment Area Designations Recommended by State to EPA

Dallas-Fort Worth Area	Classification	Pollutant
Collin Co.	Moderate	Ozone
Dallas Co.	Moderate	Ozone
Denton Co.	Moderate	Ozone
Tarrant Co.	Moderate	Ozone
Parker Co.	Unclassifiable	Ozone
Rockwall Co.	Unclassifiable	Ozone
Ellis Co.	Unclassifiable	Ozone
Johnson Co.	Unclassifiable	Ozone
Kaufman Co.	Unclassifiable	Ozone
Collin Co.	Due 5/23/91	Lead

Nonattainment Area Designations Recommended by State to EPA

Houston-Galveston-Brazoria CMSA	Classification	Pollutant
Brazoria Co.	Severe 2	Ozone
Fort Bend Co.	Severe 2	Ozone
Galveston Co.	Severe 2	Ozone
Harris Co.	Severe 2	Ozone
Liberty Co.	Severe 2	Ozone
Montgomery Co.	Severe 2	Ozone
Waller Co.	Severe 2	Ozone
Chambers Co.	Severe 2	Ozone
	(Include With Houston CMSA)	
Harris Co.	Due 5/23/91	Sulfur Dioxide

Nonattainment Area Designations Recommended by State to EPA

Beaumont-Port Arthur MSA	Classification	Pollutant
Hardin Co.	Serious	Ozone
Jefferson Co.	Serious	Ozone
Orange Co.	Serious	Ozone
Jefferson Co.	Due 5/23/91	Sulfur Dioxide

Additional Areas		
El Paso Co.	Serious	Ozone
	Moderate	Carbon Monoxide
	Moderate	PM_{10}
Culberson Co.	Unclassifiable	Ozone
Lubbock Co.	Unclassifiable	PM_{10}
Victoria Co.	Incomplete Data	Ozone

Title I - Nonattainment

Ozone Area Classifications and Attainment Dates

Class	Texas Area	Cutpoint (ppm)	Attainment Date
Marginal	None	0.121	3 Years
Moderate	Dallas-Ft. Worth*	0.138	6 Years
Serious	El Paso-Beaumont/Port Arthur*	0.160	9 Years
Severe	Houston-Galveston/ Brazoria	0.180	15-17 Years
Extreme	None	≥0.280	20 Years

** May Be Reclassified to Next Lowest Level*

I. - Marginal

1. Comprehensive Emissions Inventory

2. Reasonably Available Control Technology (RACT)

3. Inspection and Maintenance (I & M) (Where Previously Existing)

4. New Source Review Program

5. Offsets of 1.1 to 1

II. - Moderate

6. Annual VOC Reductions

   15% Within 6 Years

7. RACT & All Existing Plus 13 New Control Techniques Guidelines

8. Stage II

9. Basic I & M

10. Offsets of 1.15 to 1

III. - Serious

11. Major Source = 50 TPY

12. Enhanced Monitoring

13. Photochemical Grid Modeling

14. Submit Attainment Demonstration

15. 15% Reduction Within 6 Years

    3% Per Year Thereafter Until Attainment

16. Enhanced I & M

17. Transportation Control Measures, if Needed

18. Clean Fueled Vehicles for Fleets of 10 or More

19. Offsets of 1.2 to 1

IV. - Severe

20. Major Source = 25 TPY

21. Reduce Aggregate Vehicle Emissions

22. Employers Reduce Work-Related Trips and Employee VMT

23. Offsets of 1.3 to 1

V. - Extreme

24. Major Source = 10 TPY

25. Major Sources Burn Clean Fuels or Advanced Control Technology

26. Transportation Control Measures (Required)

27. NO_x Controls

28. Offsets of 1.5 to 1

Title I - Nonattainment Vehicle Inspection/Maintenance

Basic I/M Program

- Dallas/Ft. Worth Urbanized Areas (Revised)
- Houston/Galveston Urbanized Areas Other Than Houston (New)
- Beaumont/Port Arthur Urbanized Areas (New)

Enhanced I/M Program

- Houston Urbanized Area (Revised)
- El Paso County (Revised)

Title I - Nonattainment Vehicle Inspection/Maintenance

Basic Program Requirements

- Tailpipe Emissions Test w/Computerized Analyzers
- Anti-tampering Inspection
- One Covert Audit/Station/Year Using Pre-tampered Vehicles
- Inspector Training and Licensing
- Restrictions on Multiple Initial Inspection
- Effectiveness Evaluations
- Existing Waiver Limit of a Maximum of $200

Title I - Nonattainment Vehicle Inspection/Maintenance

Enhanced Program Requirements

- Requirements of the Basic Program
- Centralized Inspections or Equivalent
- Registration Enforcement
- On-road Testing (Roadside Surveys and/or Remote Sensing)
- Waiver Limit of a Minimum of $450

REQUIREMENTS FOR OZONE NONATTAINMENT AREAS

	Marginal	Moderate	Serious	Severe
Design Value	.121 up to .137 ppm	.138 up to .160 ppm	.160 up to .180 ppm	.180 up to .280 ppm (.190 up to .280 ppm)**
Area	Counties measuring exceedances or part of urban area (possibly Dallas and Tarrant Counties)	Counties measuring exceedances or part of urban area (Dallas and Tarrant Counties, possibly Jefferson, Orange, and Hardin Counties)	All counties in MSA/CMSA plus adjacent counties measuring exceedances (Jefferson, Orange, Hardin, and El Paso Counties)	All counties in MSA/CMSA plus adjacent counties measuring exceedances (Harris, Galveston, Brazoria, Fort Bend, Liberty, Montgomery, Waller, and Chambers Counties)
Attain By	November 15, 1993	November 15, 1996	November 15, 1999	November 15, 2005 November 15, 2007**
Planning Requirements	1. Inventory due in 2 years and every 3 years thereafter	1. Inventory due in 2 years and every 3 years thereafter 2. Plan demonstrating 15% VOC reduction and attainment (by 1996) due in 3 years	1. Inventory due in 2 years and every 3 years thereafter 2. Plan demonstrating 15% VOC reduction due in 3 years 3. Plan demonstrating continued 3%/year reduction and using UAM to demonstrate attainment (by 1999) due in 4 years 4. Plan demonstrating vehicle emissions within plan estimates due in 6 years and every 3 years thereafter	1. Inventory due in 2 years and every 3 years thereafter 2. Plan demonstrating 15% VOC reduction due in 3 years 3. Plan demonstrating continued 3%/year reduction and using UAM to demonstrate attainment (by 1999) due in 4 years 4. Plan demonstrating vehicle emissions within plan estimates due in 6 years and every 3 years thereafter
Reduction Requirements		15% VOC reduction in 6 years	15% VOC reduction in 6 years, then 3%/year VOC (or equivalent NO_x) reduction thereafter	15% VOC reduction in 6 years, then 3%/year VOC (or equivalent NO_x) reduction thereafter
Mobile Source Requirements	1. Vehicle I/M where previously required	1. Vehicle I/M with $200 repair waiver, computer emission checks, anti-tampering checks	1. Vehicle I/M with $450 repair waiver, computer emission checks, anti-tampering checks, equivalent to centralized with registration enforcement* 2. Clean fuel vehicles for fleets of 10 or more vehicles beginning in 1998 3. TCMs (in 1997 or later) if vehicle emissions exceed plan	1. Vehicle I/M with $450 repair waiver, computer emission checks, anti-tampering checks, equivalent to centralized with registration enforcement* 2. Clean fuel vehicles for fleets of 10 or more vehicles beginning in 1998 3. TCMs (in 1997 or later) if vehicle emissions exceed plan 4. TCMs to offset VMT growth due in 2 years 5. Plan requiring employers to reduce work-related trips and VMT by employees due in 2 years

	Marginal	Moderate	Serious	Severe
Stationary Source Requirements	1. RACT on all 100 tpy or larger sources	1. Stage II vapor recovery (gas station nozzle controls) 2. RACT (including 13 new source categories) on all 100 tpy or larger sources	1. Stage II vapor recovery 2. RACT (including 13 new source categories) on all 50 tpy or larger sources	1. Stage II vapor recovery 2. RACT (including 13 new source categories) on all 25 tpy or larger sources
New Source Requirements	1. New source review program for all new or modified 100 tpy or larger sources 2. Offsets of 1.1:1 for new or modified 100 tpy or larger VOC sources	1. Offsets of 1.15:1 for new or modified 100 tpy or larger VOC sources	1. Offsets of 1.2:1 for new or modified 50 tpy or larger VOC sources 2. de minimis increases limited to 25 tpy/5 years 3. VOC increases (other than de minimis) are FCAA modifications unless 1.3:1 internal offsets	1. Offsets of 1.3:1 for new or modified 25 tpy or larger VOC sources, 1.2:1 if all existing 25 tpy or larger VOC sources required to use BACT 2. de minimis increases limited to 25 tpy/5 years 3. VOC increases (other than de minimis) are FCAA modifications unless 1:3:1 internal offsets
Miscellaneous	1. Emission certification (25 tpy or larger sources) due in 3 years and every year thereafter	1. Emission certification (25 tpy or larger sources) due in 3 years and every year thereafter	1. Emission certification (25 tpy or larger sources) due in 3 years and every year thereafter 2. Enhanced monitoring for ozone, NO_x, and VOC	1. Emission certification (25 tpy or larger sources) due in 3 years and every year thereafter 2. Enhanced monitoring for ozone, NO_x, and VOC
Failure to Attain	Reclassified as moderate and meet moderate requirements by 1996 unless design value high enough to trigger higher designation	Reclassified as serious and meet serious requirements by 1999 unless design value high enough to trigger severe designation	Reclassified as severe and meet severe requirements by 2005 unless EPA approves state economic incentive or contingency plan as adequate to attain	1. Reclassified as extreme and meet extreme requirements by 2010 unless EPA approves state economic incentive or contingency plan as adequate to attain 2. Plan due by 12/31/2000 to impose $5,000/ton fee on emissions over 80% of the baseline on all 25 tpy or larger VOC sources

*These "enhancements" do not apply in areas where urbanized population is less than 200,000 (1980 census)

1/24/91

Title II - Mobile Sources

Key Provisions

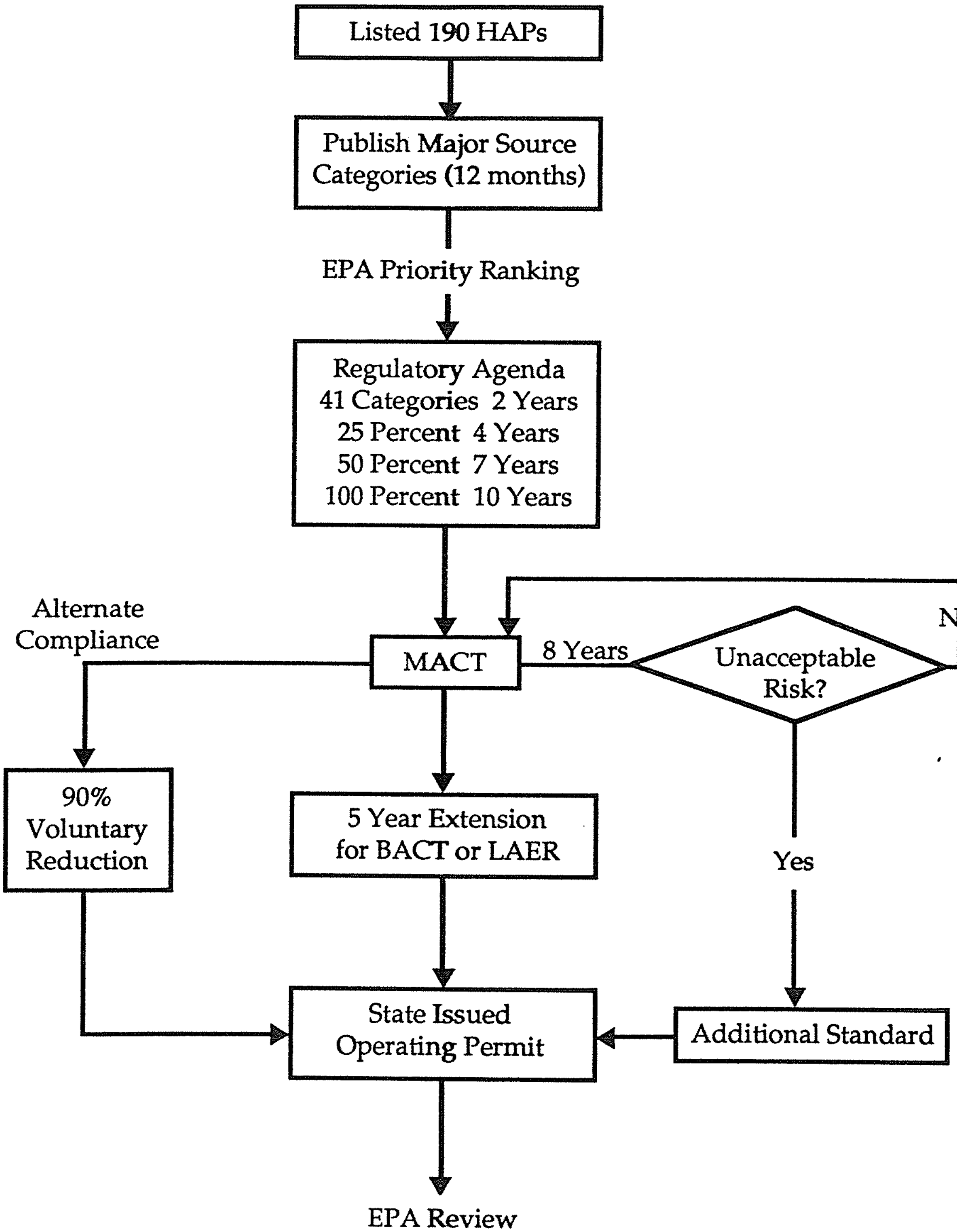
- Tailpipe Standards
- Clean Fuels
- Reformulated Gasoline
- Volatility Limits
- Non-road Engines

Title III - Air Toxics

Key Provisions

- 190 Hazardous Air Pollutants (HAP)
- Major Source; 10 TPY Single HAP or 25 TPY Aggregate
- Maximum Achievable Control Technology (MACT)
- Residual Risk Requirements
- Accidental Release Provisions

Title III - Air Toxics



Title IV - Acid Rain

Key Provisions

- SO_2 Reductions
- Allowances
- NO_x Reductions
- Clean Coal Technology
- Continuous Emissions Monitors (CEMs)

Title V - Operating Permits

- Uniform Operating Permit Program
- Codification Process
- Permit Fees
- Small Business Provisions
- Federal Oversight

Title V - Applicability

- Major Sources

  Title I

  Title III

  Title IV

  Sec. 302

- NSPS - Sec. 111
- NESHAP - Sec. 112
- PSD - Part C
- Nonattainment - Part D
- Any Other Stationary Source EPA Designates

Title V - Program Elements

- Permit Application Form
- Completeness Determination Basis
- Monitoring and Reporting
- Permit Fee
- Adequate Personnel and Funding
- Authority to Issue, Revoke, Deny, or Reissue
- Operational Flexibility
- 5-Year Permit Renewal
- Public Notice
- EPA Objection

Title V - Program Implementation

- EPA Rules by 11/15/91
- State Must Request Delegation by 11/15/93
- EPA Must Approve/ Disapprove Within 1 Year
- Applications Due Within 1 Year of Approval
- State Must Issue Permits Within 3 Years of Approval

Title V - Notification Requirements

- Notify Contiguous/Affected States
- Copy of Application and Proposed Permit to EPA
- Public Notice Provisions
- EPA May Waive Oversight Review for Other Than Major Sources

Title V - EPA Oversight

- EPA Has 45 Days to Comment
- If Objection Not Resolved Within 90 Days, EPA Must Issue or Deny Permit
- Citizen Suit Provisions
- EPA Authority to Terminate, Modify, or Revoke and Reissue Permits

Title V - Small Business Provisions

- Develop, Collect, Coordinate Information
- Assist With Pollution Prevention and Accidental Release Prevention
- State Ombudsman
- Compliance Assistance
- Eligibility

  100 or Fewer Employees

  Small Business Concern

  State May Add/Exclude Sources
- Federal Oversight/Assistance
- State Compliance Advisory Panel

Title V - State Proposal

- Convert to Single Permit System
- Five Year Renewal for All Permits
- Maintain Pre-Construction Review
- Restructure Exemption List
- Redefine Amendment Procedures
- Modify Public Hearing Process
- Small Business Compliance Assistance
- Develop "Appropriate Criminal Penalties"
- Develop Annual Emissions Fee System
- Revise Solid Waste Disposal Act

Title VI - Stratospheric Ozone

Key Provisions

- Listing by EPA
- Phase-out Schedule
- Recycling/Use Limits
- Mobile Source Air Conditioners
- Labeling
- Safe Alternative Rules
- Methane Study

Title VII - Enforcement

Key Provisions

- Administrative Penalties - $25,000/Day
- Field Citations - $5,000/Day
- Criminal Penalties - Felony
- "Bounty Hunter" Provisions - $10,000 Reward
- Citizen Suit Provisions

Title VII - Enforcement

Criminal Penalties

- Failure to Pay a Fee
  Fine and/or 1 Year in Prison

- Negligent Release of Hazardous Pollutant
  Fine and/or 1 Year in Prison

- Knowing Release of Hazardous Pollutant
  Fine and/or 15 Years in Prison

- Knowing Violation of Requirement
  Fine and/or 5 Years in Prison

- Knowing False Representations, Etc.
  Fine and/or 2 Years in Prison

- Maximum Fines
  Up to $250,000 for Individuals

  Up to $1,000,000 for Organizations

  Can be Doubled for Second Offense

  Operator Defined - Senior Management Personnel or Corporate Officer, Not Just Employees

Title VIII - Miscellaneous Provisions

Key Provisions

- Outer Continental Shelf
- U.S. - Mexico Border Provisions
- Visibility
- Grants

Title IX - Clean Air Research

Key Provisions

- Monitoring and Modeling
- Health Effects
- Ecosystems and Synergism
- Accidental Releases
- Pollution Prevention
- Acid Deposition
- Clean Fuel Alternatives

Title X - Disadvantaged Business

Key Provision

- 10% EPA Research Funds Available to Disadvantaged Businesses

Title XI - Employment Transition Assistance

Key Provision

- 5 Year, $250 Million Authorization for Training and Benefits for Workers Who Become Unemployed as a Result of Any Provision of FCAA.

"New Clean Air Routes"

State Statutory Authority Needed

Title I - Nonattainment

Inspection/Maintenance Program

- Centralized Inspection or Equivalent
- Registration Enforcement
- Other County Opt-In

Stage II Prohibition Removal

Title III - Air Toxics

Operating Permit Authority for

- Publicly Owned Treatment Works (POTW)
- Solid Waste Incineration Units

Title V - Operating Permits

Program Authority

Annual Emissions Fee

5 Year Renewal

Small Business Compliance Assistance Program

Criminal Penalties

Adequate Personnel and Funding

Title VI - Stratospheric Ozone

Clarify Authority

Title VII - Enforcement

Criminal Penalties

"Flight Delayed/Cancelled?"

Texas Legislative Action

1991 TCAA Amendments

Three Versions

- HB 1604 - Saunders

  Passed by House

- SB 35, Article 2 - Parker/Brooks

  Passed by Senate

- SB 2, Article 2 - Parker/Brooks

  Introduced First Called Session

Title I - Nonattainment

Inspection/Maintenance Program

- Additional Authority Granted
- Registration Enforcement
- Other County Opt-In
- Decentralized or Centralized
  (SB 35 Preferred Decentralized)
- Pretamper for Covert Audits
- Centralized Re-inspections
- Study I&M for Diesel Vehicles

Stage II Prohibition Removed

Title III - Air Toxics

Authority to Permit

- Hazardous Waste
  Management Facilities
- Solid Waste
  Management Facilities

(SB 35 Only)

Title V - Operating Permits

Authority to Issue

Consider Prior Compliance
(5 Years-SB 35)

5 Year Renewal

Notice & Comment Hearing

Annual Emissions Fee & CPI Escalation

Air Quality Fee Fund

- All Fees
- Mobile Source Fee - $2.00/Inspection

Small Business Stationary Source
Assistance Program

Criminal Penalties

Adequate Personnel & Funding

- Fee Cap Raised to $75,000

Title VI - Stratospheric Ozone

Rulemaking Authority for

- Acid Deposition
- Stratospheric Ozone
- Climate Changes (Global Warming)

Title VII - Enforcement

Criminal Penalties

- Knowing Violation of Rule
  $1,000-$50,000 and/or 180 Days in Jail

- Knowing Failure to Pay Fee
  Twice Fee and/or 90 Days in Jail

- Knowing False Material Statement
  $500-$100,000 and/or 1 Year in Jail

- Knowing Failure to Notify
  $500-$100,000 and/or 1 Year in Jail

- Knowing Tampering With Monitoring Device
  $500-$100,000 and/or 1 Year in Jail

- Reckless Emission That Endangers Another
  $1,000-$100,000 and/or 1 Year in Jail

- Knowing Emission That Endangers Another
  $1,500-$150,000 and/or 5 Years in T.D.C.

- Knowing Emission With Knowledge of Endangerment
  $2,500-$250,000 and/or 10 Years in T.D.C.

- Condition of Air Pollution
  $100-$5,000 (SB 35)

Title VII - Enforcement (Continued)

Second Offenses Can Double Fines and Punishment

Proof of Knowledge

- Actual Awareness
- Attempts to be Shielded

Affirmative Defenses

- Freely Consented to
- Employee Acting Under Orders

Additional Provisions

International Border Area Provision (SB 35)

Permitting

- General Permits
- Single Permits for Multiple Facilities
- Consolidate Permits
- Preconstruction Review
- Consider Prior Compliance
  (5 Years - SB 35)
- 5 Year Renewal
- Grandfather Exemption Removed (SB 35)
  - Nonattainment Areas - Immediately
  - Other Areas - Jan. 1, 2001

Public Participation
30 Day Notice on Agreed Orders & Settlements

Pollution Prevention
Comprehensive Pollution Prevention Program

PRESENTED AT THE

TEXAS ENVIRONMENTAL SUPER CONFERENCE

AUGUST 1, 1991

Submitted by:

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THE CLEAN AIR ACT OF 1990
AND NOW THE REST OF THE STORY . . .

Congress acted and the President signed the bill ending roughly ten years of debate. A debate that, when the dust settles, will have cost the American people an estimated 25 to 150 billion dollars a year. Contrast that to Superfund at 1.6 billion per year and it is easy to conclude that this was the most expensive environmental debate in history.

Let us explore for the next several minutes just what did happen to achieve this historic mark.

It may be best described as an event much like the sun and the moon and the planets all aligning to signal the end. The end of the debate in this case.

<u>POLITICS</u>

Chairman John Dingell had successfully maneuvered the automotive industry's interest during the 1977 reauthorization. But, the automobile is now credited by the USEPA as responsible for 40% of the air pollution problems and vehicle miles travelled is expected to triple in the next 20 years.

Dingell's nemesis, Henry Waxman, needed legislation to save Los Angeles and other parts of California. Waxman needed a national program and a longer time frame than other areas of the country to achieve attainment. What many don't know is the State of California is responsible for 90% of the nation's nonattainment areas.

And Norm Lent of New York needed acid rain controls and a place at the table to represent the President.

Each with his strengths and vulnerabilities, they became the checks and balances. On the other side of Capital Hill was a committee controlled by a monolith of environmental idealism.

Majority Leader Mitchell needed acid rain legislation for his State of Maine and for his leadership of all the Northeastern Senators.

Senator Baucus, the bill's floor manager, needed any kind of a win because he was up for re-election in a state looking for change. Montana is a state with virtually no air pollution problems.

Dave Durenberger needed any white hat issue under which to hide from his transgressions that earned him a senatorial censorship. Hence, he became the leader of air toxic reform.

And, Alan Simpson of Wyoming held the trump card of the coalition of Western Senators and an interest in developing his State's greatest natural resource, which just happens to be compliance coal.

Hence the unholy alliance of politics. But just Members of Congress are not enough, the business lobby was part of the equation.

BUSINESS

As I mentioned, the automobile's rising profile as part of the problem, and the fact that John Dingell would not be the Chairman of Energy and Commerce forever, brought the Big Three to the table.

The chemical industry was and is battling the lowest approval rating in the nation second in line to the bottom to the tobacco industry. This coupled with the recent data showing 2.7 billion pounds of airborne toxics made the chemical industry step forward as the first supporter of passing a Clean Air Bill with a substative proposal for reducing massive amounts of toxic emissions.

The steel industry was a target of the environmentalists because of coke oven emissions. Coke ovens are ranked as the highest health risks in the nation and, therefore, fuel for public outrage.
Utilities were out maneuvered when the President declared that time had run out for acid rain studies and proposed the Environmental Defense Fund emission trading program.

The coal industry was split with Senator Byrd of West Virginia protecting high sulfur coal jobs and Alan Simpson with millions of tons of compliance coal.

Big Oil was attacked on every front. While the automobile was tagged as 40% of the air pollution problem, fuel and fuel dispensing were fertile grounds for big reductions. Nonattainment issues were raised at the well head, the refinery, the gas pump, and the gas tank. Air toxics were debated everywhere except from the gas tank. The oil industry found themselves without a champion: one who would go to the mat and who wasn't already committed on another front.

Small business was the remaining lobby. The USEPA identified small business as another 40% of the air pollution problem that had little to stand on considering only a few direct controls had been added.

As you have heard, the sun and the moon and the planets did line up. The unholy political alliance, a vulnerable business community, and a willing President committed the nation to the Clean Air Act of 1990.

But, that is all history. The rest of the story is yet to be written. The cost and the impact is in the hands of the USEPA. Very little is available to us to see how the USEPA will administer this law. Our first real glimpse will be the promulgation of Title V, the permits sections. Their choices between state regulators, the environmental advocates, and the regulated community will provide insights to their sense of balance.

Passing the Clean Air Act of 1990 is only half the story. Congress took 10 years to pass legislation and now it will take 10 years of debate to craft and implement the regulations.

Now you see, we are the rest of the story.

IV. WATER QUALITY

Stormwater Regulations - "Pulling in the Rains"

Federal Stormwater Discharge Regulation
Susan G. Zachos
Kelly, Hart & Hallman
Austin, Texas

Petroleum Storage Tank Cleanups, PST Fund, and Financial Assurance - "Tanks a Lot"

Dan McClellan
EnecoTech
Austin, Texas

FEDERAL STORM WATER DISCHARGE REGULATION

OR

"PULLING IN THE RAINS"

Susan G. Zachos
Kelly, Hart & Hallman
Austin, Texas

3RD ANNUAL TEXAS ENVIRONMENTAL SUPERCONFERENCE

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FEDERAL STORM WATER DISCHARGE REGULATION

or

"Pulling in the Rains"

Susan G. Zachos
Kelly, Hart & Hallman
Austin, Texas

I. INTRODUCTION

A. Background

In 1987, Congress amended the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1990), also known as the Clean Water Act ("CWA"), to require the United States Environmental Protection Agency ("EPA") to establish a permitting program for point source discharges of storm water entering the waters of the United States. The purpose of the program is to control pollutants contained in storm water runoff that enters rivers, streams, and other "waters of the United States." The 1987 amendments required EPA to promulgate final regulations governing permit application requirements for industrial storm water discharge by February 1989. "Industrial Facilities" were then given one year from that date to file their permit applications. EPA missed its deadline and the final regulations were not promulgated until November 16, 1990. The permit application requirements, now codified at 40 C.F.R. pt. 122, took effect December 17, 1990 and are an extension of the National Pollutant Discharge Elimination System ("NPDES"), which has been the backbone of the CWA permit and enforcement program since its enactment in 1972. 55 Fed. Reg. 47990 (Nov. 16, 1990). The regulations and subsequent amendments set new application deadlines. <u>See</u> Appendix A for current deadline dates. The final regulations govern the permit application requirements for both storm water discharges associated with industrial activity and storm water discharges from large and medium municipal separate storm sewer systems.

B. Applicability

While the regulations focus on the permit application process, applicants should be aware that should an NPDES permit be issued, it will subject the permittee to inspections, reporting, monitoring, and effluent treatment requirements. Permits for storm water discharges associated with industrial activity will require control of discharge pollutants using the Best Available Technology ("BAT") or Best Conventional Pollutant Control Technology ("BCT"), depending on the type of pollutant. Permits for discharges from municipal separate storm sewer systems will require municipalities to reduce the discharges of pollutants to the maximum extent practicable and to effectively prohibit non-storm water discharges into storm sewers. 55 Fed. Reg. 47994.

The regulations require submission of a permit application for the following storm water discharges if they are released from a point source to waters of the United States:

- a discharge which has been permitted prior to February 4, 1987

- a discharge associated with "industrial activity"[1]

- a discharge from a large or medium municipal separate storm sewer system (as those systems are defined in the regulations)

- a discharge which the State Director or EPA Regional Administrator determines contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States

40 C.F.R. § 122.26(a). Individual facilities and municipalities have the burden of determining whether a permit application needs to be filed for their point source discharges. 55 Fed. Reg. 47997.

In addition to the specified discharges, the regulations authorize case-by-case designations of storm water discharges for immediate permitting if the State Director or Regional Administrator determines that the discharge contributes to a violation of water quality standards or is a significant contributor of pollutants to the waters of the United States. In making this determination, the Director or Administrator may consider the following factors:

- proximity of the discharge with respect to waters of the United States

- size of the discharge

- quantity and nature of the pollutants discharged

- any other relevant factors

40 C.F.R. § 122.26(a)(1)(v); 55 Fed. Reg. 47993. Once a discharger receives written notice from the Director that an individual permit will be required, the discharger has 60 days in which to file a permit application unless the Director specifies that additional time is granted. 40 C.F.R. § 124.52; 55 Fed. Reg. 47993.

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1 See definition of "industrial activity" discussed in Part II below.

The regulations define "storm water" as storm water runoff, snow melt runoff, surface runoff, and drainage. 40 C.F.R. § 122.26(b)(13). The definition does not include storm water that enters the waters of the United States by means other than a point source. 55 Fed. Reg. 47996. Thus, the storm water discharge permit regulations apply only to certain "point source" discharges.

A "point source" is broadly defined as any discernable, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. 40 C.F.R. § 122.2. This term does not include sheet flow runoff from an industrial facility nor return flows from irrigated agriculture or agricultural storm water runoff. 55 Fed. Reg. 47996. The broad definition of point source can include something as simple as contouring of the land surface for drainage control, but requires some element of human intervention which has the effect of concentrating the storm water flow to some degree.[2]

II. DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

A. Overview

Dischargers of storm water associated with "industrial activity" are required to apply for an NPDES permit. "Storm water discharge associated with industrial activity" is defined as a discharge from any conveyance which is used for collecting and conveying storm water which is directly related to manufacturing, processing or raw materials storage at an industrial plant. 40 C.F.R. § 122.26(b)(14). The definition excludes storm water discharges from wholesale, retail, service or commercial activities. Federal, state, and municipal facilities are subject to these permitting regulations. 55 Fed. Reg. 48010.

Storm water from an industrial plant which passes through a municipal storm sewer to a point source and is discharged to the waters of the United States is a discharge associated with industrial activity and the discharging facility must file a permit application. 55 Fed. Reg. 47996, 48000. A discharge associated with industrial activity is defined solely in terms of the origin of the storm water runoff. 55 Fed. Reg. 47999. The fact that the individual facility does not operate the conveyance discharging the storm water into the waters of the United States (such as a storm sewer system) is not particularly relevant; the operator of the facility where the storm water originates is responsible for compliance. Id. Downstream operators of facilities are generally responsible for their entire discharge associated with industrial activity regardless of the initial source of the storm water. However, by identifying and permitting on-site storm water sources, an operator of a facility can minimize its liability for other storm water entering the facility, such as flow from

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2 Sierra Club v. Abston Construction Co., 620 F.2d 41 (5th Cir. 1980); 55 Fed. Reg. 47997.

upstream adjacent facilities, that may commingle with the discharge from that facility. Facilities in such circumstances can or may be required to develop management practices or other runon/runoff controls which segregate or prevent outside runoff from commingling with its storm water discharge. 55 Fed. Reg. 48010.

If a facility does not own or operate a point source located on its property, then it is not required to obtain a permit for its discharge. For example, easements over an industrial facility's property may have been granted to a municipality for conveyance of storm water through a storm sewer system. In such case, the municipality, not the industrial facility, would be required to obtain a storm water permit. However, if contaminated storm water associated with industrial activity from the facility is introduced into the conveyance from a point source, then the facility owner or operator would be required to file for a permit pursuant to the requirements for industrial storm water discharged through municipal storm sewers. 55 Fed. Reg. 48009. When a facility or activity is owned by one person but is operated by another person, it is the operator's duty to obtain a permit. 40 C.F.R. § 122.21(b).

B. Industrial Activities Regulated Only Where Storm Water Contacts Certain Materials

Most of the categories of industrial activity listed in the regulations are subject to the permit application requirements regardless of whether there is actual storm water exposure to industrial activities. However, EPA has identified a group of industries which are only classified as "associated with industrial activity" if storm water comes into contact with the industrial material or activities associated with the facility.

This group of industrial activities involves facilities which are generally characterized as being wholly enclosed or having operations entirely protected from the elements. 40 C.F.R. § 122.26(b)(14)(xi); 55 Fed. Reg. 48008. Because these facilities are more akin to retail, commercial or service industries which Congress did not contemplate regulating before October 1, 1992, a permit application will not be required of these industries unless there is actual storm water contact with the listed on-site materials discussed below.

The characteristics of this group that distinguish it from the other industrial facilities and provide it with conditional exemption from regulation of its storm water discharge include generally:

- activity is undertaken in buildings
- emissions from stacks are minimal or non-existent
- minimal or no use of unhoused manufacturing and heavy industrial equipment

- no outside material storage, disposal or handling

- no generation of significant dust or particulates

55 Fed. Reg. 48008.

For this category of industries, the definition of storm water discharge incorporates only those discharges which have been exposed to any of the following:

- material handling equipment or activities[3]
- raw materials
- intermediate products
- final products
- waste materials
- by-products
- industrial machinery

40 C.F.R § 122.26(b)(14).

Facilities included in this conditional category, which are only viewed as dischargers of storm water associated with industrial activity when there is contact with on-site materials, are facilities engaged in any of the following activities (defined by their Standard Industrial Classification [SIC] code):

[SIC 20]
Production of foods and beverages, including meats, dairy food, fruit, flour, vegetable and animal fats and oils, and chewing gum

[SIC 21]
Production of tobacco products, including cigarettes, cigars, chewing tobacco and non-tobacco cigarettes

[SIC 22]
Production of textile mill products, including yarn and/or dye and finish fabrics

[SIC 23]
Production of clothing by cutting and sewing purchased woven or knitted textile products

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3 "Material handling activities" include the storage, loading and unloading, transportation or conveyance of any raw material, intermediate product, finished product, by-product or waste product. 40 C.F.R. § 122.26(b)(14).

[SIC 2434]
Wood kitchen cabinetmaking

[SIC 25]
Furniture-making

[SIC 265 and 267]
Manufacture of paperboard products

[SIC 27]
Performance of services such as bookbinding, plate making, printing and publishing

[SIC 283]
Manufacture of pharmaceuticals

[SIC 285]
Manufacture of paints, varnishes, lacquers, enamels, etc.

[SIC 30]
Manufacture of products from rubber and plastics, primarily tires

[SIC 31, except 311]
Manufacture of products from leather and wood such as shoes, gloves, luggage and purses

[SIC 323]
Manufacture of glass products made from purchased glass

[SIC 34, except 3441]
Production of fabricated metal products, such as metal cans, tinware and cutlery, excluding fabricated structural metals, used for bridges, etc. (SIC 3441)

[SIC 35]
Manufacture of industrial and commercial machinery, equipment and computers

[SIC 36]
Manufacture of machinery and supplies for utilization of electrical energy

[SIC 37, except 373]
Production of transportation equipment such as cars, planes, trains and space vehicles, excluding ship building and repairing (SIC 373)

[SIC 38]
Manufacture of scientific and electrical instruments and optical equipment

[SIC 39]
Manufacture of a variety of miscellaneous items such as jewelry, silverware, musical instruments, dolls, toys and athletic goods

[SIC 4221-4225]
Warehousing and storing activities

40 C.F.R. § 122.26(b)(14)(xi); 55 Fed. Reg. 48008, 48066.

The permitting requirements are triggered where on-site exposure and subsequent discharge occurs in any of the following areas:

- material handling sites
- refuse sites
- sites for the application or disposal of process waste waters (defined at 40 C.F.R. pt. 401)
- sites used for the storage and maintenance of material handling equipment
- sites used for residual treatment, storage or disposal
- shipping and receiving areas
- manufacturing buildings
- material storage areas for raw materials and intermediate and finished products
- areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water

40 C.F.R. § 122.26(b)(14); 55 Fed. Reg. 48008.

Areas at industrial facilities separate from the plant's industrial activities, such as office buildings and accompanying parking lots, which do not have storm water discharges commingled with discharges from the manufacturing areas are not required to be permitted. 55 Fed. Reg. 48008, 48065. This exclusion applies whether the industrial facility is within the category of conditional or unconditional storm water dischargers.

C. Industrial Activities Regulated Regardless of Storm Water Contact

The following groups of facilities identified at 40 C.F.R. § 122.26(b)(14)(i)-(x) are considered (with a few noted exceptions) to have storm water discharges associated with industrial activity and are subject to the storm water discharge permitting program requirements, regardless of whether storm water actually comes into contact with industrial materials or activities at the facility.

[SIC 24, except 2434]
Facilities engaged in operating sawmills, planing mills and other mills which produce lumber and wood basic materials, excluding manufacturers of wood kitchen cabinets and bathroom vanities.

[SIC 26, except 265 and 267]
Pulp and paper mills, but excludes facilities that manufacture converted paper and paperboard products and manufacturers of coated or laminated flexible materials.

[SIC 28, except 283 and 285]
Producers of basic chemical products by predominantly chemical processes. Specific examples include producers of fertilizers, pesticides, soaps, detergents, perfumes, cosmetics and industrial gasses. This category excludes manufacturers of pharmaceuticals (SIC 283) and manufacturers of paints, varnishes, lacquers, enamels and allied products (SIC 285), which are regulated as conditionally exempt facilities discussed above.

[SIC 29]
Facilities engaged in the petroleum industry, including petroleum refining, manufacturers of paving and roofing materials and facilities compounding lubricating oils and greases from purchased materials.

[SIC 311]
Facilities engaged in tanning, currying and finishing hides and skins into leather. Such processes use chemicals such as sulfuric acid, sodium dichromate, detergents and a variety of raw and intermediate materials.

[SIC 32, except 323]
Manufacturers of glass, clay, stone and concrete products from raw materials in the form of quarried and mined stone, clay and sand. Excluded from this category are manufacturers of glass products made from purchased glass (SIC 323), which are regulated as conditionally exempt facilities discussed above.

[SIC 33]
Facilities that smelt and refine ferrous and non-ferrous metals from ore, pig, or scrap, and manufacture such related products as nails, insulated wire, cable and castings. Production of coke is also included in this class.

[SIC 3441]
Facilities fabricating metal for structural purposes, such as for bridges, buildings and ships.

[SIC 373]
Facilities engaged in ship building and repairing.

40 C.F.R. § 122.26(b)(14)(ii). Facilities that warehouse finished products under the same SIC codes at a different facility from the site of manufacturing are not required to file a permit application for the warehousing facility unless it is otherwise covered. 55 Fed. Reg. 48011.

Other operations, also considered to have discharges associated with industrial activity, include the following categories of industries, some of which have distinct qualifying requirements.

1. <u>Facilities Subject to Storm Water Effluent Limitation Guidelines, New Source Performance Standards, or Toxic Pollutant Effluent Standards</u>

Facilities which are subject to storm water effluent limitation guidelines, new source performance standards or toxic pollutant effluent standards under 40 C.F.R. subch. N must apply for a permit for storm water discharge associated with industrial activity, unless they are facilities with toxic pollutant effluent standards which are among those exempted under 40 C.F.R. § 122.26(b)(14)(xi), the limited exemption discussed in section II.B. above. 40 C.F.R. § 122.26(b)(14)(i); 55 Fed. Reg. 48065.

2. <u>Oil, Gas, and Mining Operations</u>

Oil, gas, and mining operations are required to apply for a storm water discharge permit only when the storm water discharge, which enters the waters of the United States, has been contaminated by contact or has come into contact with certain listed on-site materials. 40 C.F.R. § 122.26(b)(14)(iii); 55 Fed. Reg. 48031.

The group of operations covered by this provision include SIC code facilities 10-14, specifically:

a. Active or Inactive Mining Operations

- except for areas of coal mining operations no longer meeting the definition of a reclamation area under 40 C.F.R. § 434.11(i) because the performance bond issued to the facility by the appropriate Surface Mining Control and Reclamation Act authority has been released, or

- except for areas of non-coal mining operations which have been released from applicable state or federal reclamation requirements after December 17, 1990.

40 C.F.R. § 122.26(b)(14)(iii).

Not included are sites where mining claims are being maintained prior to disturbances associated with the extraction, benefaction or processing of mined materials or sites where minimal activities required for the sole purpose of maintaining the mining claim are undertaken. 55 Fed. Reg. 48033. Inactive mining sites are those no longer being actively mined but which have an identifiable owner or operator. 55 Fed. Reg. 48033.

b. Oil and Gas Operations

- includes exploration, production, processing or treatment operations or transmission facilities. 40 C.F.R. § 122.26(b)(14)(iii).

These oil, gas, and mining operations are only required to submit a permit application if the storm water discharge is contaminated by or has come into contact with any of the following:

- overburden[4]
- raw material
- intermediate products
- finished products
- by-products
- waste products

40 C.F.R. § 122.26(b)(14)(iii); 55 Fed. Reg. 48005, 48011-12, 48032.

4 Overburden is defined as any material of any nature overlying a mineral deposit that is removed to gain access to that deposit, excluding topsoil or similarly naturally occurring surface materials that are not disturbed by mining operations. 55 Fed. Reg. 48033.

c. <u>Permit Application Requirements for Oil and Gas Operations are Not Triggered Unless There Has Been a Discharge of "Contaminated" Storm Water</u>

A permit application is only required for oil and gas facilities that have had a discharge of storm water resulting in the discharge of a reportable quantity ("RQ") of oil or hazardous waste at anytime since November 16, 1987 or that have such a release in the future. 40 C.F.R. § 122.26(c)(1)(iii)(A)-(B); 55 Fed. Reg. 48031-32.

d. <u>"Oil Sheen" Test for Contamination</u>

An RQ of oil is the amount of oil that violates applicable water quality standards or causes a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited. Applicable water quality notification provisions include those set forth at 40 C.F.R. §§ 117.21, 302.6, 110.6. 40 C.F.R. § 122.26(c)(1)(iii)(A)-(B); 55 Fed. Reg. 48031.

e. <u>Permit May Not Be Required</u>

Use of an RQ is only a trigger for the permit <u>application</u> process. Determination of whether contamination is present to warrant issuance of a permit will be made by EPA in the context of the permit proceeding. 55 Fed. Reg. 48032. EPA can not require a permit for discharges not contaminated by contact with the above-listed contaminating materials. 33 U.S.C. § 1342(l)(2). However, this does not restrain EPA from requiring a permit application subsequent to the release of an RQ because EPA maintains that generally such a release will be a good indicator of the potential for water quality impacts from storm water discharges from the facility; in addition, EPA has stated that those facilities with past releases in excess of RQs are those likely to have contamination of storm water from contact with on-site materials. 55 Fed. Reg. 48032.

f. <u>Permit Application Requirements for Mining Operations Triggered by "Contact" with Certain Materials</u>

A permit application for mining operations is only required when discharges of storm water runoff come into contact with certain materials located at the site. 40 C.F.R. § 122.26(c)(1)(iv); 55 Fed. Reg. 48032. These materials are overburden, raw material, intermediate products, finished products, by-products or waste products located <u>on the site</u> of such operations. If the owner or operator determines there has been no contact, there is no need to file a permit application.

Similar to the RQ release trigger for oil and gas operations, the contact trigger for mining operations only triggers the submission of a permit application. A determination of actual contamination necessitating the issuance of a permit will be made in the context of the permit issuance proceedings. 55 Fed. Reg. 48032.

3. Hazardous Waste Treatment, Storage, or Disposal Facilities

Hazardous waste treatment, storage or disposal facilities, including those that are operating under interim status or a permit under subtit. C of the Resource Conservation and Recovery Act ("RCRA") are considered to be dischargers associated with industrial activity and are required to submit a permit application. 40 C.F.R. § 122.26(b)(14)(iv); 55 Fed. Reg. 48066.

4. Landfills, Land Application Sites, and Open Dumps

Landfills, land application sites and open dumps that receive or have received any "industrial wastes" must submit a permit application. Industrial waste consists of materials delivered to the landfill for disposal which originated at any of the facilities otherwise subject to the storm water discharge permitting requirements, and includes non-hazardous wastes that are subject to regulation under subtit. D of RCRA. 40 C.F.R. § 122.26(b)(14)(v); 55 Fed. Reg. 48013, 48066.

5. Material Recycling Facilities

Certain material recycling facilities associated with industrial activity must file a storm water permit application. The covered facilities are those engaged in dismantling, breaking up, sorting and wholesale destruction of motor vehicles and parts as well as a variety of other materials, including paper, glass, and plastics. 55 Fed. Reg. 48013.

Types of facilities included in this classification are:

- metal scrapyards
- battery reclaimers
- salvage yards
- automobile junkyards

40 C.F.R § 122.26(b)(14)(vi); 55 Fed. Reg. 48066.

6. Steam Electric Generating Facilities

Steam electric generating facilities, including coal handling sites, must submit a permit application. 40 C.F.R. § 122.26(b)(14)(vii).

7. Transportation Facilities

Certain transportation facilities which have vehicle maintenance shops, equipment cleaning operations or airport deicing operations are classified as being engaged in industrial activity and must file a permit application.

The transportation facilities included in this group are:

[SIC 40]
Railroad transportation, including train yards where repairs are undertaken

[SIC 41]
Local suburban transit and interurban highway transit, including school buses

[SIC 42, except 4221-25]
Trucking companies, excluding warehousing or storage facilities

[SIC 43]
U.S. Postal Service

[SIC 44]
Water transportation

[SIC 45]
Air transportation

[SIC 5171]
Industries primarily engaged in wholesale distribution of crude petroleum and petroleum products

40 C.F.R. § 122.26(b)(14)(viii).

Only those portions of the facility involved in vehicle maintenance, equipment cleaning operations, airport deicing operations or which are defined as industrial activities under other sections of the regulations must be permitted. Id.; 55 Fed. Reg. 48013. "Vehicle maintenance" includes repairing, painting, fueling and lubricating. 55 Fed. Reg. 48013.

Gasoline stations are not required to be permitted because they are viewed as retail commercial facilities and are so classified by SIC. The preamble to the regulations distinguishes such individual repair shops from larger transportation facilities that engage in heavier, more expansive forms of industrial activity, such as bus depots, train yards, taxi stations and airports, which are subject to the permit application requirements. 55 Fed. Reg. 48013.

8. Treatment Works

Treatment works treating domestic sewage or any other sewage, sludge or wastewater treatment device or system, used in the storage, treatment, recycling and reclamation of municipal or domestic sewage, (including lands dedicated to the disposal of sewage sludge that are located within the confines of the facility) with a design flow of 1.0 mgd or more, or required to have an approved pretreatment program under 40 C.F.R. pt. 403, must apply for a storm water discharge permit.

The following are not included under this classification:

- farm lands

- domestic gardens

- lands used for sludge management where sludge is beneficially reused and which are not physically located in the confines of the facility

- areas that are in compliance with sec. 405 of the CWA (regarding the disposal of sewage sludge)

40 C.F.R. § 122.26(b)(14)(ix); 55 Fed. Reg. 48014.

9. Construction Activities

Construction activities must be permitted for storm water discharges associated with industrial activity, except operations that disturb less than five acres total land area and developments regardless of total land area that are not part of a larger common plan of development or sale.

Construction activities include:

- clearing
- grading
- excavation

40 C.F.R. § 122.26(b)(14)(x).

The operator of an existing or new storm water discharge from a construction site has permit application requirements different from those for other industrial activities. The distinct permit application requirements specifically for construction activities are set forth at 40 C.F.R § 122.26(c)(1)(ii); 55 Fed. Reg. 48034. Permit application requirements are discussed in section II.D. below.

The characteristics of all of these activities that distinguish them from the activities discussed in section II.C., and cause them to have unconditional status as industrial storm water dischargers include the following activities and processes which occur on-site at many of the facilities:

- storing raw materials, intermediate products, final products, by-products, waste products or chemicals outside
- smelting
- refining
- producing significant emissions from stacks or air exhaust systems
- loading or unloading chemical or hazardous substances
- use of unhoused manufacturing and heavy industrial equipment
- generating significant dust or particulates

55 Fed. Reg. 48011.

For these industries, the term "storm water" includes discharges from the following areas:

- industrial plant yards
- material handling sites
- refuse sites
- sites used for the application or disposal of process waste waters (as defined at 40 C.F.R. pt. 401)
- sites used for the storage and maintenance of material handling equipment
- sites used for residual treatment, storage or disposal
- shipping and receiving areas
- manufacturing buildings, storage areas (including tank farms) for raw materials and intermediate and finished products

- immediate access roads[5] and rail lines used or traveled by carriers of raw materials, manufactured products, waste material or by-products used or created by the facility

- areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water

40 C.F.R. § 122.26(b)(14).

This last category is quite significant because it could require permitting and the attendant collection and treatment of storm water discharges from abandoned or closed facilities. In other words, owners of property where any of the industrial activities discussed above were previously conducted may be required to determine whether any materials remain on-site which are contributing to contamination of storm water discharge, and to either clean up the property or collect and treat or otherwise dispose of the contaminated storm water.

D. <u>The Permit Application</u>

All storm water discharges associated with industrial activity are required to file for NPDES permits, including discharges through municipal storm sewer systems. 55 Fed. Reg. 47996-98, 48002. Dischargers of storm water associated with industrial activity have three application options. They may file an individual permit application, a group application or a notice of intent ("NOI") to be covered by a general permit. 40 C.F.R. § 122.26(c)(1). EPA's permitting strategy for implementing the NPDES storm water program includes a four tier set of priorities for issuing permits, which will be implemented over time. Tier I consists of baseline permitting in which EPA expects to develop one or more general permits to initially cover the majority of storm water discharges associated with industrial activity. The coverage will initially be quite broad, but after time will be reduced as other permits are issued pursuant to subsequent tiers. 55 Fed. Reg. 48002. Under Tier II, facilities within watersheds shown to be adversely impacted by storm water discharges associated with industrial activity will be targeted for both individual and general watershed permitting. 55 Fed. Reg. 48002. Within Tier III specific categories will be targeted for individual and industry-specific general permits which will be developed by EPA. 55 Fed. Reg. 48002. Tier IV addresses facility specific permitting and a variety of factors will be used to target specific facilities for individual permits. Such factors include the pollution potential of the discharge, the need for individual control mechanisms and administrative burden. 55 Fed. Reg. 48003.

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5 "Immediate access roads" include only roads which are exclusively or primarily dedicated for use by the industrial facility, not public access roads which happen to be used by the facility. Also excluded from this category are access roads that are used to transport bulk samples of raw materials or products in small scale prior to industrial production, (e.g., prospecting samples from potential mines) or access roads to operations which are not yet industrial activities. 55 Fed. Reg. 48009.

1. Individual Permit Applications

All dischargers of storm water associated with industrial activity must submit an individual NPDES permit application unless they are participating in a group application or there is a general permit issued to cover their discharge. 55 Fed. Reg. 48003.

In some cases, even though a general permit is providing coverage for a facility, an individual application may also need to be filed. For instance, a general permit may require a facility to file an individual permit application as its notice of intent to be covered by the general permit. Also, an owner or operator covered by a general permit may file an individual permit application as part of a request to be excluded from the coverage of the general permit. 40 C.F.R. § 122.28(b)(2)(iii); 55 Fed. Reg. 48003. Finally, the director of the program may specifically require an owner/operator authorized by a general permit to file an individual permit application. 40 C.F.R. § 122.28(b)(2)(i); 55 Fed. Reg. 48003.

a. Application Forms

The specific storm water permit application forms required are as follows:

- Applicants with discharges composed entirely of storm water must submit Form 1 and Form 2F

- Applicants with discharges composed of storm water and non-storm water must submit Form 1, Form 2C (quantitative data describing the discharge during non-storm events) and Form 2F (quantitative data describing the discharge during storm events)

- Applicants with new sources or new discharges (as defined in 40 C.F.R. § 122.2) composed of storm water and non-storm water must submit Form 1, Form 2D and Form 2F

40 C.F.R. § 122.26(c)(1); 55 Fed. Reg. 48015-16.

b. Application Contents

The individual permit application should contain the following information:

- A topographic map of the facility showing: all drainage and discharge structures, the drainage area of each storm water outfall, paved areas and buildings within the drainage areas of each storm water outfall, each past or present area used for outdoor storage or disposal of significant materials, each existing structural control measure to reduce pollutants in storm water runoff, materials loading and access areas, areas where pesticides, herbicides, soil conditioners and fertilizers are applied, each of its hazardous waste treatment, storage or disposal facilities (including each area not required to have a RCRA permit which is used for accumulating hazardous waste under 40 C.F.R. § 263.34); each injection well and surface water body which receives storm water discharges from the facility

- An estimate of the area of impervious surfaces (including paved areas and building roofs) and the total area drained by each outfall (within a mile radius of the facility) and a narrative description of the following: significant materials that in the three years prior to the submittal of this application have been treated, stored or disposed in a manner to allow exposure to storm water; method of treatment, storage or disposal of such materials; materials management practices employed, in the past three years, to minimize contact by these materials with storm water runoff; materials loading and access areas; the location, manner and frequency in which pesticides, herbicides, soil conditioners and fertilizers are applied; the location and a description of existing structural and non-structural control measures to reduce pollutants in storm water runoff; and a description of any storm water treatment, including the ultimate disposal of any solid or fluid waster other than by discharge

- A certification that all outfalls that should contain storm water discharges associated with industrial activity have been tested or evaluated for the presence of non-storm water discharges which are not covered by a NPDES permit; tests for non-storm water discharges may include smoke tests, fluorometric dye tests, and analysis of accurate schematics. The operator must include a description of the test methods, the test dates, and the on-site drainage points that were observed during a test

- All information regarding significant leaks or spills of toxic or hazardous pollutants at the facility within the past three years

- Quantitative sampling data collected during storm events from all outfalls containing a storm water discharge associated with industrial activity (See section on Sampling)

40 C.F.R. § 122.26(c)(1)(i).

c. Deadline - Individual Application

Individual permit applications for storm water discharges associated with industrial activity, including storm water discharged through a municipal separate storm sewer, must be submitted by November 18, 1991. 40 C.F.R. § 122.26(e)(1); 55 Fed. Reg. 48059. Nevertheless, on March 21, 1991, EPA published a proposed rule to extend the individual permit application deadline to May 18, 1992. 56 Fed. Reg. 12101 (March 21, 1991).

d. Construction Activity Permitting

Construction activities, including clearing, grading and excavation, must be permitted for storm water discharge associated with industrial activity unless the operations result in the disturbance of less than five acres total land area or areas which are not part of a larger common plan of development or sale. 40 C.F.R. § 122.26(b)(14)(x). The operator of an existing or new storm water discharge described above is required to submit a permit application at least 90 days prior to the date on which construction is to commence.

Permit applications for construction activity do not require submission of quantitative data. The facility need only provide, in addition to the application form, a map indicating the site location, the name of the receiving water and a narrative description of the following:

- location and nature of the construction activity
- total area of the site and area of the site that is expected to undergo excavation during the permit period
- proposed measures, including best management practices, to control pollutants in storm water discharges both during and after construction, and a brief description of applicable State and local erosion and sediment control requirements
- an estimate of the runoff coefficient of the site and the increase in impervious area after the construction is completed, the nature of the fill material and existing data describing the soil or quality of the discharge
- name of the receiving water

40 C.F.R. § 122.26(c)(1)(ii); 55 Fed. Reg. 48034. Generally, the operator or general contractor, not the owner, of the construction site will be responsible for submitting the permit application. 40 C.F.R. § 122.21(b); 55 Fed. Reg. 48034.

e. Existing Permits

An operator of storm water discharges currently covered by an NPDES permit must apply for an individual permit 180 days before the existing permit expires, unless the discharge is included in an existing group application or covered by a general permit. Facilities with expired permits or permits due to expire before May 18, 1992 must file an individual permit application by the November 18, 1991 deadline. 40 C.F.R. § 122.26(e)(6); 55 Fed. Reg. 48006.

2. Group Permit Applications

Facilities with sufficiently similar storm water discharges may file a group application in lieu of either an individual application or an NOI for coverage under a general permit. Whether a facility can obtain a storm water permit under a group application will depend upon whether the facility is a member of the same effluent guideline subcategory (identified at 40 C.F.R. subch. N pt. 405 to 470) or has operations and discharges sufficiently similar to the other group members to be appropriate for a general or individual permit issued pursuant to such group application. 40 C.F.R. § 122.26(c)(2); 55 Fed. Reg. 48002. EPA can use group application information to develop industry-specific general permits. 55 Fed. Reg. 48003.

The difference between the group and individual permit application procedures is that the number of facilities required to submit quantitative data will be fewer if certain procedures are followed and no particular facility is identified as posing a special environmental risk. 55 Fed. Reg. 48021. The group application requires submission of quantitative data from only ten percent of the facilities in the group if there are over 100 members of the group. Only 100 of the facilities need to submit quantitative data if the group contains over 1000 members. In smaller groups, with between four and ten members, at least half of the facilities must submit quantitative data. 40 C.F.R. § 122.26(c)(2)(D). Additionally, in group applications, the representative facilities submitting quantitative data must be located in a precipitation zone in which other group members are located according to the following schedule:

4-10 group members	-	at least one representative facility in each precipitation zone in which members of the group are located
10 + group members	-	minimum of two representative facilities from each precipitation zone in which ten or more members of the group are located or one representative facility from each precipitation zone in which nine or fewer group members are located

40 C.F.R. § 122.26(c)(2)(i)(D). The facilities selected for sampling must be representative of the group, not necessarily representative of the industry. 55 Fed. Reg. 48024. Also, group applications are designed for industrial activities only and municipalities are ineligible to use this application process. 55 Fed. Reg. 48022.

EPA intends to summarize the group applications that are submitted to headquarters in Washington, D.C. The summaries will be submitted to authorized NPDES states for their review and potential use in fashioning general permits. The states are not limited to the draft model permits which may be developed by EPA, and are free to make adjustments for local standards or regional characteristics. 55 Fed. Reg. 48023-24. One aspect of the group and general permitting program involves the relationship between EPA's rules and those developed by states with NPDES authority. Texas does not have NPDES authority at the present time. Authorized NPDES states may issue general permits if they include such authority in their program and if such program is approved by EPA. 55 Fed. Reg. 48027. Authorized states that do not have general permitting authority may not recognize general permits. EPA does not have the authority to issue general or individual permits to facilities in NPDES approved states. 55 Fed. Reg. 48027-28.

As of promulgation, 38 states have been NPDES authority and 17 states have authority to issue general permits. 55 Fed. Reg. 48028. See Appendix B. NPDES approved states may choose not to accept the group applications and may require individual applications for storm water discharge associated with industrial activity. 55 Fed. Reg. 48028.

a. Deadline - Group Application

Group applications for storm water discharge associated with industrial activity, where available, are filed in two parts. Part One must be filed by September 30, 1991 and Part Two must be filed by May 18, 1992. 40 C.F.R. § 122.26(e)(2)(i), (iii); 56 Fed. Reg. 12098. Part One of the group application requires a list of the facilities applying, their location and precipitation zone, basic narrative information about each facility and a proposed designation of the facilities in the group who will perform the quantitative sampling. 40 C.F.R. § 122.26(c)(2)(i); 56 Fed. Reg. 12099. Part Two should contain the necessary quantitative data required by NPDES Form 2F. Forms 1, 2C and 2F taken together form a complete NPDES application. 40 C.F.R. § 122.26(c)(2)(ii).

b. Rejected Facilities

Facilities that are rejected as members of a group by the permitting authority have twelve months from the date they receive notification of rejection to file an individual permit application. 40 C.F.R. § 122.26(e)(1)(iv).

c. Additions or Deletions on Group Applications

Facilities may be able to add on to a group application upon a showing of good cause by the facility and the group applicant, but EPA has authority to reject add-ons at its discretion. 40 C.F.R. § 122.26(e)(1)(v). A facility not properly identified in the group application and which is unable to show good cause will have to submit an individual permit application. 55 Fed. Reg. 48022. In order to be eligible for addition to the group application (1) the add-on the facility must obtain approval from the group representing the individual facilities and (2) the addition must not reduce the percentage of facilities required to submit quantitative data to below ten percent, unless there are over 100 facilities submitting quantitative data. 40 C.F.R. § 122.26(e)(1)(v); 55 Fed. Reg. 48022.

If a facility in a group application is designated to submit quantitative data and that facility subsequently drops out of the group, then another facility must be selected to submit quantitative data. 55 Fed. Reg. 48027. EPA suggests that group applicants submit quantitative data from more than the minimum number required in order to assure that sufficient data have been collected should a departure or addition occur. Id.

3. General Permits

EPA intends to propose and promulgate general permits that will cover most types of industrial storm water discharges. Industrial dischargers eligible for coverage under such permits will simply be required to submit an NOI to be covered. General permits will be available in non-NPDES authorized states, following state certification and will be used as a model for those NPDES states having general permit authority. 55 Fed. Reg. 48006. As information on specific industries and discharges is gathered, EPA will develop more types of industry specific permits. Id. This will eliminate the need for thousands of individual or group permit applications and will reduce the burden on both applicants and permit processors. The regulations do not address NOI filing procedures. The notification procedures will be established in each general permit on a case-by-case basis and may range from full application to no notice. 55 Fed. Reg. 48003. EPA has suggested that NOI requirements should be commensurate with the needs of the permit writer and permit program and with the resources of the permitting agency. 55 Fed. Reg. 48003.

EPA is considering issuing general permits for the majority of storm water discharges associated with industrial activity in those states and territories that do not have authorized NPDES programs before the individual application deadline. This would enable eligible dischargers to use the alternative notification under a general permit in lieu of filing an individual or group permit application. 55 Fed. Reg. 48003. However, at this time the first draft general permit that EPA has created is mired in controversy over its pollution prevention details. The draft permit that emerged from EPA soon after promulgation of the storm water regulations has been held up in the Office of Management and Budget by criticism that it is inflexible, costly, and prescriptive.[6] The pollution prevention details of the draft permit are still being defined.

E. Sampling

Permit applications for storm water discharges associated with industrial activity must contain quantitative data collected from a grab sample taken during the first thirty minutes (or as soon thereafter as practicable) of a storm event discharge as well as flow weighted average storm event concentrations taken for either the entire discharge or for the first three hours of the discharge. 40 C.F.R. § 122.21(g); 55 Fed. Reg. 48004. EPA believes this new sampling requirement is necessary because most management practices primarily focus

6 EPA Defends Stormwater Pollution Prevention, Offers OMB Compromise Permit, Inside E.P.A. Weekly Report (Inside Washington Publishers) Vol. 12 No. 21, at 1 (May 24, 1991).

on treating the first discharge load. 55 Fed. Reg. 48005. All samples must be collected from a discharge resulting from a storm event that is greater than 0.1 inch and at least 72 hours from the previously measurable (0.1 inch rainfall) storm event. 40 C.F.R. § 122.21(g)(7). Where feasible, the grab sample taken should be taken from a storm event whose variance in total rainfall and event duration does not exceed fifty percent from the average or median for that area. 40 C.F.R. § 122.21(g)(7).

EPA does not require the use of automated sampling equipment, however, if such unattended automatic sampling is to be performed, the unattended flow measurement will also be required. Manual sampling is considered an appropriate alternative to automatic sampling equipment. 55 Fed. Reg. 48005. Because some of the sampling must be done during a storm event, applicants are advised to begin the necessary sampling program promptly and not to delay sampling until close to the application deadline. See 40 C.F.R. § 122.21(g)(7).

Quantitative data based on samples collected during storm events from all outfalls containing a storm water discharge associated with industrial activity is required as part of the individual permit application. This quantitative data must be collected for the following parameters:

- any pollutant limited in an effluent guideline to which the facility is subject

- any pollutant listed in the facility's NPDES permit for its process wastewater, if the facility is operating under an existing NPDES permit

- oil, grease, Ph, BOD_5, COD, TSS, total phosphorous, total Kjeldahl nitrogen, and nitrate plus nitrite nitrogen

- any information on the discharge required under 40 C.F.R. § 122.21(g)(7)(iii), (iv) -- indicate whether applicant knows or has reason to believe that any of the pollutants in Tables II, III, IV, or V of Appendix D to 40 C.F.R. pt. 122 is discharged from any outfall; if so, there may be additional sampling requirements

- flow measurements or estimates of the flow rate, and the total amount of discharge for the storm event(s) sampled, and the method of flow measurement or estimation

- the date and duration (in hours) of the storm event(s) sampled, rainfall measurements or estimates of the storm event (in inches) which generated the sampled runoff and the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event (in hours)

40 C.F.R. § 122.26(c)(1)(i)(E).

When collecting samples for permit applications, applicants with two or more outfalls with substantially identical effluents may be allowed, upon prior approval by the permitting authority, to test only one outfall and report that the quantitative data also applies to the substantially identical outfalls. 40 C.F.R. § 122.26(g)(7); 55 Fed. Reg. 48017. If so, the applicant must provide an explanation why the untested outfalls are substantially identical to the tested outfalls. 55 Fed. Reg. 48017. Where the amount of flow differs between these substantially identical outfalls, measurements or estimates of the total flow of each of the outfalls must also be provided. Id.

F. Storm Water Discharges Associated with Industrial Activities that Discharge into Separate Storm Sewers

1. Municipal Separate Storm Sewer Discharge

Storm water from an industrial facility which is discharged through a municipal storm sewer system must be permitted. 40 C.F.R. § 122.26(a)(4). This includes discharges through sewer systems serving populations less than 100,000 which were previously exempt from permitting requirements under CWA sec. 402. 55 Fed. Reg. 48001. In addition to filing a permit application, the operator of the storm water discharge associated with industrial activity which discharges through a large or medium municipal separate storm sewer (See Appendices C and D) must submit a notice to the operator of the sewer system receiving the discharge. This notice, due no later than May 15, 1991 or 180 days prior to commencing such discharge, must contain the following information:

- name of the facility

- name and phone number of a contact person

- location of the discharge

- description of the facility, including SIC code, which best reflects the principal products or services provided by the facility

- any existing NPDES permit number

40 C.F.R. § 122.26(a)(4).

Medium municipal separate storm sewers covered by these regulations are those found in cities having a population between 100,000 and 250,000. 40 C.F.R. § 122.26(b)(7). Texas cities that fall within this category include Amarillo, Arlington, Beaumont, Corpus Christi, Garland, Irving, Lubbock, Pasadena, and Waco. Appendix G to 40 C.F.R. pt. 122; See Appendix C attached. Large municipal separate storm sewers covered by these regulations are those found in cities having a population of 250,000 or more. 40 C.F.R. § 122.26(b)(4). Cities in Texas having a large municipal separate storm sewer system include Austin, Dallas, El Paso, Fort Worth, Houston, and San Antonio. Appendix F to 40 C.F.R. pt. 122; See Appendix D attached. EPA anticipates that general or individual permits covering industrial storm water discharges to municipal separate storm sewers will require the industrial facilities to comply with the terms of the permit issued to the municipality as well as other terms specific to the permittee. 55 Fed. Reg. 48006.

2. Non-Municipal Separate Storm Sewer Discharge

All storm water discharges to a non-publicly owned separate storm sewer system that discharges into waters of the United States must be covered by an NPDES permit. A single NPDES permit may be issued to the operator of the portion of the system that discharges to waters of the United States and this permit may, at the discretion of the director, name each industrial discharger to that system as a co-permittee. Alternatively, individual permits will be issued to each discharger of storm water associated with industrial activity. 40 C.F.R. § 122.26(a)(6). Where there is more than one operator of a single conveyance system, all generators of discharge associated with industrial activity must submit applications. 40 C.F.R. § 122.26(a)(6)(ii). Group applications may be appropriate when industrial facilities who discharge storm water to the same sewer system have sufficiently similar operations to meet the group application criteria. 55 Fed. Reg. 48006.

G. Penalties for Noncompliance

Any operator who believes its facility is a regulated industrial activity subject to the permit application requirements should file a permit application. Liability for failure to comply with the NPDES permit regulations is provided for in the enforcement provisions of the CWA. An operator is strictly liable for civil penalties of up to $25,000 per day for violation of the statute. 33 U.S.C. § 1319(d); 40 C.F.R. § 122.41(2). The penalty calculation will include consideration of seriousness of the violation, economic benefit to the operator, history of violations and good faith effort to comply. Criminal liability of up to $25,000 per day and imprisonment for one year is imposed for negligent violations. 33 U.S.C. § 1319(c)(1). For knowing violations, the statute imposes criminal penalties of not less than $5,000 nor more than $50,000 per day, imprisonment of up to three years, or both. 33 U.S.C. § 1319(c)(2). The criminal penalty limits are doubled for repeat convictions. Additionally, where a person knowingly violates the statute, and knows that the violation places another person in imminent danger of death or serious bodily injury, the law allows a criminal penalty of up to $250,000 and 15 years in prison for individuals and $1,000,000 for corporations, with the limits doubled for repeat convictions. 33 U.S.C. § 1319(c)(6).

In addition to the civil and criminal penalties discussed, failure to file a permit application could result in a citizen suit. The CWA contains a citizen suit provision which permits any citizen to bring a civil action against any person who discharges any pollutant or who is in violation of a wastewater discharge permit. 33 U.S.C. § 1365. Thus, a third party could bring a lawsuit against an operator who has not filed an application, but whose storm water discharge is the type subject to regulation and resulted in discharge of a pollutant.

III. DISCHARGES FROM LARGE AND MEDIUM MUNICIPAL SEPARATE STORM SEWERS

A. Overview and Applicability

The new storm water regulations require large and medium municipal separate storm sewer systems to be permitted for all storm water discharges. The intent is to identify and eliminate commercial and industrial illicit connections or illegal dumping into the municipal storm water sewer system. EPA intends to issue permits on a system wide basis whereby one permit will cover all outfalls in a city's storm water system. The thrust of the regulatory program is to push cities toward designing and implementing management programs that will reduce the pollutant loadings in storm water runoff.

A "municipal separate storm sewer" is defined as a conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains, which is:

- owned or operated by a state, city, town, borough, county, parish, district, association, or other public body created by or pursuant to state law
- designed or used for collecting or conveying storm water
- not a combined sewer
- not part of a publicly-owned treatment works ("POTW")

40 C.F.R. § 122.26(b)(8).

"Medium municipal separate storm sewer systems" are all municipal separate storm sewers located in an incorporated place having a population of between 100,000 and 250,000. 40 C.F.R. § 122.26(b)(7). Texas cities falling within this category include Amarillo, Arlington, Beaumont, Corpus Christi, Garland, Irving, Lubbock, Pasadena, and Waco. Appendix G to 40 C.F.R. pt. 122. Additionally included in this classification are those municipal separate storm sewers located in the specific counties listed in Appendix I to 40 C.F.R. pt. 122, except those located in the incorporated places, townships or towns within such counties. See Appendices C and D hereto, containing the lists of all cities and counties designated as having either large or medium municipal separate storm sewers.

"Large municipal separate storm sewer systems" are all municipal separate storm sewer that are located in an incorporated place with a population of 250,000 or more. 40 C.F.R. § 122.26(b)(4). Texas cities falling within this category include Austin, Dallas, El Paso, Fort Worth, Houston, and San Antonio. Appendix F to 40 C.F.R. pt. 122. Additionally included in this classification are those municipal separate storm sewer systems located in the specific counties listed in Appendix H to 40 C.F.R. pt. 122, except those located in the incorporated places, townships, or towns within such counties. Harris County, Texas is among those counties listed in Appendix H.

The Director may designate small cities or any municipal separate storm sewer owned or operated by a municipality as part of a large or medium municipal separate storm sewer system if the discharges of this smaller city and a larger regulated city are considered to be interrelated. 40 C.F.R. § 122.26(b)(4)(iii), (b)(7)(iii). The Director may consider the following factors in making this determination:

- physical interconnections between the municipal separate storm sewers
- the proximity of discharges of the smaller city with that of the regulated city
- the quantity and nature of pollutants discharged by each city
- the nature of the receiving waters
- other relevant factors

40 C.F.R. § 122.26(b)(4)(iii), (b)(7)(iii).

In general, however, only those systems operated by a public entity that serve 100,000 persons or more are covered by the regulations. 40 C.F.R. § 122.26(a)(1), (b)(4), (b)(7). Additionally, the rules do not cover discharges from combined sewers. A combined sewer is a system designed as both a sanitary and storm sewer. 55 Fed. Reg. 48036. A municipality which has both combined and separate storm sewers may, upon approval, reduce its census estimates by a fraction based on the length of combined sewers over the total length of all sewers when determining whether the total city population establishes its system as a medium or large separate storm sewer system. 40 C.F.R. § 122.26(f).

The operator of a discharge from a large or medium municipal separate storm sewer must submit a permit application which covers the distinct discharges for which the operator is responsible or must participate in a permit application together with one or more other operators for a permit which will cover all or a portion of all discharges from the municipal separate storm sewer. 40 C.F.R. § 122.26(a)(3)(iii). In some cases a regional authority may be responsible for submitting a permit application. If so, the following guidelines must be followed:

- the regional authority, together with co-applicants, must have authority over a storm water management program that is in existence, or shall be in existence, at the time Part One of the application is due

- the permit applicant or co-applicant shall establish their ability to make a timely submission of Parts One and Two of the municipal application

- each of the operators of large or medium municipal separate storm sewer systems that are under the purview of designated regional authority shall comply with the application requirements for such storm sewer discharge

40 C.F.R. § 122.26(a)(3)(iii)(C)(1)-(3).

Upon petition, EPA may designate as a "system" municipal storm water sewer operations located within the boundaries of a regional storm water management authority. 55 Fed. Reg. 48040. EPA encourages the regional authority to submit a permit application. 55 Fed. Reg. 48040, 48042. The various public entities must demonstrate that the separate conveyances are interrelated to qualify for a permit on a regional basis. 40 C.F.R. § 122.26(a)(3). Boundaries of regional authorities may be based on watershed boundaries but must include either a city otherwise regulated, the regulated unincorporated areas of the listed counties, or both. 55 Fed. Reg. 48042. As such, the geographical boundaries of a municipality and a municipal separate storm sewer system need not be identical. 55 Fed. Reg. 48042. Under a regional permit, the various regulatory agencies would become either regional co-permittees or be subject to a regional permit. 55 Fed. Reg. 48043. The advantage of having a number of municipalities band together to obtain a regional permit is that the cost of obtaining the permit is born by more entities. Conversely, cities that individually serve less than 100,000 persons are not required to obtain a permit unless interrelated with an otherwise regulated system.

One permit application may be submitted for all or a portion of all municipal separate storm sewers within adjacent or interconnected large or medium municipal systems. The Director may then either issue one system-wide permit covering all, or a portion of all, discharges from municipal separate storm sewers in adjacent or interconnected large or medium systems or may issue distinct permits for appropriate categories of discharges within the system. 40 C.F.R. § 122.26(a)(3)(iv). Such categories of discharges may include:

- all discharges owned or operated by the same municipality

- all discharges located within the same jurisdiction

- all discharges within a system that discharge to the same watershed

- all discharges within a system that are similar in nature

- individual discharges from municipal separate storm sewers within the system

40 C.F.R. § 122.26(a)(3)(ii).

Permits that are issued on a system-wide or jurisdiction-wide, watershed or other basis may specify different conditions relating to different discharges covered by the permit. This would include different management programs for different drainage areas which contribute to the system. 40 C.F.R. § 122.26(a)(3)(v). Co-permittees are only required to comply with conditions relating to discharges from the sewers which they operate. 40 C.F.R. § 122.26(a)(3)(vi).

A. Permit Application Requirements

Part One of the permit application requires the applicant to submit information regarding existing programs and the means available to the municipality to control pollutants in storm water discharges. This will assist in developing the information necessary to build a successful municipal storm water management program. 55 Fed. Reg. 48044. Part One of the application has three primary functions:

- to identify sources of pollutants to the sewer system

- to preliminarily identify discharges that are appropriate for individual permits

- to formulate a strategy for characterizing the discharges from the sewer system

55 Fed. Reg. 48044.

The components of Part One of the application include general information, legal authority, source identification, discharge characterization, field screening, established management programs, and financial resources. This information will be supplemented and further developed in Part Two of the application which also requires the applicant to submit a proposed storm water management plan consistent with the criteria established in this program.

1. Legal Authority

The municipal permit applicant must submit, in Part One of the permit application, a description of existing legal authority and any non-existing but necessary legal authority needed to control discharges to the municipal separate storm sewer system. 40 C.F.R. § 122.26(d)(1)(ii). Part Two of the application further requires a demonstration by the applicant that it can operate pursuant to legal authority. 40 C.F.R. § 122.26(d)(2)(i).

2. Source Identification

Municipalities must identify sources contributing pollutants to separate storm sewers. Part One of the application establishes minimum source identification objectives and is intended to provide an initial characterization of pollutants in the discharge from the municipal storm sewer system. Part Two requires the submission of a source identification plan intended to provide additional information during the term of the permit. 55 Fed. Reg. 48048. Part Two will supplement the information provided in Part One and at a minimum will identify all major outfalls. Id.

An "outfall" is a point source where a municipal storm sewer discharges into waters of the United States. 40 C.F.R. § 122.26(b)(9). A "major outfall" is defined as discharge from a single pipe with a 36-inch inside diameter or greater or if the discharge occurs from a conveyance other than a circular pipe, a discharge that is associated with a drainage area of at least 50 acres. 40 C.F.R. § 122.26(b)(5). For municipal separate storm sewers that receive discharges from land zoned for industrial activity, a major outfall is an outfall that discharges from a single pipe having an inside diameter of at least 12 inches or if the discharge occurs from a conveyance other than a circular pipe, a discharge that is associated with a drainage area of at least two acres. Id.

EPA requires the following preliminary information to be reported in Part One of the permit application:

- description of past controls to limit non-storm water discharges to POTWs serving the same area as the municipal storm sewer
- USGS 7.5 minute topographic map extending one mile beyond the boundaries of the municipal storm sewer system covered by the application noting the following:
    - location of all known outfalls
    - description of major land use classifications in each drainage area and ten year projections of population growth and development activities within the drainage area
    - location and description of operating or closed municipal landfills or other treatment, storage or disposal facility
    - location and permit number of known NPDES permitted discharges to the sewer system

- location of major structural controls for storm water discharge

- identification of public parks, recreation areas, and open lands

40 C.F.R. § 122.26(d)(1)(iii).

In addition to submitting the location of any major outfalls not reported in Part One, applicants must provide in Part Two of the application a description of industrial facilities which may discharge storm water associated with industrial activity to the municipal separate storm sewer system. 40 C.F.R. § 122.26(d)(2)(ii). The industrial facilities should be organized by watershed. Id.

3. Discharge Characterization Plan

The regulations require specific "discharge characterization" data to be submitted with the Part One application, including such data as monthly mean rain and snow fall estimates, existing quantitative data describing volume and quality of storm sewer discharges, outfall descriptions, sampling procedures, receiving waters and water quality impacts. 40 C.F.R. § 122.26(d)(1)(iv).

The characterization plan and data analysis can be divided into four main components:

- a screening analysis to be used to develop a program for identifying and controlling illicit connections and illegal dumping

- preliminary quantitative data for use in developing a sampling program to be incorporated into the permit

- estimates of, and a schedule for making future estimates of, annual system-wide pollutant loadings and mean concentration of pollutants in storm water discharges

- identification of receiving waters known to be adversely impacted by storm water discharges

55 Fed. Reg. 48049.

a. Field Screening

Municipal applicants must use "field screening" analysis to develop a comprehensive program for detecting and controlling illicit connections and illegal dumping. An illicit discharge is "any discharge to a municipal storm sewer system that is not composed entirely of storm water except discharges pursuant to an NPDES permit . . . and discharges resulting from fire fighting activities." 40 C.F.R. § 122.26(b)(2). The results of a screening analysis, to be reported in Part One of the municipal application, will be used to develop appropriate priorities for the program and for detecting such illegal discharges. 55 Fed. Reg. 48049.

Municipalities may either conduct field screening for all "major outfalls" or, alternatively, at strategically located sampling points ("field screening points") to identify illicit connections. 55 Fed. Reg. 48047. Use of this second alternative requires that the city be divided into one-quarter mile cells by use of a grid system after which a single screening point is selected for each cell containing a segment of a storm water conveyance. Selection of cells must take into account a number of drainage and land use criteria. Major outfalls may be designated as the screening point. However, screening points should be located downstream of potential illicit connections and at the furthest downstream accessible point within each cell. An alternative method of identifying field screening sites is available for cities that have inadequate maps locating storm sewer systems. 55 Fed. Reg. 48047.

EPA believes that visual inspection of dry weather discharges is an effective means for detecting illicit flows and, thus, requires applicants to submit a description of dry weather flows observed at major outfalls or field screening points. 55 Fed. Reg. 48049. Two grab samples should be collected at least four hours apart during a 24-hour period for detected dry weather flows. 40 C.F.R. § 122.26(d)(1)(iv)(D). For all samples, the applicant should submit a narrative description of the color, odor, turbidity, presence of oil sheen or surface scum, and any other relevant information regarding the possible presence of illicit discharge in the storm sewer. Id. Additionally, the field analysis results should provide information on the flow rate and presence of pH, total chlorine, total copper, total phenol, and detergents (or surfactants). Id. If no flow is observed, then, at a minimum, the field screen must include the description of visual observations made during a dry weather period. 55 Fed. Reg. 48049.

EPA does not require that the analytical methods approved under 40 C.F.R. pt. 136 be used in the field screen. In fact, the use of inexpensive field sampling techniques (e.g. colormetric detection) is anticipated, however, the more stringent analytical methods may be required during the term of the permit. 55 Fed. Reg. 48049. An applicant preferring to use an alternative method to that approved in 40 C.F.R. pt. 136 must provide a description of the method used. 55 Fed. Reg. 48049; 40 C.F.R. § 122.26(d)(1)(iv)(D).

b. Characterization Plan and Data Requirements

Quantitative data for pollutant identification must be collected and submitted to EPA. Part One of the municipal storm sewer application will require the applicant to submit information and a proposed program to collect the necessary data. The applicant must report the location of outfalls or field screening points appropriate for the representative data collection and describe why each is representative. Additionally, the applicant must report the seasons during which sampling is intended to take place and the type of sampling equipment to be used. 40 C.F.R. § 122.26(d)(1)(iv)(E). These representative outfalls or field screening points must reflect water quality concerns. Id.

Based upon information received in Part One of the application, the Director will designate between five and ten outfalls as representative of the commercial, residential and industrial land use activities in the drainage area contributing to the system. Quantitative data must then be collected from these outfalls and submitted as Part Two of the application. 40 C.F.R. § 122.26(d)(2)(iii)(A). Data must be collected from each outfall for three storm events occurring at least one month apart in accordance with the sampling requirements at 40 C.F.R. § 122.26(g)(7). 40 C.F.R. § 122.26(d)(2)(iii)(A)(1). In addition, the applicant must provide information on the date and duration of the storm events sampled, rainfall estimates of the event and the duration between the storm event and the end of the previous measurable (greater than 0.1 inch rainfall) storm event. 40 C.F.R. § 122.26(d)(2)(iii)(A)(2). EPA may require that data be collected from additional monitoring points if it is unlikely that three storm events will occur in one year. 55 Fed. Reg. 48049. If a municipal or industrial discharger believes that the sampling data does not accurately reflect the true nature of the discharges, additional sampling may be conducted at the applicant's discretion. Id.

Quantitative data for outfall samples must be provided, in Part Two, for the following:

- organic pollutants listed in Table II of App. D
- pollutants listed in Table III of App. D
- total suspended solids ("TSS")
- total dissolved solids ("TDS")
- COD
- BOD_5
- oil and grease
- fecal coliform
- fecal streptococcus
- pH
- total Kjeldahl nitrogen
- nitrate plus nitrite
- dissolved phosphorus
- total ammonia plus organic nitrogen
- total phosphorus

40 C.F.R. § 122.26(d)(2)(iii)(A)(3).

A proposed schedule must also be submitted to provide estimates on each major outfall for the seasonal pollutant load and mean concentration of a representative storm for any of the above listed constituents detected in any required sample. 40 C.F.R. § 122.26(d)(2)(iii)(C). The loading and concentration estimates will be used to evaluate both long-term and short-term water quality impacts of discharges from municipal separate storm sewer systems on receiving waters. 55 Fed. Reg. 48051.

In addition, municipalities must also submit, in Part Two, annual pollutant loading and event mean concentration estimates for the cumulative discharges to waters of the United States during a storm event from all identified municipal outfalls. This data must also describe the procedure used for estimating constituent loads and concentrations; including any modelling, data analysis, and calculation methods; and must identify the following constituents:

- BOD_5
- COD
- TSS
- dissolved solids
- total nitrogen
- total ammonia plus organic nitrogen
- total phosphorus
- dissolved phosphorus
- cadmium
- copper
- lead
- zinc

40 C.F.R. § 122.26(d)(2)(iii)(B).

Finally, a proposed monitoring program must be established for representative data collection for the term of the permit and should describe the location of outfalls or field screening points to be sampled, why they are representative, the frequency of sampling, parameters to be sampled and a description of the sampling equipment. 40 C.F.R. § 122.26(d)(2)(iii)(D).

4. Storm Water Quality Management Plans

Municipal applicants must develop a management plan to either detect and remove illicit discharges or ensure the discharges are covered by an NPDES permit. Id. Pollutant discharges from municipal separate storm sewers must be reduced to the maximum extent possible. CWA § 402(p)(3)(iii). EPA believes that management programs directed at pollutant sources will be more effective than the traditional end-of-pipe treatment. 55 Fed. Reg. 48038. The municipal applicant must develop management programs for four types of pollutant sources which discharge to large and medium municipal storm sewer systems. These are:

- runoff from commercial and residential areas
- runoff from industrial areas
- runoff from construction sites
- non-storm water discharges

55 Fed. Reg. 48052. Where other sources contribute significant amounts of pollutants to the sewer system, appropriate control measures should also be included on a site-specific basis. Id.

Section 402(p)(3)(B)(ii) of the CWA requires that non-storm water discharges be prohibited from entering the storm sewer system. However, EPA interprets the statute as allowing non-storm water discharges to enter a public storm sewer system if the discharge is permitted under the NPDES program. 55 Fed. Reg. 48036. The NPDES permit conditions will have to be met at the point where the non-storm water discharge enters the public storm sewer system. 55 Fed. Reg. 48037. An individual NPDES permit for non-storm water discharges into public storm sewer systems could be denied if the discharge causes water quality problems in receiving waters. Id.

The prohibition on non-storm water discharges for certain categories of flows into public sewer systems applies only to non-storm water flows which are sources of pollutants to waters of the United States. 55 Fed. Reg. 48037. Examples of these flows include the following:

- landscape irrigation
- diverted stream flows
- uncontaminated ground water infiltration
- irrigation water
- lawn watering
- residential car washing
- dechlorinated swimming pool discharges
- discharges form fire fighting

55 Fed. Reg. 48037.

EPA anticipates that the management programs will develop over the course of time and, thus, discharge permits will be written to incorporate flexibility for changing conditions that result from program development, implementation and improvements in water quality. 55 Fed. Reg. 48052. There should also be enough flexibility in the permit writing to allow municipalities to identify priority controls and allow cities to focus on the more serious sources of pollution. Id.

Part One of the permit application requires the applicant to submit a description of the existing management program to control pollutants from entering the storm sewer system. The description must include information regarding existing structural and non-structural prevention and control measures. 40 C.F.R. § 122.26(d)(1)(v)(A). Controls established under State law, as well as, local rules should be included. Id. The existing program to identify illicit connections to the system must also be identified and described. 40 C.F.R. § 122.26(d)(1)(v)(B). This includes descriptions of inspection and enforcement procedures used by the municipality. Id.

The proposed management program should cover the duration of the permit and must include, in Part Two of the application, a comprehensive planning process, involving public participation and intergovernmental coordination (where necessary). 40 C.F.R. § 122.26(d)(2)(iv). The discharge of pollutants must be reduced to the maximum extent practicable using control techniques and system design and engineering methods. Id. The proposed management programs should include descriptions of and implementation schedules for (1) maintenance activities and structural controls to reduce pollutants, (2) controls to reduce discharges of pollution from areas of new development and significant redevelopment, (3) practices for reduction discharges from the operation (including de-icing) of public streets, roads and highways, (4) flood management procedures, including pollutant removal, (5) program to monitor pollutants from landfills and other waste treatment, storage and disposal activities, and (6) pesticide and herbicide control programs. In addition, the plan should include:

- hazardous waste treatment, disposal and recovery facilities

- industrial facilities that are subject to section 313 of tit. III of the Superfund Amendments and Reauthorization Act

- industrial facilities that the municipal permit applicant determines are contributing a substantial pollutant loading to the sewer system

40 C.F.R. § 122.26(d)(2)(iv)(B)-(C).

5. Fiscal Resources and Analysis

Part One of the application requires the applicant to submit a description of the financial resources currently available to the municipality to complete Part Two of the permit application. This should include the budget for the existing storm water programs and an overview any indebtedness, assets, and sources of funds for storm water programs. 40 C.F.R. § 122.26(d)(1)(vi). A fiscal analysis of the necessary capital and operation and maintenance expenditures for the program must be submitted in Part Two of the application for each fiscal year to be covered by the permit. A description of the source of funds and any legal restrictions on their use should also be included. 40 C.F.R. § 122.26(d)(2)(vi). If more than one legal entity submits an application, the application must contain a description of the roles and responsibilities of each and the procedures used to ensure effective coordination. 40 C.F.R. § 122.26(d)(2)(vii).

6. Application Deadlines

Applications for large municipal separate storm sewers are due according to the following schedule:

Part One due by November 18, 1991
Part Two due by November 16, 1992

40 C.F.R § 122.26(e)(3).

Applications for medium municipal separate storm sewers are due according to the following schedule:

Part One due by May 18, 1992
Part Two due by May 17, 1993

40 C.F.R. § 122.26(e)(4).

APPENDIX A

Application Deadlines

Individual Applications[1]

- due by November 18, 1991 (proposed to be extended to May 18, 1992)

Group Applications[2]

- Part One due by September 30, 1991

- Part Two due by May 18, 1992

New Discharges[3]

- submit application for proposed new discharge 180 days before the date on which the discharge is to commence

- submit application for proposed new discharge of storm water associated with industrial activity 180 days before facility commences such industrial activity

- submit application for construction activity discharge at least 90 days before the date construction is to commence.

Existing Permits[4]

- if permit expires prior to May 18, 1992, submit individual application by November 18, 1991, otherwise, submit application 180 days prior to expiration

General Permits[5]

- different submittal dates may be required under the term of applicable general permits

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1 40 C.F.R. § 122.26(e)(2); 56 Fed. Reg. 12102 (March 21, 1991).

2 40 C.F.R. § 122.26(e).

3 40 C.F.R. § 122.21(c)(1).

4 40 C.F.R. § 122.26(e)(6).

5 40 C.F.R. § 122.26(e)(1).

APPENDIX B

STATE NPDES PROGRAM STATUS

	Approved State NPDES Permit Program	Approved to Regulate Federal Facilities	Approved State Pretreatment Program	Approved State General Permits Program
Alabama	10/19/79	10/19/79	10/19/79	06/26/91
Arkansas	11/01/86	11/01/86	11/01/86	11/01/86
California	05/14/73	05/05/78	09/22/89	09/22/89
Colorado	03/27/75	----	----	03/04/83
Connecticut	09/26/73	01/09/89	06/03/81	----
Delaware	04/01/74	----	----	----
Georgia	06/28/74	12/08/80	03/12/81	01/28/91
Hawaii	11/28/74	06/01/79	08/12/83	----
Illinois	10/23/77	09/20/79	----	01/04/84
Indiana	01/01/75	12/09/78	----	04/02/91
Iowa	08/10/78	08/10/78	06/03/81	----
Kansas	06/28/74	08/28/85	----	----
Kentucky	09/30/83	09/30/83	09/30/83	09/30/83
Maryland	09/05/74	11/10/87	09/30/85	----
Michigan	10/17/73	12/09/78	06/07/83	----
Minnesota	06/30/74	12/09/78	07/16/79	12/15/87
Mississippi	05/01/74	01/28/83	05/13/82	----
Missouri	10/30/74	06/26/79	06/03/81	12/12/85
Montana	06/10/74	06/23/81	----	04/29/83
Nebraska	06/12/74	11/02/79	09/07/84	07/20/89
Nevada	09/19/75	08/31/78	----	----
New Jersey	04/13/82	04/13/82	04/13/82	04/13/82
New York	10/28/91	06/13/80	----	----
North Carolina	10/19/75	09/28/84	06/14/82	----
North Dakota	06/13/75	01/22/90	----	01/22/90
Ohio	03/11/74	01/28/83	07/27/83	----
Oregon	09/26/73	03/02/79	03/12/81	02/23/82
Pennsylvania	06/30/78	06/30/78	----	----
Rhode Island	09/17/84	09/17/84	09/17/84	09/17/84
South Carolina	06/10/75	09/26/80	04/09/82	----
Tennessee	12/28/77	09/30/86	08/10/88	04/18/91
Utah	07/07/87	07/07/87	07/07/87	07/07/87
Vermont	03/11/74	----	03/16/82	----
Virgin Islands	06/30/76	----	----	----
Virginia	03/31/75	02/09/82	04/14/89	05/20/91
Washington	11/14/73	----	09/30/86	09/26/89
West Virginia	05/10/82	05/10/82	05/10/82	
Wisconsin	02/04/74	11/26/79	12/24/80	12/19/86
Wyoming	01/30/75	05/18/81	----	----
TOTALS	39	34	27	22

APPENDIX C

MEDIUM MUNICIPAL SEPARATE STORM SEWER SYSTEM

Appendix G to Part 122—Incorporated Places With Populations Greater Than 100,000 and Less Than 250,000 According to Latest Decennial Census by Bureau of Census

State	Incorporated place
Alabama	Huntsville.
	Mobile.
	Montgomery.
Alaska	Anchorage.
Arizona	Mesa.
	Tempe.
Arkansas	Little Rock.
California	Anaheim.
	Bakersfield.
	Berkeley.
	Concord.
	Fremont.
	Fresno.
	Fullerton.
	Garden Grove.
	Glendale.
	Huntington Beach.
	Modesto.
	Oxnard.
	Pasadena.
	Riverside.
	San Bernadino.
	Santa Ana.
	Stockton.
	Sunnyvale.
	Torrance.
Colorado	Aurora.
	Colorado Springs.
	Lakewood.
	Pueblo.
Connecticut	Bridgeport.
	Hartford.
	New Haven.
	Stamford.
	Waterbury.
Florida	Fort Lauderdale.
	Hialeah.
	Hollywood.
	Orlando.
	St. Petersburg.
Georgia	Columbus.
	Macon.
	Savannah.
Idaho	Boise City.
Illinois	Peoria.
	Rockford.
Indiana	Evansville.
	Fort Wayne.
	Gary.
	South Bend.
Iowa	Cedar Rapids.
	Davenport.
	Des Moines.
Kansas	Kansas City.
	Topeka.
Kentucky	Lexington-Fayette.
Louisiana	Baton Rouge.
	Shreveport.
Massachusetts	Springfield.
	Worcester.
Michigan	Ann Arbor.
	Flint.
	Grand Rapids.
	Lansing.
	Livonia.
	Sterling Heights.
	Warren.
Mississippi	Jackson.
Missouri	Independence.
	Springfield.
Nebraska	Lincoln.
Nevada	Las Vegas.
	Reno.
New Jersey	Elizabeth.
	Jersey City.
	Paterson.
New York	Albany.
	Rochester.
	Syracuse.
	Yonkers.
North Carolina	Durham.
	Greensboro.
	Raleigh.
	Winston-Salem.
Ohio	Akron.
	Dayton.
	Youngstown
Oregon	Eugene.
Pennsylvania	Allentown.
	Erie.
Rhode Island	Providence.
South Carolina	Columbia.
Tennessee	Chattanooga.
	Knoxville.
Texas	Amarillo.
	Arlington.
	Beaumont.
	Corpus Christi.
	Garland.
	Irving.
	Lubbock.
	Pasadena.
	Waco.
Utah	Salt Lake City.
Virginia	Alexandria.
	Chesapeake.
	Hampton.
	Newport News.
	Portsmouth.
	Richmond.
	Roanoke.
Washington	Spokane.
	Tacoma.
Wisconsin	Madison.

Appendix I to Part 122—Counties With Unincorporated Urbanized Areas Greater Than 100,000, But Less Than 250,000 According to the Latest Decennial Census by the Bureau of Census

State	County	Unincorporated urbanized population
Alabama	Jefferson	102,917
Arizona	Pima	111,479
California	Alameda	187,474
	Contra Costa	158,452
	Kern	117,231
	Orange	210,693
	Riverside	115,719
	San Bernardino	148,644
Florida	Broward	159,370
	Escambia	147,892
	Hillsborough	238,292
	Orange	245,325
	Palm Beach	167,089
	Pinellas	194,389
	Polk	104,150
	Sarasota	110,009
Georgia	Clayton	100,742
	Cobb	204,121
	Richmond	118,529
Kentucky	Jefferson	224,958
Louisiana	Jefferson	140,836
North Carolina	Cumberland	142,727
Nevada	Clark	201,775
Oregon	Multnomah	141,100
	Washington	109,348
South Carolina	Greenville	135,395
	Richland	124,684
Virginia	Arlington	152,599
	Henrico	161,204
	Chesterfield	108,348
Washington	Snohomish	103,493
	Pierce	196,113

APPENDIX D

LARGE MUNICIPAL SEPARATE STORM SEWER SYSTEM

Appendix F to Part 122—Incorporated Places With Populations Greater Than 250,000 According to Latest Decennial Census by Bureau of Census.

State	Incorporated place
Alabama	Birmingham.
Arizona	Phoenix.
	Tucson.
California	Long Beach.
	Los Angeles.
	Oakland.
	Sacramento.
	San Diego.
	San Francisco.
	San Jose.
Colorado	Denver.
District of Columbia	
Florida	Jacksonville.
	Miami.
	Tampa.
Georgia	Atlanta.
Illinois	Chicago.
Indiana	Indianapolis.
Kansas	Wichita.
Kentucky	Louisville.
Louisiana	New Orleans.
Maryland	Baltimore.
Massachusetts	Boston.
Michigan	Detroit.
Minnesota	Minneapolis
	St. Paul.
Missouri	Kansas City.
	St. Louis.
Nebraska	Omaha.
New Jersey	Newark.
New Mexico	Albuquerque.
New York	Buffalo.
	Bronx Borough.
	Brooklyn Borough.
	Manhattan Borough.
	Queens Borough.
	Staten Island Borough.
North Carolina	Charlotte.
Ohio	Cincinnati.
	Cleveland.
	Columbus.
	Toledo.
Oklahoma	Oklahoma City.
	Tulsa.
Oregon	Portland.
Pennsylvania	Philadelphia.
	Pittsburgh.
Tennessee	Memphis.
	Nashville/Davidson.
Texas	Austin.
	Dallas.
	El Paso.
	Fort Worth.
	Houston.
	San Antonio.
Virginia	Norfolk.
	Virginia Beach.
Washington	Seattle.
Wisconsin	Milwaukee.

Appendix H to Part 122— Counties with Unincorporated Urbanized Areas With a Population of 250,000 or More According to the Latest Decennial Census by the Bureau of Census

State	County	Unincorporated urbanized population
California	Los Angeles	912,564
	Sacramento	449,056
	San Diego	304,758
Delaware	New Castle	257,184
Florida	Dade	781,949
Georgia	DeKalb	386,379
Hawaii	Honolulu	668,178
Maryland	Anne Arundel	271,458
	Baltimore	601,308
	Montgomery	447,993
	Prince George's	450,188
Texas	Harris	409,601
Utah	Salt Lake	304,632
Virginia	Fairfax	527,178
Washington	King	335,800

PETROLEUM STORAGE TANK CLEANUPS,

FINANCIAL ASSURANCE,

and the

PETROLEUM STORAGE TANK REMEDIATION FUND

Presented by:

Daniel J. McClellan

EnecoTech, Inc.
Environmental Consultants

Austin, Texas

August, 1991

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1.0 INTRODUCTION

Federal authority for the regulation of underground storage tanks (UST's) was established by the creation of Subtitle I of the Resource Conservation and Recovery Act (RCRA) when the act was amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. In Texas, under a memorandum of agreement, the EPA has delegated interim authority to the Texas Water Commission (TWC) to administer the state's UST Program through rules promulgated under the authority granted by the Texas Water Code (Sections 26.341 - 26.359). These regulations are contained in the Underground and Aboveground Storage Tank rules found in Title 31 of the Texas Administrative Code, Sections 334.1 - 334.482. It is important to understand that the UST Program was established to regulate underground tanks used to store petroleum fuels and hazardous substances (products), but <u>not</u> the storage of hazardous wastes which are regulated separately under Subtitle C of RCRA.

In 1989, the Texas Legislature amended the Water Code to include the regulation of certain aboveground petroleum storage tanks. To reflect this and other new responsibilities, the TWC renamed the program as the Petroleum Storage Tank (PST) Program. However, in view of the fact that the overwhelming majority of the PST Program's environmental concerns relate to petroleum fuel releases from underground storage tanks, this paper will restrict itself to that area of discussion and the means by which these concerns are being addressed.

In Texas, there are approximately 130,000 petroleum UST's located at over 50,000 separate facilities across the state. Since 1987, over 9,000 release incidents have been reported to the TWC. At the present, new releases are being reported to the agency at a rate of about 50 per week! Based on national and state statistics, it is estimated that at least 30% of all UST's have had releases; therefore, most of the problems have yet to be discovered.

2.0 RESPONDING TO PETROLEUM STORAGE TANK RELEASES (CLEANUPS)

2.1 Regulatory Obligations

A petroleum storage tank (PST) owner or operator has very specific regulatory obligations for responding to petroleum releases. These obligations are described in the Underground and Aboveground Storage Tank rules under Subchapter D which is titled Release Reporting and Corrective Action (31 TAC, §§ 334.71-.85). In general, the rules address:

- Investigation and TWC notification of suspected and confirmed releases;
- Performance of immediate abatement actions;
- Completion of a comprehensive assessment of impacts;
- Development of a Corrective Action Plan (CAP) for agency approval; and
- Implementation and completion of the CAP.

Since the majority of petroleum storage tanks are buried in the ground, leaks frequently go undetected by the owner or operator. Indications of a leak may come from discrepancies in inventory records or finding that water has infiltrated a tank. In cities, a problem may not be suspected until a petroleum fuel is discovered damaging nearby subsurface telephone lines. In a small town, it may be the discovery of pure gasoline flowing out of a neighbor's kitchen tap. Whatever the reason for suspicion, a PST owner or operator must notify the TWC within twenty-four (24) hours of his or her first becoming aware that a release may have occurred. This notification is normally made by telephone to the appropriate TWC District Field Office of which fourteen (14) are located across the state (see attached map and listing).

The PST owner or operator is immediately obligated to investigate and confirm whether a release has actually occurred, commonly by tightness testing of the entire tank system. If no release is found, a written report of the investigation's findings must be filed with the TWC within forty-five (45) days.

Should a release be confirmed, the TWC must be notified by telephone again within twenty-four (24) hours and immediate action pursued to abate and prevent any further release into the environment. In most cases, this means shutting down the operation of the system and removing any remaining stored fuel. If accumulations of fuel (i.e., free product) are found outside of the tank such as in tank pit observation wells, then immediate action must be pursued to remove it on a continuous basis. Of utmost importance is identifying and mitigating any fire, explosion, or vapor hazards (i.e., possible routes of human exposure). Submittal to the TWC of a written report summarizing the initial abatement measures taken is required within twenty (20) days after release confirmation. A written report must also be submitted within forty-five (45) days that provides a characterization of the site and the nature of the release as well as specific information regarding any necessary free-product removal.

Following all appropriate immediate abatement and site characterization activities, the next step in responding to a release is to comprehensively assess (define) the extent of impacts to the environment. In the case of a minor release posing no threats to groundwater, the assessment may only require the excavation of adjacent soils followed by analytical verification that no impacts remain. If the release is significant in volume and/or threatens or has already impacted groundwater or other environmentally-sensitive features, an assessment generally involves the installation of borings and monitor wells from which soil and groundwater samples are collected for laboratory analysis. A comprehensive assessment of a PST release is not considered complete until both the vertical and horizontal extent of subsurface impacts have been defined. It is important to remember that the assessment must define off-site as well as on-site impacts.

The deadline for submitting a written report of the assessment findings to the TWC is established by the agency on a case-by-case basis. If those findings demonstrate that some degree of remediation or cleanup is necessary, then a proposed Corrective Action

Plan (CAP) must also be submitted with the report for agency approval. In general, the CAP must ensure that its implementation will, to the satisfaction of the TWC, adequately protect human health, safety, and the environment. In its review, the agency may make modifications to the CAP prior to approving it. Once approval is granted, the PST owner or operator is obligated to implement the CAP in accordance with a schedule and in a format established by the TWC. Agency approval of the CAP is not an absolute prerequisite to its implementation; however, the owner or operator must first notify the TWC of his or her intent to initiate cleanup and must comply with any written or verbal conditions imposed by the agency.

Finally, upon completion of the corrective action, a written report must be submitted to the agency documenting that the required level of cleanup has been fulfilled. In most response incidents, the site must be monitored for a year to verify the effectiveness of the completed cleanup.

As described above, the PST Corrective Action rules establish specific deadlines for submitting various written reports to the TWC following almost every stage of a response. The most important deadline is also the first which requires reporting both suspected and confirmed releases to the agency within twenty-four (24) hours of discovery. At the present time, however, the PST program is so severely understaffed that the average caseload is almost 200 cases per coordinator. As a result of this overwhelming workload, the current procedure by which the agency coordinates a release incident varies somewhat from the procedures established by rule.

The currently-applicable administrative process begins when a PST release is reported to the TWC. In response, the TWC sends the PST owner or operator a Corrective Action Directives (CAD) letter requesting that specific response actions be pursued. The CAD letter is more commonly referred to in industry as the infamous "Eight-point Letter" and, in general, it directs that all appropriate abatement actions be pursued followed by at least an initial assessment of the extent of impacts resulting from the release. Further communications and directives, either verbally or by letter, are made as the response progresses.

Regardless of when the owner or operator receives a CAD letter or any other directives from the TWC, he or she remains obligated under the law to fulfill the requirements of the rules immediately following confirmation of a release. In other words, if an owner or operator waits for the agency's directives, he or she may be in violation of the rules and therefore subject to enforcement. Current agency policy places special emphasis on a tank owner's responsibility to pursue whatever immediate-abatement measures that might be necessary to minimize the impacts of a release.

An enforcement action initiated by the TWC often results in administrative penalties which, under the Texas Water Code (§26.136), can be as much as $10,000 per day for every day of violation. Although maximum penalties are rare, the number of formal enforcement actions for PST violations is rising rapidly and recommended penalties in some cases are quite substantial. Even more important, however, is that failing to quickly take action to prevent off-site impacts from a release can subject an owner or operator to potential third-party lawsuits which would make the "wrath" of the TWC the least of one's concerns.

2.2 Cleanup Requirements (or "How Clean is Clean?")

One of the most thoroughly contentious debates in the environmental field is "How clean is clean?" Often, the typical response to this question is: "Until it is all gone." The problem with such a response is that in many cases it is technically impossible and/or economically infeasible to remove all measurable concentrations of a substance released into the environment. The cost of a cleanup often increases exponentially with the degree of "cleanliness" being sought. Realistically, all of the money spent on all of the environmental concerns in Texas combined could not clean up the 9,000-plus PST releases in Texas to zero or background levels.

A rational approach to evaluating appropriate cleanup requirements must therefore focus on addressing the risks posed by a release first to human health and safety and then to the environmental concerns specific to a particular location. A universal cleanup standard that applies to all release incidents is that there remain no potential for human exposure to contaminants. The two most critical routes of possible exposure are via explosive or toxic vapors in the air (frequently by infiltration into habitations) and through impacts to a drinking water source.

Ideally, every PST release incident would be evaluated on a site-by-site basis with site-specific cleanup requirements established in each case. In reality, however, this is administratively impossible due to the enormous number of incidents. The TWC has therefore established specific cleanup or remediation requirements by categorizing release incidents into four (4) separate "Groups" based upon the human exposure and environmental risks presented by the release itself and its particular environmental setting. Groups 1 through 3 are used to categorize PST releases affecting a particular category of groundwater which is distinguished by its relative quality or usefulness. The Group 4 category addresses those releases affecting only soils with no threat to groundwater of any type. Other factors of consideration when determining cleanup requirements include threatened as well as actual impacts to surface waters, the potential for a release to migrate, and, most importantly, the human health and safety concerns associated with explosive or toxic vapors.

The TWC's Petroleum Storage Tank Division has outlined the process for determining site-specific remediation requirements in its January 1990 publication entitled "Guidance Manual for LPST Cleanups in Texas" (the "brown book"). While too complex to describe in full, in general, when a PST release impacts or threatens to impact groundwater, the incident is categorized by the quality of that groundwater based upon its background levels of total dissolved solids (TDS). If the TDS of the affected or threatened groundwater is 3,000 parts per million (ppm) or less, that groundwater is considered to be of the highest quality (i.e., may be utilized for human consumption) and "Group 1" standards are applied. If the affected groundwater is a drinking water source, the standards are based upon the EPA's National Primary Drinking Water Standards and are quite strict. Group 1 standards also normally apply if a surface water is impacted.

Group 2 standards are only slightly less strict and are applied when the TDS of a threatened or impacted groundwater ranges between 3,000 and 10,000 ppm. Groundwater in this category is considered of value for agricultural and livestock purposes and, in locations where other sources may be unavailable, as a drinking water source.

Group 3 standards are utilized when the affected groundwater is considered unusable due to a natural TDS concentration of 10,000 ppm or greater. An example of this Group 3 category includes the highly saline groundwater found near the coast. If it can be properly demonstrated that the Group 3 groundwater has no current or potential use, remediation requirements may be no stricter than the removal of all free product.

In almost every case where groundwater is a concern, regardless of its established usefulness, the TWC will require at least a year of monthly or quarterly monitoring to confirm that remediation completed to an established cleanup level is maintained. It is also essential to recognize that in order to achieve a specific groundwater cleanup standard, the adjacent soils must be removed or sufficiently remediated to such a degree that they do not act as a continuing source of impact to that groundwater.

Under the Group 4 category where it can be satisfactorily demonstrated that only soils are impacted by a petroleum product and that no groundwater of any quality is threatened, the cleanup standard for those soils is normally 100 ppm Total Petroleum Hydrocarbons (TPH) and 30 ppm total benzene, toluene, ethylbenzene, and xylenes (BTEX). In most cases, soils impacted above these concentrations must be either removed or treated in place. Stricter standards will always be applied if the TWC perceives a potential for human exposure (e.g., via vapors) to any concentrations of the released substance.

In certain cases, cleanup standards may be negotiable based upon a technically-valid demonstration that allowing higher concentrations of a contaminant to remain poses no threats to human health or safety or the environment. For example, an affected groundwater may have a TDS value of less than 3,000 ppm indicating that it is of high value as a drinking water source; however, it is demonstrated that a well installed into this groundwater will produce less than one gallon per hour due to the tightness of its geological formation. The value of that groundwater therefore becomes questionable for even putting out a fire much less as a source of drinking water. The ability to prepare a definitive and persuasive assessment of the risks posed by a release therefore can have a profound effect on the cost of responding to that release.

3.0 FINANCIAL RESPONSIBILITY

3.1 History

Prior to 1986, the typical owner or operator of a petroleum storage tank was relatively untouched by environmental regulations and the responsibilities they impose. As the widespread environmental concerns associated with these tanks became apparent, a significant number of small businesses found they were financially incapable of properly responding to these problems. In many cases, such businesses were forced to declare bankruptcy placing the burden of a cleanup in the hands of the government. Furthermore, in many cases where a PST release resulted in personal injury or property damages to a third party, neither the PST owner or the government was available to provide appropriate compensation. As a result, specific regulatory requirements have been established for petroleum storage tank owners and operators requiring that they demonstrate financial responsibility for taking corrective action and for compensating third parties for bodily injury and property damage caused by accidental releases from petroleum storage tanks. The requirements only apply to petroleum underground storage tanks (UST's) and obligate either the owner or the operator. In the event of noncompliance, however, both parties are considered in violation of the regulations.

3.2 Required Amount of Financial Responsibility

- Per Occurrence:

  a. If the facility is a petroleum retail marketing facility or if the facility handles throughput of 10,000 gallons/month, minimum coverage is $1 million.

  b. For all other facilities with petroleum UST's, minimum coverage is $500,000.

- Annual Aggregate:

  a. For owners or operators of 1 - 100 petroleum UST's within the U.S., minimum coverage is $1 million.

  b. For owners and operators of 101 or more petroleum UST's within the U.S., minimum coverage is $2 million.

These amounts of financial assurance exclude legal defense costs and the required coverage amounts do not limit the liability of the petroleum UST owner or operator.

3.3 Compliance Dates

- All petroleum marketing firms owning 1,000 or more UST's within the U.S. and all other UST owners reporting a tangible net worth of $20 million or more - January 24, 1989.

- All petroleum marketing firms owning 100 - 999 UST's within the U.S. - October 26, 1989.

- All petroleum marketing firms owning 13 - 99 UST's at more than one facility within the U.S. - October 26, 1991 (revised from previous April, 1991 deadline).

- All other petroleum UST owners excluding local government entities - October 26, 1991.

- Local government UST owners (municipalities) - deadline currently under review by EPA (will have 1 year from date of final regulations to be issued Summer, 1991).

3.4 Allowable Mechanisms for Demonstrating Financial Responsibility

- Self-Insurance

- Guarantee

- Insurance of Risk Retention Group Coverage

- Surety Bond

- Letter of Credit

- Trust Fund or Standby Trust Fund

- Other Mechanisms (that satisfy required amount and scope)

4.0 PETROLEUM STORAGE TANK REMEDIATION (PSTR) FUND

4.1 History

In May of 1989, the Texas Legislature created the Groundwater Protection Cleanup Program with the passage of House Bill (HB) 1588. Included in this program was the establishment of the Petroleum Storage Tank Remediation (PSTR) Fund to provide for the reimbursement of the majority of expenses associated with responses to releases from underground and aboveground petroleum storage tanks. The Fund is administered by the TWC and is financed by a 6/10's of a cent per gallon fee imposed upon the delivery of petroleum products withdrawn from a bulk facility. Rules regulating the administration of the PSTR Fund are found in 31 TAC, Sections 334.301-.322.

Until recent changes in the law, reimbursement claims to the PSTR Fund could only be made for expenses associated with PST releases that were incurred since May 21, 1989 and only if the release involved petroleum fuels such as gasoline or diesel fuel. With the passage of HB 1214 in May of 1991, however, the PSTR Fund's eligibility criteria and monetary coverage were significantly broadened. Now, response costs for storage tank releases of spent (waste) oil and hydraulic fluid are also eligible for reimbursement. Furthermore, HB 1214 extended the period of eligibility of incurred response expenses all the way back to September 1, 1987. It also provided statutory clarification of the eligibility of financial or lending institutions holding property impacted by a petroleum storage release. New rules reflecting the amendments of HB 1214 are expected to be adopted no later than September 1, 1991.

On July 1, 1991, the balance of the PSTR Fund was approximately $67.3 million in available funds. As of June 1, 1991, approximately $32.6 million in claims had been paid out of the Fund. As with any new program, especially one as substantial as this, the payment of claims was expectedly slow in the beginning. In recent months, however, the rate at which claims are processed has accelerated so that the average claim is now paid out about two (2) months after its submittal. At this time, it appears that the output of money from the Fund paid in claims is approximately equal to the input of money into the Fund generated by the delivery fee.

4.2 Coverage

The easiest way to describe the PSTR Fund is that it is like a state-wide insurance policy providing coverage to underground and aboveground petroleum storage tank owners and operators, but without annual premiums. The cap on any single claim is $1 million per release incident. Those excluded from participating in the Fund include owners and operators of storage tanks at most bulk petroleum facilities, pipeline terminals, and refineries. Tanks storing jet fuel also are not eligible to participate in the Fund.

Like most insurance policies, there is a "deductible" on claims to the Fund. Prior to passage of HB 1214, this deductible was $10,000 per incident for all owners and operators. With the recent amendments, however, the deductible was reduced depending upon the total number of tanks owned or operated statewide by the claimant. The new deductibles are as follows:

- $10,000 if own or operate more than 1,000 tanks;

- $5,000 if own or operate 100 - 999 tanks;
- $2,500 if own or operate 13 - 99 tanks; and
- $1,000 if own or operate 1 - 13 tanks.

4.3 General Eligibility

To be eligible for reimbursement from PSTR Fund, a person must:

1. Be an owner or operator of a petroleum storage tank;
2. Have registered <u>all</u> tanks owned or operated in Texas and have paid all due annual facility fees;
3. Report the release to and have confirmation by the TWC; and,
4. Be an owner of land impacted by a tank release regardless of whether or not the tank is attached to that land; or,
5. Be a lender with a bona fide security or lienhold interest in or mortgage lien on land impacted by a release or that becomes owner of impacted land through foreclosure.

It is important to note that eligibility under the PSTR Fund does not preclude the TWC from issuing an enforcement order and assessing administrative penalties against a PST owner or operator for noncompliance with regulations.

4.4 Allowable Costs

Only "Allowable Costs" are subject to reimbursement from the PSTR Fund and they must arise directly from the performance of necessary corrective action. Under the rules, allowable costs include, but are not limited to:

1. Emergency abatement activities;
2. Provisions of alternate water supplies;
3. Assessment activities including installation of wells;
4. Removal or closure of existing tanks;

5. Removal, disposal, and replacement of affected soils and other wastes generated as a direct result of the release;

6. Design, installation, and operation of remedial systems;

7. Replacement of pavement;

8. Relocation of utilities;

9. Preparation of required reports;

10. Taxes and interest on loans; and

11. Any other costs specifically determined allowable by Executive Director of TWC.

Costs NOT Allowable for reimbursement include, but are not limited to:

1. Replacement, repair, and maintenance of tanks;

2. Loss of income or profits or decreased property values;

3. Bodily injury or property damage (including third-party claims);

4. Attorney's fees;

5. Upgrades of the PST system or facility improvements not required for corrective action;

6. Tank testing if not specifically required by TWC;

7. Preparation and filing of a PSTR Fund claim; and

8. Activities not conducted in compliance with applicable state and federal environmental laws or laws related to transport and disposal of waste.

It is very important to remember that payment from PSTR Fund cannot be made for costs determined by the TWC to not be "reasonable." A claimed expense must be in an amount or range commensurate with the necessary level of corrective action based on an evaluation of technical and cost effectiveness. In other words, excessively high costs, the cost of unnecessary activities, or activities performed in a technically improper manner will not be reimbursed. It is therefore very important that PST owners and operators hire only experienced and qualified consultants and contractors.

Claims to the TWC for PSTR Fund reimbursement involve the completion of specific forms and the provision of appropriate documentation of activities and proof of payment of expenses. The TWC may require any additional information it deems necessary to ensure that the claimed expenses were actually incurred. The TWC also maintains the right to perform an audit on a claim either before or after payment of such claim is made from the Fund.

4.5 State-Lead Cleanups

There exist two (2) options by which the PSTR Fund can be utilized to clean up petroleum UST releases. The first and by far most common is when the responsible party (i.e., owner or operator) takes the lead by directly hiring a consultant and contractors. After paying for their services out of pocket, the responsible party submits a claim for his or her costs to the TWC.

The second option is for the responsible party to request that the State (i.e., TWC) take the lead in responding to the release through the use of state-hired contractors. On the surface it would appear that this second option would be the preferred course of action. In other words, "Why worry and spend my own money when I can just hand my problem over to the State?" Beneath the surface, this option is not quite so simple. Upon receipt of a State-lead request, the TWC will prioritize the case based on actual and threatened impacts. Depending upon the degree of concern, it may be months or even years before a particular case is responded to. In the meantime, if the UST is leaking it must be shut down until the response is initiated. Furthermore, simply requesting that a leaking UST site be placed on the State-lead list does not defer the responsibility of the owner or operator to address the immediate threats presented by the release. Unless the responsible party is financially unable to respond, he or she remains legally bound to, at a minimum, pursue appropriate action to stabilize the site so that it does not continue to worsen, especially if a threat of human exposure exists. Failure to take such action can result in the imposition of administrative penalties upon the responsible party by the TWC. If off-site impacts result from such inaction, the state cannot be held responsible for third-party damages nor are such costs eligible for reimbursement from the PSTR Fund.

5.0 FUTURE OF THE PROGRAM

Texas' Petroleum Storage Tank Program has undergone extremely rapid and progressive development since it began in 1986. With over 10% of the nation's underground storage tanks and approaching almost 10,000 separate pollution-causing incidents, Texas' program is certainly the most active in the country. In speaking with representatives of several major oil companies who work with state agencies throughout the nation, all believe that the TWC's PST Program is one of if not the best.

Public concern over environmental problems is increasing daily and stricter enforcement of regulatory violations is certainly anticipated. As with most new programs, a degree of tolerance is maintained until the newly-regulated community has time to understand and prepare for meeting its obligations. The "honeymoon," however, is now over. Over the past year, enforcement actions for PST violations has increased severalfold. With a staff of only three, the PST Enforcement Unit has prepared over 100 cases for formal enforcement action with over $1.5 million in recommended penalties. The hiring of additional enforcement staff is already in progress and with the increase in enforcement actions will come a much higher public perception of the serious nature of the concerns associated with underground storage tanks. With the existence of an extremely generous funding mechanism to assist PST owners and operators, there remain few excuses for non-compliance with the PST regulations.

V. POTPOURRI

New Legislation - "Pick Acts"

Environmental Legislation of the 72nd Legislature
Lisa Anderson
Brown Maroney & Oaks Hartline
Austin, Texas

Professional Malpractice and Ethical Considerations - "Deeds: The Good, the Bad & the Ugly"

Dances With Wolves: Professional Liability Concerns of the Environmental Practitioner
Charles C. Jordan
Carrington, Coleman, Sloman & Blumenthal
Dallas, Texas

Ethical Considerations in the Environmental Profession
Davis Ford
Davis Ford & Associates
Austin, Texas

Community Right-to-Know - "Let My People Know"

Community Right-to-Know in Texas, A Regulatory Review
Joe Curtis
Baker Hughes, Inc.
Houston, Texas

State Superfund - "Hazardous Substance Abuse"

The Texas State Superfund Program: Current Developments
Steve Dickman
Texas Water Commission
Austin, Texas

Insurance - "A Matter of Policy"

Thinking About Insurance
A First Course in Environmental Insurance Issues
Tom Alleman
Vial, Hamilton, Koch & Knox
Dallas, Texas

ENVIRONMENTAL LEGISLATION OF THE 72ND LEGISLATURE

Lisa K. Anderson

ENVIRONMENTAL LEGISLATION OF THE 72ND LEGISLATURE

I. General Overview of the 72nd Legislative Session

A. Leadership Changes
   1. Governor
   2. Lieutenant Governor
   3. Attorney General
   4. Agriculture Commissioner
   5. Comptroller
   6. House/Senate Natural Resources Committee Chairs

B. Numerous Crises/Major Issues
   1. Education funding
   2. Budgetary shortfall
   3. Ethics
   4. Insurance reform
   5. Redistricting

II. General Environmental Issues

A. Media- and Contaminant-Specific Regulation
   1. Hazardous and municipal waste
   2. Water
   3. Air

B. Regulatory "Process" Legislation

C. Siting/"Single Shot" Legislation

D. Sheer Volume of Legislative Bills
   1. Approximately 400-600 bills
   2. Over 10% of all bills filed were environmental

III. Review of Specific Legislation

A. <u>Hazardous and Industrial Waste</u>

   1. Governor's hazardous waste moratorium (S.B. 1099)
      a. 4-month moratorium on issuance of commercial permits
      b. Development of commercial capacity assessment
      c. New commercial and on-site facility siting prohibitions/restrictions

         (1) faults
         (2) buffer zone distances to certain structures/areas
         (3) land use compatibility
         (4) floodplains

      d. Cost recovery by protestants

e. Increased public participation/notice requirements
f. Emergency response capabilities
g. Burden on public roads
h. Operational/monitoring requirements
i. Effective June 7, 1991

2. Pollution prevention (S.B. 830/Article II of S.B. 1099)

   a. Source reduction/waste minimization delineation
   b. Facilities required to prepare source reduction/waste minimization plans

      (1) Large-quantity hazardous waste generators
      (2) "Other" hazardous waste generators
      (3) Selected releases subject to SARA, Title III reports

   c. Plan requirements

      (1) Identification of processes resulting in generation/release
      (2) Identification of options to reduce generation/release
      (3) Selection of source reduction/waste minimization projects
      (4) Explanation of selected projects
      (5) Schedule for project implementation
      (6) Source reduction/waste minimization goals
      (7) Executive summary (public document)

   d. Annual progress report
   e. Effective June 7, 1991

3. Foreign hazardous waste (H.B. 1444)

   a. Prohibits transport of foreign hazardous waste to Texas for treatment, storage, or disposal

   b. Exemptions
      (1) Maquilladora waste
      (2) Recycling/reuse activities or use as feedstock
      (3) Waste from affiliated corporation

   c. Can't construe to interfere with federal Commerce Clause
   d. Effective September 1, 1991

4. State employee indemnification (S.B. 1762)

   a. Indemnifies state employees signing waste manifests
   b. Exempts negligent or willful misconduct
   c. Effective August 26, 1991

5. Industrial nonhazardous solid waste (H.B. 1763)

   a. Shredded scrap metals acceptable at municipal solid waste facilities if:

      (1) Facility previously authorized for Class I nonhazardous/Class II industrial, and
      (2) No free liquids and not hazardous

   b. Commercial capacity assessment
   c. Effective August 26, 1991

6. Notification to elected officials (H.B. 426)

   a. Requires notice of hazardous/solid waste permit application to area state senators and representatives

   b. Same notice required for air permits
   c. Effective September 1, 1991

B. Municipal Waste

1. Omnibus recycling legislation (S.B. 1340)
   a. Sets municipal waste recycling goal at 40% by 1994

   b. Lead-acid battery restrictions
      (1) Land disposal prohibited
      (2) Class C misdemeanor
      (3) "Acceptable" disposal is return to dealer

   c. Used oil collection and recycling
      (1) Prohibits land, water, or sewer disposal of used oil
      (2) Criminal & civil penalties provided
      (3) Encourages oil-changing operations to serve as collection centers
      (4) Funds Used Oil Recycling Fund by 2¢/quart fee on motor oil
      (5) Encourages public education programs

   d. Tire recycling (also in H.B. 847)
      (1) $2 fee on new tire sales
      (2) Waste Tire Recycling Fund to clean up tire dumps

(3) Tire facilities paid 85¢/tire to shred Texas tires, if 25% of tires are from cleaned-up dumps

e. Effective date September 1, 1991

C. Fees
1. Texas Water Commission fee bill (H.B. 1986)
a. Permit fees $2,000-$50,000 range to recover costs
b. Inclusion of industrial non-hazardous waste in facility/generation fees ($25,000/$1,000 cap respectively)
c. On-site "management" fees
d. "Consumer" fees
e. Effective date August 26, 1991

D. Surface Water
1. Clean Rivers Act (S.B. 818)
a. Regional water quality assessments
b. River authorities' leadership duties
c. Consideration of non-point source pollution, discharges
d. Authority to increase charges for water quality programs
e. Coordinate expiration dates of all discharge permits, as possible
f. Effective date June 7, 1991

2. State wetlands conservation (S.B. 1054)
a. Requires development of State Wetland Conservation Plan
(1) Develop plans to acquire coastal wetlands
(2) Encourages reduction of non-point source pollution to wetlands, bays, and estuaries
(3) Sets goal of "no net loss" of wetlands

b. Incorporates Corps of Engineer definition into "coastal wetlands" definition
c. Effective date June 5, 1991

E. Coastal Waters

1. Oil spill protection (S.B. 14)
a. Designates General Land Office as lead agency for oil spill response
b. Provides for establishment of regional response committees
c. Requires state coastal discharge contingency plan
d. Requires responsible parties to contain/clean up discharged oil

e. Creates Coastal Protection Fund to cover immediate response actions
   (1) Allows recovery of funds from responsible party
   (2) Funds Fund with 2¢/barrel fee on crude oil transfers

f. Provides that responsible persons are liable for natural resource damages
g. Provides administrative, civil and criminal penalties
h. Effective date March 28, 1991

F. <u>Oil and Gas Waste</u>

1. Oil Field Cleanup Fund (S.B. 1103)
   a. Creates Fund to clean up oil and gas wastes and plug abandoned wells
   b. Allows recovery of cleanup funds from responsible persons
   c. Funds Fund through crude petroleum, gas, and drilling fees
   d. Allows the Railroad Commission to regulate "oil and gas hazardous waste"
   e. Provides criminal penalties
   f. Effective date September 1, 1991

G. <u>State Agencies</u>

1. Office of Administrative Hearings (S.B. 884)
   a. Creates consolidated independent administrative hearings office
      (1) applies to agencies without their own administrative hearings staff
      (2) Legislature to consider moving hearings staff from individual agencies to consolidated office
   b. Governor appoints Chief Administrative Law Judge (ALJ)
   c. Chief ALJ presides over 6-member central hearings panel
   d. ALJ independent from agencies
   e. Agencies can modify order for policy reasons only
   f. Effective date August 26, 1991

2. Government Sunset (S.B. 1204)
   a. Abolishes all state agencies not renewed before Legislature before December 31, 1992
   b. Effective date September 1, 1991

3. Revolving door (S.B. 1)
   a. Executive director/board members
      (1) No contact "with intent to influence" with agency personnel for two years

   b. Exempt employees/employers at or above salary group 17
      (1) Prohibitions apply if employed on or after January 1, 1992
      (2) Cannot represent persons in matter former employee participated in during state employment
      (3) "Participated in" includes personal involvement and items within employee's official responsibility
      (4) <u>Concluded</u> rulemaking procedures not considered as matters "participated in"
      (5) No time limitations

   c. Applicability
      (1) Other laws restricting representation "prevail"

   d. Violation of restriction is Class A misdemeanor
   e. Effective date January 1, 1991

IV. Environmental Bills That Did Not Pass

A. Criminal Penalties (H.B. 2235)

B. Clean Air Act (H.B. 1604)

C. Cement Kiln Prohibitions (H.B.s 420, 2325, 2326, S.B.s 348, 349, 350, 1391, 1393)

D. Department of Natural Resources (S.B. 35)

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A. Consolidation of the Environmental Agencies

B. Criminal Penalties

C. Penalty Amounts

DANCES WITH WOLVES:

Professional Liability Concerns of the Environmental Practitioner

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Texas Environmental Superconference
Austin, Texas

August 1 and 2, 1991

DANCES WITH WOLVES:

Professional Liability Concerns of the Environmental Practitioner

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INTRODUCTION

Thoughts on Dunbar's Dilemma and Risks of the Environmental Practitioner of the '90's

Every lawyer in this room at some point wanders into the region bounded on its four sides by professional ethical guidelines, malpractice concerns, criminal laws, and societal or moral aspirations. We may not know what to do when we get there, but we know an uncharted territory when we see it. The situation of the earnest Army Lieutenant John Dunbar of *Dances with Wolves* then suggested itself to me as an appropriate metaphor for this changing frontier.

I will begin with the good news for the practitioners in the audience. When you enter the search request appropriate to identify cases in Westlaw's environmental law database dealing with the subject of attorney liability (for damages, for sanctions, for disciplinary action, or for any other sort of liability), you discover nineteen relevant cases. Of these nineteen cases, fourteen deal with the subject of sanctions under Rule 11, or discovery sanctions, or sanctions under specific statutes authorizing an award of attorneys' fees payable by counsel. Two cases involve conflict of interest issues of a garden variety. One is a malpractice case with allegations of negligence of the sort that might occur in any litigation setting. This research was probably not exhaustive, but the results suggest that major professional liability claims have not yet been litigated extensively in our practice area.

I would like to consider these sources of professional liability mostly from the respective of a private practitioner. At the bottom of the "Richter scale" of professional anxieties is sanction liability. Beyond the annoyance of defending ourselves against sanction liability, and beyond the regret that satellite sanctions litigation has in ten years' time become the rule rather than the exception in most high stakes legal disputes, we worry about this risk because it isolates us from our clients.

Moving up the Richter scale, we encounter the malpractice claim. Defense of such claims against lawyers, accountants, appraisers, and others has become a mainstay of my firm's practice in recent years. But significant claims specific to this practice area have apparently not been filed or at least not litigated.

How can this be, you ask? We have many of the basic ingredients on hand: difficult law, big dollar exposure to our clients, and big insurance policies (hopefully) backstopping us. In the private sector, the regulated community composed of my clients is being saddled with compliance costs which are often compared in magnitude to the Empire Savings Building of societal costs, the savings and loan debacle. Even NASA's space station is at risk when EPA lobbies for more money and tougher laws. Accountants, lawyers, and appraisers are learning the hard way that professionals can be held accountable for business losses too great for the Congress to swallow. We have a large and unmanageable body of substantive law which resists our best intentions to master it as it mutates almost daily into ever more incomprehensible forms. And some of us have an additional ingredient: malpractice insurance. Such insurance has been an indispensable part of the legal malpractice boom of the '90's, concocted out of the leftovers of the thrift crisis.

The parallel between the two practice areas is far from exact, but my firm's experience representing professional defendants of every stripe in the thrift wars leads me to believe that it may not be long before the lure of substantial malpractice insurance proceeds is felt by EPA or by a PRP with a big contribution claim, especially here in the land of Chapter 7.

At the top of the scale we find the criminal indictment. For better or for worse, we are sometimes perceived to have influence over our clients. My practice is a lot like playing baseball; I've had a good year if I bat over .300. Nevertheless, because we are thought to be in a position of influence, and because we practice in an area replete with surprisingly broad criminal sanctions, I think we will probably become the occasional targets of criminal investigations, as EPA, DOJ, and state authorities attempt to get even more bang for their enforcement buck. Our colleagues in the financial institutions area are learning that there was a finer line than they thought between professional counselling and criminal conspiracy, something securities lawyers have known for a while and something environmental lawyers may soon find out.

How do I prepare? I try to become sensitive to the basic sources of professional liability as they may appear in our practice area. Our Disciplinary Rules may chant ritualistically that violating a DR does not raise a claim for civil liability, but do not believe such a violation will not add considerable body to an otherwise lackluster cause of action. My attempt in this paper is to orient us, with reference to ethical guidelines, in some practice situations we commonly face. Some of this territory may be pretty mundane, with ethical issues you are accustomed to recognizing and handling. I also want to range over the frontiers of professional liability. In the common tradition of "ethics hours" speakers, I leave it to you to begin thinking about how you will cope when and if your day arrives.

INTERTRIBAL WARFARE:

Rule 11 and One Aspect of the Complex CERCLA Case

The United States sues Spacely Sprockets along with thirty other defendants in a CERCLA cost recovery action. During the course of discovery, the U.S. produces to Spacely's counsel a document listing the results of the EPA's PRP investigation for the site in litigation. The list contains the names and mailing addresses of over 150 parties, but Spacely's discovery yields no clue why they were identified as PRPs.

During the course of discovery, Spacely grows disenchanted with its counsel and decides somewhat late in the game to engage you to defend it. Spacely's president encourages you to take an aggressive posture in the litigation; he feels Spacely has provable defenses to liability.

A scheduling order entered in the case prior to your appearance allows you precisely ten days from the date you are engaged by Spacely to file third party claims. Assuming that the government's site investigation must have been fairly thorough to have identified so many PRPs, you waste no time in filing a third party complaint for contribution against the ten largest parties listed who are not already joined in the suit. Your complaint denies liability for the U.S.'s claim but pleads in the alternative that if Spacely is found to be liable, then the third party defendants are liable in contribution to Spacely, as well.

It will surprise few, if any, of the lawyers out there with an active federal court practice that Spacely's counsel may become involved in a Rule 11 tangle before he is done with this case if any party he has joined is not a PRP after all. For those of you who are not lawyers, this rule is a rule of process applying to lawyers representing federal court litigants. The rule requires us to be of the opinion that pleadings filed are "well grounded in fact and . . . warranted by existing law," based upon reasonable inquiry.[1] Breach of the rule results in mandatory sanctions, usually monetary, against counsel, the litigant, or both.[2]

To address the question most obviously presented by the hypothetical, it is open to question whether the deadline imposed by the scheduling order relieves Spacely's counsel's obligations under Rule 11.[3] It is probably the law that the type of contingent pleading of third party claims authorized under Fed. R. Civ. P. 14, if employed by Spacely's lawyer,

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[1] Fed. R. Civ. P. 11.

[2] In its most recent pronouncement on Rule 11, the Supreme Court held that the certification standard of the rule applies equally to counsel and represented parties. *Business Guides, Inc. v. Chromatic Communications Enterprises, Inc.*, 498 U.S. ___, 112 L.Ed.2d 1140 (1991).

[3] There is a conflict among the courts of appeal on the issue. Counsel's diligence is an important factor. *See, e.g., Southern Leasing Partners, Ltd. v. McMullan*, 801 F.2d 783 (5th Cir. 1986) (*per curiam*).

should meet Rule 11 standards, perhaps more readily than if the claim were asserted in a complaint, for instance. However, the law is not well-formed and prudence dictates that Spacely's lawyer should consider taking one or more of the following steps before filing his third party complaint:

1. Contacting counsel for co-defendants in order to determine why no one had yet joined the PRPs identified by the EPA's investigation.

2. Contacting the PRPs he planned to join in advance of filing the third party complaint, to seek an explanation of their appearance in the EPA's records.

3. Contacting the government's counsel in order to determine why the U.S. did not seek recovery against the PRPs he planned to join.

4. Moving to modify the scheduling order, due to the special hardship it imposed on him because of his late entry of appearance.

In any case as factually complex as the average CERCLA cost recovery action, reasonable inquiry concerning the probable basis for recovery on a contribution claim may be most difficult. The existence of public records concerning the site will help. The U.S. EPA may perform a suitable investigation, review of which may in and of itself deflect some Rule 11 flack. Further, RCRA manifests or other waste-handling records arising out of the site's operation and naming names may also exist.

However, the longer a site has been out of operation and the sketchier its operator's business records, the more caution is appropriate in proceeding to assert contribution claims. For instance, a phased approach may be best, in which thorough discovery is taken against verifiable PRPs and the site operators before suit is brought against less obvious PRPs. Another approach, often the only alternative, is to focus investigation on a site operator's employees and former employees. There is a lively current debate in the ethics press on how much talk, if any, between counsel and a corporate party's former employees is appropriate under ethical guidelines limiting *ex parte* contact. Therefore, the conflict between the dictates of Rule 11 and applicable rules of professional conduct deserves some of our attention.

WAR PARTY:

Ex parte Contacts with an Adversary's Employees

EPA has brought an action against Spacely Sprockets, an alleged generator of hazardous waste, to recover CERCLA response costs. Spacely's president has reason to believe that Sioux Solvents, a corporation located in Texas, and Kicking Bird Aviation, an Oklahoma corporation, are also potentially responsible parties. Spacely is hot to investigate its contribution claims by having you corner current and former employees of both organizations and interview them one-on-one. Thumbing through *the professional liability advance sheets which you read religiously, you become concerned that an interview at which the employees are not represented by counsel may be unethical and may also do your client more harm than good, tactically, by "arming" the opposition. When you raise the issue with Spacely's president, he just laughs and responds: "Hell, you won't get anything good if they've got a lawyer. Why would you think of doing anything like that?"*

Most lawyers recognize the tactical and economic advantages of interviewing an adversary's employees and former employees outside the presence of opposing counsel and without formal discovery procedures. However, lawyers may be somewhat less aware of the often difficult ethical issues raised by these *ex parte* contacts. Although most states' rules of professional conduct related to *ex parte* interviews are patterned after the American Bar Association's Model Rules of Professional Conduct Rule 4.2, interpretations by courts and state bar ethics committees have created widely disparate standards among the states. Fortunately, despite considerable uncertainty in other states, Texas' ethical rules in this area appear to be relatively straightforward.

Texas Disciplinary Rule 4.02(a) provides that "[i]n representing a client, a lawyer shall not communicate or cause or encourage another to communicate about the subject of the representation with a person, organization or entity of government the lawyer knows to be represented by another lawyer regarding that subject, unless the lawyer has the consent of the other lawyer or is authorized by law to do so."[4] Subsection (c) further explains that an "organization" includes "(1) those persons *presently* having a managerial responsibility with an organization or entity of government that relates to the subject of the representation, or (2) those persons *presently* employed by such organization or entity and whose act or omission in connection with the subject of representation may make the organization or entity of government vicariously liable for such act or omission."[5] Because Rule 4.02(a) refers to communications "about the subject of the *representation*," the Rule's prohibitions most likely apply regardless of whether a lawsuit is pending.

The use of the word "presently" to modify both management and employment in the organization suggests that communications with an organization's former employees do not fall within the scope of the rule. The Comment to Rule 4.02 confirms this reading by stating that "this Rule does not prohibit a lawyer from contacting a former employee of a represented organization or entity of a government."[6] Rule 4.02 could of course apply to prohibit *ex parte* contacts with a former employee if the lawyer knows that the former employee is independently represented by counsel other than the corporation's lawyer.

Because all former employees appear to be amenable to *ex parte* interviews, the only issue under the Texas rules is which of a corporation's current employees may be

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4 DR 4.02(a).

5 *Id.* § 4.02(c) (emphasis added).

6 Comment 4, to DR 4.02.

interviewed without consent of corporate counsel. The Comment to Rule 4.02 clearly contemplates that some current employees may be informally interviewed: "This Rule does not prohibit a lawyer . . . from contacting a person presently employed by such an organization or entity whose conduct is not a matter at issue but who might possess knowledge concerning the matter at issue."[7] Based on a literal reading of Rule 4.02, a lawyer must not communicate, absent consent of counsel, with current managerial employees or with those current employees whose acts or omissions could make the organization vicariously liable. Current employees who potentially fall into either of these two categories should be removed from the list of potential interviewees and should be considered as possible witnesses or deponents.

Unfortunately, an interviewing lawyer may have difficulty determining whether a particular interview will violate DR 4.02 or the analogous rule in another jurisdiction. When a lawyer considers interviewing a corporate employee, it may not always be clear whether that employee falls within one of the forbidden categories of DR 4.02. This presents the danger -- particularly during early stages of investigation -- that an interviewing lawyer may not discover that a corporate employee is a "manager" or an employee whose acts may subject the corporation to liability until well after the employee has disclosed information damaging to the corporation. At that point, the employee's damaging statement likely will be inadmissible and the attorney may be subject to disqualification.[8] This danger can be minimized by beginning the interview with a series of general questions about the employee's status in the corporation and about what role the employee played in the corporation's conduct which is at issue. While these threshold questions may not always prevent inadvertent violations of Rule 4.02, they at least create a record of an intent to comply with the rule and probably will be viewed favorably by the court in a later challenge to the *ex parte* communications.[9]

When interviewing employees of an adversary corporation, lawyers also should be aware of other considerations besides Rule 4.02. Texas Disciplinary Rule 4.03 prohibits a lawyer from implying that she is disinterested and requires that the lawyer clarify any misunderstanding that the unrepresented person may have about the lawyer's role in the

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[7] *Id.* In the context of environmental litigation, this category of employees eligible for interview might include current employees -- such as shipping clerks or loading dock workers -- who are aware of a company's waste disposal policies, but who are removed from actual responsibility of implementing the policies. In *Wright v. Group Health Hosp.*, 103 Wash. 2d 192, 691 P.2d 564, 569 (1984), the court pointed out that the purpose of the ethical rule against *ex parte* contacts is "to preclude the interviewing of those corporate employees who have authority to *bind* the corporation," not "to protect a corporate party from the revelation of prejudicial facts." There, the Supreme Court of Washington allowed the interview of nurses who may have been witnesses to conduct giving rise to malpractice liability on the part of the defendant health maintenance organization. *Id.*

[8] Wyeth, *Talking to the Other Side's Employees and Ex-Employees*, 15 Litigation (No. 4) 8, 10 (Summer 1989).

[9] *Id.* at 11.

matter.[10] Along these same lines, courts have been sensitive to the way in which lawyers have initiated and carried out *ex parte* interviews with corporate employees.[11] These courts have looked favorably on such practices as explaining to the interviewee who the attorney represents, explaining the general subject matter of the investigation or litigation, informing the interviewee that he or she may have personal counsel or corporate counsel present during the interview, and informing the interviewee that he or she may refuse to speak about the matter at issue.[12] As a preventative measure, an interviewing attorney may want to initiate an interview with similar Miranda-like statements.

In addition to being cautious when conducting interviews with the adversary corporation's employees, lawyers who represent corporations should anticipate that employees of their own clients may be vulnerable to *ex parte* interviews. When such a possibility arises, one option is to seek a protective order which designates by name, or at least by category, those employees which opposing counsel may not contact.[13] While a protective order may serve to protect certain corporate employees from *ex parte* interviews, it may have the disadvantage of clarifying for opposing counsel which employees are available to be interviewed.[14] Corporate counsel can also remind the opposing attorney of his or her obligation regarding Rule 4.02 and related restrictions. In addition, counsel could suggest that both sides work out mutual ground rules for conducting *ex parte* interviews.[15]

IN THE CORPORATE TEEPEE:

The Organization as Client and Regulatory Compliance

Acme Solvent, your long-time client, is a closely-held corporation with pretty good management controls. You counsel with the president from time to time, but your main contact at Acme is Jim Jack, an environmental manager who oversees compliance at Acme's five sites throughout Texas. JJ contacts you one morning with the news that a pretty serious release has occurred at the main plant. The release resulted from a broken pipe carrying process solvents and occurred at about 4:00 a.m.; it was not detected until the morning shift began at 7:00 a.m. Under close

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[10] DR 4.03.

[11] *See In re FMC Corp.*, 430 F. Supp. 1108 (S.D. W.Va. 1977); *Frey v. Department of Health and Human Servs.*, 106 F.R.D. 32 (E.D.N.Y. 1985).

[12] *See In re FMC Corp.*, 430 F. Supp. at 111; *Frey*, 106 F.R.D. at 38; *see generally* Miller & Calfo, *Ex Parte Contacts With Employees and Former Employees of a Corporate Adversary: Is It Ethical?*, 42 Bus. Law. 1053, 1057 n.19 (1987).

[13] *Id.* at 11.

[14] *Id.*

[15] *Id.*

questioning, JJ reveals that he thinks that a reportable quantity of the material was probably released, but "since most of it was cleaned up," JJ does not intend to make any reports to anybody. Acme is involved in an enforcement proceeding which is teetering on the brink of settlement. Because of the subject matter of that proceeding, JJ thinks the agency might balk at settling if it discovered the condition of the process line from which the spill originated. Though you attempt to persuade JJ to make the appropriate release reports, he refuses to do so and becomes extremely agitated with you. "You see," he confides, "I've got a personal stake here, too. This could hurt my year-end bonus and I am looking forward to Christmas."

Both in-house and law firm counsel will recognize the dilemma JJ has created. Assuming the solvent release is clearly reportable, either under Title III, the CERCLA release reporting provisions, or the Texas Water Code, JJ probably has the sole responsibility within Acme to get the reporting done, but he has what he thinks are some very persuasive reasons why no report should be filed. It would hurt the company. Even worse, it would apparently hurt JJ, or so he believes.[16]

Texas Disciplinary Rule 1.12 addresses the situation. DR 1.12 provides:

> (b) A lawyer representing an organization must take reasonable remedial actions whenever the lawyer learns or knows that:
>
> > (1) an officer, employee, or other person associated with the organization has committed or intends to commit a violation of a legal obligation to the organization or a violation of law which reasonably might be imputed to the organization;
> >
> > (2) the violation is likely to result in substantial injury to the organization; and
> >
> > (3) the violation is related to a matter within the scope of the lawyer's representation of the organization.
>
> (c) Except where prior disclosure to persons outside the organization is required by law or other Rules, a lawyer shall first attempt to resolve a violation by taking measures within the organization. In determining the internal procedures, actions or measures that are reasonably necessary in order to comply with paragraphs (a) and (b), a lawyer shall give due consideration to the seriousness of the violation and its consequences, the scope and nature of the lawyer's representation, the responsibility in the

[16] The hypothetical facts probably raise the issue of JJ's individual liability for failure to report, depending on the extent of his control over Acme's facility. In practice, this will be discussed, but this paper is intended to focus on the lawyer's duty to his client, Acme.

organization and the apparent motivation of the person involved, the policies of the organization concerning such matters, and any other relevant considerations. Such procedures, actions and measures may include, but are not limited to, the following:

(1) asking reconsideration of the matter;

(2) advising that a separate legal opinion on the matter be sought for presentation to appropriate authority in the organization; and

(3) referring the matter to higher authority in the organization, including, if warranted, by the seriousness of the matter, referral to the highest authority that can act in behalf of the organization as determined by applicable law.

DR 1.12 does not vary substantially from its counterpart under the ABA Model Rules, Rule 1.13, at least insofar as JJ's problem is concerned.

With what is described as "subdued mandates,"[17] DR 1.12 admonishes the attorney to assume the role of juggler/gymnast, balancing the client corporation's interests, the public interest in legal compliance, and the employee's interests (or "motivation," whatever that means). This balancing act will, of course, also tend to activate the lawyer's own self-interest in the form of keeping the client happy. This is not a comfortable act, speaking as one who has lived through it more than once. However, DR 1.12 gives the lawyer a little direction.

First of all, the rule clearly prioritizes action within the organization, primarily in the interest of maintaining the privileged information which has befallen the lawyer.[18] Second, the rule is not too preachy about what course the lawyer should take to persuade his client that compliance is just better than noncompliance; it sets out three steps for consideration. In my experience, the mere mention of the idea that I may have an obligation to pursue either course (2) or (3) often brings the recalcitrant into line.

If JJ cannot be gently persuaded, however, DR 1.12 seems to suggest that the lawyer consider going over JJ's head. This course of action may be eminently reasonable for outside counsel (at least if JJ is not in charge of approving the lawyer's statements for payment). But it may be extremely impolitic for the in-house lawyer. Matters are also compounded in the situation where the officer of "last resort," the president or chief operating officer, sides with JJ. Then counsel is faced with the quandary of whether to appeal to the corporation's directors--no simple task in the case of a public company or even a subsidiary of a remote parent unknown to the lawyer.

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[17] Schuwerk & Sutton, *A Guide to the Texas Disciplinary Rules of Professional Conduct*, 27A Hous. L. Rev. 1 (1990) at 182 (hereafter cited as the "*Reporters' Guide*").

[18] *See Reporters' Guide* at 182.

Guerilla tactics, though not mentioned in the DR 1.12 laundry list, are often effective. JJ may not respond to your pleas, and he may have an effective threat that he can do you more harm than you can do him at Acme, but if you can enlist JJ's peers or even his subordinates and marshall an objective (and perhaps more important, law-abiding) band of soldiers, the vocal majority may be able to prevail over JJ's baser instincts. It will do no harm if you can pull JJ's Christmas bacon out of the fire, either.

The conclusion of the lawyer's efforts, if unsuccessful, lies with each lawyer. In-house counsel has the more serious problem because she may be faced with this predicament more often than she likes, and her only effective recourse may not pay her mortgage or satisfy her creditors. Law firm counsel's problem is less severe, but trying nonetheless. To resign or not to resign?[19] Where the lawyer concludes he is not bound by law to make disclosure of JJ's secret, DR 1.12 elliptically suggests that some steps outside the organization may be considered, subject always to the constraints of the Disciplinary Rules governing the permissive and mandatory disclosure of confidential information.[20] I feel that the most difficult choice the lawyer may face after withdrawal from the representation is only presented where the client's actions rise to the level of a genuine health threat. I would therefore like to take a look beyond the corporate teepee at:

RISKY BUSINESS:

Client Confidences and the Endangerment Exception

In the course of a routine consultation with you, the president of your client Spacely Sprockets gets around to talking about the extremely competitive conditions he faces in his industry. One of his planned responses, he reveals, is to cut operating costs by disposing of his more toxic waste materials, of which there is a large volume, in the "back forty" at his plant site. The disposal activities will only involve three employees. He'll reduce disposal costs by at least 98%; instead of paying those SOB's with the tank truck, he says, he'll just give some cash bonuses to the employees involved to insure their loyalty. He does not intend to institute any exposure controls because, he says, "if OSHA finds out, they will probably tell the EPA, so I'm going to keep it

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[19] *See* DR 1.15(b) for circumstances permitting the lawyer's withdrawal from a representation. DR 1.15(b)(2) authorizes but does not require withdrawal where "the client persists in a course of action involving the lawyer's services that the lawyer reasonably believes may be criminal or fraudulent."

[20] Under DR 1.02, the lawyer is required to make reasonable efforts to persuade the client to correct the commission of a criminal or fraudulent act likely to result in substantial injury to the financial interest or property of another. Under DR 1.05, the lawyer may reveal confidential information when he has reason to believe it is necessary to prevent the client from committing a "criminal or fraudulent act," DR 1.05(c)(7), apparently without regard to the probable effect on the financial interests of others. Is JJ's threatened omission "criminal" or "fraudulent"? It is probably prudent for counsel to evaluate those possibilities at the earliest possible time.

secret. Who needs safety plans if OSHA will never know?" "Besides," he continues, "it's at least 75 feet from our lagoon to that day care center out back."

The basic question presented here requires a good bit more thought and soul-searching. When does the duty to prevent human endangerment override the lawyer's duty to maintain his client's confidences? The analysis begins with Texas Disciplinary Rule 1.05(e):

> (e) When a lawyer has confidential information clearly establishing that a client is likely to commit a criminal or fraudulent act that is likely to result in death or substantial bodily harm to a person, the lawyer shall reveal confidential information to the extent revelation reasonably appears necessary to prevent the client from committing the criminal or fraudulent act.

A comparison with the ABA's analogous Model Rule 1.6 is instructive. Rule 1.6(b) provides for permissive, rather than mandatory, disclosure of confidences under its endangerment exception:

> (b) A lawyer may reveal such information to the extent the lawyer reasonably believes necessary:
>
> > (1) to prevent the client from committing a criminal act that the lawyer believes is likely to result in imminent death or substantial bodily harm; or
> > (2) to establish a claim or defense on behalf of the lawyer in a controversy between the lawyer and the client, to establish a defense to a criminal charge or civil claim against the lawyer based upon conduct in which the client was involved, or to respond to allegations in any proceeding concerning the lawyer's representation of the client.

Even assuming that the Model Rule required (rather than permitted) disclosure under its endangerment exception,[21] there is still a language difference which is bound to trouble the environmental practitioner. Texas' rule requires lawyer disclosure where the client's act is "likely to result in death or substantial bodily harm." There is no mention of the <u>imminence</u> of such death (as in the analogous Model Rule). The omission raises the question whether the draftsmen of the Texas Disciplinary Rules intended that a circumstance like the presence

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[21] The endangerment exception appears in many guises in different jurisdictions. *See* Dotterrer, *Attorney-Client Confidentiality: The Ethics of Toxic-Dumping Disclosure*, 35 Wayne L. Rev. 1157 (Spring 1989) (hereafter cited as "*Dumping Ethics*") for a scholarly discussion of the variety of offspring of Model Rule 1.6. *See also* Chattman and Kinburn, "Ethical Dilemmas Confronted by Environmental Attorneys: When the Duty to Keep a Client's Confidence is not Absolute," *The Impact of Environmental Regulations on Business Transactions 1988* (PLI 1988), for practitioner's analysis of the ethical dictates in New Jersey, a "permissive disclosure" jurisdiction.

of released carcinogens or toxicants which might be predicted to cause risk of death or injury with exposure over time triggers the endangerment exception.

The Comments to DR 1.05(e) do not shed much light on this question.[22] "Whistle-blower" rules tend to generate much comment as codes of professional conduct are prepared, and DR 1.05 was no exception. However, much attention was focussed on the difficulty of predicting the likelihood that the lawyer's client will commit the criminal act in question, not on the difficulty of determining the remote health consequences of the act. In many practice settings, this question presents the toughest issue, for when your client threatens to murder someone, you do not spend a lot of time figuring out whether a bullet will hurt or not. If you are even aware of the difficulties presented by the risk assessment process, however, you may not have a high regard for the precision of that process, even if you are a devout believer in its necessity.[23] Therefore, it should come as no surprise that neither the Comments nor the *Reporters' Guide* offers much assistance here to the environmental practitioner.

The one thing that is clear from a review of these authorities is that a bias against breaking a confidence was intended. The Comments recite emphatically that "the lawyer's decisions . . . should not constitute grounds for discipline unless the lawyer's conduct ... was unreasonable under all existing circumstances."[24]

What observations can we make about a reasonable approach to the dictates of Rule 1.05(e) in our practice setting? First and foremost, there is some, but not much, case law to guide us in determining the meaning of imminent endangerment. Under both the Clean Air Act, Clean Water Act, and the Resource Conservation and Recovery Act, certain conduct, undertaken knowingly, which places another person in "imminent danger of death or serious bodily injury," subjects the actor to criminal penalties.[25] Two recent cases address the issue of when a defendant's conduct results in "knowing endangerment."

U.S. v. Protex[26] involved the criminal prosecution of Protex Industries, Inc., a steel drum recycler, for a series of alleged infractions of the Clean Water Act and RCRA, including the "knowing endangerment" clause of 42 U.S.C. § 6928(e). Protex was accused of knowingly endangering several employees by failing to make adequate safety provision for them, placing them at risk of solvent poisoning. At trial, government experts testified that

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[22] Comment 19 to DR 1.05(e).

[23] *See, e.g.*, Elliott and Hager, *Environmental Contamination Risk in Perspective -- Different Alternatives*, a paper presented to the Texas Environmental Regulation Conference (June 25 and 26, 1991, Dallas, Texas).

[24] Comment 20 to DR 1.05.

[25] The knowing endangerment provisions of these statutes are at 42 U.S.C. § 7413(c)(5)(a), 33 U.S.C. § 1319(c)(3)(a), and 42 U.S.C. § 6928(e), respectively.

[26] 874 F.2d 740 (10th Cir. 1989), hereafter cited as "*Protex*".

these employees in fact suffered varying degrees of "psychoorganic syndrome" attributable to their employment at Protex, the most severe degree of which results in irreversible damage to mental faculties in the form of severe loss of learning capabilities, severe memory loss, severe psychiatric abnormalities, and gross tremor.[27] In addition, the government introduced evidence that the employees had "an increased and irreversible risk of developing cancer" due to on-the-job exposure.[28] Protex was convicted on the knowing endangerment counts and on other counts and appealed the knowing endangerment convictions, arguing that the statute was unconstitutionally vague as applied by the trial court.

The Tenth Circuit affirmed the conviction, rejecting Protex's arguments that the risk to which its employees were subjected were not serious enough to come within the definition of "serious bodily injury" under RCRA[29] and that the enhanced risk of contracting some indeterminate type of cancer in the future likewise does not fall within the statutory definition. The Court's basic conclusion was that Protex was splitting hairs, most inappropriately in light of the obvious physical effects suffered by its employees:

> The gist of the 'knowing endangerment' provision of the RCRA is that a party will be criminally liable if, in violating other provisions of the RCRA, it places others in danger of great harm and it has knowledge of that danger.[30]

Protex is the only reported conviction involving RCRA's knowing endangerment section.

Very recently, the first decision involving a conviction under the knowing endangerment provisions of the Clean Water Act was handed down in *U.S. v. Borowski*.[31] The decision is as far as I can tell unreported, but is summarized in a recent BNA Environment Reporter.[32] *Borowski* involved the conviction of a company owner and an associate for endangerment of company employees ordered to dump industrial waste water into the public

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[27] *Protex* at 742.

[28] *Protex* at 742.

[29] The statute defines "serious bodily injury" as:

> (A) bodily injury which involves a substantial risk of death; (B) unconsciousness; (C) extreme physical pain; (D) protracted and obvious disfigurement; or (E) protracted loss or impairment of the function of a bodily member, organ, or mental facility.

42 U.S.C. § 6928(f)(6).

[30] *Protex* at 744.

[31] C.R. 89-256 (WD Mass. 1991).

[32] 21 *Env't Rep.* 298 (June 1, 1990).

sewer system in Burlington, Massachusetts. The employees, mainly illiterate Polish refugees, were allegedly exposed to toxic levels of nickel, nitric acid and nitrogen dioxide.

As *Protex* and *Borowski* suggest, you will ultimately have to make a judgment of the degree of endangerment presented by your client's threatened conduct if you find yourself advising the likes of Acme Solvent. Rule 1.05(e), plainly directed at more concise threats like murder or assault, seems to require of the environmental practitioner the impossible -- assessment of the human health risks of prospective conduct of the client when even retrospective assessments buttressed by reams of data may be inconclusive. Obviously, the lawyer's judgment must be based on the products of the most thorough investigation possible. What are the client's observations about potential health risks? What are his employees' observations? Have any experts been consulted? What are the likely exposure assumptions? How toxic or carcinogenic are the materials involved? How are these materials characterized under applicable regulations? What is the expected physical extent of the migration of the materials through the environment, and how quickly will that migration occur? These factors must be judged in light of the rigorous wording of DR 1.05(e), with its telltale omission of any requirement of "imminence."

There are commentators who argue that in light of the policy goals expressed in the familiar environmental statutes, that any degree of endangerment should be found to trigger the lawyer's duty to disclose.[33] At the other end of the spectrum, it would probably be possible to locate one or two diehards who even under the Texas rule would live and die by an almost absolute prohibition against breach of a client's confidence. Most of us, however, fall somewhere in between these extremes. For us, we will be sustained by the hope that the Acme Solvents of the world will not darken our office doors, or will at least have the decency not to consult us about the advisability of committing felonies in advance of committing them. If the problem presents itself, however, I suggest that the Texas Disciplinary Rules offer good reason to carefully consider the long-term health consequences of your client's activities; to bring your considerations home as forcefully as possibly to your client; and ultimately to act against your client's wishes in the most extreme cases where you cannot escape the conviction that someone may be irreversibly hurt.

BUFFALO HUNTS:

How Much is a Pinstriped Hide Worth, Anyway?

I dug up three cases revealing some pretty creative "buffalo hunting" in the environmental area which are excellent food for thought.

One of the central concerns of private practitioners these days is malpractice. It appears that government lawyers may also fall prey to the creative plaintiff's lawyer. The

[33] *See, e.g., Dumping Ethics.*

only malpractice case of note I located is *Blue Sky Advocates v. State of Washington*,[34] involving a litigant's claim for attorney's fees incurred in the course of resisting, unsuccessfully, the siting of a Washington generating facility. Under Washington law, the attorney general is required to appoint from among his lieutenants a "counsel for the environment" upon receipt of a site application such as that filed for the project resisted by Blue Sky. The unlucky counsel for the environment's task? "To represent the public and its interest in protecting the quality of the environment," presumably before the siting board created by the same statute.

The attorney general of Washington did so in this case. After a good bit of conscientious activity in the case at its inception, counsel for the environment apparently ran out of time and money. The Attorney General candidly admitted that since the funding for a bona fide environmental impact assessment did not exist, he decided that discretion was the better part of valor. A decision was made to discontinue an active role in the case and to monitor proceedings, but only after a modest victory was achieved relating to the location of proposed transmission line corridors. (Its good for a private practitioner's heart to know that even government lawyers have, or think they have, clients who insist that they shouldn't spend any money--just get the right result!)

Blue Sky's counsel, on the other hand, was quite active, to the tune of approximately $30,000. in unpaid attorney's fees, and $40,000. in other costs related to the siting proceeding. Sensing a bird's nest on the ground, Blue Sky sued the Attorney General for malpractice, asserting that the statute calling for the appointment of counsel for the environment established a duty in favor of Blue Sky. The negligence alleged was: (1) failure to stick with it through the course of the eighteen month siting proceeding, (ii) failure to provide funding adequate to the task of representing the environment, and (iii) failure to retain and consult expert witnesses on behalf of the environment.

The nominal defendant, the State of Washington, moved to dismiss Blue Sky's complaint for failure to state a cause of action and the trial court swiftly moved in favor of the Attorney General. With blinding speed, the appellate court passed the hot potato, certifying the issue to Washington's highest court.

The Supreme Court's response? With studied nonchalance, the Court concluded that the environment had probably gotten damn good counsel, but that it was doubtful in any event that the statute relied upon by Blue Sky imposed the sorts of duties alleged by the plaintiff. With visions of mushrooming actions against the state's attorney cramming the courts, the Court affirmed, explicitly recognizing the discretion accorded the Attorney General to "do his thing" for the environment in just about any way he saw fit. Government lawyers across the land heaved a collective sigh of relief.

[34] 107 Wash. 2d 112, 727 P.2d 644 (1986).

Next we come to the question of fraud. *Raymark Industries, Inc. v. Stemple*[35] involved some "brass knuckles" litigation in the asbestosis wars. The defendant manufacturer in the case instituted some satellite litigation well outside the Pluto orbit, alleging that the plaintiffs' lawyers fraudulently certified to it that various of their clients' claims met the criteria for settlement agreed on by the parties. The defendant's specific claims were that due to inadequate medical screening procedures and advertising techniques which amounted to nationwide client solicitations, the plaintiffs' lawyers had evidenced a fraudulent intent in the course of the settlement process adequate to raise a fact issue for purposes of fraud and civil racketeering liability.

Did it work? You bet!

A federal judge in Kansas issued a scathing opinion sixty three pages in length decrying the "professional farce" played out by the lawyers subject to the fraud claims. In the course of its decision to deny these lawyers' motion for summary judgment, the Court remarked this charming couple's "blatant disregard of professional and ethical obligations, ... their arrogant disregard of all scientific findings inconsistent with their own, [and] their open animus toward the asbestos companies."[36] As you may expect, the movants' assertion of a "litigation privilege" was given about two paragraphs' attention in the Court's wide ranging discourse on knowing violations of ethics rules. This Court was not pleased.

Last, we come to the strange case of the law firm of Sullivan, Roche, & Johnson, a San Francisco firm engaged to represent a biomedical outfit named InFerGene. Venturing onto the turf of Solano County prosecutor Marc Pollock, a decision that Messrs. Sullivan, Roche, and Johnson will forever regret, a bankruptcy attorney at the firm was hired to represent InFerGene in its Chapter 11 proceeding. The issue of the debtor's duty to remove an "environmental hazard," apparently emanating from radioactive and medical wastes, from the debtor's leased premises arose in due course. The law firm's alleged advice to its client not to expend its funds to perform the removal apparently caught the eye of Mr. Pollock, for he filed on May 30 of this year a twenty four count criminal complaint against InFerGene, its officers, <u>and</u> its attorneys. The complaint, widely reported in the environmental and legal presses,[37] apparently alleges that the law firm's advice may have caused the crime to occur.

Counsel for InFerGene is in the running for understatement of the year as she is reported to have remarked about the proceeding, "It puts a very, very chilling effect on bankruptcy lawyers."[38] Prosecutor Pollock, for his part, will not rule out the possibility of

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35 1991 WL 72588 (Case No. 88-1014-K) (D. Kan. 1990), hereafter cited as "*Raymark.*"

36 *Raymark* at 13.

37 *See* 22 *Env't Rep.* 490 (June 21, 1991). *See also The Wall Street Journal* (June 14, 1991), at B 5.

38 22 *Env't Rep.* 490, 491 (June 21, 1991).

sentences for the attorney-defendants. Bankruptcy lawyers may be excused now, if they feel the need to make any urgent phone calls to California clients.

Thus conclude my last comments on the mental state of the practicing environmental lawyer. I hope they will be understood as they are intended: as signposts through a frontier crowded with danger, getting less civilized every day.

ETHICAL CONSIDERATIONS
IN THE ENVIRONMENTAL PROFESSION

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Third Annual Texas Environmental Super Conference

August 1-2, 1991
Austin, Texas

Synopsis

Ethics in any profession, specifically in the environmental sector of our economy, merits our attention now more than ever before. This is true because of several factors:

1. The environmental sector of our economy is booming, estimated by some to be in excess of a 200 billion dollar per year business. This is primarily attributable to the stability and growth of the so called "dirty industries" combined with more restrictive Federal and State statutes and regulations.

2. This growth in the environmental industry attracts new professionals, new companies, and new entrepreneurs (as well as old ones) where commercial objectives can easily transcend ethical considerations;

3. There are many incentives inherently built into the system for inefficiency, in terms of preliminary engineering, investigative studies, design, and construction, as well as resolving disputes and litigation; and

4. The environment and "environmental issues are emotional ones, with personal, national, and international implications. With public health and welfare often at stake, the conflicts of growth with environmental protection are highly visible, polarizing, and complex. Thus, an atmosphere is often created that resists logic, negotiations, compromise and factual digestion.

An outline of approaching these ethical considerations is presented herein and is designed to vertically integrate the evolution of the professional from the educational phase and thence into the market place as a practitioner and decision-maker.

I. The Learning Phase

A. The Engineering Degree

1. The Baccalaureate
2. The Masters
3. The Doctorate

B. The Degree of Doctors of Jurisprudence

C. The Economics and Subsidies of such degrees:

1. Who obtains these degrees?

a. Self-realization over mere contentment (Aristotle)
b. Highest use of one's talents

2. Who pays for this education?
3. How much does it cost for the subsidy?
4. What and when is the payback?
5. What are the moral and ethical considerations?

II. The Marketplace

A. The invisable hand of Adam Smith (<u>The Wealth of Nations</u>)

1. Assumes decisions reached individually for personal gain will, in fact, be the best decision for the entire society.
2. Applicability and contraints, i.e., the moral and ethical caveat.

B. The ethics of wealth creation versus redistribution

C. Sins of the Marketplace

1. Wealth without work
2. Business without morality
3. Knowledge without character
4. Science without humanity

D. The role of the environmental professional in the Marketplace

1. The pursuit of existential pleasure

a. Achievement
b. Creativity
c. Satisfaction of productivity

2. Responsibility to the client

a. Efficient use of the environmental dollar
b. Risk - benefit
c. Cost - benefit
d. Human health and safety

E. The engineer and the attorney

1. The dichotomy of education

a. The tools of the trade
b. Quantification and non-quantification

2. Problem solving versus disputes

a. Engineers are programmed to tell all they know; attorneys only what they must.
b. Mechanical solutions versus negotiations
c. The verbal versus the mathematical
d. The black, the white, and the gray

F. Conflicts

1. The client versus the employer
2. Churning - nothing for something
3. Self-fulfilling prophecy
4. Litigation

a. Settlement versus trial
b. Fair game
c. Stewardship of the litigation dollar

G. Case histories

1. Matz-Childs-Agnew - stealing the common from the goose
2. The Environmental Impact Statement

a. as a policy tool
b. the conflict of preparation

3. The Alaska Pipeline

a. The ethics of overreaction
b. The ethics of underreaction

4. Superfund

a. The infrastructure
b. The record to date

5. Toxicity evaluation and reduction
6. The non-testifying expert

H. The Codes

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CODE OF ETHICS OF ENGINEERS

The Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

I. using their knowledge and skill for the enhancement of human welfare;

II. being honest and impartial, and serving with fidelity the public, their employers and clients;

III. striving to increase the competence and prestige of the engineering profession; and

IV. supporting the professional and technical societies of their disciplines.

The Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.

2. Engineers shall perform services only in the areas of their competence.

3. Engineers shall issue public statements only in an objective and truthful manner.

4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.

7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

Reference: Accreditation Board for Engineering and Technology (ABET)

TABLE I
CORE CONCEPTS IN ENGINEERING ETHICS

I. The Public Interest

A. Paramount responsibility to the public health, safety, and welfare, including that of future generations.

B. Call attention to threats to the public health, safety, and welfare, and act to eliminate them.

C. Work through professional societies to encourage and support engineers who follow these concepts.

D. Apply knowledge, skill and imagination to enhance human welfare and the quality of life for all.

E. Work only with those who follow these concepts.

II. Qualities of Truth, Honesty, and Fairness

A. Be honest and impartial.

B. Advise employer, client or public of all consequences of work.

C. Maintain confidences; act as faithful agent or trustee.

D. Avoid conflicts of interest.

E. Give fair and equitable treatment to all others.

F. Base decisions and actions on merit, competence, and knowledge, and without bias because of race, religion, sex, age, or national origin.

G. Neither pay nor accept bribes, gifts, or gratuities.

H. Be objective and truthful in discussions, reports, and actions.

III. Professional Performance

A. Competence for work undertaken.

B. Strive to improve competence, and assist others in so doing.

C. Extend public and professional knowledge of technical projects and their results.

D. Accept responsibility for actions and give appropriate credit to others.

Reference: Professional Engineer, May 1976, pp. 8-11.

COMMUNITY RIGHT-TO-KNOW IN TEXAS
A REGULATORY REVIEW

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AUGUST 1, 1991

COMMUNITY RIGHT-TO-KNOW IN TEXAS
A REGULATORY REVIEW

The roots of the present day community right-to-know program in the U.S. lie in Chemical Manufacturers Association's (CMA) Community Awareness and Emergency Response (CAER) program and the U.S. EPA's Community Emergency Planning (CEPP) Program. The CMA's CAER program is a voluntary comprehensive community outreach program designed to inform the public of the hazards of neighboring member plants as well as a contingency emergency planning system. The U.S. EPA's program (CEPP) was distributed on a limited basis to communities that had a need for developing an integrated emergency response to hazardous material incidents within their boundaries. These programs, albeit well meaning, were not wide spread within private industry and local governments until the December, 1984, methyl isocyanate disaster in Bhopal, India. Prompted by the public concern that a similar disaster could happen in the U.S. as well as highly publicized hazardous substance releases such as the ones in Institute, West Virginia, the Congress passed the Emergency Planning and Community Right-To-Know Act (EPCRTK) of 1986 and incorporated the provisions into the Superfund Amendments and Reauthorization Act of 1986, (SARA, Title III).[1]

Under the regulatory program set up by SARA, the Governors of the States were directed to set up systems to handle local emergency planning for chemical incidents as well as systems to communicate chemical hazards to local agency emergency responders and communicate those same hazards to the citizenry. Other systems were set up at the Federal and, in some cases, the State level to receive, catalog and disseminate the mandated emission reports. From a practical and an industrial compliance management view, these regulatory programs take the shape of three distinct compliance systems that should have as its centerpiece a solid hazardous chemical management system including a Material Safety Data Sheet (MSDS) retention and tracking system. This paper is an explanation of how those Federal mandates are handled in Texas.

EMERGENCY PLANNING AND NOTIFICATION

Per requirements in SARA, Title III, Section 301, each governor was to designate a state emergency response commission (SERC) whose mission is to coordinate state emergency response efforts as well as assure public access to various plans, documents and

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1 42 USC 11001

other materials that may be required for submission by the covered facilities. In Texas, this responsibility was given to the State Emergency Management Council (SEMC) which consist of a group of agencies within the State government with expertise in emergency management and planning. The SEMC was originally organized pursuant to the Texas Disaster Act.[2] Naming the Texas SEMC as the SERC under the EPCRTK Act seemed to be a natural fit since the SEMC is responsible for coordinating State emergency response to situations such as natural disasters, weather emergencies, etc. However, since the reporting burdens for the regulated community under all Title III provisions and commensurate government record keeping systems involve hazardous material regulatory concerns, the SEMC (SERC) designated the Texas Department of Health (TDH) and the Texas Water Commission (TWC) as the lead agencies involved in responding to the State responsibilities under SARA, Title III. SARA, Title III, Section 301 also provides for the naming of local emergency response committees (LEPC) whose function is to facilitate, on a local basis, the preparation, implementation, and annual review of chemical emergency response plans[3], as well as, implementation of the various information access systems mandated by the Act. In Texas, county judges are charged with the responsibility of organizing and administrating the LEPCs. A list of current Texas LEPCs is provided in Appendix A. LEPC membership consists of local law enforcement, civil defense, fire fighting, first aid, health, environmental, as well as local industrial personnel and serves as a communication link to the public with respect to hazardous material information and planning information dissemination.

SARA, Title III, Section 302[4] codified in 40 CFR 355.30 provides for notification to the area LEPC and SERC of amounts of listed "extremely hazardous substances" (EHS) in quantities that are deemed significant from an emergency planning standpoint. Extremely hazardous substances are those "chemical substances which could cause serious irreversible health effects from accidental releases".[5] Those quantities of EHS that are deemed significant are defined in 40 CFR 355.20 as "threshold planning quantities" (TPQs). Commensurate with the regulated facility's responsibility in the local emergency effort, should a covered facility exceed the TPQ amount for any EHS, a notification should be sent to both the Texas Department of Health (Hazard Communication Branch) and the LEPC.[6] Additionally, a "facility emergency coordinator" must be named by facility management for those covered

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2 Texas Government Code Annotated, Chapter 418 (Vernon Supp. 1990)

3 42 USC 11003, SARA, Title III, Section 303

4 42 USC 11002

5 52 FR 13370

6 40 CFR 355.30(b)

facilities. Notification of the facility emergency coordinator must be made to the LEPC. The coordinator's function is essentially to be a focal point of information should the LEPC (or TDH in their capacity as the SERC) need to respond to a public inquiry regarding the facility or, as the name implies, to be the facility spokesperson in case of chemical emergency.

SARA, Title III, Section 304 codified in 40 CFR 355.40 describes the emergency release notification requirements and refer to releases in excess of the reportable quantities (RQ) of any of the heretofore discussed EHS as well as the so-called CERCLA hazardous substances.[7] Under 40 CFR 355.40(b), the LEPC is to be notified of releases. Also Chapter 26 of the Texas Water Code[8] require that the covered facility report the release to the Texas Emergency Response Center (TERC).[9] The TERC, which is manned by the Texas Water Commission, coordinates emergency response activities relative to hazardous substance release(s) in Texas. It should be noted that the reporting obligations under the Texas Water Code are broadly interpreted and involve, from a practical standpoint, any "pollutant" impacting "water of the state" not necessarily just those pollutants specifically listed in federal and state regulations. Secondly, certain releases, depending on the nature of the material released as well as the media that it is released into, may trigger other reporting obligations under other State as well as federal regulations. Reporting obligations under other programs may necessitate consummate reports to the Texas Air Control Board, EPA, U.S. Coast Guard, National Response Center, Texas Department of Health, and local emergency responders. Finally, as a courtesy and certainly to promote a coordinated response, it is recommended that the local offices of the state and federal agencies be made aware of the release report. Follow-up written reports should follow all verbal reports to the agencies. The content requirements of the required reports under the EPCRTK Act can be found in 40 CFR 355.40(b)(2) and 40 CFR 355.40(b)(3).

HAZARDOUS CHEMICAL REPORTING: COMMUNITY RIGHT-TO-KNOW

The second regulatory compliance system that must be addressed under SARA emanates from the statutory requirements set out in Section 311 and 312 of the Act. Codified in 40 CFR 370, it deals primarily with hazardous chemicals that are regulated by OSHA under the Agency's hazard communication standard (HCS).[10] It is one of the few environmental

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7 40 CFR 302

8 Texas Water Code Ann., Chapter 26.039(b)

9 Texas Emergency Response Center, 512-463-7727

10 29 CFR 1910.1200

regulations that pull their qualifying definitions from the safety and health area i.e. OSHA. Additionally, since the HCS is a "generic" standard, it does not necessarily have a finite list of chemicals to be dealt with as is the case in, let's say, the "extremely hazardous substances" list.[11]

The purposes of this reporting system is basically twofold: (1) to provide basic hazard information to agencies which would be conceivable first responders in an emergency, i.e. fire department and (2) to provide this same basic hazard data to the public, presumably to those who live or work in close proximity to the regulated facility. Although the format and detail of information vary from state to state, the basic scheme is derived from the federal regulation.[12]

40 CFR 372.20 defines the threshold for hazardous chemical reporting. Since the inception of the regulation, the federal threshold level issue has been a subject of much debate. Originally, the threshold levels of reporting were designed to be reduced year after year until a zero threshold was reached. Last year however, an agency decision was made to (permanently) set the reporting threshold (1) at 10,000 pounds, and (2) for those who are required by their respective LEPC to send a more detailed report (Tier II), zero.[13] These federal reporting thresholds are modified for Texas businesses subject to the Texas Hazard Communication Act (THCA).[14] Businesses subject to the THCA[15] must file the Texas Tier II Report[16] at thresholds of 500 pounds or 55 gallons (whichever is less). Additionally, if a business stores, processes, handles or otherwise has on-hand an excess of 500 pounds of an extremely hazardous substance (EHS) or an excess of the TPQ for that particular EHS, whichever is less, then a Texas Tier II report is required to be filed. This is commensurate with federal requirements that are found in 40 CFR 370.20(b).

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11 40 CFR 355, Appendix A

12 40 CFR 372

13 55 FR 30645

14 Texas Health and Safety Code Annotated, Chapter 502 (Vernon Supp. 1991)

15 The following Standard Industrial Classification (SIC) Codes are subject to the THCA: Group 20-39 (manufacturing), Group 46 (pipelines, except natural gas), Group 47 (transportation services), Group 48 (communication services), Group 49 (electric, gas and sanitary services), Group 51 (wholesale trade-nondurable goods), Group 75 (auto repair, services and parking), Group 76 (miscellaneous repair services), Group 80 (health services), Group 82 (educational services), Group 84 (museums, art galleries, botanical gardens, and zoological gardens), and State and local agency (public employers)

16 Appendix B

Should a business fall outside the subjected SIC Codes, then the operation would be subject to the federal threshold levels for reporting: 10,000 pounds of a hazardous chemical and/or 500 pounds of an extremely hazardous substance (EHS) or an excess of the TPQ for the EHS in question.

The basic format for reporting of hazardous chemicals (and extremely hazardous substances) is found in 40 CFR 370.25 and involves a graded or tiered reporting system. The Tier I report which is described in 40 CFR 370.40 is a short, generic and nonspecific report; the Tier II form described in 40 CFR 370.41 is more specific in content and detailed with respect to the container storage and location. In Texas, a specialized Tier II report form i.e. "Texas Tier II" is used. The form[17] contains much of the information that the Tier II federal form contains, plus some additional information relative to the THCA. The form meets the full requirements of the federal hazardous chemical reporting regulations.

Within the framework of the federally mandated reporting system, the SERC, LEPC, and the local fire departments are designated to receive the Tier reports.[18] In Texas, the TDH which is the designated SERC receives an original with copies, of course, going to the jurisdictional LEPC and the local fire department. The Texas Tier II reports are due annually on March 1 for data representing the previous calendar year and there is currently a $50 filing fee. Commensurate with the filing of the Texas Tier II, those organizations that fall within the purview of the THCA are deemed compliant with "hazardous chemical list" requirement of the Act.

Following the requirements in SARA, Title III, Section 312(e) and codified in 40 CFR 370.30, public officials as well as the general public can gain access to hazardous chemical information with respect to covered facilities through the LEPC or SERC.[19] In Texas, written requests should be submitted to either the TDH or chairperson of the LEPC having jurisdiction.

TOXIC CHEMICAL REPORTING RELEASE REPORTING: COMMUNITY RIGHT-TO-KNOW

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17 Appendix B

18 40 CFR 370.25

19 In Texas, the Department of Health

The third major regulatory compliance system involves the reporting of releases, whether routine or accidental, of specifically listed "toxic chemicals" into all environmental media: land, water and air.[20]

Toxic chemicals under EPCRTK Act are listed in 40 CFR 372.65[21] and each one, according to the statute, meet the following criteria:[22]

1. Can cause significant adverse acute human health effects.

2. Has the potential to cause cancer, birth defects, nervous system effects, heritable gene mutations or other chronic health effects in humans.

3. Can cause significant and sufficiently serious adverse effects on the environment due to toxicity, persistence, or a tendency to bioaccumulate.

The list is constantly subject to re-evaluation by the regulated community, public, and the EPA so it is wise to reevaluate reporting requirements as they apply to any specific facility on a periodic basis.

The reporting system was, initially at least, a federal requirement, however, with the passage of the Toxic Chemical Release Reporting Act in Texas, state reporting responsibilities went into effect.[23]

Under both the Texas and federal regulations there are three qualifiers for coverage under the reporting system.[24] A facility must:

1. Be included in the Standard Industrial Codes (SIC) 20-39. These codes comprise those operations that are designated as manufacturers.

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20 SARA, Title III, Section 313; 40 CFR 372

21 Appendix C includes approximately 315 chemicals

22 SARA, Title III, Section 313(c)

23 Texas Revised Civil Statutes Ann. - Article 4477-7h (Vernon, 1990)

24 40 CFR 372.22

2. Have an equivalent of ten (10) or more full time employees. For businesses that have many part-time employees or a mix of full-time and part-time, an excess of 20,000 man-hours is the critical factor.

3. And finally, the facility in question must meet a 25,000 pound (calendar year) threshold of "manufacturing or processing"[25] any of the listed toxic chemicals;[26] or 10,000 pound threshold if the toxic chemical is "otherwise used".[27]

Threshold calculations of mixtures must include the amount of the listed toxic chemical present above the deminimus level in all mixtures processed or otherwise used by the facility. The deminimus level[28] of a toxic chemical component of a mixture is a concentration in a mixture which is below one percent of the mixture, or one-tenth percent of the mixture in the case of a toxic chemical that is an OSHA carcinogen.[29]

Another area of considerable complexity in threshold determination is the article exemption issue for toxic chemicals contained in solids i.e. steel, stainless steel, etc. This is dealt with in 40 CFR 372.38(b) and discussed extensively in the EPA publication, Toxic Chemical Release Inventory Reporting Package of 1990. An article is a manufactured item which is formed to a specific shape during manufacture, which has end use functions dependent in whole or in part upon its shape or design during end use and which does not release a toxic chemical under normal conditions of processing or use of that item at the facility.[30] Many times the release of chrome, nickel and other metal compounds associated with welding sheet steel for instance is overlooked. Recent directives by the EPA on the other hand have held that if wastes from articles containing listed toxic chemicals are "100%" recycled or reused, on-site or off-site, then the article status is maintained.[31] Additionally, if

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25 40 CFR 372.3

26 40 CFR 372.65

27 40 CFR 372.3

28 40 CFR 372.38

29 29 CFR 1910.1200(d)(4)

30 40 CFR 372.3

31 Directive #7: Reuse and Recycle Exceptions, Toxic Chemical Release Inventory Reporting Package for 1990, EPA 560

less than one-half pound of the waste from processing is "released" to the environment then the article status would also be maintained.[32]

The terms "manufacturing", "processing" and "otherwise used" deserve some explanation. The term "manufacture" means to produce, prepare, compound or import a listed toxic chemical. The term "process", means the preparation of a listed toxic chemical after its manufacture, for distribution in commerce. The term "otherwise used" encompasses any use of the listed chemical at a facility that does not fall under the definitions of manufacture or process.[33] More detailed explanations as well as specific examples of how these terms should be interpreted can be found in the EPA's Toxic Chemical Release Inventory Reporting Package for 1990, EPA 560/4-91-001, January, 1991.

The report form suitable for both federal and Texas law, designated as "EPA Form R"[34] is quite complicated and should be completed with the aid of the examples and extensive instructions found in the aforementioned reporting package.[35]

Form R reports are due both from a Texas and federal standpoint, annually on July 1 for releases occurring in the previous calendar year. The report should be sent to the EPCRA Reporting Center (federal)[36] and to the Texas Water Commission (state).[37] In Texas, there is a $25 filing fee for each toxic chemical report with a maximum fee of $250. There is no filing fee for reports submitted to the federal authorities. As of January, 1991, the federal reporting center is prepared to receive electronic Form Rs. The DOS-based system is available from the EPCRKA hotline,[38] however, as of this date, the Texas Water Commission does not have the capability of accepting electronic Form Rs.

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32 Question #205, Toxic Chemical Release Inventory Questions and Answers, Revised 1990 Version, Toxic Chemical Release Inventory Reporting Package for 1990, EPA 560

33 Toxic Release Inventory Program, 1988 State Report, Texas Water Commission, March, 1991.

34 EPA Form 9350-1 (Rev 1-91)

35 Toxic Chemical Release Inventory Reporting Package for 1990

36 EPCRA Reporting Center, P.O. Box 23779, Washington, DC 20026-3779, Attn: Toxic Chemical Release Inventory

37 Texas Water Commission, Emergency Response Unit, P.O. Box 13087-Capitol Station, Austin, Texas 78711-3087

38 1-800-424-0202

A final requirement under the EPCRTK Act relative to distributors, manufacturers, or persons who otherwise distribute toxic chemicals[39] in commerce involves the notification (in writing) of those facilities that may be subject to toxic chemical release reporting provisions by virtue of the content of listed toxic chemicals in the products being distributed. This notification must be made on an annual basis[40] with the first shipment of the year and, preferably, attached to the material safety data sheet (MSDS).[41]

SUMMARY - THE FUTURE

With a key to future environmental protectionism being pollution prevention, the databases that are being developed at both the state and federal level will provide the baseline for measuring our industrial society's goal toward that end. It is important that industry devote the time and technical talent to the accurate measurement and reporting through these programs. More importantly, given the accuracy of the data and relating this data to regional epidemiological databases, more definitive conclusions can be made regarding real public health impact of toxic chemical releases.

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(91jc294.doc)

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39 40 CFR 372.65

40 40 CFR 372(c)(1)

41 40 CFR 372.(c)(5)

TEXAS LOCAL EMERGENCY PLANNING COMMITTEE (LEPC) CHAIRPERSONS
UPDATED MARCH 4, 1991

COUNTY		FIRST NAME	LAST NAME	ADDRESS	CITY	ZIP	PHONE
ANDERSON	Mr.	John B.	McDonald	500 N. Church Street	Palestine	TX 75801	903 723-7406
ANDREWS	The Honorable	Gary	Gaston	County Courthouse Rm. 104	Andrews	TX 79714	915-524-1401
ANGELINA	Mr.	David	Parrish	Box 114	Lufkin	TX 75901	409-634-3331
ARANSAS	Mr.	Mitchell	Ammons	301 N. Live Oak	Rockport	TX 78382	512-729-6282
ARCHER	Mr.	Michael	Cavitt	P. O. Box 367	Archer City	TX 76351	817-574-4241
ARMSTRONG	The Honorable	Hugh	Reed	Drawer 189	Claude	TX 79019	806-226-3221
ATASCOSA	Mr.	Bryan	Crouch	1102 Campbell Avenue	Jourdanton	TX 78026	512-769-3787
AUSTIN	Mr.	Dennis	Diggs	P. O. Box 352	Bellville	TX 77418	409-865-2267
BAILEY	The Honorable	Jim	Watson	300 S. First Street	Muleshoe	TX 79347	806 272-3077
BANDERA	The Honorable	Ray	Maurer	P. O. Box 877	Bandera	TX 78003	512-796-3781
BASTROP	The Honorable	Jimmy	Copeland	805 Pecan	Bastrop	TX 78602	512-321-2579
BAYLOR	The Honorable	Joe	Dickson	County Courthouse	Seymour	TX 76380	817-888-2662
BEE	Mr.	Doyal	Childress	400 N. Washington	Beeville	TX 78102	512-358-4641
BEE	Mr.	Doyal	Childress	400 N. Washington	Beeville	TX 78102	512-358-4641
BELL	Mr.	Tom	Jacobs	5701 Airport Rd.	Temple	TX 76501	817-774-6480
BEXAR	Fire Marshal	Carl	Mixon	212 Stumberg	San Antonio	TX 78204	512 220-2123
BLANCO	Mr.	Larry A.	Depew	P. O. Box 471	Johnson City	TX 78636	512-868-4266
BORDEN	Mr.	W. A.	Telchik	Route 1	O'Donnell	TX 79351	806-439-6693
BOSQUE	Mr.	Ray	Gibbons	111 N. Main	Meridian	TX 76665	817-435-2381
BOWIE	Mr.	John	Carson	P. O. Box 170	Maud	TX 75567	903-585-5428
BRAZORIA	Mr.	James W.	Hinton	P. O. Box 685	La Porte	TX 77572-0685	713-476-3229
BRAZOS	Dr.	Edward E.	Burns	County Courthouse	Bryan	TX 77803	409-845-8625
BREWSTER	The Honorable	Tom	Conner, Sr.	P. O. Box 1630	Alpine	TX 79831	915-837-2412
BROOKS	Mr.	Lee	Thompson	116 North Terrell	Falfurrias	TX 78355	512-325-5001
BROWN	Mr.	Lowell	Windahl	P. O. Box 1669	Brownwood	TX 76804	915-646-1695
BURLESON	The Honorable	Woods A.	Caperton	P. O. Box 26	Caldwell	TX 77836	409-567-3551
BURNET	The Honorable	D. C.	Kincheloe	220 S. Pierce	Burnet	TX 78611	512-756-2121
CALDWELL	The Honorable	William J.	Ellison	County Courthouse Rm. 303	Lockhart	TX 78644	512-398-2213
CALHOUN	Mr.	W. R.	Zwerschke	211 S. Ann, Room 108	Port Lavaca	TX 77979	512-552-3226
CALLAHAN	Mr.	Shorty	Ballard	County Courthouse	Baird	TX 79504	915-854-1277
CAMERON	Ms.	Jackie	Lockett	143 E. Price Road	Brownsville	TX 78521	512-546-1161
CAMP	Mr.	David	Abernathy	P. O. Box 992	Pittsburg	TX 75686	903-856-7181
CARSON	The Honorable	Jay R.	Roselius	P. O. Box 369	Panhandle	TX 79068	806-537-3622
CASS	The Honorable	Tommy	Kessler	P. O. Box 825	Linden	TX 75563	903-756-7001
CASTRO	Mr.	Tim	Roberts	597 W. Bedford	Dimmitt	TX 79027	806-647-2323

COUNTY		FIRST NAME	LAST NAME	ADDRESS	CITY	ZIP	PHONE
ELLIS	Mr.	Richard	Williams	Ellis County Courthouse	Waxahachie	TX 75165	214-937-8620
ERATH	Dr.	J. Fred	Cross	Rt. 3, Box 94E	Stephenville	TX 76401	817-965-5577
FALLS	Mr.	James	Maxey	P. O. Box 25	Chilton	TX 76632	817-546-5123
FANNIN	The Honorable	Jimmy	Doyle	County Courthouse	Bonham	TX 75418	903-583-7455
FAYETTE	Mr.	Bill	Livingston	County Courthouse Rm 302	La Grange	TX 78945	409-968-6436
FISHER	Mr.	Archie J.	Neeley	604 Burnside	Rotan	TX 79546	
FLOYD	Mr.	Charles	Overstreet	% Sheriff Office	Floydada	TX 79235	806 983-3232
FOARD	Mr.	Mark	Christopher	116 North A	Crowell	TX 79227	817-684-1561
FORT BEND	Mr.	Ron	Bolyard	309 So. Fourth, #629	Richmond	TX 77469	713-342-4274
FRANKLIN	The Honorable	A. Wayne	Foster	P. O. Box 577	Mt. Vernon	TX 75457	903-537-2342
FREESTONE	Mr.	Hugh D.	Whitaker	P. O. Box 656	Fairfield	TX 75840	903-389-7605
FRIO	The Honorable	Sidney	Williams, III	P. O. Box L	Pearsall	TX 78601	512-334-2154
GAINES	Mr.	Henry M.	Beare	P. O. Box 1570	Seminole	TX 79360	915-758-6225
GALVESTON	Mr.	William L.	Tomkins	1301 FM 1646	Dickinson	TX 77539	713-337-2575
GALVESTON - CIT	The Honorable	Janice	Coggeshall	P.O. Box 779	Galveston	TX 77550	409-766-2103
GALVESTON-TEXAS	Mr.	Gary	Jackson	322 Laurel	LaMarque	TX 77568	409 938-7201
GARZA	The Honorable	Giles	Dalby	County Courthouse	Post	TX 79356	806-495-3421
GILLESPIE	The Honorable	Jay	Weinheimer	P. O. Box 351	Fredericksburg	TX 78624	512-997-7502
GLASSCOCK	Mr.	Norman	Kohls	P. O. Box 239	Garden City	TX 79739	915-354-2381
GOLIAD	The Honorable	John R.	Barnhill	P. O. Box 677	Goliad	TX 77963	512-645-3337
GONZALES	The Honorable	Henry	Volentine	414 St. Joseph	Gonzales	TX 78629	512 672-2327
GRAY	Mr.	Steve	Vaughn	P. O. Box 2499	Pampa	TX 79066-2499	806-665-8481
GRAYSON	Mr.	Roy	Thompson	328 W. Burton St.	Sherman	TX 75020	903-892-8306
GREGG	Mr.	Tommie	McMaster	P.O. Box 1952	Longview	TX 75606	903-753-4471
GRIMES	Sheriff	Bill	Foster	P. O. Box 434	Anderson	TX 77830	409-873-2151
GUADALUPE	Mr.	Michael	Scott	3740 N. Austin	Seguin	TX 78155	512-372-7380
HALE	Mr.	Leo	Baxter	111 W. 6th	Plainview	TX 79072	806-293-8481
HALL	The Honorable	James E.	Chappell	County Courthouse	Memphis	TX 79245	806-259-2511
HAMILTON	The Honorable	Charles	Garrett	County Courthouse	Hamilton	TX 76531	817-386-8822
HANSFORD	Mr.	Jeff	Lackey	P. O. Box 401	Spearman	TX 79081	806-659-2672
HARDEMAN	Mr.	Joel	McClellan	210 Avenue J	Chillicothe	TX 79225	817-852-5154
HARDIN	The Honorable	M. R.	McKinney	P. O. Box 760	Kountze	TX 77625	409-246-3412
HARRIS -- SEE BACK PAGE							
HARRISON	Mr.	Dennis N.	Engdahl	2110 Warren Drive	Marshall	TX 75670	903-935-4870
HASKELL	The Honorable	B. O.	Roberson	P. O. Box 905	Haskell	TX 79521	817-864-3305
HAYS	Mr.	A.D.	Carroll	P. O. Box 103	San Marcos	TX 78667-0103	512-396-0821
HEMPHILL	The Honorable	Bob	Gober	P. O. Box 536	Canadian	TX 79014	806-323-6521
HENDERSON	Mr.	Travis	Roberts	Co. Courthouse Annex	Athens	TX 75751	903-675-6157

COUNTY		FIRST NAME	LAST NAME	ADDRESS	CITY	ZIP	PHONE
LIBERTY	The Honorable	Gary	Childress	1923 Sam Houston	Liberty	TX 77575	409-336-8071
LIMESTONE	The Honorable	Ray	Sealy	P. O. Box 469	Groesbeck	TX 76642	817 729-3810
LIPSCOMB	The Honorable	Willis	Smith	P. O. Box 69	Lipscomb	TX 79056	806-862-4131
LIVE OAK	The Honorable	Jim	Huff	P. O. Box 467	George West	TX 78022	512 449-2733
LLANO	Mr.	Gordon	Hodges	801 Ford Street, Room 101	Llano	TX 78643	915-247-4352
LOVING	The Honorable	Donald	Creager	P. O. Box 153	Mentone	TX 79754	915-377-2362
LUBBOCK	The Honorable	Roderick	Shaw	P. O. Box 10536	Lubbock	TX 79401	806-741-8009
LYNN	The Honorable	J. F.	Brandon	P. O. Box 1256	Tahoka	TX 79373	806-998-4222
MADISON	The Honorable	J. R.	Fite	101 W. Main, Rm. 101	Madisonville	TX 77864	409-348-2670
MARION	The Honorable	Buddy	Power	County Courthouse	Marshall	TX 75760	903-935-3509
MARTIN	The Honorable	Bob	Deavenport	P. O. Box 1330	Stanton	TX 79782	915-756-2231
MASON	Mr.	Ricky	Smith	600 Austin Highway	Mason	TX 76856	915-347-6447
MATAGORDA	Mr.	Bill	Cornman	P. O. Box 509	Bay City	TX 77404-0509	409-245-4871
MAVERICK	Mr.	Guadalupe	Cardona	P. O. Box 4019	Eagle Pass	TX 78853	512-773-5442
MCCULLOCH	Mr.	Bill	Shepherd	County Courthouse	Brady	TX 76825	915-597-2977
MCLENNAN	The Honorable	Raymond	Matkin	County Courthouse	Waco	TX 76701	817-757-5049
MCMULLEN	The Honorable	Claude	Franklin, Jr.	P. O. Box 237	Tilden	TX 78072	512-274-3341
MEDINA	Ms.	Helen	Conlee	1405 21st Street	Hondo	TX 78861	512 426-4207
MENARD	The Honorable	Otis	Lyckman	P. O. Box 1028	Menard	TX 76859	915-396-4789
MIDLAND	Mr.	Winfree	Brown	1400 Murray	Midland	TX 79701	915-682-5002
MILAM	Ms.	Clois	Green	P. O. Box 472	Rockdale	TX 76567	512-446-8205
MILLS	Mr.	Dave	Grebe	Rt. 3, Box 7D	Goldwaithe	TX 76844	915-648-3264
MITCHELL	Mr.	Don	Webb	USPS	Loraine	TX 79532	915-728-3054
MONTAGUE	Mr.	Dwight	Whitaker	P. O. Box 475	Montague	TX 76251	817-964-2388
MONTGOMERY	Sgt.	R.L.	Williamson	#1 Criminal Justice	Conroe	TX 77301	409-760-5824
MOORE	Mr.	Greg	Smith	P. O. Box 250	Sunray	TX 79086	806-948-4111
MORRIS	The Honorable	Ronald	Cowan	500 Broadnax	Daingerfield	TX 75638	903-645-3691
MOTLEY	The Honorable	Billy	Whitaker	County Courthouse	Matador	TX 79244	806-347-2334
NACOGDOCHES	The Honorable	Bob	Dunn	P. O. Box 1112	Nacogdoches	TX 75963	409-560-7755
NAVARRO	Mr.	Douglas A.	Fogg	P. O. Box 626	Corsicana	TX 75110	903-872-4811
NEWTON	The Honorable	Lee Roy	Fillyaw	P. O. Drawer J	Newton	TX 75966	409-379-5691
NOLAN	Mr.	Barry	Merffert	201 S. Hwy. 70	Blackwell	TX 79506	915-282-2271
NUECES	Mr.	Juan	Adame	901 Leopard Street Rm 303	Corpus Christi	TX 78401-3697	512-882-6253
OCHILTREE	The Honorable	Howard	Stone	511 South Main	Perryton	TX 79070	806-435-2152
OLDHAM	The Honorable	John	Gilter	P. O. Box 9	Vega	TX 79092	806-267-2607
ORANGE	Mr.	Dale W.	Durr	Chevron Chemical FM1006	Orange	TX 77630	409-886-7491
PALO PINTO	Mr.	C. L.	Stalling	2904 Stan Terrace	Mineral Wells	TX 76067	817-325-2156
PANOLA	The Honorable	Mike	Parker	County Courthouse	Carthage	TX 76633	903-693-3245

COUNTY		FIRST NAME	LAST NAME	ADDRESS	CITY	ZIP	PHONE
TERRELL	The Honorable	Charles	Stavely	P.O. Box 674	Sanderson	TX 79848	915-345-2421
TERRY	Mr.	Earl	Elrod	218 W. Main Street	Brownfield	TX 79316	806-637-4547
THROCKMORTON	Mr.	Corky	Redden	P. O. Box 550	Throckmorton	TX 76083	817-849-3321
TITUS	Mr.	David	Ward	Box 990	Mt. Pleasant	TX 75455	903-572-8726
TOM GREEN	Judge	Jerry	Jennison	3115 Loop 306	San Angelo	TX 76904	915-657-4492
TRAVIS	The Honorable	Bill	Aleshire	P.O. Box 1748	Austin	TX 78767	512-473-9555
TRINITY	Mr.	Larry	Welker	P.O. Box 8	Grovetown	TX 75845	409-642-1768
TYLER	Mr.	Gary	Hennigan	70 Pine Grove	Woodville	TX 75979	409-283-7710
UPSHUR	Mr.	David	Mooney	P.O. Box 1004	Gilmer	TX 75644	903-843-5597
UPTON	Mr.	Henry	Watson	Box 187	McCamey	TX 79752	915-652-3428
UVALDE	The Honorable	William	Mitchell	County Courthouse	Uvalde	TX 78801	512-278-3216
VAL VERDE	The Honorable	Sergio	Gonzalez	P.O. Drawer 4250	Del Rio	TX 78841	512-774-3611
VAN ZANDT	Mr.	C.E.	Bridges	Box 406	Edgewood	TX 75117	903-896-4372
VICTORIA	Mr.	W.T.	Dodson	P.O. Box 2626	Victoria	TX 77902	512-572-1317
WALKER	Mr.	Larry	Cruse	P.O. Box 544	Huntsville	TX 77340	409-291-9551
WALLER	The Honorable	Freddie R.	Zach	836 Austin, Suite 203	Hempstead	TX 77445	
WARD	Chief	David	Mills	114 W. 2nd Street	Monahans	TX 79756	915-943-3254
WASHINGTON	Mr.	Billy	Rosenbaum	P.O. Box 786	Brenham	TX 77833	409-836-4551
WEBB	Chief	Mike	Perez	No. 1 Guadalupe St.	Laredo	TX 78040	512-722-3979
WHARTON	Mr.	John	Ramey	221 S. Fulton	Wharton	TX 77488	409-532-1123
WHEELER	Mr.	Jerry	Berten	122 W. Second St.	Shamrock	TX 79079	806-256-2136
WICHITA	Mr.	John	Mezzo	900 7th St.	Wichita Falls	TX 76301	817-766-8145
WILBARGER	The Honorable	Bobby	Arnold	County Courthouse	Vernon	TX 76384	817-552-2652
WILLACY	Mr.	Felix	Longoria	P.O. Box 565	Raymondville	TX 78580	512-689-3321
WILLIAMSON	The Honorable	John	Doerfler	County Courthouse	Georgetown	TX 78626	512-869-4346
WILSON	Mr.	William	Gleeson	P.O. Box 595	Floresville	TX 78114	512-393-4522
WINKLER	The Honorable	Frances	Clark	P.O. Drawer V	Kermit	TX 79745	915-586-6658
WISE	Mr.	Wayne	Hinshaw	P.O. Box 393	Decatur	TX 76234	817-627-5743
WOOD	The Honorable	Lee	Williams	P.O. Box 938	Quitman	TX 75783	903-763-2716
YOAKUM	The Honorable	Dallas	Brewer	P.O. Box 456	Plains	TX 79355	806-456-7491
YOUNG	Mr.	Gib	Wright	P.O. Box 546	Olney	TX 76374	817-564-5111
ZAPATA	Mr.	Juan A.	Garza	P.O. Box 2908	Zapata	TX 78076	512-765-9950
ZAVALA	The Honorable	Ron	Carr	County Courthouse	Crystal City	TX 78839	512-374-3810

TEXAS TIER TWO COVER SHEET
Budget 7C790, Fund 135

Please complete this form with a typewriter or printer only.

MAIL TO: Texas Department of Health
Hazard Communication Branch
1100 West 49th Street
Austin, Texas 78756

Revised 1991

1. REPORTING PERIOD FROM JANUARY 1 TO DECEMBER 31, 1990, PAGE ( ) OF ( )
2. CHECK IF INFORMATION BELOW IS IDENTICAL TO INFORMATION SUBMITTED LAST YEAR ( )
3. SUBMITTED FOR FEDERAL FILING -- EPCRA, SEC. 311, FIRST TIME? YES ( )
4. EPCRA, SEC. 311, UPDATE ONLY? YES ( ) EPCRA, SEC. 312, ANNUAL ? YES ( )
5. SUBMITTED FOR STATE FILING -- TEXAS HAZARD COMMUNICATION ACT? YES ( )

6. TOTAL NUMBER OF CHEMICALS (COMMON NAMES) IN LIST ( )
7. FEE ATTACHED ($) CHECK NO. ( ) CHECK DATE ( )

Facility Identification in Texas

8. NAME OF FACILITY ( )

9. STREET ADDRESS ( )

10. CITY ( ) TEXAS ZIP ( )

11. COUNTY(IES) ( )

12. SIC CODE ( ) DUN & BRADSTREET NUMBER ( )

Owner or Operator

13. COMPANY NAME ( ) PHONE ( )

14. ADDRESS ( )

15. CITY ( ) STATE ( ) ZIP ( )

Emergency Contact

16. NAME ( ) TITLE ( )

17. PHONE ( ) 24 HR. PHONE ( )

18. NAME ( ) TITLE ( )

19. PHONE ( ) 24 HR. PHONE ( )

Certification (Read and sign after completing all sections): *I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals responsible for obtaining the information, I believe that the submitted information it true, accurate, and complete.*

20. OPTIONAL ATTACHMENTS -- I HAVE ATTACHED A SITE PLAN. YES ( )
21. I HAVE ATTACHED A LIST OF SITE COORDINATE ABBREVIATIONS. YES ( )
22. NAME & OFFICIAL TITLE OF AUTHORIZED REPRESENTATIVE (PLEASE TYPE)
    NAME ( ) TITLE ( )

23. SIGNATURE ( ) DATE SIGNED ( )

TEXAS TIER TWO CHEMICAL DESCRIPTION SHEET

Revised 1991

1. REPORTING PERIOD FROM JANUARY 1 TO DECEMBER 31, 1990, PAGE (   ) OF (   )

FACILITY IDENTIFICATION IN TEXAS

2. NAME OF FACILITY (   )
3. STREET ADDRESS (   )
4. CITY (   ) COUNTY (   ) TEXAS ZIP (   )

CHEMICAL DESCRIPTIONS

5. CHEMICAL DESCRIPTION: CAS# (   ) TRADE SECRET? YES (   )
6. CHEMICAL NAME(S): (   )
7. COMMON (LABEL) NAME: (   )
8. CHECK ALL THAT APPLY: PURE ( ) MIX ( ) SOLID ( ) LIQUID ( ) GAS ( ) EHS ( )
9. HAZARDS: FIRE ( ) PRESSURE ( ) REACTIVITY ( ) ACUTE ( ) CHRONIC ( )
10. RANGE VALUES: MAX DAILY AMT (   ) AVG DAILY AMT (   ) # DAYS ON-SITE (   )
11. EHS NAME: (   )
12. STORAGE CODES: LOCATIONS OR WORK AREAS IN FACILITY:

(   ) (   ) (   ) (   )
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13. PEAK STORAGE QTY: (   ) GALS. (   ) CU.FT. (   ) LBS. (   )
14. NFPA HAZARD RATING: HEALTH (   ) FLAMMABILITY (   ) REACTIVITY (   )

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Chemical name	CAS No.	Effective date
Acetaldehyde	75–07–0	01/01/87
Acetamide	60–35–5	01/01/87
Acetone	67–64–1	01/01/87
Acetonitrile	75–05–8	01/01/87
2-Acetylaminofluorene	53–96–3	01/01/87
Acrolein	107–02–8	01/01/87
Acrylamide	79–06–1	01/01/87
Acrylic acid	79–10–7	01/01/87
Acrylonitrile	107–13–1	01/01/87
Aldrin[1,4:5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1.alpha.,4.alpha.,4a.beta.,5.alpha.,8.alpha., 8a.beta.)-]	309–00–2	01/01/87
Allyl alcohol	107–18–6	1/01/90
Allyl chloride	107–05–1	01/01/87
Aluminum (fume or dust)	7429–90–5	01/01/87
Aluminum oxide (fibrous forms)	1344–28–1	01/01/87
2-Aminoanthraquinone	117–79–3	01/01/87
4-Aminoazobenzene	60–09–3	01/01/87
4-Aminobiphenyl	92–67–1	01/01/87
1-Amino-2-methylanthraquinone	82–28–0	01/01/87
Ammonia	7664–41–7	01/01/87
Ammonium nitrate (solution)	6484–52–2	01/01/87
Ammonium sulfate (solution)	7783–20–2	01/01/87
Aniline	62–53–3	01/01/87
o-Anisidine	90–04–0	01/01/87
p-Anisidine	104–94–9	01/01/87
o-Anisidine hydrochloride	134–29–2	01/01/87
Anthracene	120–12–7	01/01/87
Antimony	7440–36–0	01/01/87
Arsenic	7440–38–2	01/01/87
Asbestos (friable)	1332–21–4	01/01/87
Barium	7440–39–3	01/01/87
Benzal chloride	98–87–3	01/01/87
Benzamide	55–21–0	01/01/87
Benzene	71–43–2	01/01/87
Benzidine	92–87–5	01/01/87
Benzoic trichloride (Benzotrichloride)	98–07–7	01/01/87
Benzoyl chloride	98–88–4	01/01/87
Benzoyl peroxide	94–36–0	01/01/87
Benzyl chloride	100–44–7	01/01/87
Beryllium	7440–41–7	01/01/87
Biphenyl	92–52–4	01/01/87
Bis(2-chloroethyl) ether	111–44–4	01/01/87
Bis(chloromethyl) ether	542–88–1	01/01/87
Bis(2-chloro-1-methylethyl) ether	108–60–1	01/01/87
Bis(2-ethylhexyl) adipate	103–23–1	01/01/87
Bromoform (Tribromomethane)	75–25–2	01/01/87
Bromomethane (Methyl bromide)	74–83–9	01/01/87
1,3-Butadiene	106–99–0	01/01/87
Butyl acrylate	141–32–2	01/01/87
n-Butyl alcohol	71–36–3	01/01/87
sec-Butyl alcohol	78–92–2	01/01/87
tert-Butyl alcohol	75–65–0	01/01/87
Butyl benzyl phthalate	85–68–7	01/01/87
1,2-Butylene oxide	106–88–7	01/01/87
Butyraldehyde	123–72–8	01/01/87
C.I. Acid Green 3	4680–78–8	01/01/87
C.I. Basic Green 4	569–64–2	01/01/87
C.I. Basic Red 1	989–38–8	01/01/87
C.I. Direct Black 38	1937–37–7	01/01/87
C.I. Direct Blue 6	2602–46–2	01/01/87
C.I. Direct Brown 95	16071–86–6	01/01/87
C.I. Disperse Yellow 3	2832–40–8	01/01/87
C.I. Food Red 5	3761–53–3	01/01/87
C.I. Food Red 15	81–88–9	01/01/87
C.I. Solvent Orange 7	3118–97–6	01/01/87
C.I. Solvent Yellow 3	97–56–3	01/01/87
C.I. Solvent Yellow 14	842–07–9	01/01/87
C.I. Solvent Yellow 34 (Aurimine)	492–80–8	01/01/87
C.I. Vat Yellow 4	128–66–5	01/01/87

Chemical name	CAS No.	Effective date
Cadmium	7440-43-9	01/01/87
Calcium cyanamide	156-62-7	01/01/87
Captan[1H-Isoindole-1,3(2H)-dione,3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-]	133-06-2	01/01/87
Carbaryl [1-Naphthalenol, methylcarbamate]	63-25-2	01/01/87
Carbon disulfide	75-15-0	01/01/87
Carbon tetrachloride	56-23-5	01/01/87
Carbonyl sulfide	463-58-1	01/01/87
Catechol	120-80-9	01/01/87
Chloramben [Benzoic acid,3-amino-2,5-dichloro-]	133-90-4	01/01/87
Chlordane [4,7-Methanoindan,1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-]	57-74-9	01/01/87
Chlorine	7782-50-5	01/01/87
Chlorine dioxide	10049-04-4	01/01/87
Chloroacetic acid	79-11-8	01/01/87
2-Chloroacetophenone	532-27-4	01/01/87
Chlorobenzene	108-90-7	01/01/87
Chlorobenzilate [Benzeneacetic acid, 4-chloro-.alpha.-(4-.chlorophenyl)-.alpha.-hydroxy-, ethyl ester]	510-15-6	01/01/87
Chloroethane (Ethyl chloride)	75-00-3	01/01/87
Chloroform	67-66-3	01/01/87
Chloromethane (Methyl chloride)	74-87-3	01/01/87
Chloromethyl methyl ether	107-30-2	01/01/87
Chloroprene	126-99-8	01/01/87
Chlorothalonil [1,3-Benzenedicarbonitrile,2,4,5,6-tetrachloro-]	1897-45-6	01/01/87
Chromium	7440-47-3	01/01/87
Cobalt	7440-48-4	01/01/87
Copper	7440-50-8	01/01/87
Creosote	8001-58-9	1/01/90
p-Cresidine	120-71-8	01/01/87
Cresol (mixed isomers)	1319-77-3	01/01/87
m-Cresol	108-39-4	01/01/87
o-Cresol	95-48-7	01/01/87
p-Cresol	106-44-5	01/01/87
Cumene	98-82-8	01/01/87
Cumene hydroperoxide	80-15-9	01/01/87
Cupferron[Benzeneamine, N-hydroxy-N-nitroso, ammonium salt]	135-20-6	01/01/87
Cyclohexane	110-82-7	01/01/87
2,4-D [Acetic acid, (2,4-dichlorophenoxy)-]	94-75-7	01/01/87
Decabromodiphenyl oxide	1163-19-5	01/01/87
Diallate [Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester]	2303-16-4	01/01/87
2,4-Diaminoanisole	615-05-4	01/01/87
2,4-Diaminoanisole sulfate	39156-41-7	01/01/87
4,4'-Diaminodiphenyl ether	101-80-4	01/01/87
Diaminotoluene (mixed isomers)	25376-45-8	01/01/87
2,4-Diaminotoluene	95-80-7	01/01/87
Diazomethane	334-88-3	01/01/87
Dibenzofuran	132-64-9	01/01/67
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	01/01/87
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	01/01/87
Dibutyl phthalate	84-74-2	01/01/87
Dichlorobenzene (mixed isomers)	25321-22-6	01/01/87
1,2-Dichlorobenzene	95-50-1	01/01/87
1,3-Dichlorobenzene	541-73-1	01/01/87
1,4-Dichlorobenzene	106-46-7	01/01/87
3,3'-Dichlorobenzidine	91-94-1	01/01/87
Dichlorobromomethane	75-27-4	01/01/67
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	01/01/87
1,2-Dichlorethylene	540-59-0	01/01/87
Dichloromethane (Methylene chloride)	75-09-2	01/01/87
2,4-Dichlorophenol	120-83-2	01/01/87
1,2-Dichloropropane	78-87-5	01/01/87
2,3-Dichloropropene	78-88-6	1/01/90
1,3-Dichloropropylene	542-75-6	01/01/87
Dichlorvos [Phosphoric acid, 2,2-dichloroethenyl dimethyl ester]	62-73-7	01/01/87
Dicofol [Benzenemethanol,4-chloro-.alpha.-(4-chlorophenyl)-.alpha.-(trichloromethyl)-]	115-32-2	01/01/87
Diepoxybutane	1464-53-5	01/01/87
Diethanolamine	111-42-2	01/01/87
Di-(2-ethylhexyl) phthalate (DEHP)	177-81-7	01/01/87
Diethyl phthalate	84-66-2	01/01/87
Diethyl sulfate	64-67-5	01/01/87

Chemical name	CAS No.	Effective date
3,3'-Dimethoxybenzidine	119–90–4	01/01/87
4-Dimethylaminoazobenzene	60–11–7	01/01/87
3,3'-Dimethylbenzidine (*o*-Tolidine)	119–93–7	01/01/87
Dimethylcarbamyl chloride	79–44–7	01/01/87
1,1-Dimethyl hydrazine	57–14–7	01/01/87
2,4-Dimethylphenol	105–67–9	01/01/87
Dimethyl phthalate	131–11–3	01/01/87
Dimethyl sulfate	77–78–1	01/01/87
m-Dinitrobenzene	99–65–0	1/01/90
o-Dinitrobenzene	528–29–0	1/01/90
p-Dinitrobenzene	100–25–4	1/01/90
4,6-Dinitro-*o*-cresol	534–52–1	01/01/87
2,4-Dinitrophenol	51–28–5	01/01/87
2,4-Dinitrotoluene	121–14–2	01/01/87
2,6-Dinitrotoluene	606–20–2	01/01/87
Dinitrotoluene (mixed isomers)	25321–14–6	1/01/90
n-Dioctyl phthalate	117–84–0	01/01/87
1,4-Dioxane	123–91–1	01/01/87
1,2-Diphenylhydrazine (Hydrazobenzene)	122–66–7	01/01/87
Epichlorohydrin	106–89–8	01/01/87
2-Ethoxyethanol	110–80–5	01/01/87
Ethyl acrylate	140–88–5	01/01/87
Ethylbenzene	100–41–4	01/01/87
Ethyl chloroformate	541–41–3	01/01/87
Ethylene	74–85–1	01/01/87
Ethylene glycol	107–21–1	01/01/87
Ethyleneimine(Aziridine)	151–56–4	01/01/87
Ethylene oxide	75–21–8	01/01/87
Ethylene thiourea	96–45–7	01/01/87
Fluometuron [Urea, N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]-]	2164–17–2	01/01/87
Formaldehyde	50–00–0	01/01/87
Freon 113 [Ethane, 1,1,2-trichloro-1,2,2-trifluoro-]	76–13–1	01/01/87
Heptachlor[1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene]	76–44–8	01/01/87
Hexachlorobenzene	118–74–1	01/01/87
Hexachloro-1,3-butadiene	87–68–3	01/01/87
Hexachlorocyclopentadiene	77–47–4	01/01/87
Hexachloroethane	67–72–1	01/01/87
Hexachloronaphthalene	1335–87–1	01/01/87
Hexamethylphosphoramide	680–31–9	01/01/87
Hydrazine	302–01–2	01/01/87
Hydrazine sulfate	10034–93–2	01/01/87
Hydrochloric acid	7647–01–0	01/01/87
Hydrogen cyanide	74–90–8	01/01/87
Hydrogen fluoride	7664–39–3	01/01/87
Hydroquinone	123–31–9	01/01/87
Isobutyraldehyde	78–84–2	01/01/87
Isopropyl alcohol (Only persons who manufacture by the strong acid process are subject, no supplier notification.)	67–63–0	01/01/87
4,4'-Isopropylidenediphenol	80–05–7	01/01/87
Isosafrole	120–58–1	1/01/90
Lead	7439–92–1	01/01/87
Lindane [Cyclohexane, 1,2,3,4,5,6-hexachloro-(1.alpha.,2.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-]	58–89–9	01/01/87
Maleic anhydride	108–31–6	01/01/87
Maneb [Carbamodithioic acid, 1,2-ethanediylbis-, manganese complex]	12427–38–2	01/01/87
Manganese	7439–96–5	01/01/87
Mercury	7439–97–6	01/01/87
Methanol	67–56–1	01/01/87
Methoxychlor [Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxy-]	72–43–5	01/01/87
2-Methoxyethanol	109–86–4	01/01/87
Methyl acrylate	96–33–3	01/01/87
Methyl *tert*-butyl ether	1634–04–4	01/01/87
4,4'-Methylenebis(2-chloroaniline) (MBOCA)	101–14–4	01/01/87
4,4'-Methylenebis(*N,N*-dimethyl) benzenamine	101–61–1	01/01/87
Methylenebis(phenylisocyanate) (MBI)	101–68–8	01/01/87
Methylene bromide	74–95–3	01/01/87
4,4'-Methylenedianiline	101–77–9	01/01/87

Chemical name	CAS No.	Effective date
Methyl ethyl ketone	78-93-3	01/01/87
Methyl hydrazine	60-34-4	01/01/87
Methyl iodide	74-88-4	01/01/87
Methyl isobutyl ketone	108-10-1	01/01/87
Methyl isocyanate	624-83-9	01/01/87
Methyl methacrylate	80-62-6	01/01/87
Michler's ketone	90-94-8	01/01/87
Molybdenum trioxide	1313-27-5	01/01/87
Mustard gas [Ethane, 1,1'-thiobis[2-chloro-]	505-60-2	01/01/87
Naphthalene	91-20-3	01/01/87
alpha-Naphthylamine	134-32-7	01/01/87
beta-Naphthylamine	91-59-8	01/01/87
Nickel	7440-02-0	01/01/87
Nitric acid	7697-37-2	01/01/87
Nitrilotriacetic acid	139-13-9	01/01/87
5-Nitro-*o*-anisidine	99-59-2	01/01/87
Nitrobenzene	98-95-3	01/01/87
4-Nitrobiphenyl	92-93-3	01/01/87
Nitrofen [Benzene, 2,4-dichloro-1-(4-nitrophenoxy)-]	1836-75-5	01/01/87
Nitrogen mustard [2-Chloro-N-(2-chloroethyl)-N-methylethanamine]	51-75-2	01/01/87
Nitroglycerin	55-63-0	01/01/87
2-Nitrophenol	88-75-5	01/01/87
4-Nitrophenol	100-02-7	01/01/87
2-Nitropropane	79-46-9	01/01/87
p-Nitrosodiphenylamine	156-10-5	01/01/87
N,N-Dimethylaniline	121-69-7	01/01/87
N-Nitrosodi-*n*-butylamine	924-16-3	01/01/87
N-Nitrosodiethylamine	55-18-5	01/01/87
N-Nitrosodimethylamine	62-75-9	01/01/87
N-Nitrosodiphenylamine	86-30-6	01/01/87
N-Nitrosodi-*n*-propylamine	621-64-7	01/01/87
N-Nitrosomethylvinylamine	4549-40-0	01/01/87
N-Nitrosomorpholine	59-89-2	01/01/87
N-Nitroso-*N*-ethylurea	759-73-9	01/01/87
N-Nitroso-*N*-methylurea	684-93-5	01/01/87
N-Nitrosonornicotine	16543-55-8	01/01/87
N-Nitrosopiperidine	100-75-4	01/01/87
Octachloronaphthalene	2234-13-1	01/01/87
Osmium tetroxide	20816-12-0	01/01/87
Parathion [Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester]	56-38-2	01/01/87
Pentachlorophenol (PCP)	87-86-5	01/01/87
Peracetic acid	79-21-0	01/01/87
Phenol	108-95-2	01/01/87
p-Phenylenediamine	106-50-3	01/01/87
2-Phenylphenol	90-43-7	01/01/87
Phosgene	75-44-5	01/01/87
Phosphoric acid	7664-38-2	01/01/87
Phosphorus (yellow or white)	7723-14-0	01/01/87
Phthalic anhydride	85-44-9	01/01/87
Picric acid	88-89-1	01/01/87
Polychlorinated biphenyls (PCBs)	1336-36-3	01/01/87
Propane sultone	1120-71-4	01/01/87
beta-Propiolactone	57-57-8	01/01/87
Propionaldehyde	123-38-6	01/01/87
Propoxur [Phenol, 2-(1-methylethoxy)-, methylcarbamate]	114-26-1	01/01/87
Propylene (Propene)	115-07-1	01/01/87
Propyleneimine	75-55-8	01/01/87
Propylene oxide	75-56-9	01/01/87
Pyridine	110-86-1	01/01/87
Quinoline	91-22-5	01/01/87
Quinone	106-51-4	01/01/87
Quintozene [Pentachloronitrobenzene]	82-68-8	01/01/87
Saccharin (only persons who manufacture are subject, no supplier notification) [1,2-Benzisothiazol-3(2H)-one,1,1-dioxide]	81-07-2	01/01/87
Safrole	94-59-7	01/01/87
Selenium	7782-49-2	01/01/87
Silver	7440-22-4	01/01/87
Styrene	100-42-5	01/01/87
Styrene oxide	96-09-3	01/01/87
Sulfuric acid	7664-93-9	01/01/87

Chemical name	CAS No.	Effective date
Terephthalic acid	100-21-0	01/01/87
1,1,2,2-Tetrachloroethane	79-34-5	01/01/87
Tetrachloroethylene (Perchloroethylene)	127-18-4	01/01/87
Tetrachlorvinphos [Phosphoric acid, 2-chloro-1-(2,4,5-trichlorophenyl)ethenyl dimethyl ester]	961-11-5	01/01/87
Thallium	7440-28-0	01/01/87
Thioacetamide	62-55-5	01/01/87
4,4'-Thiodianiline	139-65-1	01/01/87
Thiourea	62-56-6	01/01/87
Thorium dioxide	1314-20-1	01/01/87
Titanium tetrachloride	7550-45-0	01/01/87
Toluene	108-88-3	01/01/87
Toluene-2,4-diisocyanate	584-84-9	01/01/87
Toluene-2,6-diisocyanate	91-08-7	01/01/87
Toluenediisocyanate (mixed isomers)	26471-62-5	1/01/90
o-Toluidine	95-53-4	01/01/87
o-Toluidine hydrochloride	636-21-5	01/01/87
Toxaphene	8001-35-2	01/01/87
Triaziquone [2,5-Cyclohexadiene-1,4-dione,2,3,5-tris(1-aziridinyl)-]	68-76-8	01/01/87
Trichlorfon [Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-, dimethyl ester]	52-68-6	01/01/87
1,2,4-Trichlorobenzene	120-82-1	01/01/87
1,1,1-Trichloroethane (Methyl chloroform)	71-55-6	01/01/87
1,1,2-Trichloroethane	79-00-5	01/01/87
Trichloroethylene	79-01-6	01/01/87
2,4,5-Trichlorophenol	95-95-4	01/01/87
2,4,6-Trichlorophenol	88-06-2	01/01/87
Trifluralin [Benzeneamine, 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)-1]	1582-09-8	01/01/87
1,2,4-Trimethylbenzene	95-63-6	01/01/87
Tris(2,3-dibromopropyl) phosphate	126-72-7	01/01/87
Urethane (Ethyl carbamate)	51-79-6	01/01/87
Vanadium (fume or dust)	7440-62-2	01/01/87
Vinyl acetate	108-05-4	01/01/87
Vinyl bromide	593-60-2	01/01/87
Vinyl chloride	75-01-4	01/01/87
Vinylidene chloride	75-35-4	01/01/87
Xylene (mixed isomers)	1330-20-7	01/01/87
m-Xylene	108-38-3	01/01/87
o-Xylene	95-47-6	01/01/87
p-Xylene	106-42-3	01/01/87
2,6-Xylidine	87-62-7	01/01/87
Zinc (fume or dust)	7440-66-6	01/01/87
Zineb [Carbamodithioic acid, 1,2-ethanediylbis-, zinc complex]	12122-67-7	01/01/87

(b)

CAS Number listing.

THE TEXAS STATE SUPERFUND PROGRAM: CURRENT DEVELOPMENTS

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Austin, Texas

3rd Annual Texas Environmental SuperConference
State Bar of Texas
August 1 and 2, 1991

OUTLINE OF CONTENTS

THE TEXAS STATE SUPERFUND PROGRAM:
CURRENT DEVELOPMENTS

I. Overview of the State Superfund Program.

A. Purpose and Scope of the State Superfund Program.

As originally enacted, effective September 1, 1985, the state superfund program was conceived as a means for the state of Texas to address those sites which may pose a public health threat but which were not subject to the Resource Conservation and Recovery Act of 1976 ("RCRA")[1] and not eligible for cleanup under the federal superfund program embodied in the Comprehensive Environmental Response Compensation and Liability Act of 1980 ("CERCLA").[2] Until 1985, Texas had no program for handling inactive or abandoned sites, or for reaching generators and transporters with respect to such sites, except through use of the state's water quality laws. The state superfund program is statutorily contained in Subchapters F and I of the Texas Solid Waste Disposal Act ("TSWDA"), Chapter 361 TEX. HEALTH AND SAFETY CODE ANN. (Vernon Pamph. 1991).

The state superfund program was apparently modeled after CERCLA but it originally had significant differences. Many of these significant differences were eliminated in statutory amendments enacted by S.B. 1502 of the 71st Legislature.[3] Like CERCLA, the state superfund statutes require the Texas Water Commission ("TWC") to formulate a prioritized list of sites from which there is an actual or threatened release of hazardous substances which pose an imminent and substantial endangerment to public health and safety or the environment. Like CERCLA, the TWC attempts to secure the voluntary cooperation of potentially responsible parties ("PRP"s) in performing a cleanup of the site, with PRPs defined generally as all current owners and operators of the site, former owners or operators of the site at the time of disposal of the hazardous substances, and all generators and transporters of hazardous substances to the site. Following the caselaw as developed in CERCLA cases, the Texas state superfund statutes expressly provide that PRPs are jointly and severally liable for cleanup of the site. Furthermore, this liability is in the nature of a strict liability since a PRP has a defense to liability only when the release is caused solely by (1) an Act of God; (2) an act of war; or (3) an act or omission of a third party so long as the PRP has exercised due care and taken precautions against foreseeable acts or omissions of the third party and, where

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1 42 U.S.C. §§6901-6991

2 42 U.S.C. §§9601-9675

3 Acts 1989, 71st Leg., ch. 703

there is any type of contractual relationship between the PRP and the third party, the "innocent landowner" requirements of §361.275(e) and (f) are met. Finally, like CERCLA, the state superfund statutes create a fund from which the state can finance cleanup actions and they establish a mechanism pursuant to which cleanup costs expended from the fund can be recovered from the PRPs.

B. The "Superfund".

The state superfund is the Hazardous Waste Disposal Fee Fund authorized by §361.133 of the TSWDA, otherwise designated by the TWC as Fund 550. This Fund, originally composed of fees imposed on the land disposal of hazardous waste ($10 per dry weight ton), was made the state's source for 10% matching monies on CERCLA fund-lead sites on the National Priorities List ("NPL") and monies for cleanup of the state registry sites. The fee is collected quarterly on the previous quarter's disposal activities and it may be adjusted by the TWC to produce sufficient revenues to meet Fund obligations. In 1989, amendments to the TSWDA provided two new sources of revenue for the Fund. The Fund was authorized to retain interest earned on the Fund balance and a new fee was imposed on commercial hazardous waste storage, processing, and disposal facilities, 50% of which fee was allocated to the Fund.

Pursuant to H.B. 1986, enacted by the 72nd Legislature,[4] the Hazardous Waste Disposal Fee Fund is redesignated as the Hazardous and Solid Waste Remediation Fee Fund. This Fund is composed of fees imposed on the owner or operator of an industrial solid waste or hazardous waste facility for commercial and noncommercial management or disposal of hazardous waste (now known as hazardous waste management fees) and the new lead acid battery fees imposed by §361.138; interest and penalties for late payment of a fee or late filing of a report under §361.140; money paid by a PRP for facility cleanup and maintenance under §361.197; interest received from investment of the fund; and monies transferred from other agencies or grants made for the purpose of remediation of facilities. The projected balance in the Fund as of the end of FY 1991 (August 31, 1991) will be approximately $23 million, of which approximately $3 million would be unobligated. The new hazardous waste management fees are expected to generate approximately $6-8 million in the first year for Fund 550.

The TWC may use the Fund not only for necessary and appropriate removal, remedial action, and maintenance activities, expenses of compliance with CERCLA, as amended, and the state superfund statutes, but now also for expenses concerning the

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[4] Acts 1991, 72nd Leg., ch. ____

regulation and management of household hazardous substances and pollution prevention and costs of cleanup or removal of a spill or release of hazardous substances where immediate action is appropriate to protect human health and the environment. The new statute goes on to prescribe that the Fund shall maintain an unobligated balance of at least $5 million and no more than $25 million at the end of each fiscal year.

C. The State Superfund Program.

At this time there are 29 sites on the state superfund registry and, in accordance with the new procedure for proposing sites prior to listing them, there are 8 sites proposed for listing on the state superfund registry. Of the 29 sites currently on the state registry, 12 are being funded by PRPs, three with state funds, and 14 are currently under negotiation with PRPs. Two of the 29 sites are in the process of being delisted. Four of the 29 sites are under TWC administrative orders which have been appealed by PRPs to the District Court of Travis County. Of the 8 recently proposed sites, five are expected to be investigated using state funds and three are under negotiation with PRPs for the conduct of a remedial investigation/feasibility study (RI/FS).

The state superfund program is administered by the Superfund and Emergency Response Section of the Hazardous and Solid Waste Division of the TWC. The Superfund and Emergency Response Section includes four units having responsibility for state superfund activities. The Pre-remedial Unit has responsibility for all site discovery and preliminary assessment functions approximately equivalent to the time period from initial evaluation to the point of negotiation for a RI/FS. The RI/FS I Unit has responsibility for conducting state contracted RI/FS's under the state superfund program and oversight of PRP-lead RI/FS phase activities including remedy selection and negotiation of remedial action settlements. The RI/FS II Unit also has responsibility for conducting RI/FS work on state superfund sites, in addition to all federally funded RI/FS and management assistance activities. The Design Engineering Unit has responsibility for oversight of all remedial action phase activities.

D. The State Superfund Process.

The first step in the state superfund program is identifying those sites requiring cleanup which may be eligible for listing on the state registry. Typically, candidate sites originate as cases from the TWC's enforcement program for RCRA and non-RCRA facilities. Another source is citizen complaints which result in discovery and inspection of abandoned sites by the TWC field offices. Under §361.182 of the TSWDA, the TWC has broad power to investigate sites for possible inclusion on the state superfund registry, including the power to send requests for information similar to CERCLA §104(e) letters used by EPA.

After a candidate site is identified as not being capable of achieving compliance through actions of an owner or operator under the TWC's RCRA enforcement program, the statute indicates that any identified PRPs should be given an opportunity to resolve the potential environmental endangerment through an agreed administrative order issued under §361.272 of the TSWDA. When both of these avenues of addressing the site prove unavailing, the site is ranked using the state superfund Hazard Ranking System ("HRS"). If it appears that the site would rank for the NPL, the site would be referred to EPA for cleanup as a CERCLA site. If not, and the HRS score exceeds the TWC's minimum criteria for listing on the state registry, the site would be formally proposed for listing.[5]

After determining a site's eligibility for the state superfund registry, the staff publishes public notice of the intent to list the site and an opportunity to comment and request a public meeting (a non-contested case hearing), as well as certified mail notice to all identified PRPs.[6] If a public meeting is requested, notice of same is published in a local newspaper and mailed to PRPs and is also published in the Texas Register. Typically, however, the staff conducts a public meeting in the local area for all sites proposed for the registry regardless of whether a public meeting is requested. The purpose of the meeting is to answer the public's questions about the site and the state superfund process and so that the staff can obtain additional information about the site and other PRPs. After the public meeting, the TWC files, or has the owner of the site file, a notice in the real property records of the county identifying the site as one proposed for the state registry. Once a site is proposed for the state superfund registry, no person may perform a partial or total removal action, or make any substantial change in use of the site without the advance written approval of the Executive Director of the TWC.[7]

After the public meeting, the staff calls in all identified PRPs for a meeting to discuss the possibility of achieving an agreed TWC order for the conducting of a RI/FS or other similar study as approved by the Executive Director.[8] The PRPs have 90 days from the date of issuance of a notice of intent to list the

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[5] TSWDA §361.183

[6] TSWDA §361.184

[7] TSWDA §361.186

[8] TSWDA §361.185

site to submit a good faith offer for the performance of the RI/FS or similar study. If some or all of the PRPs submit a good faith offer, they have an additional 60 days in which to negotiate the terms of an agreed order for the conduct of a RI/FS or similar study. By entering into such an agreed order, the PRPs cannot be required to perform the subsequent remedial action or to admit liability for site remediation. If PRPs fail or refuse to voluntarily conduct a RI/FS, the TWC may conduct or complete the study using Fund monies. To provide an incentive to achieve an agreed order, the statute specifies that TWC oversight costs may not be assessed against those parties who fund or perform the RI/FS, whereas nonparticipating PRPs may be assessed the full costs of TWC oversight of the RI/FS phase.

The remedial action phase of a state superfund cleanup utilizes procedures similar to those used in the RI/FS phase. The Executive Director selects a proposed remedial action from the actions proposed in the feasibility study following which a non-contested case public meeting is held in the local area to receive comments on the proposed remedial action.[9] The remedial action alternative selected is one that is, in the judgment of the TWC, the alternative which has the lowest cost, is technologically feasible and reliable, and that provides adequate protection for the public health and safety or the environment.[10] Notice of the public meeting is published in a local newspaper and mailed to all PRPs. After the public meeting, the staff would call in all PRPs for a meeting to discuss the achievement of an agreed TWC order for the implementation of the remedial action. The PRPs have 60 days from the date of the public meeting to submit a good faith offer to fund or perform the remedial action. If some or all of the PRPs submit a good faith offer, they have an additional 60 days in which to negotiate the terms of an agreed TWC order. As with the RI/FS phase, the TWC cannot require that the PRPs admit to liability in the order, and TWC oversight costs may not be assessed against PRPs who fund or perform the remedial action.

After consideration of all good faith offers to perform a remedial action, the TWC issues a final administrative order that, among other things, formally lists the site on the state registry;

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[9] TSWDA §361.187

[10] TSWDA §361.193

specifies the remedial action and schedule for implementation; and designates responsible parties.[11] A site is deleted from the registry upon written petition of a PRP to the TWC.[12]

Any person subject to the TWC administrative order may appeal the order to the District Court of Travis County by filing a petition within 45 days of receipt of the order.[13] The appeal must be prosecuted with reasonable diligence within one year after being filed or else the court shall presume that the action has been abandoned. The appealing party must join the TWC as a party and may join any other persons who may be responsible regardless of whether the TWC order named such party in its administrative order. The filing of a petition does not prevent the state from proceeding with the site remediation unless expressly enjoined by the court. The district court must uphold the TWC's administrative order if the TWC proves by a preponderance of the evidence that: (1) there is an actual or threatened release of hazardous substances which constitutes an imminent and substantial endangerment to the public health and safety or the environment; and (2) the person subject to the administrative order is liable for the elimination of the release (i.e., that the person is a person responsible under §361.271 of the TSWDA). If the appropriateness of the remedial action is contested on appeal, the TWC's remedial action alternative must be upheld unless the court determines that the remedy is arbitrary or unreasonable. The court may also apportion liability among the responsible parties in accordance with the criteria set forth in §361.343 of the TSWDA.

A cost recovery action is filed by the TWC against all responsible parties who have not complied with the administrative order within one year of the completion of the remedial action.[14] The cost recovery judgment sought by the state may include costs of the remedial action, costs of any necessary studies, and oversight costs less the amount paid by other responsible parties. The cost recovery action may also include civil penalties for failure to comply with either of the two TWC administrative orders. Such action may also include a claim for up to twice the state's costs, including reasonable attorneys fees, reasonable costs of preparing and providing witnesses, and reasonable costs of studies, analyses,

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11 TSWDA §361.188

12 TSWDA §361.189

13 TSWDA §361.322

14 TSWDA §361.197

engineering reports, tests, and other necessary projects, if the nonparticipating PRP's defenses to liability are determined by the court to be unreasonable, frivolous, or without foundation.[15]

E. Highlights of 1989 Statutory Amendments.

The above process for administering state superfund cases was part of the comprehensive revision to the state superfund statutes enacted by S.B. 1502 of the 71st Legislature, effective September 1, 1989. Besides the establishment of the above CERCLA-type process, S.B. 1502 enacted several more significant changes in the scope and impact of the state superfund program from the system that had been in place since 1985. The following is a brief listing of the significant changes which occurred in 1989:

1. The state superfund program's jurisdiction was expanded to include not just sites from which there was a release of hazardous wastes, but also sites from which hazardous substances had been released.

2. The "automatic stay" feature of old section 9 of the TSWDA was eliminated so that now a site remedy may go forward even though the TWC administrative order is under appeal.

3. The investigatory authority of the TWC was expanded as reflected in §361.182 to allow, among other things, the filing of enforceable requests for information similar to CERCLA §104(e) letters.

4. The TWC was granted authority to conduct immediate removal actions at any facility prior to it being listed on the state superfund registry using monies from the Fund, and clarifying that state financed immediate removal actions do not need the approval of the Legislature.

5. The TWC was granted authority to impose administrative and civil penalties against PRPs who violate a state superfund administrative order and authority for inclusion of stipulated penalties in agreed administrative orders.

6. The TWC was required to create a program for mixed funding of state superfund cleanups, a de minimis settlement program, and to establish minimum criteria for listing a site on the state registry and for making PRP financial viability determinations.

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[15] TSWDA §361.341

7. Additional incentives for PRPs to enter into agreed orders with the TWC for site cleanups were created by providing that TWC oversight costs may be recovered against nonparticipating PRPs and by allowing double recovery of the state's costs against nonparticipating PRPs whose defenses to liability in an appeal of a TWC order are determined to be frivolous.

II. <u>The Proposed State Superfund Rules.</u>

A. Purpose and Scope of the Rules.

The amendments to the State Superfund statutes in 1989 necessitated the promulgation of an entire new set of rules to address the new process for managing state superfund cases and to implement new approaches to obtaining settlements of PRP liability. After an extended period of research and informal consultation with various interested parties, the staff drafted a substantial body of new rules which were formally proposed by the TWC and published in the Texas Register on March 19, 1991. A copy of the new rules as proposed is provided as Attachment I to these materials. At the present time, these rules are scheduled for formal adoption by the TWC at its 3:00 p.m. agenda on August 7, 1991.

The new rules are structured as a repeal of all existing rules concerning the State Superfund program contained in 31 TAC Chapter 335, Subchapter K (§§335.341 through 335.346) and as an adoption of new §§335.341 through 335.352. The structure of the old rules did not lend itself to an easy understanding of the state superfund process as a whole and they contained many references to aspects of the program which are now inapplicable. The new rules do not attempt to provide a step-by-step explanation of the state superfund process, since that process is already set forth in great detail in Subchapter F of the TSWDA. The new rules do, however, attempt to clarify for affected parties several key areas of interest which are unaddressed for the most part by the statutes and which have traditionally been maintained as informal or "in-house" guidelines.

B. Section-By-Section Highlights of the New Rules.

Section 335.341 (Purpose and Scope) of the new rules sets forth the purpose of the rules and directs the reader to read the rules in conjunction with the detailed statutory provisions of Subchapter F of the TSWDA. It goes on to describe the pre-proposal procedures for identifying and scoring sites, while making clear that if a site can be remediated through the voluntary cooperation of some or all of the PRPs pursuant to an agreed TWC order, the site need not even be proposed for listing.

Section 335.342 (Definitions) sets forth definitions of words and phrases typically encountered in the state superfund process but which have not already been defined in the TSWDA. These include "good faith offer", "imminent and substantial endangerment", "non-participating PRP", and "RI/FS".

Section 335.343 (Ranking of Facilities) describes the scoring process and sets forth the minimum score of 5.0 as a prerequisite for being proposed for the state superfund registry. This section also incorporates by reference as Appendix I the Texas State Superfund Hazard Ranking System Guidance Document.

Section 335.344 (Delisting and Modifications) describes the process for delisting a site or modifying a site's priority ranking. This process includes provisions for a public hearing on contested delisting proposals. The rule makes clear that no requests for delisting will be granted by the TWC until, at a minimum, the facility has been fully investigated under the terms of a RI/FS or other similar study as approved by the Executive Director.

Section 335.345 (Requests for Information or Production of Documents) sets forth the statutory authorization of the Executive Director to send requests for information to PRPs in investigating a site at any stage in the process. This section includes provisions for seeking a TWC order to compel responses to the request for information. Provision is made for the designation of responses as confidential if they would divulge trade secrets.

Section 335.346 (Removal Actions and Preliminary Site Investigations) prohibits the performance of a removal action or preliminary site investigation without the advance written authorization of the Executive Director, with notice and opportunity to comment by all other PRPs. The rule makes clear that by agreeing to a preliminary removal action, the TWC is not making a divisibility determination nor waiving the right to subsequently require a full site investigation.

Section 335.347 (Financial Capability Determinations) sets forth the financial documentation the Executive Director will request and review in order to make a judgement as to the financial viability of PRPs.

Section 335.348 (General Requirements for a RI/FS) sets forth the requirement of a RI/FS as a prerequisite for any remedial action. It makes clear that although the contents of a RI/FS for any particular site will vary according to the circumstances of the site, it must at least be sufficient to adequately characterize the nature and extent of contamination and to allow the TWC to select an appropriate remedial action. Basic elements of a RI/FS are described which include proposals to investigate surface waters, subsurface sediments, soils, groundwater, climatological factors, and impacts on local ecology. As part of any RI/FS, a baseline public health evaluation would normally be required to be conducted in accordance with the EPA's "Risk Assessment Guidance for Superfund - Vol. 1: Human Health Evaluation Manual" or other equivalent risk assessment guidance document. This section also sets forth criteria for evaluating remedial action alternatives. Finally, the rule incorporates by reference in Appendix II, a "List of TWC and EPA Technical Guidance Documents" which the Executive Director will utilize in evaluating specific elements of a RI/FS including sampling and analysis plans, quality assurance/quality control plans, health and safety plans, and treatability studies.

Section 335.349 (General Requirements for a Remedial Action) describes the relevant factors to be considered in a remedial action plan. These include a design engineering report, construction plans and specifications, and an operation and maintenance plan.

Section 335.350 (Defenses to Liability and Claims of Divisibility) describes the TWC policy concerning the "innocent landowner" defense or any other defense established by §361.275 of the TSWDA. Generally, a PRP may submit documentation proving an entitlement to the defense, but only in those cases where it is unequivocally demonstrated that the defense applies would the Executive Director agree to exclude a PRP from being named in a TWC order. The reason for this is that the statute envisions that the innocent landowner defense and a claim of divisibility must be advanced in district court where the PRP would prevail only if it can prove up the defense or claim by a preponderance of the evidence. Thus, the Executive Director is not required by the statute to even consider such defensive claims. Even if the Executive Director were to give effect to such a defensive claim prior to its being adjudicated in court, such an action would not impair the right of the remaining PRPs to seek cost recovery from the putative innocent landowner in court. Thus the rule makes clear that any decision by the Executive Director on a defensive claim will have no res judicata or collateral estoppel effect on a PRP's ultimate liability as subsequently determined by the district court.

Section 351.151 (Settlement Agreements) describes the various avenues for achieving settlements of PRP liability at the TWC level. These include partial settlements, mixed funding remedies, de minimis settlements, and covenants not to sue. Contribution protection is afforded by the terms of subsection (f) which provides that any settlement agreement with the TWC does not discharge the liability of any other PRP unless its terms so provide, but it does reduce the potential liability of the other

PRPs by the amount of the settlement. All PRPs will be afforded an opportunity to comment on any settlement agreement with the TWC to which it is not a party.

Section 351.152 includes Appendix I and II as described above.

sponsoring broker has received written conformation from the commission authorizing the salesman to act as a real estate agent]. A salesman whose original application or renewal application **was not subject to MCE requirements or** was subject to educational requirements imposed by the Real Estate License Act, §7, is not subject to MCE requirements as a condition of returning to active status during the term of the license issued from the original application or renewal application. The commission **may** [shall] not issue a license reflecting the sponsorship or otherwise confirm that the salesman is authorized to act as a real estate agent until the commission has received documentation of satisfaction of **any required MCE courses** [requirements] in a form acceptable to the commission **and all other requirements have been met to return the salesman's license to active status.** For the purposes of this section, the commission may accept as documentation a course completion certificate or letter from an approved MCE provider or such other proof as is satisfactory to the commission.

This agency hereby certifies that the proposal has been reviewed by legal counsel and found to be within the agency's authority to adopt.

Issued in Austin, Texas, on March 12, 1991.

TRD-9102882 Mark A. Moseley
General Counsel
Texas Real Estate Commission

Earliest possible date of adoption: April 19, 1991

For further information, please call: (512) 465-3900

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TITLE 31. NATURAL RESOURCES AND CONSERVATION

Part IX. Texas Water Commission

Chapter 335. Industrial Solid Waste and Municipal Solid Waste

Subchapter K. Hazardous Waste Facilities Assessment and Remediation

(Editor's note: The text of the following sections proposed for repeal will not be published. The sections may be examined in the offices of the Texas Water Commission or in the Texas Register office, Room 245, James Earl Rudder Building, 1019 Brazos Street, Austin.)

• 31 TAC §§335.341-335.346

The Texas Water Commission (TWC) proposes the repeal of §§335.341-335.346 and new §§335.341-335.352, concerning the identification, assessment, and remediation of hazardous substance facilities or areas (state superfund sites).

The TWC is required, under the Texas Solid Waste Disposal Act, Texas Health and Safety Code, Chapter 361 (Vernon's Supplement 1990), Subchapter F, §§361. 181-361.202, as amended, (the Act) to identify and assess facilities that may constitute an imminent and substantial endangerment to public health and safety or the environment due to a release or a threatened release of hazardous substances into the environment. The facilities or areas so identified are to be listed on the state registry (state superfund list) which shall identify the priority for action at each listed facility. The executive director of the TWC may use money in the hazardous waste disposal fee fund for removal and remedial action at listed sites if there are insufficient funds available from potentially responsible parties or from the federal government.

This set of proposed sections completely replaces the existing §§335. 341-335.346; it also adds §§335.347-335.352. The proposed sections set forth in detail the procedures for implementing the comprehensive revisions to the state superfund program enacted by the 71st Legislature under Senate Bill 1502 (Acts 1989, 71st Legislative, Chapter 703, §5, amending Texas Civil Statutes, Article 4477-7, §13). In addition, the sections seek to set out policies and procedures of general applicability which the executive director of the Texas Water Commission (the executive director) will follow when scoring a facility for listing, considering delisting petitions, conducting financial capability determinations, evaluating a remedial investigation/feasibility study or a remedial action, and negotiating settlement agreements. A brief summary of the effect of each of the sections of 31 TAC Chapter 335, Subchapter K is set forth below.

Section 335.341 concerning purpose and scope is repealed and replaced with new §335.341 concerning purpose and scope to describe the applicability of Subchapter K and the procedures the executive director is statutorily required to follow in determining whether a facility qualifies for the state superfund registry.

Section 335.342 concerning definitions is repealed and replaced with new §335.342 definitions to propose a set of definitions of terms not already defined in the Act. This section also proposes to adopt by reference all definitions set forth in the Act which are not specifically included in this section.

Section 335.343 concerning draft survey is repealed because it is no longer applicable, and it is replaced with new §335.343 conerning ranking of facilities. This new section describes the procedures the executive director proposes to use to score a facility to determine its eligibility for listing on the registry. This section adopts by reference an Appendix I to Subchapter K entitled "Texas State Superfund Hazard Ranking System Guidance Document" which describes the quantitative analysis the executive director uses to determine the hazardous ranking score.

Section 335.344 concerning registry is repealed and replaced with new §335. 344 concerning delisting and modifications to set forth criteria for deleting facilities from the registry or for modifying information regarding such a facility, as well as for holding public hearings on delisting and modification requests.

Section 335.345 concerning substantial change in use is repealed and replaced with new §335.345 concerning requests for information or production of documents to describe procedures the executive director may employ under the Act for obtaining information or documents concerning a state superfund site.

Section 335.346 cocnerning delisting and modifications is repealed and replaced by new §335.346 removal actions and preliminary site investigations to describe procedures for obtaining executive director authorization to conduct removal actions and preliminary site investigations at state superfund sites. This section also makes clear that such an authorization to conduct a preliminary site investigation or partial removal does not constitute a waiver by the TWC of any obligation of the potentially responsible parties (PRPs) to conduct a full remedial investigation and feasibility study (RI/FS) or remedial action at a later point.

New §335.347 concerning financial capability determinations proposes that the executive director will determine whether a PRP is financially capable of participating in a facility investigation or remediation and includes the criteria to be used in making such a determination.

New §335.348 general requirements for a RI/FS proposes a detailed listing of general requirements for a RI/FS. Although a study similar to a RI/FS may be approved as an alternative to the performance of a full RI/FS, any such study must adequately characterize the site so as to enable the TWC to select an appropriate remedial action to address the cleanup of the release or threatened release of the hazardous substance(s) present at a particular site. Among other requirements, a RI/FS must include investigations of surface water, soils, hydrogeology, local climatological conditions, impacts on sensitive natural resources and ecological systems, concentrations and sources of hazardous substances, and a baseline public health evaluation, a description of remedial action alternatives, and a RI/FS workplan and report.

New §335.349 concerning general requirements for a remedial action proposes general requirements for a remedial action and provides that the executive director will select the appropriate remedial action for each site based on the results of the feasibility study.

New §335.350 conerning defenses to liability and claims of divisibility proposes requirements for demonstrating a PRP's entitlement to certain defenses to liability established in the Act. This section places the burden of proof on the PRP to show that it qualifies for a defense or for a determination of divisibility.

New §335.351 conerning settlement agreements proposes guidelines by which settlement agreements may be reached. The general purpose of this section is to encourage the achievement of a negotiated settlement so that effective cleanup of the Superfund site can be done quickly. The proposed sections cover partial settlements, mixed funding settlements, de minimis settlements, and covenants not to sue.

Section 335.352 conerning Appendix I is adopted by reference. To obtain copies of this section, please contact the Texas Water

ATTACHMENT I

Commission, Library, P.O. Box 13087, 1700 North Congress Avenue, Austin, Texas 78711-3087, (512) 463-7834.

Roger G. Bourdeau, chief fiscal officer, has determined that for the first five-year period these sections are in effect, there will be fiscal implications as a result of enforcing or administering these sections. Generally, these sections will affect the costs to a potentially responsible party in the process of determining the extent of obligation for a State Superfund site and the actions to be taken. These costs would not presumably be higher than those under existing regulations, but would vary on a case-by-case basis. Under the revisions to the State Superfund Program, the commission has contemplated expansion of the efforts to identify and remediate contaminated sites. The effect on state government will be an increase in cost of $975,000 in each of the fiscal years 1991-1995. Costs of site investigation and remediation are not directly attributable to this proposal, but are projected to increase by $6 million annually for the period 1991-1993. Costs beyond 1993 have not been projected at this time. There are no fiscal impacts to local governments or economies anticipated.

Mr. Bourdeau also has determined that for each year of the first five years these sections as proposed are in effect, the public benefit anticipated as a result of enforcing and administering the sections will be improvements in the identification, assessment and remediation of facilities which may constitute an imminent and substantial endangerment to public health and safety or the environment due to the improper management enforcement of hazardous substances and enhanced enforcement of the provisions of the Texas Health and Safety Code and the regulations of the Texas Water Commission. There will be no effect on small businesses. There are no anticipated costs to persons required to comply with these sections.

Comments on the proposed sections may be submitted to Steve Dickman, Staff Attorney, Legal Division, Texas Water Commission, P.O. Box 13087, 1700 North Congress Avenue, Austin, Texas 78711-3087. Comments will be accepted 45 days after publication of these proposed sections in the *Texas Register*.

• 31 TAC §§35.341-335.346

The repeals are proposed under the Texas Water Code, §5.103, which provides the Texas Water Commission with the authority to adopt any rules necessary to carry out the powers and duties under the provisions of the Texas Water Code and other laws of this state. These sections are also repealed under the Texas Solid Waste Disposal Act, Texas Health and Safety Code, (Vernon Supplemental 1990), §361.024, and Senate Bill 1502, Acts 1989, 71st Legislature, Chapter 703, §5, (amending Texas Civil Statutes Article 4477-7, §13.)

§335.341. Purpose and Scope.

§335.342. Definitions.

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§335.344. Registry.

§335.345. Substantial Change in Use.

§335.346. Delisting and Modifications.

This agency hereby certifies that the proposal has been reviewed by legal counsel and found to be within the agency's authority to adopt.

Issued in Austin, Texas, on March 12, 1991.

TRD-9102968 Jim Haley
Director, Legal Division
Texas Water Commission

Earliest possible date of adoption: ~~April 19~~, May 6, 1991

For further information, please call: (512) 463-8069

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• 31 TAC §§335.341-335.352

The new sections are proposed under the Texas Water Code, §5.103, which provides the Texas Water Commission with the authority to adopt any rules necessary to carry out the powers and duties under the provisions of the Texas Water Code and other laws of this state. These sections are also proposed under the Texas Solid Waste Disposal Act, Texas Health and Safety Code (Vernon Supplement 1990), §361.024, and Senate Bill 1502, Acts 1989, 71st Legislature, Chapter 703, §5, (amending §13 Texas Civil Statutes, Article 4477-7.)

§335.341. Purpose and Scope.

(a) The purpose of this subchapter is to establish an assessment and remediation program to identify and assess facilities that may constitute an imminent and substantial endangerment to public health and safety or the environment due to a release or threatened release of hazardous substances into the environment. The provisions of this subchapter supplement and therefore should be read in conjunction with the provisions of Subchapter F of the Texas Solid Waste Disposal Act, Texas Health and Safety Code, Chapter 361 (Vernon Supplement), §361.181 et seq. as amended, herein referred as the Act.

(b) This subchapter applies only to facilities listed or proposed for listing on the State Registry pursuant to the Act.

(1) Prior to proposing a facility for inclusion on the State Registry, the executive director shall first determine whether any potential endangerment to public health and safety or the environment at a facility can be resolved by the present owner or operator under the federal Resource Conservation and Recovery Act, 42 United States Code §6901 et seq. (1976), as amended.

(2) If the potential endangerment cannot be fully resolved by the present owner or operator, then the executive director shall determine whether the potential endangerment can be resolved by voluntary cooperation of some or all of the potentially responsible parties (PRPs) identified in the Act, §361.271, pursuant to an agreed administrative order issued by the commission. If it can be cleaned up pursuant to Agreed Administrative Order, then it should not be listed.

(3) If, after reasonable efforts, the executive director determines that the potential endangerment to public health and safety or the environment cannot be resolved by either of these approaches, the executive director shall evaluate the facility to determine whether it is eligible for listing on the federal National Priorities List established pursuant to the federal Comprehensive Environmental Response, Compensation, and Liability Act, 42 United States Code §9601 et seq. (1980), as amended.

(4) The executive director shall determine whether the facility is eligible for proposed listing on the State Registry only if, based on information available to the executive director, the facility is not eligible for inclusion on the Federal National Priorities List.

(5) If the executive director determines that the potential endangerment to public health and safety or the environment can be resolved by any of the approaches described in subsection (b)(1)-(3) of this section, then the site will not be proposed for listing on the State Registry. Notice of the approach selected to resolve the apparent endangerment to public health and safety or the environment and the fact that such action is being taken in lieu of listing the facility on the State Registry shall be published in the Texas Registry.

§335.342. Definitions. Definitions set forth in the Act that are not specifically included in this section shall also apply. The following words and terms, when used in this subchapter, shall have the following meanings, unless the context clearly indicates otherwise.

Agreed order–An administrative order issued by the commission and agreed to by one or more PRPs for the purpose of settling potential liability for the remedial investigation/feasibility study and/or remediation of a facility proposed for listing, or listed on, the State Registry.

Divisible–That the hazardous substance(s) released or threatened to be released are capable of being managed separately under a remedial action plan.

Facility–

(A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer public-owned treatment works, well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft); or

(B) any site or area where a hazardous substance has been posted, stored, disposed of, or placed or otherwise come to be located, but does not include any consumer product in consumer use or any vessel.

Federal hazard ranking system–The scoring system developed by the United States Environmental Protection Agency as set out in 40 Code of Federal Regulations Part 300, Appendix A, as amended.

Good faith offer–A written proposal by one or more PRPs which is not contingent on participation of other PRPs which, in the judgment of the executive director, will:

(A) in the case of a good faith offer to fund or perform a remedial investigation/feasibility study or other similar study, effectively determine the nature and extent of the release or threatened release of hazardous substances and its impact on air, soils, groundwater, and surface water, both within and beyond the boundaries of the facility; or

(B) in the case of a good faith offer to fund or perform a remedial action, effectively mitigate or minimize damage to, and provide adequate protection of, the public health and safety or the environment.

Hazardous waste disposal fee fund–The fund described in the Act, §361.133.

Imminent and substantial endangerment–A danger is imminent if, given the entire circumstances surrounding each case, exposure of persons or the environment to hazardous substances is more likely than not to occur in the absence of preventive action. A danger is substantial if, given the current state of scientific knowledge, the harm to public health and safety or the environment which would result from exposure could cause adverse environmental or health effects.

Non-participating PRPs–Potentially responsible parties who:

(A) are unwilling or unable to join in the making of a good faith offer;

(B) are unwilling or unable to become a party to an agreed order to perform an RI/FS or remedial action; or

(C) intentionally violate the terms of an agreed order so as to substantially interfere with the achievement of the purposes of the agreed order.

Oversight costs–All administrative costs and costs for technical and legal services incurred by commission personnel, or agents or contractors for the commission, incurred in the oversight of the RI/FS and remedial action, plus all such costs incurred in verifying compliance by PRPs with the terms of any agreed order which may be issued.

Potentially responsible party (or "PRP")–A person potentially responsible for solid waste as defined in the Act, §361.271.

Remedial investigation/feasibility study (or RI/FS)–

(A) an investigative study of the entire facility designed to determine the nature and extent of a release or threatened release of hazardous substances and, as appropriate, its impact on air, soils, groundwater, and surface water, both within and beyond the boundaries of the facility in accordance with the requirements of §335.348 of this title (relating to General Requirements for a RI/FS); and

(B) a study which describes and evaluates a set of remedial action alternatives for effectively mitigating or minimizing damage to, and for providing adequate protection of, the public health and safety or the environment in accordance with the requirements of §335.348 of this title (relating to General Requirements for a RI/FS).

Remedial action plan–A detailed plan for the design, construction, and long-term operation and maintenance of the remedial action agreed to by the commission.

Substantial change in use–A physical or functional alteration of a facility, the effect of which is to interfere significantly with a proposed or ongoing RI/FS or similar study or to expose the public health and safety or the environment to a significantly increased threat of harm. The term includes, but is not limited to, actions such as the erection or razing of a building or other structure at the facility, the use of a facility for agricultural production, the paving over of a facility, the creation of a park or other public or private recreational use on the facility, and any partial or total removal actions at a facility.

State superfund hazard ranking system–The scoring system used by the executive director for determining the relative priority for an RI/FS or remedial action needed at a facility.

§335.343. Ranking of Facilities.

(a) The relative priority for action needed at a facility investigated by the executive director for possible listing on the State Registry is based on a State Superfund Hazard Ranking System (HRS). The State Superfund HRS is a methodology designed to determine a numerical score for a facility based on the judgment of the executive director concerning various factors which may impact the public health and safety or the environment. The State Superfund HRS is published as a guidance document by the Hazardous and Solid Waste Division of the commission and is included with these sections as Appendix I.

(b) Upon appropriate investigation by the executive director, a facility proposed for listing on the State Superfund Registry will be assigned a State Superfund HRS score. A facility may be proposed for listing on the State Superfund Registry if it is assigned a state Superfund HRS score 5.0 or greater.

(c) Facilities with the highest State Superfund HRS score shall receive the highest priority for remedial action and state-funded cleanup, unless a situation described in the Act, §361.191 warrants more immediate action.

(d) The relative priority for action at facilities listed on the State Registry will be periodically reviewed and revised by the commission as necessary to accurately reflect the need for action at the facilities.

§335.344. Delisting and Modifications.

(a) Any PRP of a facility listed or proposed for listing on the State Registry or any interested person may request the executive director to delete such facility from the Registry, modify the facilities priority ranking within the Registry, or modify any information regarding such facility by submitting a written statement setting forth the grounds of the request. The PRP or interested person shall submit to the executive director any information as may be reasonably required to enable the executive director to further evaluate the facility including, but not limited to, information on all factors used to develop a State Superfund HRS score and to make a determination on the request.

(b) The commission shall hold a public contested case hearing within the meaning of the Administrative Procedure and Texas Register Act, Texas Civil Statutes, Article 6252-13a (Vernon Supplement 1990) on requests filed pursuant to subsection (a) of this section, provided that a written request for hearing is filed with the Chief hearings examiner of the commission by any PRP of a facility listed or proposed for listing on the Registry, or any interested person, within 30 days after receipt of a determination by the executive director made pursuant to a request filed in accordance with subsection (a) of this section. At least 30 days prior to the date set for hearing, notice shall be provided by first class mail to all other PRPs and other interested persons, and by publication in a newspaper of general circulation in the county where the facility is located. The person submitting the request shall bear the cost of publication of the notice.

(c) In making a determination under subsection (a) of this section, the executive director or the commission will consider the following:

(1) the extent to which the facility has been remediated pursuant to the terms of a remedial action plan agreed to by the executive director;

(2) what further action, if any, is appropriate;

(3) whether the release no longer poses an imminent and substantial endangerment to public health and safety or the environment and, therefore, taking further action is not appropriate; or

(4) whether, because of the nature of the remedial action implemented at the facility, it is not yet feasible to make a determination that the remedial action has effectively remediated the release or threat of release of hazardous substances.

(d) No requests for the delisting of a facility from the State Registry or requests to modify information about a facility eligible for listing on the Registry will be granted unless, at a minimum, the facility has been investigated pursuant to the terms of an RI/FS or other similar study approved by the executive director.

§335.345. Requests for Information or Production of Documents.

(a) The executive director may submit requests for information and requests for production of documents as authorized by the Act, §361.182 to any person who has information or documents which in the executive director's opinion are necessary for the adequate investigation or remediation of a facility listed on the Registry or proposed for listing on the Registry. If the requested information or documents are not produced in a timely manner, the executive director may petition the commission to issue an order directing compliance with the requests for information or production of documents. The executive director shall serve a copy of the petition on the person to whom the request for information or production of documents was directed at least 20 days prior to the scheduled date of commission action on the petition. The person to whom the request for information or production of documents was directed may appear before the commission and present evidence and argument on the petition or in support of a claim asserted under subsection (b) of this section, or the commission may refer the matter to the office of hearings examiners for the taking of evidence.

(b) Information or documents provided to the executive director in accordance with this section are presumed to be public records except to the extent that a showing satisfactory to the commission is made that the information or documents would divulge trade secrets if made public. The commission shall deem the information or documents to be confidential and not subject to public disclosure if such a showing is made. Upon request, confidential information and documents supplied to the executive director will be returned to the person supplying the information or documents after it has served the purpose for which it was requested by the executive director.

§335.346. Removal Actions and Preliminary Site Investigations.

(a) For facilities listed on the Registry or proposed for listing on the Registry, no person may perform any partial or total removal activities at such facility or conduct on-site sampling, testing, or preliminary investigations of any type at such facility without the advance written authorization of the executive director after notice and opportunity for comment to all other PRPs.

(b) To expedite the executive director's consideration of a proposal to conduct removal activities or preliminary investigations at a facility, the person proposing such actions should submit to the executive director a workplan describing the precise nature of the removal or investigation activities proposed, a safety and health plan and a QA/QC plan as well as a schedule for completing various subtasks identified in the workplan.

(c) Any authorization by the executive director to perform on-site testing, sampling, or preliminary investigations or partial or total removal activities at a facility does not constitute a finding or determination by the commission that such testing, sampling, or preliminary investigation constitutes an approved RI/FS or that the removal activities constitute the final remedial action. An authorization by the executive director to perform any partial or total removal activities also does not constitute a determination or finding by the commission that any release or threatened release attributed to the removed materials is divisible as defined in the Act.

§335.347. Financial Capability Determinations.

(a) The executive director will make a determination of whether a PRP is financially capable of participating in a facility investigation or remediation. Such a determination may be based on some or all of the following financial information:

(1) audited financial statements;

(2) federal or state income tax returns;

(3) a PRP's gross and net income for each of the preceding three years;

(4) a PRP's net worth for each of the preceding three years;

(5) a PRP's current cash flow position;

(6) a PRP's longterm liabilities;

(7) the liquidity of a PRP's assets; and

(8) any other data which requested pursuant to 31 TAC §335.345 of this title (relating to Requests for Information or Production of Documents), which in the opinion of the executive director is relevant to a determination of the ability of the PRP to participate in a facility investigation or remediation.

(b) A determination by the executive director pursuant to this section shall be provided to all PRPs.

§335.348. General Requirements for a RI/FS.

(a) Unless otherwise directed by the commission, a remedial investigation/feasibility study or other similar study as approved by the TWC shall be completed before the executive director's selection of the remedial action, except for emergency removal actions and preliminary site investigations pursuant to 31 TAC 335.346 of this title (relating to Removal Actions and Preliminary Site Investigations).

(b) A similar study may be approved by the TWC as an appropriate alternative to the performance of a full RI/FS when necessary to avoid delay, to make more effective use of resources or when such similar study is sufficient to adequately characterize a site.

(c) The contents of the remedial investigation/feasibility study, as approved by the commission, will depend on the particular circumstances of each specific facility. Under any RI/FS, however, sufficient information must be collected and evaluated to allow the commission to select an appropriate remedial action.

(d) A remedial investigation/feasibility study may include the following, as appropriate to a particular facility, for the purpose of allowing the TWC to select an appropriate remedial action.

(1) Investigations of surface water and sediments necessary to characterize hydrologic features such as surface drainage patterns, areas of erosion and sediment deposition, surface waters, floodplains of surface and subsurface sediments which would influence the type and rate of hazardous substance migration or affect the ability to implement alternative remedial actions shall be characterized.

(2) Investigations to adequately characterize the vertical and areal distribution and concentrations of hazardous substances in the soils encompassing the facility. Properties associated with the soils which would influence the type and rate of hazardous substance migration or affect the ability to implement alternative remedial actions shall be characterized.

(3) Investigations of hydrogeology and geology to adequately characterize the horizontal and vertical distribution and concentrations of hazardous substances in the ground water and the features which affect the fate and transport of those hazardous substances. This should include, but is not limited to, the physical

properties and distribution of bedrock and unconsolidated materials, groundwater flow rate and gradient for contaminated and potentially contaminated aquifers, groundwater divides, areas of groundwater recharge and discharge, and location of public and private groundwater wells.

(4) Information regarding local climatological characteristics which are likely to affect the hazardous substance migration such as: rainfall patterns; frequency of storm events; temperature variations; prevailing wind direction; and wind velocity.

(5) Information to determine the impact or potential impact on the natural resources and ecology of the area such as sensitive environments, plant and animal species and other environmental receptors.

(6) Descriptions of the location, quantity, horizontal and vertical extent, concentrations and sources of hazardous substances in disposal areas. Information on the physical and chemical characteristics and the toxicological effects of hazardous substances shall be provided, if available.

(7) In order to identify possible health problems associated with the "no action" remedial action alternative, a Baseline Public Health Evaluation will be conducted in accordance with the Environmental Protection Agency's Superfund Public Health Evaluation Manual. The evaluation may not be required when the executive director determines that remediation standards are apparent and undisputed and adequately protective of human health and the environment.

(8) The number and types of remedial action alternatives to be evaluated shall take into consideration the particular characteristics and complexities of the facility. Development of remedial action alternatives shall include, at a minimum, the following:

(A) an alternative which involves the treatment of wastes to health-based levels or the level of Best Demonstrated Available Technology (BDAT);

(B) an alternative consisting of containment of all wastes either on-site or off-site;

(C) an alternative consisting of a combination of on-site and off-site containment;

(D) no remedial action.

(9) At a minimum, the following criteria will be used to evaluate each remedial action alternative:

(A) the extent to which the alternative mitigates long-term exposure of any residual contamination;

(B) the extent to which the alternative achieves remediation standards and complies with applicable federal, state and local regulations;

(C) the extent to which the alternative permanently and significantly reduces the volume, toxicity, and mobility of hazardous substances;

(D) the present value cost including the total costs of implementation and annual operation and maintenance costs;

(E) the extent to which local community concerns are addressed and whether implementation of the alternative would result in other adverse effects on the local community;

(F) other significant impacts on human health and the environment resulting from implementation of the remedial action alternative; and

(G) the technical merits of each remedial alternative relative to the other.

(10) A workplan for a RI/FS shall be submitted to the executive director for final review and possible modifications and shall include the following:

(A) a Sampling and Analysis Plan covering all sampling activities to be undertaken pursuant to the RI/FS;

(B) a Quality Assurance/Quality Control (QA/QC) Plan to assure the integrity of all samples taken pursuant to the RI/FS;

(C) a Health and Safety Plan to describe steps to be taken to assure the health and safety of all personnel engaged in implementing the RI/FS; and

(D) a Schedule of Implementation for all aspects of the RI/FS.

(11) Treatability studies may be required as necessary to provide information to evaluate remedial action alternatives.

(12) A report shall be prepared at the completion of the remedial investigation/feasibility study and submitted to the executive director for review, possible modification and final approval.

§335.349. General Requirements For a Remedial Action.

(a) Based on the proposals set forth in the feasibility study, the executive director shall select a remedial action. The selection of the remedial action shall be based on relevant information collected during the remedial investigation/feasibility study, or other approved study, as well as any other information available to the commission. The commission may select a final remedial action which incorporates elements from different remedial action alternatives as proposed in a RI/FS.

(b) Engineering documents submitted in connection with the remedial action will be required to demonstrate compliance with relevant cleanup standards, except as provided in the Act, §361.193. The scope of these documents will depend on the nature and complexity of the proposed remedial action and may vary from site to site.

(c) A remedial action plan shall consider the following factors if relevant to a particular facility, but shall not be limited to, those factors, as follows:

(1) a design engineering report to include information for the development and review of construction plans and specifications;

(2) construction plans and specifications describing in detail the cleanup actions to be performed and prepared in conformance with currently acceptable engineering techniques and practices; and

(3) an operation and maintenance plan to assure effective and environmentally safe operations under normal and emergency situations.

§335.350. Defense to Liability and Claims of Divisibility.

(a) The burden of establishing that a PRP qualifies for any defenses to liability set forth in the Act, §361.275, or that a release is divisible as set forth in the Act, §361.276, lies with the PRP asserting such claim.

(b) A PRP must demonstrate to the executive director its entitlement to a defense or claim under the Act, §361.275 or §361.276. The determination by the executive director of a PRP's request for limitation of liability under these sections of the Act is a discretionary act which does not entitle the PRP to an appeal to the commission or an adjudicatory hearing on such determination.

(c) The executive director will not consider claims of divisibility until a site has been adequately characterized by a RI/FS or other approved study.

(d) A determination by the executive director on a defense or claim asserted under the Act, §361.275 or §361.276, shall have no res judicata or collateral estoppel effect on a PRP's ultimate liability for remediation of a facility as determined in subsequent commission proceedings or in district court.

§335.351. Settlement Agreements.

(a) General purpose. The Texas Water Commission encourages PRPs to enter into negotiated settlement agreements with the commission so that an effective cleanup of a State Superfund facility can be quickly implemented while at the same time resolving PRPs' apparent liability for the facility. The goal of the executive director in negotiating PRP settlements is to obtain a complete investigation and cleanup of the facility by PRPs, or to collect from PRPs 100 of the commission's cost of performing a complete investigation and cleanup of the facility.

(b) Partial settlements. The commission may consider a settlement proposal for cleanup of less than 100% of a facility's cleanup activities or cleanup costs. Upon settling with cooperative parties, the commission will vigorously seek all remaining relief, including full cost recovery of monies expended from the Hazardous Waste Disposal Fee Fund, including penalties, damages, and interest where appropriate, as well as TWC oversight costs, from parties whose non-cooperation prevented the achievement of a complete settlement.

(c) Mixed funding. Mixed Funding means use of funds from federal, state, and private party sources, or any combination of those sources, to fund a timely response action. Mixed funding may be used in the following circumstances.

(1) In order to achieve an expeditious cleanup of a facility listed on the Registry, the commission may agree to reimburse parties to a settlement agreement from the Hazardous Waste Disposal Fee Fund, with interest, for certain costs incurred as a result of the timely implementation of the remedial action plan that the parties agree to perform but which the commission agrees to finance. The commission may agree to utilize funds from whatever other federal or state source is available to the commission for the funding of a facility remediation.

(2) Mixed funding shall be provided only to PRPs whom the commission has found to be eligible and who have entered into an agreed administrative order with the Texas Water Commission. The agreed administrative order shall identify remedial action tasks to be addressed by the mixed funding, costs to be borne by the hazardous waste disposal fee fund and the terms of agreement.

(3) A PRP must submit sufficient documentation, as requested by the executive director, to support its request for mixed funding.

(4) The commission's granting of a request for mixed funding does not diminish or alter the standard and scope of liability as set out in the Act. The commission will not approve mixed funding based solely on the grounds that a share of wastes at a site may be attributable to an unknown or financially non-viable party. In addition, the availability or the amount of any fund-financing for a particular site will not be dependant on consistency with any volumetric allocation.

(5) Good faith negotiations and early cooperation of settlers will be considered in mixed funding requests. Mixed funding for remedial actions would not be appropriate where the executive director did not receive a good faith offer for the participation of the PRPs in the completion of the remedial investigations/feasibility study.

(6) If a PRP is found to be eligible for mixed funding, the executive director shall make an initial determination regarding the amount of funding to be provided. This determination is solely within the discretion of the executive director and is not subject to adjudication in an administrative hearing or appeal to the commission. A determination of eligibility is not a funding commitment as actual funding will depend on availability of funds and approval of the commission.

(7) Where a remedial action has been completed at a facility pursuant to a mixed funding agreement, the Hazardous Waste Disposal Fee Fund (the Fund) shall be subject to an obligation for subsequent remedial actions at the same facility only to the extent that such subsequent actions are necessary by reason of failure of the original remedial action. Such obligation shall be in a proportion equal to, but not exceeding, the proportion contributed by the Fund for the original remedial action. The Fund's obligation for such future remedial action may be met through fund expenditures, or through payment by parties who were not signatories to the original agreement.

(8) Pursuant to the Act, §361.133(c), the executive director may use money in the Hazardous Waste Disposal Fee Fund for necessary and appropriate removal and remedial action at sites at which solid waste or hazardous substances have been disposed if funds from a liable party, independent third party, or the federal government are not sufficient for the removal or remedial action. A necessary and appropriate aspect of any such removal or remedial action is the construction of a fence as necessary to provide site security, and the taking and analysis of samples of potential hazardous substances, and potentially contaminated soils, surface water and ground water.

(d) De minimis settlements. The commission may reach a final settlement with a PRP for only a minor portion of the response costs at a facility if the conditions in either of the following subparagraphs (1) or (2) of this subsection are met.

(1) A PRP can demonstrate the following:

(A) the amount of the hazardous substances contributed by a particular PRP is minimal in comparison to the amounts of other hazardous substances at the facility; or

(B) the toxicity or other hazardous effects of the hazardous substances contributed by a particular PRP are minimal in comparison to the toxicity or other hazardous effects of other hazardous substances at the facility.

(2) The PRP can demonstrate that it:

(A) is the owner of the real property on or in which the facility is located;

(B) did not conduct or permit the generation, transportation, storage, treatment, or disposal of any hazardous substance at the facility; and

(C) did not contribute to the release or threat of release of a hazardous substance at the facility through any action or omission.

(3) Paragraph (2) of this subsection does not apply if the PRP purchased the real property with actual or constructive knowledge that the property was used for the generation, transportation, storage, treatment, or disposal of any hazardous substance.

(e) Covenants not to sue.

(1) The commission may, in its discretion, provide any PRP with a covenant not to sue concerning any existing or future liability resulting from a release or threatened release of a hazardous substance addressed by a remedial action if each of the following conditions is met:

(A) the covenant not to sue is in the public interest as determined by criteria set forth in subparagraph (2) of this section;

(B) the granting of the covenant not to sue would expedite a remedial action approved by the commission; and

(C) the PRP is in full compliance with the terms of any order issued by the commission for response to the release or threatened release concerned.

(2) In assessing the appropriateness of granting a covenant not to sue and in determining the appropriate legal scope of such a covenant, the commission shall consider whether the covenant is in the public interest on the basis of such factors as the following:

(A) the effectiveness and reliability of the remedial action, in light of other alternative remedies considered for the facility concerned;

(B) the nature of the environmental risks remaining at the facility;

(C) the extent to which performance standards are included in the order or decree;

(D) the extent to which the response action provides a complete remedy for the facility, including a reduction in the hazardous nature of the substances at the facility;

(E) the extent to which the technology used in the response action is demonstrated to be effective;

(F) whether the Hazardous Waste Disposal Fee Fund or other sources of funding would be available for any additional remedial actions that might eventually be necessary at the facility; and

(G) whether the remedial action will be carried out, in whole or in significant part, by the PRPs themselves.

(3) A covenant not to sue shall be subject to the satisfactory performance by the PRP of its obligations under any order issued by the commission for response of remedial actions to address the release or threatened release of a hazardous substance at the facility. A covenant not to sue concerning future liability for remediation of the facility shall not take effect until the executive director certifies that the remedial action has been completed in accordance with any such order issued by the commission.

(4) A covenant not to sue a PRP concerning future liability for remediation of a facility may include an exception to the covenant that allows the commission to sue such person where such liability arises out of conditions which are unknown to the executive director at the time he certifies under paragraph (3) of this subsection that the remedial action has been completed at the facility. A covenant not to sue may provide that such future liability may be limited to the same proportion as that established in the original settlement agreement or order issued by the commission.

(f) Any settlement agreement with the commission which resolves a PRP's liability for remediation of a facility does not discharge the liability of any other PRP unless its terms so provide, but it reduces the potential liability of the other PRPs by the amount of the settlement. A PRP will be afforded the opportunity to comment on any settlement agreement with the commission to which it is not a party.

This agency hereby certifies that the proposal has been reviewed by legal counsel and found to be within the agency's authority to adopt.

Issued in Austin, Texas on March 12, 1991.

TRD-9102969

Jim Haley
Director, Legal Division
Texas Water Commission

Earliest possible date of adoption: ~~April 19,~~ 1991 May 19

For further information, please call: (512) 463-8069

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THINKING ABOUT INSURANCE
A FIRST COURSE IN ENVIRONMENTAL INSURANCE ISSUES

by

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1991[1]

[1]The views expressed in this paper are not necessarily those of Mr. Alleman, Vial, Hamilton, Koch & Knox, or any of the firm's clients. The material in this article is also intended as a general overview of a complicated and complex subject and is not intended as legal advice or counsel.

THINKING ABOUT INSURANCE
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by
THOMAS B. ALLEMAN*

It is probably true - and just as probably unfortunate - that we all take insurance for granted. Insurance is such a deeply ingrained part of our personal and business lives that we tend to ignore it. But taking insurance for granted is, at best, perilous, and the time is soon approaching when the whole concept of insurance as we now know it may change radically.

To get some idea of why this is, one need only look at the "facts of environmental life." According to figures from the EPA, there are approximately 30,000 sites in the United States that are candidates for inclusion on the National Priorities List. The NPL, or Superfund List, as it is sometimes known, is something of a "hall of shame" for toxic waste sites. Only the worst can make it onto the list and those on the list are the first candidates to be cleaned up as a part of the ongoing national effort to remedy environmental problems. But the average cost of cleaning up a Superfund site is presently running somewhere in the neighborhood of \$3 - \$5 million, and the price is going up as clean up standards become more stringent.

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If we are conservative, and assume hypothetically that each of the 30,000 sites on the Superfund list can be cleaned up for $1 million each, the total cost of cleaning up America's toxic waste sites approaches $30 billion, and that figure does not address the cost of tort suits by persons who claim injury, cancer or disease from these sites, legal fees, and ancillary clean-up expenses, which all too often are a part of this process. If this estimate is anything approaching correct, the $30 billion dollar bill to clean up environmental waste sites is more than enough to bankrupt all of America's insurance companies, all of the London market companies --in fact it is enough to wipe out all of the surplus of all of the active insurance companies in the world at present policy rates. The same amount of money is more than enough to bankrupt or at least to wipe out virtually all of America's large chemical manufacturing companies. What has happened in response to this burden is that the insurance companies and the chemical companies are engaged in a coverage war over environmental insurance that is being fought down to the last "Republican associate" in order to determine whether there is in fact insurance coverage for environmental clean-up (as well as asbestos, savings and loan bail outs, torts and wrong turns at one-way intersections.) To understand the problems associated with insurance coverage for environmental clean-up and why this "war" has begun, it is appropriate to start at the beginning and look what insurance is intended to do and then proceed to a number of the issues that are "hottest" in the environmental coverage area.

I. THE BASICS OF INSURANCE.

When all is said and done, the question of what constitutes insurance boils down to a matter of statistics. Just as an average life expectancy can be shown by looking at a large universe of people, so it is also possible to show that in an average year an average business will be subjected to a determinable number of claims. Putting the matter in practical terms, just as it is possible to show that in any given year an average of X percent of all Americans will break their leg, it is possible to show - although somewhat imprecisely - that in a given year X number of all businesses will be sued for products liability, negligence or other similar torts.

Once this is known, and once the average costs of such claims are known, it is possible to distribute the risk of being subject to such a claim. In other words, if two of one hundred businesses will be subject to claims of $1,000 each for liability during the course of the given year, all 100 businesses can share the risk by agreeing to contribute to a fund that will pay the $2,000 in claims. It does not take much arithmetic to see that by splitting $2,000 among 100 businesses, the total cost of risk sharing goes down dramatically and, in our hypothetical, from $1,000 per business to $20.00 per business. Although most of the time a business will pay money to share risks and not have any claims, in essence what it is doing is paying for protection against the fortuitous possibility that it will be the subject of a liability claim.

When the risks being shared are relatively common occurrences such as personal injury, automotive negligence, or things that happen all the time, it is possible to compute the likelihood that someone will be exposed to such a claim as well as the likely cost of such a claim on average with the considerable degree of precision.[2]

It is also possible to share more exotic risks, including risks associated with pollution, collapse of savings and loans, medical malpractice, and also a host of other similar matters.[3] Indeed, as insurance evolved from an information risk sharing pool on ocean voyages conducted at a London coffee house in the late Seventeenth Century to modern property and casualty businesses, this is just what has occurred. But the concept of insurance, whatever the kind of property or liability involved, remains just that simple. The distribution of risks among a number of people who pay some portion of the perceived total exposure in return for the right to take from that fund if they are subjected to one of the shared risks.

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[2]Take this with a grain of salt. We are dealing with statistical probabilities, elected judges, and lawyers here, and not the laws of physics.

[3]Remember that the fewer events, the more difficult it is to judge the statistical likelihood that they will occur or the likely cost associated with the liability.

An essential concept in insurance is the concept of fortuity or fortuitousness. Obviously, insurance becomes a license to cheat or cause harm if an individual who intends or expects the harmful consequences of an act may claim the insurance for it as a matter of right. The reason for such a rule is obvious:

> Insurance works only if risks are shifted, not if the certainties of loss or harm or liability are. Thus, a person who acts in anticipation of hurting another cannot be permitted to have insurance as a cushion for the harm he or she causes. Having insurance would not only give license to wrongdoers but would, in fact, make it impossible to insure as well.

R. Keeton, Insurance Law, §5.3.

Fortuity involves a second concept that is crucial in the understanding of environmental matters, and that is the concept of repetition. Just as it is true that fortuity excludes from insurability certain kinds of conduct, it must also be true that it excludes from insurability certain kinds of consequences. The routine and regular costs of an activity or the conduct of a business should not, cannot and in most cases are not insurable. Insurance is not intended to shift the <u>internal</u> risks of running one's own business, only to shift <u>external</u> risks that come from unknown, external factors. It is for this reason, for example, that liability policies generally do not insure against faulty workmanship, warranty claims, or other claims of breach of contract. All of these defects are within the control of the manufacturer or person who makes the product, and therefore are not fortuitous.[4]

Also of importance in this regard is the concept of recurring or known risk. Some risks are repetitive in nature, and their consequences are known. For example, in <u>City of Carter Lake v. Aetna Cas. & Sur. Co.</u>, 604 F.2d 1052 (8th Cir. 1978), the city operated a sewer which, under certain conditions caused water and sewage to back up into the basement of a number of houses. When the issue was reported to the city the first time, it found out what the problem was but took no steps to fix it. The condition, however, recurred and the property owners finally filed suit against the city for the continuing backup of sewage. The city asked its liability insurance company to defend and indemnify the lawsuit, but the insurance company refused to do so, citing the concept that this was a "known risk," that is, a risk whose consequences were known by the city prior to the time that the claim was made. The court approved and held that insurance could not be available for this kind of problem where the city expected the results that ultimately it was sued over. The question of how much repetition there should be before an act no longer is fortuitous is debatable. Judge Keeton, one of the leading authors in the insurance field, tells us that it often becomes a matter of the court's perception. But in general terms, in the business and

[4]In simplest terms, an individual who refuses or fails to provide appropriate quality control cannot and should not be allowed to use insurance as a device for his own shoddy work.

in the environmental area, the longer a practice continues and the more its consequences are actually known or should be obvious the less likely it is to be fortuitous.

It is against its background that we can turn to an examination of the CGL policy.

II. THE BASICS OF LIABILITY POLICY CONSTRUCTION.

Anyone who takes the time to sit down and read their comprehensive general liability insurance policy or their commercial general liability insurance policy - an activity widely viewed as being suitable only for the treatment of chronic insomniacs - will discover that the policy basically has three parts. In the first part, called the basic insuring language, the policy sets out the kinds of things that it will insure. Here, one sees several phrases and definitions that are crucial to the environmental insurance industry and these are: "occurrence," "bodily injury," "property damage," and "damages."[5]

The policy then continues with a series of exclusions. As the name implies, this second section describes a number of areas that otherwise would be insurable but for which coverage is not provided. In the environmental area, there are three exclusions that are of particular importance. The first of these is the "pollution" exclusion, and the second is the "premises alienated"

[5]These provisions are attached in the Appendix.

exclusion, and the third is the "care, custody and control" exclusion. The policy also contains a number of conditions. A condition is a policy provision with which the insured must comply before coverage is available. With respect to CGL policies and environmental problems, the two conditions that are of most importance are the one requiring the insured to give notice of a claim or suit, and the other requiring the insured not to take any action that would materially prejudice the insurer's position.

It is important to remember in dealing with insurance questions that the law generally views insurance in the same way that it does any other contract, and therefore will apply the rules of contract law to determining what was said or not said in an insurance policy. Most of these rules--like baseball chestnut, "Ties go to the runner"--are intended for situations when the parties either were not as clear as they wanted to be or did not draft an appropriate agreement in the first place. An additional problem arises because most if not all of the rules that govern the construction of the contracts are drafted by lawyers, and therefore there are numerous exceptions, conditions, shadings, provisions, and caveats.[6]

When reduced to a reasonably simple array, the rules that govern construction contract turn out to be this. First, if the parties are clear about what they meant in a contract, it will be

[6]These all turn up because lawyers perceive that the situation is different and not because they want to have continued employment.

enforced as written. Second, in order to figure out if the parties were clear, the words used will be used in their ordinary "plain" sense --that is, they will be used as an ordinary person would use them, unless they are defined in the contract or are otherwise a term of art in the industry.[7] Third, the court must look to the whole contract and not merely to pieces and parts in enforcing the contract. All terms must be given effect and one term cannot be construed so as to read another out of the contract. If the contract is "ambiguous," if there are at least two meanings that can be ascribed to a given word or phrase, the parties may introduce evidence to show what they really intended and the court must give effect to that intent as revealed by the additional or extrinsic evidence. In the event that such evidence is not available, or if the contract is one of "adhesion," one in which the bargaining power of the parties is very unequal and the party with the greater bargaining power is able to enforce its terms on the other, then the contract will be construed against the person who wrote it all insurance contracts will be construed to provide coverage or in favor of the weaker party whenever possible.

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[7]For example, "Freight on Board" which in common sense terms means that the load is on the train, is such a term of art. It has a specific meaning in commercial usage that based on long tradition and that meeting would be imported into any contract where that phrase was seen.

The contracts to which these principles can be applied are, generally speaking, relatively standard documents that have evolved in phases over the years. And a pause to discuss this evolution as necessary to show why it is important.

Prior to 1966, most business liability insurance provided coverage only for accidents. Most courts and policies defined "as "sudden catastrophic and identifiable" events such as car crashes, explosions and events of that nature. As time went on, however, it became clear that the concept of accident as producing element of damage was not necessarily the best way to view liability. Products liability, torts involving disease rather than sudden injury, and such matters as the improper but slow deterioration of buildings made the continuing applicability of the "accident" definition debatable. In fact, most courts that construed accident policies in this period --not many but some --decided that the sudden concept contained in the pre-1966 CGL policies did not have a temporal application and therefore concluded that those policies provided coverage for gradual seepage, pollution or contamination. <u>See</u> Tyler and Wilcox, "Pollution Exclusion Clauses: Problems in Interpretation and Application Under the Comprehensive General Liability Policy," 70 Idaho L. Rev. 499 (1981). The justification for these rulings was that accidents could happen slowly as well as quickly.

In response, in 1966, the Insurance Services Office, an industry organization that among other things drafted various policies and policy provisions, changed the standard policy to provide coverage for "bodily injury" or "property damage" caused by "an occurrence." The definition of "occurrence" included in the 1966 policy form stated that there was coverage for accidents, but also for "continuous or repeated exposure to conditions, which produce[d] bodily injury or property damage neither expected or nor intended from the standpoint of the insured." The change from accident to occurrence was an attempt by the policy drafters to take account of certain kinds of "technological tort," but it is unclear what the intent was with respect to pollution.

In 1973, ISO comprehensively redrafted the CGL policy. At that time, and for the first time, it included a "pollution exclusion" within the policy. The policy continued to use the 1966 language about bodily injury, property damage and occurrences, but for the first time the form excluded specifically coverage for pollution unless the pollution was "sudden and accidental."[8] From 1973 to 1985 virtually all of the standard ISO-CGL policies issued in the United States contain this so-called "sudden and accidental" pollution exclusion. The reader will note that the "sudden and accidental" pollution exclusion did not exclude all pollution coverage. It purported to accept or remove from the exclusions pollution that was "sudden and accidental," thereby creating the seeds for later dispute.

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[8]These provisions may be found in the Appendix.

In 1985, in the wake of numerous lawsuits over what the "sudden and accidental" pollution exclusion means, the insurance companies using the ISO form changed the pollution exclusion yet again, this time to an "absolute" exclusion. The new pollution exclusion has proven to be just that. It excludes coverage for pollution of all types, sizes, colors and shapes, the decisions construing the laws have held that it is not ambiguous and must be enforced as written.

The result is that most of the insurance coverage issues that relate to environmental spills or wastes discharge take place for the years in which the 1973 "preabsolute" pollution exclusion policies are in effect.

III. WHAT HAPPENS AND HOW IT HAPPENS.

Most of the disputes over pollution exclusions and coverage for environmental matters have arisen in the context of governmental clean-up of toxic waste sites under the federal "Superfund law." The statute, enacted long after the 1973 policy provisions became effective, has radically altered the turf upon which insurance coverage battles are laid out.

The process by which an environmental happens apparently is innocuous. Ordinarily, a company or individual receives a letter from EPA or from some state environmental agency asking it to provide information on the involvement that it may have had with a particular waste site. Often this takes the form of requesting that the insured provide record information or other such data for the EPA pursuant to some statute or regulation. After this is done, the EPA typically compiles a list of "potentially responsible parties," often referred to as "PRPs". The EPA evaluates who the PRPs are, and, after this process is concluded, gives notice to those whom it believes should be responsible for the clean-up of the site.

From that point forward, the action often proceeds along parallel tracks. If the PRPs are willing, they typically get together in some fashion and work out a method for site clean-up that is approved by the EPA and implemented in the form of a concent degree in a lawsuit filed by the EPA in Federal Court. If the PRPs are unwilling to act on their own, however, or to the extent that they are unwilling to participate, the EPA may then file a lawsuit to compel those individuals to pay the costs of clean-up as requested by the EPA or to participate in the major PRP's clean-up plan. In some cases, the PRPs themselves negotiate with the EPA to obtain the right to seek contribution to an ongoing clean-up from other potentially responsible parties.

Recently, EPA and a number of state environmental agencies have invoked financial responsibility provisions in various state and federal environmental laws to make demand directly upon insurance companies for payment of clean-up costs. The extent to which this enforcement tactic will be successful remains to be seen, as most of these cases are only in the preliminary stages, but either by this vehicle or by notification from an insured, at some point an insurance company becomes aware of the existance of an environmental claim.

IV. EXAMINING THE POLICY CONDITIONS

Under well recognized principles of contract law, each party to a contract is duty-bound to perform all "conditions precedent" contained in the contract before he can recover under it. In other words, if the contract requires someone to give notice or to take a certain step or to refrain from doing something, that condition must be complied with as a condition precedent before the individual may recover under the contract. In environmental claims, and for that matter in all insurance claims, two conditions precedent are most significant and are the provisions in a contract that an insurer will typically look to first in deciding whether or not there is coverage under any part of the insurance policy. The first of these provisions is that in the contract which requires the insured to give immediate notice of any claim demand or suit, and the second is the provision in the policy which requires the insured to cooperate with the insurance company to refrain from making independent settlements or admissions of liability.

Most insurance policies contain provisions that require an insured to give immediate notice of any claim, demand or suit that may be made against it to the insurance carrier. The purpose of this provision is to allow the insurance company, which in most cases has a duty to defend the insured, sufficient time to conduct an investigation while memories are fresh, evidence is fully available, and the parties legal positions have not hardened. Most CGL policies require "immediate" notice, which under Texas law has been construed to mean as prompt as reasonably possible under the circumstances. Numerous Texas cases outside of the environmental context address the question of immediate notice and virtually all of them take the position in these circumstances that "immediate" means less than 28 days. This length of time represents an appropriate compromise, because it is less than the time that would be permitted under Texas law or federal law for the party to respond to a complaint or suit in Court, and to most other administrative demands as well. Longer than that period of time can seriously prejudice an insurer's rights, because the case may go into default or there may be other similar problems as well.

Texas law is peculiar in that it requires that there be prejudice to the insurer before coverage or a defense may be denied for late notice. Recent cases suggests that the prejudice need not be substantial; indeed, the Dallas Court of Appeals recently opined that any significant prejudice would be sufficient to satisfy this burden. Thus, if it can be shown by the insurer that its legal position has been influenced, or even that some evidence is missing, the prejudice requirement may be satisfied.

Under Texas law, ignorance of insurance coverage, failure to understand policy provisions and other similar claims will not excuse late notice. The insured simply must give notice as promptly as possible to every carrier from which it expects coverage. Anything less than the standard probably will not suffice. It should also be noted that the rule in Texas, which is relatively favorable to insurance, is not followed in other states. In <u>Steelcase, Inc. v. American Motors Ins. Co.</u>, 1990 U.S. App. Lexis 11310 6th Cir., July 3, 1990 (LEXIS Insurance Library), the Sixth Circuit applied Michigan law and affirmed summary judgment for an insurance company for the insured's failure to give timely notice. Steelcase owned an underground storage tank which discharged about 3,000 gallons of solvent in 1983. After consultation with its broker, Steelcase decided not to put its carriers on notice at the time because it thought that the clean-up costs would be small. When this proved not to be the case, Steelcase notified its carriers in December of 1985. The court found that the carriers were not able to investigate the circumstances of the failure, to look at the tank that had actually broken to participate in remedial action, thereby prejudicing the carrier. To the same effect is the <u>State of New York v. AMR Realty Corp.</u>, 697 F. Supp. 99 (N.D. N.Y. 1988), <u>aff'd</u>, ______ F.2d _____ (2d Cir. 1991). Thus, any time an insured believes that it has an environmental claim that it wishes to press, <u>it must</u> do so immediately under the peril of losing coverage for late notice.

The next condition that arises immediately when an environmental claim comes in is the duty to cooperate. As noted previously, each insurance policy provides that the insured must cooperate with the insurer. In an environmental case, the most important portion of the "cooperation clause" is that one which states that the insured shall incur no expense except at its own cost other than for immediate first aid at an accident scene. Translating this clause into "real English," an insured who voluntarily undertakes to clean up a waste site without consent of its liability insurance carrier, probably, although not necessarily certainly, forfeits the right to obtain reimbursement under the policy for the cost of that clean-up assuming that it would be otherwise covered. Such a clause prevents insureds from misusing their insurance coverage by admitting liability or taking other steps that would make it more difficult or impossible for the insurer to defend the case.

The issue of cooperation is a difficult one, because unlike the private case where a plaintiff sues for money damages, the government has the power to enforce its "clean-up" powers without regard to costs or even without regard to ultimate responsibility. The question of when the government's activities change from a request for voluntary cooperation to positive governmental coercion is unclear and has not been litigated although it has been raised in a number of other insurance coverage cases. The situation is aggravated by the fact that clean-ups that are supervised and conducted by the government typically cost as much as three times more as clean-ups conducted by private industry. Thus, literal compliance with the cooperation clause may have the effect of costing all parties, insured and insurer alike, significantly more money than prompt cooperation. Because the issue is unresolved and very delicate as a matter of policy, both environmental and insurance, extreme caution should be used but insured should be aware that their conduct with respect to governmental authorities in environmental cases is properly the subject of the cooperation clause contained in their policy.

Giving notice and cooperation are the initial steps along the road of any coverage analysis in an environmental case. The next step that must be accomplished is determining the extent to which the carrier must assist the insured in dealing with an environmental problem.

V. "SUITS"

Virtually all CGL policies contain language which requires an insurance carrier to provide a defense to an insured for claims of bodily injury or property damage arising out of an occurrence that otherwise may be covered under the policy. In Texas, if any of the allegations in a complaint or in a demand against the insured are potentially within the covered allegations of the policy, then the carrier has a duty to defend. It does not matter if the other allegations in the complaint are completely outside of coverage. The carrier must still defend. But there is a problem with this basic rule, and that is that it was evolved to meet the traditional lawsuit filed by an aggrieved tort plaintiff in a court of law and not the administrative process that is used by most governmental agencies in cleaning up the environment. Thus, the first question that must be raised in dealing with any environmental case is whether the government's administrative action is such that the insurance carrier has an obligation to defend --that is, provide counsel and conduct an investigation --a claim against its insured.

Many of the environmental administrative procedures that are involved in handling the clean-up case are administrative and do not involve adversary process or even a judgment or appeal. Thus, the issue arises quickly as to whether or not the insurance carrier has the obligation to provide a defense even if other issues associated with the matter are such as would normally be covered if brought in a suit. As might be expected, the cases are strongly divided on what constitutes a suit or proceeding must be defended by a CGL carrier.

Some cases hold that anything sort of an actual lawsuit will not trigger a duty to defend, regardless of the alleged claims or potential liabilities. See, e.g., Harter Corp. v. Home Ins. Co., 713 F. Supp. 231 (W.D. Mich. 1989) (EPA "PRP" letter threatening to hold insureds liable is not "suit seeking damages." Aetna Cas. & Sur. Co. v. Gulf Resources & Chem. Corp., 709 F. Supp. 958 (D. Ida. 1989) (suit limited to civil litigation); Patrons Oxford Mut. Ins. v. Marois, 573 F.2d 16 (Me. 1990). (State clean-up order does not constitute "suit.") Others take the position that the insurer is required to defend all claims that may result in liability against the insured. See, e.g., Avondale Indus. v. Travelers Indem. Co., 887 F.2d 1200, 1206-07 (2d Cir. 1989). (Duty to defend triggered by letter from State Attorney General.); Higgins Indus. v. Fireman's Fund, Ins. at 730 F. Supp. 774 (E.D. Mich. 1989.) (Notice of noncompliance is a "suit."); Fireman's Fund Ins. Co. v. Ex-Cel-O Corp., 662 F. Supp. 71 (E.D. Mich. 1987) (PRP letter is a "suit" as is any effort to impose upon a policy holder a liability ultimately enforceable in court). A third line of cases examines the triggering mechanism (the demand letter or order itself) to determine the nature of the required action or potential liability of the insured. Detrex Chemical Ind., Inc. v. Employers Ins. Co. of Wausau, 681 F.2d 438 (N.D. Ohio, 1988). (PRP letter does not constitute a "suit" but administrative order under surplus section 9604 or section 9606 does). Technicon Electronics Corp. v. American Home Assurance Co., 141 A.D.2d 124, 533 N.Y.2d 199, (1988) aff'd on other grounds, - 74 N.Y.2d 166 (1989). Generally mechanisms threatening penalties or other action are more likely to constitute suits and those seeking purely voluntarily compliance with no threat of further agency

action. As conclusion, if the action constitutes a "suit" there is a duty to defend if coverage is otherwise triggered. If it does not, there is not.

VI. DAMAGES: ARE CLEANUP COSTS COVERED?

The next issue that arises in a typical environmental case is whether or not the cost of cleaning up the property which may run into the millions, or even billions of dollars (as for example at Rocky Mountain Arsenal), are covered "damages" within the meaning of the basic ensuring language of the policy. Insurers have long taken the position, and with considerable justification outside of the environmental field that policies were not intended to provide coverage for remedies that were equitable in nature such as injunctions or restitution, that is, the repayment of a supposedly ill-gotten gain. Early cases in the environmental field, including two seminal cases from federal court, Maryland Cas. Co. v. Armco, Inc., 822 F.2d 1348 (4th Cir. 1987) and Continental Cas. Co. v. North Pharmaceutical & Chem. Co., Inc., 842 F.2d 977 (8th Cir. 1988), hold that clean-up costs associated with remedying a spill, as opposed to "natural resources damages" as provided for in CERCLA, were not covered under standard CGL insurance policies because they were not the kinds of damages that could or would be awarded in a civil lawsuit with the plaintiff and a defendant. The Fourth and Eighth Circuits, who have since been joined by other federal courts, reached this decision on the theory that the EPA's imposition of a "clean-up" on potentially responsible parties was not linked in any way to the measure of damages that would be used if a lawsuit had been filed claiming that the property being cleaned up had been harmed.

More recent decisions have taken a contrary position, and the emerging trend seems to be that clean-up costs are "covered damages" within the meaning of a standard CGL policy. See, e.g., Avondale Indus., Inc. v. Travelers Indem. Co., 887 2d 1200 (2d Cir. 1989); AIU Ins. Co. v. Superior Court, 51 Cal. 3d 807, 799 P.2d 1253 (Cal. 1990); Minnesota Mining & Mfg. Co. v. Travelers Indem. 457 2d 175 (Minn. 1990); C. D. Spangler Const. Co. v. Industrial Crankshaft & Eng'g Co., 326 N.C. 133, 388 S.E.2d 557 (1990); Boeing Co. v. Aetna Cas. & Sur. Co., 113 Wash. 2d 869, 784 P. 2d 507 (1990). These courts take the position that an individual owning a policy would believe that the term "damages" included payment of clean-up costs or alternatively that the ordinary person's construction of the word damages would include clean-up costs, thus triggering coverage under the rule that words in an insurance policy should be used in their plain and ordinary sense rather than in a highly technical sense.

EPA has taken the position that its mandated clean-up costs are damages. In Jones Truck Line v. Transport Ins. Co., 57 U.S.L.W. 2699 (E. Pa. 1990), a Pennsylvania case involving construction of Missouri law, the EPA argued that certain response costs constituted damages within the meaning of liability insurance policies. In adopting this position, the EPA argued that it needed to encourage and stimulate private party clean-ups of hazardous waste sites and that a court order holding that CGL policies providing coverage for such efforts would encourage such clean-ups in the future. According to EPA, such a result would reduce the demand on the Superfund for clean-ups.[9]

Another complicating issue in the question of damages is whether or not the EPA's unquestioned right under a CERCLA to claim "natural resources damages," defined in the statute as being a monetary award for decreasing the quality of the environment, would probably be covered since these represent "injury or damage to tangible property" which would be covered under a CGL insurance policy. The Ninth Circuit has held that water is "tangible property" within the meaning of a CGL policy, so that polluting it causes damage to the water. Thus, clean-up costs to cure the pollution would be covered under the property damage liability clause. See Portland v. Water Quality Ins. Syndicate, 796 F.2d 1188 (9th Cir. 1986). A third problem arises when the clean-up costs are designed to prevent property damage. In other words, if someone cleans up pollution in order to prevent further damage, that may be covered under the CGL policy. See, e.g., Broadwell Realty Services v. Fidelity & Cas. Co., 218 N.J. Supra, 516, 528 A.2d 76 (1987). See generally Kutscher's Country Club Corp. v. Lincoln Ins. Co., 465 N.Y.S.2d 136 (Sup. 1983) (clean-up costs to mitigate spill can be covered under CGL policy). The result is a

[9]Obviously, the EPA expresses no position on whether it is better or appropriate to reduce the resources available under insurance policies as a part of cleaning up.

difficult situation, but overall the better rule as of 1991 is that clean-up costs are damages within the meaning of a CGL policy, and they will be covered if other provisions in the policy do not prevent it.

VII. IS IT AN OCCURRENCE?

As we have previously noted, the definition of "occurrence" in the standard CGL policy makes the company liable to defend and indemnify only for damage which is "expected and unintended" either "by the insured" or "from the standpoint of the insured," depending on the form. In either case, the link between this definition and fortuity is apparent. Damages which are either expected or intended are by definition nonfortuitous, so that they should not be insurable. But the question is what constitutes loss or damage that is neither "expected nor intended." This can be looked at by examining three kinds of conduct. Damage that is intentionally caused, conduct that is intentional but damages which are not necessarily so, and damages which are "expected."

Intentionally caused damages are easy to deal with. The callous individual who dumps waste surely should not be entitled to insurance coverage for its actions. Proof that the individual dumped intending to cause damage, however, is very rare, so our real focus must be on two areas: Intentional conduct with either unexpected or unintended damages, and expected damages.

In most aspects of the law, an individual is presumed to intend the natural and probable consequences of his action. Thus, an individual who strikes another is presumed by the law to have intended to expected to hurt the other individual. The concept is not a difficult one as far as it goes, but it becomes much more difficult in the context of environmental loss. For example, a company may dispose of material in surface lagoons, but not intend that those lagoons leak causing pollution in the surrounding groundwater or, even more vividly, a company may entrust its waste to a licensed waste hauler or a licensed dump operator with the expectation that the waste be disposed of properly. But what about the situation where an individual dumps its waste out the back door of a plant, not expecting or intending any harm but not caring either? How should they be treated?

The cases do provide some guidances to the kinds of conduct that do and do not constitute an occurrence. In Atlantic Cement Co. v. Fidelity & Cas. Co. of Md., 91 A.D.2d 412, 459 N.Y.S.2d 425 (1st Dept. 1983), aff'd, 63 N.Y.2d 798, 471 N.E.2d 142, 481 N.Y.2d 329 (1984), the court addressed the question of pollution from a cement plant and found that that damage could be a nuisance to landowners but also an accident or occurrence within the meaning of an insurance policy. It stated:

> While it cannot be gainsaid that Atlantic intended to operate its cement plant at Ravina, that does not mean that they thereby "intended" to cause damage to the

> property of the surrounding landowners, nor on this record can it be said that it was substantially certain that such damage would result from the operation of the plant.

Id. [Emphasis in original.] On the other hand, there are some decisions which refuse to find an occurrence when an insured intentionally slights or ignores pollution problems or continues a business practice that causes pollution. See, e.g., Barmet of Indiana, Inc. v. Security Ins. Group, 425 N.E.2d 201 (Ind. App. 1981) (an insured who knew that its pollution systems released materials regularly was not insured for such releases because they did not constitute an occurrence).

The more difficult problem is to determine when something becomes "expected" either subjectively or objectively depending on the policy. Again the seminal decision is the City of Carter Lake case discussed previously. There, in addition to addressing issues of fortuity, the Court of Appeals addressed the question of when damages could be said to be expected from the standpoint of the insured. In reviewing the tests offered by the various parties, the Eighth Circuit announced the "substantial probability test" which remains the most frequently used basis for determining whether conduct is "expected" within the meaning of an insurance policy. As stated by the court:

> The difference between "reasonably foreseeable" and "substantial probability" is the degree of expectability. A result is reasonably foreseeable if there are indications which would lead a reasonably prudent man to know that the particular results could follow from his acts. Substantial probability is more than this. The indications must be strong enough to alert a reasonably prudent man not only to the possibility of the results occurring, but the indications must also be sufficient to forewarn him that the results are highly likely to occur.

There are a significant number of cases which apply this doctrine of "expected conduct" to hold that the continuous dumping of toxic materials on the property which creates damage which is expected and therefore not covered. See, e.g., American Universal Ins. Co. v. Whitewood Custom Treaters, Inc., 707 F. Supp. 1140 (D. S.D. 1989); American Mut. Liab. Ins. Co. v. Neville Chem. Co., 650 F. Supp. 929 (W.D. Pa. 1987); New Hampshire Ins. Co. v. Hecla Mining Co., 791 P.2d 1154 (Colo. App. 1989); County of Broome v. Aetna Cas. & Sur. Co., 146 A.D.2d 337, 540 N.Y.S.2d 620 (1989); Techalloy Co. v. Reliance Co., 338 Pa. Super. 1, 487 A.2d 820 (1984).

In addition to the expected and intended problem, the definition of occurrence encompasses something known as "known risk." As originally intended, the known risk doctrine encompassed losses already in progress when a policy of insurance began. In other words, if a person was already a potentially responsible party for a waste site at the time it bought a policy of liability insurance, the liability insurance would not be required to respond to the loss because it was not an occurrence. See, e.g., United States v. Conservation Chem. Co., 650 F. Supp. 123 (W.D. Mo. 1987). This doctrine is not really very surprising, because clearly once a loss is in progress, the damages that flow from it must as a matter of logic and law both be expected or intended from the standpoint of the insured. Recent cases, however, suggest that the doctrine of "known risk" may be being extended to cases in which the loss has started but is not complete. The issue is one of considerable debate among insurers and insureds and should be noted as something for the future by all involved in the area.

VIII. THE POLLUTION EXCLUSION.

Once the basic insuring language has been examined, the next stop in the road of environmental insurance coverage is traditionally the pollution exclusion.

For policy years beginning in 1986, the insurance industry used the so-called "absolute" pollution exclusion, which purports to bar virtually every possible kind of pollution from coverage. There are now a number of decisions on record concerning this exclusion, and virtually all of them have enforced it. See, e.g., Gilford Indus., Inc. v. Liberty Mut. Ins. Co., 688 F. Supp. 792 (D. Me. 1988), aff'd, 879 F.2d 853 (1st Cir. 1989); Perkins Hardwood Lumber Co. v. Bituminous Cas. Corp., 190 Ga. App. 231, 378 S.E.2d 407 (1989); League of Minnesota Cities v. City of Coon Rapids, 446 N.W. 419 (N. App. 1989); Budofsky v. Hartford Ins. Co., 147 Misc. 2d 691, 556 N.Y.S.2d 438 (Supp. 1990). In fact, the only decision to date purporting to find any ambiguity in the long form or absolute pollution exclusion clause, In Re Hub Recycling, Inc., No. 89-494 (D. N.J., October 19, 1990), involved light and new pollution from a waste dump and not the kinds of pollution traditionally involved in environmental matters. Thus, it can be said with relative safety that for normal industrial types of pollution--that is, kinds of pollution that would give rise to liability under most environmental statutes--there is no coverage under post 1986 policies.

That leaves for discussion policies issued between 1973 and 1985, during which period the CGL policy contained the so-called "sudden and accidental" pollution exclusion. This clause purported to bar coverage for pollution, but excepted from that exclusion pollution which was "sudden and accidental."

What "sudden and accidental" means has been one of the biggest problems in interpreting pollution exclusions, and to tell the story in full would require literally weeks of time.

Insurance carriers long took the position that the new "sudden and accidental" pollution exclusion meant exactly what it said, so that there was no coverage for pollution, regardless of whether the damage it caused was unexpected and unintended. Moreover, there was to be no coverage according to the carriers unless the pollution (as opposed to the damage) was sudden in the temporal sense and accidental. According to the carriers, this definition while not entirely precise was more than sufficient to deal with most routine situations. The limits of the defense were tested in a number of cases, the most prominent of which is Lansco, Inc. v. The Department of Environmental Protection, 350 A.2d 520 (N.J. Super. 1975). There, vandals opened the spigots on a number of chemical or fuel storage tanks, causing the tanks to discharge their contents into the holding basin and ultimately onto the ground and into the groundwater. The insurance carrier with responsibility initially took the position that there was no coverage because it had taken a long period of time for the pollution to leak out. The New Jersey court hearing the case rejected this contention, on the grounds that the loss was caused by an agent entirely external to the insured, and that the action was sudden within a temporal sense.

As carriers invoked the "sudden and accidental" pollution exclusion more frequently to deny coverage for business pollution and superfund site clean-up, major policyholders began to respond by vigorously examining the roots of the exclusion. Based upon a number of documents that were unearthed from state insurance offices, including most especially the transcript and ruling of the West Virginia Insurance Commission on the then new "sudden and accidental" pollution exclusion, policyholders took the position that the exclusion was not intended to change the contours of the existing coverage. They pointed especially to language in documents from the Insurance Rating Board (a predecessor of ISO) to the effect that the new exclusions were merely "clarifications" of existing coverage, and on that basis argued that "sudden and accidental" in the new pollution exclusion could only mean the same thing as "unexpected and unintended from the standpoint of the insured."

The author, who more than not represents insurance companies in coverage litigation, looks at the documents on which the policyholders rely with a considerable degree of skepticism. The fact that the new pollution exclusion was a "clarification" of existing coverage did not mean it was intended merely to keep coverage as it was before the exclusion was added. The exclusion focused on pollution rather than the damage it caused and came into effect at the same time as the insurance rating groups were working with the problem of oil spills such as the Santa Barbara spill off of the coast of California in 1969 and 1970. Thus, at least from one commentator's point of view (mine), to say that the 1973 pollution exclusion did nothing is inappropriate. Doubtless, a policyholder's representative would have strong and cogent contrary arguments to make at this point, but since this is my paper, I will use this brief opportunity for editorializing and move on.[10]

Suffice it to say for present purposes that if the pollution exclusion applied as the insurance carriers intended, policyholders faced with superfund liability had little, if any, chance in most cases of ever recovering any of their clean-up costs from their insurance carriers. Virtually all of the pollution subject to clean-up under the superfund statute and related state laws was gradual in the temporal sense, and little could be said to have arisen accidentally. Thus, the insurance carriers and policyholders quickly drew battle lines over the meaning of the sudden and accidental pollution clause. Some courts have ruled in favor of insurance companies and others in favor of policyholders, but the emerging trend appears to be to enforce the pollution exclusion clause along the lines suggested by the insurance carriers. The policyholder documents, which received a certain amount of attention in the decisional law when initially brought before the courts, seem less and less to be persuasive in judicial decisions, and the high water mark of their utility may have been in the Georgia of <u>Claussen v. Aetna Cas. and Sur. Co.</u>, 259 Ga. 333, 380 S.E.2d 686 (1989).

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10 Thank you for you indulgence.

Having said this, it is appropriate to summarize the decisions briefly and the best way to do that is to try to organize them by theme.

a. Cases finding the exclusion unambiguous and applying it in favor of the insurer's include Lumbermen's Mut. Cas. Co. v. Belleville Indus., Inc., 407 Mass. 675, 555 N.E.2d 568 (1990); Powers Chemco, Inc. v. Federal Ins. Co., 74 N.Y.2d 910, 548 N.E.2d 1301 (1989); Technicon Corp. v. American Home Assur. Co., 74 N.Y.2d 66, 542 N.E.2d 1048 (1989). See also FL Aerospace v. Aetna Cas. & Sur. Co., 897 F.2d 1416 (6th Cir. 1990); United States Fid. & Guar. Co. v. Morrison Grain Co., 734 F. Supp. 437 (D. Kan. 1990); Federal Ins. Co. v. Susquehana Broadcasting Co., 727 F. Supp. 169 (N.D. Pa. 1989); C.L. Hauthaway and Sons Corp. v. The American Motorists Ins. Co., 712 F. Supp. 265 (D. Mass. 1989); Borden, Inc. v. Affiliated FM Ins. Co., 682 F. Supp. 927 (S.D. Ohio 1987).

b. Cases favoring policyholders with respect to the pollution exclusions include Claussen v. Aetna Cas. and Sur. Co., supra; Just v. Land Reclamation, Ltd., 155 Wis.2d 737, 456 N.W.2d 570 (1990), amended, 157 Wis.2d 507 (1990); Newcastle County v. Hartford Accident & Indem. Co., 670 F. Supp. 1359 (D. Del. 1987); Pepper Steel and Alloys, Inc. v. United States Fid. & Guar. Co., 668 F. Supp. 1541 (S.D. Fla. 1987); see also Upjohn

Co. v. New Hampshire Ins. Co., 178 Mich. App. 706 444 N.W.2d 813 (1989); Summit, Inc. v. Liberty Mut. Fire Ins. Co., 229 N.J. Super 56 550 A.2d 1235 App. Div. 1988.

Putting the matter in simplest terms, the sudden and accidental pollution exclusion clause has generated a swamp of conflicting decisions that vary on a state-by-state basis. No Texas has yet construed this clause, and frankly anyone's guess as to his this issue will be resolved in Texas is probably entitled to be considered.

IX. THE OWNED PROPERTY EXCLUSIONS.

Because CGL policies are liability policies, they are intended to cover liability only from external sources and not to take the place of property insurance that an individual can procure for him or herself. Thus, most CGL policies contain exclusions for property owned by an insured for premises alienated by an insured (in plain English sold by an insured to another), or for property that is within the possession, custody and control of the insured. These exclusions are routinely enforced, see United States v. Conservation Chemical Co., 653 F. Supp. 152 (W.D. Mo. 1986), Compass Ins. Co. v. Cravens, Dargan & Co., 748 P.2d 724 (Wyo. 1988), but the problem arises when we try to consider what property one owns. In many states, ground water contamination is not viewed as being within the owned property exclusions because states take the position that they, rather than the real property owner, own the rights to the ground water. Allstate Ins. Co. v. Quinn Construction Co., 713 F. Supp. 35 (D. Mass. 1989). On the other hand, in states such as Texas where virtually everything that goes with the land is owned by the property owner such a rule may not apply, and, in this case, to the extent that the clean-up is limited to property that is purely owned by the insured or to premises annihilated by the insured, there may not be coverage.

X. POLICY TRIGGERS: "LET'S DO THE TIME WARP AGAIN."

As can be seen by a review of the policy provisions contained with this article, most CGL policies provide coverage only for events "occurring during the policy period." Thus, the question arises as to when does an environmental event take place for purposes of the policy.

There are numerous theories applied to answer this question. Some of which are contradictory and others of which are "stacked" in order to determine liability. In Dow Chemical Co. v. Associated Indemn. Corp., 724 F. Supp 70 (W.D. Mich. 1989), the court enunciated the four possible triggers used in environmental case. They are as follows:

A. The 'Exposure Theory'

Under this theory, the policy on the risk at the time the environment is first exposed to pollution is the policy that must respond. See, e.g., Continental Ins. Co. v. Northeastern Pharmaceutical Co., Inc., 842 F.2d 977 (8th Cir. 1988). Under this doctrine, continuing environmental damage typically 'runs back' in time so that the policy on the risk at the time of the first damage is responsible. On the other hand, there are a certain number of decisions that create a trigger of coverage during the entire period that a continuing exposure is underway even if the exposure is during multiple policy periods. See, e.g., Centennial Ins. Co. v. Lumbermen's Mutual Cas. Co., 677 F. Supp. 342 (E.D. Pa. 1987). It is difficult to determine in many cases when exposure begins and ends and therefore the exposure trigger, while useful in cases of dumping onto the surface, may not be particularly helpful limiting liability or focusing coverage years responsible in underground leakages, or cases of surface lagoon seepage.

B. The Injury-in-Fact Theory.

The author, exercising his editorial license for the second and last time, finds it difficult to believe that exposure of the environment to pollutants can somehow be different than actual injury to the environment, since in the environmental case, it is the escape of the material that is the injury. Nevertheless, it is possible to argue by analogy to other cases that the coverage can be triggered only when injury as opposed to exposure takes place. See, e.g., Triangle Publications, Inc. v. Liberty Mut. Ins. Co., 703 F. Supp. 367 (E.D. Pa. 1989). The major difference between the exposure theory and the injury-in-fact theory appears to arise from the notion of migration. A sudden release may take a long time to migrate and contaminate a great area. By applying the actual injury trigger, the migration and the contamination are different from the initial release, escape or exposure. This forms at least a conceptual if not a logical distinction for the trigger period.

C. Manifestation.

This theory holds that coverage on the risk when the environmental pollution manifests itself (or sometimes is reasonably capable of being discovered) is responsible. See, Mraz v. Canadian Universal Ins. Co. Ltd., 804 F.2d 1325 (4th Cir. 1986). Closely related to manifestation is the discovery theory, which says that the coverage on the risk when the pollution is actually discovered (the legal analogy to the old question of if a tree falls in a forest and no one is there, does it make a noise!) must bear the cost.

D. Multiple Theories.

Many state courts apply a multiple trigger theory based upon analogies to asbestos exposure cases. In the environmental realm, apart from asbestos, there are few cases applying such trigger, but there is every reason to believe that the asbestos cases will be viewed as appropriate precedent.

The point on trigger issues is again that the law is unclear. Insurance policies crafted to deal with broken legs, auto crashes, breaking products and things of that nature do not work very well when coverage is at stake for continuous slow moving gradual torts. Persons confronting environmental loss should act accordingly and be cautious in jumping to conclusions as what their policy means.

XI. CONCLUSION.

When all is said and done, we discover that the law regarding insurance for environment hazard is, to be charitable, unclear.

Part of the problem that has arisen in the environment field comes from the stakes that are involved. Every case is a "bet the company case," because the exposure is so great and the policy forms an issue are so consistent. The parties to environmental coverage cases have created an environment--no pun intended--in which the cost of clean up are exacerbated by the costs of litigating the insurance coverage. In the future, we hope on behalf of both sides to this dilemma that a new way that takes account of all parties' interest and minimizes costs will be adopted.

APPENDIX

IMPORTANT POLICY PROVISIONS.

1. The 1973 definition of occurrence:

An accident, including continuous or repeated exposure to conditions, which results on bodily injury or property damage neither expected nor intended from the standpoint of the insured.

2. The 1973 pollution exclusion ("sudden and accidental"):

to bodily injury or property damage arising out of the discharge, dispersal, release or escape of smoke, vapors, suds, fumes, acid, alkalis, toxic chemicals, liquids or gases, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water course or body of water; but this exclusion does not apply if such discharge dispersal, release or escape is sudden and accidental.