

# Site Review And Update

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**RADIATION TECHNOLOGY, INCORPORATED**  
**ROCKAWAY TOWNSHIP, MORRIS COUNTY, NEW JERSEY**

**CERCLIS NO. NJD047684451**

**APRIL 26, 1995**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES**  
**Public Health Service**  
**Agency for Toxic Substances and Disease Registry**  
**Division of Health Assessment and Consultation**  
**Atlanta, Georgia**

## **Site Review and Update: A Note of Explanation**

The purpose of the Site Review and Update is to discuss the current status of a hazardous waste site and to identify future ATSDR activities planned for the site. The SRU is generally reserved to update activities for those sites for which public health assessments have been previously prepared (it is not intended to be an addendum to a public health assessment). The SRU, in conjunction with the ATSDR Site Ranking Scheme, will be used to determine relative priorities for future ATSDR public health actions.

SITE REVIEW AND UPDATE

RADIATION TECHNOLOGY, INCORPORATED

ROCKAWAY TOWNSHIP, MORRIS COUNTY, NEW JERSEY

CERCLIS NO. NJD047684451

Prepared by

The New Jersey Department of Health  
Under a Cooperative Agreement with  
The Agency for Toxic Substances and Disease Registry

## SUMMARY OF BACKGROUND AND HISTORY

Radiation Technology, Inc. (RTI) is located at 108 Lake Denmark Road, Rockaway Township, Morris County, New Jersey (Figure 1). The site consists of 263 acres of land: RTI utilizes 15 acres; the former Rockaway Industrial Park (RIP) consists of an inactive, partially developed 65 acre tract; and the remaining 183 acres of land is undeveloped and thought to be uncontaminated (Figures 2 and 3). Reaction Motors/Thiokol Corporation conducted rocket testing at the site between 1941 and 1970. Radiation Technology, Inc. purchased the properties in 1970.

Since 1970, Radiation Technology, Incorporated conducted the radiation sterilization of cosmetics, medical products, and spices, production of architectural products, and production and finishing of hardwood flooring. Radiation sterilization is the only activity currently performed at the facility.

The area around the RTI site is rural. The wooded areas surrounding the Radiation Technology site are often used by hunters. However, significant residential and industrial development in the area is taking place. The population within a two mile radius of the site is about 20,000 people. Northwest of the site is the U.S. Military Picatinny Arsenal facility.

There is a major body of surface water, Lake Denmark, 0.1 mile west of the site on Picatinny Arsenal property. Other lakes are significantly further away to the east and southwest. The site is above a superficial overburden layer. Beneath this shallow aquifer is a deep fractured bedrock aquifer. Potable wells tap into either one of these water sources. Sampling has indicated that the superficial and bedrock aquifers are contaminated with VOC's.

Numerous facility and area inspections of the Radiation Technology site were conducted by the New Jersey Department of Environmental Protection and Energy (NJDEPE) and by the Rockaway Township Department of Health, starting in 1980. It was determined that Radiation Technology, Inc. had improperly stored and disposed of waste drums containing solvents and other organic chemicals and radioactive wastes. Two on-site wells were sampled by the Rockaway Township Department of Health in 1981, and the presence of a number of volatile organic compounds (VOC's) were detected. These two wells were subsequently condemned by the New Jersey Department of Health (NJDOH) and by the NJDEPE. The groundwater became contaminated through the improper disposal of wastes via dumping or by the burial of drums containing hazardous wastes by RTI and Thiokol. No elevated radiation levels have been detected in groundwater samples.

In September 1984, the site was placed on the National Priorities List (NPL). Radiation Technology, Inc. signed an Administrative Consent Order (ACO) with the NJDEPE, in March 1987, to fund a Remedial Investigation/Feasibility Study (RI/FS) (6). Phase I of the RI/FS was completed in April 1988 (7). On-site groundwater sampling indicated the presence of VOC's in the groundwater. An interim Remedial Measure (IRM) for the removal of tanks and

contaminated soil is being arranged under a Memorandum of Agreement (MOA) with the primary responsible parties, RTI and Morton Thiokol.

Radiological surveys were conducted within the 15-acre RTI site under the supervision of the Nuclear Regulatory Commission (NRC). Under a NRC directive, 30 barrels of soil contaminated with low levels of radioactivity were removed between August 1990 and February 1991. The NRC is requiring RTI to monitor the groundwater through 1995 for radioactive contamination. The NJDEPE required RTI to remove a leaking underground storage tank containing fuel waste and solvents in July 1990 (8). Under a May 1993 MOA with the NJDEPE, RTI removed tanks, drums, contaminated soil, and sumps. RTI and Thiokol Corporation entered into an ACO to reimburse the NJDEPE for the remainder of the RI/FS and to conduct design and remedial activities for contaminated ground water.

A Health Assessment for this site was prepared by the NJDOH under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) on July 30, 1990 (1). Ingestion was the primary human exposure pathway because potable wells were contaminated with VOC's. The health assessment concluded that the site is of potential public health concern because of the risk to human health resulting from possible human exposure to VOC's through the drinking of contaminated water from potable wells located downgradient and adjacent to the RTI property. Human exposure probably occurred in the past via drinking water from two on-site wells prior to their condemnation in 1981. The health assessment also concluded that potential human exposures may result from dermal absorption and/or inhalation from cleaning or showering activities or home garden irrigation. Exposure routes could include ingestion of contaminated crops and ingestion of contaminated soils by children. Also, human exposure could result from consuming contaminated fish caught in Lake Denmark.

The health assessment identified the following community health concerns: 1) The threat to the water quality of Lake Denmark by contaminants originating at RTI; 2) The impact on new development in the area which relies on potable wells for the water supply; 3) The effectiveness of charcoal filters provided by the Rockaway Township Health Department to residents of the Lake Telemark Development; 4) Related questions were expressed concerning dermal and pulmonary absorption of VOC's through showers and other water use where filters were not provided; and 5) A desire to participate in the review of remediation options recommended in the FS. (1)

Public health concerns focused on: 1) Residents using VOC contaminated well water may have had a sufficient dose to result in adverse health effects; and 2) Nearby residents who still use private wells may be at risk.

It was recommended (1) that further environmental characterization and sampling of the groundwater, Lake Denmark surface water and sediments, and soil be conducted to determine the impact on on-site and off-site areas in regards to environmental and human exposure pathways. Further sampling for VOC's was recommended for additional residential wells downgradient and adjacent to the site (9).

## CURRENT SITE CONDITIONS

On February 28, 1994, a site visit was conducted by Howard Rubin, Ph.D. of the NJDOH and the Health Officer from Rockaway Township. The site consisted of an active facility (RTI) consisting of 15 acres, the former industrial park consisting of 65 acres, and about 183 undeveloped acres. The site is in a rural sparsely populated area with the western side adjacent to the Picatinny Arsenal. Radiation Technology, Inc. uses Cobalt-60 to sterilize cosmetics, food, and medical equipment.

The active portion of the site was in good repair and there were no unusual features. The former industrial park contains many abandoned buildings, large quantities of debris, a water tower, and above ground tanks. The outstanding feature on the property is a rocket launch pad used by Morton Thiokol from the 1940's until the 1970's to launch test rockets.

The site was fenced off, however, no signs were evident indicating that this is a Superfund site. Holes in the fence indicate that trespassers had forced entry onto the site. The managers of RTI contact the police when they are aware of trespassers on-site. The management also has periodic problems with illegal dumping.

Numerous physical hazards exist on-site including the abandoned buildings, tanks, equipment, water tower, and the rocket launching pad which is approximately 30 feet high. The trespassers are usually hunters.

Changes in site conditions subsequent to the health assessment consists of several removal actions. A leaking underground storage tank containing 1,1,1-trichloroethanol waste solvents was found contained in an intact steel vault containing four other tanks: 2 empty tanks, 1 tank containing diesel fuel, and 1 tank containing 1,1,1-trichloroethanol and waste solvents. All five tanks and the vault were removed in July 1990. Radiation Technology, Inc. removed thirty barrels of soil contaminated with low levels of Cobalt-60 under a NRC directive. Under the MOA, contaminated soil, tanks and sumps have been remediated.

The superficial and bedrock aquifers have been contaminated with VOC's from the RTI site. The chance for future exposure to contaminated groundwater is minimal as long as monitoring and residential wells are sampled at regular intervals.

The health assessment was correct in its conclusions. Human exposure probably occurred in the past due to drinking contaminated water from two on-site wells at RTI prior to 1981. Exposure may have occurred through drinking contaminated well water downgradient and adjacent to the RTI property. VOC contaminated might have migrated to nearby potable wells and to Lake Denmark.

The existing data indicate that Lake Denmark is contaminated with VOC's. However, the source of the contamination has not been determined. The existing data indicate that no other

residences have had their wells contaminated, as a result of this site. Regular periodic sampling of residential wells should minimize residential exposure to VOC's emanating from the RTI site.

## CURRENT ISSUES

Past community health concerns as stated in the health assessment (1) focused on the threat to the water quality of surface waters (Lake Denmark and nearby streams), and the presence of VOC's in the superficial and the bedrock aquifers possibly contaminating other potable wells. Additional community concerns focused on the effectiveness of charcoal filters provided by the Rockaway Township Health Department to residents of the Lake Telemark development, and a desire to participate in the review of remediation options recommended in the FS. There are no newly identified public health concerns. Community health concerns were addressed by The NJDEPE conducting additional sampling being performed on Lake Denmark and holding a public meeting to address the communities concerns. This public meeting was held in August 1993 but no residents attended. The local health officer felt that there should be periodic monitoring of residential wells and that the employees of RTI should not drink the well water. Bottled water is supplied by the RTI management. No new completed human exposure pathways have been identified since the release of the health assessment. The NJDOH and ATSDR continue to have the same public health concerns as before.

Soil sampling indicated that soil was contaminated with low levels of Cobalt-60. This soil was subsequently removed. In the industrial park section there are many decaying tanks and structures. Additional soil sampling has not been done. However, there are no indications that soils at the RTI site have been contaminated. At this time, it is not known if trespassers would be subjected to contaminated soils.

Lake Denmark sediment samples, but not surface water, have been found to be contaminated with levels of VOC's that are below ATSDR comparison values (9). It is unknown if there is a correlation between increasing VOC concentration and time nor is the source of contamination known. The lake is on U.S. Army property and is, therefore, not expected to have an adverse public health impact because of its limited use.

Residential wells have been sampled by the NJDEPE (6,7) and they were found not to be contaminated by any chemicals above their comparison values. In order to prevent future problems, Rockaway Township gave the downgradient residents activated carbon filters. Also, the NJDEPE is responsible for the regular monitoring of the groundwater.

Two on-site wells that used for drinking by the Radiation Technology employees were sampled (8) and found to contain mainly volatile organic chemicals and some metals. Of these chemicals, only carbon tetrachloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethene were above their comparison values.

Adverse health effects could occur due to showering activities or home garden irrigation at the VOC concentrations found in the groundwater. It is unlikely that significant amounts of fish from Lake Denmark are ingested since it is on Federal property which is restricted to the public.

## PUBLIC HEALTH IMPLICATIONS

This section contains discussion of the potential health effects in persons exposed to specific contaminants at the RTI site in order to address specific community health concerns. Health effects evaluations are accomplished by estimating the amount (or dose) of those contaminants that a person might come in contact with on a daily basis. This estimated exposure dose is then compared to established health guidelines. People who are exposed for some crucial length of time to contaminants of concern at levels above established guidelines are more likely to have associated illnesses or disease.

In evaluating the toxicological significance of potential exposure of workers to the groundwater contaminants, the following assumptions were made: 1) Adults drank 2 liters of water per day; 2) An adult body weight is 70 kg; and 3) The workers drank water five days per week for 11 years. RTI started operations in 1970 and in 1981 the on-site well was closed. Table 1 shows the chemicals found in potable wells on-site (13,15,16) and their potential for non-cancer and cancer health effects.

Health guidelines are developed for contaminants commonly found at hazardous waste sites. Examples of health guidelines are the ATSDR's Minimum Risk Level (MRL) and the USEPA's Reference Dose (RfD). When exposure (or dose) is below the MRL or RfD; then, non-cancer, adverse health effects are unlikely to occur.

MRL's are developed for each route of exposure, such as acute (Less than 14 days), intermediate (15 to 364 days), and chronic (365 days and greater). ATSDR presents these MRL's in Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status.

The toxicological effects of the contaminants detected in the environmental media were considered singly. The cumulative or synergistic effects of mixtures of contaminants may serve to enhance their public health significance. Additionally, individual or mixtures of contaminants may have the ability to produce greater adverse health effects in children as compared to adults. This situation depends upon the specific chemical being ingested or inhaled, its pharmacokinetics in children and adults, and its toxicity in children and adults.

Lake Denmark is on Federal property which is restricted to the public. It is unlikely that fish from Lake Denmark would be ingested due to these restrictions. Therefore, ingestion of contaminated fish is not considered a viable route of exposure.



Two on-site wells that had been used for drinking were sampled (8) prior to sealing them. The calculated exposure dose for carbon tetrachloride (2) was below the No Observable Adverse Effect Level (NOAEL) for chronic oral exposure (Table 1). However, it was above the chronic RfD value, 0.0007 mg/kg/d. This indicates that there is a possibility that carbon tetrachloride may have caused minimal less serious health effects in the past to Radiation Technology employees such as a swollen liver and regional nephritis. All of the other chemicals-of-concern listed in Table 1 are not expected to cause any adverse health effects at the concentrations found in the two wells.

1,1,1-trichloroethane is a non-carcinogen (3). An insignificant cancer risk is expected for 1,1,2-trichloroethane (4) and trichloroethene (5) because of the low Lifetime Excess Cancer Risk (LECR). Carbon tetrachloride is considered to have no apparent increased cancer risk. Carbon tetrachloride, which could be expected to increase the LECR by about 6 cases per 100,000 population. The cancer risk for carbon tetrachloride may be interpreted according to the following scenario: If 10,000 people ingested this compound at the maximum reported concentration found in the on-site potable wells for 11 years, at most 1 additional case of cancer for carbon tetrachloride could result over a 70 year period.

Table 1. Chemicals of Public Health Concern in On-Site Potable Well Water Samples

CHEMICAL	MAX. CONC. (ppb)	COMPARISON VALUE (ppb)	BASIS	EXPOSURE DOSE (mg/kg/d)	ABOVE <sup>1</sup> MRL/ <sup>2</sup> RfD (mg/kg/d)	<sup>3</sup> LECR	
						Cancer Risk	Category
Carbon tetrachloride	140	0.3	<sup>4</sup> CREG	0.0029	<sup>2</sup> YES	6.0	<sup>5</sup> A
1,1,1-Trichloroethane	950	200	<sup>6</sup> LTHA	0.0190	<sup>7</sup> NO	<sup>8</sup> UNK	<sup>9</sup> —
1,1,2-Trichloroethane	6	0.6	<sup>4</sup> CREG	0.0001	<sup>2</sup> NO	0.1	<sup>10</sup> B
Trichloroethene	140	0.2	<sup>11</sup> EMEG	0.0029	<sup>1</sup> NO	0.5	<sup>10</sup> B

1 MRL - Minimal Risk Level for intermediate exposure for trichloroethene.

2 RfD - Reference Dose for chronic exposure for carbon tetrachloride and 1,1,2-trichloroethane.

3 LECR - Lifetime Excess Cancer Risk per 100,000 population.

4 CREG - Cancer Risk Evaluation Guide for  $1 \times 10^{-6}$  excess cancer risk.

5 A - No apparent increased cancer risk.

6 LTHA - Lifetime Health Advisory for drinking water.

7 No Observable Adverse Effect Level (NOAEL) was not exceeded for 1,1,1-trichloroethane.

8 UNK - Unknown. A cancer slope factor has not been established for this chemical.

9 — - Non-carcinogen.

10 B - Insignificant cancer risk.

11 EMEG - Environmental Media Evaluation Guide.

## CONCLUSIONS

1. Based on the Remedial Investigation, site-related contamination (Mainly VOC's) has occurred in groundwater on-site and off-site.
2. Conclusions made in the 1990 health assessment regarding the site being of potential health concern are no longer valid. Installation of filtration systems in homes with the potential for the contamination of potable wells have interrupted the ingestion exposure pathway. Wells are regularly monitored by the NJDEPE for VOC's and radiation to ensure the potability of the groundwater. ATSDR and the NJDOH consider the site to presently pose no apparent public health hazard.
3. No data are available indicating the nature and extent of contaminants from which to evaluate the public health significance of potential exposures prior to 1981. This information is needed to completely evaluate the community health concerns about past exposures to contaminated drinking water. However, the most conservative estimate of the duration of exposure to the VOC's via drinking water from on-site potable wells would be 11 years. Based on a worst case scenario of exposure dose and duration, the Radiation Technology workers may experience some adverse non-cancer health effects due to carbon tetrachloride in the potable wells. Estimated exposure doses, for past exposures from contaminated potable wells with carbon tetrachloride would present no apparent increased cancer risk, as calculated by the Lifetime Excess Cancer Risk (LECR). Residential wells were not contaminated. The Township gave them activated carbon filters as a preventative measure. The ATSDR/NJDOH has determined that the site posed a public health hazard to the on-site workers because of past exposure to contaminated well water.
4. As recommended in the health assessment, Lake Denmark has been sampled. However, it is unknown if there is a correlation between increasing VOC concentration and time nor is the source of contamination known. The lake is on U.S. Army property and is, therefore, not expected to have an adverse public health impact because of its limited use.
5. Physical hazards exist at the abandoned industrial park including an abandoned rocket launching pad, abandoned buildings, a water tower, above-ground storage tanks, and large quantities of debris.
6. After a review of the most recent documents and the current site conditions for the Radiation Technology, Incorporated site, the ATSDR and the NJDOH have determined that no current human exposure pathways exist on- or off-site at the present time.
7. Past community health concerns were addressed by the NJDEPE by performing additional sampling of Lake Denmark to determine its water quality and by holding a

public meeting to discuss the community's health concerns. There have been no new community health concerns nor any public health concerns identified.

### RECOMMENDATIONS

1. No health assessment or health consultation is recommended at this time because there are no current completed exposure pathways and no additional community health concerns associated with the site.
2. The remedial activities specified in the ROD, when implemented, are sufficient to address the remaining concerns of the ATSDR, the NJDOH, and the community regarding current and future exposures due to the site and are consistent with protection of the public health.
3. It is recommended that the downgradient and adjacent residential wells should be monitored on a regular periodic basis before, during, and after the remedy is completed.
4. It is recommended that the site be posted indicating that it is a USEPA Superfund site.
5. Future environmental, toxicological, health outcome data or changes in the conditions as a result of implementing the proposed plan, may determine the need for additional actions at this site.

### HEALTH ACTIVITIES RECOMMENDATION PANEL (HARP) RECOMMENDATION

The data and information developed in the Site Review and Update for the Radiation Technology, Inc. Site, Rockaway Township, New Jersey, has been evaluated by ATSDR's Health Activities Recommendation Panel (HARP) for appropriate follow-up with respect to health activities. Although past exposures have occurred to site-related contaminants, the panel determined that no followup actions are indicated at this time because the exposures are not likely to result in adverse health effects.

### PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Radiation Technology, Inc. site contains a description of the actions to be taken at or in the vicinity of the site. The purpose of the PHAP is to ensure that this site review and update not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included, is a commitment on the

part of ATSDR and NJDOH to follow-up on this plan to ensure that it is implemented. ATSDR will provide an annual follow-up to this PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this health assessment, and will be provided to persons who request it. The public health actions to be implemented are as follows:

#### **Actions Undertaken**

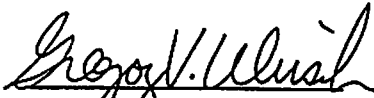
1. Environmental data and remedial activities have been evaluated within the context of human exposure pathways and relevant public health issues.

#### **Actions Planned**

1. ATSDR will provide an annual follow-up to this PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this health assessment, and will be provided to persons who request it.
3. ATSDR will reevaluate and expand the Public Health Action Plan (PHAP) when needed. New environmental, toxicological, health outcome data, or the results of implementing the above proposed actions may determine the need for additional actions at this site.

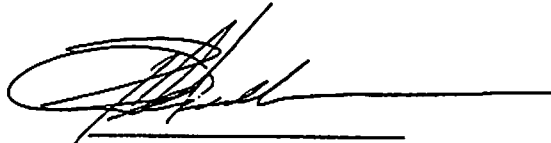
## CERTIFICATION

The Site Review and Update for the Radiation Technology, Inc., site was prepared by the New Jersey Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the Site Review and Update was initiated.



Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Site Review and Update and concurs with its findings.



Division Director, DHAC, ATSDR

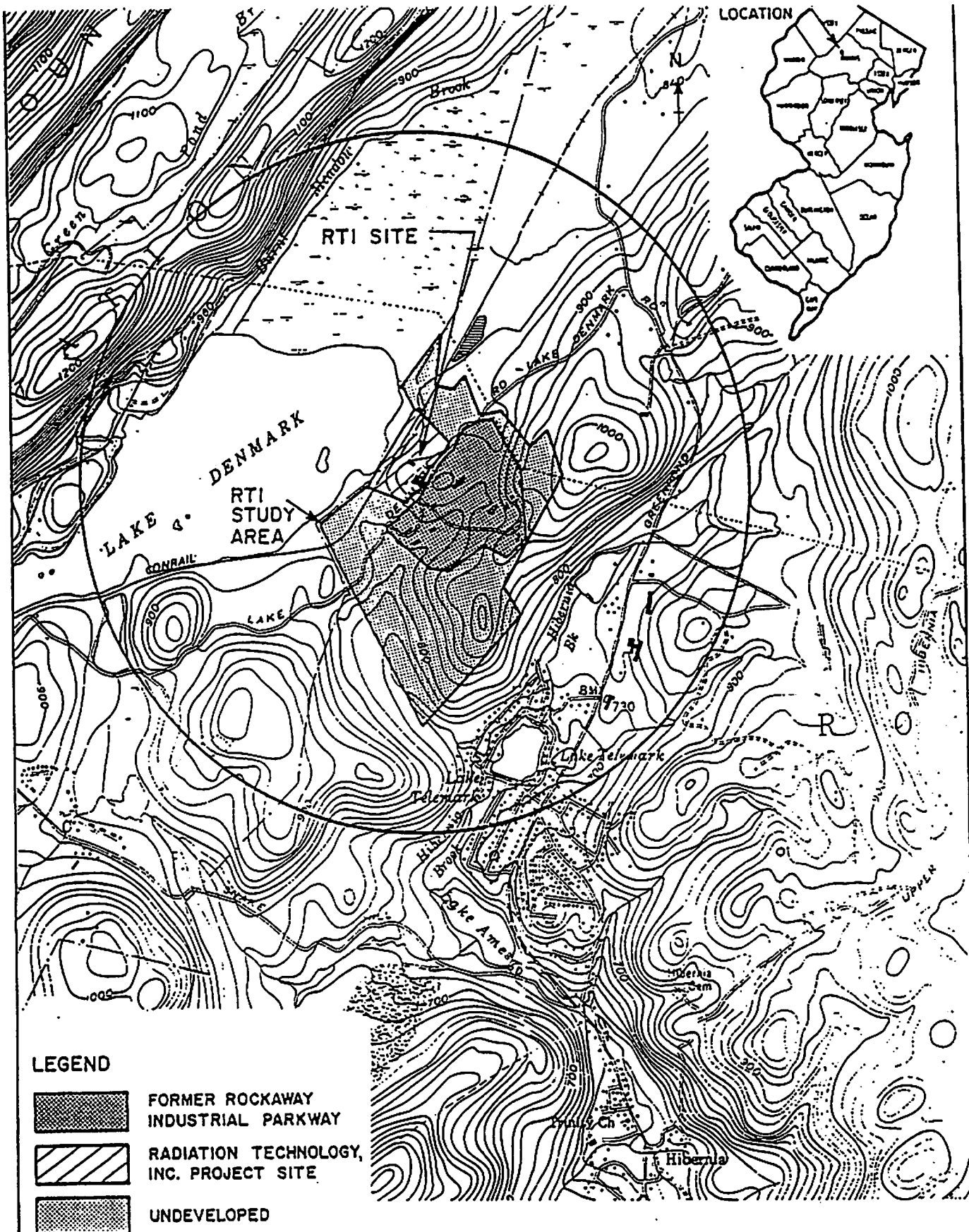
## DOCUMENTS REVIEWED

1. Agency for Toxic Substances and Disease Registry. Health Assessment for Radiation Technology, Inc., Rockaway Township, Morris County, New Jersey, July 30, 1990.
2. Agency for Toxic Substances and Disease Registry. Toxicological Profile for carbon Tetrachloride. September 1992.
3. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,1,1-Trichloroethane. October 1993.
4. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,1,2-Trichloroethane. December 1989.
5. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Trichloroethylene. April 1993.
6. New Jersey Department of Environmental Protection and Energy. Background Investigation Report. Remedial Investigation/Feasibility Study. Radiation Technology Inc., Rockaway Township, Morris County, New Jersey. 1987.
7. New Jersey Department of Environmental Protection and Energy. Phase I of Remedial Investigation Report. Radiation Technology Inc., Rockaway Township, Morris County, New Jersey. 1988.
8. New Jersey Department of Environmental Protection and Energy. PD-11 Remedial Investigation Report. Remedial Investigation/Feasibility Study. Radiation Technology Inc., Rockaway Township, Morris County, New Jersey. September 1991.
9. New Jersey Department of Environmental Protection and Energy. Additional Phase II Investigations: PD-3S Health and Safety Plan Addendum, PD-4S QA Project Management Plan Addendum, PD-5S Field Sampling Work Plan Addendum. Remedial Investigation/Feasibility Study. Radiation Technology Inc., Rockaway Township, Morris County, New Jersey. July 1992.

**PREPARER OF REPORT**

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Environmental Health Service  
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RADIATION TECHNOLOGY, INC. RI/FS  
SITE LOCATION MAP

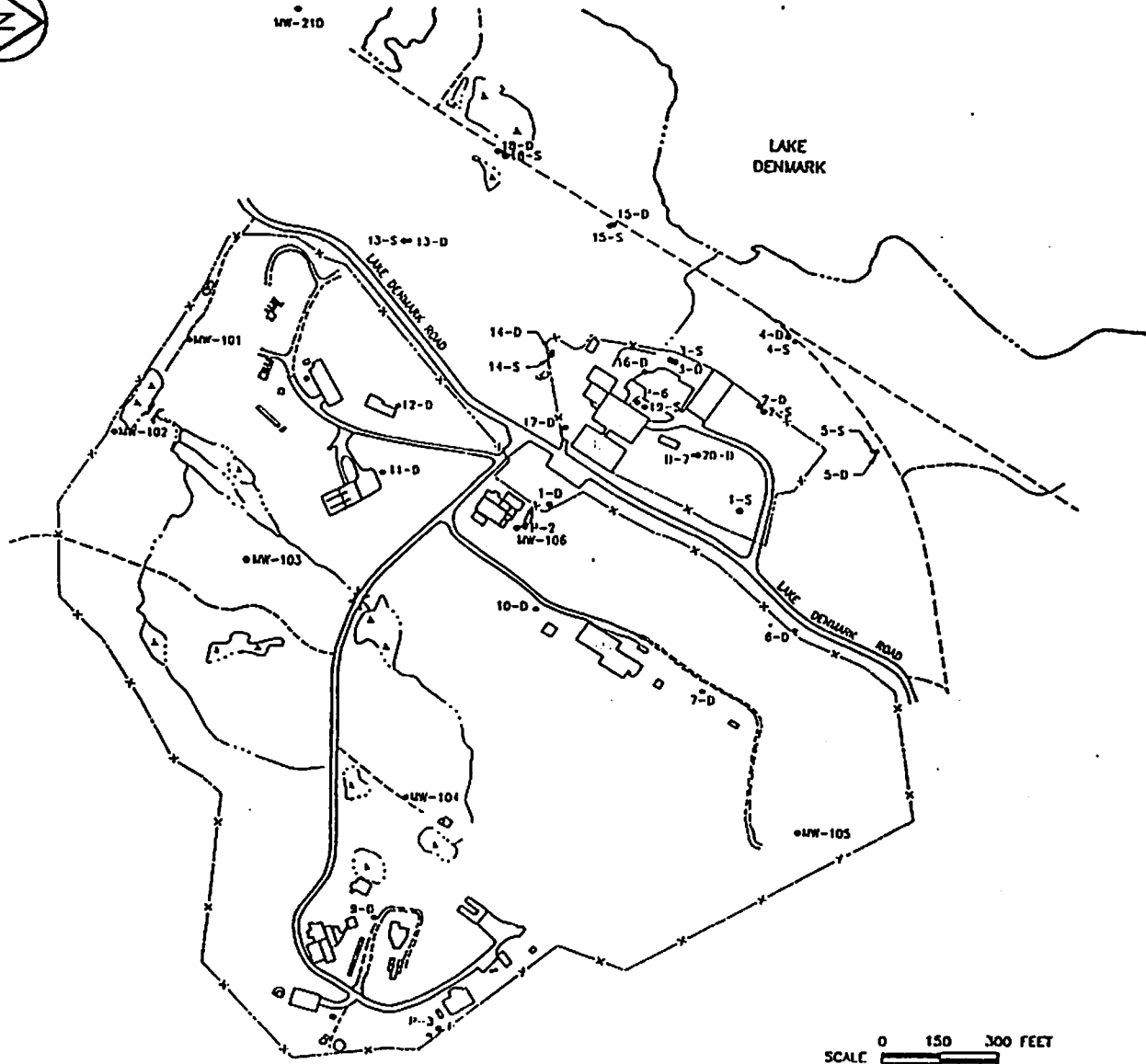
SCALE IN FEET 0 2000 4000



FIGURE 1

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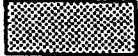

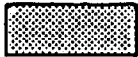
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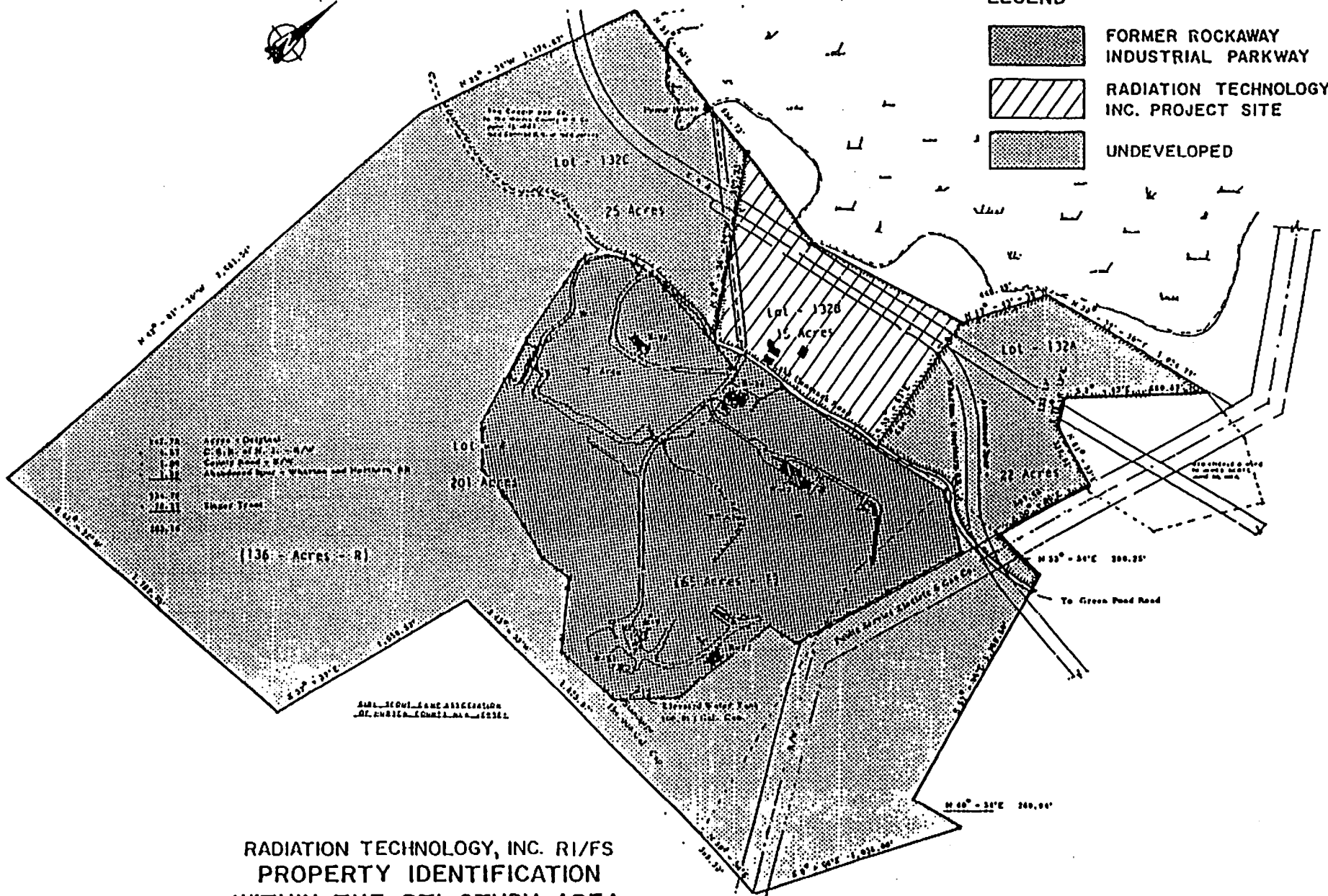


- LEGEND**
- UNPAVED ROAD OR PATHWAY
  - x— FENCE
  - ... STREAM/WATER BOUNDARY
  - BUILDING
  - ▲○ POND OR SHALLOW SURFACE WATER BODY
  - MW-210 MONITORING WELL

RADIATION TECHNOLOGY INC. R/T/S  
 ADDITIONAL PHASE II INVESTIGATIONS  
 GROUNDWATER MONITORING  
 WELL LOCATIONS

LEGEND

-  FORMER ROCKAWAY INDUSTRIAL PARKWAY
-  RADIATION TECHNOLOGY, INC. PROJECT SITE
-  UNDEVELOPED



RADIATION TECHNOLOGY, INC. RI/FS  
PROPERTY IDENTIFICATION  
WITHIN THE RTI STUDY AREA

SOURCE: RTI DRAWING NO. 101, DATE UNKNOWN

FIGURE 3

