

Public Health Consultation

MAYWOOD CHEMICAL COMPANY SITE

Radiological and Chemical Contaminants on the Sears Property and Adjacent Area

Federal Programs Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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BACKGROUND AND STATEMENT OF ISSUES

The U.S. Environmental Protection Agency (EPA) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) comment on the public health implications of the radiological and chemical contaminants found on the Sears property and on an adjacent area in Maywood, New Jersey [1]. Also, ATSDR was asked to provide a public health opinion as to the necessity of restricting public access to these properties.

The Sears property and the adjacent area are bounded on the north by property owned by the Stepan Chemical Company (formerly the Maywood Chemical Company), on the west by Route 17, and on the east by residential property located between the DeSaussure property and Maywood Avenue (figure 1). To the south the land is used for light industry [2]. The borough of Maywood is supplied with municipal water from Hackensack, New Jersey, and no private wells are being used for drinking water purposes on this property [3].

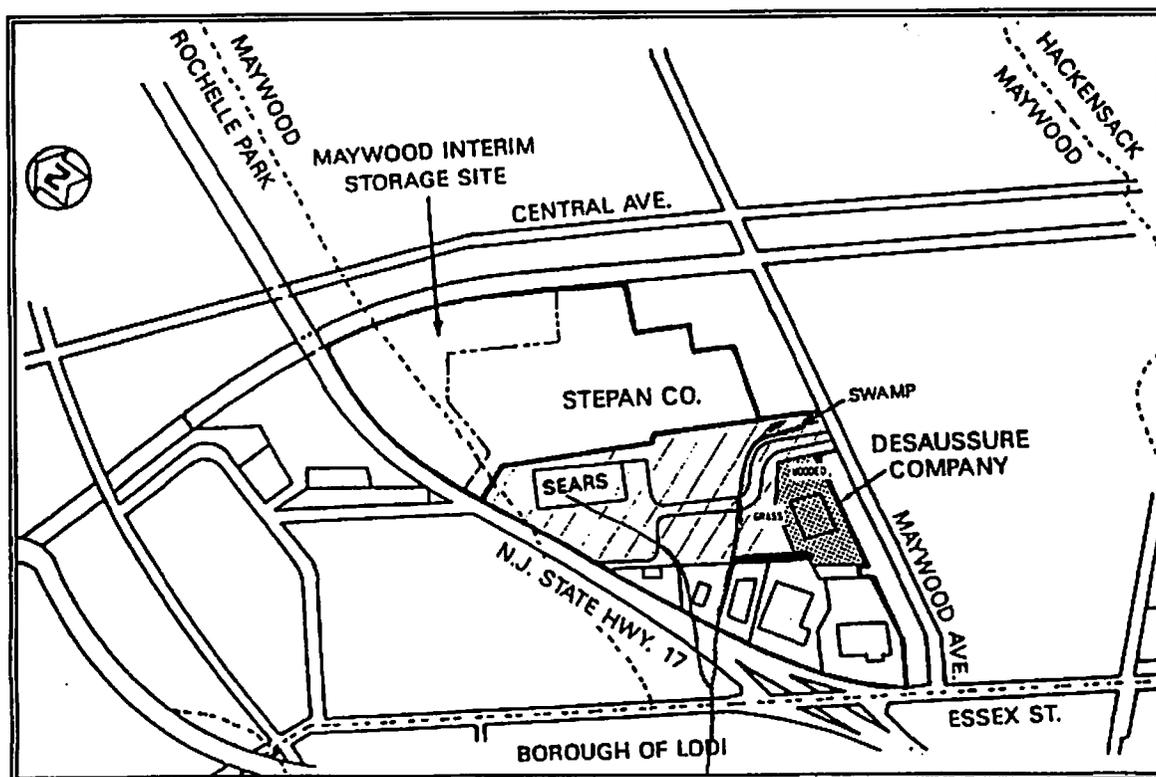


Figure 1 Sears Property and Adjacent Area

From 1916 until 1959, the Maywood Chemical Company extracted thorium and rare earth metals from monazite sands for the manufacturing of gas lantern mantles. The company also produced other chemical compounds. Process waste was disposed of on site. Contaminants were spread to neighboring properties when the waste products were used as mulch and fill dirt and by apparent migration associated with the drainage of Lodi Brook. The Sears property and adjacent area along with other commercial and governmental properties, the Stepan Chemical Company property, DOE's Maywood Interim Storage Site (MISS), and contaminated residential properties are the operable units that comprise the Maywood Chemical Company (MCC) site. The MCC site was listed on EPA's National Priorities List (NPL) in 1983. It is located in Bergen County, New Jersey, approximately 13 miles northeast of Newark, New Jersey [2].

The Sears property and adjacent area cover approximately 40 acres and include a wooded area, a swampy area and creek, a grassy area between the DeSaussure Manufacturing Plant (furniture manufacturer) and the Sears Distribution Center, a drainage ditch to the southwest of the DeSaussure plant, a large paved parking area and truck loading area, and the Sears and DeSaussure buildings. Between 200 and 250 persons work 40 hours per week at the Sears Distribution Center [4], and it is estimated that less than 50 persons are employed at the DeSaussure Manufacturing Company. Lodi Brook flows approximately 1.8 miles southwest from this property through Lodi, New Jersey, remaining underground for most of its length before joining the Saddle River [2].

During a site visit on July 20-24, 1992, ATSDR's representatives observed that the Sears property was fenced, but the gates were open during the day making the property accessible to employees and the public. The adjacent area including the DeSaussure property was unrestricted. Approximately five adults were observed eating their lunch while sitting on the grassy area west of the DeSaussure plant and by the drainage ditch southwest of the DeSaussure plant. Most of the Sears property and adjacent area are paved and well vegetated. Tall grasses and cattails were growing in the creek and swampy area, and apple trees grew next to the road between the wooded area and the creek. Two adults were observed picking and cutting vegetation (mainly cattails). No children were observed playing in the unrestricted areas.

The radiological (and chemical, if related to the thorium extraction process) characterization of the site is being performed by the U.S. Department of Energy (DOE). The chemical characterization (not related to the radiological processes) is being conducted by a contractor for Stepan Chemical Company. EPA is overseeing both projects.

Soil, sediment and surface water data, direct gamma exposure rate measurements, and borehole gamma logging results from documents used as the basis for DOE's Remedial Investigation Report for the Maywood Site and for Stepan Company's Draft Remedial Investigation Report were evaluated during the development of this health consultation. Environmental samples were collected and analyzed by Bechtel National, Inc. and its subcontractors for DOE and by CH2M Hill and its subcontractors for Stepan Company.

Samples were analyzed for volatile and semivolatile organic compounds, pesticides, polychlorinated biphenyls, metals, cyanide, and radionuclides (thorium-232, radium-226, and uranium-238). No information on vegetation samples was available for this consultation.

The gamma exposure rate measurements and the 0-6 inch downhole gamma loggings on the DeSaussure property indicated that the drainage ditch southwest of the plant had the highest surface contamination on the DeSaussure property. The maximum surface gamma exposure rate in the area of the ditch was recorded as 146 microrentgens per hour ($\mu\text{R/hr}$). (The normal background gamma rate for the Maywood area is $9 \mu\text{R/hr}$.) Six soil samples, collected from 0 to 6 inches by the drainage ditch, were analyzed for thorium-232, radium-226, and uranium-238. The results are given in Table 1. Twelve surface soil samples were collected on the Sears property; however, the results were not higher than the maximum results at the ditch. Elevated surface gamma rates were also recorded on the northwest side of the DeSaussure plant at $34 \mu\text{R/hr}$ and on the north side of the plant at $76 \mu\text{R/hr}$ [5].

Table 1: Composite Soil Samples (0-6") Collected Near Drainage Ditch Southwest of DeSaussure Plant in picocuries/gram (pCi/g)

Sample Name	Thorium-232	Radium-226	Uranium-238
Background	1.0	1.0	(not given)
#1	61.1 ± 4.7	5.3 ± 0.8	< 12.0
#2	102.7 ± 11.8	7.2 ± 1.5	80.0 ± 15.6
#3	59.1 ± 11.4	5.4 ± 1.4	< 8.0
#4	107.2 ± 14.6	12.9 ± 1.6	< 13.0
#5	123.3 ± 13.1	10.9 ± 1.1	< 20.0
#6	124.3 ± 18.5	10.1 ± 1.0	9.3 ± 8.3
[5] Bechtel National, Inc. Radiological Characterization Report for the DeSaussure Property, Maywood, New Jersey. September 1989.			

Borehole gamma loggings were performed on the Sears and DeSaussure properties with readings recorded every six inches to a maximum depth of 15 feet [4,5]. Subsurface contamination exists on most of these properties. The highest concentrations of radiological contaminants appear to be at depths of six inches to five feet on the south and southwest portion of these properties and from two to six feet under the Sears warehouse. Subsurface soil samples showed the maximum concentration of thorium-232 (180 pCi/g) and radium-226 (37 pCi/g) at 4 to 5 feet beneath the Sears warehouse and the maximum concentration of

uranium-238 (232 pCi/g) at 3 to 4 feet under the grassy area near the drainage ditch [4,5].

Gamma exposure rate measurements and radon measurements were also made inside the Sears warehouse. The gamma exposure rates in the warehouse ranged from 11 to 15 μ R/hr [4]. Radon/thoron measurements were made in two different locations of the Sears warehouse in the summer of 1986. Also, in 1986, radon measurements were made before, immediately after, and 72 hours after drilling through the floor of the Sears warehouse to obtain soil boring samples from beneath the facility. The results showed the following:

Table 2: Radon measurements in Sears warehouse in picocuries per liter (pCi/L)

METHOD	LOCATION	RESULTS (pCi/L)
Lucas Cell (predrilling)	Emp. washroom	2.2
Lucas Cell (predrilling)	Supervisor's office	0.6
Radon Pylon (predrilling)	Borehole locations in warehouse	0 - 0.9
Pylon (Immediately after drilling)	Borehole locations	5 - 30
Pylon (72 hrs. after drilling)	Borehole locations	50 - 300 *

* NOTE: Concentrations returned to background levels after the holes were sealed.

[4] Bechtel National, Inc. Characterization Report for the Sears Property, Maywood, New Jersey. May 1987.

During the fall and winter of 1986 and 1987, the New Jersey Department of Environmental Protection and Energy sampled homes in New Jersey for radon levels, and the average result was 5.2 pCi/L. In Bergen county the average result was 1.81 pCi/L, with a range of 0.3 to 19.1 pCi/L [6]. EPA has established a guideline for radon concentrations of 4 pCi/L as a goal for residential structures [7].

Soil boring samples from the Sears and DeSaussure properties were analyzed for organic and inorganic chemical contaminants [8]. The maximum concentrations of contaminants detected in 0 - 2 foot soil boring samples from the grassy area between the Sears and DeSaussure properties were reported to be: chromium - 1360 parts per million (ppm), arsenic - 90.1 ppm, and lead - 883 ppm. Lithium was also detected in these 0 - 2 foot soil boring samples at concentrations as high as 691 ppm. On the eastern corner of the Sears property (in a swampy area), soil boring samples contained total polyaromatic hydrocarbons (PAHs) at a

maximum concentration of 46 ppm. The concentration of carcinogenic PAHs in this sample was 18.2 ppm.

Test pits (0 - 8 feet) were dug with a back hoe in areas with magnetic anomalies [8]. Drums and drum remnants were uncovered in some of these test pits. Field monitoring detected organic vapors in the test pits at concentrations in excess of 1,000 ppm (OVA meter). Material recovered from buried drums contained volatile organic chemicals (VOCs) at concentrations as high as 19,920 ppm. Specific VOCs identified in waste material from the drums included xylene, 1,2-dichloroethylene, benzene, and carbon tetrachloride.

Surface water and sediment from the drainage channel on the eastern corner of the Sears property were analyzed for chemical contamination [8]. Lead was detected in surface water at a maximum concentration of 184 parts per billion (ppb), and total PAHs were detected in sediment at a maximum concentration of 35 ppm.

A blue-gray, silt-like material was found on the surface of the wooded area of the DeSaussure property. The material was analyzed by x-ray diffraction and identified as being hydrous calcium sulfate (gypsum) [9].

DISCUSSION

Human contact with contaminated surface soils could result in inadvertent ingestion of small quantities of soil during eating, smoking, and other hand-to-mouth activities. Direct gamma exposure from radiological contaminants in the soil would contribute to external radiation exposure doses. Inhalation of suspended dusts could also account for smaller exposure doses. However, most of the property is either paved or well vegetated, and very little suspended dust would be expected except during construction activities or excavation. Skin contact with contaminated soil could result in dermal absorption of PAHs, but metallic and radiologic contaminants would not be appreciably absorbed through intact skin.

Elevated concentrations of metals were detected in soil samples (at depth of 0 - 2 feet) on the Sears property and adjacent area. The area where this contamination is found is covered with grass and is not fenced. This is the same general area where maximum radiological contamination is found. The use of this property is limited mainly to on-site workers who may eat lunches in the area; however, children may infrequently access the area also. Assuming exposure to the maximum concentrations of chemical and radiological contaminants occurs for one hour per day, five days per week, and 50 weeks per year, the chemical and radiological contamination of the soil would not pose a public health hazard. The maximum radiation exposure expected from incidental ingestion of this soil and from direct gamma radiation would be less than 40 mrems/year. This is less than half the exposure limit for the general population as recommended by the International Commission on Radiological Protection [10].

The lithium concentration in on-site soil [≤ 691 mg. of lithium/kg. of soil (≤ 691 ppm)] significantly exceeds normal background soil levels (5 - 200 mg. of lithium/kg. of soil). The presence of lithium contamination may be related to the previous production of lithium tablets at the Maywood Chemical Works. Lithium occurs naturally in many plant and animal tissues, and dietary intake is about 2 milligrams a day [11]. Therefore, it is unlikely that incidental ingestion of lithium-contaminated soil would significantly increase lithium intake above normal dietary levels and would not pose a public health hazard.

High concentrations of thorium-232, radium-226, uranium-238, and VOCs were detected in the subsurface test pits and soil boring samples. Since there is no direct human contact with contamination in the test pits, it does not currently pose a public health hazard. However, the radioactive decay of thorium-232, radium-226, and uranium-238 produces radon-220 and radon-222 gas. During construction activity or during the installation of underground utility lines, radon and VOCs, that are heavier than air, could accumulate in holes and trenches. Also, contaminated soil could be suspended and inhaled during these activities. These exposures could pose a public health hazard to unprotected workers who enter the excavated areas.

Radon and VOCs could migrate through the soil and enter the Sears warehouse if a pathway through the foundation was created. Evidence of this occurring was demonstrated when soil boring drill holes were made in the Sears building in the summer of 1986. Within 72 hours the radon level near the boreholes in the warehouse reached between 50 and 300 pCi/L; however, the radon concentrations returned to background levels after the boreholes were sealed. A radon concentration of 300 pCi/L is a level that could significantly increase the risk of cancer if chronic exposure occurred [12]. Indoor radon concentrations can vary with the season of the year and with the indoor-outdoor air exchange rate. No seasonal radon monitoring data were available. Also, no monitoring data were available for VOC concentrations in the warehouse.

Although the outdoor surface gamma rates were elevated above background levels on the north ($76 \mu\text{R/hr}$) and northwest ($34 \mu\text{R/hr}$) side of the DeSaussure plant, the gamma rate and radon measurements made inside the building and the subsurface soil samples from under the plant do not indicate the presence of radiological contaminants that would cause any health concern for the employees working inside the building. Also, under current use conditions, the outdoor surface gamma rates would not pose a health concern to individuals frequenting the area [5].

PAHs were detected in surface soils from the eastern corner of the Sears property. Elevated concentrations of lead in surface water and PAHs in sediment were also detected in the drainage channel that runs through this area. This contamination is not likely to pose a public health hazard since the surrounding area is swampy and contact with the contamination is expected to occur infrequently.

The blue-gray material on the surface of the DeSaussure property was identified as calcium

sulfate (gypsum). Gypsum is nontoxic and human contact with this material would not pose a public health hazard.

Since no private wells on this property are being used for drinking water purposes [3], ingestion of groundwater is not currently a route of concern.

CONCLUSIONS

1. Future excavation or soil disturbing activities on the Sears property and adjacent area could expose unprotected workers to VOCs and radon in the air and to radiological and chemical contaminants in the soil at levels of health concern.
2. VOCs and radon may migrate through the soil into the Sears building if a pathway is created and could lead to indoor air exposures at levels of health concern.
3. Under current use conditions, surface soil contamination at the Sears property and adjacent area does not pose a public health hazard to incidentally exposed members of the public. Therefore, access control is not recommended under current use conditions.

RECOMMENDATIONS

1. Take suitable precautions during on-site excavations to protect workers and the surrounding populations. All digging, excavating, remediating and removal activities on the Sears property and adjacent area should be conducted with strict adherence to the applicable National Institute for Occupational Safety and Health (NIOSH) recommendations, the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations cited in Title 29 Code of Federal Regulations (CFR), Parts 1910, Standards for General Industry, and 1910.120, Hazardous Waste Operations and Emergency Response, and the U.S. Nuclear Regulatory Commission regulations cited in Title 10 CFR Parts 19 and 20 (or comparable DOE requirements). In certain instances, 29 CFR 1926, Standards for Construction Industry, may apply. Appropriate dust control measures should be taken to minimize potential exposures of workers and the public.
2. Monitor for radon and VOCs in indoor air in the Sears warehouse, particularly during periods of reduced indoor-outdoor air exchange.

The interpretation, conclusions, and recommendations provided are based on the data and information referenced. Additional data could alter those conclusions and recommendations. The conclusions and recommendations are site-specific and should not be considered applicable to any other situation.

If any additional information becomes available or if any clarification is needed, please do not hesitate to contact this office at (404) 639-6068.

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