IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW MEXICO

The City of Albuquerque & The Bernalillo County Commissioners,	)	
Plaintiffs,	)	Civil Action No.
v.	)	CIV-97-0206-LH
Sparton Technology, Inc.	)	
Defendant.	)	
State of New Mexico New Mexico Environment Department, & New Mexico Office of the natural Resources Trustee,	)	Civil Action No.
Plaintiffs,	)	CIV-97-02808-JC
v.	)	
Sparton Technology, Inc.	)	
Defendant	)	
United States of America	)	
Plaintiff,	)	Civil Action No.
v.	)	CIV-97-0210-M
Sparton Technology, Inc.	)	
Defendant.	)	

AFFIDAVIT OF GLENN C. MILLNER, PH.D.

Comes the affiant, Dr. Glenn C. Millner under oath and do hereby state as follows:

1. My name is Dr. Glenn C. Millner. I am over the age of 18 years, I have never been convicted of a crime of moral turpitude, I am fully competent to make this affidavit, and the following represent my opinions and conclusions.

2. I am a Senior Toxicologist at the Center for Toxicology and Environmental Health, L.L.C. an environmental consulting firm that is part of the University of Arkansas for Medical Sciences Incubator Program. I am also an adjunct assistant professor in the College of Medicine, Division of Interdisciplinary Toxicology, University of Arkansas for Medical Sciences. As a lecturer, I speak on toxicology, government regulations, and risk assessment subjects to graduate and medical students. Attached as exhibit "A" to this affidavit is my curriculum vitae. Over the past 17 years, I have been involved in the study of hazardous waste sites and their potential impacts to human health and the environment. I have testified as an expert witness on toxicological and risk assessment subjects in trials before Federal District Courts in Denver, CO, Hot Springs, AR, New Orleans, LA, and Fort Smith, AR.

3. I am testifying as an expert in toxicology and risk assessment. As such, a definition of these disciplines is in order. Toxicology is the science of poisons. Whether a substance is a poison depends on two inseparable criteria: the intrinsic nature of the substance and the dose, or how much of a substance an individual actually takes into his or her body. In toxicology, we study the dose-response of chemicals on biological systems, with emphasis on understanding the mechanisms of harmful effects. One of the principle concerns in toxicology is the protection of public health from environmental hazards.

4. Risk assessment as we know it today was defined in 1983 by the National Academy of Science in Risk Assessment in the Federal Government: Managing the Process: *We use risk assessment to mean the characterization of the potential adverse health effects of human exposures to environmental hazards. Risk assessments include several elements: description of the potential adverse health effects based on an evaluation of results of epidemiologic, clinical, toxicologic, and environmental research; extrapolation from those results to predict the type and estimate the extent of health effects in humans under given conditions of exposure; judgments as to the number and characteristics of persons exposed at various intensities and durations; and summary judgments on the existence and overall magnitude of the public health problem. Risk assessment also includes characterization of the uncertainties inherent in the process of inferring risk (NAS, 1983).*

5. This Affidavit is prepared at the request of Sparton Technology, Inc. in connection with litigation involving the Sparton Facility ("Facility"), located at 9621 Coors Road Northwest in Albuquerque, New Mexico. This affidavit examines whether chemicals present in groundwater and soil at the Sparton Facility pose an imminent and substantial endangerment to human health.

6. In evaluating issues related to this litigation, I have reviewed the pleadings and attached exhibits, reports, and affidavits that were submitted on behalf of the plaintiffs dated on or about March 31, 1997. I have also reviewed groundwater and soil monitoring data from investigations performed by Black and Veatch on behalf of the Defendant Sparton Technology, the affidavit of Pierce L. Chandler, Mr. Gaume, and other information and materials. My evaluation is continuing and may be supplemented by additional opinions as more data become available and further analyses are performed. These sources and

materials are the type of information normally found reliable and are customarily relied upon by toxicologists in the practice of their profession.

7. It is my understanding that the plaintiffs allege that chemicals in the groundwater and environment surrounding the Sparton Facility are causing an imminent and substantial endangerment to human health. The basis for this contention can be found in the EPA and the State of New Mexico reports entitled "Determination of Imminent and Substantial Endangerment Pursuant to Section 7002 of RCRA and Section 1431 of the SDWA" and "Finding of Imminent and Substantial Endangerment", respectively. I have synthesized these reports and determined that basically the plaintiffs' position is that when chemicals in groundwater (e.g., trichloroethylene or TCE) exceed the drinking water standard (i.e., exceed maximum contaminant levels, MCLs), this finding or fact represents an imminent and substantial endangerment to human health.

8. I have been asked to determine whether potential exposure to chemicals in groundwater from the Sparton Facility represent an imminent and substantial endangerment to human health.[1] To accomplish this charge, I have evaluated actual soil and groundwater monitoring data[2] collected by the plaintiffs' and defendants' consultants using acceptable exposure and risk practices established by the United Stated Environmental Protection Agency (EPA). I also evaluated the toxicological literature regarding the chemicals at issue in this lawsuit. Based on these studies and my experience as a toxicologist in assessing public health risks resulting from potential exposure to chemicals in air, surface water, groundwater, soil, and sediment, I conclude that there is no imminent or substantial endangerment to human health as a result of conditions existing on or near the Sparton Facility. This conclusion is based on health-protective methods used by the EPA and other regulatory agencies. The basis for my conclusion that there is no imminent or substantial endangerment is summarized below.

9. All chemicals have the potential to cause toxicity and harm under the appropriate set of circumstances. Toxicants are defined as chemical agents that, under certain conditions, may produce adverse effects on biological systems, ranging from minor alterations of normal function to death. The main goal of any risk assessment is to determine those conditions likely to produce harm.

10. In general terms, risk (R) represents a relationship between the toxicity (T) of the compound and factors related to the exposure (E) to the compound ($R = T \times E$). Regardless of how risks are expressed, they remain dependent on the toxicity of a compound and the exposure circumstances.

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[1] Note that some of the plaintiffs' pleadings, reports and analyses also make references to imminent and substantial endangerment to human health and the environment. However, plaintiffs fail to provide any analyses concerning effects or impacts of groundwater contamination on any ecological receptors, habitats or ecosystems. Thus, to be consistent with the government, I also focused my analyses on human health, and not the environment.

[2] Note that I was unable to determine if plaintiffs' have properly validated their data using accepted analytical data validation techniques.

11. The four basic steps of the risk assessment process follow:

HAZARD IDENTIFICATION - The hazard identification summarizes the toxicological database for the chemical of interest and identifies the potential adverse health effects observed in animal and human studies. Examples of hazard identifications are the USEPA Water Quality Criteria and Health Effects Documents.

HAZARD EVALUATION - The hazard evaluation is an analysis of the dose-response relationships, potency, and toxicological mechanisms of a chemical. Specifically, the following points are to be analyzed:

- Evaluation of the types of toxic responses and sensitive organs and tissues.
- Investigation of species variation in toxic effects.
- Examination of the mechanism(s) of toxicity.
- Determination of the validity of the tests performed in animals and their relevance for extrapolation to man.
- Comparison of animal test doses with the expected level of human exposure.
- Evaluation of available data from long-term occupational exposures and human poisonings. Such an evaluation may provide information regarding expected human effects and act as a test for extrapolations made from animal data.

EXPOSURE EVALUATION - The exposure evaluation provides estimates of likely human exposure that may result from human contact with the affected environmental media. The exposure evaluation takes into consideration site-specific characteristics that may affect the potential for human exposure to the chemical.

RISK ASSESSMENT - The risk assessment integrates the outputs of the exposure evaluation against the risk estimates for the chemical. This provides some determination as to the relative safety or hazard associated with the anticipated exposure.

12. It is important to understand that without exposure, <u>there can be no risk</u>. I have evaluated whether the risk of harm to human health is imminent by conducting an exposure assessment using EPA's own risk assessment methods (See Appendix A). In its guidance for human health risk assessment, the EPA has established guidance for conducting an exposure assessment as part of the risk assessment process. The objective of the exposure assessment is to estimate the type and magnitude of exposure to the chemicals of potential concern that are present at or migrating from a site. The results of the exposure assessment are combined with a chemical specific toxicity information to characterize

potential risks. EPA's guidance states that "An exposure pathway consists of four elements:

I. A source and mechanism of chemical release,

II. A retention or transport medium (or media in cases involving media transfer of chemicals),

III. A point of potential human contact with the contaminated medium (referred to as the exposure point), and

IV. An exposure route at the (e.g., ingestion) at the contact point."

EPA considers exposure pathways complete if all four elements are present, and incomplete if one or more of these elements are not present. Complete pathways represent the only potential routes of exposure to the chemicals of concern.

The results of my exposure assessment indicate that under current site conditions, there are no complete exposure pathways for exposure to groundwater. Thus, using the Agency's own policy guidance (EPA, 1991), the EPA cannot support its claim of imminent and substantial endangerment. It is incorrect to speculate that because chemicals are detected in groundwater that down gradient exposure to these chemicals will occur. An individual cannot be considered at risk of adverse health effects in the absence of chemical exposure. This finding is also supported by statements made by Mr. Norman Gaume in his deposition taken on April 29, 1997. Mr. Gaume is Manager of the Water Resources Division of the Public Works Department of the City of Albuquerque. In this deposition, Mr. Gaume indicated that there are no drinking water wells completed in the affected area near the Spartan facility and that the City has no plans to install a well in the near future.

13. While there can be no imminent and substantial endangerment under current site conditions, it is possible that conditions could change and that a drinking water well could be completed in the contaminated plume. It would be logical for the agency to consider the likelihood of potential future impacts from ingesting contaminated groundwater and in fact its risk assessment guidance recommends that future risks be considered when groundwater is not currently used and is of potable quality. I have reviewed EPA's and the State of New Mexico's report's concerning imminent and substantial endangerment for evidence of some estimate of the likelihood, risk, or probability of someone completing a well in the contaminated plume and drinking contaminated water. My review indicates that this type of analyses has not been performed. Thus, the agency fails to provide adequate evidence concerning the risk of harm from ingesting contaminated groundwater being "imminent". Such an analyses would include a variety of factors such as:

- Risk associated with drinking contaminated water for periods shorter than the 70 years exposure period used to estimate cancer risk,

- Probability of a homeowner completing a well in the contaminated aquifer versus using the City's municipal water supply,
- Evaluation of dose issues,
- Cost associated with well completion, (can an average homeowner afford it?),
- Permit issues.

14. In addition to failing to provide evidence of imminent exposure, the EPA and State of New Mexico reports concerning imminent and substantial endangerment also fail to provide the necessary toxicological dose-response data to conclude groundwater conditions represent an endangerment to human health. For example, on pages 17-19 of the EPA imminent and substantial endangerment report, EPA infers that if a person were to drink groundwater from the contaminated plume, it will cause the various health effects described such as cancer, liver, central nervous system, and circulatory effects. However, the report fails to provide a single dose capable of causing any of the health effects described. Many of the described health effects occur at very high doses (considerably above drinking water standards) and from the inhalation route of exposure, not from drinking contaminated water. The report simply does not provide the necessary dose-response data showing what doses cause these potential effects (an endangerment) and more importantly will ingestion of chemical in groundwater at the detected concentration cause these effects. In toxicology, *dose* is defined as the amount of chemical absorbed into the body when one comes in contact with (is exposed to) a chemical. In this case, dose would be dependent upon how much groundwater a person drank, their body weight, the concentration of chemical in groundwater, frequency of consumption (e.g., daily, weekly, etc.), the oral bioavailability of the chemical, and the duration of exposure (how may years). Even if the above alleged exposure pathways were known to occur, it would be necessary to demonstrate that the exposure is sufficient to result in adverse health risk.

15. The maximum contaminant levels (MCLs) and the maximum contaminant levels goals (MCLGs) were put into effect under the Safe Drinking Water Act (40 CFR 141). The MCL represents a safe allowable lifetime water concentration for a specific toxic chemical, based on an average 70 kg adult male consuming 2 liters of water per day. A person's total environmental exposure to the particular chemical in question is factored into this value and includes contributions made by air, food, and water exposures. This is called relative source contribution. This is usually accomplished by limiting the acceptable water exposure (the MCL) to 20 percent of the total allowable daily intake. Safety factors are included in each of the standards, the magnitude of which provide adequate protection to potentially sensitive populations such as infants, small children, the elderly, and the infirm. Note that the relative source contribution is generally applied to non-carcinogens, but in certain cases, it is also applied to potential carcinogens. In addition to considering the potential adverse health effects posed by the contaminant in question, an MCL is legally required to reflect the technological and economic feasibility of removing that contaminant from the water supply. The limit must be feasible given the best available technology (BAT) and the effects of current water treatment techniques.

16. While there clearly is no current human exposure to groundwater, I have evaluated the potential endangerment or health risk assuming that a drinking water well is in fact completed in the contaminated groundwater plume using the main chemicals at issue in this lawsuit namely trichloroethene, 1,1-dichloroethene, 1,1,1-trichloroethane, and total chromium. Using the recent groundwater monitoring data collected in January 1996, I compared the geometric mean concentration for each detected chemical to drinking water standards and health advisories in the table below.

17. Comparison of the detected chemicals to MCLs and health advisories published by the EPA indicates that the geometric mean concentration of 1,1-dichloroethene, 1,1,1-trichloroethane, and total chromium are between 3.5 to 33,333 times below their respective MCL or health advisory. While TCE is above the MCL, the geometric mean concentration is clearly below several of EPA's health advisories including a long-term health advisory. These data clearly indicate that the average levels of chemicals in the groundwater plume do not represent a significant health risk or endangerment. These data also show that while MCLs are a health protective standard, exceeding an MCL does not necessarily mean that this exceedence represents an endangerment without a thorough understanding of the health protective basis for that particular MCL which often times includes several safety factors.

Comparison of Monitoring Well Data With MCLs (drinking water standards) and EPA Health Advisories
(concentrations in μg/L)

Chemicals of Concern	Geometric Mean	Health Advisories			MCL
	(μg/L)	One-day[1] (μg/L)	Ten-day[2] (μg/L)	Longer Term[3] (μg/L)	(μg/L)
<u>Chlorinated Organic Hydrocarbons</u>					
1,1 - Dichlorocthene	2	2,000	1,000	4,000	7
1,1,1 - Trichloroethane	3	100,000	40,000	100,000	200
Trichloroethene	19	—	—	300*	5
<u>Inorganics</u>					
Chromium (total)	19	1,000	1,000	800	100

[1] One-day health advisory - the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for up to 5 consecutive days of exposure, with a margin of safety.

[2] Ten-day health advisory - the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for up to 14 consecutive days of exposure, with a margin of safety.

[3] Long-term advisory - the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects up to approximately 7 years (10% of an individual's lifetime) of exposure, with a margin of safety.

*Drinking water equivalent level (DWEL) - A lifetime exposure concentration protective of adverse, non-cancer health effects, that assumes all of the exposure to a contaminant is from a drinking water source.

MCL - Federal MCLs

(Source EPA, 1995 Drinking water regulations and health advisories; EPA's office of water, Washington, D.C.)

18. While my analyses used average levels for comparison with MCL and health advisories to determine potential health risks, EPA's analyses used individual monitoring well data points for comparison with MCLs to conclude endangerment. For water that is to be used for drinking, MCLs are generally applicable where the water will be provided directly to 25 or more people or will be supplied to 15 or more service connections. Moreover, MCLs apply at the tap. For these reasons, average levels of chemicals in groundwater seem more appropriate for comparison with MCLs than individual monitoring well results. In addition, the average concentrations would be more representative of the most plausible points where individuals would likely complete a well (i.e., off-site locations).

19. According to Mr. Norman Gaume, the City of Albuquerque applies drinking water standards at the tap for some chemicals and where water enters the public distribution system for others. Thus, exceeding an MCL in groundwater by definition cannot represent an imminent and substantial endangerment because it does not account for any dilution that may occur during transport to the City's distribution system or to the tap. On page 132 of the Gaume deposition, Mr. Gaume was asked: *"But you would agree with me that a portion of water produced by a well could be above MCLs and still produce water of a quality that the City would be willing to provide to consumers"?* He responded *"yes"*. In fact, Plaintiffs' fail to provide any evidence or analyses to show where any constituent of concern at the Spartan site would exceed the MCL at the tap or where groundwater would enter the public distribution system.

20. My review of EPA's imminent and substantial endangerment report and motion for a preliminary injunction reveal a number of technical inaccuracies as follows:

- On page 17 of the EPA's imminent and substantial endangerment report, EPA incorrectly suggests that the 5 μg/L MCL for trichloroethene is based on cancer risk. The 5 μg/L MCL for trichloroethene is based essentially on the practical quantitation level (PQL) which is defined as the lowest achievable level of analytical quantitation during routine laboratory operating conditions within specific limits of precision and accuracy. In other word, 5 μg/L is the level of trichloroethene that can be reliably detected in groundwater.

- The same comment applies to 1,1,1-trichloroethane and 1,2-dichloroethylene; the MCL is based essentially on the practical quantitation level. On page 17, EPA incorrectly states that trichloroethene is a B2 (probable) carcinogen. The carcinogen ranking of trichloroethene has been withdrawn by EPA and is currently undergoing review. There is considerable debate in the scientific community regarding the carcinogenicity of this chemical and how the animal data should be used to extrapolate human health risks (see comments below).

- On page 19, EPA incorrectly implies that chromium VI is a known human carcinogen in drinking water. Chromium VI is not carcinogenic in drinking water. However, in the occupational setting, chromium VI is a known human carcinogen when inhaled but not when ingested.

21. According to the affidavit of Mr. Norman Gaume, plaintiffs' contend that "The aquifer in the area of the Sparton Technology facility would provide high quality drinking water, if it were not for the contamination plume." I have reviewed the plaintiffs' and defendants' pleadings and attached reports and found that such a statement may not be true. Results of groundwater monitoring data at several locations reveal that wells located in the shallow aquifer have some total dissolved solids (TDS) measurements in excess of 500 mg/L and some sodium levels at 20 mg/L[3]. Likewise, the shallow aquifer has background occurring levels of nitrate at some locations above primary drinking water standards.

22. Potable water is defined as water that is fit for drinking (Vesilind and Pierce, 1983). The EPA sets national secondary drinking water regulations to control water, color, odor, appearance, and other characteristics affecting consumer acceptance of water. The secondary regulations are not federally enforceable but are considered guidelines for the states (Federal Register, 7/7/91). Secondary Maximum Contaminant Levels (SMCLs) and, in the case of sodium, the Drinking Water Equivalent Level (DWEL) were compared with selected individual groundwater monitoring well data in order to determine the potability of these waters. The table below illustrates the water quality parameters used in the determination of groundwater potability and their effect upon water usability.

[3] I recognize that the State of New Mexico defines all groundwater of the State to be potentially suitable for domestic or municipal water supply, except where the total dissolved solids (TDS) concentration exceeds 1,000 mg/L. However, as a practical matter, naturally occurring concentrations of total dissolved solids in the shallow ground water above federal secondary drinking water standards impart objectionable taste to the water, thereby precluding its use as a drinking water source. Similarly, background levels of nitrate above primary drinking water standards and sodium above health advisories preclude the use of shallow ground waters as a drinking water source because the levels represent potentially unacceptable human health risks.

Primary and Secondary Maximum Contaminant Levels and the Effect Upon Water Usability

Chemical	MCL, SMCL, or DWEL†	Effect upon Usability of Water
Sodium†	20 mg/L	In combination with chloride imparts a salty taste.
Nitrate	10 mg/L	Levels above 10 mg/L may cause methemoglobinemia in infants.
Total Dissolved Solids (TDS)	500 mg/L	More than 500 mg/L is undesirable for drinking.

* - SMCL - Secondary Maximum Contaminant Level
† - DWEL - Drinking Water Equivalent Level

23. Total dissolved solids are a measure of the total amount of minerals dissolved in water and are, therefore, a very useful parameter in the evaluation of water quality. Water containing less than 500 mg/L is preferred for domestic use and for many industrial purposes. Less than 300 mg/L is desirable for dyeing of textiles and the manufacture of plastics, pulp paper, and rayon. Dissolved solids also cause foaming in steam boilers. Levels above 500 mg/L are undesirable for drinking. Nitrate levels in water supplies above the primary standard of 10 mg/L can induce methemoglobinemia (a potentially fatal condition) in infants.

24. Because TDS, sodium, and nitrate were not measured from all wells over a sufficient period of time, I did not have the same basis for averaging and comparing results with MCLs as I did above when I compared the average level of Spartan related chemicals to MCLs[4]. All I can say at this point is that there is some data that indicates that background water quality may not be suitable as a drinking water source, for reasons unrelated to the Spartan Facility. More data would be necessary to make a valid comparison with MCLs to determine if groundwater is of high water quality. However, if one applies EPA's method discussed above (i.e., comparing individual trichloroethene monitoring well results with MCLs) to conclude endangerment, one would also have to conclude that for reasons of taste and domestic and industrial usability, as well as protection of human health, the shallow aquifer is of sufficiently poor natural quality that it would not be desirable as a drinking water source.

25. In summary, the Plaintiffs fail to provide an adequate estimate of the likelihood, risk, or probability of someone completing a well in the contaminated plume and drinking contaminated water. Thus, the plaintiffs fail to provide evidence concerning the risk of ingesting contaminated groundwater as an "imminent" hazard. Without a plausible route for people to be exposed to contaminated groundwater, there can be no imminent and substantial endangerment. Furthermore, even if exposure is assumed to occur, the Plaintiffs provide no basis for their speculation that the degree of hypothetical exposure would be sufficient to cause human health effects. Therefore, based on the results of exposure and risk analyses of groundwater monitoring data, it is my opinion that the human health is not at risk of imminent or substantial endangerment.

FURTHER THE AFFIANT SAYETH NOT.

Glenn C. Millner, Ph.D.

[4] I also was unable to take make any dilution calculations to determine if groundwater would meet MCLs at the tap or point of distribution because such procedures were not produced by Plaintiffs'.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW MEXICO

THE CITY OF ALBUQUERQUE, and THE BERNALILLO COUNTY COMMISSIONERS, Plaintiffs, vs. SPARTON TECHNOLOGY, INC., Defendant,	CIVIL ACTION NO. CIV-97-0206-LH
STATE OF NEW MEXICO, THE NEW MEXICO ENVIRONMENT DEPARTMENT, and THE NEW MEXICO OFFICE OF THE NATURAL RESOURCES TRUSTEE, Plaintiffs, vs. SPARTON TECHNOLOGY, INC. Defendant.	CIVIL ACTION NO. CIV-97-0208JC
UNITED STATES OF AMERICA, Plaintiff, vs. SPARTON TECHNOLOGY, INC. Defendant.	CIVIL ACTION NO. CIV-97-0210-M

AFFIDAVIT OF STEVEN P. LARSON

STATE OF MARYLAND)
)
COUNTY OF MONTGOMERY)

BEFORE ME, the undersigned authority personally appeared Steven P. Larson, who after being sworn, deposed and stated as follows:

EXHIBIT
"C"

1. My name is Steven P. Larson. I am over the age of 18 years, I have never been convicted of a crime of moral turpitude, I am fully competent to make this affidavit, and the following represent my opinions and conclusions on whether sufficient information currently exists with respect to impacted groundwater associated with a manufacturing plant operated by Sparton Technology, Inc., at 9621 Coors Road, Northwest, Albuquerque, New Mexico to install a well to prevent the movement of constituents of concern above drinking water limits thereby expanding the groundwater that has been impacted. The facts or data upon which I base my opinions and conclusion are of a type reasonably relied upon by experts in my field, hydrogeology, in forming opinions or conclusions.

2. Attached as Exhibit "A" to this affidavit is a current version of my curriculum vitae. Over the past 17 years I have developed, designed, monitored, and evaluated the operation of containment and/or extraction systems involving various constituents of concern that have impacted groundwater. I have also developed and supervised various investigation programs to delineate the vertical and horizontal extent of impacts to groundwater from constituents of concern. I have testified as an expert witness on matters related to soil and groundwater contamination in trials before federal district courts in Missouri, California, Tennessee, Oklahoma, New York, Nebraska, and Pennsylvania, and before state courts in Iowa and Delaware.

3. In preparing this Affidavit I reviewed the following material:

I. Memorandum Regarding Sparton Technology, Inc.'s Position on The Facts, the Law, and the Relief Sought by EPA, February 1997, and attachments:
   - A. Report of Pierce L. Chandler, Jr., on Geology/Hydrogeology Characterization, Contaminant Plume Characterization, Risk Assessment, and Aquifer Restoration, Sparton Technology Coors Road Facility; Albuquerque, New Mexico. February 4, 1997.
   - B. Report of W. Peter Balleau, CPG, P.Hg., on Sparton Technology, Inc. Site Impact on Groundwater-Resource Availability. February 3, 1997.
   - C. Report of Gary L. Richardson, P.E. on the Use of Injection Wells at Groundwater Remediation Sites. February 3, 1997.
   - E. Initial Administrative Order Under Section 3008(H) of the Resource Conservation and Recovery Act.

II. Additional Information in Support of Sparton Technology, Inc.'s Position on the Facts, the Law, and the Relief Sought by EPA, March 1997, with attachments:
   - A. Report of Pierce L. Chandler, Jr., in Technical Reply to EPA's Position Statement Responding to the Memorandum Regarding Sparton Technology, Inc.'s Position on the Facts, the Law, and the Relief Sought by EPA, dated February 4, 1997.
   - B. Report to Sparton Technology, Inc. by Sheehan, Sheehan & Stelzner.

C. Letter from: New Mexico Utilities, Inc. to: Sheehan, Sheehan & Stelzner. Re: No plans to drill any wells in the immediate vicinity of the Sparton Facility, February 5, 1997.

D. Report of Gary L. Richardson, P.E. in Technical Reply to EPA's Responses to the Memorandum Regarding Sparton Technology, Inc.'s Position on the Facts, the Law, and the Relief Sought by EPA dated February 4, 1997, March 14, 1997.

E. Report of W. Peter Balleau, CPG, P.Hg., on Sparton Technology, Inc. Site Impact on Potential Calabacillas Recharge Reach., March 14, 1997.

III. Plaintiffs' Joint Opposed Motion for Preliminary Injunction and Memorandum in Support, April 1997, and attachments:.

1. Declaration of Vincent E. Malott in Support of the Joint Motion for Preliminary Injunction, Dated on or about March 31, 1997, with attachments:

A. Hazardous Waste Facility Post Closure Care Plan, Coors Road Plant; Albuquerque, NM. Prepared for: Sparton Corporation, Prepared by: Harding Lawson Associates. December 17, 1985.

B. "Geohydrologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central New Mexico", by: Conde r. Thorn, Douglas P. McAda, and John Michael Kernodle. U.S.G.S. WRI 93-4149. Albuquerque, NM. 1993.

C. EPA Notification of Hazardous Waste Activity. August 12, 1980.

D. EPA General Information Sheet, and Hazardous Waste Permit Application.

E. Revised EPA Hazardous waste Permit Application.

F. Letter from: Sparton Southwest, to: USEPA, region 6, re: Proposed Changes during Interim Status. July 21, 1983.

G. Information sheet including: customer Service, Summary Analysis, Payment summary, and History.

H. Letter from: USEPA, to: Sparton Southwest, Inc. re: This warning letter issued pursuant of the Solid Waste Disposal Act. February 1, 1983.

I. Letter from: Sparton Southwest, Inc. to: USEPA re: response to the warning letter. March 2, 1983.

J. Letter from: USEPA to: Sparton Southwest, Inc. Re: Compliance order and notice of Opportunity for Hearing. June 24, 1983.

K. Letter from: USEPA, to: Sparton southwest, Inc. Re: Consent Agreement and Final Order. February 22, 1984.

L. Investigation of Soil and Groundwater Contamination Prepared for: Sparton Corp., Prepared by: Harding Lawson Assoc. March 19, 1984.

M. Hydrogeologic Characterization and Remedial Investigation. Prepared for: Sparton, Corp. Prepared by: Harding Lawson Assoc. March 13, 1985.

N. Letter from: Sparton Tech, Inc. to: State of NM. Re; Revised closure plan and Post closure Care Plan. December 19, 1985.

O. Pond and Drum Storage areas Closure Plan. Prepared for; Sparton Corp, Prepared by: Harding Lawson Assoc. December 19, 1985.

P. Letter from: State of NM, to: Sparton Technology, Inc. Re: Closure Plan Modifications. June 16, 1986.

Q. Soil Investigation of the unsaturated and Upper Saturated Zones. Prepared for; Sparton Technology, Prepared by: Harding Lawson. June 30, 1986.

R. Letter from: Sparton technology, to State of New Mexico, re: Certification of Closure for the New Drum Storage Area. November 17, 1986.

S. FINAL administrative order on Consent.

T. Letter from: Black & Veatch, to: USEPA, re; Revisions to Report of Effectiveness of the Groundwater Recovery Well System in the Upper Flow Zone. February 28, 1995.

U. RCRA Facility Investigation. Prepared for: Sparton Tech, Inc. Prepared by: Harding Lawson Assoc. December 14, 1990, revised by: HDR Engineering, Inc. in conjunction with Metric Corp. May 1, 1992.

V. USEPA Region 6 announces a Public Hearing and Public Comment Period for the Sparton technology Coors road Facility RCRA Statement of Basis.
W. Letter from: Black & Veatch, to: USEPA, re; Draft Final Corrective Measures Study Report. May 13, 1996.
X. Technical Review, Final Corrective Measures Study Report, RCRA Corrective Action. June 20, 1996.
Y. Final Decision, RCRA Corrective Action. June 24, 1996.
Z. Letter from: USEPA, to: Sparton Technology, Inc. re: Initial Administrative Order of RCRA Sparton Technology, Inc. September 16, 1996.
AA. Determination of Imminent and Substantial Endangerment.
AB. Protective Response and Request for Hearing.
AC. Analytical Report for the State of NM, Dept of Health. November 15, 1996.

2. Affidavit of Norman Gaume.
3. Affidavit of Robert D. Morrison.
Exhibit B. Work plan for Sparton Coors road Facility, Albuquerque, NM. March 28, 1997.
4. Findings of Imminent and Substantial Endangerment.

IV. Deposition of Robert D. Morrison, Ph.D. May 2, 1997.

V. Various Information and Data concerning groundwater conditions at and near the Sparton Technology Site Supplied by Pierce L. Chandler, Jr., 1997.

VI. Proposal: Aquifer Testing/Extraction Demonstration/ Additions to Monitoring Network; Prepared for: Sparton Technology, Inc. Prepared by: Black & Veatch and Metric Corp. Revised, Dec. 6, 1996 and Revised, January 17, 1997.

VII. "Simulation of Ground-Water Flow in the Albuquerque Basin, Central New Mexico, 1901 - 1994, with Projections to 2020", by: John Michael Kernodle, Douglas P. McAda, and Conder. Thorn. USGS WRI 94-4251. 1995.

4. EPA has indicated that 5 additional monitoring wells are necessary to define the vertical and horizontal extent of the leading edge of the plume before proceeding with a containment remedy. Based on the data from existing monitoring wells over the past several years, it is clear that 5 new monitoring wells are not necessary in order to proceed. Furthermore, the locations proposed by EPA for the additional monitoring wells are not likely to provide information that will improve the definition of the extent of TCE contamination that exceeds 5 ppb and thus improve the ability to locate or design an extraction well.

5. The existing data demonstrate several important facts. First, the contaminant plume is migrating in a west-northwest direction at a rate of about 100 feet/year. This direction and rate are consistent with the hydrogeologic data (water level gradients and aquifer transmissivity) that have been collected at the site. Second, the leading edge of the plume (concentrations exceeding 5 ppb of TCE) reached wells MW 60 and 61 near the end of 1993 or the beginning of 1994 and extended

to well MW 65 at the end of 1996. Third, almost all of the contamination is migrating within the uppermost 50 to 100 feet of the groundwater environment. Fourth, the transmissivity of the upper parts (50 to 60 feet) of the groundwater environment and the groundwater flow in this interval have been clearly established from testing at well PW-1 and measurements of groundwater levels.

6. The likely performance of a containment well can be reasonably inferred from the available data. The testing at well PW-1 has clearly shown that the transmissivity of the uppermost 50 to 75 feet of the groundwater environment is about 18,000 gpd/ft and that a single well can produce more than 180 gpm. The test also demonstrated that response to pumping 180 gpm was readily apparent at distances of more than 350 feet from the pumping well within one day. This extent of observable response would have continued to expand to greater distances if pumping had continued. Thus, the likely performance and impact of a containment well in this hydrogeologic environment has been demonstrated.

7. The hydrogeologic conditions near the leading edge of the groundwater contamination are likely to be similar to those found near PW-1. Water level data show that groundwater flow is toward the northwest in a direction consistent with the orientation of the TCE contamination. Since there are no apparent sources of unusually high groundwater recharge along this path of groundwater flow, the fundamental laws of mass conservation demonstrate that the rate of groundwater flow near the downgradient margin of the TCE contamination will be similar to the rate indicated by the transmissivity conditions near PW-1. In other words, the groundwater flow beneath the Sparton site flows to the northwest at a rate determined by the aquifer transmissivity and the water level gradient, both of which have been determined. This rate will not increase or decrease unless water is added (via recharge for example) or taken away (via pumping for example) or unless the groundwater flow pattern is converging or diverging. Since there is no evidence of significant recharge or pumping to the northwest of the Sparton site and since the water level data do not show any significant convergence for divergence of the groundwater flow pattern, one can expect that the rate of groundwater flow northwest of the site will be similar to the rate beneath the site. Consequently, the existing data and evaluations provide a sufficient basis for implementation of a containment well. Subsequent monitoring data can be used to confirm the performance or to make necessary

adjustments.

8. Based on the available facts and information, a reasonable estimate can be made as to the extent of the TCE contamination. The testing at well PW-1 and the measurements of groundwater levels provide a reasonable estimate of the rate of groundwater flow within the zone of contamination. The testing at PW-1 has also demonstrated that a single well can produce at least 180 gpm, which is more than what is likely to be necessary to intercept the contaminated groundwater. Thus, all the ingredients are available for locating and designing an extraction well and necessary adjustments can be made based on monitoring of the well performance.

9. The locations for additional monitoring wells proposed by the EPA are not likely to provide information that will improve our ability to locate or design the extraction well. The available data demonstrate that contamination progressed beyond monitoring wells 53, 60 and 61 sometime after June of 1991 and has not yet reached monitoring wells 68 and 69 which are directly along the trajectory of contaminant migration. Thus, the current extent of contamination is located somewhere between these two sets of wells.

10. EPA proposes to put additional monitoring wells between existing wells in areas where contamination is not likely to have reached. Consequently, while these wells might confirm that contamination is not present, it will not help to improve the delineation or estimation of the extent of contamination exceeding the MCL of 5 ppb for TCE. Since the placement of the extraction well would be based, at least in part, on this estimated extent, the additional wells are not likely to provide information that will improve our ability locate or design the extraction well.

11. A similar situation exists with regard to the additional deep monitoring well proposed by EPA near monitoring wells 60 and 61. Assuming the well is constructed like other deep wells, such as monitoring well 67, it would likely demonstrate that contamination has not reached that depth. This information, again, would not provide for a more precise delineation of the extent of TCE contamination exceeding 5 ppb. More importantly, however, is the fact that information on the vertical extent of contamination at the location of the extraction well can be collected when the well is constructed by sampling at different depth intervals during the drilling process. Consequently, the proposed additional deep monitoring well is not likely to provide information that

will improve the design of the extraction well and such information can be obtained as part of the drilling process.

12. As described above, the available hydrogeologic information and monitoring data provide a sufficient basis for proceeding with implementation of a containment well. Based on the available information, a tentative well location for the containment well can be selected. Drilling and testing at the selected location can be conducted to verify the selected location as suitable for containment purposes and to determine the depth of contamination. Based on the results of the drilling and testing program, an additional well may be required to provide performance monitoring for the containment well. The need for such a monitoring well would depend on the exact location of the containment well relative to existing monitoring wells. Since the exact location of the containment well can be affected by logistic and access considerations, the need for an additional well cannot be evaluated at the present time. Also, depending upon the proximity of the selected containment well location to nearby existing monitoring wells, one or two piezometers may be necessary to provide water level data necessary for evaluating performance of the containment well. It should be noted that, given the available data, clusters of monitor wells or piezometers (one at the water table and one at greater depth) are no longer necessary since the containment would focus on all of the groundwater contamination within the upper 50 to 100 feet of the groundwater environment.

13. It is worth noting that some of the consultants retained by the EPA seem to share a similar view regarding the location and design of a containment well. In the deposition of R. Morrison, an EPA consultant, exhibits were produced that included notes regarding a conference call discussion among various EPA consultants related to technical issues of locating and designing a containment well (Morrison Deposition, May 2, 1997). Among those notes were the following statements.

> *"Horizontal extents of the plume look well enough defined, for purposes of containment. At large extraction rates, capture zone should be very wide."*

Furthermore, Mr. Morrison's staff made numerous analyses to evaluate the size of the capture zone

that would be created under a range of conditions and assumptions that included conditions comparable to those observed in the testing at well PW-1. Although Mr. Morrison had difficulty understanding his staff's calculations, the results are quite clear. Pumping rates of 100 to 200 gpm will produce a broad capture zone that would completely envelop the estimate extent of TCE contamination. These statements and analyses are consistent with the conclusions described previously and reflect a conclusion that data are sufficient to proceed and that the size of the capture zone can be increased significantly, if necessary, by increasing the extraction rate from the containment well.

14. The EPA's specifications for conducting pumping tests on the containment well are excessive. This conclusion is based on several facts. First, a pumping test has already been conducted on a well (PW-1) near the Sparton facility that would be virtually identical to the test on the containment well. Results of this test demonstrated that pumping at a rate of 180 gallons per minute for about 25 hours produced clearly discernable drawdown data extending more than 350 feet from the pumping well. Furthermore, as the pumping time is extended, the aerial extent of discernible drawdown will continue to increase. The data from this test also demonstrate that the pumping rate necessary to intercept the contaminated groundwater flow will be about 85 to 130 gallons per minute. Consequently, significant information about aquifer properties is already available.

15. EPA proposes to conduct a step-drawdown test on the containment well at rates up to 600 gallons per minute. This test would be in addition to a long-term constant rate test. The step-drawdown test, however, will provide little useful information that would not be provided by the constant rate test and only adds to the cost and logistical difficulty of handling large amounts of water on a temporary basis. The principal use of a step-drawdown test is to provide information on well efficiency. However, well efficiency would only be important if the well yield was insufficient to provide the pumping rate necessary for capture. If that were the case, additional extraction wells might be necessary to provide the necessary pumping. The test at well PW-1 clearly shows that the well yield is likely to substantially exceed the pumping rate required for capture. Thus, the utility of a step-drawdown test is marginal, at best.

16. A step-drawdown test can provide information about aquifer transmissivity. However, since a constant rate test would be used to determine transmissivity of the groundwater environment and the transmissivity value will be a determining factor in selecting an operational pumping rate for the containment well, the utility of data from the step-drawdown test is extremely limited. Also, the same information can be obtained by conducting the step-drawdown test at lower pumping rates than those proposed by the EPA. Given the logistical difficulties of handling large volumes of pumped water before a permanent disposal arrangement is available and the marginal value of the data from the step-drawdown test, pumping at rates up to 600 gpm or for extended periods prior to the availability of permanent water disposal is not justified.

17. The need for piezometers associated with the containment well will depend upon the selected location. Since the effects of pumping will be discernible over a large area, the existing monitoring wells can serve to monitor and document these effects. Consequently, it is likely that only one or two piezometers would be necessary to provide the water level data necessary to sufficiently document the effectiveness of the containment well.

18. The available data and information concerning hydrogeologic conditions and the extent and progression of TCE contamination provide a reasonable basis for locating and implementing a containment well program. The installation of five additional monitoring wells at a few locations will not significantly change the process of locating and designing a containment well. Uncertainties will continue to exist even with additional wells and this uncertainty will always be a consideration in the location and design of the containment well. Furthermore, once the containment well is installed and operating, its performance can be evaluated from monitoring data and adjustments, such as increasing or decreasing the pumping rate, can be made to insure that sufficient interception/capture is being accomplished.

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