II. Historic Pesticide Contamination in New Jersey

A. History of Pesticide Use

The agricultural community has routinely and consistently applied pesticides to control pests and increase crop yield over the past 100 years. Crop recommendations have been published by the US Department of Agriculture and the NJ Agricultural Experiment Station since the late 1800s. These crop recommendations specified the types and application rates of pesticides that could be used for specific problems with specific crops. Early in the century there were very few products available to fight crop destroying pests besides arsenical pesticides (Hayes and Laws, 1991). As the organochlorine pesticides emerged, more products became available and the use of arsenical pesticides began to be phased out. The newer pesticides came with benefits. The organochlorine pesticides were effective at lower application rates, making them less expensive to use, and they were generally less persistent.

Application rates, duration of use and persistence of a pesticide are the major factors that contribute to the likelihood that pesticide residues will be present in a particular soil at levels above the Department's residential soil cleanup criteria. The agricultural use pattern (pesticide-crop recommendations and reported acreage of crop production) can be used to roughly estimate the potential for residual pesticide contamination in soil. While it is relatively easy to determine the use pattern for arsenical pesticides, it is more difficult to determine the use pattern of the different organochlorine pesticides because several of these different pesticides were recommended for a wide variety of crops.

The following historical review of arsenical and organochlorine pesticide use in New Jersey provides insight into the type and possible geographical extent of potential residual pesticide contamination of these pesticides of concern. While other pesticides have been used in agriculture, these groups are representative of the most widely used pesticides over the last century. Use information for additional pesticides is provided in Addendum 3.

Arsenical Pesticides

Around the turn of the 20th century, the use of arsenical pesticides became prominent in the United States, especially for insect pest control. Lead arsenate was employed extensively on apple orchards but was also used for control of agricultural pests in vegetable fields and other fruit orchards. Golf courses and turf farms also received applications of lead arsenate on a regular basis. White potato fields received applications of calcium arsenate. By 1917, the routine use of lead arsenate was initially recommended by the New Jersey Agricultural Experiment Station on apple and peach crops; use recommendations continued until 1967 when the use of synthetic organic pesticides (primarily organochlorine pesticides) became established. Lead arsenate was generally applied at a rate of several pounds per acre. (Murphy and Aucott, 1998).

Estimates have been developed for the historical use of arsenical pesticides in New Jersey (Murphy and Aucott, 1998). Based on crop recommendations, the greatest use appears to have been in fruit orchards. While pesticides may have been applied in agricultural areas in all New Jersey's counties, six counties have provided most of the fruit production (Burlington, Cumberland, Gloucester, Hunterdon, Monmouth and Salem) over the last 90 years. Prior to 1960, Burlington, Monmouth and Gloucester counties were the dominant apple and peach producing counties. Since 1960, Gloucester and Burlington have been the largest fruit-producing counties (Murphy and Aucott, 1998).

Based on agricultural production information, arsenical pesticides may have been applied to approximately 240,000 acres statewide. This acreage represents about 5 percent of New Jersey's area, which is approximately 5 million acres. This value is based on the average acreage for each decade from 1900 through 1960. (Murphy and Aucott, 1998)

DDT (and its metabolites DDD and DDE)

DDT (dichloro diphenyl trichloroethane) was first used in World War II to control lice and was released for commercial use soon thereafter. Its use grew rapidly through the 1950s. In the 1960s, DDT use began to decline for a number of reasons including reduced effectiveness on certain insects, the detection of DDT residues in food, and concerns about the widespread occurrence of DDT in the environment and its impact on fish and birds (Hayes and Laws, 1991 and USEPA, 1990).

The breakdown products, or metabolites, of DDT are DDD (dichloro diphenyl dichloro ethane) and DDE (dichloro diphenyl dichloroethylene). DDT was broadly recommended for the control of a wide range of insect pests on vegetables and fruits and was a major pesticide used for mosquito control programs. Because of its broad application, it is very difficult to identify specific areas of the state that are more likely than others to have elevated levels of this organic pesticide or its metabolites. Unlike the arsenicals, the organochlorines had application rates that varied from a few ounces to a few pounds of active pesticide ingredient per treated acre. The US Environmental Protection Agency prohibited all uses of DDT by 1972. (Hayes and Laws, 1991 and USEPA, 1990).

Aldrin and Dieldrin

By 1949, additional organochlorine pesticides such as aldrin and dieldrin were in common usage. Aldrin is quickly metabolized to dieldrin in the environment. Both compounds were used against insects in field, forage, vegetable and fruit crops. Aldrin/Dieldrin sales peaked in 1956. The EPA prohibited its use for food commodities by 1974 and by 1987, all uses were prohibited. (Hayes and Laws, 1991 and USEPA, 1990).

B. Fate of Pesticides in the Environment

The fate of chemicals in the environment suggests where and in what form residual pesticide contamination is expected to occur. The fate of pesticides in the environment is determined by characteristics of the specific pesticide, various environmental factors, and the impacts of human activities.

An important characteristic of the pesticides discussed in this report is that they persist in the environment (e.g., they do not readily break down). Lead and arsenic are elements that do not break down and therefore will persist in the environment indefinitely. DDT and its metabolites (DDE and DDD), aldrin and its metabolite dieldrin, while persistent in the environment, will eventually break down after a number of years. Another important factor is the ability of a pesticide to become bound to soil. Pesticides tend to adhere to fine soil particles (clays) and organic matter rather than to sandy soils. Pesticides become tightly bound to soil particles so that migration of the contaminant down deeper into the soil is limited. The solubility of a pesticide indicates whether or not it will stay bound to soil particles or dissolve into water. In most cases, contaminant levels decrease substantially with depth, usually reflecting background levels at 1.5 to 2 feet below the surface (Peryea and Creaer, 1994). However, the addition of some fertilizers or lowering of soil pH and irrigation may affect the downward mobility (Peryea and Kammerck, 1997). Arsenical pesticides and the organochlorine pesticides are not particularly water soluble and therefore pose minimal threat to ground water. However, these pesticides may pose some risk to shallow aquifers in acidic, sandy soils. Pesticides bound to soil particles may impact surface waters by contaminant migration via soil erosion and runoff.

In addition to the environmental factors discussed above, there are also human factors that affect the occurrence and distribution of pesticide residues. During active farming activities certain pesticides were applied year after year based on specific crop recommendations. When land use changes, site use and soil management will affect the concentrations and distribution of residual pesticide contamination. The excavation and transportation of top soil to other sites affect the distribution of the pesticides of concern. Currently, the movement of soil from development sites is less common than in prior years for two reasons: first, many municipalities have ordinances prohibiting the movement of soil from development sites (Halbe, Personal comm. 1998; Nogaki, Personal comm. 1998) and, second, the high cost of transporting soil. Developers generally try to maintain a soil balance when developing property so that no soil will need to be purchased and no soil will need to be removed during development (Wittenberg, Personal comm. 1997).

Other soil management practices affecting the distribution of pesticides involve the mixing of clean and contaminated soils during the course of development activities. Typical site development activities, such as the excavation of basements, the installation of water and sewer lines, and streets, generally result in the mixing of contaminated soil with underlying clean soil which is likely to reduce pesticide concentration levels at the surface.

C. Sampling Results from Select New Jersey Agricultural Sites

In this section, the Department has compiled analytical soil data from current and former agricultural sites to begin to assess the nature and extent of soil contamination caused by historic pesticide use in New Jersey. The data from 18 sites were made available to the Department between 1996 and 1998, by private parties, the US Geological Survey and municipalities seeking the Department's review. These sites were specifically sampled to determine if pesticide residues were present and may not be representative of all agricultural sites. The analytical data summarized in Tables 1 through 4 were compiled from a variety of current and former agricultural sites and have been reviewed by the Department.

Table 1.
Select New Jersey Agricultural Sites
General Information

Site #	Size (acres)	Township	County	Reported Agricultural Use
1	24	Saddle River	Bergen	Apple orchard
2	30	Mount Laurel	Burlington	Field crops
3	300	Mount Laurel	Burlington	Field crops
4	33	Burlington	Burlington	Orchard and field crops
5	Unknown	Moorestown	Burlington	Field crops
6	Unknown	Colt's Neck	Monmouth	Orchard
7	84	Upper Freehold	Monmouth	Orchard and field crops
8	105	Cranbury	Middlesex	Field crops
9	10	Marlboro	Monmouth	Orchard
10	5	Marlboro	Monmouth	Orchard
11	113	Burlington	Burlington	Orchard
12	180	Upper Freehold	Monmouth	Field crops and nursery
13	105	Delanco	Burlington	Field crops
14	60	Washington	Mercer	Field crops
15	450	Hopewell	Mercer	Dairy and field crops
16	72	Florence	Burlington	Field crops
17	50	E. Greenwich	Gloucester	Field crops
18	65	Evesham	Burlington	Field crops

Table 2.
Sampling Results from Select New Jersey Agricultural Sites
Arsenic and Lead
All data provided in parts per million (PPM)

Residential Soil Cleanup Criteria		Arsenic 20 ppm		Frequency of Detection		Lead 400 ppm		Frequency of Detection	
Site	# Samples	Range	Median*	Total	>Criteria	Range	Median*	Total	>Criteria
1	11	6.6-147	29.3	11	9	69.9-517	153	11	1
2	4	6.2-22.2	14.4	4	1	ND -25.3	24.2	2	0
3	18	8.2-65.3	28.6	18	11	ND-163	79.4	16	0
4	38	4.8-310	33	38	22	66-350	300	38	0
5	16	3.89-46.5	18.7	16	6	37.1-551	77	16	1
6	2	<20	<20	NR	0	47-50	48.5	2	0

7	5	<20-55**	35.5**	5	2	<400	<400	5	0
8	92	5.8-32.7	16.1	92	21	NA	NA	NR	NR
9	15	4.2-41.5	10.9	15	4	22-204	56.8	15	0
10	18	10.4-70.5	24.7	18	14	16.9-392	117	18	0
11	111	5.5-231	27.5	111	38	8.9-924	87.9	111	3
12	69	6.38-35.2	18.6	69	32	14.9-17.7	16.9	NR	0
13	5	2.9-9	4.4	5	0	9.1-58.2	22.9	5	0
14	4	7.0-23.6	15.2	4	2	12.4-47.3	16.2	4	0
15	6	1.4-7.4	3.6	6	0	19.3-34.5	24.5	6	0
16	43	9.6-96.9	28.6	43	12	31.4-33.8	32.6	43	0
17	0	NA	NA	0	0	NA	NA	0	0
18	6	4.1-6.47	5	6	0	7.8-13.7	11.3	6	0

NR = Not Reported
*Median of Detected Values

NA = Not Analyzed
**Concentrations due to natural background

Table 3.
Sampling Results from Select New Jersey Agricultural Sites
Organochlorine Pesticides
All data provided in parts per million (ppm)

Residential Soil Cleanup Criteria		DDT 2.0 ppm		Frequency of Detection		DDE 2.0 ppm		Frequency of Detection		DDD 3.0 ppm		Frequency of Detection	
Site	# Samples	Range**	Med*	Total	>Criteria	Range**	Med*	Total	>Criteria	Range**	Med*	Total	>Criteria
1	3	0.13-1.5	0.34	3	0	0.14-0.65	0.17	3	0	ND-0.02	na	1	0
2	24	ND-0.47	0.27	4	0	ND-0.19	0.15	4	0	ND-0.02	0.012	4	0
3	18	0.06-1.18	0.38	18	0	0.06-0.43	0.26	18	0	ND-0.43	0.02	18	0
4	3	0.06-3.0	1.3	3	1	0.1-2.6	0.33	3	1	ND	na	0	0
5	16	ND	na	0	0	ND-0.07	0.02	5	0	ND	na	0	0
6	10	0.16-0.66	0.33	10	0	0.19-0.81	0.31	10	0	ND-0.05	0.015	5	0
7	64	ND-4.0	0.44	64	2	ND-1.72	0.48	62	0	ND-0.73	0.08	13	0
8	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	111	0.01-26	1.65	111	15	0.002-8.8	0.85	111	10	0.004-6.8	0.34	111	2
12	6	0.01-0.07	0.02	6	0	0.02-0.05	0.04	6	0	0.01-0.02	0.02	6	0
13	5	0.09-0.42	0.28	5	0	0.09-0.35	0.14	5	0	ND-0.43	0.03	4	0
14	4	ND-0.19	na	1	0	ND-0.07	0.01	3	0	ND-0.03	na	1	0
15	6	ND	na	0	0	ND	na	0	0	ND	na	0	0
16	36	ND	na	0	0	ND	na	0	0	ND	na	0	0
17	5	ND-0.03	0.02	2	0	ND-0.02	0.01	4	0	ND-0.004	na	1	0
18	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ND = Not Detected
NA = Not Analyzed
na = not applicable

*Median of Detected Values
**Range is for all samples, not just detected values

Table 3. (Cont.) Sampling Results from Select New Jersey Agricultural Sites
Organochlorine Pesticides
All data provided in parts per million (ppm)

Residential Soil Cleanup Criteria		Dieldrin 0.042 ppm		Frequency of Detection		Aldrin 0.042 ppm		Frequency of Detection	
Site	No. Samples	Range**	Med*	Total	>Criteria	Range**	Med*	Total	>Criteria

1	3	ND	ND	0	0	ND	ND	0	0
2	24	0.002-0.39	0.17	11	4	ND	ND	0	0
3	18	ND-0.16	0.04	24	22	ND	ND	0	0
4	3	ND-0.37	0.33	2	2	ND	ND	0	0
5	16	ND-0.06	0.03	2	1	ND	ND	0	0
6	10	0.04-0.09	0.08	10	5	ND	ND	0	0
7	64	ND	ND	0	0	ND	ND	0	0
8	0	NA	NA	NA	NA	ND	ND	0	0
9	0	NA	NA	NA	NA	ND	ND	0	0
10	0	NA	NA	NA	NA	ND	ND	0	0
11	111	ND-0.27	0.03	71	23	ND	ND	0	0
12	6	ND	na	0	0	ND	ND	0	0
13	5	ND	na	0	0	ND	ND	0	0
14	4	ND-0.01	na	1	0	ND	ND	0	0
15	6	ND	na	0	0	ND	ND	0	0
16	36	ND-0.05	0.01	10	1	ND	ND	0	0
17	5	ND	na	0	0	ND	ND	0	0
18	0	NA	NA	NA	NA	ND	ND	0	0

ND = Not Detected NA = Not Analyzed na = not applicable

*Median of Detected Values **Range is for all samples, not just detected values

Table 1 includes general site information and Tables 2 and 3 include the range of detected values, the median of the detected values, the frequency of detection and the frequency of detection at concentrations greater than the Department's residential soil cleanup criteria. Table 4 is a summary of the detected values for the less frequently detected organochlorine pesticides.

All samples were collected from the surface soil (0-6 inches) and were analyzed for metals and the organochlorine pesticides (Addendum 2). As indicated in the number of samples column, not all samples were analyzed for all parameters. Arsenic and lead are the only metals reported, because either the other metals reported were below the Department's residential soil cleanup criteria and thus not of concern, or because the data were not made available to the Department. Only pesticides that were detected at least once in any sample from the 18 sites are included in the Tables. The following pesticides were included in the analysis but were not detected in any sample: aldrin, delta-BHC, gamma-BHC, alpha-chlordane, gamma-chlordane, heptachlor, heptachlor epoxide, methoxychlor and toxaphene.

Arsenic was detected in all the samples (463) in the data set at concentrations ranging from 1.4 ppm to 310 ppm. Arsenic was detected above the Department's residential soil cleanup criteria more frequently than any other analyte. Arsenic was detected above the cleanup criteria in 38% of the samples. In contrast, lead concentrations, which ranged from non-detect to 924 ppm, was detected above the cleanup criteria in only 1% of the samples.

Of the organochlorine pesticides, DDT, DDE, DDD and dieldrin were detected most frequently in the samples analyzed for organochlorine pesticides. However, with the exception of dieldrin, these pesticides were rarely present at concentrations greater than the Department's residential soil cleanup criteria. DDT was detected 227 times at concentrations up to 4 ppm. However, only 6% of the samples contained concentrations of DDT greater than the cleanup criteria of 2 ppm. DDE was detected in 234 samples at concentrations up to 8.8 ppm, but only 4% of the samples contained concentrations above the Department's residential soil cleanup criteria of 2 ppm. DDD was detected in 164 of the samples ranging in concentration up to 6.8 ppm, only 2 samples contained concentrations greater than the cleanup criteria of 3 ppm. For dieldrin, even though the concentrations detected were low, ranging ND-0.39 ppm, a higher percentage of the samples contained concentrations above the cleanup criteria (18%). This is probably due to the low cleanup number for dieldrin (0.042 ppm).

Table 4 contains data for the additional pesticides that were detected at the 14 sites using the organochlorine pesticide scan. These pesticides include alpha and beta-BHC, endrin, endrin aldehyde, endrin ketone, endosulfan I and II and endosulfan sulfate. Of the 311 samples analyzed, these 8 pesticides were detected in only 20 samples at very low concentrations.

Samples from four sites (13, 15, 17 and 18) did not contain any concentrations greater then the Department's residential soil cleanup criteria; however, samples from site 17 were not analyzed for metals and samples from site 18 were not analyzed for organochlorine pesticides.

Due to the small sample size, one cannot draw any conclusions regarding the location of the sites or the type of agricultural use and the resulting analytical data.

Table 4.
Sampling Results from Select New Jersey Agricultural Sites
Organochlorine Pesticides
All data provided in parts per million (ppm)

Residential Cleanup Criteria		alpha-BH (no criteria)		beta-BHC (no criteria)		Endrin 17 ppm		Endrin aldehyde (no criteria)		Endrin ketone (no criteria)		Endosulfan I 340 ppm		Endosulfan II 340 ppm		Endosulfan sulfate (no criteria)	
Site	No. of Samples	Range	Freq*	Range	Freq	Range	Freq	Range	Freq	Range	Freq	Range	Freq	Range	Freq	Range	Freq
1	3	ND	0	ND-0.02	1	ND	0	ND	0	ND	0	ND	0	ND-0.45	1	ND-0.04	1
2	24	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
3	18	ND-0.001	1	ND-0.016	2	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
4	3	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
5	16	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
6	10	ND	0	ND	0	ND-0.05	5	ND-0.02	5	ND-0.02	1	ND-0.004	1	ND	0	ND	0
7	64	ND	0	ND-0.022	1	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
8	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	111	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
12	6	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
13	5	ND-0.46	1	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
14	4	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
15	6	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
16	36	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
17	5	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
18	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ND = Not Detected   NA = Not Analyzed   *Frequency compund was detected

D. Similar Issues in Other States and Countries

The Department contacted other states around the country to determine the extent of historical pesticide contamination nationally and to learn how other states were responding to the problem (Hamilton, 1998). Based on the results of the survey 14 states consider the historic use of pesticides to be problematic with respect to site regulation, development and cleanup.

For example, the state of Washington, a major producer of apples, has reported problems with pesticide contaminated soils. In situations similar to New Jersey, Washington's Department of Ecology (DEC) has reviewed site-specific data for sites slated for development. DEC reported a range of lead concentrations up to 1000 ppm and arsenic concentrations up to 800 ppm in orchard soils. Reportedly, some orchards in Washington state have experienced problems of phytotoxicity, in which the levels of arsenic in soils became toxic to fruit trees. (Roundtry, Personal comm. 1998)

Only Michigan reported that it requires sampling for pesticide residues before site development. However, fifteen states (Alaska, California, Connecticut, Delaware, Idaho, Illinois, Iowa, Michigan, Minnesota, Montana, New York, Rhode Island, South Carolina, South Dakota and Texas) reported that lenders sometimes require testing.

Based on this limited survey, nearly every state that has dealt with the problem of contamination caused by the historic legal use of pesticides and subsequent remedial action has done so using a voluntary, case-by-case approach. Depending upon the anticipated use of the land and likely routes of exposure, most states accept remedial actions such as the removal or the covering of contaminated soil. Several states allow, but do not mandate, the use of deed restrictions (Delaware, Massachusetts, Michigan, Minnesota, Missouri, New York, Rhode Island South Carolina and Texas) as part of a remediation. None of the responding states is considering regulation to address past pesticide contamination at this time.

Lead arsenate-contaminated soils have been reported in fruit growing regions of Australia, Canada and New Zealand and likely occur in many other countries (Peryea and Kammereck, 1997).

E. Natural Background Soil Concentrations of Arsenic and Lead

Arsenic and lead are naturally occurring in soil and can vary widely. All soils contain naturally-occurring arsenic and lead in some amount (Kabata-Pendias and Pendias, 1984). In general, the concentrations of arsenic in any particular soil are dependent upon the parent material and the soil forming processes. Because the soil forming processes are relatively consistent in New Jersey, differences in arsenic concentrations depend primarily on the soil parent material and past and present land use (Motto, Personal comm., 1997).

Because the underlying geologic materials vary widely throughout New Jersey, naturally-occurring concentrations of metals in New Jersey soils also vary widely. Even though soils within a specific soil series can be similar in texture and color, the mineral and organic matter composition of soil tend to be heterogeneous. As a result, concentrations of metals in adjacent soil samples can vary substantially over distances of a few feet.

Based on a Department survey of background concentrations of metals in soil in rural and suburban areas of the state, non-agricultural soils contained 0.02 – 22.7 ppm of arsenic with an average 3.25 ppm and less than 1.2- 150 ppm of lead with an average of 19.2 ppm (Fields, et al., 1993). A statistical test was conducted to determine the correlation between sand, silt and clay content of the samples and metal concentrations. Samples containing higher clay content tended to have higher concentrations of most metals, including arsenic and lead (Fields, et al., 1993).

While naturally-occurring lead concentrations have not been detected above the Department's residential soil cleanup criteria in New Jersey, elevated arsenic concentrations have been found. Higher concentrations of naturally-occurring arsenic have been specifically associated with soils containing glauconite. The US Geological Survey found arsenic concentrations generally lower than 10 ppm in sandy soils from undeveloped areas, but concentrations were as large as 40 ppm in samples containing higher clay content (Barringer, et al., 1998). Soil sampling conducted as part of site remediation activities have shown glauconite soils to commonly contain arsenic concentrations of 20-40 ppm and range as high as 260 ppm (Schick, Personal comm., 1998). The Department is currently involved in a research project with the New Jersey Geological Survey investigating metal levels in glauconite soils.

Although some metals can be expected to occur naturally at levels greater than the Department's residential soil cleanup criteria, synthetic compounds such as the organochlorine pesticides, are not naturally occurring chemicals. The natural background concentrations of such synthetic organic compounds should be zero (Fields et al., 1993). The presence of DDT and dieldrin clearly indicate human impacts to the soil. Trace levels of some pesticides have been associated with deposition of air-borne contaminants. However, concentrations of pesticides such as DDT, DDE, and dieldrin in soil (Fields et al., 1993) that exceed the Department's residential soil cleanup criteria typically result from direct application to the soil surface.

The Department is not authorized to require remediation of naturally-occurring conditions in the environment. (See N.J.S.A. 58:10B-35g(4)). However, it is important to determine during the remedial investigation and the remedial action at a site, whether elevated levels of arsenic are the result of a discharge or whether they reflect natural background conditions.

It is assumed that naturally elevated arsenic levels in soil pose similar health risks as those resulting from historical pesticide use (Florida Agricultural Information Retrieval System, 1998) . In addition, natural background conditions can also affect the selection of an appropriate remedy for a site. For example, blending would not be a viable option for a site with high background concentrations of arsenic.

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