

Health Assessment for

LODI MUNICIPAL WELDFIELD

CERCLIS NO. NJD980769301

LODI, NEW JERSEY

JUN 20 1990

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

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, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

**HEALTH ASSESSMENT
LODI MUNICIPAL WELLFIELD
BERGEN COUNTY
LODI, NEW JERSEY**

Prepared by:
Division of Science and Research
New Jersey Department of Environmental Protection (NJDEP)
and
Environmental Health Service
New Jersey Department of Health (NJDOH)

Prepared for:
Agency for Toxic Substances and Disease Registry (ATSDR)

BACKGROUND

The Lodi Municipal Wellfield consists of eleven municipal wells located in the Borough of Lodi, Bergen County, New Jersey. Significant levels of volatile organic compounds (VOC) have been detected in all the wells. In addition, analysis revealed one well site with radiological contamination. Tap water obtained from two commercial businesses in Lodi, along with a private well, were also found with high levels of radionuclides. Consequently, these public wells which provided Lodi with its drinking water supply were individually closed down over a six year period. By June of 1987, all the municipal wells were permanently closed.

The Borough is now connected to alternative water supplies provided by outside purveyors. The wellfield has been placed on the National Priorities List for Superfund. The sources of both the VOC and radiologic contamination are presently unknown though several local industries are under investigation. As part of the Environmental Protection Agency's lead operations, the work plan for Phase I of the Remedial Investigation (RI) has just been completed. The study area included in the RI encompasses the entire Borough of Lodi in order to cover the most likely sources and extent of contamination.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. On-Site Contamination

As Figure 1 (appended) indicates, the Lodi site wells are named by their street addresses; Arnot Street, Columbia Avenue,

Garfield Avenue, Corabelle Avenue, Home Place, Kimmig Avenue (4 wells), Lawrence Avenue and Terrace Avenue. While two of these wells were abandoned shortly after construction in the 1920s because of insufficient water draw, the remaining wells continued supplying Lodi with its drinking water until the early 1980s. Additionally, there are numerous private wells used by Lodi residents as a source of drinking water. A number of different volatile organics have been found in the public and/or private wells of Lodi at levels which exceed federal or state standards. The most frequently detected contaminants in the Lodi municipal wells were trichloroethylene, tetrachloroethylene, and carbon tetrachloride.

Table 1 indicates the range of volatile organic contamination levels detected in any one of these underground water sources. High levels of volatile organic contamination have also been detected in the tap water supplies of several commercial establishments. These detectable values are compared to applicable New Jersey standards. All data were collected between 1981 and 1987 by the New Jersey Department of Environmental Protection, the NJ Department of Health, the Lodi Water Department, outside consulting firms, or the US Department of Energy.

Table 1: Range of Contamination Detected in Lodi Water Wells and the Applicable or Relevant and Appropriate Requirements (ARARs)

CONTAMINANT	RANGE DETECTED (ug/l)	ARARs (ug/l) (1)
Carbon tetrachloride	ND - 49.0	2
Chlorobenzene	ND - 200.0	4
1,2-Dichloroethane	ND - 3.34	2
trans-1,2-Dichloroethene	ND - 220.0	10
Methylene chloride	ND - 4.7	2
Tetrachloroethylene	ND - 32.0	1
Trichloroethylene	ND - 324.0	1
Total Trihalomethanes	ND - 115.8	100

ND = nondetectable Footnotes:

(1) ARARs are from N.J.A.C. 7: 10.5.1 et seq. and 7:10-16.7

Elevated levels of gross alpha and beta radiation have been detected in several of the well sites and in a few samples taken from the tap water at commercial establishments located in Lodi. The alpha contamination is attributed primarily to uranium isotopes (U-234, U-235, U-238) and Radium-226 which may have been a result of either manmade or natural sources. The sites where radiologic contamination exceed existing federal Safe Drinking Water Act (SDWA) standards are listed in Table 2.

Table 2: Radiologic Contaminants in the Lodi Area Water Supplies

Water Site	Range of Gross Alpha Contamination (pCi/L)	Federal SDWA Standard (pCi/L)
PUBLIC WELL(a)	ND - 150 +/-50	15
PRIVATE WELL(b)	ND - 210 +/-105	15
COMMERCIAL TAP(c)	10.2 - 51 +/-32	15

Footnotes: a) Sample dates were between 9/13/83 and 7/15/84; b) Analysis of Inmont Chemical Co. Monitoring Well, 7/15/84; c) Analysis of the tap water at a commercial eating establishment in Lodi, 7/15/84.

Air and soil media samples have not yet been collected as part of the investigation. The local surface water has not been tested for organic chemical contamination. The United States Army Corp of Engineers and the United States Geological Survey conducted limited sampling of the Saddle River, which flows from the northeast to the southwest through the center of the town, and detected high levels of ammonia, oil and grease, and mercury (RI/FS Interim Report, 1987). As part of another Superfund Remedial Investigation (the Maywood Chemical Co. site) the river was also analyzed for radionuclide contamination -- Th-226, Ra-226, U-235, and U-238 -- but all results were below detection levels.

B. Off-Site Contamination

Because of the site's underground pollution problems, off-site contamination can potentially occur via the migration of groundwater. Since neither the Lodi regional ground water flow has been characterized nor has the contamination source been identified, it is difficult to determine the extent of off-site migration that has occurred. Volatile organic compound contamination has also been detected in municipal wells in surrounding communities, including Garfield, Maywood, and Rochelle Park. The RI will include off-site analysis of wells located in these nearby towns which are both upgradient and downgradient of Lodi.

C. Quality Assurance/Quality Control

Most of the data on volatile organic contamination has no quality assurance/quality control information though most of the testing should have been under the A-280 certified laboratory requirements. Limited QA/QC information was available for the Lodi radiological data. The margin of error reported by radiologic analysis was often very large. In some

cases, the margin of error was listed as greater than 100%, indicating that the data may be questionable. Data was collected and analyzed by many different state agencies, divisions and laboratories along with outside contractors over a 8-9 year period. Because of the lengthy testing period and the possible methodologic differences in sampling and testing procedures, the data is also limited in its comparative purposes.

D. Physical Hazards

Since this site is associated primarily with groundwater contamination problems, there are no apparent physical hazards.

POTENTIAL ENVIRONMENTAL AND HUMAN EXPOSURE PATHWAYS

A. Environmental Pathways

The primary route for environmental contamination is via groundwater. If the contamination source is identified within the Borough of Lodi, there may be possible contamination of the soil. Soil contamination could potentially be pervasive as the area is subject to frequent flooding (the site is located in the low lying flood plains of the Newark basin). There is also a potential for the surface waters in Lodi to be affected by contaminated industrial sites.

B. Human Exposure Pathways

Since Lodi Borough has closed the contaminated wells, the majority of the local population should no longer be exposed to hazardous substances in their water supply. It is reported that some residents and local industries still rely on water supplied from private wells which may tap into the Passaic Member, the aquifer which supplies the Lodi municipal wellfield. These persons may be potentially exposed to contaminated water supplies similar to the levels of volatile organics and radionuclides detected in Lodi's public supply. Exposure can potentially occur through ingestion of drinking water, dermal contact or inhalation during showering and bathing when chemicals can be volatilized. Other nearby townships are also potentially subject to the contamination experienced by Lodi through migration of the contaminant plume in the groundwater aquifer.

Exposure to contaminated surface water is unlikely since the Saddle River or its tributaries are reportably not used by humans for recreational purposes such as swimming or fishing.

Airborne exposure to the listed contaminants is possible due to their volatile nature but because the source of contamination is unknown, this pathway is only speculative. Industries that use large quantities of the contaminated water supply may volatilize contaminants in their industrial processes. In addition, human exposure could occur through direct contact with contaminated soil.

C. Demographics

The Lodi study site covers the entire Borough of Lodi which is approximately 2.29 square miles in size. Based on the 1980 census, the population of this community is 24,000 with a density of roughly 10,461 persons per square mile. Lodi represents a well-developed urban area with 61% land use as high-density residential dwellings, 26% as commercial property, 6% used for industrial purposes and the remaining 7% used for other functions. There is no information on sensitive subpopulations in the area.

COMMUNITY CONCERNS

Review of USEPA's final community relations plan and the summary of NJDEP's public meeting of 3/17/88, identified several major community issues which are associated with the contamination of the Lodi wells. These may be summarized as follows:

Perceived health effects. There is a general feeling that Lodi residents suffer a higher than normal cancer rate due to contamination of drinking water. Cancer rates among females is thought to be especially high. Many residents feel that, as a result of bureaucratic procrastination, the municipal wells were not closed quickly enough, exposing residents to harmful chemicals and resulting in abnormal cancer rates.

Water quality. Residents remain skeptical about the present quality of public water even after the utilization of alternate sources. Complaints of bad taste, particulates and chlorine are common. There is concern among the community as to the effects of the groundwater contamination on the local environment. Residents requested current public water to be tested as part of any RI/FS study to be conducted. (These tests are currently being conducted by EPA's consultant.) In addition, as per the A-280 (amendments to the New Jersey Safe Drinking Water Act) all public water supplies are required to be periodically tested for a specified list of contaminants.

Costs. The closure of Lodi's well system and the current policy of purchasing water from an outside water company have resulted in increased water utility rates. Additionally, residents have stated that purchasing bottled water is a burden upon their income. Lodi citizens have reportedly been approached by water purification system salesmen who cite local water conditions as part of their sales tactics.

Lack of confidence in remediation efforts. There is a lack of confidence in Federal and State Agencies associated with the site. Residents perceive site-related information and planning as deliberately deceptive. There is concern that potential responsible parties (PRP's) have not been identified.

EVALUATION AND DISCUSSION

The only available data characterizing the Lodi Wellfield site is a limited analysis on the chemical and radiologic contamination found in the Borough's public and private wells. These active wells for the Lodi water system were never tested simultaneously so data results inconsistently reflect a seven year time period. Regardless, the data clearly demonstrated the highly contaminated condition of this public water supply. Since these wells are now closed, they pose no immediate health concerns. But local residents and businesses who still rely on private wells for their drinking water supply may be at risk.

Elevated levels for volatile organics were detected in all the public wells located in the Borough of Lodi. Trichloroethylene, tetrachloroethylene and carbon tetrachloride were the most commonly detected contaminants. All three of these compounds have been categorized by the US EPA as probable human carcinogens (Group B2). Laboratory animal testing has reported significant increase of liver neoplasms with trichloroethylene (mouse), carbon tetrachloride (hamster, rat and mouse) and tetrachloroethylene (mouse). In addition, chronic exposure to all three of these volatile organics is associated with liver injury. Liver injury is not likely at the concentrations that were detected.

The remaining contaminants listed in Table 2 -- which were all reported above federal or state standards/recommendations -- were detected in the Lodi wells with less frequency than the previously discussed compounds. Most of these compounds are classified by the US EPA as possible human carcinogens (Group C), with the exception of methylene chloride which is cited by the USEPA as a Group B2, probable human carcinogen. Chronic exposure to chlorobenzene can also result in central nervous system effects along with histologic changes in the human liver

and kidney. Long term exposures to many of these other contaminants are associated with specific organ toxicity; methylene chloride (liver), t-1,2-dichloroethene (liver and kidney), or 1,2-dichloroethane (liver, kidney, lungs, heart and other systems). Damage to the central nervous system and organ toxicity are not likely at the concentrations that were detected.

Radionuclide contamination, specifically Uranium (234,235, and 238) and Radium-226, was also detected in a limited number of wells in Lodi. Ingestion of these radioactive materials can result in toxic effects due to the absorption of the radionuclide and/or irradiation of the gastrointestinal tract. Radium-226 is known to induce bone cancer and carcinomas associated with the respiratory system (mastoid and paranasal air sinuses). Uranium is also considered a human carcinogen, and has been reported to affect the male reproductive capacity. The soluble forms of the Uranium nuclides are associated with liver damage. Liver damage is unlikely at the concentrations that were detected.

The source of contamination has not been identified though independent RIs are ongoing at three facilities within the Lodi region. These include the Hexcel Corporation and the Inmont Corporation in Lodi and the Maywood/Sears property in nearby Maywood, NJ. The Maywood site, which is on the Superfund National Priorities List, has extensive radiologic contamination which has been documented to have migrated off-site. Even though there are uranium deposits in the underlying bedrock it is unlikely that large amounts of uraniumiferous ground water is migrating up-section to contaminate shallow water at Lodi. The Maywood hazardous waste site is a suspected source of radiologic contamination to the Lodi wells.

Still, there is minimal analytical data available on the extent and character of both soil and air contamination in the Lodi area. Since the primary pollutant contributor is presently unknown, this media information is difficult to obtain. Yet in order to conduct an adequate health assessment of the Lodi Wellfield site, all possible routes of exposure to hazardous substances must be evaluated. The present work plan for the Lodi RI is limited in this area because it does not include adequate consideration of potential soil and air contamination at the site.

CONCLUSIONS AND RECOMMENDATIONS

On the basis of the information reviewed, the Lodi Well Site is a potential public health concern because humans may be exposed to volatile organic chemicals and radionuclides at concentrations that may result in adverse health effects. As noted in environmental pathways section and human exposure pathways section above, human exposure to volatile organic compounds and radionuclides may be occurring due to continued use of private wells by a limited number of Lodi and surrounding area residents and definitely occurred in the past via use of contaminated public drinking water supply.

All private well users in the region should be immediately notified about these concerns and have their water supplies tested for possible chemical and radiologic contamination. The present public water supply is periodically monitored under A-280 but more frequent monitoring is required to assure the maintenance of the quality. This monitoring will be done by EPA's consultant during the current RI. Furthermore, the site may be considered by the NJDOH for inclusion in a larger scale retrospective epidemiology study on volatile organic compounds in drinking water. Additional work is needed in characterizing the potentially sensitive subpopulations in Lodi that may be more susceptible to adverse health effects as a result of exposure to contaminated drinking water supply.

While the evidence is not definitive, the Maywood hazardous waste site might be responsible for at least the radiologic contamination detected in the Lodi groundwater supply. A comprehensive groundwater analysis should be conducted in order to determine whether the Maywood site is the primary source of contamination. If it is revealed that the Maywood site is responsible for extensive off-site contamination, immediate action is required by the Department of Energy to initiate clean-up of these facilities in order to minimize further groundwater pollution. In addition, all other sites currently under consideration as potential contaminant sources should be restricted from the public pending their remedial investigations.

Furthermore, the Remedial Investigation undertaken by the EPA should include a thorough investigation of all potential contamination sources in the Lodi region, beyond the three sites presently under review. This should include provisions for analyzing the air and nearby soils of possible contributors to the Lodi groundwater pollution.

In accordance with CERCLA as amended, the Lodi Municipal Wellfield site has been evaluated for appropriate follow-up with respect to health effects studies. Since human exposure to on-site and off-site contaminants has occurred in the past, this site is being considered for follow-up health studies. The site will be considered by NJDOH for inclusion in a larger scale epidemiological study of VOC's in drinking water. After consultation with Regional EPA staff and State and Local Health and Environmental Officials, the Division of Health Studies, ATSDR and NJDOH, will determine if the inclusion of Lodi Municipal Wellfield site in a larger scale epidemiological study or any other follow-up public health actions or studies are appropriate for this site.

This Health Assessment was prepared by the State of New Jersey Departments of Health and Environmental Protection, under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry. The Division of Health Assessment and Consultation and the Division of Health Studies of ATSDR have reviewed this Health Assessment and concur with its findings.

REFERENCES

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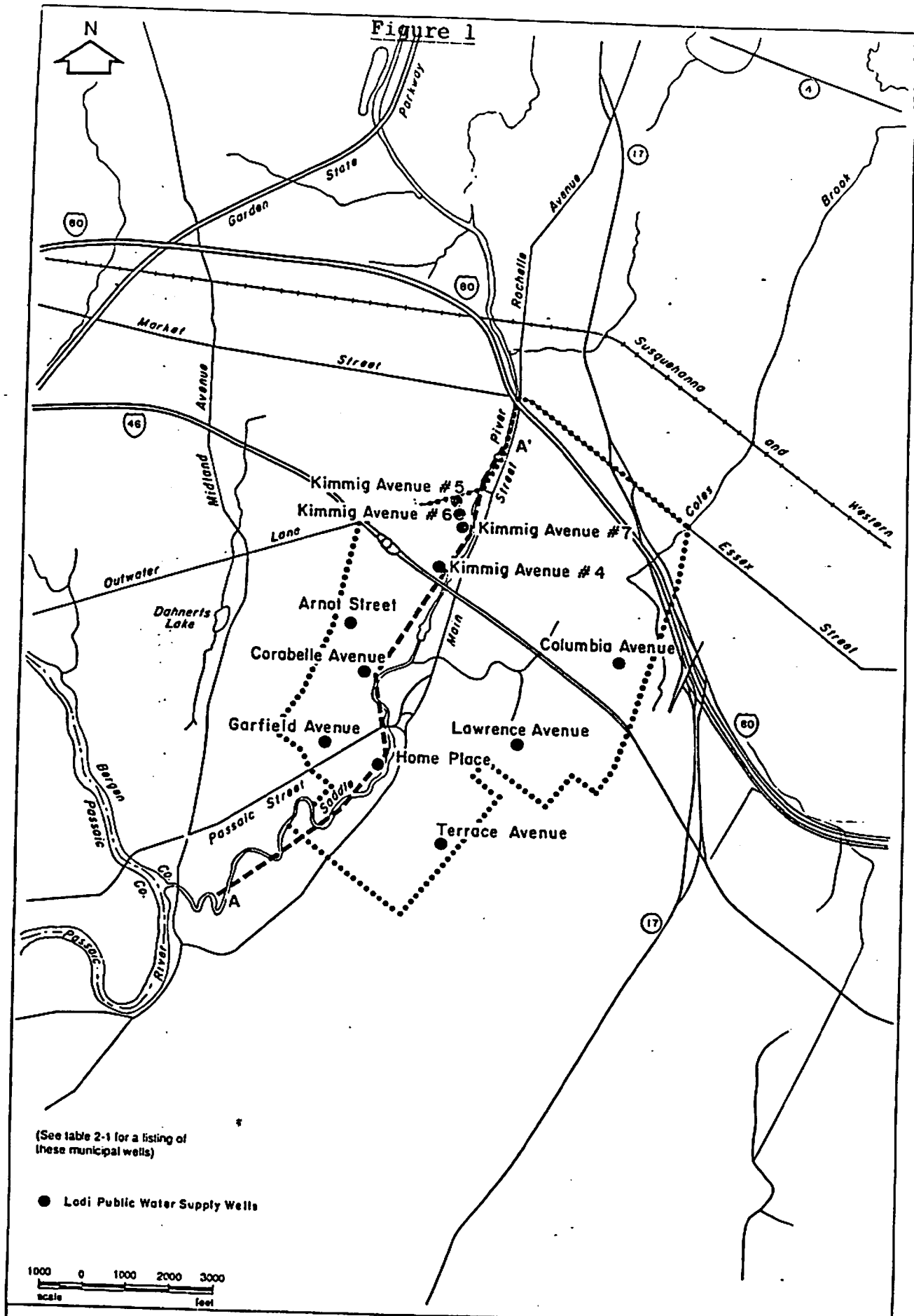
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Memoranda/Letters:

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Technical Coordinator, NJDEP/Bureau of Environmental Evaluation and Risk Assessment (BEERA) Memo to Site Manager, BSM, NJDEP, Review of Draft Work Plan for the Phase I Remedial Investigations at the Lodi Wellfield Site, June 22, 1987.

Letter to Project Manager, USEPA, from Site Manager, NJDEP/BSM, Lodi Wellfields Draft RI/FS Work Plan, June 24, 1987.



CDM

environmental engineers scientists
planners & managers consultants

Figure 1-

Lodi Wellfield Site

Lodi Wellfield