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REPORT

A Health Survey of the Population Living

Near the Price Landfill Conducted By

The Environmental Health Hazard Evaluation Program,

New Jersey State Department of Health

in Cooperation with

The Atlantic County Health Department

July 1983

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A HEALTH SURVEY OF A POPULATION LIVING NEAR THE PRICE LANDFILL, EGG HARBOR TOWNSHIP, ATLANTIC COUNTY

Price Landfill is located on the western side of Mill Road between Delilah and Spruce Street in Egg Harbor Township, Atlantic County. The 26-acre site was licensed by the New Jersey Department of Environmental Protection (DEP) in 1972 as a sanitary landfill to accept municipal, bulky waste, vegetative, animal and food, junk, auto, and non-chemical industrial waste. Operations ceased in September 1980, and the site is now closed and inactive with a final cover, although some debris can be seen and erosion with leachate is present on the western edge of the site. The landfill mass rises to about 40 feet above the mean ground elevation, with shallow groundwater 20 feet below in a permeable sandy soil.

According to the Solid Waste Administration files at DEP, an estimated five to six thousand fifty-gallon drums and unknown amounts of bulk liquid chemical wastes were accepted at the site. In a period from April 10 to May 7, 1972, 82,000 cubic yards and 2,968 drums of various chemical wastes were accepted. Open chemical dumping went on for nearly four years.[1]

Contamination of both private and public wells has been established by the U.S. Environmental Protection Agency (EPA), DEP and the Atlantic County Health Department. Both organic and inorganic contaminants have been found in monitoring wells. Samples exceeded Water Quality Criteria (WQC) established or recommended by EPA, in some cases by many thousand times, for substances such as cadmium, beryllium, lead, zinc, nickel, bis (2 chloroethyl) ether, chloroform, tetrachloroethylene, vinyl chloride, benzene, 1,2 dichloroethane, methylene chloride, toluene, trichloroethylene and many more.[2]

[1] New Jersey Department of Environmental Protection-Hazard Management Division Price Landfill Site Inspection Report, January 5, 1981.

[2] USEPA Price Landfill analytical results, June 10, 1980 and September 23, 1980

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Generally, these substances are poorly degraded by natural processes and tend to persist in the environment. These compounds are known to be toxic. Research to identify adverse health effects from exposure to low concentrations of these chemicals is necessary. Concern over this contamination led the Atlantic County Health Department and the New Jersey State Department of Health to conduct a health survey of the population living close to the landfill and in the direction of the groundwater flow, most of whom were using private wells as their only water supply.

Some 50 homes lie in the study area which covers a sector up to about 1½ miles to the north and northeast of Price Landfill. (Hydrogeologic studies determined that the groundwater flows north and northeast below the landfill.) When the wells of some of these homes were tested in 1980 and found to have levels of total volatile organics exceeding 100 ppb, the Atlantic County Health Department recommended that the residents discontinue using the water for drinking and cooking purposes. DEP ordered the water company to provide lines and by late 1981, the pipes were installed. As of the summer of 1982, 22% of the participating surveyed residents were still using private well water.

The survey consisted of a questionnaire administered to each member of the household to gather information on exposure to toxic substances, the presence of symptoms and reported medical problems. In addition, this questionnaire was administered to a control group of residents living several miles away from the landfill who had always been on a municipal water supply. The control households were from a similar type of housing in the same county. The information was analyzed to determine whether or not health symptoms were more prevalent in residents living near the landfill on private water supplies.

METHODS

The data for the present analysis are from a cross-sectional study of reported symptoms and illness in the population residing in the area of suspect or proven groundwater contamination to the north and northeast of the Price Landfill compared to another population residing in another part of Atlantic County using a

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public water supply. Maps of the surveyed area are shown on pages 9 and 10. The analyses of relative risks were done separately by sex and water usage. First, all the exposed population versus the unexposed population was examined. Then, those individuals still using private well water for drinking, cooking, washing and bathing were compared to the unexposed population. Former users of private well water now using municipal water for drinking, cooking, washing and bathing were also compared to the unexposed population. In addition, analyses were done for physician visits and frequency of complaints. The questionnaire used is shown in Appendix A.

RESULTS

The sample sizes, the proportion of households successfully interviewed, the distribution by sex, age, tobacco use and/or chemical exposure and the perception of taste in the water are shown in Table I. Differences between the exposed and unexposed populations are small with the exception of the number of vacant households and those bothered by the taste of the water. Twenty-seven percent of the exposed homes were vacant compared to eight percent in the unexposed. Forty-six percent of the exposed compared to five percent of the unexposed were bothered by the taste of their water.

The data presented in Table II are tabulated relative risks of complaints in the exposed population compared to complaints in the unexposed group. A relative risk greater than one (1) indicates that the risk of the specific symptom is greater in the exposed population. An asterick (*) by a relative risk indicates a statistically significant risk at the 5% probability level.

Muscle pain was the only significant complaint reported at all levels of frequency either daily, weekly, monthly or seldom in the exposed Price males, whereas the exposed Price females reported rash, skin irritation, joint pain, nausea and abdominal pain significantly more often. The same is true for those currently on well water. Exposed females using well water at the time of interview reported more eye irritation, rashes, tiredness, muscle pain and nausea. Exposed males using well water at the time of the interview did not report any complaints that were statistically significant. Overall, the exposed females reported more complaints than the males and the exposed population living in the survey area near

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Price's Landfill, as a whole, reported more complaints than those in the unexposed group on public water supply several miles away. The actual numbers and percentages for the various symptoms are shown in Appendix B.

Table III presents the reported medical problems for both the exposed population and the unexposed control population by complaint, number of cases, and percent of total respondents. No particular complaint or medical problem was outstanding and both populations were quite similar in this analysis.

Table IV is a summary of pregnancy problems as reported by exposed and unexposed females. Fifty-two of the sixty-four exposed females and fifty-one of the seventy-two unexposed females responded to this question. As with the analysis of medical problems, nothing was outstanding with pregnancy problems, although a slightly higher percentage of exposed females reported a variety of problems.

SUMMARY

It is known that the groundwater flowing beneath the Price Landfill moves in a north and northeast direction. We also know that there were forty-one occupied homes in the study area within one and a half miles to the north and northeast of the landfill and that this was believed to be the extent to which the plume of groundwater contamination had spread, all of this at the time of our survey during the summer of 1982.

What we do not know is the exposure that each individual may have had. There is no data available on a complete sampling program of private wells. Some respondents may have had high levels of exposure to various contaminants and other respondents may not have had any exposure. What we have referred to as the exposed population certainly reported more symptoms than the control population which used a public water supply assumed to be free of the substances found in the groundwater below Price Landfill. However, there was no increase among the exposed population in chronic health problems or adverse reproductive outcomes.

The majority of exposed respondents were hooked up to a newly installed water supply some months prior to our survey. The number and frequency of

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symptoms are beyond what one expects based on the known toxicity of the comparatively low levels of chemicals found. What the exact role stress or increased concern about one's health as a consequence of knowing about the water contamination plays is unknown. The same questionnaire has been administered to an "exposed" and "non exposed" group of individuals in another part of New Jersey where water contamination was initially suspected (Somerset County). The results from that study are similar to the ones found at Price's Pit, in that the "exposed" group also has an increased number of reported symptoms. After reviewing the water data, however, the "exposed" group in Somerset County was found not to have any water contamination. It is interesting to note the same increase in reported symptoms among individuals that thought their drinking water was contaminated with that found in individuals who do have low level contamination of their water. The similarity of these results suggests that increased concern or stress may be a more important factor in the etiology of health complaints among individuals with low level water contamination than previously considered.

The actual etiology of the increased symptoms in a practical sense may not really be that important. After drinking water contamination is found, individuals are instructed not to use the contaminated water and are provided with alternate forms of water to prevent the possible long term potential chronic effect of continued exposure. This substitution of non contaminated water should alleviate the symptoms whether they are of toxicological or psychological origin. We are reassured by the absence of increased chronic health effects or adverse reproductive effects. With the low levels and comparatively short duration of exposure, we feel that the risk in the future of developing increased chronic health effects from the past exposure to the contaminated water is extremely unlikely. Individuals who do have persistence of symptoms should seek medical consultation with their personal physician as they may have some undiagnosed medical condition causing these problems.

In conclusion, we see no long term adverse health outcomes developing in residents living adjacent to Price's Pit as a consequence of their drinking water formerly being contaminated. The increase in reported symptoms can be attributed to some combination of toxicological and psychological factors. The provision for a clean water supply should alleviate these symptoms. Future work which would include a followup questionnaire to assess the expected remission of symptoms is being considered.

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TABLE I

PRICE STUDY DISTRIBUTION OF POPULATION SURVEYED EXPOSED AND UNEXPOSED

	EXPOSED POPULATION TO PRICE'S LANDFILL	UNEXPOSED POPULATION TO PRICE'S LANDFILL
Total Sample Size Of Households	56 (100%)	53 (100%)
Respondent Households	38 (67.9%)	40 (75.5%)
Non-Respondent Households	18 (32.1%)	13 (24.5%)
	15 Vacant (26.8%)	4 Vacant (7.5%)
	3 Refusals (5.3%)	9 Refusals (17.0%)

Sex		
Male	57 (47.1%)	51 (41.5%)
Female	64 (52.9%)	72 (58.5%)
Total Respondents	121 (100%)	123 (100%)

AGE	Male	Female	Total	Male	Female	Total
0-9	7 (12.3%)	6 (9.4%)	13 (10.7%)	13 (25.5%)	11 (15.3%)	24 (19.5%)
10-19	16 (28.1%)	15 (23.4%)	31 (25.6%)	11 (21.6%)	14 (19.4%)	25 (20.3%)
20-59	24 (42.1%)	30 (46.9%)	54 (44.6%)	23 (45.1%)	38 (52.8%)	61 (49.6%)
60+	10 (17.5%)	13 (20.3%)	23 (19.1%)	4 (7.8%)	9 (12.5%)	13 (10.6%)
Total	57 (100%)	64 (100%)	121 (100%)	51 (100%)	72 (100%)	123 (100%)

Tobacco Use and/or Chemical Exposure	Male	Female	Total	Male	Female	Total
Yes	25 (43.9%)	13 (20.3%)	38 (31.4%)	19 (37.3%)	21 (29.2%)	40 (32.5%)
No	32 (56.1%)	51 (79.7%)	83 (68.6%)	32 (62.7%)	51 (70.8%)	83 (67.5%)
Total Respondents	57 (100%)	64 (100%)	121 (100%)	51 (100%)	72 (100%)	123 (100%)

Bothered By Taste				
Yes	56	(46.3%)	6	(4.9%)
No	65	(53.7%)	117	(95.1%)
Total Respondent	121	(100%)	123	(100%)

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TABLE II

PRICE STUDY RELATIVE RISKS OF REPORTED SYMPTOMATOLOGY
(ALL COMPARISONS ARE MADE TO THE APPROPIRATELY MATCHED CONTROL GROUP.)

WATER USE BY SOURCE SEX, AND FREQUENTCY OF COMPLAINTS (ALL RELATIVE RISKS ARE AGE-ADJUSED)	# EX-POSED	YES	EYE IRRI-TATION	NASAL IRRI-TATION	RASH	SKIN IRRI-TATION	TIRED-NESS	JOINT PAIN	MUSCLE PAIN	NAU-SEA	DIAR-RHEA	LOSS OF APPE-TITE	WGHT. LOSS	ABDOM-INAL PAIN	OTHER	MED-ICAL PROB-LEMS	PREG-NANCY PROB-LEMS
	64	Bothered	2.02	0.93	4.12*	7.13*	1.47	2.27*	1.79	3.18*	1.18	1.94	2.17	2.79*	1.55		
PRICE FEMALE	64	Freqently Bothered	2.28	2.29	6.06*	4.33	2.75*	3.62*	1.29	3.95	1.08	1.92	1.69	1.80	1.65		
	64	Saw Physician	0.40	0.69	1.74	3.35	1.49	1.26	0.80	1.66	1.06	1.76	1.97	1.39	1.37	1.15	2.09
	57	Bothered	1.87	1.48	2.04	2.46	1.99	2.35	8.19*	2.23	2.65	2.41	1.13	2.49	3.03		
PRICE MALE	57	Frequently Bothered	2.34	14.74*	2.72	3.06	2.39	3.29		1.29	0.66	7.80*		3.37			
	57	Saw Physician	1.18	0.72	0.82	1.62	0.93	1.33				2.23	0.0	4.09	0.75	0.62	
	121	Bothered	1.96*	1.11	3.04*	4.21*	1.67	2.12*	2.16*	2.78*	1.45	2.44*	1.71	2.79*	1.74		
PRICE MALE &	121	Frequently Bothered	2.36*	3.24*	4.17*	3.62*	2.61*	3.19*	1.25	2.51	0.90	4.06*	2.28	2.66	2.64		
FEMALE	121	Saw Physician	1.00	0.68	1.26	2.46	1.21	1.11	0.87	1.68	1.41	2.18	1.32	1.85	1.17	0.86	
CURRENT FEMALE USERS	14	Bothered	3.99*	2.05	11.32*	2.72	3.66*	2.41	4.36*	3.76*	0.28	3.54	0.00	2.74	0.00		
PRIVATE WELL WATER*	14	Frequently Bothered	4.44	8.75*	8.80*	0.00	6.38*	4.25	1.12	0.00	0.00	4.50	0.00	0.00	0.00		
CURRENT MALE USERS	13	Bothered	1.25	0.49	0.30	0.41	0.60	1.48	2.58	0.57	2.40	3.14	1.26	0.48	2.22		
PRIVATE WELL WATER*	13	Frequently Bothered	1.10	4.16x	0.00	0.00	0.59	0.86		0.00	5.00	15.00x	0.00	1.61	0.00		
FORMER FEMALE USERS	47	Bothered	1.61	0.72	3.24*	9.32*	1.14	2.23	1.34	2.86*	1.52	1.89	2.91*	2.92*	1.87		
PRIVATE WELL WATER*	47	Frequently Bothered	1.53	1.57	3.84	6.40*	2.13	3.27*	1.36	4.98*	1.32	1.87	1.91	2.51	2.02		
FORMER MALE USERS	43	Bothered	1.82	1.96	2.91*	3.51*	2.66*	2.40	11.36*	3.01	2.84	1.90	1.00	3.09*	2.83		
PRIVATE WELL WATER*	43	Frequently Bothered	2.29	14.64*	3.82	4.01	3.14*	4.30*	0.00	1.71	0.00	4.73		3.32			

[TOTAL EXPOSED = 121
TOTAL UNEXPOSED = 123]

Bothered = Positive report regardless of frequency (daily, weekly, monthly, and seldom)
Frequently bothered = Frequent complaints (daily or weekly)

x = Crude Rate
* (Three females and one male did not respond to water usage question at interview)

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TABLE III

PRICE STUDY
REPORTED MEDICAL PROBLEMS
FOR
EXPOSED AND UNEXPOSED POPULATIONS

Medical Problem	Exposed - 121		Unexposed - 123	
	#	%	#	%
Thyroid Problem	1	0.8	-	-
Hypertension	7	5.8	7	5.7
"Back Problems"	1	0.8	1	0.8
Dermatitis	1	0.8	2	1.6
Edema	1	0.8	-	-
"Sarcoidosis"	1	0.8	1	0.8
Arthritis	7	5.8	9	7.3
Diabetes	3	2.5	4	3.3
Heart Problem	3	2.5	2	1.6
Hiatal Hernia	1	0.8	-	-
Allergies	3	2.5	6	4.9
Asthma	2	1.7	1	0.8
"Orange Peel"	1	0.8	-	-
Eye Problem	2	1.7	-	-
Cholycystectomy	1	0.8	-	-
Bronchitis	1	0.8	3	2.4
Seizure Disorder	1	0.8	-	-
"Bowel Problem"	1	0.8	1	0.8
CVA	1	0.8	2	1.6
Ulcers	-	-	3	2.4
Gallstones	-	-	1	0.8
Tumors	-	-	1	0.8
Glaucoma	-	-	2	1.6
Eczema	-	-	2	1.6
Anemia	-	-	1	0.8
Pneumonia	-	-	1	0.8

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TABLE IV

PRICE STUDY
REPORTED PREGNANCY PROBLEMS IN EXPOSED
AND
UNEXPOSED AREAS BY NUMBER AND PERCENT

PREGNANCY PROBLEM	EXPOSED AREA RESPONDING - 52		UNEXPOSED AREA RESPONDING - 51	
	#	%	#	%
Unable to Conceive	1	1.9	-	-
C-Section	2	3.8	1	1.9
"Large Birth"	1	1.9	-	-
"Pains"	1	1.9	-	-
No Description	1	1.9	-	-
Toxemia	-	-	1	1.9
Tumor	-	-	1	1.9
Miscarriage	1	1.9	1	1.9
TOTAL	7	13.5	5	9.8

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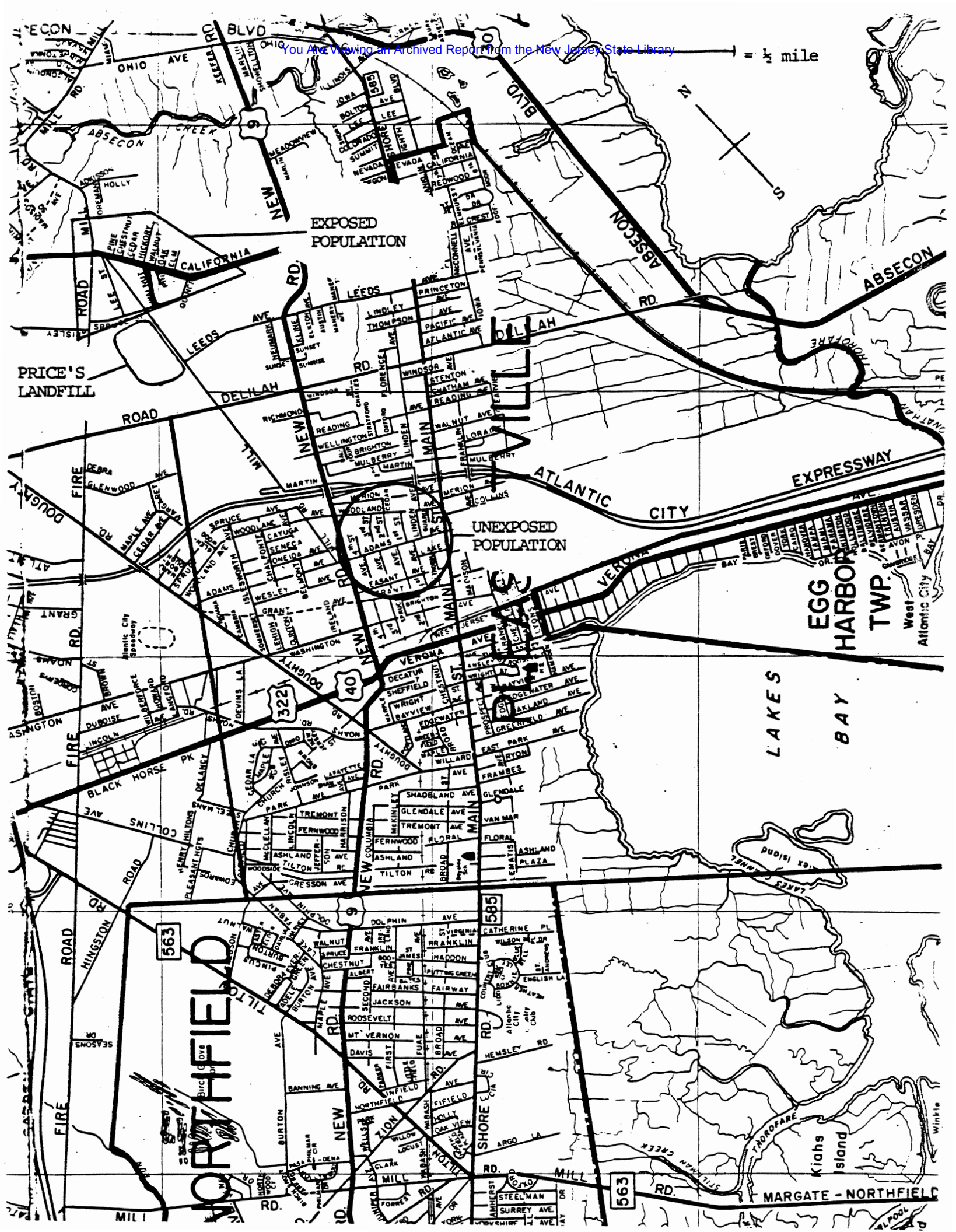

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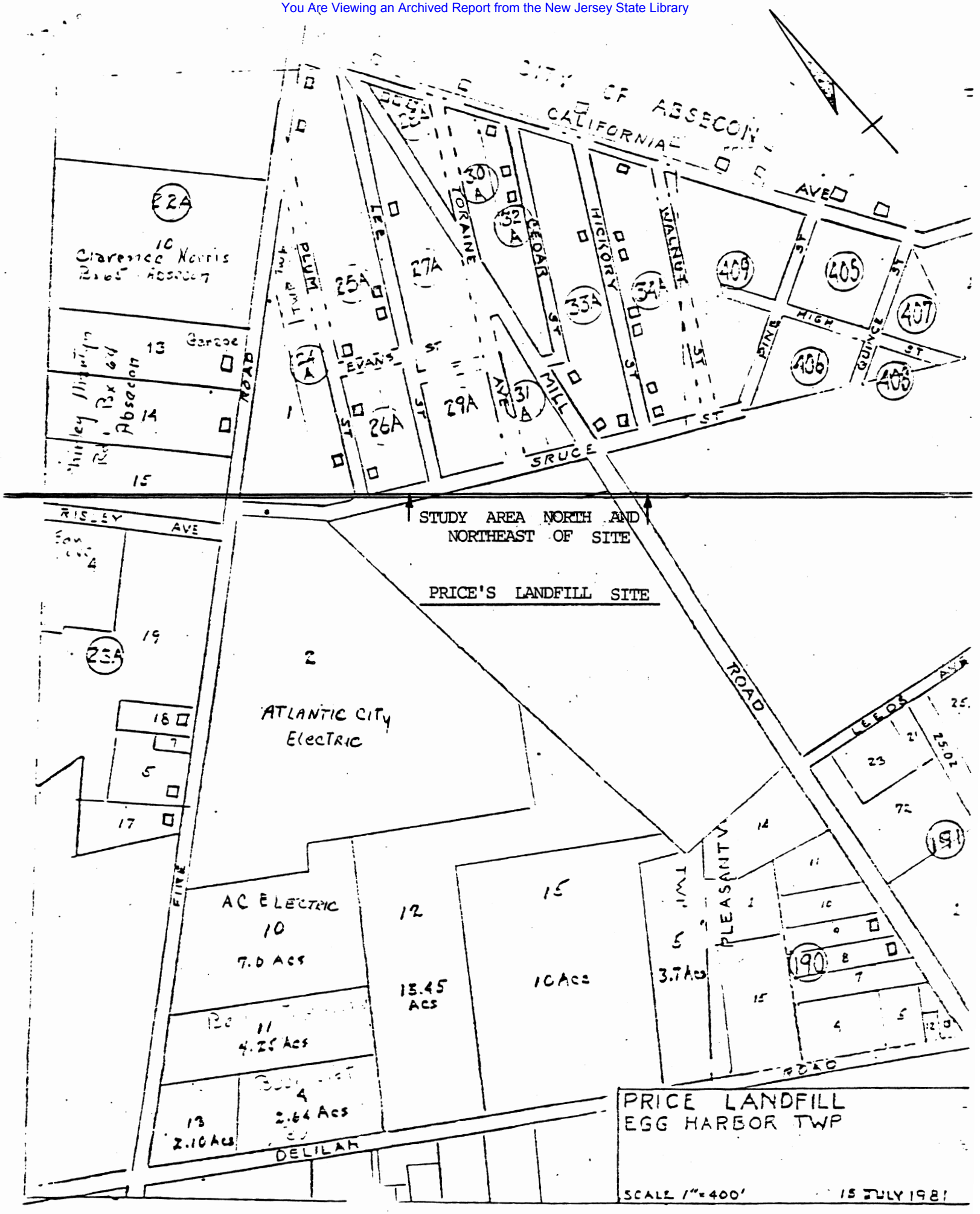

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APPENDIX A

State of New Jersey

DEPARTMENT OF HEALTH

JOHN FITCH PLAZA
CN 360, TRENTON, N.J. 08625

SHIRLEY A. MAYER, M.D., M.P.H.
COMMISSIONER

CONSENT FORM

I have been informed that the New Jersey State Department of Health is conducting a study of environmental factors and their effect on the health of individuals. This study involves obtaining information from me about my residence, and health, as well as some information about other substances I may have been exposed to. The interview will require approximately 15 minutes of my time. I understand it may be necessary to contact me again.

I have agreed to take part in this study and to give information to the interviewer understanding that:

1. My responses will be kept completely confidential.

2. My participation is voluntary and I am free to discontinue participation at any time.

3. The information in this study will be summarized by New Jersey State Department of Health to determine whether environmental factors in this area may be contributing to health problems.

Name (Print) _____

Participant Signature _____

Date: _____

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Household Number _____

Interviewer's Name _____

Respondent's Name _____

Address _____

Mailing address if diffrent _____

Now I want to ask you about all persons who live in this household. (Interviewer to circle race of household here: White Non-white)

What are the names of all persons who live here?

What are the ages?

Does or did anyone smoke cigarettes regularly (at least once a day for a year or 20 packs in a lifetime)?

(CODE 1 = Current Smoker

2 = Ex smoker (quit more than 1 year ago.)

3 = Non-smoker

Does anyone in this household have a regular exposure either at a job or hobby to chemicals?

(Code 1 = At job 2 = Hobby 3 = None)

		Name	Age	Sex	Smoking Status	Dust or Chemical Exposure
Subject #	1					
	2					
	3					
	4					
	5					
	6					

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What is the source of your water for showering, bathing and washing dishes?

(If water is from different sources check more than one box and indicate percentage for all sources and indicate year)

Private well	☐	_____	Mo. ___ Yr. ___	to Mo. ___ Yr. ___
Municipal water	☐	_____	Mo. ___ Yr. ___	to Mo. ___ Yr. ___
Bottled water	☐	_____	Mo. ___ Yr. ___	to Mo. ___ Yr. ___
Other	☐	_____	Mo. ___ Yr. ___	to Mo. ___ Yr. ___

What is the source of the water you use for cooking and drinking?

(If water is from different sources check more than one box and indicate percentage for all sources and indicate year)

Private well	☐	Mo. ___ Yr. ___	to Mo. ___ Yr. ___
Municipal well	☐	Mo. ___ Yr. ___	to Mo. ___ Yr. ___
Bottled water	☐	Mo. ___ Yr. ___	to Mo. ___ Yr. ___
Other	☐	Mo. ___ Yr. ___	to Mo. ___ Yr. ___

Have you been informed that your water is contaminated? Yes ___ No ___

If yes, Date ____/____/____

day Mo. Yr.

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Household _____
Subject _____

Are you bothered by any of the following:

If yes, to any of the below symptoms, ask: How frequently does these symptoms occur?

Code: 1 = Seldom
2 = Monthly
3 = Weekly
4 = Daily

Have you been bothered by these symptoms?

	Yes	No	Frequency of Symptom	Seen by physician Yes	No
Eye irritation (itchy, red or watery eyes)	___	___	_____	___	___
Nasal irritation (sneezing, runny nose or stuffness)	___	___	_____	___	___
Skin rash	___	___	_____	___	___
Skin irritation (redness)	___	___	_____	___	___
Tiredness	___	___	_____	___	___
Pain in joints	___	___	_____	___	___
Pain in muscles	___	___	_____	___	___
Nausea	___	___	_____	___	___
Diarrhea	___	___	_____	___	___
Loss of appetite	___	___	_____	___	___
Loss of weight (without dieting)	___	___	_____	___	___
Stomach pain	___	___	_____	___	___
Other gastrointestinal problems (specify) _____	___	___	_____	___	___

Have you been told by a physician that you have a medical problem?
Yes ___ No ___ If yes, name of physician and phone number.

If yes, describe condition and date of diagnosis.

For any women living in the house: Have you had trouble becoming pregnant or with a pregnancy? Yes ___ No ___

If yes, describe and list years.

Have you ever been bothered by the taste of water in this community? Yes ___ No ___

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These are all the questions I have for you. Is there anything else that I haven't asked you about that you think is important?

In case I've forgotten to ask you something and my supervisor needs to call you back, may I have a phone number and a convient time to reach you?

Phone _____

Best Time _____ AM PM

Time Ended _____ AM PM

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PRICE STUDY APPENDIX B

EYE IRRITATION - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	28	43.8	19	26.4	2.02
PRICE FEMALE	12	18.8	6	8.3	2.28
	16	25.0	16	22.2	0.40
	22	38.6	11	21.6	1.87
PRICE MALE	13	22.8	5	9.8	2.34
	11	19.3	7	13.7	1.18
	50	41.3	30	24.4	1.96*
PRICE MALE	25	20.7	11	8.9	2.36*
AND FEMALE	27	22.3	23	18.7	1.00
CURRENT FEMALE	7	50.0	19	26.4	3.99*
USERS - PRIVATE	3	21.4	6	8.3	4.44
WELL WATER					
CURRENT MALE	4	30.8	11	21.6	1.25
USERS - PRIVATE	2	15.4	5	9.8	1.10
WELL WATER					
FORMER FEMALE	19	40.4	19	26.4	1.61
USERS - PRIVATE	7	14.9	6	8.3	1.53
WELL WATER					
FORMER MALE USERS	17	39.5	11	21.6	1.82
PRIVATE	10	23.3	5	9.8	2.29
WELL WATER					

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PRICE STUDY — APPENDIX TO TABLE II

NASAL IRRITATION - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	23	35.9	26	36.1	0.93
PRICE FEMALE	10	15.6	5	6.9	2.29
	13	20.3	19	26.4	0.69
	21	36.8	13	25.5	1.48
PRICE MALE	8	14.0	1	2.0	14.78*
	9	15.8	9	17.6	0.72
	44	36.4	39	31.7	1.11
PRICE MALE	18	14.9	6	4.9	3.24*
AND FEMALE	22	18.2	28	22.8	0.68
CURRENT FEMALE	8	57.1	26	36.1	2.05
USERS - PRIVATE	3	21.4	5	6.9	8.75*
WELL WATER					
CURRENT MALE	2	15.4	13	25.5	0.49
USERS - PRIVATE	1	-	1	2.0	4.16
WELL WATER					
FORMER FEMALE	14	29.8	26	36.1	0.72
USERS - PRIVATE	6	12.8	5	6.9	1.57
WELL WATER					
FORMER MALE USERS	19	44.2	13	25.5	1.96
PRIVATE	7	16.3	1	2.0	14.64*
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

RASH - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	22	34.4	8	11.1	4.12*
PRICE FEMALE	13	20.3	3	4.2	6.06*
	8	12.5	6	8.3	1.74
	20	35.1	10	19.6	2.04
PRICE MALE	7	12.3	2	3.9	2.72
	7	12.3	7	14.7	0.82
	42	34.7	18	14.6	3.04*
PRICE MALE	20	16.5	5	4.1	4.17*
AND FEMALE	15	12.4	13	10.6	1.26
CURRENT FEMALE	6	42.9	8	11.1	11.32*
USERS - PRIVATE	5	35.7	3	4.2	8.80*
WELL WATER					
CURRENT MALE	1	7.7	10	19.6	0.30
USERS - PRIVATE	0	-	2	3.9	0.00
WELL WATER					
FORMER FEMALE	14	29.8	8	11.1	3.24*
USERS - PRIVATE	6	12.8	3	4.2	3.84
WELL WATER					
FORMER MALE USERS	19	44.2	10	19.6	2.91*
PRIVATE	7	16.3	2	3.9	3.82
WELL WATER					

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PRICE STUDY — APPENDIX TO TABLE II

SKIN IRRITATION - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	17	26.6	4	5.6	7.13*
PRICE FEMALE	7	10.9	2	2.8	4.33
	7	10.9	3	4.2	3.35
	13	22.8	5	9.8	2.46
PRICE MALE	7	12.3	2	3.9	3.06
	4	7.0	2	3.9	1.62
	30	24.8	9	7.3	4.21*
PRICE MALE	14	11.6	4	3.3	3.62*
AND FEMALE	11	9.1	5	4.1	2.46
CURRENT FEMALE	2	14.3	4	5.6	2.72
USERS - PRIVATE	0	-	2	2.8	0.00
WELL WATER					
CURRENT MALE	1	7.7	5	9.8	0.41
USERS - PRIVATE	0	-	2	3.9	0.00
WELL WATER					
FORMER FEMALE	15	31.9	4	5.6	9.32*
USERS - PRIVATE	7	14.9	2	2.8	6.40*
WELL WATER					
FORMER MALE USERS	12	27.9	5	9.8	3.51*
PRIVATE	7	16.3	2	3.9	4.01
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

TIREDNESS - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	27	42.2	23	31.9	1.47
PRICE FEMALE	22	34.4	11	15.3	2.75*
	12	18.8	9	12.5	1.49
	24	42.1	12	23.5	1.99
PRICE MALE	20	35.1	8	15.7	2.39
	4	7.0	3	5.9	0.93
	51	42.1	35	28.5	1.67
PRICE MALE	42	34.7	19	15.4	2.61*
AND FEMALE	16	13.2	12	9.8	1.21
CURRENT FEMALE	8	57.1	23	31.9	3.66*
USERS - PRIVATE	7	50.0	11	15.3	6.38*
WELL WATER					
CURRENT MALE	3	23.1	12	23.5	0.60
USERS - PRIVATE	2	15.4	8	15.7	0.59
WELL WATER					
FORMER FEMALE	18	38.3	23	31.9	1.14
USERS - PRIVATE	14	29.8	11	15.3	2.13
WELL WATER					
FORMER MALE USERS	20	46.5	12	23.5	2.66*
PRIVATE	17	39.5	8	15.7	3.14*
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

JOINT PAIN - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	29	45.3	18	25.0	2.27*
PRICE FEMALE	19	29.7	7	9.7	3.62*
	18	28.1	15	20.8	1.26
	16	28.1	6	11.8	2.35
PRICE MALE	9	15.8	3	5.9	3.29
	4	7.0	2	3.9	1.33
	45	37.2	24	19.5	2.12*
PRICE MALE	28	23.1	10	8.1	3.19*
AND FEMALE	22	18.2	17	13.8	1.11
CURRENT FEMALE	6	42.9	18	25.0	2.41
USERS - PRIVATE	4	28.6	7	9.7	4.25
WELL WATER					
CURRENT MALE	3	23.1	6	11.8	1.48
USERS - PRIVATE	1	7.7	3	5.9	0.86
WELL WATER					
FORMER FEMALE	22	46.8	18	25.0	2.23
USERS - PRIVATE	14	29.8	7	9.7	3.27*
WELL WATER					
FORMER MALE USERS	12	27.9	6	11.8	2.40
PRIVATE	7	16.3	3	5.9	4.30*
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

MUSCLE PAIN - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	19	29.7	13	18.1	1.79
PRICE FEMALE	6	9.4	5	6.9	1.29
	8	12.5	10	13.9	0.80
	10	17.5	1	2.0	8.19*
PRICE MALE	1	17.5	0	-	∞
	2	3.5	0	-	∞
	29	23.9	14	11.4	2.16*
PRICE MALE	7	5.8	5	4.1	1.25
AND FEMALE	10	8.3	10	8.1	0.87
CURRENT FEMALE	7	50.0	13	18.1	4.36*
USERS - PRIVATE	1	7.1	5	6.9	1.12
WATER WATER					
CURRENT MALE	1	7.7	1	2.0	2.58
USERS - PRIVATE	1	7.7	0	-	∞
WELL WATER					
FORMER FEMALE	12	25.5	13	18.1	1.34
USERS - PRIVATE	5	10.6	5	6.9	1.36
WELL WATER					
FORMER MALE	9	20.9	1	2.0	11.36*
PRIVATE	0	-	0	-	0.00
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

NAUSEA - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	21	32.8	9	12.5	3.18*
PRICE FEMALE	7	10.9	2	2.8	3.95
	9	13.1	6	8.3	1.66
	13	22.8	5	9.8	2.23
PRICE MALE	3	5.3	2	3.9	1.29
	2	3.5	0	-	∞
	34	28.1	14	11.4	2.78*
PRICE MALE	10	8.3	4	3.3	2.51
AND FEMALE	11	9.1	6	4.9	1.68
CURRENT FEMALE	5	35.7	9	12.5	3.76*
USERS - PRIVATE	0	-	2	2.8	0.00
WELL WATER					
CURRENT MALE	1	7.7	5	9.8	0.57
USERS - PRIVATE	0	-	2	4.1	0.00
WELL WATER					
FORMER FEMALE	14	29.8	9	12.5	2.86*
USERS - PRIVATE	7	14.9	2	2.8	4.98*
WELL WATER					
FORMER MALE USERS	12	27.9	5	9.8	3.01
PRIVATE	3	7.0	2	3.9	1.71
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

DIARRHEA - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	13	20.3	13	18.1	1.18
PRICE FEMALE	2	3.1	2	2.8	1.08
	5	7.8	5	6.9	1.06
	9	15.8	3	5.9	2.65
PRICE MALE	1	1.8	1	2.0	0.66
	2	3.5	0	-	∞
	22	18.2	16	13.0	1.45
PRICE MALE	3	2.5	3	2.4	0.90
AND FEMALE	7	5.8	5	4.1	1.41
CURRENT FEMALE	1	7.1	13	18.1	0.28
USERS - PRIVATE	0	-	2	2.8	0.00
WELL WATER					
CURRENT MALE	2	15.4	3	5.9	2.40
USERS - PRIVATE	1	7.7	1	2.0	5.00
WELL WATER					
FORMER FEMALE	11	23.4	13	18.1	1.52
USERS - PRIVATE	2	4.3	2	2.8	1.32
WELL WATER					
FORMER MALE USERS	7	16.3	3	5.9	2.84
PRIVATE	0	-	1	2.0	0.00
WELL WATER					

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PRICE STUDY — APPENDIX TO TABLE II

LOSS OF APPETITE - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	7	10.9	4	5.6	1.94
PRICE FEMALE	4	6.3	2	2.8	1.92
	2	3.1	1	1.4	1.76
	16	28.1	6	11.8	2.41
PRICE MALE	9	15.8	1	2.0	7.80*
	5	8.8	2	3.9	2.23
	23	19.0	10	8.1	2.44*
PRICE MALE	13	10.7	3	2.4	4.06*
AND FEMALE	7	5.8	3	2.4	2.18
CURRENT FEMALE	2	14.3	4	5.6	3.54
USERS - PRIVATE	1	7.1	2	2.8	4.50
WELL WATER					
CURRENT MALE	5	38.5	6	11.8	3.14
USERS - PRIVATE	3	23.1	1	2.0	15.00x*
WELL WATER					
FORMER FEMALE	5	10.6	4	5.6	1.89
USERS - PRIVATE	3	6.4	2	2.8	1.87
WELL WATER					
FORMER MALE USERS	10	23.3	6	11.8	1.90
PRIVATE	5	11.6	1	2.0	4.73
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

WEIGHT LOSS - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	11	17.2	6	8.3	2.17
PRICE FEMALE	2	3.1	1	1.4	1.69
	7	10.9	4	5.6	1.97
	3	5.3	2	3.9	1.13
PRICE MALE	1	1.8	0	-	∞
	0	-	1	2.0	0.0
	14	11.6	8	6.5	1.71
PRICE MALE	3	2.5	1	0.8	2.28
AND FEMALE	7	5.8	5	4.1	1.32
CURRENT FEMALE	0	-	6	8.3	0.00
USERS - PRIVATE	0	-	1	1.4	0.00
WELL WATER					
CURRENT MALE	1	7.7	2	3.9	1.26
USERS - PRIVATE	0	-	0	-	0.00
WELL WATER					
FORMER FEMALE	11	23.4	6	9.1	2.91*
USERS - PRIVATE	2	4.3	1	1.4	1.91
WELL WATER					
FORMER MALE USERS	2	4.7	2	3.9	1.00
PRIVATE	1	2.3	0	-	∞
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

ABDOMINAL PAIN - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	15	23.4	7	9.7	2.79*
PRICE FEMALE	4	6.3	3	4.2	1.80
	6	9.4	5	6.9	1.39
	15	26.3	6	11.8	2.49
PRICE MALE	8	14.0	2	3.9	3.37
	5	8.8	1	2.0	4.09
	30	24.8	13	10.6	2.79*
PRICE MALE	12	9.9	5	4.1	2.66
AND FEMALE	11	9.1	6	4.9	1.85
CURRENT FEMALE	3	21.4	7	9.7	2.74
USERS - PRIVATE	0	-	3	4.2	0.00
WELL WATER					
CURRENT MALE	1	7.7	6	11.8	0.48
USERS - PRIVATE	1	7.7	2	3.9	1.61
WELL WATER					
FORMER FEMALE	11	23.4	7	9.7	2.92*
USERS - PRIVATE	4	8.5	3	4.2	2.51
WELL WATER					
FORMER MALE USERS	13	30.2	6	11.8	3.09*
PRIVATE	6	14.0	2	3.9	3.32
WELL WATER					

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PRICE STUDY APPENDIX TO TABLE II

OTHER - BY NUMBER OF CASES, PERCENT AND RELATIVE RISK

WATER USE BY SOURCE SEX AND FREQUENCY OF COMPLAINTS	EXPOSED #	EXPOSED %	UNEXPOSED #	UNEXPOSED %	RELATIVE RISK
	8	12.5	6	8.3	1.55
PRICE FEMALE	3	4.7	2	2.8	1.65
	5	7.8	4	5.6	1.37
	5	8.8	1	2.0	3.03
PRICE MALE	3	5.3	0	-	∞
	2	3.5	1	2.0	0.75
	13	10.7	7	5.7	1.74
PRICE MALE	6	5.0	2	1.6	2.64
AND FEMALE	7	5.8	5	4.1	1.17
CURRENT FEMALE	0	-	6	8.3	0.00
USERS - PRIVATE	0	-	2	2.8	0.00
WELL WATER					
CURRENT MALE	1	7.7	1	2.0	2.22
USERS - PRIVATE	0	-	0	-	0.00
WELL WATER					
FORMER FEMALE	7	14.9	6	8.3	1.87
USERS - PRIVATE	3	6.4	2	2.8	2.02
WELL WATER					
FORMER MALE USERS	4	9.3	1	2.0	2.83
PRIVATE	3	7.0	0	-	∞
WELL WATER					