Historic Arsenical Pesticide Research

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List of Acronym

As	arsenic
C	carbon
Ca	calcium
CAMA	calcium acid methanearsonate
C.F.R.	Code of Federal Regulations
COOP	Cooperative
Cu	copper
2,4-D	2,4 -dichlorophenoxy acetic acid
DDAMA	dodecylammonium methanearsonate
DDT	dichlorodiphenyltrichloroethane
DMAA	dimethylarsinic acid
DSMA	disodium methanearsonate
ELR	Environmental Law Reporter
EPA	United States Environmental Protection Agency
EPD	Environmental Protection Division of the Denver Department of Environmental Health
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FOIA	Freedom of Information Act
H	hydrogen
K	potassium
MAMA	monoammonium methanearsonate
MMAA = MAA	monomethylarsonic acid = MMA
mm^3	cubic millimeter
MSMA	monosodium acid methanearsonate
N	nitrogen
Na	sodium
ND	No Date
NPIC	National Pesticide Information Center
NPIRS	National Pesticide Information Retrieval System
O	oxygen
OAMA	octylammonium methanearsonate
OPP	Office of Pesticide Programs
P	phosphorous
Pb	lead
PAN	Pesticide Action Network
PMEP	Pesticide Management Education Program
PPIS	Pesticide Product Information System
PPLS	Pesticide Product Label System
ppm	parts per million
RFC	Reason For Cancellation
S	sulfur
TMAO	trimethylarsine oxide
US	United States
U.S.C.	United States Code
USGS	United States Geological Survey
VB/I-70	Vasquez Boulevard & Interstate 70

Introduction

Elevated levels of arsenic have been found in soils in residential properties at the Vasquez Boulevard & Interstate 70 (VB/I-70) Superfund site in Denver, Colorado. Initial surface soil sampling results showed 67 percent of sampled residential properties (1390 properties) were below the detection limit (51 ppm average) and less than three percent of sampled properties had one or more samples above 450 ppm arsenic (USEPA, 2001). Further investigation revealed about one percent of properties sampled had arsenic above 300 ppm (Washington Group International, 2001). Elevated arsenic levels frequently occur yard-wide, with arsenic levels dropping off near the property line. In many cases properties containing soil with elevated levels of arsenic are next door to properties with soils containing low levels of arsenic. Depth analysis shows the majority of the arsenic to be in the top two to six inches of the soil (Washington Group International, 2001; EnviroGroup Limited, 1997).

The VB/I-70 Superfund site is roughly a mile away from the location of a former Asarco smelter. Evaluation of depositional patterns of emissions from the smelter stack indicates that particle sizes associated with arsenic in soils from residential properties were too large to have come from smelter stack emissions (Washington Group International, 2001). Drexler (2003) speciated arsenic from the residential soils and determined that the predominant form of arsenic was arsenic trioxide (As_2O_3), a trivalent form of arsenic (+3). There was a smaller but significant population of lead arsenic oxide particles (PbAsO), which was the predominant form of lead, with a trace amount of arsenic antimony oxide particles (AsSbO) (Washington Group International, 2001). Drexler (2003) indicates arsenic trioxide particles from the elevated properties resemble product from a smelter.

EnviroGroup Limited (1997), Folkes et al. (2001) and (EPD, 2004a) found that the most likely source of arsenic in VB/I-70 soils was historic use of pesticides applied to lawns because it is consistent with the spatial pattern, the frequency of properties with elevated levels, speciation, and particle size data. EnviroGroup Limited (1997) found a 100% correlation with high-level (>70 ppm) arsenic properties and lush lawns in historic photographs (1948-1965). If residual arsenic and lead from past pesticide use is a source then some properties outside the Superfund site should also have elevated levels of arsenic. Limited sampling outside the Superfund site has found some properties with elevated levels of arsenic.

Historic arsenical pesticides were investigated to determine timeframes of application, formulation, mode of application, potential for significant residual, and any inert components that could be used as tracers. This paper documents research findings compiled as part of a US Environmental Protection Agency (EPA) grant to evaluate pesticides as a source of arsenic in residential soils.

Method

Research started with Appendix F of the "Evaluation of Anomalous Arsenic Concentrations in Surface Soils, Asarco Globe Plant Site, Denver Colorado" (EnviroGroup Limited, 1997) that included the Report of the PAX Company Arsenic Advisory Committee to the Environmental Protection Agency (Frost et al., 1973). Information on inorganic pesticides was obtained from searches in the EPA Office of Pesticide Programs (OPP) Pesticide Product Information System

(PPIS) and the EPA OPP Pesticide Product Label System (PPLS) databases as well as searches in the National Pesticide Information Retrieval System (NPIRS) databases. Documents found on the NPIRS databases were obtained by Freedom of Information Act (FOIA) requests. Phone interviews were conducted with CENEX and Martin Resources, Inc. employees to obtain more information about PAX. From there research was done on the world-wide-web using searches on arsenic trioxide, arsenical pesticide, arsenic pesticide, and PAX in search engines and in catalogue databases. Some information was found during orchard research on neighborhoods chosen for the Sampling and Analysis Plan at the Colorado Historical Society Museum library. The first volume of Drexler's deposition to the State of Colorado was read. Some of the regulatory information came from the Denver University Law library and some from the Denver Public Library. Archived issues of the Denver Post for the first two weeks of April 1945-1948, 1950-1953, 1955, 1965, 1971, 1972 and 1973 were searched for pesticide advertisements at the Denver Public Library. Other local Colorado newspapers were searched for PAX advertisements at the Colorado Historical Society Museum Library.

Historic Use and Regulation of Inorganic Arsenical Pesticides

The first recorded use of Paris Green (copper acetoarsenite) in the U.S. was to control the Colorado Potato Beetle in 1867 (Benny, 1999) in Mississippi (Cremlyn, No Date [ND]). Lead arsenate was introduced to the U.S. for insect control in 1892 (Benny, 1999; Peryea, 1998). A recipe for a spray mixture utilizing arsenic trioxide, sodium carbonate, and lime for insecticide use appeared in a Denver newspaper in 1897 (Denver Republican, 1897). In time more products utilizing a variety of forms of arsenic were marketed including arsenic acid, and sodium arsenite. Organic arsenicals are still in use today.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was passed in 1947 requiring the registration of 'economic poisons', later called pesticides. Administrative authority for the Act was given to the United States Department of Agriculture, until 1970 when the EPA was formed. Records of formulations, registrants, product use, and status of registration are available in government records after1947. Inert ingredient information is required on registration applications but is considered confidential and is not available to the public.

EPA started a Special Review Action in 1978 of registered uses for inorganic arsenical pesticides, due to the classification of arsenic as a carcinogen. As a result of the Special Review Action most registrations for inorganic arsenicals were cancelled in 1988 (USEPA, 1988). Many companies voluntarily cancelled their registrations in 1987. Not all registrations cancelled by the review action were in production. EPA noted that none of the calcium arsenate products had been manufactured for years. A more detailed history can be found in Appendix A.

Identification of Arsenical Pesticides Available in the United States

Searches were performed (2002) in the EPA OPP databases (1947-present) as well as in the NPIRS databases (1947-present) to identify available inorganic arsenical pesticides, their formulation, and uses. Fifteen different pesticide chemical codes came up for arsenic. Five codes did not have product matches. Three codes were registered for use exclusively as wood preservatives: arsenic pentoxide, arsenic acid monoammonium salt, and diarsenic acid tetrasodium salt. These codes were not investigated further because wood preservatives, although a potential source of some arsenic in residential soils, would not lead to the yard-wide

distribution found at VB/I-70 properties. Sodium arsenate had registered uses as a wood preservative and as an ant killer. Similarly since neither of these uses would lead to yard-wide distribution no further investigation of these products was performed. Products associated with the remaining six codes: arsenic acid, arsenic trioxide, calcium arsenate, copper arsenate, and two different codes for lead arsenate formed a list of inorganic arsenical pesticides. Literature references indicated use of sodium arsenite as an herbicide so performing a search on sodium arsenite identified a sixteenth code. Products containing sodium arsenite were also added to the list of inorganic arsenical pesticides. Similarly copper acetoarsenite products were added to the list. A complete list of products registered under these codes is included in Appendix B.

Two subsets of the list of inorganic arsenical pesticides were created. Label information from the EPA OPP PPLS database was used to delete products not marketed for home use to generate the first subset. This subset also included all products without labeling information. Legislative changes were made in 1968 and 1972 (documented in the history in Appendix A) that effected whether certain arsenical products could be marketed for home use or not. The labels on arsenical products may have changed to reflect new or restricted product uses compliant with the new legislation. Therefore, label information had to exist prior to 1968 for arsenic trioxide and sodium arsenite, and prior to 1972 for other forms of arsenic in order for the product to be deleted from the list for this subset. This list, which is included in Appendix B, contains all products potentially used in and around homes. The list of products potentially used in and around homes was reduced to a second subset of products potentially applied on lawns (included in Appendix B) by deleting products such as paint, ant bait, grass killers/soil sterilizers, and agricultural/garden products. Technical grade formulations used for manufacturing other products were also deleted.

Arsenic Acid (H_3AsO_4)-Code 6801

Arsenic acid was commonly used as a desiccant for cotton until 1993 (PMEP, 2003a) and is used as a wood preservative; other uses included herbicide, insecticide, and miticide (NPIRS, 2002). Thirty registrations were associated with arsenic acid. Seven of the twelve wood preservative registrations are still active (EPA OPP PPIS, 2002; NPIRS, 2002). Eleven registrations were for desiccants (NPIRS, 2002). One registration was strictly for use in manufacturing purposes (EPA OPP PPLS, 2002). The remaining six product registrations were herbicides (NPIRS, 2002).

Scorch was used to control annual broadleaved weeds and grasses on non-crop areas such as parking lots, fence lines, highway and railway sites, industrial yards, and similar areas. Two registrations (Delta and Ferti Lome) had label information confirming use on lawns. Information on the remaining three soluble concentrate herbicides can be found in Appendix B, labels in the OPP database were either illegible and/or could not be verified as being associated with the registration (EPA OPP PPLS, 2002).

Delta Brand Arsenic Acid F/Bermuda Lawns, F/Control of Dallis & Crab (registered 1982-1989)

In spite of the registration dates, the label in the EPA OPP PPLS database is dated as accepted in July 1971. Delta Brand Arsenic Acid F/Bermuda Lawns, F/Control of Dallis & Crab was a soluble concentrate (NPIRS, 2002) registered to Osmose, Inc. and contained 75 percent

arsenic acid (EPA OPP PPIS, 2002; EPA OPP PPLS, 2002; NPIRS, 2002). The label designates Commercial Chemical Company as the manufacturer. Total water soluble arsenic expressed as metallic arsenic was 39.61 percent. Arsenic trioxide equivalent was 52.3 percent. The label indicates six ounces (3/4 cup) of product was to be put in a quart jar designed for use as a siphon type garden hose sprayer; the jar was then filled with water. This mixture could be used for 1,000 square feet of turf area, resulting in approximately 25 pounds of arsenic acid applied per acre (EPA OPP PPLS, 2002). Calculations indicate one application results in approximately 148 parts per million (ppm) arsenic applied to the top centimeter of soil.

Ferti-Lome Weed & Wild Grass Killer (registered 1963-1987)

Ferti-Lome Weed & Wild Grass Killer has a label record indicating it should not be used on Bermuda grass lawns with less than three months growth and that it should not be used on creeping bent lawns, which indicates it was used on lawns (EPA OPP PPLS, 2002). Ferti-Lome Weed & Wild Grass Killer was a ready-to-use solution (NPIRS, 2002) manufactured by the Voluntary Purchasing Group Inc. and had 2.14 percent arsenic acid (EPA OPP PPIS, 2002; EPA OPP PPLS, 2002; NPIRS, 2002). Other names associated with this registration include 'Ferti-Lome Ready-to-Use Weed & Wild Grass Killer', and 'Ferti-Lome Multi-Purpose Weed Killer' (NPIRS, 2002). Some Ferti-Lome products were advertised in Colorado local newspapers, like the Denver Post, but none were found for the names associated with this registration see Appendix C.

Arsenic acid is a pentavalent (arsenate) form of arsenic; it cannot be distinguished from natural arsenic in the environment (PMEP, 2003b). Bacteria in soil can transform pentavalent (+5) to trivalent arsenic (+3) (Jones et al., 2000) but it is unlikely to look like it came from a smelter. So while it is possible that past use of arsenic acid products may have contributed to the total arsenic found on some residential lawns it is not consistent with other data as a primary source of arsenic.

Arsenic Trioxide (As_2O_3) -Code 7001

Arsenic trioxide (white arsenic) was an ingredient listed in a recipe for an insecticidal spray printed in a local Denver newspaper in 1897, so it was in use prior to when pesticide registration was required. Arsenic trioxide was used as an herbicide, insecticide, miticide, antifoulant, and rodenticide (NPIRS, 2002). Currently arsenic trioxide is used as an insecticide to control ants, which accounts for the only two active registrations of the 27 registrations associated with arsenic trioxide; one for the ant control product and one for the technical chemical used in manufacturing the product (EPA OPP PPIS, 2002; NPIRS, 2002). Ten registrations were for rodenticides or for insecticides to control ants (EPA OPP PPLS, 2002; NPIRS, 2002).

Eight registrations were for technical chemicals used in manufacturing herbicides, insecticides, and miticides (NPIRS, 2002). Arsenic trioxide is used to manufacture sodium arsenite (Bradberry et al., 1997) and arsenic acid (US Department of Health and Human Services, 2002). In fact five companies holding technical arsenic trioxide registrations also hold registrations for products with sodium arsenite and/or products with arsenic acid in them (EPA OPP PPIS, 2002; NPIRS, 2002). One technical registration documents a transfer from one

company to another. The remaining two technical arsenic trioxide registrations were likely used to manufacture some of the other registered arsenic trioxide products.

Four registrations were for anti-fouling paints. Two registrations were for wood treatments (EPA OPP PPIS, 2002; NPIRS, 2002). The one remaining registration is for a granular herbicide, insecticide, and miticide (NPIRS, 2002) called PAX® 400 3-Year Crabgrass Control (EPA OPP PPIS, 2002; NPIRS, 2002).

PAX® 400 3-Year Crabgrass Control (registered 1953-1987)

PAX® 400 3-Year Crabgrass Control was a granular (NPIRS, 2002) pre-emergent crabgrass control product registered to Martin Resources, Inc.; it contained 25.11 percent arsenic trioxide and 8.25 percent lead arsenate (EPA OPP PPIS, 2002; NPIRS, 2002). The recommended application rate for the registered formulation changed over time from 50 to 10 pounds per 1000 square feet (Appendix D). PAX® 400 3-Year Crabgrass Control would have been applied in fall or early spring (Greeley Tribune, 1960). A single application is calculated to range from 990-2475 ppm arsenic and from 284-710 ppm lead in the top centimeter of soil for 10-25 pounds respectively. Advertisements for PAX Crabgrass control products were found in the Denver Post and other Colorado local papers (Appendix C). Another registered name was PAX Lawn Moth and Soil Pest Control (NPIRS, 2002).

A granular product with arsenic trioxide is consistent with speciation and nature of arsenical particle information from the VB/I-70 Superfund Site. Extensive research was done on PAX crabgrass control products which show the arsenic trioxide in PAX crabgrass control products was provided by the Tacoma smelter in Washington (Bass, 2002), so residual arsenic trioxide from PAX would look like product from a smelter. The PAX Company possessed a patent that covers both use of arsenic trioxide for crabgrass control and use of mixtures of arsenic trioxide and lead arsenate for crabgrass control (Stewart, 1959). Other findings are summarized in Appendix D.

Calcium Arsenate ($Ca_3[AsO_4]_2$)-Code 13501

Calcium arsenate was used as an herbicide, insecticide, miticide, fungicide, and it was mixed in baits for molluscs, tadpoles, and shrimp (NPIRS, 2002). Thirty-two product registrations are associated with calcium arsenate (EPA OPP PPIS, 2002; NPIRS, 2002). Fourteen are for slug, snail, and cutworm bait. Seven registrations are for insecticde, miticide and/or fungicide dusts for vegetables or fruits – predominantly tomatoes (EPA OPP PPLS, 2002; NPIRS, 2002). Two registrations are to control housefly maggots in poultry droppings and manure (EPA OPP PPLS, 2002). Two registrations are wettable powders for use as insecticides and miticides (NPIRS, 2002) with no label information. There are two products on the list of seven inorganic arsenical pesticides potentially applied on lawns with calcium arsenate as the active ingredient and with label information confirming use on lawns (EPA OPP PPLS, 2002). They are wettable powder (NPIRS, 2002) Lacco Brand Calcium Arsenate (registered 1948-1987) and granular (NPIRS, 2002) Gro-Well Pre-Vent, registered 1961-1985 (EPA OPP PPIS, 2002; NPIRS, 2002).

Lacco Brand Calcium Arsenate (registered 1948-1987)

The Lacco wettable powder (NPIRS, 2002) product, made by the Los Angeles Chemical Company, had 70 percent calcium arsenate by weight (EPA OPP PPIS, 2002; NPIRS, 2002), which was 26.4 percent total elemental arsenic by weight, and 0.5 percent total water soluble arsenic by weight. *Lacco Brand Calcium Arsenate was used to control crabgrass at 8-12* pounds per 1000 square feet, annual bluegrass at 6-8 pounds per 1000 square feet, or chickweed at 10-14 pounds per 1000 square feet in established Kentucky bluegrass or rye grass. Application could be done in early spring or late fall. High phosphate fertilizers were not to be used in the first year of treatment (EPA OPP PPLS, 2002). Calculations indicate one maximum application for chickweed (14 pounds) would result in approximately 1800 ppm arsenic in the top centimeter of soil.

Gro-Well Pre-Vent (registered 1961-1985)

Gro-Well Pre-Vent was a granular (NPIRS, 2002) product made by the J&L Adikes, Inc. of Ithaca, New York. It contained 48 percent calcium arsenate (EPA OPP PPIS, 2002; NPIRS, 2002). Gro-Well Pre-Vent was for pre-emergent crabgrass control as well as control of annual bluegrass, chickweed, and certain lawn insects (EPA OPP PPLS, 2002).

Labels for the remaining five registrations (see Appendix B for product details) are either not available or are dated after 1971 and are for turf management on golf courses (EPA OPP PPLS, 2002). Prior to 1971 they may have been marketed for home use (see Appendix A for documentation).

Arsenate is also a pentavalent form of arsenic so it is not consistent with the speciation information found at VB/I-70. If the lawn-care products were used in the Denver area it could add to the total arsenic found in residential soils and would alter lead to arsenic ratios compared to lead arsenate products and compared to the lead to arsenic ratios found in PAX products.

Copper Acetoarsenite ($[CH_3COO]_2Cu•3Cu[AsO_2]_2$ –Paris Green)-Code 22601

Copper acetoarsenite was first manufactured as a pigment for paint in 1814, as Schweinfurt Green (Lipscher, 2001). As mentioned in the History section, copper acetoarsenite was used in the US in 1867 to control the Colorado Potato Beetle. The Barteldes Seed Company of Denver, Colorado advertised Paris Green as an insecticide in a 1909 edition of The Colorado Fruit Grower. There were seven registrations in the EPA OPP PPIS database (2004) for copper acetoarsenite. Two were for marine anti-fouling paints, three were for mixtures with aliphatic petroleum hydrocarbons, and two were for the pure chemical. One label for one of the mixtures indicated it was applied to water to control mosquitoes (EPA OPP PPIS & PPLS, 2004). Technically copper acetoarsenite is an organic arsenical but it was listed in EPA's documentation of a Special Review Action on inorganic arsenicals noting all registrations were cancelled by 1987 see Appendix A.

Paris Green is a possible source of arsenic for residences built on land used for agriculture in the late 1800s or early 1900s. But it is not consistent with speciation data for VB/I-70 properties.

Copper Arsenate ($Cu_3[AsO_4]_2$)-Code 22801

Copper arsenate was used as an insecticide and fungicide (NPIRS, 2002). There is only one registration associated with copper arsenate. PBI/Gordon Corporation held the registration that was cancelled in February 1983 for 91 percent copper arsenate (EPA OPP PPIS, 2002; NPIRS, 2002). The 1968 label was for Sherwin-Williams Basic Copper Arsenate. Directions were for application to cabbage, cauliflower, brussel sprouts, kohlrabi, and tomatoes (EPA OPP PPLS, 2002). This was not likely to result in yard-wide applications. Additionally, it is not consistent with the speciation information from VB/I-70.

Lead Arsenate –Codes 13502 & 13503

Lead arsenate may not refer to a specific compound because lead arsenate came in several different forms: lead arsenate ($PbHAsO_4$) and lead arsenate, basic (which cannot be assigned a chemical formula because manufacturers used different PbO to As_2O_5 ratios) (Frear, 1965). Peryea (1998) states the principal marketed form of lead arsenate, basic became $Pb_5OH(AsO_4)_3$. Another formula commonly found on the internet is $Pb_3[AsO_4]_2$.

As shown in Appendix A lead arsenate was used for approximately eighty-years and it was the pesticide of choice with multiple uses for almost fifty-years. Lead arsenate has been used as an insecticide, miticide, fungicide, herbicide, nematicide, and as a maturity regulator for grapefruit (NPIRS, 2002). Advertisements for lead arsenate appeared in a 1909 edition of The Colorado Fruit Grower by companies based in Denver and Grand Junction. Turf managers of golf courses commonly used lead arsenate to control grubs, earthworms, and Japanese beetles in the 1920s and 1930s (Leach, 1928; Green Section Committee, 1938). Additional uses of lead arsenate include: on garden crops, mosquito abatement, and in cattle dips (Peryea, 1998). Stadtherr (1963) reported that Leach and Lipp reported the first arsenical crabgrass control using lead arsenate in 1927. He further reported the Ohio Agricultural Experiment Station performed extensive studies using arsenates for crabgrass control from 1930 to 1947; reporting crabgrass control from one application of lead arsenate, 35 pounds per 1000 square feet, lasted 10 years. An article in a 1950 Denver Post recommends mixing five pounds of arsenate of lead with two cubic feet of sand and scattering it over the infested area to eliminate "night crawlers" (Partridge, 1950). In 1953 a Denver Post advertisement indicates arsenate of lead kills crabgrass and nightcrawlers, and can be mixed with fertilizer.

Fifty-four registrations are associated with lead arsenate (EPA OPP PPIS, 2002; NPIRS, 2002). Two registrations are for fungicides, three registrations are herbicides, one registration is as a regulator (grapefruit), and the rest are insecticides see Appendix B (NPIRS, 2002). There are three insecticide products on the list of inorganic arsenical pesticides potentially applied on lawns with lead arsenate as the active ingredient with label information confirming use on lawns (EPA OPP PPLS, 2002). They are: Patterson's Lead Arsenate (registered 1957-1987) for crabgrass control, Suspenso Lead Arsenate (registered 1971-1986) for earthworm control, and E-Z Flo Arsenate of Lead (registered 1953-1986); all are wettable powders (NPIRS, 2002).

Patterson's Lead Arsenate (registered 1957-1987)

The registration for Patterson's Lead Arsenate belonged to the Patterson Chemical Company from January 1957 to March 1985 when it was transferred to Pursell Acquisition Co., Inc.[1] Patterson's Lead Arsenate contained 96 percent lead arsenate (EPA OPP PPIS, 2002; EPA OPP PPLS, 2002; NPIRS, 2002): total arsenic expressed as metallic was 20.7 percent, arsenic in water soluble form expressed as metallic not more than 0.33 percent, and lead expressed as metallic was 57.3 percent. The 10/28/69 label gives directions for use on apples, pears, cherries, plums, prunes, lawns, tomatoes, evergreens, peaches, and Japanese plums. For grub and worm proofing lawns ten pounds of product should be mixed with two bushels of fine top soil or sand. This mixture should be broadcast evenly over 1000 square feet of surface. 'Apply only when grass is dry and work into the ground with a broom or rake.' For crabgrass control the same application procedure is used in fall or early spring, but needs to be done with more diligence given to obtaining complete lawn coverage (EPA OPP PPLS, 2002). Calculations indicate one lawn application would result in 1012 ppm arsenic and 2798 ppm lead to the top centimeter of soil.

Suspenso Lead Arsenate (registered 1971-1986)

Suspenso Lead Arsenate was a wettable powder (NPIRS, 2002) registered to FMC Corporation Agricultural Products Group. It contained 94 percent lead arsenate (EPA OPP PPIS, 2002; EPA OPP PPLS, 2002; NPIRS, 2002): total arsenic expressed as metallic was 20.3 percent, arsenic in water soluble forms expressed as metallic was 0.5 percent, and lead expressed as metallic was 56 percent. The label gives directions for use on apples, pears, peaches, cherries, plums, prunes, lawns, golf greens, and grapefruit. On lawns and golf greens for Japanese, Asiatic, and Oriental Beetles, and Earthworms, apply 10 pounds of product per 1000 square feet of surface, working it into the soil during preparation of seedbed. For Earthworm control on established turf apply at the same rate and follow with thorough watering (EPA OPP PPLS, 2002). Calculations indicate one lawn application would result in 991 ppm arsenic and almost 2734 ppm lead to the top centimeter of soil.

E-Z Flo Arsenate of Lead (registered 1953-1986)

E-Z Flo Arsenate of Lead was a wettable powder/dust (NPIRS, 2002) registered to Grower Services Corporation. It contained 98 percent lead arsenate (EPA OPP PPIS, 2002; EPA OPP PPLS, 2002; NPIRS, 2002): total arsenic expressed as metallic was 21.14 percent, arsenic in water soluble form expressed as metallic not more than 0.35 percent, and lead expressed as metallic was 58 percent. The label contains directions for use on apples, pears, quinces, peach, plum, cherry, ornamental turf, old fairways, new lawns, greens, and tees. For new lawns 10 pounds of product was to be mixed with "a quantity" of moist soil or sand and applied to 1000 square feet. "Immediately after application water in thoroughly." Application should be made after "grading is completed but before seeds . . . are planted" (EPA OPP PPLS, 2002). Calculations indicate one lawn application would result in 1032 ppm arsenic and 2832 ppm lead to the top centimeter of soil.

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[1] There are a few other documented transfers like this one. In order to match database search numbers if someone were to independently search the databases utilized, each registration was counted. For example Patterson's Lead Arsenate had two registrations, one for each company, and both are included in the total 54 lead arsenate registrations.

ACME Arsenate of Lead (registered 1968-1987)

Label information in the EPA OPP PPLS database is not legible, however anecdotal evidence exists that bags of ACME Arsenate of Lead have been collected in Denver in chemical round-ups and that it was used for crabgrass control (VanDerLoop, 2002); similar collection observations were made by the Tri-County Health Department (Robbio-Wagner, 2004). ACME Arsenate of Lead was a wettable powder/dust (NPIRS, 2002) registered to PBI Gordon Corporation. It contained 98 percent lead arsenate (EPA OPP PPIS, 2002; NPIRS, 2002) and is listed as an insecticide, miticide, and nematicide (NPIRS, 2002). Information in the PAN Pesticides Database (2004) indicates ACME Arsenate of Lead was used on apples, pears, quinces, peaches, fruit trees, ornamental evergreens, ornamental turf, juniper, and Japanese Plum. Crabgrass is listed as a pest controlled by the product.

Lead arsenate is a likely source of residential arsenic because it was used for so long and had so many different uses. Studies have shown that lead and arsenic from lead arsenate tends to remain in the top six inches of soil. However arsenate is a pentavalent form of arsenic, which is not consistent with the speciation data from VB/I-70, so while it is a contributing factor it is not likely the primary source of arsenic on properties with high levels of arsenic.

Sodium Arsenite ($NaAsO_2$)-Code 13603

Sodium arsenite was used as an herbicide, insecticide, miticide, and fungicide (NPIRS, 2002). A 1939 "Turf Culture" article reported a mixture of 12 quarts of dry sand and 4 ounces of sodium arsenite applied to 1,000 square feet of a Pennsylvania lawn killed all weeds except for dandelions (Grau, 1939). There were 94 registrations for products with sodium arsenite all of which are cancelled. The majority of the cancellations were in 1987 and 1988 (EPA OPP PPIS, 2002; NPIRS, 2002) coinciding with decisions made by the EPA special action review (Appendix A). Four registrations are for products to kill ants, and most of the other registrations were for non-selective weed-killers, which would poison the soil (Appendix B). Many weed-kill products were for use on tank farms, near roadways, as preparation for paving, at substations or other industrial areas. Some weed-kill products could also be used to control fungus on grapes, or to kill termites or trees (EPA OPP PPLS, 2002). Most labels in the EPA OPP PPLS database were dated after 1968, so products may have had additional uses prior to 1968 (see Appendix A for details).

Given post 1968 uses, even if these products were marketed for home use, application of these products is not likely to have been yard-wide distribution. Sodium arsenite is a trivalent form of arsenic that is much more soluble than arsenic trioxide. It is possible, since sodium arsenite is a form of arsenic trioxide, that the PAX Company's patent prevented marketing of sodium arsenite for crabgrass control. If so it would further indicate that no sodium arsenite products were marketed to control crabgrass prior to the PAX Company obtaining their patent. An advertisement was found in an April 1948 Denver Post for 'Triox', which was a 48 percent arsenic trioxide liquid (likely sodium arsenite) that poisoned the soil, marketed as an Ortho product (Appendix C). No further investigation was pursued for these products.

Residual Arsenic and Lead from Pesticides in Soil

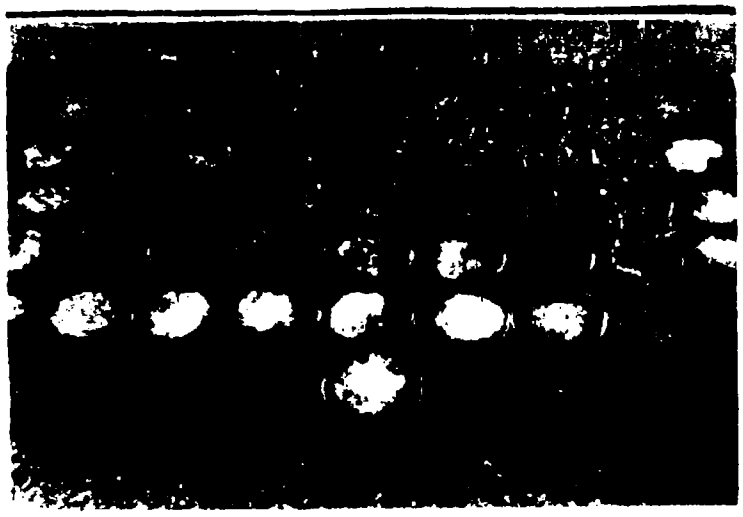
Elevated levels of arsenic and lead in soil from the past use of pesticides are well documented phenomena. New Jersey and Wisconsin were among the first states to formerly address the issue of elevated arsenic and lead levels from past pesticide use in residential areas developed on agricultural land; see EPD (2004b). Examples of documented findings of the persistence of arsenic and lead from historic pesticide use include:

- The Electric Power Research Institute (EPRI) has been funding projects to develop remediation technologies for arsenic in the soil due to a build up of arsenic in soil at numerous substations and other industrial sites from the historic use of arsenic trioxide as a soil sterilant to control vegetation (EPRI, 2003).
- Drexler (2003) stated the maximum value of arsenic in soil found at a Denver golf course that applied PAX at least once and possibly three times in the early 1970s was 500 ppm.
- Robinson and Ayuso (2002) conducted a lead isotope survey in New England and found a correlation between agricultural land use for apple, blueberry, and potato crops and elevated lead and arsenic levels.
- Evidence that residual arsenic from lead arsenate applied to orchards in New England was mobilized by surface runoff has been found, though it still remained in the top 20 centimeters of soil (Wong et al., 2002).
- A USGS study in two counties in New Jersey found average arsenic in soils from orchards to be 12 ppm (5-42 ppm), 25 ppm (7-70 ppm) in soils from residential areas, and 5 ppm (2-11 ppm) in forest soils (Barringer et al., 2001). The increased levels in residential areas were attributed to increased pesticide use or from soil disturbance during construction.
- Six different studies have indicated the presence of lead and arsenic residuals in the top 25 cm of soils as a result of lead arsenate application (Peryea, 1998; Sanok et al., 1995). One study concluded lead and arsenic concentrations in orchard soils are dependent on the depth of mixing by tillage implements (Peryea, 1998).
- Lead and arsenic were found at levels high enough to be of environmental concern in lead arsenate treated orchard soils in the state of Washington (Peryea and Creger, 1994).
- Arsenic concentrations in lawn grasses grown in soil repeatedly treated with arsenic trioxide and lead arsenate had a maximum of 2 ppm As, while the soil ranged from 150-550 ppm As (Hiltbold, 1973).
- Studies have shown that use of PAX® 400 3-Year Crabgrass Control lead to a build-up of arsenic in the soil (Fults, 1966).
- The Ohio Agricultural Experiment Station reported soluble arsenic from 5-years of lead arsenate treatment was retained in the top two-inches of soil (Stadtherr, 1963).

A visual illustration of arsenical pesticides remaining in surface soils was provided by Stadtherr (1963) who performed column studies with PAX and the arsenicals in PAX using two different types of soil. He crushed the PAX or the arsenicals with a mortar and pestle, and then distributed it evenly on the columns at the recommended application rate. Water equivalent to 1-inch, 4-inches, or 16-inches was leached through each column. Columns were then sliced at regular intervals and 50 crabgrass seeds were sown on the top of each slice. PAX did not leach in the loamy soil, but leached to a slight extent in the sandy soil (Figures 1 and 2).

Figure 1: Loamy Soil Column Leaching Study

Figure 7. Crabgrass stands (50 seeds per dish) in a loamy soil (B) three weeks after seeding in soil slices taken from indicated depths following surface herbicide treatment and leaching as described below



Depth from surface (inches)

3-3 1/2

2-2 1/2

1-1 1/2

1/2-1

0-1/2

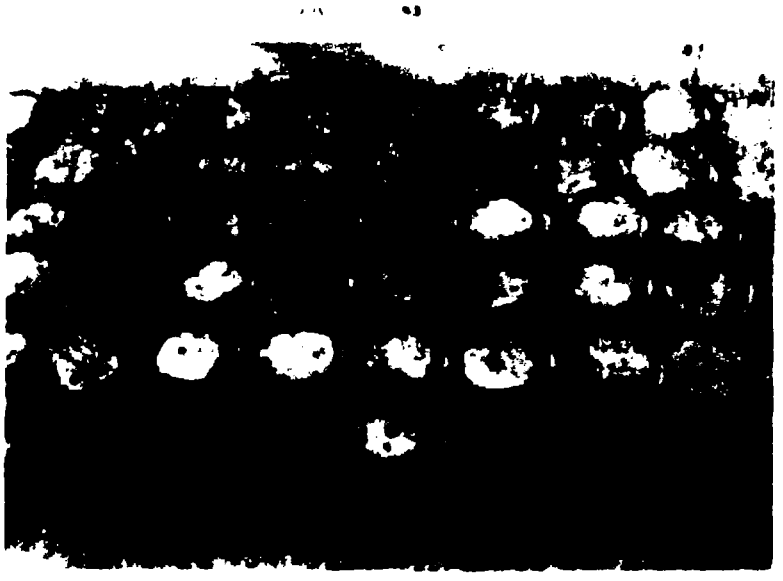
Non-seeded check

Columns:
Treatments[1]
As-1 As-4 As-16 PAX-1 PAX-4 PAX-16 C

[1]As = arsenical compounds at same levels as in the 1x rate of PAX with 1, 4, or 16 inches of leaching with water, PAX at the 1x rate leached with 1, 4, or 16 inches of water and C = untreated control.

Taken from Stadtherr (1963).

Figure 2: Sandy Soil Column Leaching Study



Taken from Stadtherr (1963).

Stadtherr (1963) grew crabgrass on both soils at various application rates of PAX. The sandy soil comparison of crabgrass growth on surface-treated soils to crabgrass growth on column slices show that less than six-percent of toxic substances from the herbicide moved below the ½-inch depth.

Lead Arsenate

Most of the studies documenting residual levels of arsenic and lead from past use of lead arsenate were done by comparing soils known to have received past lead arsenate application to soils known not to have lead arsenate application. Antimony is co-transported with arsenic during the ore refining process and has been demonstrated to be enriched in orchard soils previously treated with lead arsenate (Wagner et al., 2003). Concentrations of antimony in

contaminated soils were higher than uncontaminated soils but remained in the worldwide normal range; they were substantially lower than levels that constitute a health risk. So elevated antimony levels could be considered a weak tracer indicative of past lead arsenate use.

Lead from lead arsenate dissociates from the arsenic. Five studies show preferential leaching of arsenic, especially in sandy soils (Peryea, 1998). This is consistent with arsenic and lead results from orchard soils in Washington, Wisconsin, and North Carolina where lead was found at higher levels than arsenic (EPD 2004b). However addition of ammonia, as in some fertilizers, could preferentially leach lead compared to arsenic (Cohen, 2003).

Seemingly contrary to Stadtherr's findings, a study on orchard soils in Canada found more lead and arsenic in a sandy soil compared to a clay loam soil (Elfving et al., 1994). It is possible that more lead arsenate was applied to the sand compared to the loam, as surface samples in the sand contained more than twice the arsenic and lead than the clay. Arsenic and lead levels were similar, though still higher in the sand at 25-30 cm.

Studies have also shown that lead from lead arsenate sprays is not phytotoxic while the arsenic can be, confirming arsenic is the active herbicidal ingredient. Lead arsenate converts to less soluble minerals over time, and there is indirect evidence that arsenic from lead arsenate becomes less phytotoxic over time (Peryea, 1998). So lawns treated with lead arsenate or other arsenicals in the past could still be inhibiting weed growth but not as strongly as when they were first applied.

PAX®

The lead arsenate in PAX® products increased the solubility of arsenic trioxide in the first two-and-a-half to three weeks after application (Stewart, 1959) resulting in improved control compared to either arsenical alone (Ellison, 1963). However, Stadtherr's studies (1963) showed the arsenic tended to stay in the top two inches of soil after sixteen inches of water was applied. PAX® products also contained ammonium sulfate (see Appendix D) which could cause some leaching of lead in preference to the arsenic (Cohen, 2003).

According to the PAX Company's petition to EPA (Frost et al., 1973) to keep the 3-Year Crabgrass Control product on the market if the arsenic from one application completely converted to anion form it would occupy the anion exchange capacity to a depth of 1 cm of soil. Soils in Arcadia, California and St. Joseph, Missouri were found to 'fix' the arsenicals in PAX and no control of crabgrass was provided; so the PAX Company provided refunds to customers in these areas (Ellison, 1973).

Wind and surface water runoff, erosion, and subsequent deposition can concentrate soil arsenic. When lawn-soil is dry and dusty mowing the lawn can concentrate arsenic rich soils by redistributing the surface soil. In fact PAX material has been shown to accumulate in depressions in an irregular lawn surface and cause dead spots (Frost et al., 1973).

The liming of an iron-rich soil high in fixed arsenic would release a large amount of soluble arsenic (Frost et al., 1973; Blum and Renshaw, 2004). If a soil with high fixed or stored arsenic content is subject to anaerobic conditions, the original compounds would be reduced to arsenite,

which could be further reduced to dimethylarsine both of which are more toxic than arsenate. Flooding or construction placed over the soil could cause such anaerobic conditions (Zinke, 1973).

Sources reported conflicting information about the mobilization of arsenic by addition of phosphorous, which led to in depth research on the fate and transport of arsenic in the environment. In part fate and transport information was also collected to help answer the questions of if and how arsenic and lead from past pesticide use can be differentiated from natural sources. Due to the complexity of the topic this information will be incorporated in a separate report.

Conclusion

Arsenical pesticides including arsenic trioxide and lead arsenate are known to be persistent in surface soils. Therefore past application of pesticides is a possible source of arsenic and lead on some of the properties in VB/I-70. Nine confirmed inorganic arsenical pesticide lawn products were identified from 72 inorganic arsenical pesticide products identified as being potentially used on lawns. Two of the nine confirmed products utilize arsenic acid as the active ingredient, which is indistinguishable from natural arsenic. Two products utilize calcium arsenate and four products contain lead arsenate. Arsenates are pentavalent forms of arsenic, which is not consistent with the speciation data associated with VB/I-70 properties with high levels of elevated arsenic. One arsenic trioxide product was found which is consistent with the speciation data at VB/I-70.

PAX® 3-Year Crabgrass Control is the only arsenic trioxide lawn product found, which makes it the most likely arsenical pesticide source at the sampled locations. PAX® was a granular product initially marketed as a fertilizer and registered as a pesticide in 1953. Perlite, one of the known inert ingredients in PAX®, is too common to be a helpful tracer; it was present on some lawns with elevated arsenic levels in the VB/I-70 Superfund site (Drexler, 2003; Folkes, 2003).

Denver Post advertisements indicate that PAX® crabgrass control products (without verifiable formulation) were available in Denver in 1947, 1951-52; while the registered formula for PAX® was available in Denver for nineteen years (1953-1972) (Appendix C). Recommended application rates varied over the years. Estimates of arsenic residuals in soil were made assuming that PAX® was applied annually for nineteen years at a rate of 10 pounds per 1000 square feet per year (Appendix D). The result is a residual of 4,017 ppm arsenic in the top two inches of soil. Factoring in leaching (assuming no leaching below six inches and no volatilization after methylation by microorganisms) would reduce this to 1,339 ppm arsenic distributed in the top six inches of soil. The maximum composite 0-2-inch sample at the VB/I-70 Superfund site was 1410 ppm arsenic (Washington Group International, 2001 raw data). Therefore PAX Crabgrass Control products are a likely source of arsenic in residential soils. Use of lead arsenate over a 19 year period could lead to similar levels of arsenic, but the predominant form of arsenic would be pentavalent, not trivalent, and there would likely be more lead than arsenic.

Speciation was only done on a subset of samples, so other locations could have arsenic from past applications of other arsenical lawn products. Although advertisements were not found for some

of the other identified lawn products, it does not guarantee the products were not available. Pesticide products containing organic arsenicals are still marketed today[2] and could also contribute to total soil arsenic, however even if transformed to inorganic forms it is unlikely that particle sizes found at VB/I-70 would form from the organic arsenicals.

Because PAX® and other arsenical products were distributed nationally there could be residential lawns with elevated arsenic levels nation-wide. If so the bulk of these elevated arsenic levels should be at homes built prior to 1975. Unfortunately, the VB/I-70 data is not consistent with this theory as there were no properties with homes built after 1960 (about 100 homes in the sample) above 100 ppm arsenic. A possible explanation for this is that new crabgrass control herbicides were introduced in the 1960's, dinitroanilines, which may have decreased sales of arsenical products (Quakenbush, 2004). Therefore it is also possible the bulk of affected homes would be ones built prior to 1960 with only a few affected homes built between 1960 and 1975.

[2] See the list in Sources of Arsenic in Soil, EPD, 2004.

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Appendix A:

History of Arsenical Pesticides

History

The first recordings of insecticide use were by the Sumerians who used sulfur compounds to control insects in 2500 BC. In 1200 BC the Chinese used mercury and arsenical compounds to control body lice. Alchemist Ko Hung recommended a root application of white arsenic [arsenic trioxide] when transplanting rice to protect against insect pests in 400 AD (Dent, 2001). Cacodyl, the first organic arsenical was made in 1846. Schweinfurt green (copper acetoarsenite), discovered as a pigment in 1808 (Lipscher, 2001), was introduced around 1870 to control Grape Phylloxera (an insect damaging to vine roots) and mildew in French vineyards as Paris Green (Dent, 2001). The first recorded use of Paris Green in the U.S. was to control the Colorado Potato Beetle in 1867 (Benny, 1999) in Mississippi (Cremlyn, No Date [ND]). Paris Green is still used in foreign countries (NPIC, 1999). Lead arsenate was introduced to the U.S. for insect control in 1892; its first use was against the gypsy moth (Benny, 1999) in Massachusetts (Peryea, 1998).

A recipe for an insecticide spray mixture utilizing white arsenic (arsenic trioxide), salsoda (sodium carbonate), and lime appeared in a Denver newspaper in 1897 (Denver Republican, 1897). Farmers made lead arsenate by mixing soluble lead salts with sodium arsenate; pastes and powders were also available commercially. Lead arsenate was superior to Paris Green because it was less phytotoxic. Additional uses of lead arsenate include: on fruit trees, garden crops, turf-grasses, mosquito abatement, in cattle dips, and on rubber and coffee trees (Peryea, 1998). Turf managers of golf courses commonly used lead arsenate to control grubs, earthworms, and Japanese beetles in the 1920s and 1930s (Leach, 1928; Green Section Committee, 1938). Lead arsenate and sodium arsenite were used as an insecticide and as an herbicide respectively on potatoes (Sanok et al., 1995). "Lead arsenate was registered for use on apples, apricots, asparagus, avocados, blackberries, blueberries (huckleberries), boysenberries, celery, cherries, citrus (used as a growth regulator and only in Florida), cranberries, currants, dewberries, eggplant, gooseberries, grapes, loganberries, mangoes, nectarines, peaches, pears, peppers, plums (fresh prunes), quinces, raspberries, strawberries, tomatoes and youngberries" (PMEP, 2003a).

During the First World War calcium arsenate replaced lead arsenate for many uses because of increasing costs of lead salts. Lead arsenate was still used for controlling codling moth on apple trees, because of its lower phytotoxicity. DDT replaced lead arsenate use in orchards after World War II. Records indicate lead arsenate was later used in smaller doses and mixed with other pesticides, like DDT (Peryea, 1998). In 1956 arsenic acid was first used as a desiccant for cotton and cacodylates and methanarsonates were first used as desiccants, defoliants, and herbicides. Licensed uses of tricalcium and lead arsenate were accepted in most states for use on golf courses in 1971 (Frost et al., 1973). EPA banned use of lead arsenate on food crops in 1988.

Lead arsenate may not refer to a specific compound; because lead arsenate came in several different forms; lead arsenate ($PbHAsO_4$) and lead arsenate, basic (which cannot be assigned a chemical formula because manufacturers used different PbO to As_2O_5

ratios) (Frear, 1965). Peryea (1998) states the principal marketed form of lead arsenate, basic became $Pb_5OH(AsO_4)_3$. Another formula commonly found on the internet is $Pb_3[AsO_4]_2$.

As time moved on more products utilizing a variety of forms of arsenic were marketed including: arsenic acid, arsenic trioxide, sodium arsenite, calcium acid methanearsonate (CAMA), disodium methanearsonate (DSMA), dodecylammonium methanearsonate (DDAMA), monoammonium methanearsonate (MAMA), monosodium acid methanearsonate (MSMA), octylammonium methanearsonate (OAMA), cacodylic acid, and cacodylic acid, sodium salt. All of the arsonates and cacodylic acids are organic forms, which tend to be less toxic than inorganic forms. Organic forms of arsenic are still used in pesticide products marketed today.

Regulation

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was passed in 1947 requiring the registration of 'economic poisons', later called pesticides. Administrative authority for the Act was given to the Department of Agriculture, until 1970 when the EPA was formed. Records of formulations, registrants, product use, and status of registration are available in government records after1947. Inert ingredient information is required on registration applications but is considered confidential and is not available to the public.

On July 25, 1968, the Department of Agriculture promulgated Interpretation 25 (7 C.F.R. 2762.123). This interpretation reads as follows:

> § 2762.123 Interpretation with respect to labeling of sodium arsenite or arsenic trioxide products.
> (a) *Home use Unacceptable.* Labeling for economic poisons submitted in connection with registration under the Act bearing directions for use of products containing more than 2 percent sodium arsenite or more than 1.5 percent arsenic trioxide in or around the home is not acceptable.

According to administrative procedure described in 7 U.S.C. § 135b(c) companies marketing products affected by this legislation could; change their formulations or their labels and maintain registration, have their product registration cancelled, request a referral to an advisory committee, or request a public hearing. Requesting a referral or a hearing suspended cancellation of the registration until the administrative decision-making process was complete and allowed the product to remain on the market.

PAX Crabgrass Control was linked to the death of livestock in Iowa in 1969; however, the safety of PAX was upheld in Utah District Court. In response some States (e.g., New York and Iowa) passed legislation in 1970 requiring inorganic arsenical pesticides to be applied by licensed professionals (Frost et al., 1973).

In October 1972, the EPA promulgated United States Code Title 7 Section 136(a)(d)(1)(C)(i) requiring classification of pesticides into general, restricted, or both general and restricted categories depending on use; and requiring restricted use

pesticides to be applied 'only by or under the direct supervision of a certified applicator'. The Code of Federal Regulations Chapter 40 Section 152.170 based the definition of restricted use pesticides on a variety of toxic lethal doses and potential toxic effects resulting from use of the pesticide. Pesticides meeting any one of the criteria were to be deemed as restricted.

All registrations of copper acetoarsenite were voluntarily cancelled in 1987. On August 1, 1988, EPA partially concluded a final special review action, which resulted in the cancellation of most registrations and denial of applications for inorganic arsenicals for non-wood preservative use due to the oncogenic risks posed during mixing/loading and application, and due to the acute risks from accidental ingestion. The notice in the Federal Register indicated that registrations cancelled included uses of lead arsenate, calcium arsenate, sodium arsenite, arsenic trioxide, and sodium arsenate. Registrations not considered as part of this special review action included: the use of flowable calcium arsenate as a turf herbicide, the use of lead arsenate as a grapefruit growth regulator (Florida only), the use of sodium arsenite as a grape fungicide, and the use of arsenic acid as a desiccant on okra (grown for seed) and cotton[1]. Final conclusions of the special review action for all of these uses were pending the results of the EPA Risk Assessment Council's re-assessment of the carcinogenic potency of inorganic arsenic for dermal exposure. Additional exceptions include arsenic trioxide insecticide use (solid formulation manufactured in a sealed metal container only) for indoor and outdoor domestic use and arsenic trioxide mole, gopher, and pocket gopher killer use (solid formulation only) for outdoor domestic use, and terrestrial non-food crops, golf courses, ornamental plants and lawns, and other non-crop areas. By 1987 effective and economic alternatives for lead arsenate and sodium arsenite products were already available, calcium arsenate had not been manufactured for years, and the only use of sodium arsenate was for ant bait. It was determined that the risks outweighed the benefits and nearly all registered uses of inorganic arsenical pesticides were voluntarily cancelled after the preliminary determination was published in January 1987 (USEPA, 1988).

EPA proposed cancellation of registrations for use of arsenic acid as a desiccant for cotton in December 1991 (Pesticide Management Education Program [PMEP], 2003b). Arsenic acid use was banned completely when EPA accepted the voluntary request for registration cancellation from the registrants of products using arsenic acid as a cotton desiccant in 1993 (PMEP, 2003c).

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[1] These uses of arsenic acid were cancelled in 1993.

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Appendix B:

Inorganic Arsenical Pesticides

Information included in the lists is described below:

Product Name of the product.
% Percent of active ingredients in the product.
Ingredient Active ingredient(s) in the product.
Use Registered use of the product.
Formulation Process used to improve the product's storage, handling, application, effectiveness, or safety properties.
Registrant Owner of the pesticide registration.
Registrant Dates Dates the product was actively registered.
EPA # Number EPA assigned to the active arsenical ingredient.
EPA Reg. No. Number EPA assigned to the pesticide registration.
RFC Reason For Cancellation or date of initial registration if the product registration was transferred

The '**Use**' category includes:

antifouling –used to prevent growth of limpets, molluscs, algae, etc. on ships;
desiccant –used to speed the drying of crop plant parts such as cotton leaves and potato vines;
fungicide –used to kill or stop development of fungi;
fungicide, restricted –fungicide that required a licensed applicator to apply it after 1972;
herbicide terrestrial –used to kill weeds on land as opposed to in water;
herbicide unspecified –used to kill weeds;
insecticide –used to kill insects;
miticide –used to kill mites;
molluscicide –used to kill molluscs;
nematicide –used to kill nematodes;
poison, single or multidose –used as a poison e.g. to kill moles, rats, or mice;
regulator –used to control plant growth;
rodenticide –used to kill rodents;
shrimp –used to kill shrimp; and
tadpole –used to kill tadpoles.

Formulations include:

Dust –particles small enough to pass through a 60-mesh (grids per inch) screen. Inert clay is often used as a diluent (Ware, 1989).
Emulsifiable concentrate –concentrated oil solutions with enough emulsifier added to make the concentrate mix readily with water for spraying.
Impregnated materials –active ingredients infused into a material such as wood, shelf paper, or wax.
Flowable concentrate –several kinds exist, they are all thick and creamy. Wet-milling the active ingredient with a clay diluent and water forms one kind of flowable concentrate, leaving the mixture finely ground but wet. Consumers then add water to the mixture and spray it. An emulsifiable concentrate with a high percentage of water-stable toxicant and a thickener mixed with two to four

volumes of water is another kind of flowable concentrate. Consumers dilute the resulting emulsion with water prior to use and spray it.

Formulation intermediate –intermediate form of active ingredient Must be mixed with other materials to create marketed products.

Granular –product ranges in size from 20 to 80 mesh (Ware, 1989). Vermiculite, attaclay, ground walnut shells, or other similar coarse particulates impregnated with an active ingredient. Also includes many types of bait in coarse particulate form, smaller than 10 mm^3 (Tompkins, 2004).

Pelleted / tabletted –active ingredient mixed with binders, fillers, and/or other inert ingredients and formed into a pellet, tablet, or cake; also includes capsules, boluses, rodenticide block baits, salt blocks and "Job Spikes", larger than 10 mm^3.

Soluble concentrate –active ingredient may be initially water miscible, or it may be alcohol miscible and formulated with an alcohol to become water miscible (Ware, 1989).

Solution-ready to use –oil or water solution applied directly without dilution.

Technical chemical –pure form of a chemical; and

Wettable powder –concentrated dusts with a wetting agent to facilitate mixing the powder with water before spraying. An average particle size is 20 micrometers for an 80 percent wettable powder (Ware, 1989).

Tompkins, Jim. (2004). EPA. E-mail via Laura Quakenbush, Ph.D Pesticide Registration Coordinator Colorado Dept of Agriculture, Division of Plant Industry

Ware GW. (1989). The Pesticide Book. 3rd Edition, Thomas Publications, Fresno, CA.

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
American Brand Cotton Desiccant	75	Arsenic acid	Desiccant	emulsifiable concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 5/6/93	6801	7401-195	CR
Best 4 Servis Brand Super 10 Arsenic Acid Cotton Desiccant	75	Arsenic acid	Desiccant	soluble concentrate	Falls Chemicals Inc.	4/3/79 to 7/1/87	6801	40831-15	GDEC
De Pester Desiccant-A	75	Arsenic acid	Desiccant	soluble concentrate	Crompton Manufacturing Company, Inc.	12/29/82 to 10/10/89	6801	400-230	NPF
De Pester Desiccant-A	75	Arsenic acid	Desiccant	soluble concentrate	The Agriculture & Nutrition Co.	transferred to 400-230 on 12/29/82	6801	46946-55	F-82
Delta Brand Arsenic Acid	75	Arsenic acid	Desiccant	soluble concentrate	Osmose Inc.	5/14/82 to 10/30/1986	6801	3008-43	SRA
Desiccant L-10	75	Arsenic acid	Desiccant	soluble concentrate	Cerexagri, Inc.	11/2/64 to 5/6/93	6801	4581-231	CR
Desiccant L-10	75	Arsenic acid	Desiccant	emulsifiable concentrate	Cerexagri, Inc.		6801	SLN AZ-790038	
Drexel Arsenic Acid	75	Arsenic acid	Desiccant	soluble concentrate	Drexel Chemical Co.	12/1/81 to 7/22/93	6801	19713-103	CR
Hi-Yield Arsenic Acid Concentrate	75	Arsenic acid	Desiccant	soluble concentrate	Voluntary Purchasing Group Inc.	May-93	6801	7401-184	
Hi-Yield Sinergized H-10	75	Arsenic acid	Desiccant	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 5/6/93	6801	7401-200	CR
Traco Arsenic Acid	75	Asenic acid	Desiccant	soluble concentrate	Traylor Chemical & Supply Co.	11/5/74 to 10/10/89	6801	20004-3	NPF
Arsenic Acid	75	Arsenic acid	Fungicide	formulation intermediate	Osmose Inc.	Active Approval 9/19/86	6801	3008-66	S-86
Arsenic Acid	75	Arsenic acid	Fungicide	formulation intermediate	Cerexagri, Inc.	transferred to 3008-66 on 7/7/94	6801	4581-360	S-86
CCA 50% Concentrate	21 23.8 9.2	Arsenic acid Chromic acid *Copper (II) oxide*	Fungicide	soluble concentrate	Chemical Specialties, Inc.	7/2/82 to 4/1/87	6801	45968-5	OAA

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CR	Company Request	FR	Federal Register	OAA	Other Agency Action	U	Unknown
DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Koppers Arsenic Acid	75	Asenic acid	Fungicide	soluble concentrate	Koppers Co., Inc.	transferred to 62190-7 on 4/27/89	6801	61-171	M-75
Osmose Arsenic Acid 75%	75	Asenic acid	fungicide	soluble concentrate	Osmose Inc.	Active Approval 3/25/96	6801	3008-72	
Bardec Part I	75	Arsenic acid	fungicide, restricted	formulation intermediate	Osmose Inc.	Active	6801	3008-69	F-96
Chemonite Part A	75	Arsenic acid	fungicide, restricted	formulation intermediate	J H Baxter & CO	Active Approval 7/19/82	6801	3098-16	J-82
CSI Arsenic Acid 75%	75	Arsenic acid	fungicide, restricted	formulation intermediate	Chemical Specialties, Inc.	transferred to 10465-32 on 1/4/95	6801	10356-18	D-89
CSI Arsenic Acid 75%	75	Arsenic acid	fungicide, restricted	formulation intermediate	Chemical Specialties, Inc.	Active	6801	10465-32	J-95
Koppers Arsenic Acid	75	Arsenic acid	fungicide, restricted	formulation intermediate	Arch Wood Protection, Inc.	Active	6801	62190-7	A-89
Delta Brand Arsenic Acid F/Bermuda Lwns, F/Control of Dallis & Crab	75	Arsenic acid	herbicide unspecified	soluble concentrate	Osmose Inc.	5/14/82 to 10/10/1989	6801	3008-44	NPF
Ferti Lome Dal Crab	75	Arsenic acid	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 4/1/87	6801	7401-186	SRA
Ferti-Lome Weed & Wild Grass Killer	2.14	Arsenic acid	herbicide unspecified	solution-ready to use	Voluntary Purchasing Group Inc.	12/2/63 to 4/1/87	6801	7401-5	SRA
Hi-Yield Decimex Surfactant	38 18	Arsenic acid MSMA	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 5/1/87	6801	7401-205	SRA
Hi-Yield General Weed Killer	75	Arsenic acid	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 4/1/87	6801	7401-204	SRA
Scorch	75	Asenic acid	herbicide unspecified	soluble concentrate	Cerexagri, Inc.	1/23/69 to 7/1/87	6801	4581-268	GDEC
(Ortho) Chevron Arsenic Acid	68	Arsenic acid	insecticide & miticide	formulation intermediate	The Scotts Co.	10/26/66 to 2/21/86	6801	239-2207	FR

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CR	Company Request	FR	Federal Register	OAA	Other Agency Action	U	Unknown
DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Intracel-15	3 5.5 14.6	Arsenic acid Cu sulfate pentahydrate Sodium dichromate	insecticide & miticide, fungicide	soluble concentrate	Chemical Specialties, Inc.	10/19/82 to 4/1/87	6801	45968-4	OAA
Osmose Special K-33 Preservative	1.75 5.03 3.20	Copper (II) oxide Arsenic acid Chromic acid	insecticide & miticide, fungicide	solution-ready to use	Osmose Inc.	Active Approval 5/11/70	6801	3008-21	
Basic Copper Arsenate	91	Arsenic acid, Cu salt	insecticide & fungicide		PBI/Gordon Corp	To 2/11/1983	22801	33955- 90	FR
Chilton Dripless Bottom Paint Red	1.6 22.2	Arsenic trioxide Copper (I) oxide	antifouling, herbicide	solution-ready to use	Chilton Paint Company	6/6/68 to 10/10/89	7001	9881-2	NPF
Chilton Metallic Copper Paint New Dripless Blue	2.23 26.23	Arsenic trioxide Copper (I) oxide	antifouling, herbicide	solution-ready to use	Chilton Paint Company	1/4/73 to 10/10/89	7001	9881-4	NPF
Chilton Metallic Copper Paint Original Formula No. 888 Red	1.5 21.2	Arsenic trioxide Copper (I) oxide	antifouling, herbicide	solution-ready to use	Chilton Paint Company	6/26/69 to 10/10/89	7001	9881-3	NPF
Chilton Super Dripless #8 Bottom Paint	2.3 27.7	Arsenic trioxide Copper (I) oxide	antifouling, herbicide	solution-ready to use	Chilton Paint Company	2/9/68 to 10/10/89	7001	9881-1	NPF
LACCO White Arsenic	94.6	Arsenic trioxide	herbicide terrestrial	formulation intermediate	Los Angeles Chemical Company	1/23/68 to 10/4/85	7001	962-340	FR
Arsenic Trioxide (Technical)	99	Arsenic trioxide	herbicide unspecified	Technical chemical	Tifa Limited	4/21/67 to 8/1/88	7001	1439-189	SRA
Arsenic Trioxide (Technical)	90	Arsenic trioxide	herbicide unspecified, insecticide & miticide	Technical chemical	Ametalco Inc.	6/14/67 to 7/1/87	7001	9777-1	DCN
Ant Jex Redwood Ant Stakes	0.25	Arsenic trioxide	insecticide & miticide	impregnated materials	General Pest Service Inc.	5/6/66 to 10/10/89	7001	3324-3	NPF
Arsenic Trioxide Technical	97.5	Arsenic trioxide	insecticide & miticide	Technical chemical	Grant Laboratories Inc	Active Apprvl 12/17/96	7001	1663-31	
Blue Ball Ant Killer	0.5	Arsenic trioxide	insecticide & miticide	solution-ready to use	Blue Ball Chemical Company	1/1/76 to 3/30/87	7001	422-5374	DCN
Grant's Ant Control	0.46	Arsenic trioxide	insecticide & miticide	granular	Grant Laboratories Inc	Active	7001	1663-15	A-72

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DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Mattes Ant Paste	1	Arsenic trioxide	insecticide & miticide	solution-ready to use	Robinson Lab Inc.	1/1/76 to 9/29/88	7001	11151-3820	FIC
Refined White Arsenic	94	Arsenic trioxide	insecticide & miticide	Technical chemical	American Firestoline Corp	8/11/67 to 12/19/88	7001	3840-5	UM
Refined White Arsenic	99.5	Arsenic trioxide	insecticide & miticide	Technical chemical	Voluntary Purchasing Group Inc.	9/13/72 to 5/1/87	7001	7401-202	DCN
Cobra Salts	20 21.5 51	Arsenic trioxide 2,4-dinitrophenol Sodium fluoride	insecticide & miticide, fungicide	soluble concentrate	Cobra Wood Treatment Corporation	9/28/50 to 10/10/89	7001	3231-1	NPF
J H Baxter Chemonite Base Mix	37 36	Arsenic trioxide Copper (metallic)	insecticide & miticide, fungicide	formulation intermediate	J H Baxter & CO	6/28/71 to 5/1/87	7001	3098-15	U
Blue Ball Rat Killer	1.5	Arsenic trioxide	poison, multidose	solution-ready to use	Blue Ball Chemical Company	1/1/76 to 3/30/87	7001	422-5379	DCN
Cowley's "Original" Rat and Mouse Poison	1.5	Arsenic trioxide	poison, multidose	solution-ready to use	Cowley S L & Sons Mfg Inc.	8/24/48 to 12/1/87	7001	505-1	DCN
Mol-Ex	1.5	Arsenic trioxide	poison, multidose	pelleted/ tabletted	Blue Ball Chemical Company	1/1/76 to 3/30/87	7001	422-5375	DCN
AFC Arsenious Oxide	99	Arsenic trioxide	poison, single dose	formulation intermediate	Southern Mill Creek Products Co Inc.	8/27/84 to 4/1/87	7001	6720-289	DCN
Mol-Ex	2	Arsenic trioxide	poison, single dose	granular	Blue Ball Chemical Company	6/18/67 to 5/1/87	7001	422-17	U
Perkerson's Mole-End	1.5	Arsenic trioxide	poison, single dose	pelleted/ tabletted	Perk Products and Chemical Co Inc.	2/23/66 to 8/10/93	7001	690-29	NPF
Arsenic Trioxide	94	Arsenic trioxide	poison, single dose; herbicide unspecified; insecticide & miticide	Technical chemical	Cerexagri, Inc.	4/18/68 to 5/1/87	7001	4581-259	DCN
Bonide Moletox Poison Peanuts	1.5	Arsenic trioxide	rodenticide, multi-dose	granular	Bonide Products	1/1/76 to 10/1/88	7001	4-3823	FIC
Bonide Moletox	1.5	Arsenic trioxide	rodenticide, s-dose	granular	Bonide Products	2/10/81 to 10/10/89	7001	4-282	NPF

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CR	Company Request	FR	Federal Register	OAA	Other Agency Action	U	Unknown
DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
AFC Arsenious Oxide	99	Arsenic trioxide	unclassified poison, single dose	formulation intermediate	American Fluoride Corp	transferred 8/84 to 6720-289	7001	255-25	O-48
PAX 400 3 Year Crabgrass Control	25.11 8.25	Arsenic trioxide Lead arsenate	herbicide unspecified, insecticide & miticide	granular	Martin Resources, Inc. Pax Division	8/3/53 to 7/1/87	7001 13502	3234-3	GDEC
Security Brand Tomato Dust	7 60	Cupric sulfate Calcium arsenate	fungicide	dust	Value Gardens Supply, LLC	5/5/53 to 7/28/86	13501	769-149	DCN
Security Brand Turf-Cal Granular	48	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	granular	Value Gardens Supply, LLC	11/1/79 to 7/28/86	13501	769-466	DCN
Security Brand Turf-Cal Spray	70	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	wettable powder	Value Gardens Supply, LLC	11/1/79 to 7/28/86	13501	769-467	DCN
Security Turf-Cal Flowable	26	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	flowable concentrate	Mallinckrodt Inc.	5/22/86 to 10/10/89	13501	372-65	NPF
Security Turf-Cal Flowable	26	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	flowable concentrate	Value Gardens Supply, LLC	transferred to 372-65 on 5/22/86	13501	769-500-372	A-81
Chip-Cal Granular	48	Calcium arsenate	herbicide unspecified, insecticide & miticide	granular	Rhone-Poulenc Agrochemical Division	1/15/59 to 9/27/85	13501	359-360	FR
Gro-Well Pre-Vent	48	Calcium arsenate	herbicide unspecified, insecticide & miticide	granular	J & L Adikes Inc.	2/1/61 to 9/27/85	13501	5535-35	FR
LACCO Brand Calcium Arsenate	70	Calcium arsenate	herbicide unspecified, insecticide & miticide	wettable powder / dust	Los Angeles Chemical Company	4/2/48 to 7/1/87	13501	962-93	GDEC
Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder	Helena Chemical Co.	1/1/76 to 10/24/85	13501	5905-3080	CR
Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder	Helena Chemical Co.	1/1/76 to 10/24/85	13501	5905-7878	CR
Niagra Blueberry Maggot Dust	35	Calcium arsenate	insecticide & miticide	dust	FMC Corp Agricultural Products Group	3/27/62 to 7/1/87	13501	279-1874	GDEC

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DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Pestco K-A-L Term Dust	35	Calcium arsenate	insecticide & miticide	dust	Pest Control Chemicals, Inc.	1/1/76 to 9/29/88	13501	11134-6022	FIC
Security Brand Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder / dust	Value Gardens Supply, LLC	2/12/48 to 7/28/86	13501	769-14	DCN
Security Calnate	70	Calcium arsenate	insecticide & miticide	wettable powder	Value Gardens Supply, LLC	6/27/74 to 7/28/1986	13501	769-443	DCN
Security Flag	70	Calcium arsenate	insecticide & miticide	wettable powder	Value Gardens Supply, LLC	7/14/67 to 3/30/87	13501	769-374	DCN
Farmrite Cop-Cal Vegetable Dust	7.0 14.0	Cupric sulfate Calcium arsenate	insecticide & miticide, fungicide	dust	Carovail, Inc.	9/30/65 to 8/1/88	13501	477-73	SRA
Niagra New Cucurbit Dust	5.25 8.3	Calcium arsenate Cu oxychloride sulfate	insecticide & miticide, fungicide	dust	FMC Corp Agricultural Products Group	4/12/48 to 9/27/85	13501	279-153	FR
Niagra Potato Dust 7-20	7.0 14.0	Cupric sulfate Calcium arsenate	insecticide & miticide, fungicide	dust	FMC Corp Agricultural Products Group	1/6/54 to 5/1/87	13501	279-825	U
Best Snail & Slug Pellets Double 5	5 5	Calcium arsenate Metaldehyde	Molluscicide, tadpole, shrimp	pelleted/ tabletted	J.R. Simplot Co	6/27/72 to 5/1/87	13501	7001-141	DCN
Calcium Arsenate-Metaldehyde 5-3 Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp	pelleted/ tabletted	Zeneca, Inc.	4/13/61 to 7/1/87	13501	476-1551	GDEC
Slug Killer	5.0 3.25	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp	pelleted/ tabletted	PBI/Gordon Corp	10/18/67 to 7/1/87	13501	2217-454	GDEC
UNICO Snail and Slug Bait	5.0 3.2	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp	granular	Universal Cooperatives Inc	1/10/64 to 7/1/87	13501	1386-447	GDEC
Cal-Meta Snail Pellets	6.75 1.5	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Zeneca, Inc.	5/28/57 to 7/1/87	13501	476-192	GDEC
Chipman Meta A Pellet	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Rhone-Poulenc Agrochemical Division	2/17/64 to 9/27/85	13501	359-536	FR

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Coastox Meta Cal	5 3	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Western Farm Service, Inc.	6/19/74 to 7/1/87	13501	11656-22	GDEC
Metag Agricultural Bait	5.16 1.5	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	The Scotts Co.	5/27/58 to 10/4/85	13501	239-74	FR
Metag-XX Agricultural Bait	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	The Scotts Co.	10/18/51 to 10/4/85	13501	239-561	FR
Ortho Bug-Geta Meal	5.16 1.75	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	granular	The Scotts Co.	2/10/59 to 11/23/84	13501	239-111	FR
Ortho Bug-Geta Pellets	5 3.25	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	The Scotts Co.	11/12/58 to 10 ?11/23/84	13501	239-23	FR
Pacific Cooperatives Slug Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Farmers Union Central Exchange Inc.	transferred to 3234-41 on 11/26/84	13501	912-91	J-78
Pacific Cooperatives Slug Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Martin Resources, Inc. Pax Division	11/26/84 to 7/1/87	13501	3234-41	GDEC
Pearson's Kwik-Kill Bait	5.0 2.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	granular	Southland Pearson & Co Drexel Chemical Company	5/4/50 to 8/1/88	13501	728-23	SRA
E-Z-Flo Peach Spray #3	11.5 34	Lead arsenate Sulfur	fungicide	wettable powder	Grower Service Corp	7/20/67 to 4/24/1986	13502	635-561	FR
LACCO Brand Standard Lead Arsenate	93.6	Lead arsenate $Pb_5(AsO_4)_3(OH)$	fungicide	wettable powder	Los Angeles Chemical Company	3/30/48 to 7/1/87	13502	962-57	GDEC
Fasco Deflocculated Lead Arsenate Prod No 550	96	Lead arsenate	herbicide unspecified, herbicide terrestrial	wettable powder	Micro-Flo Company LLC	3/8/85 to 1/22/91	13502	51036-29	NPF

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FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Fasco Deflocculated Lead Arsenate Prod No 550 also sold as Marman Lead Arsenate	96	Lead arsenate	herbicide unspecified, herbicide terrestrial	wettable powder	Landia Chemical Co.	3/22/79 to 9/30/87 transferred	13502	9859-121	DCN
Chipco Hi-Test Lead Arsenate	98	Lead arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	wettable powder / dust	Rhone-Poulenc Agrochemical Division	2/8/62 to 2/21/86	13502	359-488	FR
Arcadian Astringent Lead Arsenate	97	Lead arsenate	insecticide & miticide	wettable powder / dust	Allied Signal, Inc.	3/2/48 to 2/21/86	13502	218-48	FR
Arcadian Lead Arsenate Powdered Standard	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Allied Signal, Inc.	1/30/48 to 2/21/86	13502	218-6	FR
Chipman Hi-Test Lead Arsenate	90.5	Lead arsenate	insecticide & miticide	wettable powder / dust	Rhone-Poulenc Agrochemical Division	6/17/59 to 2/21/86	13502	359-371	FR
CO-OP Powdered Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Land O'Lakes Farmland Feed LLC	7/19/68 to 10/4/85	13502	1990-325	FR
Corona Dry Powdered Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder	W R Grace & Company	8/31/66 to 4/29/87	13502	2124-455	DCN
Drexel Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder / dust	Drexel Chemical Co.	11/25/81 to 10/10/89	13502	19713-71	NPF
E-Z-Flo Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Grower Service Corp	11/23/53 to 4/24/86	13502	635-143	FR
E-Z-Flo Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Grower Service Corp	3/27/68 to 4/24/86	13502	635-594	FR
Farmrite Dry powdered Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder	Carovail, Inc.	1/7/48 to 8/1/88	13502	477-18	SRA
Flowable Lead Arsenate	32.8	Lead arsenate	insecticide & miticide	flowable concentrate	Landia Chemical Co.	1/1/76 to 7/1/87	13502	9859-5667	GDEC
Flowable Lead Arsenate	32.8	Lead arsenate	insecticide & miticide	flowable concentrate	Landia Chemical Co.	1/1/76 to 7/1/87	13502	9859-10408	GDEC

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Gator Roach Hives	16.2	Lead arsenate	insecticide & miticide	impregnated materials	De Soto Chemical Company	1/12/48 to 8/1/88	13502	60-1	SRA
IDA, Inc. Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	IDA, Inc.	7/21/82 to 8/1/88	13502	45115-29	SRA
Lobel Lead Arsenate Deflocculated	96	Lead arsenate	insecticide & miticide	wettable powder / dust	Lobel Chemical Corp	7/10/67 to 8/1/88	13502	6170-5	SRA
Miller's Lead Arsenate 15D	14.1	Lead arsenate	insecticide & miticide	dust	Central Garden & Pet	7/22/57 to 2/21/86	13502	802-204	FR
Ortho Standard Lead Arsenate 15 Dust	14.25	Lead arsenate	insecticide & miticide	dust	The Scotts Co.	5/28/56 to 2/21/86	13502	239-881	FR
Ortho Standard Lead Arsenate Colored	95	Lead arsenate	insecticide & miticide	wettable powder	The Scotts Co.	3/11/48 to 2/21/86	13502	239-161	FR
Parsons Arsenate of Lead	97	Lead arsenate	insecticide & miticide	wettable powder	Prentiss, Inc.	12/11/79 to 5/11/84	13502	655-599	FR
Patterson Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Patterson Chemical Company	transferred to 3442-728 on 3/12/85	13502	2169-46	J-57
Patterson Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Pursell Acquisition Co, Inc.	3/12/85 to 7/1/87	13502	3442-728	GDEC
Security Lead Arsenate (Defloculated)	96	Lead arsenate	insecticide & miticide	wettable powder	Value Gardens Supply, LLC	3/7/56 to 1/22/87	13502	769-186	DCN
Standard Lead Arsenate	94	Lead arsenate	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	3/25/48 to 12/24/86	13502	279-29	CR
Standard Lead Arsenate	95	Lead arsenate	insecticide & miticide	wettable powder	Zeneca, Inc.	4/10/51 to 7/1/87	13502	476-374	GDEC
Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder	Zeneca, Inc.	2/6/58 to 7/1/87	13502	476-1186	GDEC
Standard Lead Arsenate	94	Lead arsenate	insecticide & miticide	soluble concentrate	FMC Corp Agricultural Products Group	1/1/76 to 7/1/87	13502	279-4038	GDEC

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Stauffer Standard Arsenate of Lead	95	Lead arsenate	insecticide & miticide	wettable powder	Zeneca, Inc.	5/15/57 to 7/1/87	13502	476-1084	GDEC
Sure Death Brand Powdered Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder	Land O'Lakes Farmland Feed LLC	6/25/81 to 10/4/85	13502	1990-418	FR
Suspenso Lead Arsenate	94	Lead arsenate	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	12/9/71 to 12/24/86	13502	279-79	CR
T.N.T.Roach Killer	16.67	Lead arsenate	insecticide & miticide	granular	Vinson Chem Prod Company	10/26/48 to 8/1/88	13502	2095-1	SRA
UNICO Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Universal Cooperatives Inc	6/15/48 to 7/1/87	13502	1386-7	GDEC
Captan Guthion Lead 5-1.5-7D	7 1.5 5	lead arsenate Azinphos-methyl Captan	insecticide & miticide, fungicide	wettable powder	Agway Inc.	6/25/65 to 2/1/85	13502	8590-132	FR
Captan Lead 5-15D	15 5	lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	Agway Inc.	7/12/65 to 4/1/87	13502	8590-143	DCN
E-Z-Flo Apple Spray	3.2 16 38	Cupric sulfate Lead arsenate Sulfur	insecticide & miticide, fungicide	wettable powder	Grower Service Corp	3/22/67 to 4/24/86	13502	635-528	FR
Farmcraft Lead Arsenate 15-Sulfur 70 dust	15 70	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	Farm Craft, Inc.	1/1/76 to 8/1/87	13502	1871-8966	CR
Miller's Lead Arsenate 1585D	14.1 83.3	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	Central Garden & Pet	4/29/63 to 2/21/86	13502	802-332	FR
Ortho ® Custom Blend No. 5	47.5 25.0	Lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	The Scotts Co.	3/25/59 to 2/21/86	13502	239-1288	FR
Ortho Custom Blend No. 4	59.0 12.5	Lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	The Scotts Co.	4/4/60 to 12/24/86	13502	239-1463	CR
Ortho Standard Lead Arsenate-Sulfur 15-85 Dust	14.25 83.0	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	The Scotts Co.	5/25/55 to 2/21/86	13502	239-880	FR

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Pan Peach Spray	11.5 34 19.2	Lead arsenate Sulfur Zinc sulfate	insecticide & miticide, fungicide	wettable powder	Value Gardens Supply, LLC	2/16/48 to 1/22/87	13502	769-32	DCN
Security Lead Arsenate Zink-O-Dust 80-5-15	4.8 76 3	Lead arsenate Sulfur Zinc sulfate	insecticide & miticide, fungicide	dust	Value Gardens Supply, LLC	6/2/65 to 1/22/87	13502	769-341	CR
Security Sulphur-Lead-Arsenate-Lime Peach Dust	4.8 76	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	Value Gardens Supply, LLC	6/9/65 to 1/22/87	13502	769-343	DCN
ACME Arsenate of Lead	98	Lead arsenate $PB_5(ASO_4)_3(OH)$	insecticide & miticide, nematicide	wettable powder / dust	PBI/Gordon Corp	7/9/68 to 7/1/87	13502	33955-31	GDEC
Sherwin-Williams Standard Arsenate of Lead	96	Lead arsenate	insecticide & miticide, nematicide	wettable powder	PBI/Gordon Corp	12/16/69 to 7/1/87	13502	33955-455	GDEC
Lead Arsenate Grapefruit Maturity Spray	94	Lead arsenate	regulator	soluble concentrate	Agra Chem Sales Company	1/1/76 to 9/29/88	13502	35253-6036	FIC
Gator Roach Hives (Household Pesticide)	16.2	Lead arsenate			De Soto Chemical Company	1/1/76 to 9/29/88	13502	60-4493	FIC
Basic Powdered Arsenate of Lead	96	Lead arsenate $PBHASO_4$	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	3/25/48 to 7/1/87	13503	279-46	GDEC
LACCO Basic Lead Arsenate	96	Lead arsenate	insecticide & miticide	soluble concentrate	Los Angeles Chemical Company	3/24/60 to 7/1/87	13503	962-300	GDEC
Ortho Basic Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	The Scotts Co.	12/11/47 to 2/21/86	13503	239-87	FR
Ortho Standard Lead Arsenate	95	Lead arsenate	insecticide & miticide	soluble concentrate	The Scotts Company D/B/A The Ortho Group	1/1/76 to 8/22/86	13503	239-4254	RSC
Sodium Arsenite No. 4-L	40	Sodium arsenite	fungicide	soluble concentrate	Moyer Products Inc	1/1/76 to 8/22/86	13603	5967-5152	RCN

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Lacco Sodium Arsenite Solution No. 4	43.4	Sodium arsenite	fungicide, herbicide unspecified, herbicide terrestrial	soluble concentrate	Los Angeles Chemical Company	transferred to 55146-35 on 11/3/86	13603	962-398	N-80
Lacco Sodium Arsenite Solution No. 4	43.4	Sodium arsenite	fungicide, herbicide unspecified, herbicide terrestrial	soluble concentrate	Nufarm America's Inc.	11/3/86 to 9/30/91	13603	55146-35	NPF
40% Solution Sodium Arsenite	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Value Gardens Supply, LLC	6/29/61 to 7/1/87	13603	769-287	GDEC
Arsenical Weed Killer	44	Sodium arsenite	herbicide unspecified	soluble concentrate	I. Schneid	10/13/58 to 7/1/87	13603	2155-26	GDEC
Atlas "A" A Sodium Arsenite Solution	44	Sodium arsenite	herbicide unspecified	soluble concentrate	Rhone-Poulenc Agrochemical Division	12/31/47 to 5/1/87	13603	359-1	DCN
Atlas "A6" Sodium Arsenite Solution	57.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Rhone-Poulenc Agrochemical Division	1/11/54 to 5/1/87	13603	359-228	DCN
Belco Non-Selective Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Bell Chemical Company	3/3/72 to 10/10/89	13603	839-59	NPF
Bonide Sodium Arsenite Grass & Weed Killer	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Bonide Products, Inc.	11/12/58 to 8/1/88	13603	4-109	SRA
Brulin's Non-Selective Weed Killer	45.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Brulin & Company, Inc.	1/15/48 to 12/24/86	13603	106-1	DCN
Chapman Narsite 60	57.48	Sodium arsenite	herbicide unspecified	soluble concentrate	IBC Manufacturing, Co.	transferred to 19713-199 on 11/26/84	13603	1022-414	F-68
Chapman Narsite 60	57.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Drexel Chemical Co.	11/26/84 to 8/1/88	13603	19713-199	SRA
Chem Sen 56	66	Sodium arsenite	herbicide unspecified	soluble concentrate	Tifa Limited	7/2/74 to 10/10/89	13603	1439-234	NPF
CMC Weed Killer(Sodium Arsenite)Weed-X	40	Sodium arsenite	herbicide unspecified	solution-ready to use	Comet Manufacturing Corporation	1/10/75 to 7/1/87	13603	6294-22	GDEC

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
De Weed Concentrated Killer Of Weeds	40	Sodium arsenite	herbicide unspecified	soluble concentrate	M.S.I.	transferred to 34956-21on 5/17/88	13603	1325-60	A-72
De Weed Concentrated Killer Of Weeds	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Royal Chemical Co.	5/17/88 to 8/1/88	13603	34956-21	SRA
De Witt Formula No 102 Weed Killer	50	Sodium arsenite	herbicide unspecified	soluble concentrate	DeWitt Chemical Co.	3/20/59 to 4/30/87	13603	1269-22	CR
Deep Kill Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	5/9/60 to 3/16/87	13603	1769-70	CR
Dexol Weedsol Non Selective Weed Killer	43.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Value Gardens Supply, LLC	1/5/72 to 12/24/86	13603	192-90	DCN
Dolge Super Strength Weed Killer	42.7	Sodium arsenite	herbicide unspecified	soluble concentrate	C.B. Dolge Company	8/4/48 to 7/1/87	13603	1057-20	GDEC
Du Cor Formula 71 Weed Killer Concentrate	26 1.9 11	Sodium metaborate Sodium arsenite Sodium chlorate	herbicide unspecified	soluble concentrate	Du Corp Chemical Corp	1/1/76 to 8/9/85	13603	13437-4075	CR
Edco Sodium Arsenite Solution 15%	15	Sodium arsenite	herbicide unspecified	soluble concentrate	EDCO Chem Company Inc	4/19/74 to 5/1/87	13603	3040-38	DCN
Edco Sodium Arsentie Solution 40 (Colored)	40	Sodium arsenite	herbicide unspecified	soluble concentrate	EDCO Chem Company Inc	4/19/74 to 5/1/87	13603	3040-39	DCN
Em 1400 (Sodium Arsenite Solution) Non-Selective Weed & Brush Killer	48.75	Sodium arsenite	herbicide unspecified	soluble concentrate	Empire International	3/22/69 to 1/28/87	13603	5-31	DCN
Excelcide Tw-40	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Huge Company, Inc.	5/29/73 to 8/1/88	13603	2270-684	SRA
F-40 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	3/29/55 to 3/16/87	13603	1769-37	CR
Floratox 40 Tree Killer And Contact Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Wood Protection Products, Inc.	10/8/85 to 8/1/88	13603	7234-84	SRA
Floratox 40 Tree Killer And Contact Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Crown Chemical Industries	transferred to 7234-84 on 10/8/85	13603	7273-61	D-71

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Flora-Tox 60 Tree Killer And Contact Weed Killer	55.8	Sodium arsenite	herbicide unspecified	soluble concentrate	Wood Protection Products, Inc.	10/8/85 to 8/1/88	13603	7234-88	SRA
Flora-Tox 60 Tree Killer And Contact Weed Killer	55.8	Sodium arsenite	herbicide unspecified	soluble concentrate	Crown Chemical Industries	transferred to 7234-88 on 10/8/85	13603	7273-72	A-71
Formula-444 Weed Killer	45.4	Sodium arsenite	herbicide unspecified	soluble concentrate	The State Chemical Manufacturing Co	2/11/63 to 3/13/87	13603	1685-26	DCN
Hammond's Weed Killer	30.06	Sodium arsenite	herbicide unspecified	soluble concentrate	Hammond Paint & Chem Company, Inc.	1/19/48 to 7/1/87	13603	604-17	GDEC
Hill's No. 572 Herbicide Concentrate Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Hill Manufacturing Co., Inc.	8/23/57 to 4/1/87	13603	402-53	DCN
Insecticide Sodium Arsenite Concentrate	53.86	Sodium arsenite	herbicide unspecified	soluble concentrate	Truetech, Inc	6/29/62 to 8/1/88	13603	1691-85	SRA
Kill-All Concentrated Weed & Grass Killer	42	Sodium arsenite	herbicide unspecified	emulsifiable concentrate	Bonded Chemicals Corporation	1/1/76 to 12/31/87	13603	850-10253	GDEC
Main Line Weed Killer	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Cooper Creek Chemical Corp	1/6/58 to 12/29/86	13603	363-1	DCN
Marko Kill-Ko Arsenical Weed Killer	30	Sodium arsenite	herbicide unspecified	soluble concentrate	MARKO Inc.	6/20/69 to 7/1/87	13603	10204-11	GDEC
Mwk Non-Selective Weed Killer For Cont Of Weeds, Grass And Other Veg	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Malter International Corporation	2/10/64 to 3/16/87	13603	1266-43	DCN
Napasco Sa-40 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NAPASCO International, Inc	transferred to 3367-87 on 5/18/83	13603	2831-4	A-68
Napasco Sa-40 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Regency Chemical Company/Reily Chemical Division	transferred to 51033-30 on 6/26/85	13603	3367-87	M-83
Napasco Sa-40 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Omnitech International, Inc.	6/26/85 to 7/1/87	13603	51033-30	GDEC

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Narsite 40	40	Sodium arsenite	herbicide unspecified	soluble concentrate	IBC Manufacturing, Co.	transferred to 19713-194 on 11/26/84	13603	1022-109	J-55
Narsite 40	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Drexel Chemical Co.	11/26/84 to 8/1/88	13603	19713-194	SRA
National Chemsearch Dk-80 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	3/5/64 to 3/16/87	13603	1769-121	CR
No-Gro Liquid Concentrate	40.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Sheff Chemical & Supply Company	1/1/76 to 1/16/87	13603	10193-9447	UM
Ortho Arsenical Weed Killer (Also Triox)	55	Sodium arsenite	herbicide unspecified	soluble concentrate	The Scotts Company D/B/A The Ortho Group	8/23/48 to 10/4/85	13603	239-289	FR
Penite 35	45.9	Sodium arsenite	herbicide unspecified	soluble concentrate	Cerexagri, Inc.	5/10/63 to 7/1/87	13603	4581-205	GDEC
Permakill'weed Killer Concentrate	40.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Du Corp Chemical Corp	1/1/76 to 9/29/88	13603	13437-4074	FIC
Poly Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Poly Chem, Inc.	6/29/64 to 3/25/87	13603	8047-9	DCN
S.C. Weed Killer Type "B"	20	Sodium arsenite	herbicide unspecified	soluble concentrate	KALLD Enterprises, Inc. DBA	12/19/73 to 3/26/87	13603	6762-29	DCN
Selig's Weed Killer	44	Sodium arsenite	herbicide unspecified	soluble concentrate	Selig Industries	1/9/48 to 7/1/87	13603	491-3	GDEC
Sharp Sodium Arsenate Solution 40 Percent	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Sharp Chemical Co.	8/18/75 to 12/31/87	13603	22058-2	GDEC
SMCP Sodium Arsenite "4" Solution	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Southern Mill Creek Products Co Inc.	12/29/71 to 7/1/87	13603	6720-150	GDEC
SMCP Trim-Trap Herbicide	41.7	Sodium arsenite	herbicide unspecified	soluble concentrate	Southern Mill Creek Products Co Inc.	6/12/74 to 7/1/87	13603	6720-181	GDEC
Sodium Arsenite "8"	71.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Cameron Baird	10/2/72 to 10/10/89	13603	551-208	NPF
Sodium Arsenite 4	46.9	Sodium arsenite	herbicide unspecified	soluble concentrate	Cameron Baird	2/8/73 to 10/10/89	13603	551-214	NPF

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Sodium Arsenite 42.5% Solution	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Good Life	11/26/56 to 7/1/87	13603	4931-33	GDEC
Sodium Arsenite 6-Lb. Solution	55	Sodium arsenite	herbicide unspecified	soluble concentrate	G S and Robbins Co	6/6/75 to 1/29/87	13603	842-113	DCN
Sure Weed Killer	38	Sodium arsenite	herbicide unspecified	soluble concentrate	Cantol, Inc.	11/8/63 to 7/1/87	13603	5664-1	GDEC
Sure-Kill	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Wilmar Co., Inc.	3/29/63 to 12/31/87	13603	6837-30	GDEC
Unico Sodium Arsenite Weed Killer Solution	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Universal Cooperatives Inc	12/16/57 to 4/27/87	13603	1386-136	DCN
Varco Four Plus Fifty Non-Selective Concentrate	42.4	Sodium arsenite	herbicide unspecified	soluble concentrate	James Varley & Sons, LLC	11/19/63 to 1/28/87	13603	421-368	DCN
Varco Six Plus Sixty Non Selective Concentrate	59.5	Sodium arsenite	herbicide unspecified	soluble concentrate	James Varley & Sons, LLC	8/16/72 to 1/28/87	13603	421-398	DCN
Weed - X	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Dettelbach Chemical Co	1/31/58 to 10/10/89	13603	1421-74	NPF
Weed Killer No. 50	16.5 4.5	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	4/14/48 to 10/10/89	13603	551-1	NPF
Weed Killer No. 50A	33 9	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	transferred to 50415-17 on 7/29/83	13603	551-88	O-52
Weed Killer No. 50A	33 9	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	7/29/83 to 7/1/87	13603	50415-17	GDEC
Weedex Sodium Metarsenite 41%	41	Sodium arsenite	herbicide unspecified	soluble concentrate	Good James Company	1/15/48 to 7/1/87	13603	446-1	GDEC
Wil-Kill Arsenical Weed Killer	20	Sodium arsenite	herbicide unspecified	soluble concentrate	Wilmar Co., Inc.	2/13/61 to 12/31/87	13603	6837-22	GDEC
Wk-90 Concentrated Non Selective Weed Killer	55.8	Sodium arsenite	herbicide unspecified	soluble concentrate	Navy Brand Manufacturing Co.	11/12/64 to 8/1/88	13603	1926-30	SRA
Xd-542 Non Selective Weed Killer	25	Sodium arsenite	herbicide unspecified	soluble concentrate	CHEMEX Chemicals & Coatings Co Inc	6/15/54 to 8/1/88	13603	4450-6	SRA

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Zep R-59 Weed Killer	50	Sodium arsenite	herbicide unspecified	soluble concentrate	Zep Manufacturing Co. A division of Acuity Specialty Products	9/26/58 to 8/23/87	13603	1270-42	DCN
Ind-Sol 40	40	Sodium arsenite	herbicide unspecified regulator	soluble concentrate	Chemical Specialties, Inc.	1/1/76 to 9/29/88	13603	10827-4073	FIC
Weed-X	40	Sodium arsenite	herbicide unspecified regulator	soluble concentrate	D. H. Hunter Enterprises, Inc D/B/A	1/1/76 to 12/31/87	13603	37347-4050	GDEC
40% Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified repellent or feeding depressant	soluble concentrate	Big Bee Chemical And Supply Co.	1/1/76 to 9/29/88	13603	36688-8218	FIC
Herbicidox Weed Killer	17 2.15 0.5 18.5	*Sodium arsenite* Coal tar acids 2,4-D Aliphatic Petroleum Hs	herbicide unspecified, herbicide terrestrial	solution-ready to use	U.S. Borax Inc.	6/10/64 to 7/1/87	13603	1624-55	GDEC
Ind-Sol 40 Contact Weed And Tree Killer	40	Sodium arsenite	herbicide unspecified, herbicide terrestrial	emulsifiable concentrate	Chemical Specialties, Inc.	7/9/80 to 8/1/88	13603	10827-54	SRA
Sodium Arsenite 40% Liquid Solution	40	Sodium arsenite	herbicide unspecified, herbicide terrestrial	soluble concentrate	Stewart Pharmacal, Inc.	9/20/82 to 8/1/88	13603	45128-11	SRA
Weed Killer (Sodium Arsenite Solution)	42.5	Sodium arsenite	herbicide unspecified, herbicide terrestrial	soluble concentrate	Faesy & Besthoff Inc.	3/25/48 to 7/1/87	13603	779-2	GDEC
40% Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, herbicide terrestrial, insecticide & miticide	soluble concentrate	ABC Compounding Co, Inc	10/18/71 to 7/1/87	13603	3862-43	GDEC
6840-281-2030 Insect. Sod.Arsenite Conc Fed. Specif. 0-I-579	53.86	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Yukon Service Company	9/5/68 to 8/1/88	13603	9791-4	SRA

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Patterson's Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Patterson Chemical Company, Inc.	transferred to 3442-864 on 5/31/85	13603	2169-27	O-50
Patterson's Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Pursell Acquisition Co, Inc.	5/31/85 to 7/1/87	13603	3442-864	GDEC
Ant Exit	1.6	Sodium arsenite	insecticide & miticide	solution-ready to use	WPC Brands, Inc.	5/16/67 to 3/31/88	13603	305-6	DCN
Antrol Ant Killer	0.61	Sodium arsenite	insecticide & miticide	impregnated materials	Reckitt Benckiser Inc.	3/11/48 to 5/1/87	13603	475-7	U
Antrol Ant Syrup	0.61	Sodium arsenite	insecticide & miticide	solution-ready to use	Reckitt Benckiser Inc.	3/12/48 to 5/1/87	13603	475-13	U
Getem Ant Poison	0.26	Sodium arsenite	insecticide & miticide	solution-ready to use	Getem Manufacturing, Inc.	1/15/48 to 3/25/87	13603	328-2	SRA
Penite - 6	53.86	Sodium arsenite	insecticide & miticide	soluble concentrate	Cerexagri, Inc.	9/18/64 to 7/1/87	13603	4581-229	GDEC
Sodium Arsenite Solution No.4	43.4	Sodium arsenite	insecticide & miticide, herbicide unspecified, fungicide	soluble concentrate	Los Angeles Chemical Company	1/1/76 to 7/1/87	13603	962-10173	GDEC
Sodite Grape Spray	42	Sodium arsenite	insecticide & miticide, fungicide	soluble concentrate	The Scotts Company D/B/A The Ortho Group	12/2/47 to 10/4/85	13603	239-61	FR
Laggo Sodium Arsenite Solution No. 6	52.5	Sodium arsenite	insecticide & miticide, fungicide, herbicide unspecified	soluble concentrate	Los Angeles Chemical Company	transferred to 55146-25 on 7/24/86	13603	962-349	N-71
Laggo Sodium Arsenite Solution No. 6	52.5	Sodium arsenite	insecticide & miticide, fungicide, herbicide unspecified	soluble concentrate	Nufarm America's Inc.	7/24/86 to 9/30/91	13603	55146-25	NPF
Kilroy Weed Killer	42	Sodium arsenite	insecticide & miticide, herbicide unspecified	soluble concentrate	Barber Laboratories	1/1/76 to 2/13/87	13603	18599-10168	LIP

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Penite-8 Sodium Arsenite Solution	66.1	Sodium arsenite	insecticide & miticide, herbicide unspecified	soluble concentrate	Cerexagri, Inc.	1/27/59 to 7/1/87	13603	4581-102	GDEC
SMCP Paris Green Granular-7 1/2	7.5 35.2	Copper Acetoarsenite Petroleum Oil	insecticide, mosquito		Southern Mill Creek Products Co Inc.	Cancelled 5/1/1987	22601	6720-00031	U
FASCO Paris Green Aerogran-5	5.0 35.0	Copper Acetoarsenite Natural Gasoline			Kerr-McGee Chemical LLC	Cancelled 2/4/1987	22601	002342-00502	CR
FASCO Paris Green Granular-7 1/2	7.5 35.2	Copper Acetoarsenite Natural Gasoline			Kerr-McGee Chemical LLC	Cancelled 2/4/1987	22601	002342-00502	SRA
LACCO Paris Green	99.99	Copper Acetoarsenite			Los Angeles Chemical Company	Cancelled 7/1/1987	22601	000962-00344	GDEC
Paris Green	99.99	Copper Acetoarsenite			University of Hawaii Co-OP Extension	Cancelled 10/10/1985	22601	037843-08562	CR
Pettit Marine Paint Anti-Fouling 1330 Alumacide Green	26.5 2.0	Copper Acetoarsenite Bis(tributyltin) oxide			Pettit Paint Company Inc.	Cancelled 10/7/1983	22601	000390-00038	FR
Pettit Marine Paint Anti-Fouling 1342 Green Tropicop	13.5 16.0	Copper Copper Acetoarsenite			Pettit Paint Company Inc.	Cancelled 10/7/1983	22601	000390-00038	FR

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Appendix B continued:

Inorganic Arsenical Pesticides Marketed for Home Use.

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Security Brand Tomato Dust	7 60	Cupric sulfate Calcium arsenate	fungicide	dust	Value Gardens Supply, LLC	5/5/53 to 7/28/86	13501	769-149	DCN
Sodium Arsenite No. 4-L	40	Sodium arsenite	fungicide	soluble concentrate	Moyer Products Inc	1/1/76 to 8/22/86	13603	5967-5152	RSCN
E-Z-Flo Peach Spray #3	11.5 34	Lead arsenate Sulfur	fungicide	wettable powder	Grower Service Corp	7/20/67 to 4/24/86	13502	635-561	FR
Kill-All Concentrated Weed & Grass Killer	42	Sodium arsenite	herbicide unspecified	emulsifiable concentrate	Bonded Chemicals Corporation	1/1/76 to 12/31/87	13603	850-10253	GDEC
40% Solution Sodium Arsenite	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Value Gardens Supply, LLC	6/29/61 to 7/1/87	13603	769-287	GDEC
Arsenical Weed Killer	44	Sodium arsenite	herbicide unspecified	soluble concentrate	I. Schneid	10/13/58 to 7/1/87	13603	2155-26	GDEC
Atlas "A" A Sodium Arsenite Solution	44	Sodium arsenite	herbicide unspecified	soluble concentrate	Rhone-Poulenc Agrochemical Division	12/31/47 to 5/1/87	13603	359-1	DCN
Atlas "A6" Sodium Arsenite Solution	57.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Rhone-Poulenc Agrochemical Division	1/11/54 to 5/1/87	13603	359-228	DCN
Belco Non-Selective Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Bell Chemical Company	3/3/72 to 10/10/89	13603	839-59	NPF
Bonide Sodium Arsenite Grass & Weed Killer	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Bonide Products, Inc.	11/12/58 to 8/1/88	13603	4-109	SRA
Chapman Narsite 60	57.48	Sodium arsenite	herbicide unspecified	soluble concentrate	IBC Manufacturing, Co.	transferred to 19713-199 on 11/26/84	13603	1022-414	2 Feb 68
Chapman Narsite 60	57.48	Sodium arsenite	herbicide unspecified	soluble concentrate	Drexel Chemical Co.	11/26/84 to 8/1/88	13603	19713-199	SRA
De Weed Concentrated Killer Of Weeds	40	Sodium arsenite	herbicide unspecified	soluble concentrate	M.S.I.	transferred to 34956-21on 5/17/88	13603	1325-60	4 Apr 72
De Weed Concentrated Killer Of Weeds	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Royal Chemical Co.	5/17/88 to 8/1/88	13603	34956-21	SRA

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
De Witt Formula No 102 Weed Killer	50	Sodium arsenite	herbicide unspecified	soluble concentrate	DeWitt Chemical Co.	3/20/59 to 4/30/87	13603	1269-22	CR
Deep Kill Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	5/9/60 to 3/16/87	13603	1769-70	CR
Delta Brand Arsenic Acid F/Bermuda Lwns, F/Control of Dallis & Crab	75	Arsenic acid	herbicide unspecified	soluble concentrate	Osmose Inc.	5/14/82 to 10/10/1989	6801	3008-44	NPF
Dexol Weedsol Non Selective Weed Killer	43.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Value Gardens Supply, LLC	1/5/72 to 12/24/86	13603	192-90	DCN
Dolge Super Strength Weed Killer	42.7	Sodium arsenite	herbicide unspecified	soluble concentrate	C.B. Dolge Company	8/4/48 to 7/1/87	13603	1057-20	GDEC
Du Cor Formula 71 Weed Killer Concentrate	26 1.9 11	Sodium metaborate Sodium arsenite Sodium chlorate	herbicide unspecified	soluble concentrate	Du Corp Chemical Corp	1/1/76 to 8/9/85	13603	13437-4075	CR
Em 1400 (Sodium Arsenite Solution) Non-Selective Weed & Brush Killer	48.75	Sodium arsenite	herbicide unspecified	soluble concentrate	Empire International	3/22/69 to 1/28/87	13603	5-31	DCN
F-40 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	3/29/55 to 3/16/87	13603	1769-37	CR
Ferti Lome Dal Crab	75	Arsenic acid	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 4/1/87	6801	7401-186	SRA
Floratox 40 Tree Killer And Contact Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Crown Chemical Industries	transferred to 7234-84 on 10/8/85	13603	7273-61	12 Dec 71
Flora-Tox 60 Tree Killer And Contact Weed Killer	55.8	Sodium arsenite	herbicide unspecified	soluble concentrate	Crown Chemical Industries	transferred to 7234-88 on 10/8/85	13603	7273-72	8 Aug 71
Formula-444 Weed Killer	45.4	Sodium arsenite	herbicide unspecified	soluble concentrate	The State Chemical Manufacturing Co	2/11/63 to 3/13/87	13603	1685-26	DCN
Hill's No. 572 Herbicide Concentrate Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Hill Manufacturing Co., Inc.	8/23/57 to 4/1/87	13603	402-53	DCN

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Hi-Yield Decimex Surfactant	38 18	Arsenic acid MSMA	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 5/1/87	6801	7401-205	SRA
Hi-Yield General Weed Killer	75	Arsenic acid	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 4/1/87	6801	7401-204	SRA
Insecticide Sodium Arsenite Concentrate	53.86	Sodium arsenite	herbicide unspecified	soluble concentrate	Truetech, Inc	6/29/62 to 8/1/88	13603	1691-85	SRA
Main Line Weed Killer	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Cooper Creek Chemical Corp	1/6/58 to 12/29/86	13603	363-1	DCN
Mwk Non-Selective Weed Killer For Cont Of Weeds, Grass And Other Veg	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Malter International Corporation	2/10/64 to 3/16/87	13603	1266-43	DCN
Narsite 40	40	Sodium arsenite	herbicide unspecified	soluble concentrate	IBC Manufacturing, Co.	transferred to 19713-194 on 11/26/84	13603	1022-109	7 July 55
National Chemsearch Dk-80 Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	3/5/64 to 3/16/87	13603	1769-121	CR
No-Gro Liquid Concentrate	40.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Sheff Chemical & Supply Company	1/1/76 to 1/16/87	13603	10193-9447	UM
Ortho Arsenical Weed Killer (Also Triox)	55	Sodium arsenite	herbicide unspecified	soluble concentrate	The Scotts Company D/B/A The Ortho Group	8/23/48 to 10/4/85	13603	239-289	FR
Penite 35	45.9	Sodium arsenite	herbicide unspecified	soluble concentrate	Cerexagri, Inc.	5/10/63 to 7/1/87	13603	4581-205	GDEC
Permakill'weed Killer Concentrate	40.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Du Corp Chemical Corp	1/1/76 to 9/29/88	13603	13437-4074	FIC
Poly Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Poly Chem, Inc.	6/29/64 to 3/25/87	13603	8047-9	DCN
S.C. Weed Killer Type "B"	20	Sodium arsenite	herbicide unspecified	soluble concentrate	KALLD Enterprises, Inc. DBA	12/19/73 to 3/26/87	13603	6762-29	DCN

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Scorch	75	Asenic acid	herbicide unspecified	soluble concentrate	Cerexagri, Inc.	1/23/69 to 7/1/87	6801	4581-268	GDEC
Selig's Weed Killer	44	Sodium arsenite	herbicide unspecified	soluble concentrate	Selig Industries	1/9/48 to 7/1/87	13603	491-3	GDEC
Sharp Sodium Arsenate Solution 40 Percent	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Sharp Chemical Co.	8/18/75 to 12/31/87	13603	22058-2	GDEC
Sodium Arsenite 42.5% Solution	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Good Life	11/26/56 to 7/1/87	13603	4931-33	GDEC
Sure Weed Killer	38	Sodium arsenite	herbicide unspecified	soluble concentrate	Cantol, Inc.	11/8/63 to 7/1/87	13603	5664-1	GDEC
Sure-Kill	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Wilmar Co., Inc.	3/29/63 to 12/31/87	13603	6837-30	GDEC
Unico Sodium Arsenite Weed Killer Solution	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Universal Cooperatives Inc	12/16/57 to 4/27/87	13603	1386-136	DCN
Varco Four Plus Fifty Non-Selective Concentrate	42.4	Sodium arsenite	herbicide unspecified	soluble concentrate	James Varley & Sons, LLC	11/19/63 to 1/28/87	13603	421-368	DCN
Weed - X	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Dettelbach Chemical Co	1/31/58 to 10/10/89	13603	1421-74	NPF
Weed Killer No. 50	16.5 4.5	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	4/14/48 to 10/10/89	13603	551-1	NPF
Weed Killer No. 50A	33 9	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	transferred to 50415-17 on 7/29/83	13603	551-88	10 Oct52
Weed Killer No. 50A	33 9	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	7/29/83 to 7/1/87	13603	50415-17	GDEC
Wil-Kill Arsenical Weed Killer	20	Sodium arsenite	herbicide unspecified	soluble concentrate	Wilmar Co., Inc.	2/13/61 to 12/31/87	13603	6837-22	GDEC
Wk-90 Concentrated Non Selective Weed Killer	55.8	Sodium arsenite	herbicide unspecified	soluble concentrate	Navy Brand Manufacturing Co.	11/12/64 to 8/1/88	13603	1926-30	SRA
Xd-542 Non Selective Weed Killer	25	Sodium arsenite	herbicide unspecified	soluble concentrate	CHEMEX Chemicals & Coatings Co Inc	6/15/54 to 8/1/88	13603	4450-6	SRA

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Zep R-59 Weed Killer	50	Sodium arsenite	herbicide unspecified	soluble concentrate	Zep Manufacturing Co. A division of Acuity Specialty Products	9/26/58 to 8/23/87	13603	1270-42	DCN
Ferti-Lome Weed & Wild Grass Killer	2.14	Arsenic acid	herbicide unspecified	solution-ready to use	Voluntary Purchasing Group Inc.	12/2/63 to 4/1/87	6801	7401-5	SRA
Arsenic Trioxide (Technical)	99	Arsenic trioxide	herbicide unspecified	Technical chemical	Tifa Limited	4/21/67 to 8/1/88	7001	1439-189	SRA
Ind-Sol 40	40	Sodium arsenite	herbicide unspecified regulator	soluble concentrate	Chemical Specialties, Inc.	1/1/76 to 9/29/88	13603	10827-4073	FIC
40% Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified repellent or feeding depressant	soluble concentrate	Big Bee Chemical And Supply Co.	1/1/76 to 9/29/88	13603	36688-8218	FIC
Weed Killer (Sodium Arsenite Solution)	42.5	Sodium arsenite	herbicide unspecified, herbicide terrestrial	soluble concentrate	Faesy & Besthoff Inc.	3/25/48 to 7/1/87	13603	779-2	GDEC
Fasco Deflocculated Lead Arsenate Prod No 550	96	Lead arsenate $Pb_5(AsO_4)_3(OH)$	herbicide unspecified, herbicide terrestrial	wettable powder	Micro-Flo Company LLC	3/8/85 to 1/22/91	13502	51036-29	NPF
Fasco Deflocculated Lead Arsenate Prod No 550 also sold as Marman Lead Arsenate	96	Lead arsenate	herbicide unspecified, herbicide terrestrial	wettable powder	Landia Chemical Co.	3/22/79 to 9/30/87 transferred	13502	9859-121	DCN
Security Brand Turf-Cal Granular	48	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	granular	Value Gardens Supply, LLC	11/1/79 to 7/28/86	13501	769-466	DCN
40% Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, herbicide terrestrial, insecticide & miticide	soluble concentrate	ABC Compounding Co, Inc	10/18/71 to 7/1/87	13603	3862-43	GDEC
Security Brand Turf-Cal Spray	70	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	wettable powder	Value Gardens Supply, LLC	11/1/79 to 7/28/86	13501	769-467	DCN

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Chipco Hi-Test Lead Arsenate	98	Lead arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	wettable powder / dust	Rhone-Poulenc Agrochemical Division	2/8/62 to 2/21/86	13502	359-488	FR
Chip-Cal Granular	48	Calcium arsenate	herbicide unspecified, insecticide & miticide	granular	Rhone-Poulenc Agrochemical Division	1/15/59 to 9/27/85	13501	359-360	FR
Gro-Well Pre-Vent	48	Calcium arsenate	herbicide unspecified, insecticide & miticide	granular	J & L Adikes Inc.	2/1/61 to 9/27/85	13501	5535-35	FR
PAX 400 3 Year Crabgrass Control	25.11 8.25	Arsenic trioxide Lead arsenate	herbicide unspecified, insecticide & miticide	granular	Martin Resources, Inc. Pax Division	8/3/53 to 7/1/87	7001 13502	3234-3	GDEC
6840-281-2030 Insect. Sod.Arsenite Conc Fed. Specif. 0-I-579	53.86	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Yukon Service Company	9/5/68 to 8/1/88	13603	9791-4	SRA
Patterson's Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Patterson Chemical Company, Inc.	transferred to 3442-864 on 5/31/85	13603	2169-27	10 Oct 50
Patterson's Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Pursell Acquisition Co, Inc.	5/31/85 to 7/1/87	13603	3442-864	GDEC
Arsenic Trioxide (Technical)	90	Arsenic trioxide	herbicide unspecified, insecticide & miticide	Technical chemical	Ametalco Inc.	6/14/67 to 7/1/87	7001	9777-1	DCN
LACCO Brand Calcium Arsenate	70	Calcium arsenate	herbicide unspecified, insecticide & miticide	wettable powder / dust	Los Angeles Chemical Company	4/2/48 to 7/1/87	13501	962-93	GDEC
Niagra Blueberry Maggot Dust	35	Calcium arsenate	insecticide & miticide	dust	FMC Corp Agricultural Products Group	3/27/62 to 7/1/87	13501	279-1874	GDEC
Ortho Standard Lead Arsenate 15 Dust	14.25	Lead arsenate	insecticide & miticide	dust	The Scotts Co.	5/28/56 to 2/21/86	13502	239-881	FR
Pestco K-A-L Term Dust	35	Calcium arsenate	insecticide & miticide	dust	Pest Control Chemicals, Inc.	1/1/76 to 9/29/88	13501	11134-6022	FIC

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Flowable Lead Arsenate	32.8	Lead arsenate	insecticide & miticide	flowable concentrate	Landia Chemical Co.	1/1/76 to 7/1/87	13502	9859-5667	GDEC
Flowable Lead Arsenate	32.8	Lead arsenate	insecticide & miticide	flowable concentrate	Landia Chemical Co.	1/1/76 to 7/1/87	13502	9859-10408	GDEC
LACCO Basic Lead Arsenate	96	Lead arsenate $PbHAsO_4$	insecticide & miticide	soluble concentrate	Los Angeles Chemical Company	3/24/60 to 7/1/87	13503	962-300	GDEC
Ortho Standard Lead Arsenate	95	Lead arsenate $PbHAsO_4$	insecticide & miticide	soluble concentrate	The Scotts Company D/B/A The Ortho Group	1/1/76 to 8/22/86	13503	239-4254	RSCN
Penite - 6	53.86	Sodium arsenite	insecticide & miticide	soluble concentrate	Cerexagri, Inc.	9/18/64 to 7/1/87	13603	4581-229	GDEC
Refined White Arsenic	99.5	Arsenic trioxide	insecticide & miticide	Technical chemical	Voluntary Purchasing Group Inc.	9/13/72 to 5/1/87	7001	7401-202	DCN
Basic Powdered Arsenate of Lead	96	Lead arsenate $PbHAsO_4$	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	3/25/48 to 7/1/87	13503	279-46	GDEC
Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder	Helena Chemical Co.	1/1/76 to 10/24/85	13501	5905-3080	CR
Calcium Arsenate	70	*Calcium arsenate*	insecticide & miticide	wettable powder	Helena Chemical Co.	1/1/76 to 10/24/85	13501	5905-7878	CR
Corona Dry Powdered Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder	W R Grace & Company	8/31/66 to 4/29/87	13502	2124-455	DCN
E-Z-Flo Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Grower Service Corp	3/27/68 to 4/24/86	13502	635-594	FR
Farmrite Dry powdered Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder	Carovail, Inc.	1/7/48 to 8/1/88	13502	477-18	SRA
IDA, Inc. Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	IDA, Inc.	7/21/82 to 8/1/88	13502	45115-29	SRA
Ortho Basic Lead Arsenate	96	Lead arsenate $PbHAsO_4$	insecticide & miticide	wettable powder	The Scotts Co.	12/11/47 to 2/21/86	13503	239-87	FR
Ortho Standard Lead Arsenate Colored	95	Lead arsenate	insecticide & miticide	wettable powder	The Scotts Co.	3/11/48 to 2/21/86	13502	239-161	FR

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Parsons Arsenate of Lead	97	Lead arsenate	insecticide & miticide	wettable powder	Prentiss, Inc.	12/11/79 to 5/11/84	13502	655-599	FR
Patterson Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Patterson Chemical Company	transferred to 3442-728 on 3/12/85	13502	2169-46	1 Jan 57
Patterson Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Pursell Acquisition Co, Inc.	3/12/85 to 7/1/87	13502	3442-728	GDEC
Security Lead Arsenate (Defloculated)	96	Lead arsenate	insecticide & miticide	wettable powder	Value Gardens Supply, LLC	3/7/56 to 1/22/87	13502	769-186	DCN
Standard Lead Arsenate	94	Lead arsenate	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	3/25/48 to 12/24/86	13502	279-29	CR
Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder	Zeneca, Inc.	2/6/58 to 7/1/87	13502	476-1186	GDEC
Sure Death Brand Powdered Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder	Land O'Lakes Farmland Feed LLC	6/25/81 to 10/4/85	13502	1990-418	FR
Suspenso Lead Arsenate	94	Lead arsenate	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	12/9/71 to 12/24/86	13502	279-79	CR
UNICO Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Universal Cooperatives Inc	6/15/48 to 7/1/87	13502	1386-7	GDEC
Arcadian Astringent Lead Arsenate	97	Lead arsenate	insecticide & miticide	wettable powder / dust	Allied Signal, Inc.	3/2/48 to 2/21/86	13502	218-48	FR
Arcadian Lead Arsenate Powdered Standard	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Allied Signal, Inc.	1/30/48 to 2/21/86	13502	218-6	FR
Chipman Hi-Test Lead Arsenate	90.5	Lead arsenate	insecticide & miticide	wettable powder / dust	Rhone-Poulenc Agrochemical Division	6/17/59 to 2/21/86	13502	359-371	FR
CO-OP Powdered Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Land O'Lakes Farmland Feed LLC	7/19/68 to 10/4/85	13502	1990-325	FR

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Drexel Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder / dust	Drexel Chemical Co.	11/25/81 to 10/10/89	13502	19713-71	NPF
E-Z-Flo Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Grower Service Corp	11/23/53 to 4/24/86	13502	635-143	FR
Lobel Lead Arsenate Deflocculated	96	Lead arsenate	insecticide & miticide	wettable powder / dust	Lobel Chemical Corp	7/10/67 to 8/1/88	13502	6170-5	SRA
Security Brand Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder / dust	Value Gardens Supply, LLC	2/12/48 to 7/28/86	13501	769-14	DCN
Sodium Arsenite Solution No.4	43.4	Sodium arsenite	insecticide & miticide, herbicide unspecified, fungicide	soluble concentrate	Los Angeles Chemical Company	1/1/76 to 7/1/87	13603	962-10173	GDEC
Farmcraft Lead Arsenate 15-Sulfur 70 dust	15 70	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	Farm Craft, Inc.	1/1/76 to 8/1/87	13502	1871-8966	CR
Farmrite Cop-Cal Vegetable Dust	7.0 14.0	Cupric sulfate Calcium arsenate	insecticide & miticide, fungicide	dust	Carovail, Inc.	9/30/65 to 8/1/88	13501	477-73	SRA
Niagra New Cucurbit Dust	5.25 8.3	Calcium arsenate Cu oxychloride sulfate	insecticide & miticide, fungicide	dust	FMC Corp Agricultural Products Group	4/12/48 to 9/27/85	13501	279-153	FR
Niagra Potato Dust 7-20	7.0 14.0	Cupric sulfate Calcium arsenate	insecticide & miticide, fungicide	dust	FMC Corp Agricultural Products Group	1/6/54 to 5/1/87	13501	279-825	U
Ortho Standard Lead Arsenate-Sulfur 15-85 Dust	14.25 83.0	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	The Scotts Co.	5/25/55 to 2/21/86	13502	239-880	FR
Security Lead Arsenate Zink-O-Dust 80-5-15	4.8 76 3	Lead arsenate Sulfur Zinc sulfate	insecticide & miticide, fungicide	dust	Value Gardens Supply, LLC	6/2/65 to 1/22/87	13502	769-341	CR
Security Sulphur-Lead-Arsenate-Lime Peach Dust	4.8 76	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	Value Gardens Supply, LLC	6/9/65 to 1/22/87	13502	769-343	DCN
Captan Lead 5-15D	15 5	lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	Agway Inc.	7/12/65 to 4/1/87	13502	8590-143	DCN

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
E-Z-Flo Apple Spray	3.2 16 38	Cupric sulfate Lead arsenate Sulfur	insecticide & miticide, fungicide	wettable powder	Grower Service Corp	3/22/67 to 4/24/86	13502	635-528	FR
Ortho ® Custom Blend No. 5	47.5 25.0	Lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	The Scotts Co.	3/25/59 to 2/21/86	13502	239-1288	FR
Ortho Custom Blend No. 4	59.0 12.5	Lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	The Scotts Co.	4/4/60 to 12/24/86	13502	239-1463	CR
Pan Peach Spray	11.5 34 19.2	Lead arsenate Sulfur Zinc sulfate	insecticide & miticide, fungicide	wettable powder	Value Gardens Supply, LLC	2/16/48 to 1/22/87	13502	769-32	DCN
Laggo Sodium Arsenite Solution No. 6	52.5	Sodium arsenite	insecticide & miticide, fungicide, herbicide unspecified	soluble concentrate	Los Angeles Chemical Company	transferred to 55146-25 on 7/24/86	13603	962-349	1 Nov 71
Laggo Sodium Arsenite Solution No. 6	52.5	Sodium arsenite	insecticide & miticide, fungicide, herbicide unspecified	soluble concentrate	Nufarm America's Inc.	7/24/86 to 9/30/91	13603	55146-25	NPF
Kilroy Weed Killer	42	Sodium arsenite	insecticide & miticide, herbicide unspecified	soluble concentrate	Barber Laboratories	1/1/76 to 2/13/87	13603	18599-10168	LIP
Penite-8 Sodium Arsenite Solution	66.1	Sodium arsenite	insecticide & miticide, herbicide unspecified	soluble concentrate	Cerexagri, Inc.	1/27/59 to 7/1/87	13603	4581-102	GDEC
ACME Arsenate of Lead	98	Lead arsenate $PB_5(AsO_4)_3(OH)$	insecticide & miticide, nematicide	wettable powder / dust	PBI/Gordon Corp	7/9/68 to 7/1/87	13502	33955-31	GDEC
Best Snail & Slug Pellets Double 5	5 5	Calcium arsenate Metaldehyde	Molluscicide, tadpole, shrimp	pelleted/ tabletted	J.R. Simplot Co	6/27/72 to 5/1/87	13501	7001-141	DCN
UNICO Snail and Slug Bait	5.0 3.2	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp	granular	Universal Cooperatives Inc	1/10/64 to 7/1/87	13501	1386-447	GDEC
Calcium Arsenate-Metaldehyde 5-3 Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp	pelleted/ tabletted	Zeneca, Inc.	4/13/61 to 7/1/87	13501	476-1551	GDEC
Slug Killer	5.0 3.25	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp	pelleted/ tabletted	PBI/Gordon Corp	10/18/67 to 7/1/87	13501	2217-454	GDEC

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Ortho Bug-Geta Meal	5.16 1.75	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	granular	The Scotts Co.	2/10/59 to 11/23/84	13501	239-111	FR
Pearson's Kwik-Kill Bait	5.0 2.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	granular	Southland Pearson & Co Drexel Chemical Company	5/4/50 to 8/1/88	13501	728-23	SRA
Cal-Meta Snail Pellets	6.75 1.5	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Zeneca, Inc.	5/28/57 to 7/1/87	13501	476-192	GDEC
Chipman Meta A Pellet	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Rhone-Poulenc Agrochemical Division	2/17/64 to 9/27/85	13501	359-536	FR
Coastox Meta Cal	5 3	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Western Farm Service, Inc.	6/19/74 to 7/1/87	13501	11656-22	GDEC
Metag Agricultural Bait	5.16 1.5	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	The Scotts Co.	5/27/58 to 10/4/85	13501	239-74	FR
Ortho Bug-Geta Pellets	5 3.25	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	The Scotts Co.	11/12/58 to 10 ?11/23/84	13501	239-23	FR
Pacific Cooperatives Slug Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Farmers Union Central Exchange Inc.	transferred to 3234-41 on 11/26/84	13501	912-91	7 July 78
Pacific Cooperatives Slug Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Martin Resources, Inc. Pax Division	11/26/84 to 7/1/87	13501	3234-41	GDEC
LACCO Paris Green	99.99 9	Copper Acetoarsenite			Los Angeles Chemical Company	Cancelled 7/1/1987	22601	000962-00344	GDEC
Paris Green	99.99 9	Copper Acetoarsenite			University of Hawaii Co-OP Extension	Cancelled 10/10/1985	22601	037843-08562	CR

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Appendix B continued:

Inorganic Arsenical Pesticides that may have been Applied to Lawns.

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Sodium Arsenite No. 4-L	40	Sodium arsenite	fungicide	soluble concentrate	Moyer Products Inc	1/1/76 to 8/22/86	13603	5967-5152	RSCN
40% Solution Sodium Arsenite	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Value Gardens Supply, LLC	6/29/61 to 7/1/87	13603	769-287	GDEC
Arsenical Weed Killer	44	Sodium arsenite	herbicide unspecified	soluble concentrate	I. Schneid	10/13/58 to 7/1/87	13603	2155-26	GDEC
Belco Non-Selective Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Bell Chemical Company	3/3/72 to 10/10/89	13603	839-59	NPF
Chapman Narsite 60	57.48	Sodium arsenite	herbicide unspecified	soluble concentrate	IBC Manufacturing, Co.	transferred to 19713-199 on 11/26/84	13603	1022-414	2 Feb 68
Chapman Narsite 60	57.48	Sodium arsenite	herbicide unspecified	soluble concentrate	Drexel Chemical Co.	11/26/84 to 8/1/88	13603	19713-199	SRA
De Weed Concentrated Killer Of Weeds	40	Sodium arsenite	herbicide unspecified	soluble concentrate	M.S.I.	transferred to 34956-21on 5/17/88	13603	1325-60	4 Apr 72
De Weed Concentrated Killer Of Weeds	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Royal Chemical Co.	5/17/88 to 8/1/88	13603	34956-21	SRA
Deep Kill Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	NCH Corp	5/9/60 to 3/16/87	13603	1769-70	CR
Delta Brand Arsenic Acid F/Bermuda Lwns, F/Control of Dallis & Crab	75	Arsenic acid	herbicide unspecified	soluble concentrate	Osmose Inc.	5/14/82 to 10/10/1989	6801	3008-44	NPF
Du Cor Formula 71 Weed Killer Concentrate	26 1.9 11	Sodium metaborate Sodium arsenite Sodium chlorate	herbicide unspecified	soluble concentrate	Du Corp Chemical Corp	1/1/76 to 8/9/85	13603	13437-4075	CR
Ferti Lome Dal Crab	75	Arsenic acid	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 4/1/87	6801	7401-186	SRA
Formula-444 Weed Killer	45.4	Sodium arsenite	herbicide unspecified	soluble concentrate	The State Chemical Manufacturing Co	2/11/63 to 3/13/87	13603	1685-26	DCN

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Hi-Yield General Weed Killer	75	Arsenic acid	herbicide unspecified	soluble concentrate	Voluntary Purchasing Group Inc.	9/13/72 to 4/1/87	6801	7401-204	SRA
Insecticide Sodium Arsenite Concentrate	53.86	Sodium arsenite	herbicide unspecified	soluble concentrate	Truetech, Inc	6/29/62 to 8/1/88	13603	1691-85	SRA
No-Gro Liquid Concentrate	40.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Sheff Chemical & Supply Company	1/1/76 to 1/16/87	13603	10193-9447	UM
Penite 35	45.9	Sodium arsenite	herbicide unspecified	soluble concentrate	Cerexagri, Inc.	5/10/63 to 7/1/87	13603	4581-205	GDEC
Permakill'weed Killer Concentrate	40.4	Sodium arsenite	herbicide unspecified	soluble concentrate	Du Corp Chemical Corp	1/1/76 to 9/29/88	13603	13437-4074	FIC
Poly Weed Killer	40	Sodium arsenite	herbicide unspecified	soluble concentrate	Poly Chem, Inc.	6/29/64 to 3/25/87	13603	8047-9	DCN
S.C. Weed Killer Type "B"	20	Sodium arsenite	herbicide unspecified	soluble concentrate	KALLD Enterprises, Inc. DBA	12/19/73 to 3/26/87	13603	6762-29	DCN
Sodium Arsenite 42.5% Solution	42.5	Sodium arsenite	herbicide unspecified	soluble concentrate	Good Life	11/26/56 to 7/1/87	13603	4931-33	GDEC
Sure Weed Killer	38	Sodium arsenite	herbicide unspecified	soluble concentrate	Cantol, Inc.	11/8/63 to 7/1/87	13603	5664-1	GDEC
Weed Killer No. 50	16.5 4.5	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	4/14/48 to 10/10/89	13603	551-1	NPF
Weed Killer No. 50A	33 9	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	transferred to 50415-17 on 7/29/83	13603	551-88	10 Oct52
Weed Killer No. 50A	33 9	Sodium arsenite Coal tar acids	herbicide unspecified	soluble concentrate	Cameron Baird	7/29/83 to 7/1/87	13603	50415-17	GDEC
Ferti-Lome Weed & Wild Grass Killer	2.14	Arsenic acid	herbicide unspecified	solution-ready to use	Voluntary Purchasing Group Inc.	12/2/63 to 4/1/87	6801	7401-5	SRA

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Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
40% Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified repellent or feeding depressant	soluble concentrate	Big Bee Chemical And Supply Co.	1/1/76 to 9/29/88	13603	36688-8218	FIC
Fasco Deflocculated Lead Arsenate Prod No 550	96	Lead arsenate $Pb_5(AsO_4)_3(OH)$	herbicide unspecified, herbicide terrestrial	wettable powder	Micro-Flo Company LLC	3/8/85 to 1/22/91	13502	51036-29	NPF
Fasco Deflocculated Lead Arsenate Prod No 550 also sold as Marman Lead Arsenate	96	Lead arsenate	herbicide unspecified, herbicide terrestrial	wettable powder	Landia Chemical Co.	3/22/79 to 9/30/87 transferred	13502	9859-121	DCN
Security Brand Turf-Cal Granular	48	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	granular	Value Gardens Supply, LLC	11/1/79 to 7/28/86	13501	769-466	DCN
Security Brand Turf-Cal Spray	70	Calcium arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	wettable powder	Value Gardens Supply, LLC	11/1/79 to 7/28/86	13501	769-467	DCN
Chipco Hi-Test Lead Arsenate	98	Lead arsenate	herbicide unspecified, herbicide terrestrial, insecticide & miticide	wettable powder / dust	Rhone-Poulenc Agrochemical Division	2/8/62 to 2/21/86	13502	359-488	FR
Chip-Cal Granular	48	Calcium arsenate	herbicide unspecified, insecticide & miticide	granular	Rhone-Poulenc Agrochemical Division	1/15/59 to 9/27/85	13501	359-360	FR
Gro-Well Pre-Vent	48	Calcium arsenate	herbicide unspecified, insecticide & miticide	granular	J & L Adikes Inc.	2/1/61 to 9/27/85	13501	5535-35	FR
PAX 400 3 Year Crabgrass Control	25.11 8.25	Arsenic trioxide Lead arsenate	herbicide unspecified, insecticide & miticide	granular	Martin Resources, Inc. Pax Division	8/3/53 to 7/1/87	7001 13502	3234-3	GDEC
6840-281-2030 Insect. Sod.Arsenite Conc Fed. Specif. 0-I-579	53.86	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Yukon Service Company	9/5/68 to 8/1/88	13603	9791-4	SRA
Patterson's Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Patterson Chemical Company, Inc.	transferred to 3442-864 on 5/31/85	13603	2169-27	10 Oct 50

RFC **Reason For Cancellation** (or original approval date if the registration was transferred):

CR	Company Request	FR	Federal Register	OAA	Other Agency Action	U	Unknown
DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Patterson's Sodium Arsenite Solution	40	Sodium arsenite	herbicide unspecified, insecticide & miticide	soluble concentrate	Pursell Acquisition Co, Inc.	5/31/85 to 7/1/87	13603	3442-864	GDEC
LACCO Brand Calcium Arsenate	70	Calcium arsenate	herbicide unspecified, insecticide & miticide	wettable powder / dust	Los Angeles Chemical Company	4/2/48 to 7/1/87	13501	962-93	GDEC
Pestco K-A-L Term Dust	35	Calcium arsenate	insecticide & miticide	dust	Pest Control Chemicals, Inc.	1/1/76 to 9/29/88	13501	11134-6022	FIC
Flowable Lead Arsenate	32.8	Lead arsenate	insecticide & miticide	flowable concentrate	Landia Chemical Co.	1/1/76 to 7/1/87	13502	9859-5667	GDEC
Flowable Lead Arsenate	32.8	Lead arsenate	insecticide & miticide	flowable concentrate	Landia Chemical Co.	1/1/76 to 7/1/87	13502	9859-10408	GDEC
Ortho Standard Lead Arsenate	95	Lead arsenate $PbHAsO_4$	insecticide & miticide	soluble concentrate	The Scotts Company D/B/A The Ortho Group	1/1/76 to 8/22/86	13503	239-4254	RSCN
Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder	Helena Chemical Co.	1/1/76 to 10/24/85	13501	5905-3080	CR
Calcium Arsenate	70	Calcium arsenate	insecticide & miticide	wettable powder	Helena Chemical Co.	1/1/76 to 10/24/85	13501	5905-7878	CR
IDA, Inc. Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	IDA, Inc.	7/21/82 to 8/1/88	13502	45115-29	SRA
Ortho Standard Lead Arsenate Colored	95	Lead arsenate	insecticide & miticide	wettable powder	The Scotts Co.	3/11/48 to 2/21/86	13502	239-161	FR
Parsons Arsenate of Lead	97	Lead arsenate	insecticide & miticide	wettable powder	Prentiss, Inc.	12/11/79 to 5/11/84	13502	655-599	FR
Patterson Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Patterson Chemical Company	transferred to 3442-728 on 3/12/85	13502	2169-46	1 Jan 57
Patterson Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Pursell Acquisition Co, Inc.	3/12/85 to 7/1/87	13502	3442-728	GDEC
Security Lead Arsenate (Defloculated)	96	Lead arsenate	insecticide & miticide	wettable powder	Value Gardens Supply, LLC	3/7/56 to 1/22/87	13502	769-186	DCN

RFC **Reason For Cancellation** (or original approval date if the registration was transferred):

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DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Standard Lead Arsenate	94	Lead arsenate	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	3/25/48 to 12/24/86	13502	279-29	CR
Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder	Zeneca, Inc.	2/6/58 to 7/1/87	13502	476-1186	GDEC
Sure Death Brand Powdered Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder	Land O'Lakes Farmland Feed LLC	6/25/81 to 10/4/85	13502	1990-418	FR
Suspenso Lead Arsenate	94	Lead arsenate	insecticide & miticide	wettable powder	FMC Corp Agricultural Products Group	12/9/71 to 12/24/86	13502	279-79	CR
UNICO Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder	Universal Cooperatives Inc	6/15/48 to 7/1/87	13502	1386-7	GDEC
Arcadian Astringent Lead Arsenate	97	Lead arsenate	insecticide & miticide	wettable powder / dust	Allied Signal, Inc.	3/2/48 to 2/21/86	13502	218-48	FR
Arcadian Lead Arsenate Powdered Standard	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Allied Signal, Inc.	1/30/48 to 2/21/86	13502	218-6	FR
CO-OP Powdered Standard Lead Arsenate	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Land O'Lakes Farmland Feed LLC	7/19/68 to 10/4/85	13502	1990-325	FR
Drexel Lead Arsenate	96	Lead arsenate	insecticide & miticide	wettable powder / dust	Drexel Chemical Co.	11/25/81 to 10/10/89	13502	19713-71	NPF
E-Z-Flo Arsenate of Lead	98	Lead arsenate	insecticide & miticide	wettable powder / dust	Grower Service Corp	11/23/53 to 4/24/86	13502	635-143	FR
Sodium Arsenite Solution No.4	43.4	Sodium arsenite	insecticide & miticide, herbicide unspecified, fungicide	soluble concentrate	Los Angeles Chemical Company	1/1/76 to 7/1/87	13603	962-10173	GDEC
Farmcraft Lead Arsenate 15-Sulfur 70 dust	15 70	Lead arsenate Sulfur	insecticide & miticide, fungicide	dust	Farm Craft, Inc.	1/1/76 to 8/1/87	13502	1871-8966	CR
Captan Lead 5-15D	15 5	lead arsenate Captan	insecticide & miticide, fungicide	wettable powder	Agway Inc.	7/12/65 to 4/1/87	13502	8590-143	DCN

RFC **Reason For Cancellation** (or original approval date if the registration was transferred):

CR	Company Request	FR	Federal Register	OAA	Other Agency Action	U	Unknown
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FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Product	%	Ingredient	Use	Formulation	Registrant	Registrant Dates	EPA #	EPA Reg No.	RFC
Kilroy Weed Killer	42	Sodium arsenite	insecticide & miticide, herbicide unspecified	soluble concentrate	Barber Laboratories	1/1/76 to 2/13/87	13603	18599-10168	LIP
ACME Arsenate of Lead	98	Lead arsenate $Pb_5(AsO_4)_3(OH)$	insecticide & miticide, nematicide	wettable powder / dust	PBI/Gordon Corp	7/9/68 to 7/1/87	13502	33955-31	GDEC
Best Snail & Slug Pellets Double 5	5 5	Calcium arsenate Metaldehyde	Molluscicide, tadpole, shrimp	pelleted/ tabletted	J.R. Simplot Co	6/27/72 to 5/1/87	13501	7001-141	DCN
Pearson's Kwik-Kill Bait	5.0 2.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	granular	Southland Pearson & Co Drexel Chemical Company	5/4/50 to 8/1/88	13501	728-23	SRA
Cal-Meta Snail Pellets	6.75 1.5	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Zeneca, Inc.	5/28/57 to 7/1/87	13501	476-192	GDEC
Coastox Meta Cal	5 3	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Western Farm Service, Inc.	6/19/74 to 7/1/87	13501	11656-22	GDEC
Pacific Cooperatives Slug Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Farmers Union Central Exchange Inc.	transferred to 3234-41 on 11/26/84	13501	912-91	7 July 78
Pacific Cooperatives Slug Pellets	5.16 3.0	Calcium arsenate Metaldehyde	mulluscicide, tadpole, shrimp, insecticide, and miticide	pelleted/ tabletted	Martin Resources, Inc. Pax Division	11/26/84 to 7/1/87	13501	3234-41	GDEC
LACCO Paris Green	99.99 9	Copper Acetoarsenite			Los Angeles Chemical Company	Cancelled 7/1/1987	22601	000962-00344	GDEC
Paris Green	99.99 9	Copper Acetoarsenite			University of Hawaii Co-OP Extension	Cancelled 10/10/1985	22601	037843-08562	CR

RFC **Reason For Cancellation** (or original approval date if the registration was transferred):

CR	Company Request	FR	Federal Register	OAA	Other Agency Action	U	Unknown
DCN	Data Call-in Notification	GDEC	General Data Exemption Call-in	RSCN	Reg. Standard Call-in Notice	UM	Undeliverable Mail
FIC	Final Intrastate Cancellation	NPF	Non-Payment of Maintenance Fee	SRA	Special Review Action		RAS X

Appendix C:

Product Advertisements

The Chronicle News, Trinidad
The Daily Sentinel, Grand Junction
The Denver Post, Denver
The Fort Collins Coloradoan, Fort Collins
The Fort Morgan Times, Fort Morgan
The Greeley Tribune, Greeley
The Pueblo Chieftain, Pueblo

The Chronicle News, Trinidad

The Daily Sentinel, Grand Junction

The Denver Post, Denver

The Fort Collins Coloradoan, Fort Collins

The Fort Morgan Times, Fort Morgan

The Greeley Tribune, Greeley

The Pueblo Chieftain, Pueblo

Appendix D:

Supplemental PAX Information

Introduction

PAX® 400 3-Year Crabgrass Control is the only registered arsenic trioxide pesticide that would have been applied yard-wide to lawns. Advertisements for PAX® Crabgrass control products were found in the Denver Post and other Colorado local papers. PAX® 400 3-Year Crabgrass Control (registered 1953-1987) contained 25.11 percent arsenic trioxide and 8.25 percent lead arsenate (EPA OPP PPIS, 2002). It is a granular herbicide, insecticide, and miticide (NPIRS, 2002) used as a pre-emergent crabgrass control product that would have been applied in fall or early spring (Greeley Tribune, 1960).

A granular arsenic trioxide product is consistent with speciation and particle size information from the VB/I-70 Superfund Site. The arsenic trioxide in PAX® crabgrass control products was provided by the American Smelting Tacoma smelter in Washington (Bass, 2002), so residual arsenic trioxide from PAX® would look like product from a smelter, which is consistent with Drexler's data (2003). Chevron and Woolfolk Chemical supplied the lead arsenate (Martin Resources, Inc., 1999). The PAX Company possessed a patent that covers both use of arsenic trioxide for crabgrass control and use of mixtures of arsenic trioxide and lead arsenate for crabgrass control (Stewart, 1959).

Ownership of PAX® 400 3-Year Crabgrass Control Registration History

Martin Resources, Inc. is listed as the owner of the PAX® 400 3-Year Crabgrass Control registration (USEPA OPP database, 2002). When contacted for information, Martin Resources said they never made the product and referred to CENEX as the previous owner (Ashley, 2002). CENEX said if they ever made the product it was only for six months to a year and it was possible that they never made it (King, 2002). King (2002) explained that product registrations, as part of company property, are transferred to the new owner when companies are sold. The Utah Cooperatives Association, a farmer's COOP in Salt Lake City, Utah, which formed the PAX Company, formulated and marketed PAX products from the early 1950s to the early 1970s (Bass, 2002). Both the Association and the Company were sold to CENEX in May 1976 (Thompson & Knight, 1999) so it is likely CENEX never made PAX® 400 3-Year Crabgrass Control.

Marketing PAX

When

Based on the approval date of the registration the first year PAX® 400 3-Year Crabgrass Control could have been marketed would be 1953. PAX® Crabgrass Control was introduced in the East in 1956 (Ellison, 1963). The trademark for PAX as an herbicide-insecticide, registered by the Utah Cooperative Association, was first used in 1939 (USPTO, 2004). PAX was advertised in the Denver Post in 1947 to control crabgrass and night crawlers.

PAX® 400 3-Year Crabgrass Control would have been canceled by Interpretation 25 of FIFRA (see Appendix A) but the PAX Company of Utah requested referral to an advisory committee (ELR 1972) so it remained on the market. Bass (2002) indicates

that PAX Crabgrass Control was discontinued in the early 1970's because the supplier for arsenic trioxide stopped supplying it by rail car. Due to the toxicity of arsenic trioxide and the PAX® product formulation the 1972 legislation should have required PAX® 400 3-Year Crabgrass Control to be applied by a licensed applicator. In 1973 PAX® products were permitted and marketed "in certain western states . . . with predominately alkaline soils" (Frost et al., 1973). PAX Crabgrass Control was advertised in the Denver Post in 1972 but only PAX Total was advertised in 1973.

What

PAX® 400 3-Year Crabgrass Control is the only registration that came up for arsenic trioxide, however references to other PAX® products containing arsenic trioxide were found. For example the PAX Company also made and distributed a product in California for dichondra lawns with 50 percent lead arsenate and 0.4 percent arsenic trioxide (Ellison, 1963). Information given in the patent application indicates that PAX® was first marketed as PAX® AR-76. Advertisements for PAX® used a variety of names (none of them with the 400 in it) and in one case pictures of several PAX® products (Daily Sentinel, 1960). A search for products associated with Martin Resources, Inc. revealed 23 products of which six had no active ingredients listed that were all canceled on July 1, 1987 on a generic data call-in which included the 400 3 Year Crabgrass Control Product. Thus, the cancellations may have been associated with EPA's inorganic arsenical Special Review Action notification of intent to cancel, which indicates inorganic arsenic may have been an active ingredient. Four of the six products were for the control of crabgrass on dichondra lawns. Super PAX® Crabgrass Control with 'complete lawn fertilizer' was one, and the other was PAX® Total Lawn Care. There is a separate registration for PAX® Total for Lawns, which incorporated dacthal and 2,4-D as active ingredients. The 1947 Denver Post advertisement simply said 'PAX Kills Crabgrass'.

How and Where

Home use

PAX® Crabgrass Control was first marketed for home use in Salt Lake City, Utah (Ellison, 1963). General distribution information is not available from PAX Company records although information contained in the PAX Company Arsenic Advisory Committee Report (Frost et al., 1973) indicates:

- PAX® was the product of choice in Indiana in 1958, but was no longer marketed there by 1965 due to lack of sales;
- PAX® was sold in Iowa, however; it was banned in 1970 due to the death of five horses fed grass clippings from a lawn treated with PAX®.[1] The label was changed to indicate grass clippings should not be fed to animals;
- PAX® was marketed in Utah, California, New York, Maryland, Missouri, and was possibly used on golf courses in New Jersey.

[1] Investigation found grass clippings from treated plots contained arsenic levels hazardous to mammals following a period of several months, after several inches of rain and snowfall, and after the lawn had been mowed seven times.

- At the time of the report, 1973, PAX® products were permitted and marketed "in certain western states . . . with predominately alkaline soils".

Advertisements for PAX® Crabgrass Control products were found in the Denver Post in April 1947, 1951-53, 1955, 1965, 1971, and 1972[2]. A 1955 Denver Post ad listed PAX® dealers in the area, which included locations in Aurora, Englewood, Golden, and Littleton as well as Denver. Lakewood and Northglenn were included in a similar list in 1965. Advertisements for PAX® Crabgrass Control Products were also found in local Colorado newspapers[3] for Delta, Fort Collins, Fort Morgan, Fruita, Grand Junction, Greeley, Montrose, Pueblo, Rangely, & Trinidad. Advertisements can be found in Appendix C. PAX® was advertised to kill crabgrass seed; kill night crawlers, grubs, and cutworms; and fertilize the lawn. Several 1960 advertisements (The Daily Sentinel) indicate PAX® Crabgrass and Soil Pest Control also controls mouse-ear chickweed and euphorbia. Another 1960 advertisement (Greeley Tribune) indicates the "seed-killing ingredients are highly insoluble and remain on the surface to kill seeds that ripen and fall after application in addition to those on the ground at time of application." Prior to 1953 it was advertised as a fertilizer. In 1955 PAX® was said to last all year (Denver Post). A 1960 advertisement in The Daily Sentinel (Grand Junction) indicates PAX® Crabgrass Soil and Pest Control came with a three-year 90-100 percent control guarantee. The 1971 Denver Post advertisement was labeled as PAX® 3-Year Crabgrass Control.

Golf Courses

Although PAX® was primarily marketed for home use it was also used on golf courses. 1956 was the first year PAX® was applied to a golf course, the 15th fairway of the Bel Air Country Club in Beverly Hills, California, followed by application to the whole course in approximately 1960 (Frost et al., 1973). Ellison (1973) observed:

> "We do not even package our product in a convenient size to be used on large areas of turf. Remarkably enough, each sale to a golf course has resulted from experimental applications made either by the PAX Company or, in many cases, research men from the various State Experiment Stations."

Salt Lake Country Club treated all 18 fairways in 1968 with PAX® 3-Year Crabgrass Control. Due to their success vicinity Country Clubs followed suit including: Hidden Valley, Willow Creek, Oakridge, and Riverside. Green Gables Country Club was the first of several Denver country clubs to use PAX®, it was applied in May 1970[4]. PAX® was also applied at the Nassau County Golf Course in New York (Frost et al., 1973).

PAX Formulation and Inert Ingredients

It is known that changes in the formulation of PAX® were made through time. However documentation on when changes were made, and what they were, is limited. The USEPA

[2] The only other crabgrass control product advertised in Denver prior to 1971 was ferti-lome crabgrass preventer which used an organic chemical (not arsenical) as active ingredient.

[3] This was not a comprehensive search of local papers, so PAX® may have been distributed in other Colorado cities and towns.

[4] *Drexler (2003) sampled Green Gables where PAX® had been applied for a maximum of 2-3 years, the highest arsenic level found was 500 ppm.*

OPP pesticide registration database indicates the formulation for the product as 25.11 percent arsenic trioxide and 8.25 percent lead arsenate, which is probably what it was in 1953 when the registration was approved. This is the 'optimal' formulation given in the patent. The patent claim noted river sand, and expanded perlite as inert ingredients (Stewart, 1959).

The first bag made is hanging on the wall of Martin Resources, Inc. According to the label it contained 2.5 percent arsenate of lead, 0.04 percent water-soluble arsenate, ammonium sulfate, and crushed igneous country rock (Ashley, 2002); this could be the product from 1939 (USPTO, 2004). Robert Bass (retired in 1997), the facility manager during the production of PAX® crabgrass control products said the formulation was 5 percent arsenic trioxide and 0.5 percent lead arsenate with "a lot of ammonium sulfate and sand" (Bass, 2002). Mr. Bass started as a sales manager in 1959; he said the formula changed frequently in the early years; it had changed just before he started with the company, but that it did not change again.

A 1955 advertisement in the Denver Post indicates PAX® provides the lawn with nitrogen equal to 6-10-4 fertilizers[5]. B.R. Ellison (1973) submitted an affidavit to the PAX Company Arsenic Advisory Committee (Frost et al., 1973) indicating the formula in 1956 included 0.35 percent technical chlordane and fertilizer grade 7-0-0 in addition to the 8.25 percent lead arsenate and 25.11 percent arsenic trioxide. An advertisement in The Daily Sentinel (Grand Junction, 1960) indicates PAX® controls soil pests with aldrin. A 1965 advertisement in the Coloradoan (Fort Collins) indicates a 6-3-2 fertilizer grade. Mr. Ellison wrote that the 1973 formula used heptachlor rather than chlordane with a fertilizer grade of 4-0-0, also mentioning he reduced the fertilizer grade when he started with the company in 1956.

Ellison (1963), Director of Research for the PAX Company, in a letter to the US Department of Agriculture in support of registering PAX® Crabgrass Control Plus Fertilizer, identifies the original PAX® Crabgrass and Soil Pest Control as having 8.25 percent lead arsenate and 25.11 percent arsenic trioxide. The goal of the new product was to improve crabgrass control performance in the first year of application in the East. PAX did not work well in the East due to sporadic watering (natural precipitation compared to "artificial irrigation" in the West), and research indicated simply increasing the rate of application of regular PAX® did not solve the problem (Ellison, 1963). An article by Done and Peart (1971) on acute toxicities of arsenical herbicides describes two formulations of PAX®: Pax (47 percent arsenic oxide, 3.5 percent lead arsenate) and New Pax (25 percent arsenic oxide, 8.25 percent lead arsenate). Mr. Ellison (1963) also indicated PAX® Crabgrass Control Plus Fertilizer has more arsenic trioxide than the original so apparently Done and Peart's 'Pax' was the New PAX® Crabgrass Control Plus Fertilizer and their 'New Pax' was the original product.

[5] Fertilizers are graded by their percentage of plant available nitrogen-phosphorous-potassium (N-P-K) content. So 6-10-4 has 6% nitrogen, 10% phosphorous, and 4% potassium in forms available to plants.

Application Rate

The 1951 Denver Post advertisement indicates an application rate of 6 pounds per 100 square feet. In 1955 the advertised application rate in the Denver Post was 5 pounds per 100 square feet (50 pounds per 1000 square feet). Stadtherr's work (1963) started in 1958 and he applied the product at the recommended rate of 25 pounds per 1000 square feet. However the PAX Company's 1973 report to EPA in defense of keeping the 3-Year Crabgrass Control product on the market (Frost et al., 1973) records the recommended application rate of 20 pounds per 1000 square feet resulted in 2100 ppm arsenic applied to the soil (in the top centimeter). Eventual leaching and 'fixing' of the arsenic in the soil would decrease the concentration to 210 ppm (Frost et al., 1973). When Fults et al. (1966) tested the efficacy of PAX® 'regular' in Greeley and Denver Colorado it was applied at 20 pounds per 1000 square feet. Folkes (2002) indicates that the recommended rate of application changed in the 1960's from 20 to 10 pounds per 1000 square feet. Drexler (2003) calculated that a one-time application at the recommended rate of 10 pounds per 1000 square feet (listed on a bag of PAX® supplied to him) would result in 65 ppm arsenic if the arsenic was distributed in the top six inches of soil.

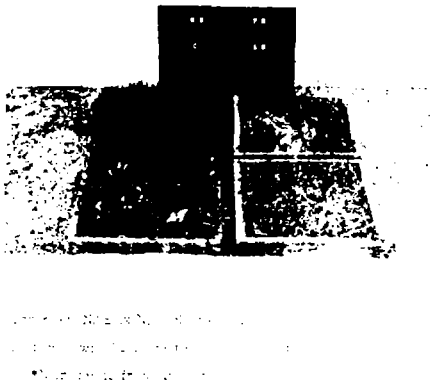
Ellison (1963) stated the recommended application rate for PAX® was 1.709 pounds of arsenic trioxide per square rod with a total arsenical rate of 2.271 pounds per square rod. Although a 1960 Greeley Tribune advertisement indicates one application protects against reinfestation of crabgrass for 18 months to two years; Ellison reported that,

> "Up to the present time [1963], no suggestion has been made on the bag as to maintenance rate and, consequently, over a period of a number of years, many customers have been using it at full rate yearly. This is of particular significance in Salt Lake City where the product is the oldest. Remarkably enough . . . they have been using PAX Crabgrass and Soil Pest Control . . . for the fertilizer effect which the PAX supplied. These people used PAX, then, spring and summer for its fertilizer effect over a period of many years. . . . we sought the names and addresses of a number of such customers and went out to view their turf areas, as well as carry on some arsenic soil studies. We were most gratified to find that all of the turf areas showed no evidence whatever of damage and were uniformly of good quality."

Therefore for at least ten years it is likely the registered formulation of PAX® Crabgrass Control was applied annually by customers leading to an increased potential for buildup of arsenic in the soil. A copy of PAX® 400 3-Year Crabgrass Control bag partial label from 1970 (EPA OPP PPLS, 2003) indicates: "Control can be maintained by a yearly application at one-third rate or by making a full-rate reapplication every third year."

PAX® killed some grass when applied at 8 times the recommended application rate of 25 pounds per thousand square feet, see figure 1.

Figure 1: PAX kills some grass when applied at 200 pounds per square foot.



8x N = ammonium sulfate applied equivalent to the amount in 200 pounds per square feet of PAX. 8x PAX = PAX applied at 200 pounds per square feet. 8x As = the arsenicals in PAX applied equivalent to the amount in 200 pounds per square feet of PAX. Taken from Stadtherr (1963).

Arsenic concentrations in lawn grasses grown in soil repeatedly treated with arsenic trioxide and lead arsenate had a maximum of 2 ppm As; while the soil ranged from 150-550 ppm As (Hiltbold, 1973).

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2 ELR 20087 | Environmental Law Reporter | copyright © 1972; http://www.elr.info/litigation/vol2/2.20087.htm.

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