PRELIMINARY

Health Assessment for

DEREWAL CHEMICAL COMPANY NATIONAL PRIORITIES LIST (NPL) SITE

KINGWOOD TOWNSHIP, HUNTERDON COUNTY, NEW JERSEY

CERCLIS No. NJD980761373

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

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THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i)(7)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR has conducted this preliminary health assessment on the data in the site summary form. Additional health assessments may be conducted for this site as more information becomes available to ATSDR.

PRELIMINARY HEALTH ASSESSMENT

DeRewal Chemical Company
Kingwood Township, Hunterdon County
New Jersey

Prepared by:
Office of Health Assessment
Agency for Toxic Substances and Disease Registry (ATSDR)

Background

The site is listed by the U.S. Environmental Protection Agency (EPA) on the National Priorities List (NPL). The site is located on 3.7 acres about one-half mile south of Frenchtown, Kingswood Township, Hunterdon County, New Jersey, between State Route 29 and eastern bank of the Delaware River.

About 20 years ago part of the site was used an informal junk disposal area. Several empty rusted drums, and a rusted 100-gallon fuel tank are located in this former dump area. Between 1970 and 1973, DeRewal Chemical Corporation leased an on-site building and operated what was believed to be a textile preservative and agricultural fungicide manufacturing facility. The building also served as a warehouse for the storage and resale of chemicals (including metal plating wastes). In 1973 numerous chemical spills occurred at the site. The worst spill involved the draining of about 3,000 to 5,000 gallons of suspected plating wastes into the on-site soils. This spill eventually reached the Delaware River.

In 1979, the eastern half of the site was sold. The new owner set up his private residence and honey bee raising operation in this portion of the site. Raising bees has ceased since the initiation of the remedial investigation process. In 1983, the owner of this operation excavated about 30 tons of soil from the top 6 to 8 inches his property in an effort to improve drainage. This soil was deposited at an open dump (known as the Pinkerton Dump) located about one-quarter mile southeast of the site near the Frenchtown Roller Rink. This soil has since been at least partially buried by more recently disposed construction debris and household wastes. Other excavated on-site soil was placed along the north walls of the on-site resident's house and garage. There is no restricted access to either on-site areas or to the Pinkerton Dump. The on-site area and the Pinkerton Dump site will be considered the study area for the purposes of this Preliminary Health Assessment.

The following documents form the basis of this Preliminary Health Assessment: Final Remedial Investigation (RI) Report for the Derewal Chemical Company site, October 1988; Bingham, F.T., et al., Growth and Cadmium Accumulation of Plants Grown on a soil Treated with a Cadmium-Enriched Sewage Sludge, J Environ Qual 4: 207-211 (1975); Draft Toxicological Profile for Cadmium, ATSDR, November 1987; DWH, 1982. Drinking Water and Health. Safe Drinking Water Committee, Board on Toxicology and Environmental Health Hazards, National Research Council, National Academy Press, Washington, D.C., 1982; Childhood Lead Report, ATSDR, 1988.

Environmental Contamination and Physical Hazards

Table I: Site-Related Ground Water Contamination[a]

Contaminant	Maximum Detected Concentration		
	Monitoring Wells		Private Wells[b,c]
	Deep Wells (ug/L)	Shallow Wells (ug/L)	(ug/L)
Aluminum	885(126)	8,750(468)	ND
Barium	346(310)	2,380(130)	224
Cadmium	40(ND)	20(4.6)	ND
Chromium (total)	27(15)	5,030(17)	7
Hexavalent Chromium	25(24)	ND	3.0
Lead	ND	113	8.6[d]
Mercury	3.4[d](ND)	ND	ND
Nickel	16[d](ND)	758(138)	22
Sodium	17,400	21,200	37,800[d]
1,1-Dichloroethene	3.9	19	ND
Trans-1,2-DCE	ND	270	ND
Methylene Chloride	NA	920	ND
Tetrachloroethene	13.1	130	ND
1,1,1-trichloroethane	7.1	410	0.7
Trichloroethene	8.4	34,000	1.6

Notes:

( ) - Filtered ground water monitoring results for the reported maximum unfiltered samples.
ug/L- Micrograms per liter or parts per billion.
ND- Not detected.
NA- Not available-data was rejected because of QA/QC.
a- Only private well water was sampled near the Pinkerton Dump site.
b- Samples obtained from residential wells and one commercial well which is used for drinking water purposes.
c- Residential well water samples were all unfiltered.
d- Detected in only one residential well near the Pinkerton Dump site.
Trans-1,2-DCE- Trans-1,2-dichloroethene.

Table II: Site-Related Surficial Soils (0-2 feet) Contamination

Contaminant	Maximum Detected Concentration (mg/kg)
Cadmium	199
Chromium (total)	2,270[a]
Hexavalent Chromium	930[a]
Copper	6,370[a]
Lead	783[b]
Carcinogenic PAHs	74.3

Notes:

mg/kg- Milligrams per kilogram or parts per million.
a- Maximum concentration detected at the Pinkerton Dump site.
b- Estimated value.
PAHs- Polycyclic aromatic hydrocarbons.

Analysis of surface water samples from the Delaware River, adjacent to the site, did not detect concentrations which were appreciably higher than those detected in a upstream background sample. Analysis of sediment samples taken adjacent to the site indicated slightly elevated concentrations of lead (124 mg/kg) and total chromium (146 mg/kg). Hexavalent chromium was not detected in sediment samples from the Delaware River.

Ambient air quality monitoring for volatile organic compounds (VOCs) was performed during on-site remedial activities for the Phase I RI. For the most part, the readings were all at background levels. The readings above background were during soil sampling or during monitoring well installation. In addition, ambient air monitoring for the presence of respirable particulates was performed during the Phase I RI on-site remedial activities. No significant levels of respirable particulates were detected, during drilling activities for three deep monitoring wells. However, the particulates generated were a localized cloud of dust such that breathing zone measurements 5-10 feet away were at or near background levels. Ambient air monitoring for VOCs and for the presence of particulates was also performed at the Pinkerton Dump site. No significantly elevated levels were detected.

As indicated in the background section, various rusted drums and a rusted fuel tank are found on-site. Furthermore, construction debris and household wastes are found at the Pinkerton Dump site. These exposed wastes are attractive to young children who enter the site. Since site access is not restricted, these waste present a hazard which may result in physical injuries to humans who come in contact with the wastes.

Demographics

Several residences are located north and south of the site, and currently there is one residence on-site, which house the owner of the property and tenants. The tenants consist of two adults and three children ranging from about age 7 to 12. In addition, about five residences are located near the Pinkerton Dump site. No other specific demographic information was provided in the RI.

Potential Environmental and Exposure Pathways

Surface Water and Sediment

Monitoring data do not indicate appreciable concentrations of site-related contaminants of public health concern in the surface water or sediment from the Delaware River. Hence, no significant oral (ingestion), dermal, or inhalation exposures to contaminated surface water or sediment appear to be occurring at this time. The potential exists, without site remediation, for contaminant migration through future surface runoff into the Delaware River. Hence, without remediation, the potential exists for future exposure to contaminants because of recreational use (e.g., swimming and fishing), if surface runoff transports appreciable concentrations of contaminants to the Delaware River.

Air

It appears that the potential for significant frequent generation of fugitive dusts on-site (not Pinkerton Dump) is minimal because:

(1) No significant levels of respirable dust particles were encountered during on-site remedial activities, except during drilling activities for three deep monitoring wells (see Environmental Contamination and Physical Hazards Section above).

(2) The site is heavily vegetated, and few vehicles presently enter the site (Personal Communication, Lawrence Granite, Remedial Project Manager (RPM), EPA-Region II, March 29, 1989).

However, intermittent exposure to children who play on-site may occur when these activities generate dusts.

Although no significant levels of respirable particulates were detected during the remedial activities at the Pinkerton Dump site, there does not appear to be any mitigating factors (i.e., vegetative cover) at the site which would reduce the potential for the generation of fugitive dusts. Hence, the potential exists for inhalation exposure to heavy-metal-contaminated fugitive dusts, especially if soils are disturbed. Furthermore, the residents near the Pinkerton Dump have the greatest potential for long-term inhalation exposure to these heavy-metal-contaminated fugitive dusts.

Consumable Biota

There is no crops or gardens presently grown on-site. In addition, there is no livestock or hunting on-site (Personal Communication, Lawrence Granite, RPM, EPA-Region II, March 29, 1989). However, wildlife may inhabit the site. The elevated concentrations of heavy metals (especially cadmium) found in surficial soils on-site may contribute to an environmental and human exposure pathways if consumable wildlife are exposed to these contaminants, and subsequently bioaccumulate them in their tissues. As indicated above, low concentrations of lead and chromium were found in the sediment from the Delaware River. However, lead and chromium do not appreciably bioaccumulate in fish; hence, it appears that at present the potential for fish in the Delaware River to bioaccumulate site-related contaminants is minimal. Therefore, no significant exposure to contaminated fish appears to be occurring.

Ground Water

Two water-bearing units underlie the study area, a sand and gravel unconfined shallow zone and a fractured shale bedrock deep aquifer. The deep aquifer is considered the most productive water-bearing unit in the study area. It appears that the private and municipal wells withdraw water from this aquifer. An impermeable shale layer, which confines the deep aquifer, exists in some areas of the study area. However, these impermeable layers probably do not exist in areas of fractured bedrock. Hence, a hydraulic connection may exist between the aquifer units; however, this has not been definitively established. Ground water flows to the west in the shallow aquifer; however, the direction of flow in the deep aquifer was not determined during the RI. The relationship between the Delaware River and the aquifers underlying the study area was also not definitively established. Hence, it cannot be determined if ground water is discharging contaminants to the Delaware River. In addition, the effect of the pumping of the nearby deep aquifer municipal well on contaminant movement has not determined.

Elevated concentrations of volatile organic compounds (VOCs) and heavy metals were detected in on-site (DeRewal site) ground water from the shallow and deep aquifers. Polycyclic aromatic hydrocarbons (PAHs) were not detected in ground water on-site or near the Pinkerton Dump site. No ground water monitoring wells have been installed at the Pinkerton Dump site to characterize the ground water medium. The only appreciable concentrations of apparent site-related contaminants (i.e., lead at 8.6 ug/L) were detected in ground water from one residential well near the Pinkerton Dump. In addition, sodium (which may not be site-related) was detected in appreciable concentrations in water from one residential well near the Pinkerton Dump. No monitoring data for ground water from the municipal well was collected during in the RI. However, the New Jersey

Department of Environmental Protection (NJDEP) will be monitoring the municipal well twice a year for at least two years. NJDEP is planning to monitor the municipal well water for VOCs and heavy metals (Personal Communication, Lawrence Granite, RPM, EPA-Region II, April 12, 1989). In addition, the NJDEP will be monitoring some private wells in the study area. However, specific information on the number of private wells to be monitored, the frequency of monitoring, and the analysis to be performed on the well water has not been determined (Personal Communication, Lawrence Granite, RPM-EPA, April 12, 1989).

Based on current monitoring data, exposure to lead and sodium may be occurring via ingestion of contaminated ground water from private wells. Because of the lack of monitoring data for the water in the municipal well, the potential human exposure pathways associated with the use of this water cannot be evaluated. In addition, since the potential exists for the migration of appreciable concentrations of site-related contaminants in the fractured deep aquifer to the private or municipal wells, then the potential exists for additional exposure to site-related contaminants by users of private or municipal well water in the study area.

Soils

Elevated concentration of heavy metals and PAHs were detected in surficial soils from the study area. Hence, the potential exists for oral (ingestion), dermal, and/or inhalation exposure to heavy metals (see air pathway discussion above), detected in surficial soils, by on-site residents or trespassers (especially children) onto the DeRewal or Pinkerton sites.

Evaluation and Discussion

Because of the potential environmental and human exposure pathways indicated above, the following public health implications are warranted:

(1) Air

The concentrations of hexavalent chromium (Pinkerton Dump) and cadmium (Derewal site) may pose an additional carcinogenic risk for long-term inhalation exposure (especially hexavalent chromium) to heavy-metal-contaminated dusts. In addition, the concentrations of lead and copper (both sites) may pose an additional non-carcinogenic risk for long-term inhalation exposure (especially lead) to heavy-metal-contaminated dusts. However, inhalation exposure on-site is expected to be only intermittent because of vegetative cover. The public health implications of inhalation exposure to lead are presented in the Ground Water and Soils Sections below.

(2) Consumable Biota

The concentrations of heavy metals in surficial soils (especially cadmium) may constitute a significant health concern if humans consume plants and animals which may have bioaccumulated these heavy metals in their tissues. However, as indicated above, presently there are no consumable plants grown on-site, and the extent of bioaccumulation of site-related contaminants by consumable animals (i.e., wildlife) cannot be determined without additional information and monitoring data. The following cadmium discussion is presented to indicate the potential health effects that may occur if land use is altered in the future.

Cadmium

Plants that are grown in cadmium-contaminated soil are capable of absorbing cadmium through their roots and translocating it throughout the plant. In an experimental study, food plants were grown on soil that had been treated with cadmium-containing sludge. When grown in a soil containing 10 ppm cadmium, the cadmium content of seeds from corn, wheat, and soybeans was 1.4, 5.8 and 10.7 ppm, respectively (Bingham et al., 1975).

The use of plants containing high concentrations of cadmium for animal feed may result in cadmium accumulation in the animals, particularly in the kidneys and liver. Human consumption of these organ meats could thereby result in exposure to cadmium which if found in elevated levels may pose a health concern.

The human ingestion of cadmium is of concern because of its potential for causing damage to the kidneys. The chronic ingestion of cadmium leads to its accumulation in the kidneys. When the cadmium concentration in the kidneys exceeds 200 micrograms per gram (ug/g or parts per million), damage to the renal proximal tubules may result.

In addition, it has been suggested that cadmium may contribute to hypertension in humans. However, epidemiological and experimental studies have not provided unequivocal evidence for such an effect.

(3) Ground Water

As indicated above, based on current monitoring data, exposure to sodium (which may not be site-related) and lead may be occurring via ingestion of contaminated residential well water. Since the potential exists for the transport of appreciable concentrations of heavy metals and VOCs to private or municipal supply wells at or near the study area, the potential exists for significant exposure to contaminants at concentrations of long-term and possibly acute public health concern. The following discussion is presented to indicate the public health concerns of ingestion of lead and sodium from residential well water and the potential exposure to aluminum, found in on-site ground water monitoring wells, by a sensitive subpopulation.

Lead

Lead concentrations detected in water from one residential well and in on-site ground water exceeded EPA's Proposed Maximum Contaminant Level (PMCL) of 5 ppb. The EPA has established this PMCL for drinking water, at the point where the water enters the municipal distribution system. It is important to note that this PMCL's pertain only to drinking water, and that health effects resulting from chronic exposure to lead in domestic water supplies are further compounded by incidental oral, dermal, and inhalation exposures as a result of activities such as showering, bathing, and cooking. The current MCL (Maximum Contaminant Level) for lead in water is 0.05 mg/L (milligrams per liter), or 50 ppb. Although exposures of this sort vary considerably depending on individual life-styles and situations, each of these exposure routes nonetheless contributes to the overall body burden of lead, and thus increases the potential for chronic (long-term), lead-induced health effects.

Chronic exposure to elevated lead levels produces a variety of toxic sequelae, with the most consequential effects being neurological, renal and hematological. Neurological effects consist of peripheral neuropathy, characterized by degeneration of sensory and motor nerve function, and encephalopathy, characterized by a wide range of alterations in the morphology and function of the brain and spinal cord. The neonate and young are particularly sensitive to lead-induced encephalopathy, with clinical effects ranging from subtle deficiencies in learning ability to frank ataxia, stupor, coma and convulsions. Renal effects resulting from excess lead exposure consist of reversible tubular dysfunction (primarily as a result of acute lead exposure), and chronic interstitial nephropathy (primarily as a result of chronic exposure). Hematological effects range from subtle effects on a variety of enzymes necessary for heme synthesis, to frank microcytic anemia.

Sodium

The concentration of sodium (which may not be site-related) was detected at 37,800 ug/L (37.8 mg/L) in one residential well. The American Heart Association recommends sodium concentrations in drinking water not exceed 20 mg/L for sensitive populations. Oral exposure by receptors who are hypertensive and/or on low sodium diets, as a result of such disorders as kidney disease, congestive heart disease, or hyperthyroidism, are the potential sensitive receptors of concern.

Aluminum

Aluminum in ground water sampled in deep and shallow monitoring wells from the Derewal site was detected at maximum concentrations of 885 ug/L and 8,750 ug/L, respectively. Currently, there is no Federal guidance regarding aluminum concentrations in water supplies, although guidelines are scheduled to be established in August 1989, with a standard scheduled for promulgation by 1991.

In general, aluminum is relatively nontoxic and at the concentrations found at this site is not likely to be a public health concern. However, for individuals on kidney dialysis, the levels of aluminum detected in ground water at this site could pose a health concern unless certain precautions are taken. Some nephrologists believe that levels of aluminum above 50 ug/L may lead to dialysis dementia, osteomalacia fractures and myopathy. There is some evidence to support this association. Therefore, nephrologists have recommended that water being used for dialysis be prepared by softening, followed by treatment with reverse osmosis and then deionization to reduce aluminum concentrations (DWH, 1982).

(4) Soils

Except for lead, the concentration of heavy metals and PAHs found in surficial soil samples from the study area do not appear to constitute a public health concern via oral (incidental ingestion). Maximum levels of lead detected in on-site surficial soils are greater than the maximum level for lead typically found in U.S. soils and are also greater than the ATSDR Advisory Level of 500-1,000 mg/kg, indicative of a potential increase in the blood lead level of children via ingestion and inhalation of contaminated soils and soil dusts (ATSDR, 1988). This level of concern in soil is derived from exposures of children to lead-contaminated residential soils.

ATSDR has prepared, or will prepare, Toxicological Profiles on the site contaminants (with the exception of aluminum and sodium) noted above.

Conclusions

This site (including Pinkerton Dump) is of potential public health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Environmental and Human Exposure Pathways Section above, human exposure to lead and sodium (which may not be site-related) may occur, may be occurring, and may have occurred via ingestion of residential well water. Human exposure to lead in on-site surface soils may occur, may be occurring, or may have occurred via oral (ingestion) and inhalation exposure to soils and soil dusts although inhalation exposure on-site. In addition, inhalation exposure to other heavy-metal- contaminated dusts at both sites may constitute a health concern for long-term exposure. However, inhalation exposure on-site (not Pinkerton Dump) appears to be only intermittent because of the presence of vegetative cover. Intermittent exposure to children who play on the site may occur when soils are disturbed.

Recommendations

(1) Consider periodic monitoring (at least on a quarterly basis) of water from private and municipal (raw and finished water) wells, that could potentially be affected by the site-related contaminants, in order to

evaluate the potential human exposure associated with their use. As previously indicated, monitoring of municipal and private well water in the study area will be performed by the NJDEP. Monitoring for VOCs and heavy metals is being planned for the municipal well water—analyses for the private well water has not been determined. Because of the presence of other contaminants (i.e., PAHs) in soils from the study area, the potential exits for migration of these contaminants into ground water. Although the potential for PAH migration is slight, because of the tendency of PAHs to remain immobile in soils, periodic monitoring of the municipal and private well water for the Hazardous Substances List (HSL) compounds should be considered in order to protect public health.

(2) Consider exposure point ambient air monitoring for particulates at the Pinkerton Dump site, under varying metereological conditions, in order to evaluate the potential for inhalation of heavy-metal-contaminated fugitive dusts. Inhalation exposure by the any residents near the Pinkerton Dump site is of particular importance because the concentrations of heavy metals in surficial soils may be of concern to human health with long-term exposure.

(3) Consider performing a wildlife consumption survey and monitoring of consumable animal tissue (i.e, wildlife) in order to characterize the public health implications posed by the potential ingestion contaminated consumable wildlife.

(4) Because of the presence of elevated levels of cadmium in on-site soils, and because cadmium has been shown to bioaccumulate in biota, no crops or gardens (i.e., containing edible plants) should be placed on-site.

(5) Institutional controls should be considered to prevent future use of contaminated aquifers as sources of drinking water supplies in areas of known ground water contamination until remediation has reduced concentrations below levels of health concern.

(6) Further environmental characterization and sampling of the site and impacted off-site areas should be designed to address the environmental and human exposure pathways discussed above. When additional information and data become available, such material will form the basis for further assessment by ATSDR as warranted by site-specific public health issues.

<u>Preparer of Report</u>

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