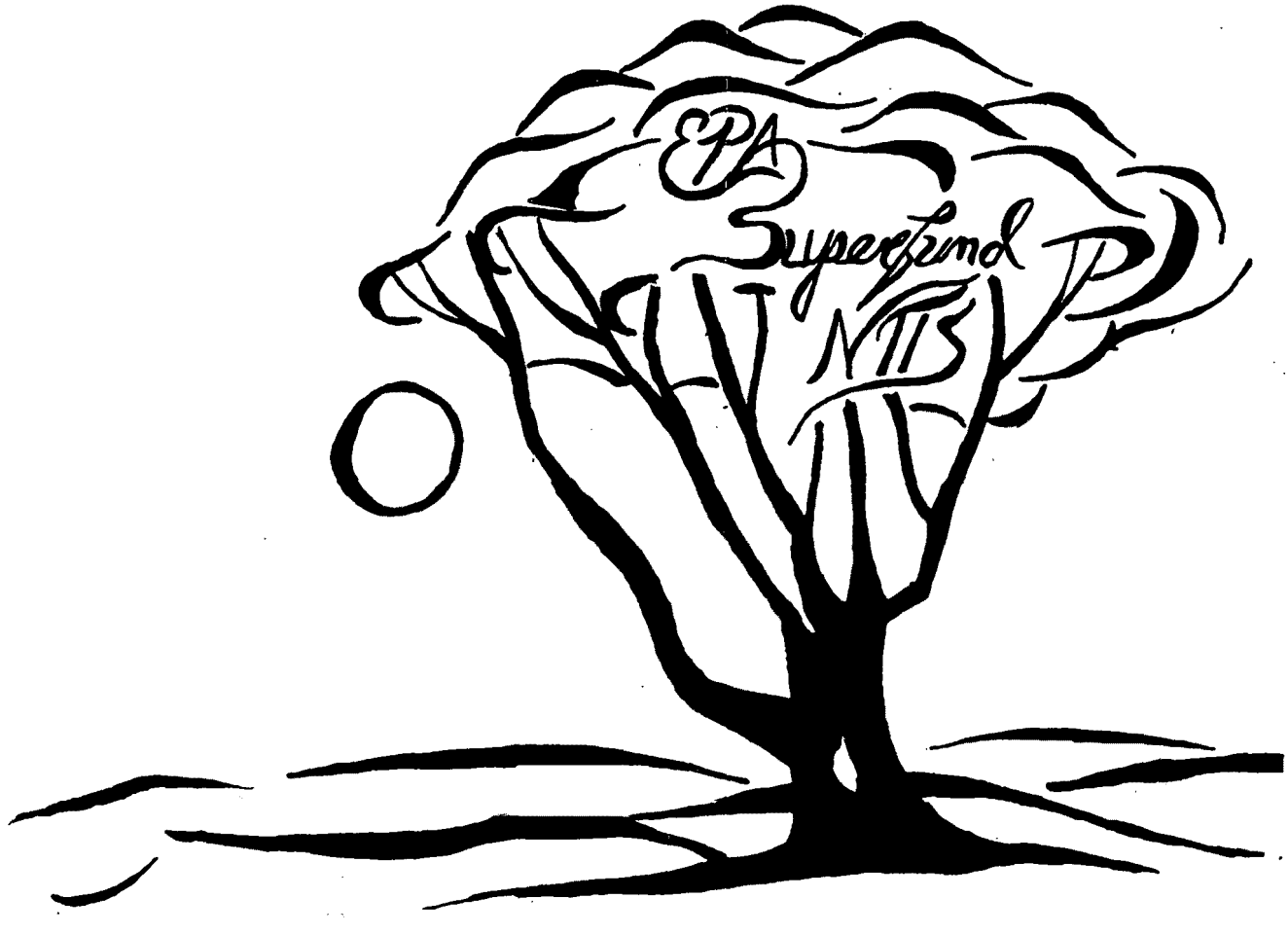
PB94-963804
EPA/ROD/R02-94/227
July 1994

EPA Superfund Record of Decision:

Juncos Landfill Site, Juncos, PR



ROD FACT SHEET

SITE

Name :	Juncos Landfill
Location/State :	Juncos, Puerto Rico
EPA Region :	II
HRS Score (date):	32.57 (8-2-82)

ROD

Date Signed:	10-5-93
Remedy/ies:	Natural Attenuation/ No Action/ Institutional Controls/ Monitoring
Operating Unit Number:	OU-2
Capital cost:	$51,624
Construction Time:	1 month
O & M:	$42,250/yr
Present worth:	$603,112

LEAD

Remdial/Enforcement:	Enforcement
EPA/State/PRP:	EPA
Primary contact (phone):	Jose C. Font (809) 729-6951
Secondary contact (phone):	Melvin Hauptman (212) 264-7681
Main PRP(s):	Becton Dickinson, Browning Ferris Industries, General Electric Co., Chesebrough Ponds, Municipality of Juncos,the Puerto Rico Land Administration and the Puerto Rico Development and Housing Improvement Administration
PRP Contact (phone):	Luis R. Lomba, P.E. (809) 746-1735

WASTE

Type:	Metals, Chloroform
Medium:	Groundwater
Origin:	Landfill
Est. quantity:	Unknown

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

Juncos
4.2.1

DATE: 01 OCT 1993

SUBJECT: Record of Decision (ROD) for the Juncos Landfill Site

FROM: George Pavlou, Acting Director
Emergency and Remedial Response Division

TO: William J. Muszynski, P.E.
Acting Regional Administrator

Attached for your approval is the ROD for the Juncos Landfill Site, located in the Municipality of Juncos, Puerto Rico. This operable unit is the second of two operable units for the Site and focuses on groundwater contamination. The first operable unit ROD, which selected capping of the landfill, was signed on September 24, 1991. Currently, the first operable unit remedy is in the design phase.

The selected remedial action for the second operable unit is no action/natural attenuation for the groundwater, a recommendation that the Commonwealth of Puerto Rico implement institutional controls restricting groundwater withdrawal in the area north of the landfill, and groundwater monitoring to ensure that contaminant levels are decreasing. If the concentrations of contaminants in the groundwater do not decrease over time, EPA may reevaluate this decision to see if active groundwater remediation is necessary.

The remedial investigation and feasibility study report and the Proposed Plan were released for public comment on August 9, 1993. A public comment period on these documents were held from August 9, 1993 through September 7, 1993. In addition, a public meeting to discuss these documents and the preferred no action remedy was held on August 25, 1993. Comments received during the public comment period indicated that the nearby residents are concerned about the impact of the landfill on their health.

The ROD has been reviewed by the Commonwealth of Puerto Rico Environmental Quality Board (EQB), and the appropriate program offices within Region II. Their input and comments are reflected in this document. EQB has concurred with the selected no action remedy for the second operable unit of the Juncos Site (see Appendix D of this document).

If you have any questions or comments, I would be happy to discuss them with you at your convenience.

Attachments

Declaration for the Decision Document

SITE NAME AND LOCATION

Juncos Landfill Site
Municipality of Juncos
Juncos, Puerto Rico

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit Two (OU-II) of the Juncos Landfill located in the Municipality of Juncos, Puerto Rico, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this site.

The Commonwealth of Puerto Rico Environmental Quality Board (EQB) concurs with the selected remedy. A letter of concurrence from EQB is appended to this document (Appendix C).

The information supporting this remedial action is contained in the Administrative Record for this site. The index to the Administrative Record is attached as Appendix E.

DESCRIPTION OF THE SELECTED REMEDY

This operable unit is the second of two operable units for the Juncos Landfill Site. It focuses on groundwater contamination, resulting from contaminant migration from the landfill.

The source control action selected under the Operable Unit One (OU-I) remedy will cap the landfill and reduce the potential threat to human health and the environment by isolating the landfill and reducing the risk of contaminant migration from the landfill into the groundwater.

The key components of the OU-II remedy include the following:

- Natural attenuation/no action for the groundwater.
- Recommendation that institutional controls consisting of restrictions on groundwater withdrawal in the area north of the landfill be implemented by the Commonwealth.

- Groundwater monitoring to ensure that the concentrations of contaminants in the groundwater are decreasing over time. It is estimated that approximately 16 wells will be sampled, although the exact number and duration of the sampling will be determined at a later date. If the concentrations of contaminants in the groundwater do not decrease over time, EPA may reevaluate this decision to see if active groundwater remediation is necessary.

The implementation of this selected remedy in conjunction with the OU-I remedy will minimize or eliminate the potential carcinogenic and noncarcinogenic impacts caused by ingestion of groundwater containing chloroform, carbon disulfide, antimony, manganese and vanadium should it be used in the future.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment and complies with federal and Commonwealth requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This is achieved through the use of a single-barrier cap under OU-I in conjunction with institutional controls to preclude direct contact and access to groundwater. The surface controls (implemented with capping) and cap also reduce leachate generation and subsequent groundwater impacts. The institutional controls will serve to restrict access to the groundwater by residents in a potential future use scenario. Current residents obtain their drinking water from the municipal public supply wells and surface water filtration plants. Natural attenuation will serve to reduce the concentration of chloroform in the groundwater over time through various physical and chemical processes.

The components of the selected remedy in conjunction with the OU-I remedy represent the maximum extent to which a permanent solution and treatment technology can be utilized in a cost effective manner for the site.

A review of the remedial action pursuant to CERCLA §121(c), 42 U.S.C. §9621(c), will be conducted within five years of the commencement of the remedial action and every five years thereafter to ensure that the remedy continues to provide adequate protection to human health and the environment, because this remedy will result in hazardous substances remaining on-site above health-based levels.

William J. Muszynski, P.E.
Acting Regional Administrator

10/5/93
Date

Table of Contents

DECISION SUMMARY

JUNCOS LANDFILL SITE

SECOND OPERABLE UNIT

JUNCOS, PUERTO RICO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

NEW YORK

I. SITE LOCATION AND DESCRIPTION

The Juncos Landfill Site (the "Site" or "the Landfill") is located in the Municipality of Juncos, Puerto Rico as illustrated in Figure 1. The Site includes an inactive municipal landfill which occupies approximately 17 to 20 acres of land. The northern perimeter of the Landfill is bordered by a residential housing development as illustrated in Figure 2. The southern boundary of the Landfill is bordered by a high point which is nearly 70 feet above grade. Outside the eastern and western boundaries, the Landfill is bordered by two unnamed streams. These streams flow to the north and are tributaries to the Quebrada Ceiba which flows to the Rio Gurabo. The confluence of the unnamed tributaries with Quebrada Ceiba is approximately 2,000 feet north of the Landfill. A municipal public water supply well field is located 1.5 miles northwest of the Site.

The Landfill is approximately 10 to 30 feet thick with a soil cover, approximately 1.5 feet thick, and thick grassy vegetation. Topographically, the Landfill slopes are predominantly low to moderate with a topographic high in the southwest quadrant of the Site. While surficial runoff will occur radially off the topographic high, the prevailing directions of runoff are to the east and west. Surficial runoff from the Landfill ultimately flows into the two unnamed tributaries of the Quebrada Ceiba. Flow in the two tributaries is intermittent and is dependent on precipitation events. There are no apparent marshes or wetland areas within 1 1/2 miles of the Site.

The Juncos Landfill is underlain by Cretaceous to Jurassic-aged granodiorite, which is described as a light to medium-grey, medium-grained rock predominantly composed of plagioclase, quartz,and othrocolase. Overlying the granodiorite just to the north and northeast, and along the western quarter and northeastern limits of the Landfill are piedmont fan and alluvial terrace deposits of Quaternary Age, consisting of unconsolidated deposits of sand. The remaining deposits overlying the bedrock in the vicinity of the Site are comprised of either manmade fill material or residual derived from the decomposition and weathering of granodiorite. As a result of weathering and decomposition, a friable bedrock unit developed in place along the contact between the surficial deposits and the granodiorite.

The predominant direction of groundwater flow in the study area is to the north-northeast. There is no evidence of the existence of a continuing unit between the surficial deposits/weathered bedrock unit and the underlying granodiorite formation. The predominant horizontal direction of groundwater flow is the same for the surficial deposits and bedrock unit, i.e., to the northeast.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Landfill is owned by the Municipality of Juncos, Puerto Rico, which operated the Landfill between the years 1957 and 1977. The Landfill was closed in 1981. In addition to municipal wastes, the Landfill received industrial waste including mercury thermometers, waste acids and sodium hydroxide, off-specification perfumes, and electrical equipment. These materials came from local industrial facilities.

In April 1982, the EPA Region II Field Investigation Team (FIT) initiated sampling at the Site. The presence of mercury was reported in ambient air and soil headspace, but the locations and concentrations were not identified.

In September 1983, EPA conducted a Site inspection of the Landfill. During the Site inspection, mercury was detected in the air and soil in the southwest portion of the Landfill, in off-site leachate samples, and in soil samples collected in gardens and behind homes adjacent to the Site. The FIT also conducted a more extensive air survey in February 1983, which indicated the detection of volatile organic compounds. Based on these findings, EPA listed the Landfill on the National Priorities List (NPL).

On March 15, 1984, EPA entered into an Administrative Order on Consent with Becton Dickinson (BD) pursuant to Section 106(a) of CERCLA, 42 USC 9606(a), which called for BD to perform immediate corrective actions at the Site (which included some access restrictions and a soil cover on some portions of the Landfill where wastes were exposed) and for performance of a preliminary investigation at the Site to assess the imminent and significant risks, if any, to human health and the environment posed by the mercury presence at the Landfill.

Pursuant to this Order, BD retained Fred C. Hart and Associates (HART) to conduct the investigation. Results of this investigation are presented in the Preliminary Remedial Investigation of Juncos Municipal Landfill, dated June 28 1984. The investigation indicated the following: mercury vapors were detectable in the ambient air at the Landfill and in subsurface soil pore spaces adjacent to the Landfill; concentrations of mercury below background levels were detected in the samples of edible fish collected from the stream adjacent to the Landfill; and no mercury was detected in soils or sediments collected from off-site locations. In addition, mercury levels detected in the soils and sediments collected from locations near the Landfill were within a range that is typical for locations with no known point source of mercury contamination. The investigation also compared household dust samples collected from residences directly adjacent to the Landfill with background samples and found slightly higher levels of total mercury in the household dust. Based on this investigation, it was concluded that the Juncos Landfill was not a

significant source of mercury exposure to off-site locations. An evaluation of the results made by the Centers for Disease Control (CDC), as requested by EPA, concluded that the Site posed no immediate threat to human health.

On October 9, 1984 BD entered into a second Administrative Order on Consent (AOC) with EPA, which required BD to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Juncos Landfill. BD retained HART for this work. Field activities commenced in October of 1986 and continued at various times in 1987. Following EPA comments on the first draft RI report, HART conducted additional environmental sampling and analysis, which included leachate, air, shallow soil, surface water, ground water and municipal well sampling at and/or in the vicinity of the Landfill.

In December 1989, HART submitted an Addendum to the Site Operations Plan (SOP) for additional field investigation activities to address USEPA concerns regarding leachate characterization and biota uptake of metals. The SOP was revised in February 1990 in response to EPA comments, and was approved by EPA in a letter to BD dated March 22, 1990. Field investigation activities commenced in August 1990 and were completed in January 1991. A draft Phase II RI Report for OU-II was submitted in July 1991 and a revised version was submitted in November 1991 in response to EPA comments. In March 1992, EPA approved the November 1991 revised draft RI Report for the off-site component OU-II. An OU-II revised Feasibility Study (FS) was submitted to EPA in June 8, 1993.

In November 1990, EPA separated the cleanup of the Site into two operable units or phases. The first operable unit (OU-I) focused on the abatement of the source of Site contamination, the Landfill itself. The second operable unit (OU-II), focused on the migration of contaminated groundwater.

In April 1991, Hart submitted the Draft FS Report for OU-I. In June 1991, EPA distributed the Proposed Plan for OU-I to solicit public comments regarding EPA's preferred remedial alternative. The public comment period began on June 1, 1991 and continued through July 31, 1991. EPA signed the OU-I Record of Decision (ROD) on September 24, 1991. The remedial action selected for OU-I was closure of the Landfill by construction of a single barrier cap with a geomembrane liner; installation of a security fence around the perimeter of the Landfill, a leachate control system as necessary and a Landfill gas venting system; provision for erosion and sediment control appurtenances; placing institutional controls on the Landfill property in an attempt to preclude future development to ensure the integrity of the cap; temporary relocation of families living in homes located along the immediate north face of the Landfill during the construction phase of the remedial action; provision of long-term operation and maintenance of the Landfill cap and long-term air, sediment, surface water, and

leachate monitoring to evaluate the remedial action effectiveness.

From 1991 to 1992, EPA conducted a search to locate parties responsible for contamination at the Landfill. EPA subsequently negotiated with these parties to implement the OU-I remedy. Because negotiations were unsuccessful, on September 30, 1992, EPA issued a CERCLA Unilateral Administrative Order to BD, Browning-Ferris Industries, Chesebrough-Pond's, General Electric Company, the Municipality of Juncos, the Puerto Rico Land Administration, and the Puerto Rico Development and Housing Improvement Administration.

Additionally, on August 14, 1991, EPA was notified by a citizen adjacent to the Landfill that smoke was being released from the Landfill. Concern was raised about the potential release of contaminants from the Landfill through the smoke. EPA conducted an investigation on August 16, 1991 which revealed that an area approximately 50 feet by 100 feet on the oldest portion of the Landfill had apparently subsided. The grass in this area was dead and several cracks in the surface were venting smoke. The prevailing winds carried smoke in a westerly direction parallel to La Ceiba Community. The smoke observed during the investigation dissipated within 50 feet of the burned area. Air sampling results for mercury and organic compounds showed non-detectable concentrations for these chemicals. However, EPA directed BD and the Municipality of Juncos to implement immediate corrective actions at the Site that included covering the crevices of the Landfill that were smoking with fill material, posting of signs advising potential hazards posed by the Site to trespassers and repairing the fencing that currently exists at the Site to prevent unauthorized access. During the implementation of the OU-I remedy, additional actions may have to be taken if there is a reoccurrence of fire.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI report, Risk Assessment and the Proposed Plan for the Site were released for public comment on August 9, 1993 pursuant to the requirements set forth in CERCLA Sections 113(k)(2)(i-v) and 117. These documents were made available to the public in the Administrative record file at the EPA Docket Room in Region II, New York City and the information repositories at the EPA Region II Caribbean Field Office in Santurce, Puerto Rico and the Juncos Town Hall in Juncos, Puerto Rico. A public notice was published on August 9, 1993 in the El Nuevo Día and the San Juan Star newspapers, announcing EPA's preferred remedy, the availability of these documents for review and notice of the August 25, 1993 public meeting.

A public participation meeting was conducted by EPA on August 25, 1993, at the Municipal Assembly Room of the Juncos Town Hall,

Juncos, Puerto Rico to discuss the Proposed Plan for OU-II and to provide an opportunity for interested parties and communities to present oral comments and questions to EPA.

A summary of the significant comments related to the selection of the remedy, received during the public meeting and public comment period and EPA's responses to these comments are presented in the Responsiveness Summary, which is part of this Decision Document (attached as Appendix D). The Responsiveness Summary and Decision Document, along with the administrative record for the Juncos Landfill OU-II, are available at the information repositories referenced above.

IV. SCOPE AND ROLE OF RESPONSE ACTION

This OU-II ROD identifies EPA's selected no action alternative for addressing potential off-site impacts resulting from contaminant migration from the Landfill via groundwater. This is the second of two operable units for the Site. OU-I focused on source control measures for the Site. EPA signed an OU-I ROD on September 24, 1991 which selected proper landfill closure utilizing a single barrier cap with geomembrane. This selected remedy for OU-I consisted of the following components:

- Installment of a security fence around the perimeter of the Landfill property to restrict access at the Site.

- Placing institutional controls on the landfill property in an attempt to preclude future development to ensure the integrity of the cap;

- Installation of a passive landfill gas venting system which could be converted into an active system, if necessary. The decision to convert to an active system will be made after sampling of the gases is completed;

- Installation of a leachate control system, as necessary. This will be decided during regrading operations for construction when the presence and quantity of leachate will be more apparent;

- Clearing and grubbing of existing vegetation on the Landfill area, as needed, and regrading of the Landfill to provide a maximum slope of 3H:1V;

- Temporary relocation of families living in homes located along the immediate north face of the Landfill during the construction phase of this alternative;

- Construction of a single-barrier cap which includes installation of a fabric membrane liner on the top surface of

the Landfill to reduce surface infiltration, prevent direct contact, limit gas emissions, and control erosion;

- Provision for erosion and sediment control appurtenances as needed to be in compliance with any local requirements in Puerto Rico and best engineering practices. This typically consists of drainage channels, stilling basins, and sediment basins;

- Provision of long-term operation and maintenance of the Landfill cap, including routine inspections and repairs; and

- Provision of long-term air, sediment, surface water, and leachate monitoring to evaluate the remedial action effectiveness.

The OU-I selected remedy is being implemented pursuant to a Unilateral Administrative Order issued by EPA to the potentially responsible parties on September 1992. The implementation of this remedy is currently in the remedial design phase.

OU-II addresses the measures that may be necessary to mitigate potential off-site impacts resulting from chloroform, carbon disulfide, and potentially the metals antimony, manganese, and vanadium migration via groundwater. While the Site has been separated into two operable units, this ROD considers the remedy selected for OU-I (Landfill capping component) as part of the overall evaluation of alternatives for OU-II. The source control action of capping the Landfill will reduce the potential threat to human health and the environment by isolating the Landfill and reducing the risk of contaminant migration from the Landfill into groundwater which results from leachate generated by surface precipitation.

V. SUMMARY OF SITE CHARACTERISTICS

This section only addresses groundwater. For a more detailed discussion of all data related to the Site, see the RI report which is located in the information repositories.

Groundwater in the vicinity of the Site occurs within hydraulically connected overburden and bedrock units. The overburden consists of predominantly light to dark green/gray organic silt and clay interspersed with deposits of light brown and orange/brown fine to medium-grained sand, silt and clay. A zone of deeply weathered rock (saprolite) separates the overburden from the fractured bedrock. The saprolite consists mainly of clays and partially decomposed grains of quartz and feldspars. The bedrock unit is granodiorite, defined as quartz rich rock with andesine plagioclase as the dominant feldspar and hornblende. Groundwater flow in the bedrock occurs along fractures created by joining and faulting.

Groundwater in the overburden aquifer flows radially away from a north-trending central bedrock outcrop which forms a topographic high. North of the Landfill, flow is generally toward the north-northeast. Similar flow directions exists in the underlying bedrock aquifer.

Groundwater flow within the overburden aquifer occurs through primary intergranular porosity. The bedrock aquifer is massive, and flow is restricted to discrete fractures created by jointing and faulting, and to zones of fractured, highly weathered rock formed by the weathering of fault zones.

Groundwater flow in the bedrock aquifer also occurs along individual fault planes located at various depths. Most occur within discrete mineralized fractures with fiber veins or fault cast veins, greatly reducing their permeability. The slow recharge observed during development and sampling of the RI monitoring wells, as well as the low calculated hydraulic conductivities, indicate that minor mineralized faults transmit only very small quantities of groundwater.

A total of 23 groundwater monitoring wells were installed and sampled during the RI to monitor the overburden, intermediate bedrock and deep bedrock water-bearing units at locations around the Landfill, in the direction of groundwater flow. See Figure 3 for well locations.

Sampling of the groundwater monitoring wells indicates that chloroform concentrations exceeding the Federal Safe Drinking Water Act Maximum Contaminant Level (MCL) of 100 parts per billion (ppb or ug/l) have been detected in samples collected north of the Landfill at the J-3, J-7, and J-10 well nest locations. At the J-3 nest, the MCL was exceeded in bedrock wells J-3-1 and J-3-3. Concentrations ranged between 770 ug/l and 2,590 ug/l in intermediate bedrock well J-3-1 and between 190 ug/l and 1,800 ug/l in deep bedrock well J-3-3. Chloroform was also detected at concentrations below the MCL in the shallow overburden well J-3-2, ranging in concentration from 14 ug/l to 70.5 ug/l. Chloroform was detected in bedrock wells J-7-2 and J-7-3 at concentrations of 925 ug/l and 330 ug/l, respectively, but was not detected in overburden J-7-1. The MCL for chloroform was also exceeded in overburden well J-10-1 and bedrock well J-10-2 at concentrations of 1,090 ug/l and 292 ug/l, respectively. A summary of the chloroform analytical results in groundwater is presented in Table 1.

Carbon disulfide was detected in five of the wells sampled (J-1-2, J-3-1, J-3-3, J-4-2, J-6). Well J-6, which contained the highest detected value obtained by Hart (300 ug/l), were sampled by CDM Federal in 1991 and were not found to contain carbon disulfide. Therefore, the compound's presence in these wells can not be confirmed. J-4-2 is screened in the bedrock aquifer and is apparently upgradient of the landfill. The 1989 Phase IA results

can not be confirmed for wells J-3-1 and J-3-3- because these were not resampled for carbon disulfide in subsequent sampling events. These wells are both screened in the bedrock aquifer. It should be noted that carbon disulfide was detected in the landfill leachate sampled by Hart during the OU-I investigations. A summary of the groundwater analytical results is presented in Table 2.

There are other potential sources of groundwater contamination which exist in the immediate area of the Site including discharges from septic systems; discharges of wastewaters to storm drains including direct observation of a discharge of what appeared to be oil and spent degreasing fluids noted in a storm drain and traced to a nearby home where three empty forty gallon drums were found next to the storm sewer; and, discharge of household wastewaters (presumably from washing machines.)

Metals detected at elevated concentrations in groundwater throughout the RI include antimony, manganese and vanadium. Antimony was detected in five wells (J-2-2,J-3-2,J-7-1,J-7-2,J-1-2) at levels which exceeded the MCL of 6 ug/l. Manganese was detected in five of the wells from unfiltered groundwater samples. There is a Secondary MCL for manganese of 50 ppb pursuant to the Safe Drinking Water Act which is based on aesthetic factors only, not health. This metal occurs naturally within the Site geology. Vanadium was detected at three wells at concentrations ranging between 9.7 ug/l and 267 ug/l in unfiltered groundwater samples. There is no MCL for vanadium. A summary of the inorganics analytical results in groundwater is presented in Table 3.

All operating wells within the Juncos municipal public water supply well field were sampled and analyzed for leachate indicators, EPA priority pollutants and major cations and anions. No volatile organic compounds were detected at concentrations above the detection limit, and all other parameters were below federal MCLs. A summary of the public supply wells analytical results is presented in Table 4.

VI. SUMMARY OF SITE RISKS

Based upon the results of the OU-II RI, a baseline Risk Assessment was conducted to estimate the risks associated with future Site conditions. The risks associated with current Site conditions were not evaluated since groundwater within the Site is not currently used. The baseline Risk Assessment estimates the human health and ecological risk which could result from the contamination at the Site if no remedial action were taken.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario. Hazard

Identification - identifies the contamination of concern at the Site based on several factors such as toxicity, frequency of occurrence, and concentration. Exposure Assessment - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well water) by which humans are potentially exposed. Toxicity Assessment - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). Risk Characterization - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

The OU-II Risk Assessment focused on contaminants in the groundwater which are likely to pose significant risks to human health and the environment. Additional data had been collected since the OU-I Risk Assessment was conducted and these data were incorporated into the OU-II Risk Assessment. The summary of the contaminants of concern (COC) in sampled matrices is listed in Table 5.

The groundwater contaminant screening process for OU-II identified 34 chemicals of concern; 21 metals, 10 organics and 3 pesticides. These chemicals of concern were selected because they were identified above detection limits in the groundwater sample analysis from the Juncos Landfill. This is taken to be the most comprehensive basis for developing risk estimates.

Several of the contaminants of concern, including arsenic, beryllium, chromium and chloroform are known to cause cancer in laboratory animals and are suspected to be human carcinogens.

The baseline Risk Assessment evaluated the health effects which could result from future exposure to contamination as a result of ingestion, dermal contact (from showering) and inhalation (from showering) of contaminated groundwater. Currently, the contaminated groundwater is not in use. Residents currently obtain their drinking water from municipal water supply wells which are located approximately 1.5 miles northwest of the Site and 2 surface water filtration plants. These plants are located at Ceiba Sur Ward in Juncos and Quebrada Grande in Las Piedras. A summary of the exposure pathways considered in the baseline Risk Assessment is presented in Table 6. A potential risk of exposure may exist in the future if the contaminated groundwater flowing beneath the Site becomes potable.

EPA's acceptable cancer risk range is 10^{-4} to 10^{-6} which can be interpreted to mean that an individual may have a one in ten thousand to a one in a million increased chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the

Site. The carcinogenic risk for potential future users of groundwater is estimated to be 4.9×10^{-4} for adults and 4.0×10^{-4} for children.

To assess the overall potential for noncarcinogenic effects posed by more than one contaminant, EPA has developed a Hazard Index ("HI"). This index measures the assumed exposures to several chemicals simultaneously at low concentrations which could result in an adverse health effect. When the HI exceeds one, there may be concern for potential noncarcinogenic effects. The HI for future users of groundwater was estimated to be 12.14 for adults and 48.7 for children.

Table 6 to 12 present the results of risk and noncancer health effects calculations for ingestion, dermal contact and inhalation exposures to groundwater beneath and downgradient of the Site.

The results of the baseline Risk Assessment indicate that the contaminated groundwater at the Site poses an unacceptable carcinogenic and noncarcinogenic risk to human health under the groundwater future use scenario. However, any corrective action implemented at the Landfill itself is expected to reduce concentrations of hazardous substances released. The Landfill is expected to be capped by Fall 1995. This source control action will reduce the leachate generated from precipitation and should thereby reduce the source of the groundwater contamination.

Ecological Risk Assessment

Groundwater contamination does not present a risk to ecological receptors at the Site. No correlation was found to exist between contaminants detected in groundwater and those detected in surface water and sediment samples. Therefore, for this operable unit, no complete exposure pathway for ecological receptors has been identified.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled.

Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the Risk Assessment provides upper-bound estimates of the risks to populations near the site, and is highly unlikely to underestimate actual risks to populations near the Site.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the OU-II Risk Assessment Report for the Site.

VII. DESCRIPTION OF ALTERNATIVES

CERCLA §121 (b) (1), 42 U.S.C. §9621(b) (1), mandates that a remedial action must be protective of human health and the environment, cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121 (b) (1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants and contaminants, which at least attains Applicable or Relevant and Appropriate Requirements (ARARs) under federal and state laws, unless a waiver can be justified pursuant to CERCLA (d) (4), 42 U.S.C. §9621 (d) (4).

This ROD evaluates in detail three remedial alternatives for addressing the contaminants associated with the Second Operable Unit of the Juncos Landfill Site. The time to implement a remedial alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate with the potentially responsible parties, procure contracts for design and construction, or conduct

operation and maintenance at the Site.

The remedial alternatives are:

Alternative I: Natural Attenuation-No Action

Capital Cost:	$ 0
Annual O & M:	$ 0
Present Worth:	$ 0
Construction Time:	None

The No Action Alternative provides a point of comparison for remedial action alternatives and serves as a baseline against which the degree of remediation and associated cost of the other alternatives can be compared. Under this alternative, no activity would take place to remediate the groundwater containing chloroform, but rather the contaminated groundwater would be left to naturally attenuate. Natural attenuation is based on the natural ability of the groundwater to decrease chemical concentrations through physical, chemical, and biological processes until cleanup levels are met. It is expected that it would take approximately 13 years for concentrations to decrease. Under this alternative, no monitoring of the groundwater or institutional controls would be put in place.

Because this alternative would result in contaminants remaining on-site above health-based levels, CERCLA requires that the Site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat the wastes.

Alternative II:Natural Attenuation-No Action/Institutional Controls/Monitoring

Capital Cost:	$ 51,624
Annual O&M:	$ 42,250
Present Worth:	$ 603,112
Construction Time:	1 month

This alternative is similar to Alternative I, in that it allows the groundwater to naturally attenuate. However, this alternative includes groundwater monitoring to track its direction and rate of movement, in conjunction with maintaining effective and reliable

institutional controls to prevent the future use of groundwater.

Institutional controls would consist of restrictions on groundwater withdrawal wells in the area north of the Landfill. These controls would be regulated by the Commonwealth of Puerto Rico Department of Natural Resources under the Regulation for the Appropriation, Use, Conservation and Administration of the Waters of Puerto Rico, September 1984, Department of State Regulation No. 3171, November 13, 1984.

For purposes of cost evaluation, it is assumed that groundwater monitoring will be conducted quarterly for the first five years, semi-annually for years six through ten and annually for years eleven through thirty. At this time the following 12 wells are proposed for each round of sampling: J-2-1, J-2-2, J-2-3, J-3-1, J-3-2, J-3-3, J-7-1, J-7-2, J-7-3, J-10-1, J-10-2, and J-10-3.

In addition, one existing downgradient off-site monitoring well (USGS Water Resources Division Well # CJ-TW6) and a new, two-well cluster, to be installed between the J-10 well cluster and well #CJ-TW6 would be sampled at the same frequency. Results of previous sampling by USGS indicated that well #CJ-TW6 is currently not impacted. As such, future sampling of these wells would allow monitoring for migration of compounds of concern from potential upgradient sources.

The exact number of wells that will be sampled will be finalized prior to the design of the selected remedy. A total of 22 samples is expected to be taken for each round to include field blanks, trip blanks, method blanks, two duplicates per sampling round and a method spike. These samples will be analyzed for volatile organic compounds, antimony, manganese and vanadium. Water level elevations will also be measured during each sampling event. Monitoring requirements would be assessed every five (5) years and revised as warranted.

Because this alternative would result in contaminants remaining on-site above health-based levels, CERCLA requires that the Site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat the wastes.

Alternative III: Groundwater Extraction/Metals Removal/Air Stripping/Discharge/Institutional Controls/Monitoring

Capital Cost:	$ 867,802
Annual O&M:	$ 490,071
Present Worth:	$ 6,417,408
Construction Time:	12 months

Alternative III would consist of the installation of 15 overburden extraction wells and 6 bedrock extraction wells along the northern boundary of the Site in order to create a hydraulic barrier to prevent the migration of groundwater away from the Landfill. This remedial alternative assumes that each overburden well extracts groundwater at a rate of 5 gallons per minute (GPM), and that each bedrock well extracts groundwater at a rate of 10 gpm. The combined total yield of the overburden and bedrock extraction wells is estimated at 135 gpm. The current estimates of extraction well numbers, locations and pumping rates are derived from the hydrogeologic data generated at the Site during the RI, and are reported in the FS for the sole purpose of evaluating anticipated costs. The exact number, locations and pumping rates of extraction wells would be determined through extensive aquifer testing performed during the remedial design. The groundwater treatment method considered in this alternative is air stripping to remove the chloroform concentrations and oxidation, precipitation and sedimentation to remove metals. One air stripper can be used to lower the level of chloroform in the extracted groundwater to below the MCL of 100 ppb. It is unknown how long it would take to remediate the aquifer to the MCL, however it is expected to be lengthy, due to the uncertainty of completely capturing the groundwater in this fractured bedrock aquifer. Metals removal has been included to account for the possibility that it may be required. The results of groundwater sampling will be analyzed to determine what, if any, metals treatment is required. Monitoring would be required for the entire duration of this alternative. A schematic diagram for the treatment system for this alternative is presented in Figure 3.

Treated waters must be discharged to a surface water body. Surface water bodies that could serve as recipients of treated water could be either Ceiba Creek or the Gurabo River. The option of discharging treated waters to the Juncos publicly owned treatment works (POTW) is not practicable since the volume of treated waters to be generated is too large and will exceed the current available capacity of the POTW. Transporting the treated water to another

POTW by tank truck is also not feasible due to the large volume of treated water expected to be generated.

Institutional controls may include deed extractions and/or groundwater restrictions for the duration of the remediation.

The long term monitoring program is as described in Alternative II.

Because this alternative would result in contaminants remaining on-site above health-based levels, CERCLA requires that the Site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat the wastes.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

EPA has developed nine criteria (OSWER Directive 9355.3-01), codified in the NCP §300.430(e) and (f), to evaluate potential alternatives to ensure all important considerations are factored into remedy selection. This analysis is comprised of an individual assessment of the alternatives against each criterion and a comparative analysis designed to determine the relative performance of the alternatives and identify major trade-offs, that is, relative advantages and disadvantages, among them.

The nine evaluation criteria against which the alternatives are evaluating are as follows:

Threshold Criteria - The first two criteria must be satisfied in order for an alternative to be eligible for selection.

1. o **Overall Protection of Human Health and the Environment** addresses whether remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. o **Compliance with Applicable, or Relevant and Appropriate Requirements (ARARs)** is used to determine whether each alternative will meet all of its federal and state ARARs. When an ARAR is not met, the detailed analysis should discuss whether one of the six statutory waivers is appropriate.

Primary Balancing Criteria - The next five "primary balancing criteria" are to be used to weigh trade-offs among the different hazardous waste management strategies.

3. o **Long-Term Effectiveness and Performance** focuses on any residual risk remaining at the Site after the completion of the remedial action. This analysis includes consideration of the degree of threat posed by the

hazardous substances remaining at the Site and the adequacy of any controls (for example, engineering and institutional) used to manage the hazardous substances remaining at the Site.

4. o **Reduction of Toxicity, Mobility, or Volume Through Treatment** is the anticipated performance of the treatment technologies a remedial alternative may employ.

5. o **Short-Term Effectiveness** addresses the effects of the alternative during the construction and implementation phase until the remedial response objectives are met.

6. o **Implementability** evaluates the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation.

7. o **Cost** includes estimated capital, and operation and maintenance costs, both translated to a present worth basis. The detailed analysis evaluates and compares the cost of the respective alternatives, but draws no conclusions as to the cost effectiveness of the alternatives. Cost effectiveness is determined in the remedy selection phase, when cost is considered along with the other balancing criteria.

Modifying Criteria - The final two criteria are regarded as "modifying criteria", and are to be taken into account after the above criteria have been evaluated. They are generally to be focused upon after public comment is received.

8. o **State Acceptance** reflects the statutory requirement to provide for substantial and meaningful State involvement.

9. o **Community Acceptance** refers to the community's comments on the remedial alternatives under consideration, along with the Proposed Plan. Comments received during the public comment period, and EPA's responses to those comments, are summarized in the Responsiveness Summary which is attached to this ROD.

The following is a summary of the comparison of each alternatives strengths and weakness with respect to the nine evaluation criteria.

1. Overall Protection of Human Health and the Environment

Both Alternatives I and II would not reduce the potential future risk posed by the chloroform concentrations in the groundwater, even though the likelihood of future groundwater use is minimal. Future demand for water within the Town of Juncos is projected to

be supplied from surface water sources. Alternative II would minimize the unlikely risk of future groundwater use through implementation of institutional controls which would prevent any future withdrawal of groundwater from the residential area downgradient of the Site. Continued groundwater monitoring would confirm that chloroform concentrations were naturally attenuating over time. The degree to which Alternatives I and II would satisfy this criterion is directly related to the successful implementation of the OU-I selected remedy whereby the migration of contaminants to the groundwater is reduced. The groundwater extraction and treatment proposed as Alternative III would offer the same advantages as Alternative II, except that the reduction of chloroform concentrations would be accelerated, although it is uncertain by how much, through the capture of impacted groundwater at the Landfill boundary.

2. Compliance with ARARs

Both Alternative I and Alternative II would not be effective in complying with ARARs in the short term because ARARs would continue to be exceeded for certain compounds absent taking a remedial action. Based on the results of a groundwater contaminant transport model for the overburden aquifer conducted by McLaren Hart, it is estimated that it will take approximately 13 years for ARARs to be achieved in the aquifer after capping of the landfill is completed. However, this is only an estimate, and the actual time frame may be shorter or longer. Groundwater monitoring will take place to make sure that concentrations are decreasing. The groundwater extraction and treatment proposed as Alternative III would be effective in complying with ARARs because compounds of concern potentially migrating away from the Landfill would theoretically be captured by the extraction wells. However, due to the complexities of pump and treat systems in fractured bedrock aquifers, it is uncertain how long it would take for ARARs to be met in the aquifer itself. Tables 13 through 16 presents Federal and Commonwealth of Puerto Rico ARARs and TBCs for OU-II of the Juncos Landfill Site. They are presented in groups based on whether they are chemical specific, location specific, or action-specific.

3. Long Term Effectiveness and Permanence

Alternative I would not be an entirely effective approach in the long term because compounds of concern at the Landfill could potentially continue to impact the groundwater. The no action and the administering of institutional controls proposed as part of Alternative II would be effective in the long term since the institutional controls would restrict the withdrawal of groundwater in the residential area which would prevent exposure in the unlikely event of future groundwater usage in this area for potable purposes. For both Alternatives I and II, existing concentrations of compounds of concern are expected to decline in the long term

due to the natural attenuation process after the OU-I remedial action has been completed. Alternative III would accelerate the removal of concentrations of compounds of concern in the groundwater at the Site. However, the ability of the groundwater extraction system to effectively capture all impacted groundwater in a fractured bedrock aquifer system is uncertain.

4. Reduction of Toxicity, Mobility or Volume

Alternatives I and II would not be effective in reducing the toxicity, mobility or volume of chloroform. In the long term, the volume and toxicity of chloroform should diminish due to the natural attenuation process through adsorption to the organic carbon content of soil and its degradation to breakdown products. Alternative III would have a similar effect except that the rate of reduction in the toxicity and volume of compounds of concern should be accelerated due to the capture of groundwater at the Landfill boundary.

5. Short Term Effectiveness

There is no current risk presented by impacted groundwater downgradient of the Site; the predominant concern identified is the potential future use of groundwater. Alternative I would not be an effective short term remedy because compounds could potentially continue to impact the groundwater. Alternatives II and III would be effective in the short term in that the institutional controls would immediately restrict the use of groundwater in the residential area north of the Landfill, although groundwater is not currently used in this area. The groundwater extraction and treatment component of Alternative III may have a more immediate impact on the reduction of concentrations of compounds in the groundwater, and therefore may be more effective than Alternative II in the short term. Alternative II would take approximately 13 years to reduce chloroform concentrations to its MCL after the OU-I remedial action has been completed. The ability of the Alternative III groundwater extraction system to effectively capture all the impacted groundwater in a fractured bedrock aquifer system is uncertain; however, it would certainly be less than Alternative II for the attainment of MCLs.

No adverse impacts on human health and the environment are expected to result during implementation of Alternatives I, II and III.

6. Implementability

Alternative I has no implementation problems and Alternative II may also be readily implemented. The establishment of institutional controls by the appropriate Commonwealth agencies is not anticipated to be a problem because there are no wells used for drinking water within one mile north of the Landfill. Alternative III differs markedly from Alternatives I and II with respect to

this evaluation criterion due to the difficulties anticipated for the implementation of the groundwater extraction and treatment system. First, past experiences during implementation of the RI indicate that obtaining access to neighboring properties is problematic. Access would be necessary at a large number of private properties in order to install extraction wells as proposed under Alternative III. Second, the high density of residential structures and the limited amount of available space would make it extremely difficult to construct an interconnected system of extraction wells and a treatment plant. Finally it would be difficult to verify that complete capture of impacted groundwater in the fractured bedrock aquifer is occurring due to the complex and random flow patterns in this type of aquifer.

7. Cost

The cost comparison for the remedial alternatives evaluated indicates a significant disparity in cost. The Capital Cost for Alternative I is $0, Annual O&M of $0 and a 30-year present worth of $0. Alternative II has a Capital Cost of $51,624, Annual O&M of $42,250 and a 30-year present worth of $603,112. Alternative III has a Capital Cost of $867,802, Annual O&M of $490,071 and a 30-year Present Worth Cost of $6,417,408.

8. Community Acceptance

All comments submitted during the public comment period were evaluated and are addressed in the attached Responsiveness Summary. Based on the comments received during the public comment period, EPA believes that the residents and town officials of Juncos generally supported EPA's preferred alternative described in the Proposed Plan.

9. State (Commonwealth) Acceptance

A concurrence letter from EQB on behalf of the Commonwealth of Puerto Rico is attached to this Record of Decision as Appendix C.

IX. DESCRIPTION OF THE SELECTED REMEDY

Based upon an evaluation of the alternatives and comments received from the public, EPA has selected Alternative II, No Action/Institutional Controls/Monitoring for Operable Unit II at the Juncos Landfill Site.

The major components of the selected remedy are as follows:

- Natural attenuation/No Action for the groundwater.
- Recommendation that institutional controls consisting of restrictions on groundwater withdrawal in the area north

of the Landfill be implemented by the Commonwealth.

- Groundwater monitoring to ensure that the concentrations of contaminants in the groundwater are decreasing over time. It is estimated the approximately 16 wells will be sampled, although the exact number and duration of the sampling will be determined at a later date. If the concentrations of contaminants in the groundwater do not decrease over time, EPA may reevaluate this decision to see if active groundwater remediation is necessary.

X. STATUTORY DETERMINATIONS

As previously noted, CERCLA Sec. 121 (b)(1), 42 U.S.C. Sec. 9621 (b)(1), mandates that a remedial action must be protective of human health and the environment, cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site. CERCLA Sec. 121(d), 42 U.S.C. Sec. 9621(d), further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Sec. 121(d)(4), 42 U.S.C. Sec. 9621(d)(4).

For the reasons discussed below, EPA has determined that the selected remedy meets the requirements of CERCLA Sec. 121, 42 U.S.C. Sec.9621.

Overall Protection of Public Health and the Environment

Alternative II (No Action/Natural Attenuation/Monitoring) is a remedial action which protects public health and the environment by mitigating potential future risks associated with utilization of groundwater for drinking purposes. This is achieved through the use of a single-barrier cap in conjunction with institutional controls to preclude direct contact and access to groundwater. The surface controls (implemented with capping) and cap also reduce precipitation infiltration which minimizes the potential for subsequent groundwater impacts. The institutional controls will serve to restrict access to the groundwater by residents in a potential future use exposure scenario. Current residents utilize a municipal water supply for drinking purposes. Natural attenuation will serve to reduce the concentration of chloroform in the groundwater over time through various physical and chemical treatment processes.

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

The components of Alternative II, in conjunction with the OU-I remedy, represent the maximum extent to which a permanent solution and treatment technology can be utilized in a cost-effective manner for the Site. The recommended alternative is consistent with the NCP expectation that containment technologies will generally be appropriate remedies for sites that pose a relatively low-level threat or where treatment is impracticable. This recommended alternative provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity mobility and volume, short-term effectiveness, implementability and cost. The success of more active groundwater extraction and treatment alternatives is uncertain due to their inability to capture all the impacted groundwater in a fractured bedrock aquifer system.

Compliance with ARARs

The recommended alternative will comply with all applicable or relevant and appropriate action and location specific requirements. The extent to which contaminant-specific ARARs (e.g. chloroform) can be met is uncertain due to the complexities of groundwater flow in fractured bedrock aquifer systems.

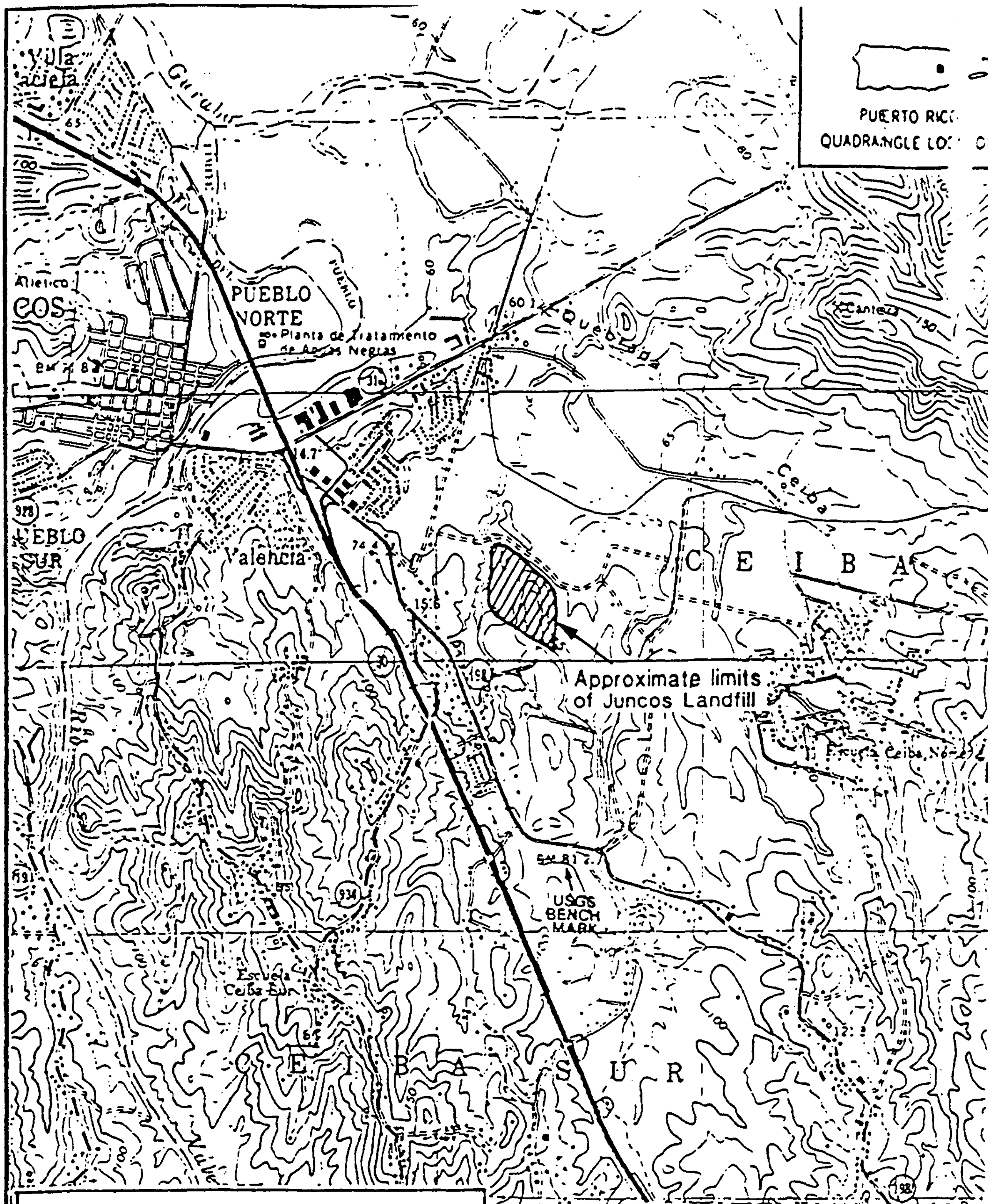
Cost Effectiveness

Alternative II effectively addresses the potential future-use risks posed by the Site. This alternative affords the highest level of overall effectiveness proportionate to its costs. The increased costs of the other alternatives evaluated do not provide significantly greater protection of public health and the environment relative to their costs.

XI. DETERMINATION OF SIGNIFICANT CHANGES

There are no significant changes from the preferred alternative presented in the Proposed Plan.

APPENDIX A



NOTE:
Base map is a portion of the Juncos Quadrangle, 1967, photorevised 1982. Contour interval is 10 meters. Dashed contours represent 5 meter contours.

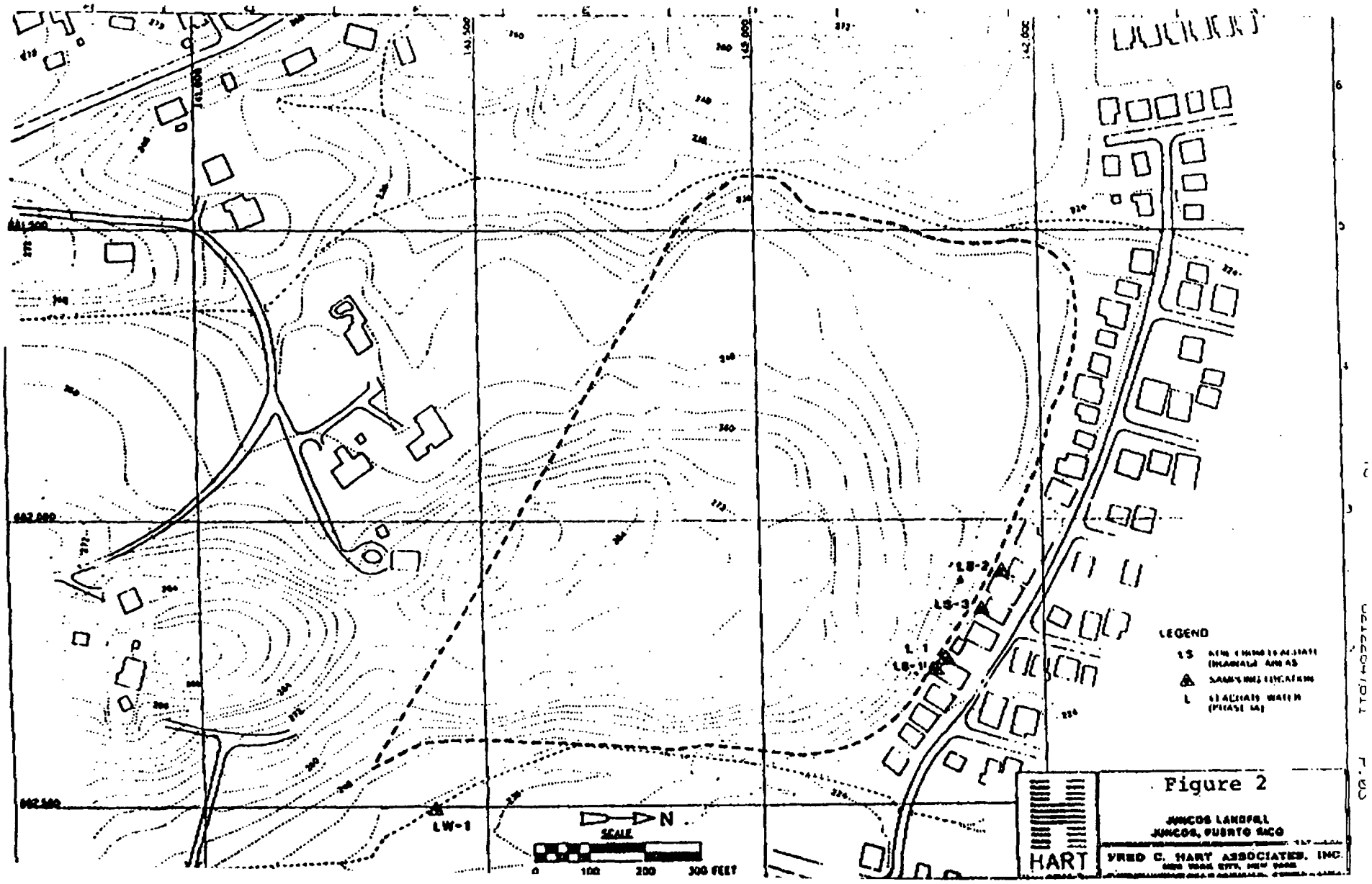
FIGURE 1

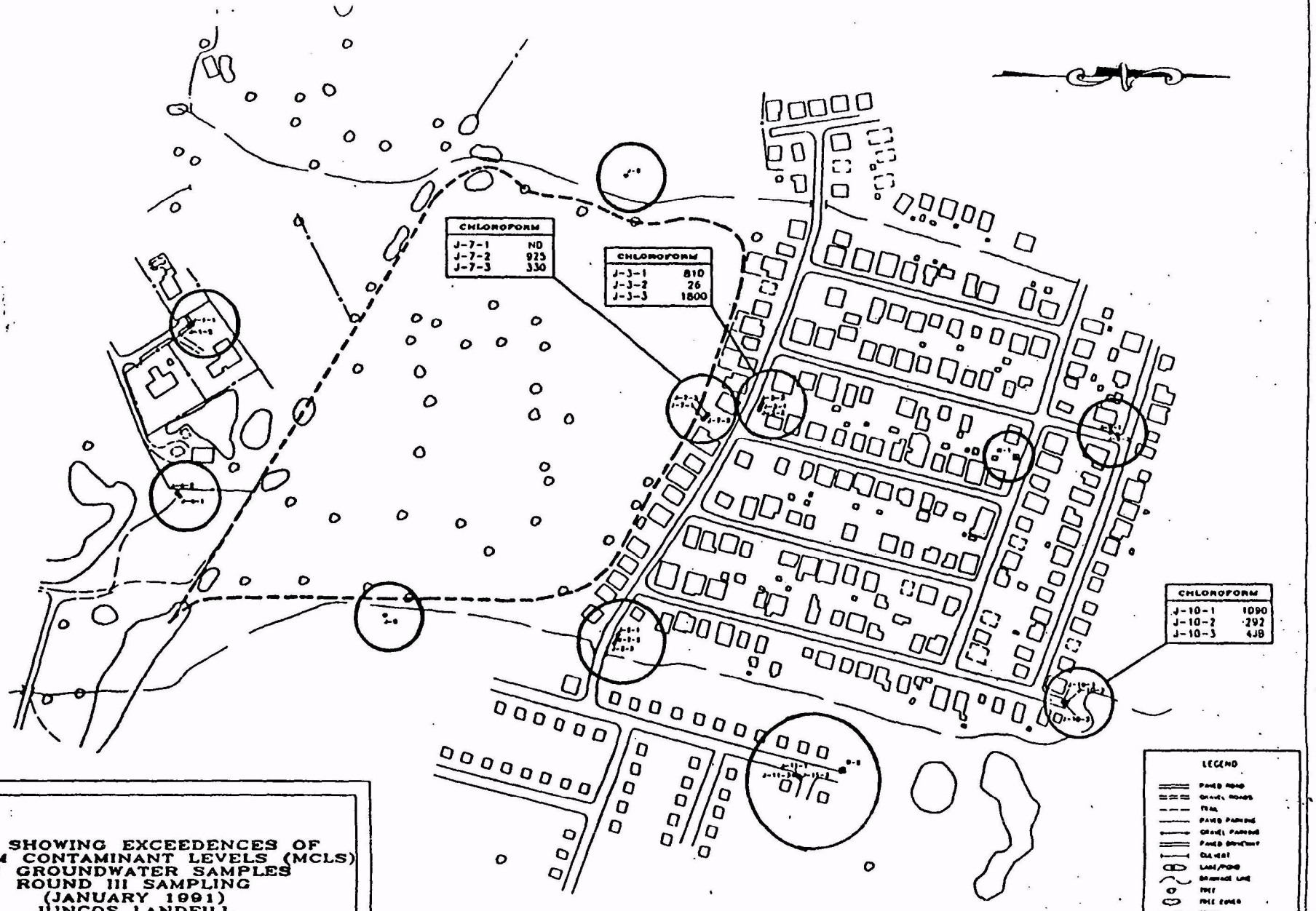
SITE LOCATION MAP

JUNCOS LANDFILL
JUNCOS, PUERTO RICO

FRED C. HART ASSOCIATES, INC.

FIGURE 2





MAP SHOWING EXCEEDENCES OF IMUM CONTAMINANT LEVELS (MCLS) IN GROUNDWATER SAMPLES ROUND III SAMPLING (JANUARY 1991) JUNCOS LANDFILL JUNCOS, PUERTO RICO

McLaren Hart

FIGURE 3

APPENDIX B

Table 1

SUMMARY OF CHLOROFORM ANALYTICAL RESULTS IN GROUNDWATER

Monitoring Well	Round I		Round II		Round III
	March 1987	October 1987	Jan/Feb. 1989	April 1989	January, 1991
J-1-1	ND	-	ND	-	ND
J-1-2	ND	-	ND	-	ND
J-2-1	ND	-	ND	-	ND
J-2-2	ND	-	ND	-	ND
J-2-3	*	*	*	*	ND
J-3-1	2,590 (2,290)	-	110J	770(880)**	810
J-3-2	70.5	-	19J	14**	26
J-3-3	-	1,750 (1,090)	980J	190**	1800
J-4-1	-	2.27	ND	-	ND
J-4-2	-	2.59	ND	-	ND
J-5	-	ND	ND	ND**	ND
J-6	-	ND	ND	ND**	ND
J-7-1	***	***	***	***	ND
J-7-2	***	***	***	***	925
J-7-3	***	***	***	***	330
J-9-1	***	***	***	***	2.61B
J-9-3	***	***	***	***	5B
J-10-1	***	***	***	***	1090
J-10-2	***	***	***	***	292
J-10-3	***	***	***	***	4JB
J-11-1	***	***	***	***	ND (ND)
J-11-2	***	***	***	***	6.06 B
J-11-3	***	***	***	***	6.03 B

Footnotes:

1. All values in ug/l (micrograms per liter).
2. Values in ( ) are results of duplicate samples.
3. - means that the well was not sampled.
4. ND means Not Detected.
5. * indicates well not sampled due to dry or near-dry conditions.
6. ** indicates that this well was resampled because VOC holding times were exceeded for the January/February, 1989 samples.
7. J means values are estimated.
8. *** indicates well not installed at time of sampling.
9. B indicates compound was detected at similar concentrations in blank sample.

TABLE 2

SUMMARY OF ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

Parameter	Number of Samples	Number Positive IDs	Sample Range Low	Sample Range High	Sample Mean	USEPA Drinking Water Standard
Inorganics:						
Antimony	11	1	BDL -	0.098	0.098	-
Arsenic	11	8	BDL -	0.035	0.009	0.050
Beryllium	11	*****	ALL SAMPLES WERE BDL	*****		-
Cadmium	11	1	BDL -	0.006	0.006	0.010
Chromium	11	4	BDL -	0.009	0.007	0.050
Copper	11	10	BDL -	0.125	0.034	1.000*
Lead	11	8	BDL -	0.019	0.007	0.050
Mercury	11	*****	ALL SAMPLES WERE BDL	*****		0.002
Nickel	11	1	BDL -	0.012	0.012	-
Silver	11	*****	ALL SAMPLES WERE BDL	*****		0.05
Zinc	11	11	0.023-	0.251	0.105	5.000*
Organics:						
Chloroform	11	3	BDL -	0.825	0.343	0.100
Methylene Chloride	11	1	BDL -	0.0055	0.0055	-
Chlorobenzene	11	1	BDL -	0.0005	0.0005	-
Carbon Disulfide	11	5	BDL -	0.300	0.090	-
Benzoic acid	11	1	BDL -	0.002	0.002	-
Di-n-butylphthalate	11	1	BDL -	0.002	0.002	-
Phenol	11	1	BDL -	0.004	0.004	-

Footnotes:

1. All results in mg/l.
2. Results for metals are from filtered groundwater samples. Therefore, these results indicate dissolved metals concentrations.
3. Drinking water standards are Maximum Contaminant Levels (MCLs) except those designated with a *, which are secondary drinking water standards.
4. - indicates that a value is not available.
5. The value for chloroform is for total trihalomethanes, the chemical group to which chloroform belongs.
6. The sample mean is based only on the samples in which the parameter was detected, not the total number of samples.
7. Results are for the second sampling round occurring in January/February and April, 1989.
8. Detected values for chloroform are from samples collected April, 1989 (See Table 7.2-3)

Table 3

GROUNDWATER INORGANICS ANALYTICAL RESULTS

PARAMETER	NUMBER OF SAMPLES (1)	NUMBER OF POSITIVES	SAMPLE RANGE MIN	SAMPLE RANGE MAX	MEAN	ARAR COMPARISON
INORGANICS						
Antimony	20	4	BDL	219	104	MEAN/MAX>PMCLG,PMCL; MAX>FWQC
Arsenic	20	9	BDL	41.1	21.9	MEAN/MAX>FWQC,PRWQS(GW)
Barium	4	4	25.8	1830	657	MAX>PRWQS(SW)
Beryllium	20	5	BDL	4.1	2.1	MEAN/MAX>PMCLG,PMCL,FWQC,PRWQS(SW)
Cadmium	20	2	BDL	3.4	2.7	SEE TABLE 2-1 FOR PRWQS(SW); OTHERWISE --
Chromium (total)	20	11	BDL	112	44.8	MAX>MCLG,MCL,PRWQS(SW)
Copper	20	16	BDL	284	48.8	SEE TABLE 2-1 FOR PRWQS(SW); OTHERWISE --
Lead	20	11	BDL	42.1	15.8	MEAN/MAX>MCLG,MCL - SEE TABLE 2-1 FOR PRWQS(SW)
Manganese	4	4	76.2	8593	2877	MEAN/MAX>PRWQS(SW)
Mercury	20	5	BDL	4	1.4	MEAN>PRWQS(SW);MAX>MCLG,MCL,PRWQS(SW)
Molybdenum	1	1	14	14	14	N/A
Nickel	20	14	BDL	53	29.5	MEAN/MAX>FWQC, SEE TABLE 2-1 FOR PRWQS(SW)
Vanadium	4	2	BDL	216	113	N/A
Zinc	20	17	BDL	647	116	MEAN/MAX>PRWQS(SW)

(1) Results are from unfiltered, downgradient wells J-2, J-3, J-5, J-6, J-7, J-9, J-10 and J-11.
-- - ARARs not exceeded; N/A - Not Applicable/No ARARs.
Units are ug/L.
BDLs were excluded from the calculation of the means as were replicates which were given a value of zero (J-4,J-4-3,J-3-10,J-11-11 and J-10-20).
Results are combined for the three sampling rounds.
PMCL - Proposed Maximum Contaminant Level.
PMCLG - Proposed Maximum Contaminant Level Goal.
PRWQS - Puerto Rico Water Quality Standards; SW: Surface Water, GW: Groundwater.
FWQC-HH - Federal Ambient Water Quality Criteria adjusted for drinking water only.

TABLE 4

PHASE I MUNICIPAL WELL SAMPLING RESULTS

Parameter	Detection Limit (Water)	HART Identifier - WJUNCOS 01 ETC Identifier - BB7772	WJUNCOS 05 BB7769	WJUNCOS 07 BB7766	WJUNCOS 08* BB7767	Field Blank BB7775	Trip Blank BB7773	Units
Leachate Indicators								
Chloride	1.0	34.1	22.9	2.7	34.5	ND	-	mg/l
Nitrate as N	.1	.9	.7	.5	.9	ND	-	mg/l
Sulfate as SO_4	5	35	26	51	33	ND	-	mg/l
TOX	5	18, 20	16, 17	19, 21	24, 27	14, 18	-	ug/l
TOC	1.0	1.8, 1.8	ND, ND	1.8, 1.9	5.3, 5.4	ND, ND	-	mg/l
Specific Conductance	10	478, 482	367, 368	581, 581	485, 491	ND, ND	-	um/cm
pH	NA	7.16, 7.20	6.82, 6.82	6.95, 6.96	6.66, 6.68	7.15, 7.16	-	pH Units
Acidity as $CaCO_3$	5	-	ND	ND	ND	-	-	mg/l
Alkalinity as $CaCO_3$	5	170	13	180	170	ND	-	mg/l
Ammonia as N	.05	.09	ND	ND	.10	ND	-	mg/l
Bicarbonate as $CaCO_3$	5	170	130	180	170	ND	-	mg/l
Carbonate as $CaCO_3$	5	ND	ND	ND	ND	ND	-	mg/l
BOD	2	6JH	2JH	6JH	5JH	4JH	-	mg/l
COD	10	11	ND	13	ND	ND	-	mg/l
TDS	10	170JH	240JH	370JH	310JH	92JH	-	mg/l
Metals								
Cadmium	1.7	ND	1.4	BMDL	BMDL	BMDL	-	ug/l
Copper	28	ND	17	ND	BMDL	ND	-	ug/l
Zinc	20	BMDL	ND8	ND8	BMDL	22	-	ug/l
Calcium	220	41100	32700	55700	41400	BMDL	-	ug/l
Magnesium	54	16200	16600	15500	16300	68	-	ug/l
Sodium	260	32100	20000	42200	33900	540	-	ug/l
Potassium	100	2000	730	1100	1900	BMDL	-	ug/l
Volatile Organic Compounds								
Trichlorofluoromethane	10	ND	ND	ND	ND	BMDL	ND	ug/l
Base/Neutral Extractable Organic Compounds								
Di-n-butyl phthalate	10-11	ND	ND	ND	BMDL	ND	-	ug/l

Legend

ND - Not Detected
BMDL - Below Method Detection Limit
\- - Sample not analyzed for parameter
JH - Value is estimated because holding times were exceeded.
ND8 - Value is reported as not detected because it was found at concentrations less than five times (ten times for common lab contaminants) the amount in any blank associated with sample.
* - WJUNCOS 08 is a replicate of WJUNCOS 01.

TOX - Total Organic Halides
TOC - Total Organic Carbon
BOD - Biochemical Oxygen Demand
COD - Chemical Oxygen Demand
TDS - Total Dissolved Solids

mg/l - Milligrams per liter
ug/l - Micrograms per liter

(1350n-17)

4/16/92
COPC.XLS

Table 5

CHEMICALS OF POTENTIAL CONCERN DETECTED AT THE JUNCOS LANDFILL SITE

INORGANICS:	VOLATILE ORGANICS:	SEMIVOLATILE ORGANICS:	PESTICIDES/PCBs:
Aluminum*	Benzene	Benzoic Acid	4,4'-DDT
Antimony	Carbon Disulfide	Bis(2-chloroisopropyl) ether	Dieldrin
Arsenic	Chlorobenzene	Bis(2-ethylhexyl) phthalate	Endrin
Barium	Chloroform	Phenol	
Beryllium	1,1-Dichloroethane		
Cadmium	Methylene Chloride		
Calcium*			
Chromium (III and VI)			
Cobalt*			
Copper*			
Iron*			
Lead*			
Magnesium*			
Manganese			
Mercury			
Molybdenum			
Nickel			
Potassium*			
Sodium*			
Vanadium			
Zinc			

NOTES:
* Indicates that the chemical could not be quantitatively evaluated due to a lack of toxicity data.

4/26/92
PWAYAS XLS

Table 6

PATHWAY ANALYSIS/PATHWAY SELECTION, JUNCOS LANDFILL SITE*

Medium	Route	Receptors	Occurrence		Comment	Pathway Retained for Analysis
			Current	Future		
Groundwater	Ingestion	Residents (Adults and Children)	U	L	Groundwater is not currently used for residential and/or industrial application. There is potential for its use in the future.	Yes
	Dermal Contact (Shower)	Residents (Adults and Children)	U	L	Groundwater is not currently used for residential and/or industrial application. There is potential for its use in the future.	Yes
	Inhalation (Shower)	Residents (Adults and Children)	U	L	Groundwater is not currently used for residential and/or industrial application. There is potential for its use in the future.	Yes

NOTES.

* All groundwater pathways were retained for quantitative analysis since drinking water is obtained from the municipal wellfield which draws water from the same aquifer as that located beneath Juncos Landfill. A hypothetical upper bound exposure evaluation was conducted using the data from monitoring wells in the vicinity of and downgradient of the site.

U = Unlikely
L = Likely

11/4/92
GW-IN-RF XLS

TABLE 7 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: INGESTION EXPOSURE OF ADULTS TO CHEMICALS IN GROUNDWATER

CARCINOGENS - GROUNDWATER INGESTION EXPOSURE

$$\text{Chronic Daily Intake} = \frac{\text{Water Concentration} \times \text{Ingestion Rate} \times \text{Exposure Frequency} \times \text{Exposure Duration}}{\text{Body Weight} \times \text{Averaging Time}}$$

$$= \frac{\text{mg/l} \times 2.0\ \text{l/day} \times 350\ \text{days/year} \times 30\ \text{years}}{70\ \text{kg} \times 25550\ \text{days}}$$

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Cancer Slope Factor (CSF)	RISK = (CDI*CSF)
Benzene	3.00E-03	2.0	350	30	70	25550	3.5E-05	2.90E-02	1.0E-06
Chloroform	0.59E+00	2.0	350	30	70	25550	2.1E-02	6.10E-03	4.3E-05
Methylene Chloride	1.30E-02	2.0	350	30	70	25550	1.5E-04	7.50E-03	1.1E-06
Bis(2-ethylhexyl) phthalate	4.00E-03	2.0	350	30	70	25550	4.7E-05	1.40E-02	6.6E-07
Dieldrin	1.00E-05	2.0	350	30	70	25550	1.2E-07	1.60E+01	1.9E-06
4,4'-DDT	2.00E-05	2.0	350	30	70	25550	2.3E-07	3.40E-01	8.0E-08
Arsenic	1.6E10-02	2.0	350	30	70	25550	4.2E-04	1.80E+00	3.4E10-4
Beryllium	3.80E-03	2.0	350	30	70	25550	4.5E-05	4.30E+00	1.9E-04

TOTAL RISK = 3.9E-04

11/4/92
GW-IN-RF.XLS

TABLE 7 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: INGESTION EXPOSURE OF ADULTS TO CHEMICALS IN GROUNDWATER

NONCARCINOGENS - GROUNDWATER INGESTION EXPOSURE

$$\text{Chronic Daily Intake} = \frac{\text{Water Concentration} \times \text{Ingestion Rate} \times \text{Exposure Frequency} \times \text{Exposure Duration} \times \frac{1}{\text{Body Weight}}}{\text{Averaging Time}}$$

$$= \frac{\text{mg/l} \times 2.0\ \text{l/day} \times 350\ \text{days/year} \times 30\ \text{years} \times \frac{1}{70\ \text{kg}}}{\frac{1}{10950\ \text{days}}}$$

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ = CDI/RfD
Chlorobenzene	1.00E-02	2.0	350	30	70	10950	2.7E-04	2.00E-02	1.4E-02
Chloroform	0.59.00	2.0	350	30	70	10950	4.9E-02	1.00E-02	1.62E+00
1,1-Dichloroethane	1.00E-03	2.0	350	30	70	10950	2.7E-05	1.00E-01	2.7E-04
Methylene Chloride	1.30E-02	2.0	350	30	70	10950	3.6E-04	6.00E-02	5.9E-03
Carbon Disulfide	2.02E-01	2.0	350	30	70	10950	5.5E-03	1.00E-01	5.5E-02
Bis(2-chloroisopropyl) ether	6.59E-02	2.0	350	30	70	10950	1.8E-03	4.00E-02	4.5E-02
Bis(2-ethylhexyl) phthalate	4.00E-03	2.0	350	30	70	10950	1.1E-04	2.00E-02	5.5E-03
Benzoic Acid	2.00E-03	2.0	350	30	70	10950	5.5E-05	4.00E+00	1.4E-05
Phenol	2.00E-03	2.0	350	30	70	10950	5.5E-05	6.00E-01	9.1E-05
Dieldrin	1.00E-05	2.0	350	30	70	10950	2.7E-07	5.00E-05	5.5E-03
Endrin	1.00E-05	2.0	350	30	70	10950	2.7E-07	3.00E-04	9.1E-04
4,4'-DDT	2.00E-05	2.0	350	30	70	10950	5.5E-07	5.00E-04	1.1E-03
Antimony	5.7E-02	2.0	350	30	70	10950	3.4E-03	4.00E-04	3.9E+00
Arsenic	1.60E-02	2.0	350	30	70	10950	9.9E-04	3.00E-04	1.5E+00
Barium	1.83E+00	2.0	350	30	70	10950	5.0E-02	7.00E-02	7.2E-01
Beryllium	3.80E-03	2.0	350	30	70	10950	1.0E-04	5.00E-03	2.1E-02
Cadmium	3.40E-03	2.0	350	30	70	10950	9.3E-05	5.00E-04	1.9E-01
Chromium (III)	9.60E-02	2.0	350	30	70	10950	2.6E-03	1.00E+00	2.6E-03
(VI)	1.60E-02	2.0	350	30	70	10950	4.4E-04	5.00E-03	8.8E-02
Manganese	8.59E+00	2.0	350	30	70	10950	2.4E-01	1.00E-01	2.4E+00
Molybdenum	1.40E-02	2.0	350	30	70	10950	3.8E-04	4.00E-03	9.6E-02
Nickel	5.03E-02	2.0	350	30	70	10950	1.4E-03	2.00E-02	6.9E-02
Mercury	2.10E-03	2.0	350	30	70	10950	5.8E-05	3.00E-04	1.9E-01
Vanadium	2.16E-01	2.0	350	30	70	10950	5.9E-03	7.00E-03	8.5E-01
Zinc	3.63E-01	2.0	350	30	70	10950	9.9E-03	2.00E-01	5.0E-02

HAZARD INDEX = 1.2E+01

11/4/02

GW-DC-RF.XLS

TABLE 8 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: DERMAL EXPOSURE OF ADULTS TO CHEMICALS IN GROUNDWATER:SHOWER SCENARIO

CARCINOGENS - GROUNDWATER DERMAL CONTACT EXPOSURE

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Skin Surface Area X Permeability Constant X Exposure Time X Exposure Frequency X Exposure Duration X Conversion Factor X 1/Body Weight X 1/Averaging Time

mg/l X 18150 cm2 X cm/hr X 0.2 hr/day X 350 days/year X 30 years X 1 L/1000 cm3 X 1/70 kg X 1/25550 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Cancer Slope Factor (CSF)	RISK = (CDI*CSF)
Bis(2-ethylhexyl) phthalate	4.00E-03	18150	8.4E-04	0.2	350	30	1.0E-03	70	25550	7.2E-08	1.40E-02	1.0E-09
Dieldrin	1.00E-05	18150	8.4E-04	0.2	350	30	1.0E-03	70	25550	1.8E-10	1.60E+01	2.9E-09
4,4'-DDT	2.00E-05	18150	8.4E-04	0.2	350	30	1.0E-03	70	25550	3.6E-10	3.40E-01	1.2E-10

TOTAL RISK = 4.0E-09

NONCARCINOGENS - GROUNDWATER DERMAL CONTACT EXPOSURE

Chronic Daily Intake= (mg/kg-day) = Water Concentration X Skin Surface Area X Permeability Constant X Exposure Time X Exposure Frequency X Exposure Duration X Conversion Factor X 1/Body Weight X 1/Averaging Time

mg/l X 18150 cm2 X cm/hr X 0.2 hr/day X 350 days/year X 30 years X 1 L/1000 cm3 X 1/70 kg X 1/10950 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ= CDI/RfD
Bis(2-chloroisopropyl) ether	6.59E-02	18150	8.4E-04	0.2	350	30	1.0E-03	70	10950	2.8E-06	4.00E-02	6.9E-05
Bis(2-ethylhexyl) phthalate	4.00E-03	18150	8.4E-04	0.2	350	30	1.0E-03	70	10950	1.7E-07	2.00E-02	8.4E-06
Benzoic Acid	2.00E-03	18150	8.4E-04	0.2	350	30	1.0E-03	70	10950	8.4E-08	4.00E+00	2.1E-08
Phenol	2.00E-03	18150	8.1E-03	0.2	350	30	1.0E-03	70	10950	8.1E-07	6.00E-01	1.3E-06
Dieldrin	1.00E-05	18150	8.4E-04	0.2	350	30	1.0E-03	70	10950	4.2E-10	5.00E-05	8.4E-06
Endrin	1.00E-05	18150	8.4E-04	0.2	350	30	1.0E-03	70	10950	4.2E-10	3.00E-04	1.4E-06
4,4'-DDT	2.00E-05	18150	8.4E-04	0.2	350	30	1.0E-03	70	10950	8.4E-10	5.00E-04	1.7E-06

HAZARD INDEX = 9.0E-05

11/4/92
GW-INH2 XLS

TABLE 9 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: INHALATION EXPOSURE OF ADULTS TO CHEMICALS IN GROUNDWATER: SHOWER SCENARIO

		Variable Values
C(sa) =	Concentration in bathroom during showering (ug/m3)	:
C(w) =	Concentration in shower water (ug/l)	: 95% UCL or maximum concentration (ug/l)
FL =	Flow rate of shower water (l/hr)	: 400 liters/hour
VF =	Fraction of contaminant volatilized	: 0.90
t =	One half duration of shower (hr)	: 0 1 hour
V =	Bathroom volume (m3)	: 12 meter3

EQUATION:

$$C(sa) \text{ (ug/m3)} = FL \text{ (l/hr)} \times C(w) \text{ (ug/l)} \times VF \text{ (unitless)} \times t \text{ (hr)} \times \frac{1}{V \text{ (1/m3)}}$$

C(sa):

Chloroform	400	1784.0	0.90	0.1	0.08	=	5138
Methylene Chloride	400	13.0	0.90	0.1	0.08	=	37
Carbon Disulfide	400	202.0	0.90	0.1	0.08	=	582
Chlorobenzene	400	10 0	0 90	0 1	0.08	=	29
Benzene	400	3 0	0 90	0.1	0.08	=	8 6
1,1-Dichloroethane	400	1.0	0.90	0.1	0 08	=	2.9

CARCINOGENS - GROUNDWATER INHALATION EXPOSURE

$$\text{Chronic Daily Intake (mg/kg-day)} = \text{Air Concentration} \times \text{Inhalation Rate} \times \text{Exposure Time} \times \text{Exposure Frequency} \times \text{Exposure Duration} \times \frac{1}{\text{Body Weight}} \times \frac{1}{\text{Averaging Time}}$$

$$\text{mg/m3} \times 0\ 6\ \text{m3/hr} \times 0.2\ \text{hrs/day} \times 350\ \text{days/year} \times 30\ \text{years} \times \frac{1}{70\ \text{kg}} \times \frac{1}{25550\ \text{days}}$$

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Cancer Slope Factor (CSF)	RISK = (CDI*CSF)
Chloroform	5.14E+00	0.6	0.2	350	30	70	25550	3 6E-03	8.10E-02	9.6E-05
Methylene Chloride	3 70E-02	0.6	0.2	350	30	70	25550	2.6E-05	1.70E-03	4 4E-08
Benzene	8.60E-03	0.6	0.2	350	30	70	25550	6.1E-06	2.90E-02	1 8E-07
									TOTAL RISK =	9.6E-05

NONCARCINOGENS - GROUNDWATER INHALATION EXPOSURE

$$\text{Chronic Daily Intake (mg/kg-day)} = \text{Air Concentration} \times \text{Inhalation Rate} \times \text{Exposure Time} \times \text{Exposure Frequency} \times \text{Exposure Duration} \times \frac{1}{\text{Body Weight}} \times \frac{1}{\text{Averaging Time}}$$

$$\text{mg/m3} \times 0\ 6\ \text{m3/hr} \times 0.2\ \text{hrs/day} \times 350\ \text{days/year} \times 30\ \text{years} \times \frac{1}{70\ \text{kg}} \times \frac{1}{10950\ \text{days}}$$

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Reference Dose (RfD)	HQ = CDI/RfD
1,1 Dichloroethane	2 90E-03	0 6	0 2	350	30	70	10950	4.8E-06	1.00E-01	4 8E 05
Methylene Chloride	3 70E-02	0 6	0 2	350	30	70	10950	6.1E-05	8 60E 01	7 1E-05
Carbon Disulfide	5 82E-01	0 6	0 2	350	30	70	10950	9 6E-04	2 90E-03	3 3E-01
Chlorobenzene	2 90E-02	0 6	0 2	350	30	70	10950	4 8E-05	5 00E 03	9 5E 03
									HAZARD INDEX =	3 4E 01

11/4/92
GW-IN-RF.XLS

TABLE 10 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: INGESTION EXPOSURE OF CHILDREN TO CHEMICALS IN GROUNDWATER

NONCARCINOGENS - GROUNDWATER INGESTION EXPOSURE (0 - 6 YEARS)

Subchronic Daily Intake = (mg/kg-day) = Water Concentration X Ingestion Rate X Exposure Frequency X Exposure Duration X 1/Body Weight X 1/Averaging Time

mg/l X 2.0 l/day X 350 days/year X 6 years X 1/16 kg X 1/2190 days

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (CDI)	Subchronic Reference Dose (RfD)	HQ= CDI/RfD
Chlorobenzene	1.00E-02	2.0	350	6	16	2190	1.2E-03	2.00E-01	6.0E-03
Chloroform	0.59E+00	2.0	350	6	16	2190	2.1E-01	1.00E-02	6.9E+00
1,1-Dichloroethane	1.00E-03	2.0	350	6	16	2190	1.2E-04	1.00E+00	1.2E-04
Methylene Chloride	1.30E-02	2.0	350	6	16	2190	1.6E-03	6.00E-02	2.6E-02
Carbon Disulfide	2.02E-01	2.0	350	6	16	2190	2.4E-02	1.00E-01	2.4E-01
Bis(2-chloroisopropyl) ether	6.59E-02	2.0	350	6	16	2190	7.9E-03	4.00E-02	2.0E-01
Bis(2-ethylhexyl) phthalate	4.00E-03	2.0	350	6	16	2190	4.8E-04	2.00E-02	2.4E-02
Benzoic Acid	2.00E-03	2.0	350	6	16	2190	2.4E-04	4.00E+00	6.0E-05
Phenol	2.00E-03	2.0	350	6	16	2190	2.4E-04	6.00E-01	4.0E-04
Dieldrin	1.00E-05	2.0	350	6	16	2190	1.2E-06	5.00E-05	2.4E-02
Endrin	1.00E-05	2.0	350	6	16	2190	1.2E-06	5.00E-04	2.4E-03
4,4'-DDT	2.00E-05	2.0	350	6	16	2190	2.4E-06	5.00E-04	4.8E-03
Antimony	5.70E-02	2.0	350	6	16	2190	1.5E-02	4.00E-04	1.7E+01
Arsenic	1.60E-02	2.0	350	6	16	2190	4.3E-03	1.00E-03	1.9E+00
Barium	1.83E+00	2.0	350	6	16	2190	2.2E-01	5.00E-02	4.4E+00
Beryllium	3.80E-03	2.0	350	6	16	2190	4.6E-04	5.00E-03	9.1E-02
Cadmium	3.40E-03	2.0	350	6	16	2190	4.1E-04	5.00E-04	8.2E-01
Chromium (III)	9.60E-02	2.0	350	6	16	2190	1.2E-02	1.00E+01	1.2E-03
(VI)	1.60E-02	2.0	350	6	16	2190	1.9E-03	2.00E-02	9.6E-02
Manganese	8.59E+00	2.0	350	6	16	2190	1.0E+00	1.00E-01	1.0E+01
Molybdenum	1.40E-02	2.0	350	6	16	2190	1.7E-03	4.00E-03	4.2E-01
Nickel	5.03E-02	2.0	350	6	16	2190	6.0E-03	2.00E-02	3.0E-01
Mercury	2.10E-03	2.0	350	6	16	2190	2.5E-04	3.00E-04	8.4E-01
Vanadium	2.16E-01	2.0	350	6	16	2190	2.6E-02	7.00E-03	3.7E+00
Zinc	3.63E-01	2.0	350	6	16	2190	4.3E-02	2.00E-01	2.2E-01

HAZARD INDEX = 4.7E+01

11/4/92
GW-IN-RF.XLS

TABLE 10 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: INGESTION EXPOSURE OF CHILDREN TO CHEMICALS IN GROUNDWATER

CARCINOGENS - GROUNDWATER INGESTION EXPOSURE (0 - 6 YEARS)

$$\text{Chronic Daily Intake (mg/kg-day)} = \text{Water Concentration} \times \text{Ingestion Rate} \times \text{Exposure Frequency} \times \text{Exposure Duration} \times \frac{1}{\text{Body Weight}} \times \frac{1}{\text{Averaging Time}}$$

$$= \text{mg/l} \times 2.0\ \text{l/day} \times 350\ \text{days/year} \times 6\ \text{years} \times \frac{1}{16\ \text{kg}} \times \frac{1}{25550\ \text{days}}$$

Chemicals	Water Concentration	Ingestion Rate	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Cancer Slope Factor (CSF)	RISK = (CDI*CSF)
Benzene	3.00E-03	2.0	350	6	16	25550	3.1E-05	2.90E-02	9.0E-07
Chloroform	0.59+00	2.0	350	6	16	25550	1.8E-02	6.10E-03	1.8E-05
Methylene Chloride	1.30E-02	2.0	350	6	16	25550	1.3E-04	7.50E-03	1.0E-06
Bis(2-ethylhexyl) phthalate	4.00E-03	2.0	350	6	16	25550	4.1E-05	1.40E-02	5.8E-07
Dieldrin	1.00E-05	2.0	350	6	16	25550	1.0E-07	1.60E+01	1.6E-06
4,4'-DDT	2.00E-05	2.0	350	6	16	25550	2.1E-07	3.40E-01	7.0E-08
Arsenic	1.60E-02	2.0	350	6	16	25550	3.7E-04	1.80E+00	2.9E-04
Beryllium	3.80E-03	2.0	350	6	16	25550	3.9E-05	4.30E+00	1.7E-04
								TOTAL RISK =	3.1E-04

11/4/92
GW OC RF.XLS

TABLE 11 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: DERMAL EXPOSURE OF CHILDREN TO CHEMICALS IN GROUNDWATER:SHOWER SCENARIO

CARCINOGENS - GROUNDWATER DERMAL CONTACT EXPOSURE (0 - 6 YEARS)

Chronic Daily Intake = (mg/kg-day) = Water Concentration X Skin Surface Area X Permeability Constant X Exposure Time X Exposure Frequency X Exposure Duration X Conversion Factor X 1/Body Weight X 1/Averaging Time

mg/l X 7200 cm2 X cm/hr X 0.2 hr/day X 350 days/year X 6 years X 1 L/1000 cm3 X 1/16 kg X 1/25550 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Cancer Slope Factor (CSF)	RISK = (CDI*CSF)
Bis(2-ethylhexyl) phthalate	4.00E-03	7200	8.4E-04	0.2	350	6	1.0E-03	16	25550	2.5E-08	1.40E-02	3.5E-10
Dieldrin	1.00E-05	7200	8.4E-04	0.2	350	6	1.0E-03	16	25550	6.2E-11	1.60E+01	9.9E-10
4,4'-DDT	2.00E-05	7200	8.4E-04	0.2	350	6	1.0E-03	16	25550	1.2E-10	3.40E-01	4.2E-11

TOTAL RISK = 1.4E-09

NONCARCINOGENS - GROUNDWATER DERMAL CONTACT EXPOSURE (0 - 6 YEARS)

Subchronic Daily Intake = (mg/kg-day) = Water Concentration X Skin Surface Area X Permeability Constant X Exposure Time X Exposure Frequency X Exposure Duration X Conversion Factor X 1/Body Weight X 1/Averaging Time

mg/l X 7200 cm2 X cm/hr X 0.2 hr/day X 350 days/year X 6 years X 1 L/1000 cm3 X 1/16 kg X 1/2190 days

Chemicals	Water Concentration	Skin Surface Area	Permeability Constant	Exposure Time	Exposure Frequency	Exposure Duration	Conversion Factor	Body Weight	Averaging Time	Subchronic Daily Intake (CDI)	Subchronic Reference Dose (RfD)	HQ = CDI/RfD
Bis(2-chloroisopropyl) ether	6.59E-02	7200	8.4E-04	0.2	350	6	1.0E-03	16	2190	4.8E-06	4.00E-02	1.2E-04
Bis(2-ethylhexyl) phthalate	4.00E-03	7200	8.4E-04	0.2	350	6	1.0E-03	16	2190	2.9E-07	2.00E-02	1.4E-05
Benzoic Acid	2.00E-03	7200	8.4E-04	0.2	350	6	1.0E-03	16	2190	1.4E-07	4.00E+00	3.6E-08
Phenol	2.00E-03	7200	8.1E-03	0.2	350	6	1.0E-03	16	2190	1.4E-06	6.00E-01	2.3E-06
Dieldrin	1.00E-05	7200	8.4E-04	0.2	350	6	1.0E-03	16	2190	7.2E-10	5.00E-05	1.4E-05
Endrin	1.00E-05	7200	8.4E-04	0.2	350	6	1.0E-03	16	2190	7.2E-10	5.00E-04	1.4E-06
4,4'-DDT	2.00E-05	7200	8.4E-04	0.2	350	6	1.0E-03	16	2190	1.4E-09	5.00E-04	2.9E-06

HAZARD INDEX = 1.6E-04

11/4/92
GW-INH2.XLS

TABLE 12 RISK CHARACTERIZATION FOR JUNCOS LANDFILL: INHALATION EXPOSURE OF CHILDREN TO CHEMICALS IN GROUNDWATER: SHOWER SCENARIO

Variable Values

C(sa) = Concentration in bathroom during showering (ug/m3) :
C(w) = Concentration in shower water (ug/l) : 95% UCL or maximum concentration (ug/l)
FL = Flow rate of shower water (l/hr) : 400 liters/hour
VF = Fraction of contaminant volatilized : 0.90
t = One half duration of shower (hr) : 0.1 hour
V = Bathroom volume (m3) : 12 meter3

EQUATION:

$$C(sa) = (ug/m3) \quad \frac{FL\ (l/hr)}{} \times C(w)\ (ug/l) \times VF\ (unitless) \times t\ (hr) \times \frac{1}{V\ (l/m3)}$$

C(sa):							
Chloroform	400	1784 0	0 90	0.1	0.08	=	5138
Methylene Chloride	400	13.0	0 90	0 1	0.08	=	37
Carbon Disulfide	400	202.0	0 90	0 1	0.08	=	582
Chlorobenzene	400	10.0	0.90	0.1	0.08	=	29
Benzene	400	3.0	0 90	0 1	0 08	=	8.6
1,1-Dichloroethane	400	1.0	0.90	0.1	0.08	=	2.9

CARCINOGENS - GROUNDWATER INHALATION EXPOSURE (0 - 6 YEARS)

$$\text{Chronic Daily Intake (mg/kg-day)} = \frac{\text{Air Concentration} \times \text{Inhalation Rate} \times \text{Exposure Time} \times \text{Exposure Frequency} \times \text{Exposure Duration}}{\text{Body Weight} \times \text{Averaging Time}}$$

$$\frac{\text{mg/m3} \times 0.6\ \text{m3/hr} \times 0.2\ \text{hrs/day} \times 350\ \text{days/year} \times 6\ \text{years}}{16\ \text{kg} \times 25550\ \text{days}}$$

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Chronic Daily Intake (CDI)	Cancer Slope Factor (CSF)	RISK = (CDI*CSF)
Chloroform	5.14E+00	0.6	0.2	350	6	16	25550	3.2E-03	8 10E-02	8.6E-05
Methylene Chloride	3.70E-02	0.6	0.2	350	6	16	25550	2.3E-05	1 70E-03	3 9E-08
Benzene	8.60E-03	0.6	0.2	350	6	16	25550	5.3E-06	2.90E-02	1 5E 07
									TOTAL RISK =	8.6E-05

NONCARCINOGENS - GROUNDWATER INHALATION EXPOSURE (0 - 6 YEARS)

$$\text{Subchronic Daily Intake (mg/kg-day)} = \frac{\text{Air Concentration} \times \text{Inhalation Rate} \times \text{Exposure Time} \times \text{Exposure Frequency} \times \text{Exposure Duration}}{\text{Body Weight} \times \text{Averaging Time}}$$

$$\frac{\text{mg/m3} \times 0.6\ \text{m3/hr} \times 0.2\ \text{hrs/day} \times 350\ \text{days/year} \times 6\ \text{years}}{16\ \text{kg} \times 2190\ \text{days}}$$

Chemicals	Air Concentration	Inhalation Rate	Exposure Time	Exposure Frequency	Exposure Duration	Body Weight	Averaging Time	Subchronic Daily Intake (CDI)	Subchronic Reference Dose (RfD)	HQ= CDI/RfD
1,1-Dichloroethane	2 90E-03	0 6	0.2	350	6	16	2190	2 1E-05	1.00E+00	2 1E 05
Methylene Chloride	3 70E-02	0 6	0 2	350	6	16	2190	2.7E-04	8 60E-01	3 1E 04
Carbon Disulfide	5 82E-01	0 6	0 2	350	6	16	2190	4 2E-03	2 90E 03	1 4E+00
Chlorobenzene	2 90E-02	0 6	0 2	350	6	16	2190	2 1E 04	5 00E 02	4 2E 03
									HAZARD INDEX =	1 4E+00

TABLE 13

POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs FOR THE JUNCOS LANDFILL

Parameters	MCL(1)	Adjusted FWQC For Drinking Water (2)
Chloroform	100*	0.19(3)

Units are parts per billion (ppb)

* MCL for trihalomethanes as a class of compounds. Includes chloroform, bromoform, bromodichloromethane and dibromochloromethane.

(1) MCLs Fact Sheet: Drinking Water Regulations Under the Safe Drinking Water Act, May 1990. Table 14.

(2) Federal Ambient Water Quality Criteria for protection of Human Health adjusted for drinking water only.

(3) FWQC corresponding to a 10E-6 risk level.

TABLE 14

POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs FOR THE JUNCOS LANDFILL

LOCATION	REQUIREMENT	PREREQUISITE(S)	CITATION	COMMENTS
Area effecting stream or river.	Action to protect fish or wildlife.	Diversion, channeling, or other activity that modifies a stream or river and effects fish or wildlife.	Fish and Wildlife Coordination Act (16 USC 641 et esq.); 40 CRF 6.302.	The Fish and Wildlife Coordination Act requires consultation with the Department of Fish and Wildlife prior to any action that would alter a body of water of the United States.
Wetlands	Action to avoid adverse effects, minimize potential harm and preserve, and enhance tot he extent possible.	Action involving construction of facilities or management of property in wetlands.	40 CFR Part 6, Appendix A	
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts.	Action to recover and preserve artifacts.	Alteration of terrain that threatens significant scientific, prehistorical, historical or archaeological data.	National Historical Preservation Act (16 USC Section 469); 36 CFR Part 65.	
Historic project owned or controlled by Federal agency	Action to preserve historic properties; planning of action to minimize harm to National Historic Landmarks.	Property included in or eligible for the National Register of Historic Places.	National Historic Preservation Act, Section 106 (16 USC 470 et seq.); 36 CFR Part 800	

TABLE 15

POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR JUNCOS LANDFILL

Actions	Requirement	Prerequisites	Citation	Comments
Air Stripping	Design system to provide odor free operation.		CAA Section 101[a]	Odor regulations are intended to limit nuisance conditions from air pollution emissions.
	File an Air Pollution Emission Notice (APEN) with the State to include estimation of emission rates for each pollutant expected.		40 CFR 52[a]	State will have particular interest in emissions for compounds on their hazardous, toxic or odorous list. Preliminary meeting with state prior to filing APEN is recommended in the regulation. Meeting would identify additional issues of concern to the State.
	Include with filed APEN the following: • Modeled impact analysis of source emissions. • Provide a Best Available Control Technology (BACT) review for the source operation.	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52[a]	State may identify further requirements for permit issuance after first review. These provisions follow the federal Prevention of Significant Deterioration (PSD) framework with some modifications. Additional requirements could include ambient monitoring and emission control equipment design revisions to match Lowest Achievable Emission Requirements (LAER). While a permit is not required for an onsite CERCLA action, the substantive requirements identified during the permitting process are applicable.
	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr. 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[a]	The control technology review for this regulation (RACT) could coincide with the BACT review suggested under the PSD program.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CRF 61[b]	
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[b]	Regulation 8 indicates any source emitting the regulated compounds is subject to this regulation. However, some of the specific regulations further restrict the scope of applicability.
Direct Discharge of Treatment System Effluent	Applicable federal water quality criteria for the protection of aquatic life must be complied with when environmental factors are being considered.	Surface discharge of treated effluent.	50 FR 30784 (July 29, 1985).	

TABLE 15

POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR JUNCOS LANDFILL

Actions	Requirement	Prerequisites	Citation	Comments
Direct Discharge of Treatment System Effluent (Continued)	Applicable federally approved state water quality standards must be complied with. These standards may be in addition to or more stringent than other federal standards under the CWA.	Surface discharge of treated effluent.	40 CFR 122.44 and state regulations approved under 40 CFR 131.	If state regulations are more stringent than federal water quality standards, the state standards will be applicable to direct discharge. The state has authority under 40 CFR 131 to implement direct discharge requirements within the state, and should be contacted on a case by-case basis when direct discharges are contemplated.
	The discharge must be consistent with the requirement of a Water Quality Management plan approved by EPA under Section 208(b) of the Clean Water Act.		CWA Section 208(b)	Discharge must comply with substantive but not administrative requirements of the management plan.
	Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology based limitations may be determined on a case-by-case basis.	Surface discharge of treated effluent.	40 CFR 122.44 (a)	If treated effluent is discharged to surface waters, these treatment requirements will be applicable. Permitting and reporting requirements will be applicable only if the effluent is discharged at an offsite location. The permitting authority should be contacted on a case-by-case basis to determine effluent standards.
	The discharge must conform to applicable water quality requirements when the discharge affects a state other than the certifying state.	Surface water discharge affecting waters outside certifying state.	40 CFR 122.44(d)(4)	No discharge is expected to affect surface water outside certifying state.
	Discharge limitations must be established for all toxic pollutants that are or may be discharged at levels greater than those that can be achieved by technology-based standards.	Surface discharge of treated effluent.	40 CFR 122.44(e)	Exact limitations are based on review of the proposed treatment system and receiving water characteristics, and are usually determined on a case-by-case basis. The permitting authority should be contacted to determine effluent limitations.
	Discharger must be monitored to assure compliance. Discharge will monitor: • The mass of each pollutant discharged. • The volume of effluent discharged. • Frequency of discharge and other measurements as appropriate.	Surface discharge of treated effluent.	40 CFR 122.44(i)	These requirements are generally incorporated into permits, which are not require for onsite discharges. The substantive requirements are applicable, however, in that verifiable evidence must be offered that the discharge standards are being met. The permitting authority should be contacted to determine monitoring and operational requirements.

POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR JUNCOS LANDFILL

Actions	Requirement	Prerequisites	Citation	Comments
Direct Discharge of Treatment System Effluent *(Continued)*	Approved test methods for waste constituents to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided. Permit application information must be submitted, including a description of activities, listing of environmental permits, etc. Monitor and report results as required by permit (at least annually).		40 CFR 122.21 40 CFR 122.44(i)	
	Comply with additional permit conditions such as: • Duty to mitigate any adverse effects of any discharge. • Proper operation and maintenance of treatment systems.		40 CFR 122.41(i)	
	Develop and implement a Best Management Practices (BMP) program and incorporate in the NPDES permit to prevent the release of toxic constituents to surface waters. The BMP program must: • Establish specific procedures for the control of toxic and hazardous pollutant spills. • Include a prediction of direction, rate of flow, and total quality of toxic pollutants where experience indicates a reasonable potential for equipment failure. • Assure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.	Surface water discharge.	40 CFR 125.100 40 CFR 125.104	These issues are determined on a case-by-case basis by the NPDES permitting authority for any proposed surface discharge of treated wastewater. Although a CERCLA site remediation is not required to obtain an NPDES permit for onsite discharges to surface waters, the substantive requirements of the NPDES permit program must be met by the remediation action if possible. The permitting authority should be consulted on a case-by-case basis to determine BMP requirements.

TABLE 4.5

POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR JUNCOS LANDFILL

Actions	Requirement	Prerequisites	Citation	Comments
	Sample preservation procedures, container materials, and maximum allowable holding times are prescribed.	Surface water discharge.	40 CFR 136.1-136.4	These requirements are generally incorporated into permits, which are not required for onsite discharges. The substantive requirements are applicable, however, in that verifiable evidence must be offered that standards are being met. The permitting authority should be consulted on a case-by-case basis to determine analytical requirements.
Discharge to POTW[a]	Pollutants that pass through the POTW sludge are prohibited.		40 CFR 403.5	If any liquid is discharged to a POTW, these requirements are applicable. In accordance with guidance, a discharge permit will be required even for a onsite discharge, since permitting is the only substantive control mechanism available to a POTW.
	Specific prohibitions preclude the discharge of pollutants to POTWs that: • Create a fire or explosion hazard in the POTW. • Are corrosive (pH < 5.0). • Obstruct flow resulting in interference. • Are discharged at a flow rate and/or concentration that will result in interference. • Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW influent temperature above 104°F (40°C).			Categorical standards have not been promulgated for CERCLA sites, so discharge standards must be determined on a case-by-case basis, depending on the characteristics of the waste stream and the receiving POTW. Some municipalities have published standards for non-categorical, non-domestic discharges. Changes in the composition of the waste stream due to pretreatment process changes or the addition of new waste streams will require renegotiation of the permit conditions.
	Discharge must comply with local POTW pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.		40 CFR 403.5 and local POTW regulations	
	RCRA permit-by-rule requirements must be complied with for discharges of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe.		40 CFR 264.71 and 40 CFR 264.72	

TABLE 15

POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR JUNCOS LANDFILL

Actions	Requirement	Prerequisites	Citation	Comments
Operation and Maintenance (O&M)	Post-closure care to ensure that site is maintained and monitored.		40 CFR 264.118 (RCRA, Subpart G)	Post-closure requirements for operation and maintenance of municipal landfill sites are relevant and appropriate to new disposal units with nonhazardous waste, or existing units capped in place. In cases where municipal landfill site wastes are determined to be hazardous wastes, and new disposal units are created, the post-closure requirements will be applicable.
Treatment	Standards for miscellaneous units (long-term retrievable storage, thermal treatment other than incinerators, open burning, open detonation, chemical, physical, and biological treatment units using other than tanks, surface impoundments, or land treatment units) require new miscellaneous units to satisfy environmental performance standards by protection of groundwater, surface water, and air quality, and by limiting surface and subsurface migration.	Use of the units for treatment of hazardous wastes. These units do not meet the definitions for units regulated elsewhere under RCRA.	40 CFR 264 (Subpart X)	The requirement will be relevant and appropriate to the construction, operation, maintenance, and closure of any miscellaneous treatment unit (a treatment unit that is not elsewhere regulated) constructed on municipal landfill site for treatment and/or disposal of nonhazardous wastes. These requirements would be applicable to the construction and operation of a miscellaneous treatment unit for the treatment and/or disposal of hazardous wastes.
	Treatment of wastes subject to ban or land disposal must attain levels achievable by best demonstrated available treatment technologies (BDAT) for each hazardous constituent in each listed waste.	Effective date for CERCLA actions is November 8, 1988, for F001-F005 hazardous wastes, dioxin wastes, and certain " California List" wastes. Other restricted wastes have different effective dates as promulgated in 40 CFR 268.	40 CFR 268 (Subpart D)	These regulations are applicable to the disposal of any municipal landfill site waste that can be defined as restricted wastes. These requirements are relevant and appropriate to the treatment prior to land disposal of any wastes that contain components of restricted wastes in concentrations that make the site wastes sufficiently similar to the regulated wastes. The requirements specify levels of treatment that must be attained prior to land disposal.
Operation and Maintenance (O&M)	Post-closure care to ensure that site is maintained and monitored.		40 CFR 264.118 (RCTA, Subpart G)	Post-closure requirements for operation and maintenance of municipal landfill sites are relevant and appropriate to new disposal units with nonhazardous waste, or existing units capped in place. In cases where muhicipal landfill site wastes are determined to be hazardous wastes, and new disposal units are created, the post-closure requirements will be applicable.

TABLE 16

POTENTIAL COMMONWEALTH ARARs and TBCs FOR THE JUNCOS LANDFILL

REQUIREMENT	CITATION	DESCRIPTION
General Prohibitions	EQB Part III Rule 302	General prohibitions and requirements for generation and handling of solid waste.
General Solid Waste Facility Prohibitions	EQB Part III Rule 304	General prohibitions for solid waste facility regarding floodplains, endangered species, disease vectors and public safety.
General Prohibition Against Contamination of Groundwater	EQB Part III Rule 305	Prohibitions all persons from causing or permitting the contamination of existing or potential underground drinking water source.
Rule II - 806 Sections e,d,h,j,k,l	Groundwater Protection	Requirements for groundwater protection at facilities that treat, store, or dispose of hazardous waste; includes standards, identification of hazardous constituents, monitoring requirements for detection and compliance, and corrective action.
Rule II - 814 Sections d,e,g,h,i,j	Landfills	General prohibitions and requirements for inspection, monitoring and recordkeeping, as well as disposal of ignitable or reactive incompatible, bulk, and containerized waste landfills.
Rule II - 906	Permit to Operate a Non-Hazardous Solid Waste Generating Activity	General requirements for application and approval of Permit to Operate non-hazardous waste generating activities.
Rule 1201	Land Disposal Restrictions	Identification of hazardous wastes restricted from Land disposal at definition of exception and treatment requirements.
General Water Quality Standards Article 2.1.1	Solids and Other Matter	Prohibits material attributable to discharges which will settle to from objectionable deposits or which will float in amounts sufficient to be unsightly or deleterious
General Water Quality Standards 6.1.1	Pollution of the Waters of Puerto Rico	Prohibits pollution of the Waste of Puerto Rico.
General Article 6.1.2	Discharge of Pollution	Prohibits discharge of water pollution in violation of applicable rules and regulations established by Puerto Rico that prevents the attachment of applicable water quality standards.

APPENDIX C

COMMONWEALTH OF PUERTO RICO / OFFICE OF THE GOVERNOR
ENVIRONMENTAL QUALITY BOARD
SUPERFUND PROGRAM

September 28, 1993

Mr. George Pavlou
Director
Emergency and Remedial Response Div.
U.S. Environmental Protection Agency
26th Federal Plaza, Room 747
New York, New York 10278

RE: ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL QUALITY BOARD
CONCURRENCE LETTER
DECISION SUMMARY
JUNCOS LANDFILL SITE
SECOND OPERABLE UNIT
JUNCOS, PUERTO RICO

Dear Mr. Pavlou:

The Puerto Rico Environmental Quality Board (PREQB) received the Decision Summary of the Juncos Landfill Site, Second Operable Unit or OU-II, Juncos, Puerto Rico on Friday, September 24, 1993. On this document the United States Environmental Protection Agency (USEPA) proposed Alternative II: Natural Attenuation/Institutional Controls/Monitoring, as their preferred remedial action.

PREQB's concurs with this alternative based primarily ou the decisions made on a meeting held on July 27, 1993 between USEPA and PREQB personnel. PREQB's concurrence was already communicated to Eng. José Font, Remedial Project Manager on a letter dated September 1, 1993.

If you have any question regarding this matter please contact Eng. Francisco Claudio Ríos, Director, Air Quality Area, at phone numbers (809) 767-8071 or 767-8056.

Cordially,

Héctor Russe Martínez
Chairman

VR/inj

xc: Mr. Melvin Hauptman
Eng. Carl-Axel P. Soderberg
Eng. José Font
Eng. Francisco Claudio

APPENDIX D

RESPONSIVENESS SUMMARY
FOR THE
REMEDIAL ACTION
AT THE
JUNCOS LANDFILL SITE, JUNCOS, PUERTO RICO

TABLE OF CONTENTS

RESPONSIVENESS SUMMARY
JUNCOS LANDFILL SITE
SECOND OPERABLE UNIT
JUNCOS, PUERTO RICO

INTRODUCTION

This Responsiveness Summary summarizes the public's comments and concerns and the U.S. Environmental Protection Agency's (EPA's) responses to those comments regarding the Proposed Plan for the Second Operable Unit at the Juncos Landfill Site (the Site or the Landfill) in Juncos, Puerto Rico. EPA's preferred remedial alternative for operable unit two (OU-II) is comprised of natural attenuation of the groundwater, institutional controls consisting of restrictions on groundwater withdrawal in the area north of the landfill, and groundwater monitoring to ensure that the concentrations of contaminants are decreasing over time. EPA signed a Record of Decision for the Site's first operable unit (OU-I) in 1991. The selected remedy for OU-I is the installation of a single-barrier cap with a geomembrane to control the source of contamination.

EPA held a public comment period from August 9, 1993 through September 7, 1993 to provide interested parties with the opportunity to comment on the OU-II Proposed Plan for the Juncos Site.

EPA held a public information meeting to present its preferred remedial action alternative for addressing the groundwater contamination at the site. EPA held this meeting for local residents and officials on August 25, 1993 at 7:00 p.m. in the Juncos Town Hall, Juncos, Puerto Rico.

EPA conducted the meeting in Spanish because Spanish is spoken by the majority of the local residents. An EPA Region II Caribbean Field Office staff member summarized and translated into Spanish questions from and responses to non-Spanish speaking EPA representatives who attended the meeting. EPA distributed copies of the Spanish Proposed Plan to the citizens who attended the meeting. In addition, English and Spanish versions of the Proposed Plan were made available to the public for review in the information repository, which is located at the Juncos Town Hall in Juncos, Puerto Rico and at EPA's Caribbean Field Office in Santurce at 1413 Fernandez Juncos Avenue.

Based on the tone of the comments received during the public comment period, EPA believes that the residents and town officials of Juncos and the Puerto Rico Environmental Quality Board were responsive to the Proposed Plan and generally supported EPA's preferred alternative for addressing the groundwater contamination at the Site. At the public meeting, citizens and officials raised no major objections to the Proposed Plan or to EPA's preferred alternative.

This Responsiveness Summary is divided into the following sections:

I. **BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS;** This section provides the history of community concerns and describes community involvement in the process of selecting a remedy for the Juncos Landfill Site.

II. **COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS, AND RESPONSES;** This sections summarizes the comments EPA received during the public comment period. Oral comments received at the public meeting and written comments received during the public comment period, in addition to EPA's responses to those comments, are included.

In addition to Sections I and II, a list of EPA community relations activities conducted at the Juncos Site is included as an attachment to this Responsiveness Summary. A Spanish transcript of the proceedings of the public meeting is available in the information repository.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

The Municipality of Juncos has a total population of approximately 25,000 people and is governed by a mayor and municipal assembly, all of whom are elected by the community at large to serve four-year terms.

Most of the industrial facilities in Juncos are owned by Fomento, a Commonwealth agency also known as the Puerto Rico Industrial Development Company. Fomento leased the facilities to various businesses, including pharmaceutical firms and other manufacturing facilities.

Community involvement regarding the Juncos Landfill began in May 1971, when a local citizens group filed a complaint with the Puerto Rico Department of Health regarding Landfill operations. Residents registered complaints of exposed waste materials and on-site burning of these materials. In addition, residents complained of mercury contamination in 1976, when, as part of a legal action, employees reported that Becton Dickinson disposed of broken thermometers at the Site. In March 1976, a local newspaper published a story concerning thermometer waste materials at the Site. Other citizen complaints focused on burning garbage, windblown trash, air contamination, Landfill leachate, thermometer wastes, and vehicular traffic generated by the Landfill.

In 1979, the Commonwealth of Puerto Rico began the development of parcels of land immediately adjacent to the Landfill. The government sponsored this program to allow qualified citizens to purchase small plots of land for minimal cost. The government assisted these citizens in constructing homes on the parcels of land.

In May 1984, the Town of Juncos held a public meeting concerning upcoming remedial activities at the Site. Approximately 70 residents attended the meeting and expressed a moderate level of interest. In June 1986, EPA conducted a public meeting at the Juncos Town Hall to explain the nature of the Site and the scope of the upcoming Remedial Investigation and Feasibility Study (RI/FS). In June 1991, EPA held a public meeting for citizens to comment on the OU-I Proposed Plan that was prepared based on the results of the OU-I RI/FS. Approximately 80 residents attended the meeting and expressed a high level of interest. In August 1993, EPA held another public meeting for citizens to comment on the OU-II Proposed Plan presenting EPA's preferred no action alternative for the groundwater.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES

Public comments on the Proposed Plan submitted between August 9, 1993 and September 7, 1993 are summarized and addressed below. EPA has separated oral comments from written comments. EPA has categorized the comments by topic and has consolidated similar comments into a single topic. Individual commentors and their questions are identified in the meeting transcript on file in the information repository.

A. SUMMARY OF ORAL QUESTIONS AND RESPONSES FROM THE PUBLIC MEETING CONCERNING THE SECOND OPERABLE UNIT FOR THE JUNCOS LANDFILL SITE

1. Concerns about the Preferred Alternative

Comment: A citizen expressed a concern regarding the origin of chloroform in the groundwater.

EPA Response: Chloroform is one of the degradation by-products of landfill waste material. It could be formed by the chlorination of methane. Other potential sources of groundwater chloroform contamination within the immediate area of the Site include, discharges to septic systems, discharges of wastewaters to storm drains including observation of a discharge of what appeared to be oil and spent degreasing fluids noted in a storm drain and discharge of household wastewater presumably from washing machines. However, based on the groundwater sampling results from various locations and depths, we can conclude that the Landfill is the major contributor for the groundwater chloroform contamination.

Comment: A citizen expressed his concern about the relationship between capping the Landfill and the groundwater contamination.

EPA Response: The source control action under the first operable unit selected remedy of capping the landfill will reduce the potential threat to human health and the environment by isolating

the landfill. This will reduce precipitation infiltration which minimizes the potential for subsequent groundwater impacts. Natural attenuation will then serve to reduce the concentration of chloroform in the groundwater over time through various physical and chemical processes.

Comment: A citizen expressed his concern regarding the potential impact of groundwater contaminants to the nearby Public Supply Wells.

EPA Response: The municipal public water supply well field is located approximately 1.5 miles northwest of the site. This well field provides approximately 25% of the drinking water consumed in Juncos. Groundwater flows to the north - northeast direction from the Site. All operational wells within the Juncos Municipal Public Water Supply Well Field were sampled and analyzed for leachate indicators, EPA priority pollutants and major cations or anions. No volatile organic compounds (including chloroform) were detected at concentrations above the detection limit, and all other parameters were below federal Maximum Contaminant Levels (MCLs). In addition, sampling of a USGS monitoring well located between the RI monitoring wells and the Public Supply Wells showed no presence of chloroform. Furthermore, EPA's preferred remedy requires the installation of a two-well cluster located between the RI J-10 wells and the USGS monitoring wells, to serve as an early warning for chloroform migration towards the public supply wells, even though it is highly unlikely since the groundwater flow direction within the site area is northeast.

2. Length of Time for Remediation

Comment: A citizen asked how much time will be required for chloroform concentrations to reach the MCL after the capping has been implemented.

EPA Response: Based on the results of a groundwater contaminant transport model for the overburden aquifer conducted by McLaren Hart, it is estimated that it will take approximately 13 years for chloroform concentration reduction to the MCL after the capping of the landfill is completed. However, this is only an estimate, and the actual time period may be shorter or longer. Groundwater monitoring will take place to make sure that concentrations are decreasing. This reduction will take place by natural attenuation. Natural attenuation is a combination of physical and chemical processes by which the toxicity of chloroform is reduced over time.

No exposure above MCLs will take place since the proposed institutional controls will restrict access to the site groundwater from residents in a potential future use scenario until MCL's are met. In addition, all water is obtained from the public supply wells locate 1.5 miles northwest of the Site.

3. Groundwater Concerns

Comment: A citizen requested a clarification on how groundwater flow occurs within the bedrock aquifer.

EPA Response: Groundwater flow in the bedrock aquifer occurs along individual fault planes (i.e. fractures) heterogeneously located at various depths below the ground surface. Test results and observations indicate that mineral growths along the fault planes reduces the amount of ground water flow transmitted to a calculated value of 5 gallons per minute.

4. Health-Related Concerns

Comment: Many residents asked if the Site presents a problem to public health in its current condition.

EPA Response: Since 1981 when the Landfill was closed, several studies have been conducted to evaluate the nature and extent of contamination at the Site and to evaluate any potential health threats posed by the Site, specifically to nearby residents. In 1984 the Centers for Disease Control (CDC) assisted EPA by evaluating the data collected during a preliminary remedial investigation geared to determine if the Site poses an immediate health threat to nearby residents. This investigation was performed under a CERCLA Administrative Order issued by EPA to Becton Dickinson. CDC's evaluation concluded that the Site posed no immediate threat to human health. Then, EPA continued with the long-term investigations at the site by conducting an RI/FS pursuant to another CERCLA Administrative Order issued to Becton Dickinson. This study was geared to define the nature and extent of contamination at the site and included the performance of an Endangerment Assessment or Risk Assessment which estimated the long term human health risks which could result from the contamination at the site if no remedial action were taken under both operable units for the Site (i.e. landfill source control actions, groundwater remediation).

The Endangerment Assessment for both operable units for the Site evaluated several potential exposure pathways by which the public may be exposed to contaminant releases from the landfill under a current land use scenario (OU-I) and groundwater under a future use scenario.

The potential exposure routes identified for the Site OU-I included:

- exposure to contaminants from ingestion and dermal contact of contaminated surface soils at the Landfill.

- inhalation exposure to mercury vapors emitted from contaminated soils.

• hypothetical ingestion, inhalation and dermal contact exposure to metals and organic compounds from contaminated groundwater beneath the Site as a source of potable water.

The potential exposure routes identified for the Site OU-II included:

• future exposure to contaminants as a result of ingestion, dermal contact (from showering) and inhalation (from showering) of contaminated groundwater.

Results of the Endangerment Assessments for both operable units indicate that under current Landfill conditions and future use of the contaminated groundwater within the site, the entire Site poses an unacceptable carcinogenic and noncarcinogenic risk to human health.

Implementation of the 1991 selected remedy for OU-I (landfill capping) and EPA's preferred remedy under OU-II (groundwater remediation) will reduce those risks to acceptable levels, therefore, resulting in the site posing an acceptable risk to human health and/or the environment.

Comment: Many citizens claimed to be suffering Site related health problems. They demanded a health study be performed to investigate their health problems.

EPA Response: Health effect studies are the responsibility of the Puerto Rico Department of Health. However, after the meeting, EPA requested assistance from the Agency for Toxic Substances and Disease Registry (ATSDR) in evaluating any connection between the Site and the health problems claimed to be suffered by Juncos residents. ATSDR is already in the process of collecting available information in preparation for interviewing the allegedly affected citizens.

5. Concerns Regarding First Operable Unit Selected Remedy

Comment: A citizen asked why EPA's selected alternative for OU-I calls for capping instead of removing the contaminated waste material from the landfill.

EPA Response: The remedial investigation conducted at the landfill revealed that the contaminated waste material within the landfill is heterogeneously distributed throughout; therefore removal of hot spots was not appropriate. Generally, EPA does not excavate and remove entire landfills because it is technically impracticable and the costs of removing such a large volume of waste are prohibitively expensive.

Comment: A citizen asked when is the remedial action for operable unit one at the Site, scheduled to start.

EPA Response: Construction of the Landfill cap is projected to start during 1994 and be completed in 1995.

Comment: Various citizens asked if air releases originating at the Landfill represent a health problem.

EPA Response: Air sampling for mercury and priority pollutant volatile organics was conducted during the OU-I RI in the vicinity of the Juncos Landfill to assess if the Landfill was impacting ambient air. Air sampling was also conducted at off-site locations during drilling for health and safety purposes. Detected values were compared to Threshold Limit Values (TLVs), where applicable. TLVs are concentrations established for worker safety during routine 8-hour work days. Three out of twenty air samples indicated inorganic mercury downwind of the Landfill during normal site conditions. Concentrations of inorganic mercury in these three samples ranged from 0.5 -1.2 ug/m^3 (for TLVs 0.05 mg/m^3). All detected levels of inorganic mercury in air samples collected at off-site locations during drilling activities were below TLVs.

In addition, ambient air levels of volatile organics during drilling were approximately one million times below TLVs. Because there were negligible differences between upwind and downwind concentrations, the Landfill does not appear to be impacting ambient air levels with volatile organics.

On August 14, 1991, EPA was notified by a citizen adjacent to the Landfill that smoke was being released. Concern was raised about the potential release of contaminants from the Landfill through the smoke. EPA conducted an investigation on August 16, 1991 which revealed that an area approximately 50 feet by 100 feet on the oldest portion of the landfill had apparently subsided. The grass in this area was dead and several cracks in the surface were venting smoke. The prevailing winds carried smoke in a westerly direction parallel to La Ceiba Community. The smoke observed during the investigation dissipated within 50 feet of the burned area. Air sampling results for mercury and organic compounds showed non detectable concentrations for these chemicals. However, EPA directed Becton Dickinson and the Municipality of Juncos to implement immediate corrective actions at the site that included covering the crevices of the Landfill that were smoking with fill material.

Comment: A citizen expressed concern regarding cattle access to the landfill and how this will be prevented to maintain the integrity of landfill cap.

EPA Response: One of the components of the OU-I selected remedy is the installation of a security fence around the perimeter of the Landfill property to restrict access to the site.

6. Other Concerns Not Related To The Site

Comment: A citizen expressed a concern regarding the potential for chloroform to represent a problem at every landfill.

EPA Response: Leachate is generated by water percolating through a landfill. The type of contaminants found in leachate is usually dependent upon physical, chemical and biological influences as well as the type of waste disposed. Leachate usually does contain hazardous substances, which may or may not include chloroform, depending upon the type of waste disposed.

Comment: A citizen expressed a concern regarding the new Juncos Landfill (North of the site) operation and inquired about EPA involvement and/or actions taken at this facility. He mentioned an incident in which 8 cows died while at the new landfill and the plans for converting this municipal landfill into a regional facility by the Commonwealth of Puerto Rico.

EPA Response: The U.S. Environmental Protection Agency (EPA) Region II Superfund Program is not currently involved in any investigation regarding the New Juncos Landfill. This is an active solid waste facility regulated under the Resource Conservation and Recovery Act (RCRA), Subtitle D regulations and under the Commonwealth of Puerto Rico Environmental Quality Board regulations for solid wastes.

In addition EPA has recently promulgated the revisions to the Criteria for Classification of Solid Waste Disposal Facilities and Practices set forth in 40 CFR part 257. This regulation establishes the federal minimum criteria for municipal solid waste landfills, including location restrictions, facility design and operating criteria, groundwater monitoring requirements, corrective action requirements, financial assurance requirements, and closure and post closure requirements. This new federal regulation will become effective on October 9, 1993. All current and future activities at the New Juncos Landfill will be subjected to these regulations.

B. SUMMARY OF WRITTEN QUESTIONS AND RESPONSES RECEIVED DURING THE PUBLIC COMMENT PERIOD

EPA received the following written comments from the Commonwealth of Puerto Rico Agencies:

Comment: Well CJ-TW6 (USGS monitoring well) is too far from the site to serve as an early warning of contaminant migration towards the Public Supply Well Field.

EPA Response: A well cluster composed of two monitoring wells at different depths is required to be installed under the preferred alternative in a location between monitoring wells J-10 and CJ-TW6.

This well cluster will better serve the purpose of an early warning for groundwater plume migration towards the public supply wells. It is unlikely for contaminants in groundwater originated at the landfill to migrate toward the Public Supply Wells since they are located northwest of the site and groundwater flow direction is to the northeast.

Comment: EQB expressed concern about leachate flowing out of the landfill.

EPA Response: The OU-I selected remedy will address the leachate generation issue in two ways. First, by capping the landfill the leachate generation should be significantly reduced by isolating the landfill therefore avoiding the infiltration of surface precipitation. Second, the selected remedy includes the installation of a leachate control system, as necessary.

Comment: Chain of custody records were not followed correctly.

EPA Response: All sampling data had been Quality Assure/Quality Control audited and validated according to EPA guidances and protocols established within the EPA approved Site Operations Plan for the Site.

Comment: The Puerto Rico Aqueduct and Sewage Authority (PRASA) does not endorse any remedial action at a Superfund Site which proposes to use their systems.

EPA Response: The preferred remedy under OU-II does not contemplate the use of PRASA systems for discharge or disposal of any waste streams originating from the Site since the groundwater action only includes monitoring.

Comment: The Puerto Rico Department of Natural Resources requested a more precise description of the area targeted for restrictions on groundwater withdrawal.

EPA Response: The targeted area for groundwater withdrawal restriction includes groundwater in the area north of the Landfill until it reaches the Gurabo River in the north direction with east and west boundaries defined by the two unnamed creeks running on both sides to the Landfill towards the north. The southern boundary is determined by the landfill southern perimeter.

Comment: The Commonwealth of Puerto Rico Industrial Development Company expressed concern regarding the length of time required for groundwater withdrawal restrictions and its impact to the future industrial development within the area.

EPA Response: The area in which the groundwater withdrawal restrictions are to be imposed pursuant to the OU-II selected remedy is already developed with housing projects. Therefore, no

impact to the industrial development of the area is expected to result from this action.

Furthermore, according to PRASA, future demand for water within the Municipality of Juncos is projected to be supplied through the construction of a surface water reservoir and filtration plant at the Valenciano River.

ATTACHMENT

COMMUNITY RELATIONS ACTIVITIES AT JUNCOS LANDFILL

Community relations activities conducted at the Juncos Landfill Site to date have included the following:

- EPA conducted community interviews with local officials and interested residents. (April 1984)
- The Town of Juncos held a public meeting at the Town Hall concerning upcoming remedial activities at the Site. Approximately 70 people attended, including citizens, elected officials, and technical and legal representatives of the responsible party. (May 1984)
- EPA prepared a Revised Community Relations Plan for the Juncos Landfill to reassess community concerns. (August 1984)
- EPA conducted a public meeting at the Juncos Town Hall to explain the nature of the Site and the scope of the upcoming remedial investigation. (June 1986)

<u>First Operable Unit</u>

- EPA established an information repository at the Juncos Town Hall. Copies of documents at the repository were placed in files in EPA's offices in Santurce and New York. (1988)
- EPA made Spanish translations of the Proposed Plan available for public review and comment. The Proposed Plan is in the information repository. (June 1991)
- EPA publicized and held a public meeting at the Juncos Town Hall to describe the RI/FS report and Proposed Plan and to respond to citizen concerns. A Spanish transcript of the proceedings of this meeting is available in the information repository. (June 1991)
- At citizens' requests, EPA extended the public comment period on the Proposed Plan. The public comment period lasted 60 days, from June 1, 1991 to July 30, 1991.

- EPA prepared a Responsiveness Summary to document its responses to all of the public comments received in writing and at the public meeting. (August 1991)

Second Operable Unit

- EPA established an information repository at the Juncos City Hall in Juncos, Puerto Rico. Copies of the documents in the repository were also placed in files in EPA's offices in San Juan, and New York (1993).

- EPA made Spanish translation of the Proposed Plan available for public review and comment. The Proposed Plan is part of the information repository. (August 1993)

- EPA publicized and held a public meeting at the Juncos Town Hall to describe the second operable unit RI/FS Report and Proposed Plan and to respond to citizen concerns. A Spanish transcript of the proceedings of this meeting is available in the information repository. (August 1993)

- EPA prepared a Responsiveness Summary to document its response to all of the public comments received in writing and at the public meeting. (September 1993)

APPENDIX E

Final 05/19/93

JUNCOS LANDFILL SITE
OPERABLE UNIT TWO
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.5 Previous Operable Unit Information

P. 100001-100151 Plan: Remedial Design Work Plan for Selected Remedial Alternative, Juncos Landfill Superfund Site, Juncos, Puerto Rico, prepared for Becton Dickinson Puerto Rico, Inc., Browning Ferris Industries of Puerto Rico, Inc., RCA Corporation/General Electric Company, prepared by McLaren/Hart Environmental Engineering Corporation, Pittsburgh, Pennsylvania, February, 1993.

P. 100152-100191 Administrative Order for Remedial Design/Remedial Action, September 30, 1992.

P. 100192-100194 News Release: EPA Selects Remedies at Three Superfund Sites in Puerto Rico, as prepared by EPA Region II, for release: Wednesday, October 23, 1991.

P. 100195-100197 Letter to Ms. Kathleen Callahan, Director Emergency and Remedial Response Division, United States Environmental Protection Agency (USEPA) Region II, from Mr. Pedro Maldonado, Acting Chairman, Puerto Rico Environmental Quality Board (PREQB), re: Environmental Protection Agency (EPA) Declaration for Record of Decision (ROD) of Juncos Landfill Site, Juncos, Puerto Rico. PREQB concurs with USEPA selected alternative and requests specific information on all future activities of the site, September 10, 1991.

P. 100198-100229 Letter to Mr. Jose Font, USEPA Caribbean Field Office, Santurce, Puerto Rico, from Mr. Edwin A. Hernandez, Comite Junqueno Pro Rescate del Medio Ambiente, Juncos, Puerto Rico, re: Community organization's recommendations for remedial action (attached), July 29, 1991. (Note: Documents in Spanish).

P.	100230-100231	Letter to United States Environmental Protection Agency, Region II, Emergency and Remedial Response Division, from Señora Carmen H., private citizen, re: Response to lack of information from local authorities and request for cooperation and assistance, July 18, 1991.
P.	100232-100261	Index: Operable Unit One, Juncos Landfill Site Administrative Record. This Administrative Record is located at Juncos Town Hall, Juncos, Puerto Rico; United States Environmental Protection Agency Caribbean Field Office, 1413 Fernandez Juncos Avenue, Santurce, Puerto Rico, 00909; United States Environmental Protection Agency, Records Center, Room 2900, 26 Federal Plaza, New York, New York, 10278, June 20, 1991.
P.	100262-100264	Letter to Hon. Jose Font, Gerente de Proyecto, Agencia Federal Proteccion Ambiental, from Señora Carmen H., private citizen, re: Series of questions and concerns about declining land value, water contamination, and past harm resulting from her home's proximity to the site, June 20, 1991. (Note: Document in Spanish).
P.	100265-100372	Transcript of public meeting on the Proposed Superfund Remedial Action Plan for Juncos Landfill Site, presided over by Mr. Jose Font, Remedial Project Manager, United States Environmental Protection Agency, Caribbean Regional Office, June 15, 1991. (Note: Document in Spanish).
P.	100373-100378	List of Attendees, re: Proposed Remedial Action Plan Public Meeting, June 15, 1991.
P.	100379-100393	Proposed Plan for Juncos Landfill Site, issued by United States Environmental Protection Agency, Region II, June, 1991.
P.	100394-100394	Letter to Mr. Jose Font, Environmental Engineer, from Pedro A. Maldonado Ojeda Esq., Acting Chairman, Puerto Rico Environmental Quality Board, Santurce, Puerto Rico, re: Environmental Protection Agency (EPA), "Proposed Preferred Alternative Plan", Juncos Landfill Site, Juncos, Puerto Rico, May 31, 1991.

3.0 REMEDIAL INVESTIGATION

3.4 Remedial Investigation Reports

P. 300001-300234 Letter to Mr. Erwin Smieszek, TES V Regional Project Officer, United States Environmental Protection Agency, from Mr. Scott Graber, CDM Federal Programs Corporation, re: Attached Final Endangerment Assessment, Juncos Landfill Operable Unit Two, Juncos, Puerto Rico. Attachment A: Letter to Ms. Jill Naugle, CDM Federal Programs Corporation from Mr. Jose C. Font, Environmental Engineer, re: EPA's comments on the Draft Endangerment Assessment, Juncos Landfill OU2, October 19, 1992, November 10, 1992.

P. 300235-300604 Report: Final Phase II Remedial Investigation Report, Juncos Landfill, Juncos, Puerto Rico, prepared for Becton Dickinson Puerto Rico Inc., Juncos, Puerto Rico, prepared by McLaren/Hart Environmental Engineering Corporation, Warren, New Jersey, July, 1991, REVISED November, 1991, REVISED April, 1992.

7.0 ENFORCEMENT

7.5 Affidavits

P. 700001-700003 Letter to Mr. Jose C. Font, Caribbean Field Office, United States Environmental Protection Agency, from Mr. Luis Lomba, Country Manager, Micropette, Inc., re: Cecilio Miranda Sworn Statement. September 21, 1992. Attachment: Affidavit signed by Cecilio Miranda, September 21, 1992. (Note: Document in Spanish).

P. 700004-700004 Witness Interview Summary of Mr. Jose Martinez Agosto, former landfill employee, now retired. Conducted by Mr. Jose C. Font, site RPM, at witness residence in Juncos, June 24, 1992.

P. 700005-700005 Witness Interview Summary of Mr. Carmelo Miranda, former private waste hauler, now retired. Conducted by Mr. Jose C. Font, Juncos Landfill Site Remedial Project Manager (RPM), at Becton Dickinson plant in Juncos, June 10, 1992.

P. 700006-700006 Witness Interview Summary of Mr. Luis Rogel Mojica, former landfill employee, now retired. Conducted by Mr. Jose C. Font, site RPM, at Becton Dickinson plant in Juncos, June 10, 1992.

P. 700007-700008 Witness Interview Summary of Mr. Ismael Melendez Arias, former landfill employee, now retired. Conducted by Mr. Jose C. Font, site RPM, at Becton Dickinson plant in Juncos, June 10, 1992.

7.8 Correspondence

P. 700009-700011 Letter from Mr. Henry Guzman, Assistant Regional Counsel, United States Environmental Protection Agency Region II, re: CERCLA 106 Administrative Order Juncos Landfill Site, Juncos, Puerto Rico, October 9, 1992. Attachment: List of Addressees.

P. 700012-700014 Letter to Mr. Gamaliel Rodriguez Mercado, Executive Director, Administracion de Desarrollo y Mejoras de Vivienda, Hato Rey, Puerto Rico, from Mr. Henry Guzman, Assistant Regional Counsel, USEPA Region II, re: CERCLA 106 Administrative Order for Remedial Design/Remedial Action ("RD/RA"), Juncos Landfill Superfund Site, Juncos, Puerto Rico, October 9, 1992.

P. 700015-700015 Memorandum to Juncos Landfill OU2 Site file from Mr. Jose C. Font, Environmental Engineer, Air and Hazardous Substances Staff, re: Issuance of unilateral order, Juncos Site OU2, for implementation of September, 1991 Record of Decision, October 6, 1992.

P. 700016-700025 Letters to Browning-Ferris Industries of Puerto Rico, Inc.; RCA Barinquen, Inc.; Mr. Mathew Bigley, Manager for Safety and Loss Prevention, Becton Dickinson and Company; Prince Matchabelli Co. c/o Chesebrough-Pond's, Inc.; and Mr. Rafael Betran Pena, Mayor, Municipality of Juncos, Puerto Rico, from Ms. Kathleen C. Callahan, Director, Emergency and Remedial Response Division, USEPA Region II, re: Special Notice for Remedial Design/Remedial Action ("RD/RA"), Juncos Landfill Site, Juncos, Puerto Rico, December 31, 1991.