EXHIBIT A

McFarland Community Health Newsletter

California Department of Health Services
Environmental Epidemiology and Toxicology Section

Volume 1, Number 2 October 1, 1988

Update on McFarland Cancer Studies

This is the second newsletter from the State Department of Health Services (DHS) to inform McFarland community residents about investigations that relate to the ten childhood cancer cases that occurred between 1975 and 1985. Backround information about the cancer problem and more detailed technical reports about the investigations can be found at the County Library (McFarland branch). At this location you will find copies of the first newsletter and the Phase One and Phase Two reports which describe the epidemiologic and environmental investigations that have been completed.

This newletter contains articles about: 1.) a program to screen McFarland children for health problems, 2.) two epidemiologic studies (the case-control and the four county) which have looked for causes of the cancers, 3.) ongoing studies on pesticide use in the McFarland area, 4.) studies on the Voice of America radio transmissions, 5.) studies on ground and surface water and 6.) a calendar which shows approximately when DHS expects to complete these programs and studies. If you have questions or comments, you will find names, addresses, and phone numbers of people to contact at the end of most articles.

A Program To Look At The Health of McFarland Children

The Environmental Epidemiology and Toxicology Section of the California Department of Health Services (DHS) has contacted various community groups and members for input into the design of the child health screening program. Many groups have been asked to participate, including the Mayor's Advisory Committee, the Kern County Health Dept., the Kern County Medical Society, local and regional doctors, public health and school nurses, and organizers of various regional not-for-profit health clinics. Our goal is to design an effective screening program that will address the concerns of McFarland residents. Decisions to be made include which children to screen, what laboratory tests to obtain, what health questions to ask of children and their families, and how best to insure that all selected children will participate.

In the process of screening, when children are identified with health problems, DHS will arrange for appropriate medical follow-up. The results of the screening will demonstrate whether there are childhood health problems that are not being adequately treated. If you have any questions or suggestions about the screening program, please contact Richard Kreutzer, M.D., Environmental Epidemiology and Toxicology Section, 2151 Berkeley Way Rm 515, Berkeley, CA 94704 telephone (415) 540-2669.

THERE WILL BE A COMMUNITY MEETING ON WEDNESDAY, OCTOBER 12, AT 7:00 P.M. 107 SHERWOOD AVE. STATE REPRESENTATIVES WILL DISCUSS THE CANCER INVESTIGATIONS. A SPANISH TRANSLATOR WILL BE PRESENT.

The McFarland Child Cancer Study

To study the possible causes of a cluster of childhood cancer, DHS interviews parents or relatives to find out whether the children had any exposure in common that was different from that of similar children in the community who do not have cancer. When this is done by selecting specific children to represent noncancer children, it is called a case-control study. Such a study was per-

formed by DHS for McFarland. The cases for McFarland were the children with cancer; the controls were children without cancer who were matched on date-of birth, sex, and ethnicity. DHS interviewed a parent or close relative (usually the mother) of each child who had cancer in McFarland. DHS asked questions about: 1.) medications the child had taken, 2.) previous illnesses, 3.) where the child went to school, 4.) where he or she had spent spare time, 5.) some possible specific exposures, 6.) addresses of all the places the child had lived, 7.) materials of which the homes were built and 8.) heating and air conditioning. Since the community was particularly concerned about the quality of the drinking water, we asked questions about consumption of water and other beverages.

Because the mother might have been exposed to something during pregnancy that would affect the child, we asked where she had lived during her pregnancy, where she had worked during her pregnancy, about illness, medication, smoking, alcohol consumption, and water and beverage consumption during pregnancy. We asked similar questions about the father for the period several months before the pregnancy, which was the period of time when the sperm for that pregnancy would be forming.

We compared the answers from parents of children with cancer (cases) and parents of children without cancer (controls) for each question. We found several possible differences between the cases and the controls, but when we reinterviewed the parents to obtain more information, we found that most of these differences were due to lack of detail in the original questionnaire. However, we noted that eight out of ten (80%) of the fathers of cancer cases reported working in agricultural fields, while only nine out of twenty (45%) of the control fathers reported working there. Differences such as these, based on small numbers (30 children), may be due to chance, but because of particular concern about exposure to pesticide, additional follow-up is planned (see the article on Environmental Investigation: Occupational Studies). For more information, call Margaret Deane (415) 540-2669.

The Next Step: Study Childhood Cancer in Four Counties

Our investigation of the cluster of childhood cancer in McFarland highlighted the need for the recently established tumor registry in San Joaquin Valley to keep track of new cancer occurrences. The registry routinely would take up to one year to collect cancer data for analysis from the hospitals that participate in the registry. To see if the cluster continues, it is important to obtain information about new cancer cases as soon as they occur. Therefore, DHS has arranged with the regional tumor registry (The Center for Strategic Health Planning) to obtain reports of cases of childhood cancer in Kern County more rapidly, and to interview the parents of any newly diagnosed McFarland cases.

In addition, DHS arranged with the registry for the collection of cancer data in Kern, Kings, Tulare, and Fresno Counties back through 1980. Information will also be collected on demographic characteristics, farming practices, pesticide use, and surrounding crop type of each community. A study of this broader geographic area will help examine possible causes for the McFarland cancer cases. For more information, call the Center for Strategic Health Planning (209) 435-6745.

Environmental Investigation

During the investigation of potential causes for the higher occurrence of childhood cancer, McFarland residents expressed concern about possible contamination of drinking water and soil. As a result, DHS conducted an investigation of soil, water, and occupational exposure. The following summarizes what DHS learned from sampling the water and soil and outlines the current work plan.

Soil Samples of the top three feet of soil were collected from yards of nine case homes and six randomly chosen control homes. In five of the nine case homes, and in one of the control homes, no detectable levels of pesticides were found. Traces of long-lasting chlorinated pesticides, such as DDT, were found in the soil of the remaining four case and five control homes. In March 1987, surface soil samples were collected from Browning Road School, Browning Road Park, Sherwood Avenue Park, and from the water collection sump off of Glenwood Avenue. Only trace levels of metals and a limited number of the same type of pesticides were found. The findings indicate that soil contamination by these levels of chemicals did not pose a threat to the health of McFarland children during the time of sampling. DHS will continue to assess the need for further soil sampling.

Water In 1985 and 1988, water samples were col-

lected from the six McFarland municipal wells, homes of the cancer cases, three randomly chosen control homes, and other community locations. Samples were analyzed for pesticides, other organic chemicals, nitrates, and metals. Of the hundreds of compounds examined, only low levels of a few solvent-like compounds and nitrates could be found. A separate study found that the pattern of past nitrate contamination could not account for the cluster of cancer. This study is contained in the Phase II report. DHS is exploring the possibility of conducting mutagenicity assays on McFarland drinking water. These assays will help determine the potential of the water to cause cancer.

The Governor's Scientific Advisory Panel has recommended that no further monitoring, with the exception of the mutagenicity water testing, be conducted until the results of the four county epidemiological study have been obtained. DHS will comply with these directions, but is also evaluating the results of any environmental monitoring that has already been conducted in the McFarland area.

DHS is also planning to sample water for lead contamination from homes where lead solder may have been used on plumbing. DHS is interested in sampling a total of six to ten homes, and would like to sample homes from both sides of town. **If your home is two to ten years old, or has copper plumbing, and you would like to have your water analyzed for lead contamination, please leave your name and address with Mr. Cliff Ford, manager of McFarland Mutual Water Company (792-3058).** Mr. Ford will relay the information to DHS.

Occupational Studies Occupational exposures of parents to some chemicals have been known to cause adverse health effects in children. Because the case control study conducted in McFarland revealed that more fathers of children with cancer reported working in agriculture than did fathers of children without cancer, it is necessary to learn more about parental exposure. DHS is, now, planning to contact the parents of all of the children studied to find out more about their pesticide exposures. Along with the interviews, DHS plans to gather information by visiting the work sites of agricultural workers. If you have any questions or comments about the environmental investigations, or the occupational study, please contact Gina Micarelli, Environmental Epidemiology and Toxicology Section, 2151 Berkeley Way, Berkeley, CA 94704 tel. (415) 540-2669.

Evaluations of Pesticide Use in McFarland

The California Department of Health Services (DHS) examined reports of pesticides used in the McFarland area collected by the county agriculture commissioner and the Kern County Health Department. The objective of the review was to identify those pesticides that were used considerably more during the period of time when environmental exposures would have been common to all of the cancer cases. The initial information obtained by DHS proved to be incomplete. Consequently, we are double-checking our original analysis using data from computer tapes at California Department of Food and Agriculture (CDFA) in Sacramento. Even then the information will not be 100% complete since certain pesticides used were non-restricted and, therefore, not reported after application. Some of these pesticides (both restricted and non-restricted) are carcinogenic (cancer causing) in animals.

The analysis of the CDFA data will take several months. When complete, DHS will hopefully have a better estimate of the amount of restricted pesticides used in the area in past years.

DHS will also be reviewing ways to improve the pesticide use reporting system to reflect more accurately the actual quantity of commercially-applied pesticide in an area, as well as expand the list of pesticides that must be reported.

Voice of America Transmission Study

Questions have been raised about the possible cancer risk from radio waves from the Voice of America (VOA) transmitter near Delano, about four miles north of McFarland. In February, 1986, VOA staff conducted an unsystematic survey which showed a very rapid decrease in intensity of the radio frequency (RF) waves as they moved away from the transmitter. By the time they reached McFarland their intensity was zero. VOA staff concluded that "any adverse health effects in citizens living near the Delano VOA station are unlikely to be related to RF radiation."

In order to make more systematic measurements in McFarland, DHS requested another study by expert staff of the National Institute of Occupational Safety and Health (NIOSH), which is part of the U.S. Centers for Disease Control (CDC). The

study was conducted on May 19, 1988. NIOSH investigators were accompanied by staff of the Federal Occupational Safety and Health Administration (OSHA) and by staff from DHS.

Radio frequency (RF) waves generate electric fields and magnetic fields. Both of these were measured before and after VOA began its broadcasts (5 pm) at five locations in McFarland. At 9:00 p.m. (while the VOA was operating) measurements were taken in three McFarland residences. Electric field measurements were taken at various distances from the VOA facility before and after 5:00 p.m. At all outdoor locations, the investigators measured body currents, resulting from exposure to RF fields, using a special NIOSH body current detector system that was applied to several team members before and after VOA began its broadcasts.

The instrument used to measure the electric fields can detect levels that are 8,000 times smaller than the OSHA worker exposure standard of 40,000 V^2/M^2, and the instrument used to measure the magnetic fields can detect levels that are 50 times smaller than the OSHA worker exposure standard of 0.25 A^2/M^2. Neither of these instruments detected anything at any of the five locations in McFarland either before or after the station was broadcasting. Body current measurements were zero and radio frequency measurements in the buildings were below the detection limit. The electric field measurements fell away sharply with increasing distance from the VOA facility and were no longer detectable beyond three miles from the station. McFarland is five to six miles from the station.

In addition, the team measured electric fields that are generated at frequency ranges much higher than the ranges used by VOA, in order to detect the presence of any transmitting RF/microwave source at other frequencies. They used an instrument called a Narda probe. With this instrument, levels of RF were detected that were 100 to 500 times smaller than the acceptable worker exposure standard of 1 to 5 (depending on the frequency) mW/cm^2. The source of these low levels of higher frequencies is unknown but could represent normal radio or TV station broadcasts.

The report that was prepared by NIOSH concludes that, "As a result of these measurements, it is obvious none of the readings exceed either OSHA, ACGIH (American Council of Governmental Industrial Hygienists), or ANSI (American National Standards Institute) criteria. These results clearly indicate that RF exposure on the day of measurement in the town of McFarland from the VOA transmitter, located in Delano, does not represent an occupational health hazard." We also believe that the consistently negative findings suggest that radio frequency waves from the VOA transmitter are not a likely cause of the cancer cluster under investigation. However, DHS has requested the Environmental Protection Agency (EPA) look further at this question using instruments capable of detecting even lower levels and lower frequencies of transmission. This will happen in late summer or early fall of 1988.

Study Of Ground And Surface Water Movement In McFarland

Investigation to date indicates that nitrates have contaminated some of the well water in the past. As a result, wells have been removed from the community water system and others have been outfitted with nitrate removal treatment plants. DBCP, a pesticide, had been detected at very low levels in well five in 1985 to 1988. As a result, the well, which went into operation in the Spring of 1984, was immediately removed from public use and finally pulled in July, 1988.

Because of concerns about these problems, DHS geologists with the Toxic Substances Control Division are evaluating the hydrogeology (movement of ground and surface water) in the area.

DHS geologists report that McFarland is situated along the eastern side of the southern San Joaquin Valley. The valley is a geologic basin between the Sierra Nevada and the Coast Ranges which has been filled over many millions of years with many thousands of feet of sediments. In particular, McFarland is built on the alluvial fan (gravel, sand, and silt) deposited from Poso Creek.

Sources of new ground water within this basin are rainfall; seepage from streams, rivers, and canals; and irrigation which exceeds the requirements of crops and evaporation. This new water percolates downward to the water table.

The movement of ground water is from the sources mentioned above toward areas where water is withdrawn. The major withdrawal of ground water around McFarland is due to the pumping of agricultural and municipal wells. Those wells are screened at various depths beneath the water table and ground water flows toward the screens in response to pumping.

Driller's logs of the McFarland municipal wells indicate that clay zones occur in all wells between the water table and the depth of the highest opening in the well. This is fortunate because the clay layers act as protective layers to restrict the flow of shallow ground water, which may have lower quality, to the well.

Both the nitrates and the DBCP originated at the ground surface; nitrates mostly from agricultural fertilizers, and DBCP as a fumigant for nematodes (a group of worms). The usage of DBCP as a pesticide was suspended by EPA in 1979. It is not yet known how these chemicals migrated from the ground surface down 200 feet to the ground water table, and from the water table downward an additional 50 to 450 feet through several clay layers to the aquifer at the well screens. As a result, it may be necessary to review the details of well construction which could account for a pathway for contaminants to access the underlying aquifers.

Timetable of Health Investigations

Program	Aug - Sept 88	Sept - Dec 88	Jan - Mar 89	April - June 89	July - Nov 89	Nov 89 Mar 90	Apr - May 90	June 1990
Newsletter		Oct. 1		April		Nov.		Final
Tech Advisory Committee				give 1st screen results				present results
McFarland Public Mtg		Oct. 12	To be announced					present results
Childhood Screening	gather community input	set plan, assemble personnel	screening, medical follow-up	descriptive summary				
4 county cancer study		collect & enter data			descriptive statistical analysis		combine analyses	
Environmental Monitoring				design studies	conduct studies	f/u samples analysis	↓	
Cancer Rapid Case Detection			On going					
Summary Reports								written & submitted

Itinerio de Investigaciones Sobre la Salud

Programa	Ago - Sept 88	Sept - Dic 88	Enero - Marzo 89	Abril - Junio 89	Julio - Nov 89	Nov 89 - Marzo 90	Abril - Mayo 90	Junio 1990
Boletin Informativo		Oct. 1		Abril		Nov.		Final
comité consultor tecnológico				dar primer resul.de eva.				presentar resultados
Reunión pública en McFarland		Oct. 12		se anunciará posteriormente				presentar resultados
Evaluación de niños	reunir opiniones de la comun	est. plan, reunir personal	eval.exam médicos result.	sumario descriptivo				
Estudio del cáncer en los cuatro condados		reunir y utilizar la inform			análisis estadist. descript.		combinar análisis	
Observación del medioambiente				diseñar estudios	conducir estudios	cont. con análisis muestras	de ▼	
Detección rapida de casos de cancer			continua →					
Reportes sumarios								Escritos y presentados

THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL EPIDEMIOLOGY AND TOXICOLOGY BRANCH

EXHIBIT B

QUESTIONS & ANSWERS

ABOUT THE McFARLAND HEALTH SCREENING

October 1990

In 1988, McFarland residents attended a public meeting to talk about their fears that unknown contaminants and lack of access to health care were making their children sick. At the meeting, they asked that their children be given check-ups. The governor asked the state legislature to fund the one-time screening. The screening included 1744 children between the ages of 1 and 12. This fact sheet responds to common questions about the McFarland health screening.

QUESTIONS AND ANSWERS

■ **Q: Was the health screening set up to look for more cases of cancer in McFarland children?**

A: The health screening was a general check-up, not a screening for cancer. However, if a child had cancer, it might be caught in the course of the screening.

The screening project was designed to look at three components of children's health:

1. Did McFarland children have more common or unusual health problems than other children?
2. Did any children have unusual psychological or behavioral problems based on parents' descriptions?
3. Were the children able to get medical care when they needed it?

Existing cases of cancer might, or might not, be caught on the day of the check-up, but nothing a doctor could do would tell whether a child would later develop cancer. There are no medical tests which can predict whether children will develop cancer later in their lives.

■ **Q: What are the signs and symptoms of cancer in children?**

A: There are many signs and symptoms of cancer in children. However, none of them proves the child has cancer. This is because different types of cancer do different things to the body. The best way to protect a child and find cancer early is to take the child to the doctor at the first sign of any unusual symptoms or symptoms that do not go away. Yearly physical examinations are recommended to detect cancer as early as possible when treatment may be effective, rather than waiting for problems to develop.

A pediatrician or family doctor can diagnose cancer with routine questions, a physical exam, and follow-up testing if the results of the exam are suspicious. The American Cancer Society lists the following warning signs for childhood cancer:

1. Any firm mass or swelling that does not go away
2. Unexplained paleness and lack of energy
3. Sudden tendency to bruise without being hit or bumped
4. Persistent pain in one spot, or limping without any reason
5. Long, unexplained fever or illness that does not follow the usual course

6. Many headaches, especially with vomiting
7. Any sudden eye changes, loss of vision, swelling, bulging, or abnormal eye movement

■ **Q: Do McFarland children have difficulty getting health care?**

A: Most McFarland children come from families with lower incomes and less medical insurance than average for California. As a result, their families are less able to get and pay for medical care. Children in McFarland also seem to have difficulty getting dental care.

Parents interviewed by the screening project described many problems getting medical care for their children. They say it costs too much, waiting times in doctors' offices are too long, and they cannot afford transportation to the doctor's office.

■ **Q: Based on the health screening results, are McFarland children as healthy as other children in California (or the United States)?**

A: Seventy-one percent of the children screened were referred for more health care.

The kinds of health problems found in McFarland children—vision problems, untreated tooth decay and nutritional anemia—were not unusual for a town of its size. These problems were the same as those seen by pediatricians all over the country.

But these problems occurred more often in McFarland than in similar groups throughout the state and nation.

■ **Q: Why didn't the Health Department test parents of children with cancer to see if they had high levels of chemicals, such as pesticides, in their blood?**

A: The Department found out which pesticides known or thought to cause cancer were applied in McFarland during the years prior to the cancer cases. There were no tests available which could measure levels of these pesticides in the body years after exposure. Even if tests had been available and pesticides were found in the parents' bodies, this would not have proved either that the children were exposed to pesticides or that their cancers were caused by pesticides.

■ **Q: Will there be ongoing check-ups for the children who participated in the health screening?**

A: The California Department of Health Services was given money to screen the children only one time. However, DHS is helping to fund the McFarland Community Health Clinic which has a sliding fee scale.

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For More Information

For more information contact:

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THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL EPIDEMIOLOGY AND TOXICOLOGY PROGRAM

HISTORY OF THE MCFARLAND HEALTH STUDIES

OCTOBER 1991

McFarland is a small Kern County farming community of about 6,000 people located 22 miles north of Bakersfield in California's Central Valley. In March, 1984, a worried McFarland resident contacted the Kern County Health Department (KCHD) to report that an unusually high number of children in her neighborhood had cancer. Upon examination, KCHD and the California Department of Health Services (CDHS) found that ten McFarland children had been diagnosed with cancer between January, 1975 and December, 1985. This is about three times the number expected in a town the size of McFarland. Since 1985, three more McFarland children have been diagnosed with cancer.

CDHS and KCHD have conducted a series of environmental studies to find out what might be causing McFarland's high childhood cancer rate and whether the town's environment is safe. The U.S. Environmental Protection Agency (EPA) has also supported state and local efforts in the environmental investigation. The McFarland Scientific Advisory Committee, composed of scientists, health professionals and community representatives, was established in 1988 to evaluate research efforts and to advise CDHS about its studies.

This fact sheet provides a brief outline of the investigations conducted from 1985 to the present. A wide variety of factors have been studied, with a particular focus on chemical or other environmental exposures. They include:

- potential contamination of the cancer victims' homes, schools or parents' workplace
- potential contamination of McFarland's water, soil and air caused by pesticide use, radiation, toxic waste dumps, electromagnetic fields, radio waves, automobile exhaust
- naturally occurring metals and gases such as arsenic and radon
- the general health status of McFarland children to determine whether the cancers were part of a larger pattern of childhood health problems
- the childhood cancer rate in the area surrounding McFarland (Fresno, Kern, Kings and Tulare counties).

STUDY RESULTS

■ Homes of the children with cancer

In 1985, KCHD studied homes of 10 children who had cancer and 4 who didn't to see how they were different. Scientists found that children with cancer did not have different chemicals or building and plumbing materials in their homes than those without cancer.

■ Activities of the children with cancer

In 1986-1987, CDHS conducted a health study comparing the activities of the 10 children with cancer to those of 20 healthy McFarland children. Parents were asked what substances their children were exposed to at home, work, school and in the community. They also were asked what substances the mother had been exposed to when she was pregnant, and what the father had been exposed to during the three months before the mother became pregnant, when his sperm were being formed. Researchers gathered health histories for both parents and each child.

No differences were found between the activities of the two groups of children or their parents that could explain why some children developed cancer and others did not.

■ Parents' workplace

During the 1986-1987 health study, CDHS researchers asked the parents of the 10 children with cancer and those of 20 McFarland children without cancer about their jobs. Mothers were asked what jobs they had held from the time they got pregnant until their child was diagnosed with cancer. Fathers were also asked what jobs they held from three months before conception when the sperm were being formed until the child was diagnosed with cancer. Researchers found no difference between the jobs of parents of children with cancer and parents of children without cancer.

■ Health Status of McFarland Children

In 1989, CDHS and KCHD conducted a health screening of McFarland children to determine whether they had any unusual health problems. Doctors examined children between the ages of 1 and 12. No cases of cancer or poisoning by pesticides or metals were found during the examinations. However, any existing cancers in their very early stages might not have been caught on the day of the check-up. Other health problems the doctors found—vision problems, tooth decay and anemia— were typical of those found in any small town in the United States, but in McFarland they were more likely to have gone untreated. CDHS made specific recommendations to the appropriate agencies to address this problem of access to health care.

■ Childhood Cancer Rate in Fresno, Kern, Kings and Tulare Counties

CDHS conducted a study of childhood cancer rates in Fresno, Kern, Kings, and Tulare counties to determine whether rates were elevated in areas with environments similar to McFarland, such as other small, agricultural communities. The study also looked at whether rates were different in individual small towns throughout the region. No excess of childhood cancer was found in the area as a whole. There are some communities with cancer rates that are higher than average and some communities with rates that are lower than average.

The charts which appear on the following pages summarize the studies DHS has conducted of McFarland's water, soil, air, and radiation and electromagnetic fields.

■ Water

CDHS and KCHD tested McFarland wells and tap water for more than 100 substances. Researchers found traces of a few chemicals at different times in some McFarland wells, but because of the small amounts found and the times and places they appeared, DHS believes they could not have caused the high cancer rate. The following chart summarizes all the water testing that has been done, including the substance studied, the year of testing, the agency that conducted the study and the study results.

Contaminant	Year	Source Tested (Testing Agency)	Results
Pesticides, Polychlorinated biphenyls (PCBs), metals, other chemicals	1985	Drinking water wells 1-6; (KCHD, CDHS)	Wells 1, 2, 4, 5, 6: No chemicals found. Well 3: Very low levels of pentachlorophenol, dibromochloropropane (DBCP). Second sample—no chemicals found.
		Tap water—homes of 10 children with cancer, 3 children without (KCHD, CDHS)	Tap Water: Benzene and pentachlorophenol found in one tap. Second sample—no chemicals found.
Radon, total organic halides, total organic carbon, arsenic, nitrosamines	1987	Drinking water wells 2, 4, 5, 6 (CDHS)	Wells 2, 4, 5, 6: Arsenic—levels were far lower than current standard. No standard for radon; levels were similar to other areas of U.S. Organic halides and nitrosamines not found. Wells 2 and 4: Organic carbons—levels similar to those throughout state.
Dibromochloropropane (DBCP)	1987	Drinking water wells 2,4,5,6 (CDHS)	Well 5: DBCP—exceeded current standards. Well closed because of mechanical problems. Researchers concluded that DBCP could not have caused excess cancers because the well was only used from 1984 to 1987 which was after most of the children were diagnosed.
Arsenic	1983-87	Wells 5, 6 (CDHS)	Well 5: Arsenic—levels far lower than current standard. Well 6: High levels of arsenic before well opened in 1984 (arsenic was flushed out before well opened). Repeat tests—levels met current standards.
Nitrates	1965-85	Drinking water wells 1-6 (CDHS)	Levels often exceeded current standard. (Nitrates not known to cause cancer.) Nitrate removal equipment installed, 1986.
	1984	Tap water in 3 schools* and homes of 4 children with cancer and 2 without (KCHD)	Levels below current standards.
All contaminants regulated by law, including pesticides, metals, and radiation.	1985-present	Drinking water wells—tested regularly (McFarland Mutual Water Company)	Levels rarely exceed current standard. The public is notified when levels exceed the standard.
		Various sources—tested periodically (McFarland Mutual Water Company)	All findings below current standards.

* Browning Road Elementary School, Kern Avenue Elementary School, McFarland High School

■ Soil

McFarland's soil was tested for a variety of potential contaminants. CDHS found no pattern of hazardous soil contamination in residential or public areas. There is no evidence to link McFarland's cancer cluster with chemicals in the soil. Residents had been particularly concerned about whether contaminated soil was present in the northeast neighborhood. Some felt that contaminated soil had been brought into this neighborhood to construct new housing. In 1989, McFarland's city engineers said that no new soil had been brought into the neighborhood. Other specific findings are listed below.

Contaminant	Year	Source Tested (Testing Agency)	Results
Pesticides	1985	Soil—top 3 inches,1-3 feet below the surface—from yards of 9 children who had cancer and 6 who did not (KCHD)	Very small amounts of DDT, chlordane and dieldrin found in yards of 3 children who had cancer and 5 children who did not. Levels similar in homes of children with and without cancer and typical of those found all over the U.S. Not known to pose a health threat. Elevated levels of pesticides for termite control found in home of one child who had cancer.
Pesticides, arsenic, heavy metals	1987	38 soil samples from Browning Road School, Sherwood Avenue Park, and Glenwood Avenue water collection sump (CDHS)	7 samples contained very small amounts of a few pesticides; similar to levels found throughout the U.S. All metals below levels considered safe by CDHS.
Pesticides, metals	1989	16 soil samples, McFarland (Environmental Protection Agency (EPA))	Pesticide levels below current standards, except one isolated location on commercial property.
Lead, chromium, arsenic	1989	Soil from over 300 McFarland sites tested using X-ray fluorescence (EPA)	Low levels of metals found throughout McFarland; typical of levels found in U.S. soils. Elevated levels of arsenic in one location near railroad tracks; referred to Toxic Substances Control Department.
Hazardous waste, pesticides	1988	Aerial photographs of McFarland taken 1937-84 (EPA)	No evidence of hazardous waste dump in McFarland.
		Agricultural drainage patterns and sump pits (Toxic Substances Control Department)	Drainage patterns not likely to concentrate pesticides in north-east neighborhood.

■ Radiation and Electromagnetic Fields

Radiofrequency radiation, ionizing radiation and electromagnetic fields (produced by power lines and household appliances) were also studied as possible sources of environmental contamination. The chart below summarizes the results of these studies. Levels of radiation in McFarland were found to be similar to those in other areas and within the range of commonly found background radiation levels as reported by EPA. No link was found between exposure to electromagnetic fields or radiation and McFarland's cancer cluster.

Contaminant	Year	Source Tested (Testing Agency)	Results
Radio frequency radiation	1986	Voice of America, Delano station (Voice of America staff)	Low levels of radiation detected near Delano station.
	1988	Voice of America, Delano station (National Institute for Occupational Safety and Health (NIOSH))	Radiation too low to detect.
	1989	Voice of America, UHF/ VHF television, AM/FM radio, microwave emissions (EPA)	Levels in McFarland no different from other areas of U.S.
Ionizing radiation	1985	Homes of 8 children with cancer and of 10 children without cancer (KCHD)	All measurements within range of natural background radiation levels as reported by EPA.
	1986	McFarland High School, Browning Road School, Kern Avenue School (KCHD)	All measurements within range of natural background radiation levels as reported by EPA.
Electromagnetic Field	1987	Homes of 10 children with cancer and of 10 children without cancer (University of Southern California)	EMF levels lower than in homes in other cities. No difference in EMF levels between two groups of households.

■ Air

KCHD tested McFarland's air for contamination from automobile exhaust. Automotive emissions were found to be lower than those in the San Francisco Bay Area, which does not have an elevated cancer rate. CDHS reviewed air monitoring data on pesticide contamination conducted by the Air Resources Board. Although some pesticide contamination was found, there is not enough data to fully determine the level of pesticide contamination in McFarland's air. Specific test results are summarized below.

Contaminant	Year	Source Tested (Testing Agency)	Results
Car exhaust (carbon monoxide)	1986	Air samples, McFarland (KCHD)	Automotive emissions lower than San Francisco Bay Area, which does not have an elevated cancer rate.
Pesticides	1987-91	CDHS reviewed the results of air monitoring studies conducted by the California Air Resources Board.	Some pesticide contamination detected. Limited testing indicated no unusual risk in McFarland. Some pesticide contamination (DEF, telone, parathion, inorganic arsenic, methyl bromide) of potential regulatory concern in other areas of the valley. Has been referred to appropriate regulatory agencies.

For More Information

You can get more information from the following reports, which are at the McFarland Public Library and the Beale Memorial Library:

McFarland Public Library
200 Harlow Avenue
McFarland, CA 93250

Beale Memorial Library
701 Truxton Avenue
Bakersfield, CA 93301

- *Epidemiologic Study of Cancer in Children in McFarland, California, 1985 - 1986, Phase I Report*
- *Epidemiologic Study of Adverse Health Effects in Children in McFarland, California, 1988, Phase II Report*
- *Radiofrequency Radiation Survey in the McFarland, California Area, 1989, U.S. Environmental Protection Agency, #520/6-89/022*
- *Aerial Photographic Analysis of the McFarland Study Area, 1988, U.S. Environmental Protection Agency, #TS-PIC-88796*
- *Report on Electric and Magnetic Fields in McFarland, California, 1988, Division of Occupational Health, University of Southern California*
- *Report on Radiofrequency Measurements in McFarland, California, 1988, National Institute for Occupational Safety and Health*

The most recent CDHS report, *Summary of Environmental Data Concerning A Cancer Cluster Investigation in McFarland, California, 1991, Phase III Report,* will be sent to those libraries on October 24, 1991.

If you have any comments on this draft report, please submit them in writing by November 29, 1991 to:

Asa Bradman
Environmental Epidemiology and Toxicology Program
5900 Hollis Street, Suite E
Emeryville, CA 94608

If you have any questions about the information presented in this fact sheet, please contact:

Asa Bradman, Merri Weinger, or Suzanne Teran
(510) 540-3657
You may call collect.

THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL EPIDEMIOLOGY AND TOXICOLOGY PROGRAM

THE FOUR COUNTY STUDY OF CHILDHOOD CANCER—PART 2

OCTOBER 1991

The California Department of Health Services (DHS) conducted the Four County Study of Childhood Cancer to further investigate questions raised by the McFarland childhood cancer cluster. The study looked at the childhood cancer rates (which include cases in children up to age 15) in the four county area of Fresno, Kern, Kings and Tulare for the time period between 1980 and 1988, and addressed the following three questions:

Is there an elevated rate of childhood cancer:

- among residents of the four county area?
- in areas with environments similar to McFarland, such as other small, agricultural communities?
- in individual communities throughout the region containing McFarland?

Part 1 of the study, which focused on the first two questions, was released in May, 1990. There were 402 cases of childhood cancer reported in the four county area between 1980 and 1988. DHS analyzed information on all of these cases. The results showed that there was no excess of childhood cancer in the four county region as a whole, or in agricultural areas of the region.

This fact sheet describes Part 2 of the study, which addressed the question about cancer rates in individual communities throughout the four county region.

DHS found that a few communities did have higher than average rates. These communities do not appear to be concentrated in any one area of the region, nor do they have any obvious similarities.

QUESTIONS AND ANSWERS

■ **Q: Did DHS discover any new communities with unusually high rates of cancer?**

A: The communities with unusually high rates of cancer (McFarland, Fowler, Rosamond) had all been previously identified. DHS also found some communities with unusually low rates of cancer (Visalia, Sanger, and the Mendota vicinity).

■ **Q: Why do some communities have higher rates than others?**

A: From this study, we do not know why some communities have higher rates of cancer than others. By chance alone, we would expect to find around two or three communities with high rates and two or three communities with low rates. We do not know whether these high rates occurred by chance or because something caused them to be high.

■ **Q: Are communities with high rates located in the same area within the four county region?**

A: DHS looked at the locations of the communities with high and low rates on a map, and found no clear geographic pattern or grouping of these communities.

■ **Q: Are cancer cases from communities with high rates different from cancer cases in other communities?**

A: The only difference found between cancer cases in communities with high rates and the cases in other communities was that the cases in communities with high rates tended to be diagnosed in the early years of the

study (1980-1982), while in the other communities, cases were more evenly distributed throughout 1980-88. Other than that, the cases from communities with high and low cancer rates were very similar with regard to type of cancer, race/ethnicity, sex and age of diagnosis.

■ **Q: Is my child more likely to get cancer if we live in a community with a higher cancer rate?**

A: The fact that cancer rates were high in some communities during the time of the study (1980-88) does not mean your child will have a higher chance of getting cancer if you live in a community that had a higher cancer rate. We do not know why the rates were higher in some communities, so the causes of the cancers may not be related to where the children live. Also, the rates of cancer for small areas go up and down over time and communities with higher rates during 1980-88 may have lower rates now.

■ **Q: What are the limitations of this study?**

A: The primary limitations of this study are related to the special problems in studying rare events like cancer in small geographic areas. In a small community, missing one case of cancer or incorrectly adding one case could have important effects on the rates. Since the numbers we are studying are so small, just one case could make the difference between a community with a "high" rate and one with an "average" rate.

In addition, this is only a study of cancer rates for the communities that children lived in when they were first diagnosed with their cancer. We do not have information about where the children lived before they were diagnosed or about children who may have been diagnosed with cancer after moving from the area.

■ **Q: Will DHS continue to study the rates of childhood cancer in these four counties?**

A: The McFarland Scientific Advisory Committee, composed of scientists, health professionals and community representatives, was created in 1988 to provide guidance to DHS in conducting the McFarland Health Study. This Committee will assist DHS by reviewing the study results and making recommendations for follow-up activities. DHS will notify the McFarland community of any further investigations.

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For More Information

Copies of the draft report on the Four County Study of Childhood Cancer will be sent to the following locations on October 24, 1991:

McFarland Public Library
200 Harlow Avenue
McFarland, CA 93250

Beale Memorial Library
701 Truxton Avenue
Bakersfield, CA 93301

You may also request a copy by calling Suzanne Teran at (510) 540-3657.

If you have any comments on this draft report, please submit them in writing by November 29, 1991 to:

Peggy Reynolds
Environmental Epidemiology and Toxicology Program
5900 Hollis Street, Suite E
Emeryville, CA 94608

If you have any questions about the information presented in this fact sheet, please contact:

Peggy Reynolds, Enid Satariano, or Dr. Lynn Goldman
(510) 540-3657
You may call collect.

Update on Cancer among Children in McFarland

MAY 1996

In the recent past, the Environmental Health Investigations Branch of the California Department of Health Services (DHS) investigated a cluster of childhood cancers in McFarland. That investigation included a wide range of environmental assessments to determine whether chemicals in the environment could have caused the childhood cancers. DHS was not able to find an environmental cause for the cancer cases identified in previous studies. As promised in 1991, at the close of the investigations, DHS has continued to monitor the occurrence of cancer in McFarland children. Since 1990, seven new cases have occurred—three more cases than one would expect in a town the size of McFarland. Although there were no cases in 1990 and 1991, one case of cancer occurred in 1992, one case in 1993, three cases occurred in 1994, and two cases in 1995.

The majority of the types of cancer identified in the seven recent cases are among the most common types of childhood cancer: 4 Leukemias, 2 Brain Cancers, and 1 Germ Cell Cancer (a cancer of the genital/urinary system). During the 21-year period, 1975-1995, a total of 21 cases of cancer of various kinds were diagnosed in McFarland-area children under the age of 19. This is an average of one case every year, as opposed to the expected average of one case every two years.

Through past studies of childhood cancer in McFarland, the Department was not able to find an environmental cause for these cancers and unfortunately, the new cases of cancer are unlikely to help us in determining a cause. Medical science has been unable to show a connection between the environment and clusters of cancer like this. We will, however, be available to community residents to answer questions about our previous work and recent research about childhood cancer.

Limitations in Understanding Childhood Cancers in McFarland

There are many reasons why it is difficult to determine whether chemicals in the environment could have caused the unexpected number of childhood cancers. The following is a list of some of the reasons:

- The cases of childhood cancer seen in McFarland are of several different types. We would expect a single environmental factor to cause only one type of cancer. Therefore, there is not likely to be one obvious exposure that could explain these cases.
- Even after exposure to some cancer causing agent, a person may not develop cancer for a long time, even for several years. For many environmental factors, there are no good methods of measuring what exposures might have been in the past. Therefore, without knowing what a child was exposed to years ago, it is difficult to say whether any past exposure may have caused his or her cancer.
- Very few types of childhood cancer are known to be caused by environmental exposures or chemicals. Most of the cancers that have occurred in McFarland are the types of cancer that occur everywhere, and specific environmental causes are not understood.
- The number of childhood cancer cases in McFarland, while greater than expected, is still too small to help us determine possible causes.

Both scientists and community members feel the frustration in a case like this one when science cannot provide an answer.

Previous DHS studies in McFarland

Previous studies of the McFarland child cancer cluster demonstrate the limitations described above. During the 1980s, and under the guidance of the McFarland Scientific Advisory Committee (a committee of scientists, health professionals, and community residents assembled to oversee DHS studies in McFarland), DHS conducted a series of studies in McFarland to try to understand why cancer was occurring in children at a rate that was higher than would be expected in a town like McFarland. Some contaminants were identified but the investigations were unable to provide information about the causation of the childhood cancer. DHS conducted the following studies:

- **Interview Study:** In 1984, a McFarland resident told authorities of what appeared to be an excess of cancer cases. DHS confirmed the

excess and identified ten cases of childhood cancer. DHS conducted an interview study between 1985 and 1987 with parents of the ten children and the parents of 20 children from McFarland who did not have cancer. When the information from these interviews was compared between the two groups, no differences were found in activities or exposures to cancer causing chemicals that could explain why some children developed cancer while others did not.

- **Environmental Studies:** Between 1985-1991, DHS conducted an intensive series of studies of McFarland water, soil, air, and radiation including electromagnetic fields (invisible lines of force that surround any electrical device). Researchers found traces of pesticides in some locations. There was no evidence, however, of patterns of unusual or excessive environmental contamination in small areas or throughout the town that could explain the higher cancer rate in children. [For specific information about the study findings and resulting activities please contact the McFarland Library or the Bakersfield Library for access to copies of the DHS studies.]
- **Health Screening Program:** In 1989, DHS and the Kern County Health Department conducted a health screening consisting of a general check-up. Doctors examined nearly all McFarland children (91% or about 1750 children) between the ages of 1-12 to determine whether they had any unusual health problems. No new cancers were detected by the screening program. No unusual numbers of chronic disease were found; however, other problems such as vision problems, tooth decay, and anemia were found in McFarland children. This showed an additional need for the McFarland Health Clinic.
- **Four County Study:** A study was conducted in Fresno, Kern, Kings, and Tulare to see if rates of childhood cancer from 1980-1988 were similarly elevated in other Central Valley communities. DHS detected four more cases of cancer in McFarland children occurring between 1985 and 1988. No excess of childhood cancer was found in the area as a whole, but rates of cancer among children in McFarland remained higher than would be expected in a town of that size.

McFarland Scientific Advisory Committee

In October of 1991 the McFarland Scientific Advisory Committee met for the last time. The Committee recommended against further formal studies in McFarland. Instead, the Committee recommended additional medical outreach for children's health in the community as a higher priority. The committee also made the recommendation that DHS further pursue the general issue of pesticide-related risks for cancer among California children. By studying larger populations than McFarland, the studies may be better able to detect risks which may exist.

United States Environmental Protection Agency Activities

United States Environmental Protection Agency (EPA) has responded to a petition from some McFarland residents and a non-profit organization named Greenlaw. In response, the EPA recently announced that they would conduct studies of air, soil, and water in McFarland to determine if regulatory standards are being violated. These studies are designed to evaluate current exposures but are not designed to explain the occurrence of excess cancer.

Present DHS Activities

DHS is not currently conducting environmental studies in McFarland but is available to respond to questions from the community. DHS will follow the activities of the EPA and will consult on related health issues. We are also available to meet with McFarland residents including parents of children with newly diagnosed cancers. In addition, DHS has received federal funds to study the relationship between childhood cancer and environmental factors (including pesticides) in California. These studies, however, will take many years to complete.

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For More Information

If you have any questions about the information presented in this fact sheet, please contact:

Rick Kreutzer,
Christine Arnesen, or
Tivo Rojas
(510) 450-3818

You may call collect.

Copies of the studies carried out by DHS and referred to in this fact sheet are available at the following locations:

McFarland Public Library
500 Kern Avenue
McFaralnd, CA 93250

Beale Memorial Library
701 Truxton Avenue
Bakersfield, CA 93301