



Superfund Record of Decision:

Radium Chemical, NY



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16. Abstract (Limit: 200 words) The Radium Chemical site consists of a one-story brick building in a light industrial/residential section in Woodside, Queens County, New York. The Radium Chemical Company (RCC) produced luminous paint beginning in 1913 and later manufactured, leased, and sold radium ²²⁶ to hospitals, medical centers and research laboratories. The radium sources were stored onsite in lead containers in a poured concrete vault. In 1983, the State suspended the RCC operating license due to disposal and safety infractions and in 1987 ordered RCC to remove the radium sources and decontaminate the building. RCC abandoned the building without complying leaving a large number of radium-containing sealed devices, some of which were suspected of releasing radium and radon gas. Also onsite were hundreds of containers of laboratory chemicals. From 1988 to 1989, EPA undertook a limited emergency removal action to secure the facility and remove the radioactive sources. In 1989, a Public Health Advisory was issued for the site based on the threatened release of radium ²²⁶ . This Record of Decision (ROD) supplements the emergency removal action by addressing the remaining residual radioactive contamination at the site including drummed hazardous waste contaminated with radium. (See Attached Sheet)					
17. Document Analysis a. Descriptors Record of Decision - Radium Chemical, NY First Remedial Action - Final Contaminated Media: soil, debris Key Contaminants: radioactive materials (radium ²²⁶ , decay products) b. Identifiers/Open-Ended Terms c. COSATI Field/Group					
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Abstract (Continued)

The primary contaminants of concern affecting the soil and debris are radioactive materials including radium²²⁶ and its decay products, including radon gas.

The selected remedial action for this site includes partial decontamination and complete dismantling of the contaminated building, followed by offsite disposal of debris as appropriate based on a contamination level; excavation and offsite disposal of contaminated soil and subsurface piping, followed by replacement of piping and backfilling with clean soil; and treatment of some radium-contaminated hazardous waste, followed by offsite disposal of treated and untreated radium-contaminated hazardous wastes in approved facilities. The estimated total cost for this remedial action is \$18,699,000. O&M costs are included in the total cost estimate.

PERFORMANCE STANDARDS OR GOALS: All soil will be excavated and disposed of offsite that exceeds 5 pCi/g above background at the surface in the first six inches and 15 pCi/g above background at the subsurface (i.e., subsequent 6-inch layers). Building masonry with less than 5 pCi/g radium²²⁶ will be disposed of in a sanitary landfill, masonry exceeding this level and other material (e.g., steel) exceeding specific surface contamination levels will be disposed of offsite along with the soil at a radioactive waste disposal facility. Chemical-specific goals for radium-contaminated hazardous waste were not specified.

ROD FACT SHEET

SITE

Name: Radium Chemical Company Site
Location/State: Woodside, Queens County, New York
EPA Region: II
HRS Score (date): Did not score - Added under ATSDR
NPL Rank (date): Added to NPL 11/21/89

ROD

Date Signed: June 21, 1990

Selected Remedy: Partial Decontamination of Facility Followed by
Complete Dismantling of Facility

Capital Cost: \$ 18,699,000
Time to Implement: 2 years (one time remedy - no O&M)

LEAD

Remedial, EPA
Primary Contact (phone): Janet Cappelli (212-264-8679)
Secondary Contact (phone): Doug Garbarini (212-264-0109)

WASTE

Type: Radioactive (e.g. radium-226 and radon)
Medium: Building Debris/Soil
Origin: Contamination resulted from the improper storage and
handling of radium-226 sealed sources.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Radium Chemical Company, Woodside, Queens County, New York

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Radium Chemical Company Site developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. § 9601, et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300. This decision is based on the administrative record for the site.

The State of New York concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF SELECTED REMEDY

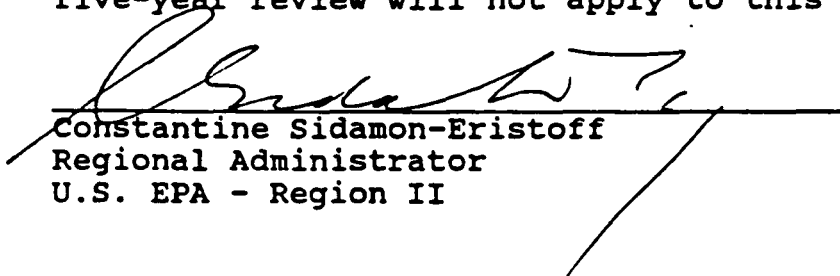
This final remedy addresses remediation of the residual radioactive contamination remaining at the site by eliminating or reducing the risks posed by the site.

The major components of the selected remedy include:

- ▲ Partial decontamination of the building followed by complete dismantling of the building and disposal of contaminated material in an approved radioactive waste facility and clean material in an approved sanitary landfill;
- ▲ Surface and subsurface soil investigation with excavation and disposal of any contaminated material in an approved radioactive waste facility followed by backfilling with clean soil;
- ▲ Subsurface piping, including sewer line, investigation with disposal of any contaminated material in an approved radioactive waste facility followed by replacement with clean material; and
- ▲ Treatment of some radium-contaminated hazardous waste followed by disposal of treated and untreated radium-contaminated hazardous wastes in approved facilities.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. The remedy does not satisfy the statutory preference for treatment, since there is no technology to treat the principal contaminant, radium-226, and treatment is neither feasible nor scientifically possible. The selected remedy, however, satisfies the statutory preference to the maximum extent practicable by requiring the treatment of radium-contaminated hazardous waste, as well as reducing the mobility and volume of the radium-contaminated materials. Because this remedy will not result in hazardous substances remaining on-site above health-based levels, the five-year review will not apply to this action.



Constantine Sidamon-Eristoff
Regional Administrator
U.S. EPA - Region II



Date

DECISION SUMMARY
RADIUM CHEMICAL COMPANY
WOODSIDE, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
NEW YORK

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- Appendix I - Figures
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- Appendix III - NYSDEC Letter of Concurrence
- Appendix IV - Responsiveness Summary

SITE LOCATION AND DESCRIPTION

The Radium Chemical Company Site ("Site") is located at 60-06 27th Avenue in Woodside, Queens County, New York. Figure 1 depicts the Site location. The area surrounding the Site is classified as a light industrial/residential sector. The Site consists of a 1-story brick building bordered on the west by 27th Avenue and on the east by the Brooklyn-Queens Expressway ("BQE"), a major roadway in New York City. The westbound lane of the BQE is located less than 6 feet from the rear wall of the facility. A health club is located within 100 feet of the Site and numerous pedestrians pass the Site fence and building daily. Vehicular traffic is very heavy along 27th Avenue, a primary access route to the BQE.

The building is approximately 10,000 square feet in size; 7,220 square feet of which encompassed the Radium Chemical Company ("RCC"). The Solux Company, a commercial manufacturing facility, occupies space in an adjoining building. The Radium Chemical and Solux facilities share a common wall within the building, and some of the Solux floor space at one time was leased to Radium Chemical. The layout of the RCC facility and its location relative to the Solux Company is depicted in Figure 2.

The population within a 3-mile radius of the Site obtains drinking water from the New York City municipal system, which comes from surface impoundments 10 miles from the Site. The ground water underlying the Site is very shallow at 5 - 10 feet, but is not used as a drinking water supply. The nearest drinking water well is 6 miles from the Site. The nearest surface water body to the Site is the East River, over 1.5 miles away. There are no endangered species or critical habitats within close proximity of the Site. The nearest residence is located 500 feet from the Site. It is estimated that 27,000 people reside in high-rise apartments and row houses within a 1-mile radius of the site.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Radium Chemical Company ("RCC") was founded in New York in 1913. The original corporate offices were located in Manhattan. The company initially produced luminous paint for watch dials and instruments. Later, the company manufactured, leased and sold radium-226 in the form of radiation therapy and radiographic sources to hospitals, medical centers, and research laboratories. Sources were also leased or sold in limited quantities to the oil industry for geophysical logging. In the late 1950's, RCC transferred its operations to the present location in Woodside, New York. The radium sources were stored on-site in lead containers in a poured concrete vault. Eventually the demand for radium sources lagged as they were replaced with more advanced radiation therapy techniques using cesium-137, cobalt-60, and iridium-192. Subsequently, many leased radium sources were returned to RCC and were stored on-site.

In 1983, the State of New York suspended the RCC operating license due to various disposal and safety infractions. RCC attempted to obtain permission to begin operations again in 1986, but was denied. The New York State Department of Labor issued an order against RCC on October 17, 1987, for the removal of the radium sources and decontamination of the building. The owner was unable to finance the remediation and, subsequently, abandoned the building. This resulted in a second order, issued on July 20, 1988, determining that the facility could not be maintained and that it was de facto abandoned by RCC.

Remaining on-site were a large number of radium-containing sealed devices, some of which were suspected of releasing radium and radon gas. The amount of radium-226 at the Site was estimated, at the time, to be 110 Curies ("Ci"). Also on-site were hundreds of containers of laboratory chemicals, many of which were reactive, corrosive, flammable, and/or potentially shock sensitive.

In July 1988, at the request of the State of New York, the U.S. Environmental Protection Agency ("EPA") undertook a limited emergency removal action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. § 9601, et seq., to secure the facility and remove the radioactive sources. EPA provided 24-hour security and initiated measures to stabilize the Site. By August 1988, EPA had erected fencing around the perimeter and installed remote monitoring surveillance, a foam fire suppressant system, special vents, and other safety measures. In February 1989, EPA developed a support agreement with the U. S. Army Armament, Munitions and Chemical Command to use an existing contract with Chem-Nuclear Systems, Inc. to remove the radium sources and other hazardous materials from the Site and transport them to approved disposal facilities. The removal action was completed in October 1989. Approximately 120 Ci of radium in the form of sources, contaminated debris, and loose radium salts and luminous compounds were removed from the Site. This material was disposed of at facilities located in Richland, Washington and Beatty, Nevada, both operated by U.S. Ecology.

On February 10, 1989, at EPA's request, the U.S. Agency for Toxic Substances and Disease Registry ("ATSDR") issued a Public Health Advisory to alert the public, EPA, and the State of New York of a serious threat to human health, based on the threatened release of radium-226 from the RCC site. EPA had requested ATSDR to perform an assessment on the Site to evaluate the priority for complete remediation. In an August 1989 special National Priorities List ("NPL") update, EPA proposed the RCC site for the NPL based on the ATSDR advisory. On November 21, 1989, the RCC Site was added to the NPL.

EPA completed a Focused Feasibility Study ("FFS") of the Site in April 1990. The FFS report characterizes the nature and extent of the contamination at the Site, and describes various remedial alternatives for addressing the contamination. In April 1990, the FFS report was released to the public along with the Proposed Remedial Action Plan ("Proposed Plan"), developed by EPA. A 30-day public comment period was provided, ending on May 13, 1990.

COMMUNITY RELATIONS ACTIVITIES

A Community Relations Plan for the Radium Chemical Company Site was finalized in early 1989, prior to the removal action. This document lists contacts and interested parties throughout government and the local community. It also establishes communication pathways to ensure timely dissemination of pertinent information. Numerous fact sheets, outlining the progress of the removal action, were distributed during 1989. The FFS and Proposed Plan were released to the public in April 1990. These last two documents were made available through two information repositories maintained at the Woodside Branch Library and the Sunnyside Branch Library. A public comment period was held from April 12, 1990 to May 13, 1990. In addition, a public meeting was held on May 1, 1990 to present the results of the FFS and the preferred alternative as presented in the Proposed Plan for the Site. All substantive comments which were received by EPA prior to the end of the public comment period, including those expressed verbally at the public meeting, are addressed in the Responsiveness Summary which is attached, as Appendix IV, to this Record of Decision.

SCOPE AND ROLE OF RESPONSE ACTION

The scope of this response action is to address the remaining residual radioactive contamination at the Site. As discussed, a previous emergency removal action addressed the principal threat at the Site, namely the radium-226 sources.

The purpose of this response is to remove or reduce radium-226 and its daughters, or decay products, and to prevent radon concentrations from exceeding acceptable levels. Also, this response will prevent both the release of radioactivity to the air and the possible spreading of contamination into the soil and groundwater beneath the facility and restore the Site property to a condition allowing unrestricted use.

The selected alternative for this final phase of the project will address all remaining concerns at the Site.

SUMMARY OF SITE CHARACTERISTICS

The site is presently inactive and secure. All windows are covered with steel grates and all doors are equipped with locked steel roll-up covers. Permanent caps have been placed on all roof vents and stacks, except for the four high efficiency particulate air ("HEPA") vent lines. Fencing with razor ribbon on top surrounds the Site as well as the roof around the entire facility. EPA has posted signs warning that the site contains radioactive materials and entry to the property is prohibited.

Residual radioactive contamination by radium-226 ("Ra-226") and radon gas still exists within the facility. The source area, as depicted in Figure 2, has widespread contamination including nineteen areas of elevated radiation levels, or hot spots. A hot spot is defined as an area that measures more than 10.0 mR/hr at a distance of one centimeter from the floor or wall surface, more than 100,000 disintegrations per minute ("dpm")/100 cm² removable alpha contamination, or more than 250,000 dpm/100 cm² removable beta contamination. The highest radiation exposure rate identified in the source vault area was 200.0 mR/hr at one centimeter from the interior of a safe in the source vault area. The highest contamination level identified in the source vault area was 847,000 dpm/100 cm² removable beta in a 55-gallon drum filled with lead containers, or pigs, that were used to shield radium sources for storage. Four hot spots were found in areas outside the source vault. The highest radiation exposure rate found in this area, outside of the source vault, was 50.0 mR/hr one centimeter from the surface of the concrete pedestal in the tritium room. The highest contamination level, outside of the source vault area, was 483,000 dpm/100 cm² removable beta found inside of a safe in the pump room. Approximately 75% of all survey points in the lease area and 25% of all survey points in the administrative office area exceeded acceptable radiation levels for surface contamination (see Tables 2 and 3 which reference these acceptable levels). None of the soil samples, outside of the RCC building, collected below six inches was found to exceed the standards.

A 30-gallon metal pail containing radium-contaminated mercury is stored in a safe located in the source vault room within the RCC building. An additional two 55-gallon drums containing radium-contaminated hazardous wastes (i.e. various hazardous chemicals as indicated in Table 1) are also being stored in the source vault room within the RCC building. Please note that the Proposed Plan referred to the hazardous waste contaminated by radium-226 as "mixed waste". The correct term is radium-contaminated hazardous waste. "Mixed waste" applies only to hazardous waste contaminated by radionuclides governed under the Atomic Energy Act, which does not have authority over radium-226.

SUMMARY OF SITE RISKS

Although the emergency removal action addressed the immediate danger at the Site by removing approximately 120 Ci of Ra-226, the RCC facility still poses a potential risk due to residual levels of contamination within the building and fenced area. The remaining concerns are the levels of radioactivity, the amount of exposure the maximally exposed individual could receive, and the potential for exposure to the public.

Radium decays to form radon gas and other decay products. Within tightly enclosed buildings, the danger exists for the potential build-up of radon gas above the standards set to protect human health, representing a long-term exposure hazard to people who live or work in the buildings.

The radiation and contamination levels in the facility exceed both State regulations and Federal guidance for exposure to the public. The levels of removable alpha radiation and removable beta radiation within the RCC facility clearly exceed the Federal standards (see the discussion in the "Summary of Site Characteristics" section on page 5 and Tables 2 and 3). It is believed the beta radiation is from the decay products of Ra-226. The alpha radiation most likely results from residual Ra-226 remaining in the building, but may also result from polonium-210, a radon daughter or decay product, which is an alpha emitter. This material still is a potential health hazard to members of the neighboring area. There still is a possibility of either inhalation or ingestion of radioactive materials as a result of either fire or vehicular collision with the building from the BQE, although this has been greatly lessened due to the emergency removal action. The facility as it presently exists is primarily a hazard from a direct contact and entry point. The prime concern involving a fire in the facility now will be the toxic components of the smoke and the mercury which may be airborne.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF ALTERNATIVES

This section describes the remedial alternatives which were developed to meet the objectives of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 CFR Part 300, and CERCLA, 42 U.S.C. § 9601, et. seq. These alternatives were developed and screened for the applicability to site-specific conditions and were evaluated for their effectiveness, implementability, and cost.

The alternatives developed for the Radium Chemical Company Site are detailed below.

ALTERNATIVE 1 - NO ACTION

Total Costs: \$ 515,000
Time to Implement: 1 month

Under this alternative, no further actions would be taken to prevent radon generation or to remove any of the contamination. The building and Site perimeter would be secured against intrusion and the contamination would be left in place. Additional fencing would be installed between the building and the BOE. All windows, as well as all but one door, would be sealed with brick. The four HEPA vent lines would also be sealed. Surveillance cameras would be installed and an electronic system would be used to provide 24-hour monitoring to ensure that building security is not broken. A sampling program would be instituted to ensure that no releases are occurring. A public awareness program would be maintained to keep the neighboring community and businesses informed. All radium-contaminated hazardous waste would be secured and left on-site.

ALTERNATIVE 2 - TOTAL DECONTAMINATION OF FACILITY

Total Costs: \$ 21,211,000
Time to Implement: 2 years

Under this alternative, the RCC facility would undergo a total decontamination and decommissioning of the contaminated interior and exterior areas. This work would involve the partial or complete removal of interior walls and floors. A site characterization survey would be performed to further quantify the extent of contamination in surface and subsurface soils as well as underground piping, including sewer lines, in the immediate vicinity of the Site. Certain constituents of the radium-contaminated hazardous waste would be treated for their hazardous nature and disposed of as radioactive waste. An attempt would be made to temporarily store the remaining radium-contaminated hazardous waste at an off-site location until such time as a facility becomes permitted to accept it for disposal. If that attempt fails, the remaining radium-contaminated hazardous waste would have to be securely stored on-site until a disposal facility could accept it. This radium-contaminated hazardous waste would be stored in the lease area portion of the facility while decontamination efforts would take place in other areas of the facility.

As much of the building as possible would be left in place after the contamination was removed. Precautions would be necessary to minimize the spread of contamination, releases to the environment, and potential exposures to workers. Contaminated material would be packaged in accordance with Department of Transportation regulations and shipped to an approved radioactive waste disposal facility. It is not possible to estimate the extent of contamination in floor/foundation materials at this time. Floor structures, and possibly soils below the floor, may be contaminated and would require decontamination/removal. Decontamination and removal of the floor/foundation would require additional structural support of the building.

It is also not possible to determine the extent, if any, of drain line or sewer contamination. It is highly likely that floor drains originating from the source area are contaminated. Contaminated materials were regularly disposed of via the sanitary sewer system. Other drains from the restricted area of the facility (source repair room, toilets, janitor's closet, and tritium room) have known contamination. This remedy would include an investigation to further determine the extent of that contamination. Decontamination of drains or sewers would involve complete removal of the pipes, conduits, and replacement of sewer lines and/or catch basins.

ALTERNATIVE 3 - COMPLETE DISMANTLING AND REMOVAL OF FACILITY

Total Costs: \$ 19,776,000
Time to Implement: 2 years

The entire RCC facility would be dismantled as is and shipped to a radioactive waste repository. This would involve the complete removal of the building and contaminated soil. Precautions would be necessary to minimize the spread of contamination to the environment and potential exposures to workers. All material would be packaged and shipped in accordance with Department of Transportation regulations.

It is not possible, at the present time, to determine the extent of contamination in the soils or structures below the foundation. As with Alternative 2, a site characterization survey would be conducted to further quantify the extent of contamination in surface and subsurface soils as well as underground piping, including sewer lines, in the immediate vicinity of the Site. If soil contamination is discovered below grade, the materials would have to be removed and replaced with "clean" soils. If sewers or drain lines are found to be contaminated, they would require removal and replacement.

Again, as with Alternative 2, certain constituents of the radium-contaminated hazardous waste would be treated for their hazardous nature and disposed of as radioactive waste. An attempt would be

made to temporarily store the remaining radium-contaminated hazardous waste at an off-site location until such time as a facility becomes permitted to accept it for disposal. If that attempt fails, the remaining radium-contaminated hazardous waste would have to be stored on-site until a disposal facility could accept it. This radium-contaminated hazardous waste would be stored in the lease area portion of the facility while dismantling efforts would take place in other areas of the facility.

ALTERNATIVE 4 - PARTIAL DECONTAMINATION AND DISMANTLING OF FACILITY

Total Costs: \$ 18,699,000
Time to Implement: 2 years

The RCC facility would be decontaminated and then dismantled. Essentially this option is a combination of Alternatives 2 and 3. The work would involve the partial or complete removal of contaminated interior walls and floors, as well as the removal of any radioactively contaminated sewer lines and soil beneath the building. The remaining areas would be dismantled and disposed of as either contaminated or uncontaminated waste, depending on whether or not decontamination operations were undertaken in the area. Decontamination efforts will result in a reduction of the amount of radioactive material requiring disposal. Precautions would be necessary to minimize the spread of contamination, releases to the environment, and potential exposures to workers. Contaminated material would be packaged in accordance with Department of Transportation regulations and shipped to an approved disposal facility.

It is not possible to determine the extent of contamination in floor or foundation materials at this time. As with Alternatives 2 and 3, a site characterization survey would be conducted to further quantify the extent of contamination in surface and subsurface soils as well as underground piping, including sewer lines, in the immediate vicinity of the Site. Structures and possibly soils below the floor may be contaminated and would require excavation and disposal. If contamination is discovered below the foundation, the time required for excavation, as well as disposal costs, would increase.

It is also not possible to determine the extent, if any, of drain line or sewer contamination. It is highly likely that floor drains originating from the source area are contaminated. Contaminated materials were regularly disposed of via the sanitary sewer system. Other drains from the restricted area of the facility (source repair room, toilets, janitor's closet, and tritium room) have known contamination. This remedy would include an investigation to further determine the extent of that

contamination. Decontamination of drain lines or sewers would involve complete removal and replacement.

As with Alternatives 2 and 3, certain constituents of the radium-contaminated hazardous waste would be treated for their hazardous nature and disposed of as radioactive waste. An attempt would be made to temporarily store the remaining radium-contaminated hazardous waste at an off-site location until such time as a facility becomes permitted to accept it for disposal. If that attempt fails, the remaining radium-contaminated hazardous waste would have to be stored on-site until a disposal facility could accept it. This radium-contaminated hazardous waste would be stored in the lease area portion of the facility while decontamination and dismantling efforts would take place in other areas of the facility.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

All remedial alternatives were evaluated in detail utilizing nine criteria as set forth in the NCP, 40 C.F.R. § 300.430 (e)(9). These criteria were developed to address the requirements of Section 121 of CERCLA to ensure all important considerations are factored into remedy selection decisions.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

- Threshold Criteria**
- ▲ Overall protection of human health and the environment; and
 - ▲ Compliance with applicable or relevant and appropriate requirements.

The following "primary balancing" criteria are used to make comparisons and to identify the major trade-offs between alternatives:

- Primary Balancing Criteria**
- ▲ Long-term effectiveness and permanence;
 - ▲ Reduction in toxicity, mobility, or volume through treatment;
 - ▲ Short-term effectiveness;
 - ▲ Implementability; and
 - ▲ Cost.

The following "modifying" criteria are considered fully after the formal public comment period on the Proposed Plan is complete:

- Modifying Criteria**
- ▲ State/support agency acceptance; and
 - ▲ Community acceptance.

The discussion which follows provides a summary of the relative performance of each alternative with respect to the nine criteria.

Overall Protection of Human Health and the Environment

This criterion addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

Protection of human health is the central mandate of CERCLA. Protection is achieved primarily by taking appropriate action to ensure that there will be no unacceptable risks to human health or the environment through any exposure pathways.

Alternatives 2, 3, and 4 are all designed to remove any source of contamination. Therefore, the potential for public exposure would be eliminated and any potential spread of contamination into the surroundings would be halted. Alternatives 2, 3, and 4 all provide protection of both human health and the environment. Since Alternative 1 does not remove the source of radon generation, but merely secures the Site, the potential for the spread of contamination into the community would continue. Therefore, it would not be as protective of human health and the environment.

Compliance with ARARs

This criterion addresses whether or not a remedy will meet all applicable or relevant and appropriate requirements and/or provide grounds for invoking a waiver. ARARs can be chemical-specific, location-specific, or action-specific.

After implementation of Alternatives 2, 3, and 4, all ARARs providing standards for radiation protection within buildings and allowable surface and soil contamination would be met since all radioactive contamination would be removed from the Site. All ARARs governing the transportation of radioactive material would be met with Alternatives 2, 3, and 4. Tables 2 and 3 identify the major ARARs for the Site. Since no removal of contaminated material would occur with Alternative 1, ARARs would not be achieved.

Long-term Effectiveness and Permanence

This criterion refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

Alternatives 2, 3, and 4 present no long-term threat to public health because these alternatives are designed to remove any source of radon generation. After implementation of Alternatives 2, 3, or

4, there would no longer be any unacceptable risks posed by radioactive or hazardous contaminants associated with the site. Since Alternative 1, no further action, does not involve any actions to prevent further radon generation or to remove any radioactive materials, it would present a long-term risk due to the resulting continual presence of contamination at the Site.

Reduction of Toxicity, Mobility, or Volume

This evaluation criterion relates to the anticipated performance of a remedial technology, with respect to these parameters, that a remedy may employ.

Alternatives 2, 3, and 4 are designed to remove the source of radiation from the Site and, thereby, eliminate any potential mobility of radiation into the Site surroundings. In turn, the volume of radioactive material and its associated toxicity would be removed from the Site. Alternative 2 would result in the smallest volume of radioactive material requiring disposal followed by Alternatives 4 and 3. However, Alternative 1, no further action, does not employ any removal or treatment technologies and, therefore, would not achieve any level of reduction of toxicity, mobility, or volume of contaminants.

Short-term Effectiveness

This criterion involves the period of time necessary for each alternative to achieve protection, and any adverse impacts on human health and the environment that may be posed during construction and implementation of the alternative.

Alternatives 2, 3, and 4 present some minimal short term risks to workers during the remediation. With Alternatives 3 and 4, involving dismantling, there is typically less control over possible releases of contamination to workers than where remediation involves only decontamination, as with Alternative 2. Measures, such as strict adherence to the "as low as is reasonably achievable" ("ALARA") operating philosophy, would be taken to ensure that exposures to the workers are reduced as far below specified limits as is reasonably achievable. Any adverse short-term impacts during implementation of Alternatives 3 and 4, involving dismantling (such as the creation of dust), could be controlled by instituting dust suppression measures. Since Alternative 1, no further action, does not involve any substantial construction, there would be no short-term risks associated with it.

Implementability

This criterion involves the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Alternative 1, no further action, does not require any substantial construction and would be easily and promptly implemented. Alternatives 2, 3, and 4 would all require approval of detailed plans before field work is started. After Alternative 2 is implemented, a verification survey must be performed to ensure that decontamination efforts have succeeded. If not, the decontamination must be performed again, possibly resulting in reinforcement or dismantling of the building. Alternative 3 assumes the entire volume of the facility to be contaminated since segregation of clean debris after dismantling is impossible. Locating a radioactive disposal facility capable of accepting such a great volume of material may prove difficult, thus creating a barrier to implementation. Alternative 4, using partial decontamination, would result in a reduction of contaminated material requiring disposal. This would help in locating a radioactive disposal facility which could accept all the material.

Cost

This criterion includes both estimated capital and operation and maintenance ("O&M") costs.

Alternative 2 would be the most costly to implement followed by Alternatives 3 and 4. Alternative 1, no further action, would be the least costly to implement. The overall cost estimates for each alternative are as follows:

Alternative 1:	\$	515,000
Alternative 2:		21,211,000
Alternative 3:		19,776,000
Alternative 4:		18,699,000

State/Support Agency Acceptance

This criterion assesses the technical and administrative issues and concerns the state may have regarding each of the alternatives. The factors to be evaluated are those features of the alternatives that the state supports or opposes, and any reservations the state may identify.

The State of New York, through the New York State Department of Environmental Conservation ("NYSDEC"), has concurred with EPA's selected remedy. The NYSDEC letter of concurrence is attached as Appendix III.

Community Acceptance

This criterion provides an assessment of any public concerns regarding any of the alternatives. Factors of community acceptance to be discussed include support, reservation, and opposition by the community.

No strong objections from the community were raised regarding the selected remedy. The only concerns regarding implementation centered mainly on the issue of rerouting traffic through the area. The community has expressed a strong preference for a permanent solution and off-site disposal. A responsiveness summary which addresses all substantive comments received during the public comment period, including the May 1, 1990 public meeting, is attached as Appendix IV.

SELECTED REMEDY

Based upon all available data and analyses conducted to date, EPA has selected **Alternative 4 - Partial Decontamination and Complete Dismantling** as the most appropriate solution for meeting the goals of this study. This alternative provides the best balance among the nine criteria used as a means of evaluation. Alternative 4 provides protection of human health and the environment, while minimizing future costs and problems, and offers the best balance in time spent, volume of radioactive waste generated, and overall costs. The volume of waste generated, although greater than that of the decontamination option, is less than that of the total dismantling option. This is an important consideration as the availability of disposal space for radium contaminated material is expected to continue to decrease in the future. After implementation of Alternative 4, the source of radon generation will be removed and the Site property will be restored to a condition allowing unrestricted use.

The partial decontamination will be performed in order to remove hot spots and reduce the risk of worker exposure and the risk of spreading contamination outside the Site boundary during dismantling. The decontamination will also prepare parts of the building masonry (with less than 5 pCi/g radium-226) for disposal in a sanitary landfill, thereby reducing the volume of material requiring costly disposal in a radioactive waste facility.

The dismantling will be accomplished in three phases: (1) removal of material (except masonry) from the building interior; (2) removal of the building roof, windows, and doors; and (3) dismantling of the residual masonry. All clean material (i.e., steel) with surfaces that meet the limits of Table 3, or bulk material (i.e., masonry, soil) with less than 5 pCi/g Ra-226 will not require disposal in a radioactive waste facility. Soil on the Site will be considered contaminated if it contains more than 5 pCi (above background) of Ra-226 per gram of soil averaged over the first 6 inches and greater than 15 pCi (above background) of Ra-226 per gram of soil for subsequent 6 inch layers. Although New York State Department of Labor ("NYS DOL") regulations require no more than 0.1 pCi/g of Ra-226 for disposal of material in a sanitary landfill and for soil remediation, due to the technical difficulty in achieving this level, NYSDOL has agreed to waive their soil/disposal limits in favor of the EPA 5/15 pCi/g Ra-226 regulation. The NYSDOL letter,

waiving the regulation requiring 0.1 pCi/g of Ra-226 for soil remediation and disposal, shall be placed in the administrative record for the Site. All contaminated material is expected to be disposed of in the radioactive waste disposal facility operated by Envirocare of Utah, Incorporated, located in Clive, Utah, since, at the present time, this is the only facility capable of accepting this type of naturally occurring radioactive material.

Certain constituents of the radium-contaminated hazardous waste would be treated for their hazardous nature and disposed of as radioactive waste. Utilizing present technology, it appears that the mercury, potassium chromate, and galena may be treated for their characteristic toxicity hazard and then disposed of in a radioactive waste facility. An attempt would be made to temporarily store the remaining radium-contaminated hazardous waste at an off-site location until such time as a facility becomes permitted to accept it for disposal. If that attempt fails, the remaining radium-contaminated hazardous waste would have to be stored on-site until a disposal facility could accept it. This radium-contaminated hazardous waste would be stored in the lease area portion of the facility while decontamination and dismantling efforts would take place in other areas of the facility. The remediation will not be completed until the radium-contaminated hazardous waste is disposed of off-site.

Once complete, the remedial action will have removed all radioactive and hazardous materials, above acceptable levels, from the Site, rendering the Site property allowable for unrestricted use.

STATUTORY DETERMINATIONS

EPA believes that the selected remedy will satisfy the statutory requirements of providing protection of human health and the environment, being cost-effective, utilizing permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and satisfying the preference for treatment as a principal element.

Protection of Human Health and the Environment

The selected remedy will eliminate all remaining threats posed by the Site. All sources of radioactive and hazardous materials will be removed from the Site. The Site property will be returned to a condition allowing unrestricted use once the remedial action is complete. There are no unacceptable short-term risks caused by implementation of the remedy.

Compliance with ARARs

Few applicable standards exist for the cleanup of radioactively contaminated sites and buildings. This section discusses the applicability or relevance and appropriateness ("ARARs") of standards for the remediation of sites containing radioactive contamination. Several agencies have authority over the cleanup of sites contaminated with radioactive materials. Each agency has a variety of general regulations that could be applicable or relevant and appropriate to CERCLA sites with similar radioactive contamination. In addition, there are a variety of radiation advisories and guidance, referred to as "to be considered" ("TBCs"), that, while not ARARs, may be considered when developing protective remedies at CERCLA sites. The primary agencies that have regulatory programs for the cleanup of such sites and buildings are EPA, the Nuclear Regulatory Commission ("NRC"), the Department of Energy ("DOE"), and States. The Department of Transportation ("DOT") also has regulations governing the transporting of radioactive wastes. The selected remedy will comply with all of the following ARARs.

EPA regulations governing the cleanup of uranium mill tailings, 40 C.F.R. 192, have been determined to be relevant and appropriate for soil remediation and disposal of materials for the Site. Again, as stated on page 13, although NYSDOL regulations for soil/disposal are more stringent, NYSDOL has agreed to waive those levels in favor of the levels found in 40 C.F.R. 192. Table 2 highlights the uranium tailings cleanup standards and summarizes additional ARARs for the Site. Table 3 highlights the allowable surface levels for Ra-226 as found in NRC Regulatory Guide 1.86. These NRC limits for allowable surface contamination are more stringent than NYSDOL limits for allowable surface contamination and are relevant and appropriate for remediation of the Site. The selected remedy will comply with the more stringent regulations. The regulations discussed above and additional regulations found to be relevant and appropriate for remediation of the Site are listed below.

EPA ARARs

- ▲ 40 CFR Part 61: "National Emissions Standards for Hazardous Air Pollutants: Standards for Radionuclides"
- ▲ 40 CFR Part 192: "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings"
- ▲ 40 CFR Part 261: "Identification and Listing of Hazardous Waste"

NRC ARARs

- ▲ 10 CFR Part 20: "Standards for Protection Against Radiation"
- ▲ 10 CFR Part 61: "Licensing Requirements for Land Disposal of Radioactive Waste"

- ▲ Regulatory Guide 1.86: "Termination of Operating Licenses for Nuclear Reactors"
- ▲ 10 CFR Part 71: "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions"

DOT

- ▲ 49 CFR 173: "Transportation and Packaging of Radioactive Materials"

STATE

- ▲ 12NYCRR38: "Ionizing Radiation Protection"
- ▲ 6NYCRR Part 380: "Rules and Regulations for Prevention and Control of Environmental Pollution by Radioactive Materials"

TBCs

- ▲ "Technological Approaches to Cleanup of Radiologically Contaminated Superfund Sites" - EPA - May 23, 1988.
- ▲ "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material"- NRC - July, 1982.

Cost-Effectiveness

The preferred alternative, Alternative 4, provides overall effectiveness proportionate to its cost. It is estimated to be the least expensive alternative to implement, other than the no action alternative, and saves substantial costs on the disposal of contaminated material by reducing the amount of contaminated material requiring disposal through the partial decontamination effort.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the Radium Chemical Company Site. The selected remedy represents the best balance of the nine evaluation criteria used to judge all alternatives.

No treatment exists for radioactively contaminated material. Therefore, the selected remedy must involve disposal in an approved radioactive waste disposal facility. Treatment technologies will be used for certain portions of the radium-contaminated hazardous waste

to render them non-hazardous prior to their disposal as radioactive material.

After dismantling and removal of the building and any contaminated soils or subsurface piping is complete, the Site will no longer be contributing any contamination and will be restored to a condition allowing unrestricted use.

Preference for Treatment as a Principal Element

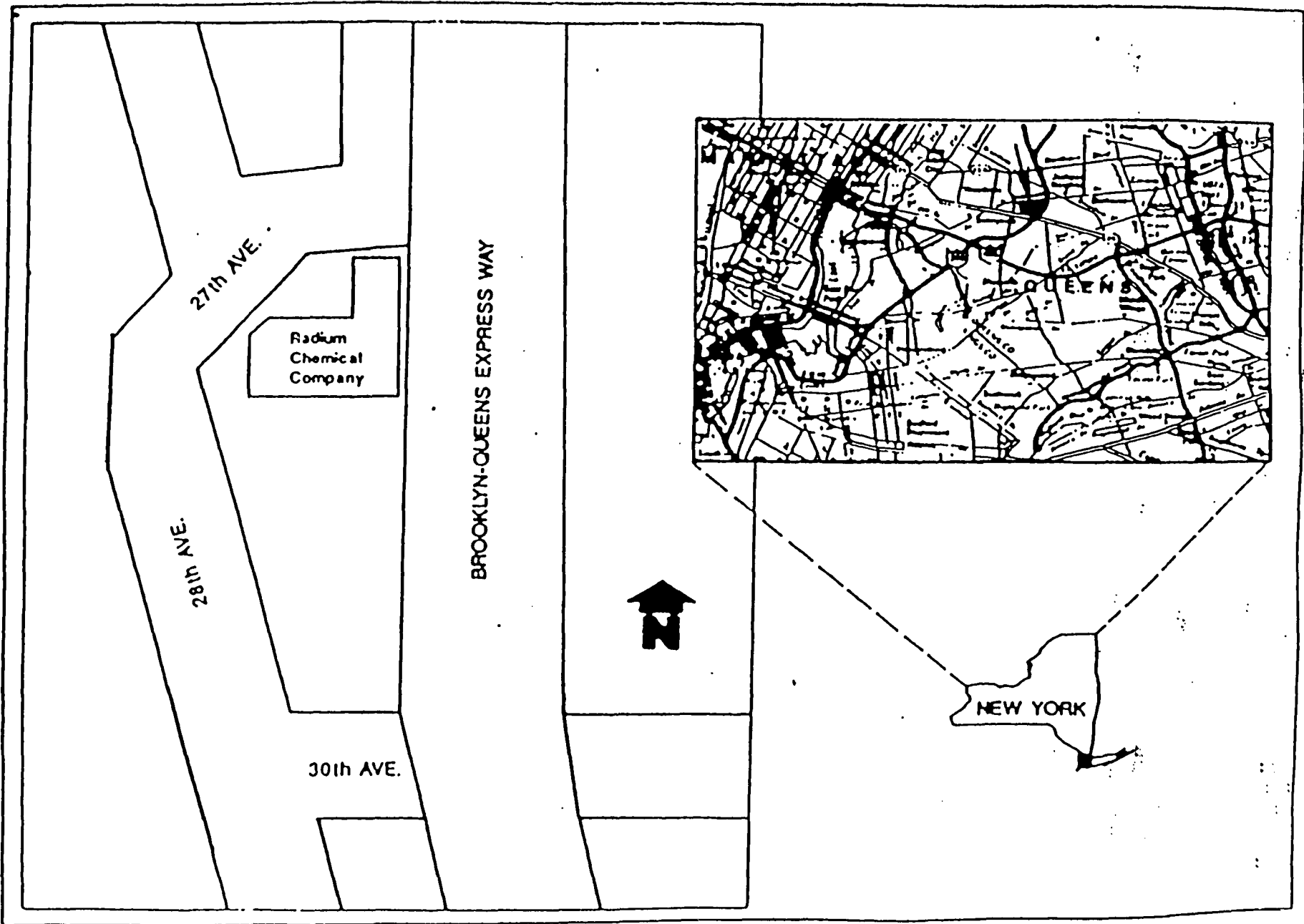
The statutory preference for treatment is not satisfied by the selected remedy, since no treatment exists for addressing the principal threat, namely radioactive material. Again, treatment methods will be employed for certain constituents of the radium-contaminated hazardous waste prior to its disposal.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Radium Chemical Company Site was released to the public in April 1990. The Proposed Plan identified Alternative 4, Partial Decontamination and Complete Dismantling, as the preferred alternative. EPA reviewed all comments submitted during the public comment period. Upon review, it was determined that no significant changes to the selected alternative, as it was originally identified in the Proposed Plan, were necessary.

APPENDIX I

FIGURES



27th AVE.

Radium
Chemical
Company

28th AVE.

BROOKLYN-QUEENS EXPRESS WAY



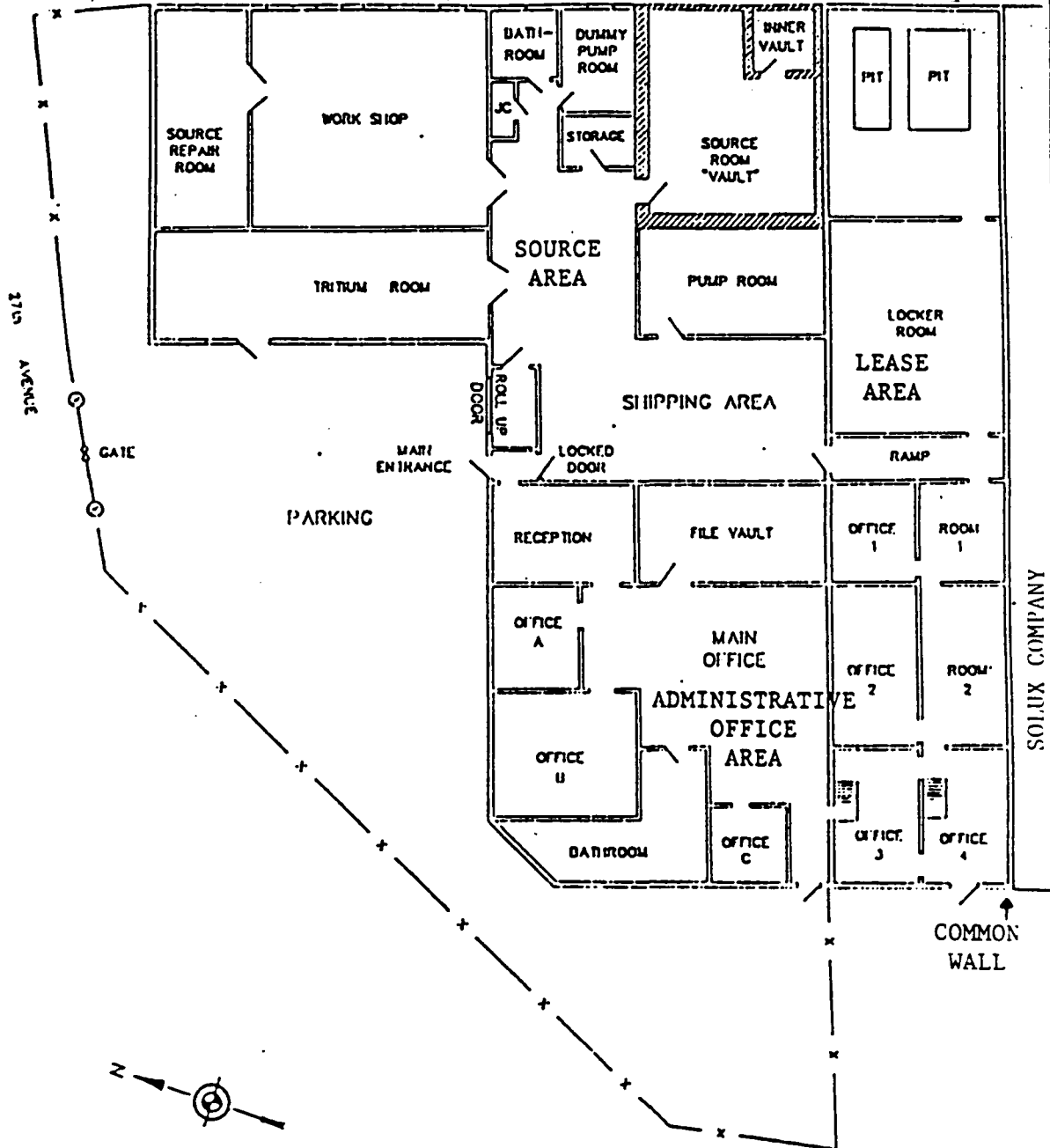
30th AVE.



NEW YORK

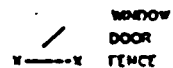
FIGURE 2

RADIUM CHEMICAL COMPANY
60-06 27th AVE.
WOODSIDE, NY 11377



SOLUX COMPANY

LEGEND



GRAPHIC SCALE



(IN FEET)
1 inch = 10 ft.

APPENDIX II

TABLES

TABLE 1

RADIUM-CONTAMINATED HAZARDOUS WASTE CONSTITUENTS REMAINING ON-SITE

<u>Chemical</u>	<u>Radium Content (pCi/g or pCi/l)</u>
Mercury	(6.09 c/s gross)
Mercury	1.32 (32.35 c/s gross)
Mercury	(9.59 c/s gross)
Mercury	(105.91 c/s gross)
Mercury	(6.88 c/s gross)
Mercury	(68.86 c/s gross)
Mercury	0.61
Mercury	(5.45 c/s gross)
Mercury	(7.44 c/s gross)
Mercury	(10.85 c/s gross)
Mercury	(18.01 c/s gross)
Mercury	(14.89 c/s gross)
Mercury	(10.76 c/s gross)
Mercury	(10.75 c/s gross)
Mercury	(27.34 c/s gross)
Mercury	(7.12 c/s gross)
Mercury	(5.39 c/s gross)
Varnish	3.3
Zinc Powder	4.9
Adhesive	0.55 pCi/ml Cs-137
Acetone	1.1 pCi/ml Cs-137
Ferric Chloride	2.9
Platinum Plating Solution	23.7
Dupont Phosphine gg	805
Para Rosaniline Base	22.0 Th-232
Flourcin	19
Dupont Auramine	67.5
Granylurea Phosphate	17.5
Formaldehyde	9.2
Galena (Lead Sulfide)	3795
5-Chlor-2-Hydroxy Benophene	6.2
Potassium Chromate	4.2
Unknown	316
Unknown	11.2
Unknown	4.7
Unknown	416

TABLE 2

MAJOR ARARs

Type of Requirement	ARAR	Source of ARAR
<u>Public Health</u>		
▲ Radon Decay Products	0.02 WL (as an annual average)	40 CFR 192; EPA guidance
▲ Gamma radiation	20 micro R/hr above background	40 CFR 192 EPA guidance
▲ Radon	4 pCi/l	EPA guidance
<u>Cleanup of Land</u>		
▲ Radium concentration in soil	5 pCi/g above back- ground at surface ² in first six inches	40 CFR 192
	15 pCi/g above back- ground at subsurface ² in successive 6 inches	40 CFR 192
<u>Cleanup of Surfaces</u>	(See Table 3)	NRC Reg. 1.86
<u>Land Disposal</u>		
▲ Longevity	At least 200 yrs.	40 CFR 192
▲ Radon Emission rate	20 pCi/m ² /sec	40 CFR 192
<u>Transportation</u>	(See discussion in Appendix IV)	49 CFR 173

TABLE 3

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE ^a	AVERAGE ^{b c}	MAXIMUM ^{b d}	REMOVABLE ^{b e}
U-nat, U-235, U-238, and associated decay products	5,000 dpm α /100 cm ²	15,000 dpm α /100 cm ²	1,000 dpm α /100 cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm ²	3000 dpm/100 cm ²	200 dpm/100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm β - γ /100 cm ²	15,000 dpm β - γ /100 cm ²	1000 dpm β - γ /100 cm ²

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

^cMeasurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

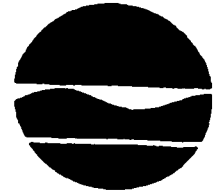
^dThe maximum contamination level applies to an area of not more than 100 cm².

^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

APPENDIX III

NYSDEC LETTER OF CONCURRENCE

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233



Thomas C. Jorling
Commissioner

MAR 30 1990

Dear Ms. Cappelli:

The New York State Department of Environmental Conservation has reviewed both the Draft Focused Feasibility Study and the Draft Proposed Remedial Action Plan ("PRAP") for the Radium Chemical Company Site ("Site"). These two draft reports were sent to Dr. Paul J. Merges by letters dated February 12, 1990 and March 9, 1990. The Department concurs with the PRAP in that Alternative 4 is the preferred method for remediating the Site.

Both draft reports discuss "mixed waste" constituents presently remaining on the Site. EPA has recently announced their intent to delegate "mixed waste" authority under RCRA to this Department. However, mixed waste delegation does not apply to naturally occurring radioactive materials (NORM), such as the radium contaminated hazardous wastes at the Radium Chemical Site. Thus, it is recommended that EPA avoid using the term, "mixed wastes" when referring to hazardous wastes also contaminated by NORM. The reports should also discuss the disposal of explosive materials (ether) found at the Site.

Thank you for the opportunity to comment on these reports. If you have any questions, please contact Dr. Paul J. Merges, Director, Bureau of Radiation at:

NYS Department of Environmental Conservation
Division of Hazardous Substances Regulation
Bureau of Radiation
50 Wolf Road, Room 510
Albany, New York 12233-7255
(518) 457-2225

Sincerely,

R. Darryl Banks
Deputy Commissioner

cc: Dr. Paul J. Merges

Ms. Janet Cappelli
Remedial Project Manager
U. S. Environmental Protection Agency
Jacob K. Javits Federal Building
Room 29-100
New York, NY 10278

APPENDIX IV

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

FOR THE

RADIUM CHEMICAL COMPANY
WOODSIDE, NEW YORK

MAY 1990

This document was published for the U.S. Environmental Protection Agency (EPA) by Roy F. Weston, Inc. (WESTON) under ARCS Contract No. 68-W9-0022, Work Assignment No. 007-2L3H. It is a compilation of portions of the May 1, 1990 public meeting transcript (Document Control No. 4200-07-AAPJ), a draft question and answer information sheet reflecting questions asked and answers provided at the May 1, 1990 public meeting (Document Control No. 4200-07-AAPK), a draft question and answer information sheet reflecting questions asked and answers provided at the May 1, 1990 meeting with area businesses (Document Control No. 4200-07-AAPJ), the Proposed Remedial Action Plan (Document Control No. 4200-07-AAOJ), and a Congressional inquiry (Document Control No. 4200-07-AAQX) and corresponding EPA response (Document Control No. 4200-07-AAQY).

**RESPONSIVENESS SUMMARY
RADIUM CHEMICAL COMPANY
WOODSIDE, NEW YORK**

A. OVERVIEW

This Responsiveness Summary includes 1) information on the site background (Section B), 2) an explanation of the proposed and selected alternatives (Section C), 3) a summary of the comments received during the public comment period and Agency responses (Section D), and 4) the remaining concerns (Section E).

B. SITE BACKGROUND

The Radium Chemical Company (RCC) Site is located at 60-06 27th Avenue in Woodside, Queens, New York. The Site consists of a one-story building bordered on the west by 27th Avenue and on the east by the Brooklyn-Queens Expressway (BQE), a major urban highway. The area surrounding the Site is classified as a light commercial/industrial sector. A Health Fitness Club is located within 100 feet of the Site and numerous pedestrians pass the Site fence and building daily. Vehicular traffic is very heavy along 27th Avenue, a primary access route to the BQE.

The RCC building is approximately 10,000 square feet in size; 7,220 square feet of which encompassed the Radium Chemical Company. The Solux Company occupies space in an adjoining part of the building. The Radium Chemical Company and Solux facilities share a common wall within the building, and some of the Solux floor space at one time was leased to Radium Chemical.

The RCC Site and the surrounding population within a 3-mile radius obtain drinking water from the New York City municipal system, which comes from surface impoundments 10 miles from the Site. The ground water underlying the Site is very shallow at 5 - 10 feet, but is not used as a drinking water supply. The nearest drinking water well is 6 miles from the Site. The nearest surface water body to the Site is the East River, over 1.5 miles away. The nearest residence is located 500 feet from the Site. It is estimated that 27,000 people reside in high rise apartments and row houses within a 1-mile radius of the Site.

RCC was founded in New York in 1913. The company initially produced luminous paint for watch dials and instruments. Later, the company manufactured, leased and sold radium-226 in the form of radiation therapy and radiographic sources to hospitals, medical centers, and research laboratories. Sources were also leased or sold in limited quantities to the oil industry for geophysical logging. In the late 1950s, RCC transferred its operations to the present location in Woodside, New York. The radium and radon devices were stored on-site in lead containers in a concrete vault room. Eventually the demand for radium sources lagged as they were replaced with advanced radiation therapy techniques using cesium and cobalt sources. Subsequently, many leased radium sources were returned to RCC and were stored on-site.

In 1983, the State of New York suspended the RCC operating license due to various disposal and safety infractions. RCC attempted to get permission to begin operations again in 1986, but was denied. The New York State Department of Labor issued an Order against RCC on October 17, 1987, for the removal of the radium sources and decontamination of the building. The owner was unable to finance the remediation and, subsequently, abandoned the building. This resulted in a second Stipulation and Order, issued on July 20, 1988, determining that the facility could not be maintained and that it was de facto abandoned by RCC. Remaining on-site were a large number of radium-containing sealed devices, some of which were suspected of releasing radium and radon gas. The amount of radium-226 at the Site was estimated, at the time, to be 110 Curies (Ci). Also on-site were hundreds of containers of laboratory chemicals, many of which were reactive, corrosive, flammable, and/or potentially shock sensitive.

In July 1988, at the request of the State of New York, EPA undertook a limited emergency removal action to secure the facility and remove the radioactive sources. EPA provided 24-hour security, instituted a comprehensive program of public outreach, and initiated measures to stabilize the Site. By August 1988, EPA had erected fencing around the perimeter and installed remote monitoring surveillance, a foam fire suppressant system, special vents, and other safety measures. In February 1989, EPA developed a support agreement with the U.S. Army Armament, Munition, and Chemical Command to utilize an existing contract with Chem-Nuclear Systems, Incorporated., to remove the radium sources and other radioactive and hazardous materials from the Site and transport them to approved disposal facilities. The removal action was completed in October 1989. Approximately 120 Ci of radium in the form of sources, contaminated debris, and loose radium salts and luminous compounds were removed from the Site. This material was disposed of in facilities, operated by U.S.

Ecology, Incorporated, located in Richland, Washington and Beatty, Nevada.

On February 10, 1989, prior to the removal action described above, the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) issued a Public Health Advisory to alert the public, EPA, and the state of New York of a serious threat to human health, based on the threatened release of radium-226 from the RCC site. EPA had requested ATSDR to perform the assessment so that the Site would be recognized as a high priority and be eligible to receive federal Superfund funding for complete remediation. In an August 1989 special National Priorities List (NPL) update, EPA proposed the RCC Site for the NPL based on the ATSDR advisory. On November 21, 1989, the RCC Site was added to the NPL.

Currently, the Site is inactive and secure. Residual radioactive contamination exists within the facility. Also inside the facility are two 55-gallon drums containing a small volume of chemicals and a 30-gallon container of mercury that had been used in RCC's manufacturing operations. These chemicals were found to contain radioactive contamination and are classified as radium-contaminated hazardous waste.

Radium decays to form radon gas and other decay products. Within tightly enclosed buildings, the danger exists for potential build-up of radon gas above the standards set to protect human health, representing a long-term exposure hazard to people who live or work in the buildings.

C. SUMMARY OF PROPOSED AND SELECTED ALTERNATIVES

Although the removal actions to date have stabilized the Site and reduced the immediate risk, it is now necessary to address the long-term remediation of the Site. The Superfund law requires each site remedy that is selected to be protective of human health and the environment, cost-effective, and in accordance with statutory requirements. Permanent solutions to contamination problems are to be achieved to the maximum extent practicable.

The remedial alternatives are:

- Alternative 1: No Further Action
- Alternative 2: Total Decontamination of Facility
- Alternative 3: Complete Dismantling and Removal of Facility
- Alternative 4: Partial Decontamination and Complete Dismantling of Facility

After detailed evaluation of all alternatives, EPA has selected Alternative 4: Partial Decontamination and Complete Dismantling of the Facility as its preferred alternative. Under this alternative, parts of the RCC facility would first be decontaminated and then the entire facility would be dismantled. The work would involve the partial decontamination of certain areas in the facility in order to reduce the volume of radioactive material requiring disposal. Since it is not possible to determine the level of contamination in soils and sewer lines at this time, this alternative would also include a site characterization survey to further quantify the extent of contamination in soil and sewer lines in the immediate vicinity of the Site. If contamination is discovered below grade, the materials will have to be removed and replaced with clean soils. If sewers are found to be contaminated, they will require removal and replacement. All contaminated material would be packaged in accordance with Department of Transportation regulations and disposed of in an approved out-of-state disposal facility.

The radium-contaminated hazardous waste presents a unique problem. Certain constituents of the radium-contaminated hazardous waste would be treated for their hazardous nature and disposed of as radioactive waste at an approved waste repository. An attempt will be made to temporarily store the remaining radium-contaminated hazardous waste at an off-site location until such time as a facility becomes permitted to accept it for disposal. If that attempt to locate an off-site facility fails, the remaining radium-contaminated hazardous waste will have to be secured and stored on-site. It may be stored in the lease area portion of the building while decontamination and dismantling efforts are performed in other portions of the facility.

Based on current information, this alternative provides the best balance among the nine criteria used as a means of evaluation. Alternative 4 provides protection of human health and the environment, while minimizing future costs and problems. This partial decontamination and complete dismantling option seems to offer the best balance in time spent, volume of radioactive waste generated, and overall costs. The volume of waste generated, although greater than that of the decontamination option, is less than that of the total dismantling option. This is an important consideration, as the availability of disposal space for radium contaminated material is expected to continue to decrease in the future. After implementation of Alternative 4, the source for radon generation will be removed and the site property will be restored to a condition allowing unrestricted use.

D. SUMMARY OF PUBLIC COMMENTS & AGENCY RESPONSES

D-1. SUMMARY OF QUESTIONS RAISED AT MEETING HELD WITH AREA BUSINESSES AND RESPONSES - MAY 1, 1990 AT 4:00 P.M.

A meeting was held with the area businesses owners. Following a brief introduction of the various EPA representatives by Rich Cahill, Public Affairs Specialist, the Remedial Project Manager, Janet Cappelli, explained the four alternatives in the Proposed Remedial Action Plan (Proposed Plan), and the reasons why EPA is recommending Alternative 4, Partial Decontamination and Complete Dismantling of the Facility. Concerns raised by area business owners and managers following her presentation included the following:

1. Is there a potential threat to our ground water?

EPA Response: EPA would not expect to find any ground water contamination. EPA tested the soil to 24 inches and found radioactive contamination in only the first six inches of soil. The groundwater is at least ten feet below the surface.

2. Why is EPA proposing to dismantle the entire building?

EPA Response: A full decontamination of the building would likely damage the structural integrity of the building and require reinforcement. Leaving the building standing would also require EPA to perform continuous monitoring. Dismantling would ensure that all radioactive materials are taken off the site and would alleviate the need for monitoring. The remedy may be modified if EPA discovers new information when on site during the cleanup process.

3. An area businessowner asked why he had not received results from the air monitoring that was conducted during the removal phase.

EPA Response: Shawn Googins, EPA, is in the process of preparing a full report that will document that information. Although the air monitoring report is not part of the Administrative Record, it shall be placed, along with the Administrative Record, at the repositories which are located at the Woodside Branch Library and Sunnyside Branch Library. Preliminary analysis of monitoring results shows that all samples collected were within background limits.

4. Is Shawn Googins still on the project?

EPA Response: Not directly. However, he will be involved in a consultative capacity.

5. What were the purposes of the ambulances [seen around the site last Friday, 4/27]?

EPA Response: On that date, EPA entered the RCC facility to check on site conditions. The presence of the ambulance was requested by the New York City Department of Health as a precautionary measure. During the remedial action, ambulances may be on a stand-by basis for emergencies, primarily construction injuries.

6. Is there still gamma radiation in the building?

EPA Response: Yes, along with beta and alpha radiation.

7. Will dust release be controlled during the remedial action?

EPA Response: Yes, EPA plans to institute a comprehensive method of dust control. This includes an attempt to limit all contamination to the interior of the building. One of EPA's contractors, Ebasco Services, Inc., is preparing specifications documenting how the remedial (cleanup) contractor will contain contamination within the building. High-efficiency particulate air (HEPA) filters on the building roof will constantly be running while workers are in the building. The HEPA filters will establish negative pressure inside the building, thus containing the contamination within the building. Dust suppression will also be maintained by the use of dust vacuum cleaners and water misting during all dismantling activities.

8. Will the "envelope" of contained radioactivity be broken as the building is dismantled?

EPA Response: An envelope of radioactive containment will be formed by the use of the HEPA system which creates a negative pressure preventing outward flow of air. The envelope will only be broken after all decontamination efforts are completed.

9. How is traffic going to be handled?

EPA Response: Traffic will be rerouted to minimize disruption to the community. During the remedial action phase, the traffic will probably be rerouted as it was during the removal action, by preventing traffic flow directly alongside the site. EPA will try to prevent traffic from moving through the BQE Racquetball Club parking lot. EPA is open to suggestions from the area businesses for further traffic control measures.

10. Who will assume liability if someone gets hurt walking through the parking lot that separates Humiseal from the BQE Racquetball Club?

EPA Response: Liability for incidents in the parking lot rests with the property owner, Humiseal.

11. Shouldn't the New York City Traffic Department be represented at these meetings?

EPA Response: Terry Hamilton, New York City Traffic Department, will be invited to attend future meetings. EPA has already contacted him regarding the rerouting of traffic for the remedial action.

12. What is the range of danger now?

EPA Response: The emergency removal action removed the greatest source of radioactivity at the site, namely the radium sources. Measurements taken after the removal action was completed indicated the levels of radiation to be substantially reduced. However, there exists levels of radiation within the site, attributable to the residual radioactive contamination, which are still above acceptable health-based limits.

13. What disposal site will be used to receive the radioactive waste removed from the site?

EPA Response: The radioactive waste will be transported to a disposal site in Clive, Utah licensed strictly to handle naturally occurring radioactive material (NORM). This is the only facility in the country presently licensed to accept this type of waste. It is operated by Envirocare of Utah, Incorporated.

14. What is the project timetable?

EPA Response: It is estimated that Alternative 4, Partial Decontamination and Complete Dismantling of the Building, will take a maximum of two years to complete. However, the project is targeted for completion in one year.

Public comments on the Proposed Plan will be received through May 13, 1990. A remedy will be selected in June and funds for the remedial action will be transferred to the U.S. Army Corps of Engineers (which is responsible for selecting the remedial contractor) by June 30, 1990. The remedial action will then be initiated in July 1990. Actual on-site presence by the remedial action contractor and the U.S. Army Corps of Engineers will most likely not occur until late August 1990.

15. How much did the removal action cost?

EPA Response: The removal action was initially budgeted at \$5 million. The actual cost was approximately \$4.3 million.

D-2. SUMMARY OF QUESTIONS RAISED AT PUBLIC MEETING ON MAY 1, 1990 AT 7:30 P.M. AND RESPONSES

A public meeting was held on May 1, 1990 at the Bulova Corporate Center. (See Appendix A for the agenda). Questions raised by the public and the EPA responses follow.

1. Who retains title to the land (the Radium Chemical property)?

EPA Response: The title will remain in the owner's name, Joseph Kelly Jr., but EPA will be placing a lien on the property. New York State has issued an order which found the site property to be de facto abandoned, which may relinquish Mr. Kelly's property right.

2. What is being done to limit the use of the property?

EPA Response: EPA is proposing to clean up the property completely. Once that is done, the property will be available for unrestricted use. Imposing limits on uses of real property, i.e. institutional controls, is the responsibility of local government and beyond EPA's control.

3. **Can Mr. Kelly have access to the site property?**

EPA Response: New York State has an order against Mr. Kelly finding that he abandoned his property. With respect to the site, Mr. Kelly was ordered not to interfere with any remedial efforts that any agency shall make on that property. Therefore, he cannot go back onto the property during the remedial action.

4. **Is Joseph Kelly being investigated under Federal law?**

EPA Response: Yes, EPA is presently investigating the financial assets, if any, of Mr. Kelly.

5. **Why isn't Mr. Kelly in jail? (Citizens expressed concerns with the threats left to the community by Mr. Kelly)**

EPA Response: The EPA planned remedial action is a civil law action. EPA cannot comment on the existence, nature, or extent of any criminal law investigation in the context of this action.

6. **Where is the waste from the site going to be taken?**

EPA Response: It is EPA's intent to dispose of these materials in a facility located in Clive, Utah operated by Envirocare of Utah, Incorporated. The Utah facility is the only facility that can accept the kind of radioactive waste generated by the Radium Chemical Company site. Specifically, the waste type is naturally occurring radioactive material.

7. **How will the waste be transported? What kinds of routes are used?**

EPA Response: EPA is working very closely with the New York City Police Department and the New York City Department of Transportation to ensure that any transportation will be done in a safe manner. The best route of transportation, one that will minimize any risks to the community, will be used. The transportation routes for the removal were thoroughly investigated to ensure as minimal an impact to the community surrounding the site as possible. Those routes proved effective and therefore the same routes for transportation out of the city will likely be used for the remediation.

Additionally, the U.S. Department of Transportation (USDOT) regulates the cross-country transportation of radioactive waste. USDOT also requires the waste to be packaged according to specific guidelines. The waste from this site will probably be transported by truck. There are certain specifications on how much waste can be put into each truck, what the levels of radiation at a certain distance from the truck must be, and the routes that can be used. These routes are designed to pass by the fewest number of residences as possible.

8. **A member of the public expressed concern because the site is in a very populated area, and the BQE is a very heavily congested public thoroughfare.**

EPA Response: EPA will not transport the waste during rush hours or during normal business hours. Transportation of hazardous materials will be done during the hours with the least amount of traffic.

One of the advantages of the site is its close proximity to a major highway. To the degree possible, it is EPA's intention to try to avoid going through residential areas. The specific routes have not yet been determined, but discussions have been initiated with the Department of Transportation and the New York City Police Department.

9. **Is the City doing anything because, according to the video shown at the public meeting, Mr. Kelly is still receiving cash flow from the Company?**

EPA Response: This is not occurring any more. Everyone who leased sources from the Radium Chemical Company was sent a form letter stating that the lessees could not send the sources back to Radium Chemical since the Company is no longer in business. Those leasing could either purchase and take full responsibility for the sources (needles), or dispose of them and send EPA the manifest showing exactly how and where the sources were disposed of to ensure correct procedures were followed.

10. **Was gold stolen from this facility? What has happened to the gold that was stolen from the Radium Chemical Site?**

EPA Response: Gold was stolen from the Radium Chemical Company in 1978. By the time Radium Chemical realized the gold was missing, it was too late for them to track it. The location of the gold is not known.

11. Is the gold that is potentially being sold in the New York area being checked for radioactivity?

Response [According to a representative from Assemblyman Lafayette's Office]: State law requires that all gold be tested for radioactivity prior to its distribution.

EPA Response: The regulation of the gold is beyond the scope of EPA.

12. Has any checking been done on the health of the people who worked at Radium Chemical Company?

EPA Response: The New York City Department of Health (NYCDOH) is checking up on the people who have worked at the Company and are currently living in the New York City area. NYCDOH sent them letters informing them of the situation and asking them if they would like to be tested and/or have their homes tested. The New York State Department of Health (NYSDOH) is doing something similar. EPA has also identified three past employees who live in the State of New Jersey. EPA and NYSDOH are currently communicating with the State of New Jersey regarding similar follow-ups.

D-3 ADDITIONAL WRITTEN COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND RESPONSES.

Several questions were raised regarding the storage of "mixed waste" remaining at the site. Please note that although the Proposed Plan identified hazardous waste contaminated by radium as "mixed waste", the proper term for this waste is "radium-contaminated hazardous waste". This is in response to comments identifying that "mixed waste" only applies to radionuclides governed under the Atomic Energy Act (AEA), which does not govern radium-226.

EPA's response to questions referring to "mixed waste" are answered by substituting "radium-contaminated hazardous waste".

1. Could you explain what the nature of the attempt to temporarily store the remaining radium-contaminated hazardous waste at an off-site location will be?

EPA intends to remove the radium-contaminated hazardous waste from the site as soon as possible. EPA's ability to do so is dependent upon the availability of a facility which is licensed and permitted to accept such wastes. New York State is presently reviewing a permit application submitted by the Nuclear Diagnostic Laboratories, Incorporated

facility, located in Peekskill, New York, for temporary storage of radium-contaminated hazardous waste." We are identifying the means available for transporting the radium-contaminated hazardous waste to these facilities in hopes that they will soon be permitted.

2. **What are the difficulties in locating such a site? What is the likelihood of locating such a site?**

The Environmental Protection Agency is responsible for ensuring that the hazardous and radioactive components of the radium-contaminated hazardous waste are disposed of properly. In order for a commercial facility to dispose of radium-contaminated hazardous waste, it must first receive a permit under RCRA for disposal of radium-contaminated hazardous waste as well as the state. Since the AEA does not govern radium, the Nuclear Regulatory Commission's authority does not extend to the disposal of radium-contaminated hazardous waste.

Presently, no facility in the United States is fully approved to accept radium-contaminated hazardous waste on a temporary or permanent basis. However, the NORM waste repository operated by Envirocare of Utah, Incorporated, located in Clive, Utah, is in the process of applying for a permit which will allow the facility to accept radium-contaminated hazardous waste for burial. A spokesman for Envirocare of Utah, Inc. indicated to us that his facility will be permitted by December 1990. The disposal cell necessary to bury the radium-contaminated hazardous waste is already under construction, so that upon issuance of the permit, the facility will be ready immediately to accept radium-contaminated hazardous waste. In addition, New York State, as discussed above, is reviewing an application for a temporary storage facility in Peekskill, New York.

3. **If the attempt fails, how will the remaining radium-contaminated hazardous waste be secured and how will it be stored on-site?**

The remedial action selected in the Record of Decision is expected to begin in July 1990. The radium-contaminated hazardous waste currently in the Radium Chemical facility will be secured in the lease area portion of the building while remediation efforts are conducted in other portions of the building. The entire remediation is expected to be completed within two years. The removal of the radium-contaminated hazardous waste is an integral part of the selected remedy for the site, and as such, the remediation

would not be considered to be complete until the radium-contaminated hazardous wastes are removed from the site. If necessary, the radium-contaminated hazardous waste will be stored in a portion of the building that is free of contamination and completion of the remediation will be delayed until the radium-contaminated hazardous waste can be transported off-site. In the absence of a permitted facility, EPA has no option but to allow the radium-contaminated hazardous waste to remain secure on-site until such a facility for disposal is found.

4. **What is the level of difficulty in securing the permit for such a disposal? What is the likelihood of a permit being granted?**

Both license and permit applications require description of the manner and condition of disposal; evaluation of pertinent environmental information; usage of ground and surface water in the area; public interaction, etc. Difficulties which arise in siting RCRA disposal facilities are often related to environmental conditions, land use and lack of acceptance by members of the public in the vicinity of the site.

APPENDIX A

PUBLIC MEETING AGENDA

U.S. ENVIRONMENTAL PROTECTION AGENCY ACTION
at the
Radium Chemical Company Site
60-06 27th Avenue
Woodside, Queens

PUBLIC MEETING
Bulova Corporate Center
Tuesday, May 1, 1990
7:30 P.M.

AGENDA

Introduction

Rich Cahill
Public Affairs Specialist
Environmental Protection Agency

An Overview of the Superfund Program

George Pavlou
Associate Director
New York Superfund Programs
Environmental Protection Agency

*Site History, Removal Action,
and the Proposed Remedial
Action Plan*

Janet Cappelli
Superfund Project Manager
Environmental Protection Agency

Questions and Answers

APPENDIX B

**PUBLIC MEETING AND PRE-MEETING
SIGN-IN SHEETS**

PUBLIC MEETING REGISTRATION

Radium Chemical Company Superfund Site
Bulova Corporate Center
May 1, 1990

Your name will be added to the mailing list.

Name	Address
JEANNE PROVEN	20-77 45th St Apt. 11105
Maria Edenhofer	20-70- 45th St. L.I.C. 11105
GALERIE FISCHER C 31	30-64 49th St. C-1-L 11103
LAURENCE DEMARCO	P.O. BOX 034 MASSPETH, N.Y. 11378
Judy Lewis	Bulova Complex 75-20 ASTOR BLVD BROOKLYN
JOAN D'AMICO	74-17 Ast Blvd JACKSON HEIGHTS 11370
BOB CECILIO	COUNCILMAN PETER F. VALLONE
Luis A Booth (P.O. Box 4344 Jamaica NY 11404)	48-25 43rd St WOODSIDE
Theresa Mangano	955 L'Enfant Pl SW 6th Fl WASH DC 20024
Pat Ottens	Assemblyman LaFayette
Kalph Doca	67-50 Astor Pl PLZE 11375 FOREST HILLS N.Y.
Jan Couden	Ray F. Weston

PUBLIC MEETING REGISTRATION

Radium Chemical Company Superfund Site
Bulova Corporate Center
May 1, 1990

Your name will be added to the mailing list.

Name

Address

Louis Ray ^{ALVIN}	570 Hartford ^{Orange St} NY 11501
Joseph B. Martin	Queens BPO 170-55 Queens Blvd Kew Gardens NY 11427
Charles Fer	3301 71 st St. Jamaica, NY
George DeCh	36-01 35 Ave LIC 11101
John W. ...	1 Pentire St Roseton NY 11750
Rich Conn	64 Lewis Ave Smith NY 11791
George Kavlow	26 Federal Plaza, NY, NY 10278

PRE-PUBLIC MEETING REGISTRATION

Radium Chemical Company Superfund Site
 Bulova Corporate Center
 May 1, 1990

Your name will be added to the mailing list.

Name	Address/Company or Affiliation
Karen Cowden	Ray F. Weston
Flaminia Marzoni	Ray F. Weston
Wallace Y. Okawa	EBASCO ENVIRONMENTAL
William J. Johnson	ONE BULOVA AVENUE WOODSIDE N.Y 11371
Larry Stutz	27-01 BRE WEST
Les Skoski	EBASCO Environmental
Law Marshall	B O H
John Wang	Chase Corp
George Pavlov	EPA - Superfund
Mathy Stanislaw	EPA - Office of Regional Councils
Bruce Nelson	Automotive Electric Service
Kevin Lapin	FITNEY & BROWN
Doug Jacobson	EPA - Superfund
Rich Carroll	EPA Public Affairs
A. S. Smetana	Smetana Corp
H. Brown	" "