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EXPLANATION OF SIGNIFICANT DIFFERENCES
EAST MOUNT ZION SUPERFUND SITE

I. INTRODUCTION

Site Name:	East Mount Zion Superfund Site
Site Location:	Springettsbury Township, York County Pennsylvania
Lead Agency:	U.S. Environmental Protection Agency, Region III ("EPA" or the "Agency")
Support Agency:	PA Department of Environmental Protection ("PADEP")

Statement of Purpose

This Explanation of Significant Differences ("ESD") is issued in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act, as amended ("CERCLA"), and is now a part of the Administrative Record for the East Mount Zion Superfund Site ("Site"). This document explains significant differences to the remedy selected in the Record of Decision ("ROD") for the Site signed by the EPA Regional Administrator on June 29, 1990. EPA has determined that these changes to the selected remedy are necessary to protect the health and safety of local residents during construction of the selected remedy and to implement the remedial action in an effective manner. The ROD is attached hereto as Exhibit 1.

II. SUMMARY OF THE SITE HISTORY, SITE CONDITIONS, AND SELECTED REMEDY

The East Mount Zion Site is located in Springettsbury Township, York County, Pennsylvania. The Site is approximately 10 acres in size and is bounded on the east, north, and south by Rocky Ridge County Park; Doersam Woods subdivision bounds the Site to the west. Over the course of its active life (approximately 1955 to 1972), the Site was the repository for domestic and industrial wastes. It operated as an area type landfill in which areas for filling were excavated, filled, and covered with native materials. The Site presently exists as an open field on which weeds and small woody plants grow. The cover placed on the Site since it ceased operation is thin, and in some locations waste materials are protruding.

On the southern side of the property, the height of the landfill gradually increases from east to west until, at the southwestern end, there is a steep rise culminating with an approximately 70 percent toe slope. The toe slope averages 70-80 percent along the southern edge of the landfill. The northern half of the landfill, which bounds Deininger Road, is flatter and gradually approaches the grade of the roadway.

The principal contaminants of concern at the Site are arsenic, vinyl chloride, benzene, 1,1-dichloroethane, and bis(2-ethhylhexyl)phthalate. Federal Maximum Contaminant Levels ("MCLs") for drinking water established pursuant to the Safe Drinking Water Act, 42 U.S.C. §§300f et seq., were exceeded for benzene and vinyl chloride in ground water. The ROD addresses remediation of the releases and threatened releases of those hazardous substances.

A complete description of the selected remedy as well as EPA's rationale for the decision is presented in the June 29, 1990 ROD which is attached hereto as Exhibit 1. The major components of the selected remedy are:

(1) Installation and maintenance of an impermeable cap over the 10 acre landfill;

(2) Installation and maintenance of surface water control systems for the cap;

(3) Installation and maintenance of a fence around the Site;

(4) Monitoring ground water contaminant attenuation after installation of the cap; and

(5) Initiation of a deed restriction regarding future activities at the Site.

III. DESCRIPTION OF SIGNIFICANT DIFFERENCES

Since the issuance of the ROD and during remedial design, EPA has determined that several changes should be made to the remedy set forth in the ROD. These changes are identified as Significant Differences and do not constitute an amendment, as that term is used in 40 C.F.R. §300.435(c)(2)(ii), to the ROD because these changes do not fundamentally alter the overall approach intended by the selected remedy for the Site. The Significant Differences between the remedy presented in the ROD and the remedy that will be implemented are listed below. Except to the extent changed by 1 and 2 below, all terms of the ROD remain in effect.

(1). EPA has determined that it will be necessary to provide for the temporary relocation of some of the residents in the Doersam Woods subdivision located on the Site's western boundary. This relocation is necessary because of the potential health and safety concerns associated with the remedial action activities to be undertaken at the Site. During remedial action, a significant amount of refuse relocation will occur. Open excavations and exposed refuse may be a potential source of hazardous and odorous emissions from the Site. Although air dispersion modeling reveals that concentrations of hazardous substances at the

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nearest residence will not significantly impact the nearest residences, as a precautionary measure, due to the proximity of some of the residents to the construction area, EPA has determined to temporarily relocate some of the residents during construction.

(2). The ROD states that the purchase of property may be necessary to ensure efficient access during construction. This ESD clarifies the nature of this property acquisition as a permanent easement. During the remedial design, it became apparent that a permanent easement along the southern perimeter of the Site would be required to accommodate the installation and maintenance of a drainage swale to convey surface water runoff from the cap to the detention basins. This permanent easement will be located on the southern border of the Site in Rocky Ridge County Park and is approximately 0.75 acres in size.

The Commonwealth of Pennsylvania on March 28, 1995, entered into a Superfund State Contract (SSC) concerning the remedial action at the Site. That SSC includes language in accordance with Section 104(j) of CERCLA assuring that the Commonwealth will accept transfer of the acquired permanent real estate interests following completion of the remedial action.

In addition to the permanent easement, temporary work area easements around the perimeter of the Site will be required during construction for staging areas and access. The temporary easements will expire with the remedial action.

V. PUBLIC PARTICIPATION

This ESD and the information upon which it is based have been included in the Administrative Record file for this Site. The Administrative Record also includes the ROD and all documents that formed the basis for EPA's selection of the remedy. The Administrative Record is available for public review at the locations listed below:

U.S. EPA, Region III
841 Chestnut Building
Philadelphia, PA 19107
Hours: Mon.-Fri., 9:00 am to 4:00 pm

and

Springettsbury Township Building
1501 Mt. Zion Road
York, Pennsylvania 17402
Hours: Mon.-Fri., 8:00 am to 5:00 pm

Questions and comments on EPA's action and requests to review the Administrative Record can be directed to:

AR301416

John Banks
Remedial Project Manager
Mailcode: (3HW22)
U.S. EPA, Region III
841 Chestnut Building
Philadelphia, PA 19107
(215) 566-3214

VI. SUPPORT AGENCY REVIEW

The Pennsylvania Department of Environmental Protection has concurred with the proposed Explanation of Significant Differences in a letter dated May 28, 1996.

VII. AFFIRMATION OF STATUTORY DETERMINATION

Considering the new information that has been developed and the changes that have been made to the scope of the selected remedy, the EPA and PADEP believe that the revised remedy remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective.

In addition, the revised remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for the Site.

7/3/96
Date

Thomas C. Voltaggio, Director
Hazardous Waste Management
Division

AR301417

DECLARATION
FOR THE
RECORD OF DECISION

Site Name and Location

East Mt. Zion Landfill
Springettsbury Township, York County, Pennsylvania

Statement of Basis and Purpose

The decision document presents the selected remedial action for the East Mt. Zion site in Springettsbury Township, Pennsylvania, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). This decision is based upon the contents of the administrative record for the East Mt. Zion site.

The United States Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Resources (PADER) agree on the selected remedy.

Assessment of the Site

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

Description of the Remedy

This remedy addresses remediation of ground water contamination by eliminating or reducing the risks posed by the site through engineering and institutional controls.

The selected remedy includes the following major components:

- Installation and maintenance of an impermeable cap and gas vents over the 10-acre landfill
- Installation and maintenance of surface water control systems for the cap
- Installation and maintenance of a fence around the site

- Monitoring ground water contaminant attenuation after installation of the cap

- Initiation of a deed restriction regarding future activities at the site.

Declaration

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies, to the maximum extent practicable for the site. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element. As this remedy will result in hazardous substances remaining onsite above health based levels, a review will be conducted within five years after the initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Edwin B. Erickson
Regional Administrator
Region III

6/29/90
Date

Site Description and Summary of
Remedial Alternative Selection for the
East Mt. Zion Superfund Site.
York County, Pennsylvania

SITE LOCATION AND DESCRIPTION

The East Mount Zion site is located in Springettsbury Township, York County, Pennsylvania, upon a wooded ridge east of Mount Zion and approximately 15 miles southeast of Harrisburg. It is located along the south side of Deininger Road just before the entrance to Rocky Ridge County Park. The site location is shown in Figure 1.

The site is situated on 10 acres atop an 860-ft-high forested ridge. Bounding the site to the east, north, and south is the York County Recreation Park, Rocky Ridge; Doersam Woods subdivision bounds the site to the immediate west. Also dispersed among the woodlands areas and at lower elevations to the south (Ridgewood Road), west (Mount Zion Road), and north (Deininger Road and Druck Valley Road) are numerous private dwellings.

On the southern side of the property, the height of the landfill gradually increases from east to west until, at the southwestern end, there is a steep rise culminating with an approximately 70 percent toe slope. The toe slope averages 70-80 percent along the southern edge of the landfill. The northern half of the landfill, which bounds Deininger Road, is flatter and gradually approaches the grade of the roadway. Exposed refuse is located on the steep side slopes. Figure 2 shows the site topography and approximate fill boundary.

The East Mount Zion site is located in the Conestoga Valley Section of the Piedmont Physiographic Province. The Conestoga Valley Section includes a relatively flat central valley and two prominent hill areas on the northwest edge of the section--the Pigeon Hills north of Hanover and the Hellam Hills northeast of York. The hill areas coincide with the outcrops of hard quartzite and conglomerate.

The predominant bedrock underlying the site has been mapped as the Hellam Member of the Lower Cambrian Chickies Formation. The Chickies Formation is typically a massive, prominently bedded, white arkosic quartzite and quartz pebble conglomerate in a sericitic, arkosic matrix. Structurally, the site is situated on the upper plate of the Glades Overthrust on the northwest limb of the Mount Zion Anticline, which strikes east-northeast to south-southeast. Bordering the site to the southeast is the

Highmount Overthrust. In the vicinity of the site, bedding plane strike and dip is approximately 32 degree E, 29 degree SE. Field measurements indicate the orientation of the primary joint set to be N66 degree SW with joint spacings on the order of 10-15 ft (Lloyd and Growitz 1977). The site is situated at an average elevation of 860 ft mean sea level (MSL), just north of the ridge crest of 880 ft MSL. The topography primarily slopes to the northwest, west-southwest and southeast.

The in situ soil underlying the site consists of highly permeable Edgemont Channery stoney loam which ranges in thickness from <2 to 15 ft. The soil is well drained. Much of the in situ soil was stripped away and redistributed over the site during waste disposal operations. Additionally, other soil from offsite locations may have been utilized for the final cover fill.

The site is situated within the Susquehanna River Basin and lies at the divide of the Codorus and Kreutz Creek watersheds to the west and southeast, respectively. Subsurface drainage is channeled via two tributaries. Both drainage density and patterns are controlled by geologic features (i.e., topography, bedding, and jointing). Near the site, the dominant drainage pattern is semirectangular to the south and east, and semiradial to the west. Surface runoff exits the site to the west along an adjoining intermittent stream which turns south toward the township of East York. Surface runoff exiting the southern and eastern slopes of the landfill enters an unnamed intermittent stream which flows south to Kreutz Creek. A leachate seep emanating from the southeast corner of the site previously discharged to the intermittent stream at the southeast boundary of the site; however, recent regrading of a dirt access road has dammed the seep and formed a small leachate pond.

The Chickies Formation, Hellam Member, constitutes the major aquifer beneath the site. Secondary porosity in the form of fractures and joints control both the storage and flow characteristics of the aquifer. Ground water flow is typically controlled by surface topography (i.e., recharge topographic high areas, discharge adjacent low-lying streams and springs). Data from the existing Doersam Woods test well adjacent to the northwest property boundary indicate bedrock aquifer water levels are on the order of 100-120 ft below the surface. Typical of this type of ground water regime, fluctuations of 20-30 ft are not uncommon, especially in the recharge zones (i.e., hills). Water-bearing zones (open fractures and joints) are reported to occur with consistent frequency to about 200 ft below the surface. The average specific capacity of a well drilled in the Chickies Formation is 0.34 gpm/ft. Average well yields are about 8 gpm with 50 ft of drawdown after 1 day of pumping. The maximum reported well yield for the Chickies Formation is 100 gpm.

Typically, fracture density and aperture decrease with increased depth. Below 250-300 ft, fracture apertures are small and few; water contribution from these deeper fracture sets is usually negligible.

Since the initiation of Pennsylvania Department of Environmental Resources (PADER) investigations pertinent to the site, Springettsbury Township has installed municipal water supply lines along portions of Mount Zion, Deininger, Druck Valley, and Ridgewood roads. As a result, many of the residences that were once dependent on private supply wells are now using the township water supply. However, the water line installation is incomplete along Druck Valley and Ridgewood roads and some residences along portions of these roads are still using ground water obtained from private wells that withdraw from the Chickies Aquifer. As part of the RI, the private wells of residences on Druck Valley and Ridgewood roads not serviced by the municipal water line were sampled. Since these samples were taken, these residences have also been hooked up to the township water supply.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Over the course of its active life (approximately 1955 to 1972), the site was a repository for domestic and industrial wastes. It operated as an area-type landfill in which areas for filling were excavated (at times to nonrippable bedrock), filled, and covered with native materials. There is evidence that the site was operated as an open-burning dump at some period in its history. The site presently exists as an open field on which weeds and small woody plants grow. The cover placed on the site at and since closure of the site is thin, and in some locations waste materials, such as tires, are protruding.

The site was purchased in January 1952 by Charles H. Fetrow. Mr. Fetrow used the property as a nonpermitted disposal site for residential and industrial wastes. The date when disposal operations commenced is unknown; however, a 1955 aerial photograph shows signs of some excavation activity at the site. Early 1963 PADER inspection reports on the landfill indicate improper disposal of residential and industrial wastes. Notes of interviews conducted by PADER personnel indicate that paint thinner, paint filters, and metal sludge wastes were disposed at the site.

Throughout 1969 and 1971 PADER personnel completed numerous Sanitation Establishment Inspections on the site. Discrepancies were frequently cited, pointing out that garbage and trash were being placed directly on bedrock in open trenches, and that proper cover was not being applied on a daily basis, as required. Litter control was also inadequate. The landfill was closed in 1972 by court order and has remained inactive since. Some additional grading, covering, and seeding was conducted by the

site owner under court order from 1974 to 1976. Since 1974 the property has changed owners several times.

In 1983 EPA conducted a Preliminary Assessment and Site Inspection (PA/SI) at the site. The site inspection revealed trace levels of trichloroethylene (TCE) in ground water samples. Benzene was reported in a leachate sample, and dichlorobenzene was found in a leachate and pond sediment samples. Previous investigations by the Pennsylvania Department of Environmental Resources (PADER) indicated low level contamination of one monitoring well and surface water samples. A test well near the northwest boundary of the site was reported by PADER to contain trace levels of several organic compounds including vinyl chloride and benzene. PADER also sampled wells serving Rocky Ridge County Park. No organic pollutants were detected in these samples. The landfill was listed on the Superfund National Priorities List (NPL) in September 1984. An RI/FS was conducted to quantify any contamination which might be attributable to the site; to assess any risks to human health and the environment; and to develop a set of alternatives which could be used to address any risks posed by the site.

Eleven potentially responsible parties (PRPs) have been identified as being associated with the site. These PRPS were sent General Notice Letters in April 1989 to come forward and take responsibility for part, if not all, of the RI/FS. Due to inadequate interest on the part of the PRPs to perform the RI/FS, the State of Pennsylvania took the lead for performing the RI/FS under a Cooperative Agreement with EPA. Field work for the RI/FS commenced in February 1988 and was completed by April 1989.

COMMUNITY RELATIONS

Pursuant to section 300.67(c) of the National Contingency Plan (NCP), a Community Relations Plan was developed for the Proposed Plan that was based on the Remedial Investigation/Feasibility Study (RI/FS). In compliance with Sections 113(k)(2)(i-v) and 117 of SARA, the Administrative Record, including the Proposed Remedial Action Plan, was placed for public viewing at the Springettsbury Township Building on Friday, May 18, 1990.

An announcement of the availability of the Administrative Record was placed in the York Daily Record on May 18, 1990. The Administrative Record contained the Draft Remedial Investigation/Feasibility Study Reports which listed the alternatives developed as part of the Feasibility Study. A period for public review and comment on the Proposed Remedial Action Plan was held from May 18, 1990 to June 1 1990. A public meeting was held on May 30, 1990, at the Springettsbury

Township Building regarding EPA and PADER selection of the preferred alternative. Approximately 25 people were in attendance at the meeting.

SCOPE AND ROLE OF RESPONSE ACTIONS

The scope and role of the response action for the East Mt. Zion landfill is to prevent further contamination of the deep ground water aquifer by controlling or eliminating the source of contamination to the aquifer. The response action addresses the ground water contamination at the site which is the principal threat posed by the site.

SUMMARY OF SITE CHARACTERISTICS

Waste Fill Characterization

The areal extent and volume of the fill material were estimated using geophysical survey results and identifying high conductivity anomalies of the fill that may be associated with high concentration of metallic constituents. The results of the terrain conductivity survey indicated a relatively heterogeneous, moderately high to very high conductive fill. The survey estimated the approximate thickness of the fill to be typically less than 15 ft thick in the east to a maximum thickness greater than 45 ft along the southwest and west portions of the site. The results of the soil vapor contaminant assessment (SVCA) indicated significant levels of methane gas in the soil vapor at the site. In general, the northern portion of the site contains the highest levels of methane. Organic compounds (benzene and toluene) were also detected during the SVCA in the fill. The highest organic compound concentrations occurred in the eastern and northeastern portions of the fill.

Data from the geophysical survey and SVCA were used to pick locations for the waste characterization borings. The results of soil borings performed in the fill indicated that the fill ranges from 11 to 33 ft in thickness and may be up to 50 ft thick in the southwest and west-central portions of the site. The waste material, which was saturated at some borings, typically consisted of general household and municipal refuse, including wire, paper, cloth, brick, wood, glass, plastic, and cans, with a matrix of silty sand. Significant decomposed organic debris apparently accounts for much of the methane generated. Sample locations are shown in Figure 3.

Eighteen waste samples were obtained at varying depths from six waste characterization boring locations. Additionally, one waste material sample was observed and then collected at the surface near the toe of the fill. Analytical results show that trace metals concentrations were elevated in the majority of samples. Trace metal concentrations are shown in Table 1. In

general, the concentrations ranged from 2 to 500 times concentrations normally found as an average in background soil samples. In general, the greatest number of trace metals were detected in boring B-5. However, the highest concentrations of several trace metals (i.e., copper and aluminum) contamination were detected in the exposed waste sample. The metals observed are generally consistent with known past disposal practices at the site and metals such as cadmium, chromium, and zinc were previously sampled in sludges that were reportedly disposed of at the site.

Various volatile organic compounds (VOCs) and semivolatile compounds were detected in the waste. The volatile organic compounds which were observed at significant levels in the fill included acetone, 2-butanone, toluene, chlorobenzene, ethylbenzene, and xylenes. Although the soil vapor indicated the presence of TCE and PCE, those chlorinated compounds were not observed during the waste sampling.

Pesticides were detected in a total of four of the composite samples from waste borings B-1 through B-4. PCBs were detected in several soil boring samples collected. Two borings, B-3 and B-5, had concentrations above 1ppm (although estimated values) of Arochlor 1016 and 1254.

Ground Water

Ground water was sampled from each of ten monitoring wells during three different sampling rounds conducted 19-20 April, 24-25 May, and 15 September 1988. Analytical results for ground water samples from the monitoring wells around the perimeter of the site reflected low level contamination from the fill. The population at risk were area residents that were still using ground water as a drinking water source.

The majority of the ground water trace metal concentrations were less than the drinking water standards or at naturally occurring concentration levels, as defined by the literature value ranges. The only trace metal contaminants consistently (for two or more sampling events) detected above the literature concentration ranges and/or drinking water standard MCLs in various wells were cobalt, iron, magnesium, and manganese.

There were no PCBs detected in any of the ground water samples. Also, with the exception of a relatively low level of endosulfan sulfate detected in Well EA-5D during the May sampling round, no pesticides were detected.

There were only a few monitoring well samples containing relatively low concentrations of a small group of volatile and semivolatile compounds. Almost all organics observed were not consistently measured in more than one sampling round. Also, all

were observed at low concentrations. A few compounds (volatile and semivolatile) were consistently detected during all three sampling rounds. The volatile compounds consistently detected in all three sampling rounds included 1,1, dichloroethane, benzene, and chlorobenzene. The semivolatile compounds detected in all three sampling rounds at low concentrations were 1,4 dichlorobenzene and bis(2ethylhexyl)phthalate.

Also, vinyl chloride concentrations in EA-4D and EA-6D were 6 and 7 ug/L, respectively, during only the April sampling event. Also, since TCE was detected during the SVCA and since vinyl chloride is a degradation product of TCE (and PCE) the observed vinyl chloride concentrations may be a direct result of leachate generation during the spring months.

Figure 3 presents reasonable worst case average concentrations of detected compounds for the monitoring wells. As illustrated in Figure 3, vinyl chloride and benzene concentrations marginally exceed their primary maximum contaminant levels (MCLs) in the deep aquifer zone at the site perimeter. The MCLs for vinyl chloride and benzene are 2 ug/L and 5 ug/L, respectively. Manganese also exceeded the secondary maximum contaminant level (SMCL) in the majority of samples at the site perimeter.

Ground water samples were also obtained on 28-29 August 1988 from 14 residential wells, two wells on the Rocky Ridge Park property, and one well on a lot for Doersam Woods. The locations of the residential, Doersam Woods test and park wells in relation to the East Mount Zion site are shown in Figure 4.

The trace metal concentrations for the residential wells (Table 2) were within the acceptable levels as defined by MCLs and SMCLs. The iron and manganese concentrations exceeded the SMCLs for seven and three residential locations, respectively. No elevated levels of cadmium, chromium, or zinc were observed. The Old Park Well had a high lead concentration (68.6 ug/L); however, since no monitoring wells showed high levels, the concentration is not believed to be related to the site. Furthermore, the water in the Old Park Well was stagnant for a long period of time. This may also be a reason why lead levels in this well were elevated.

No detectable levels of PCBs, pesticides, or volatile organics were observed during any sampling events. One semivolatile compound, di-n-butylphthalate, was detected at 6 ug/L at one residence, which may be a result of laboratory contamination, since (1) the compound was also detected in the method blank, and (2) it was not detected in any other domestic or ground water samples (di-n-butylphthalate is a known laboratory contaminant).

The ground water flow patterns identified at the site include several interrelated regimes. The flow regimes include a shallow water-bearing zone, which is seasonal in nature, an intermediate zone, and a deep water-bearing zone. The depth to ground water is generally less than 20 ft. The shallow zone is in intimate hydraulic communication with the saturated portion of the landfill. Based on the waste characterization data, shallow water-level data, and surface topography, a radial flow pattern from the fill is inferred. Outside the radial flow influences, the shallow water flows predominantly in a westerly and southeasterly direction where it discharges into intermittent streams. The intermediate zone is also seasonal in occurrence and serves as a transitional zone from the shallow to the deep zone.

The deep water zone is the regional aquifer and exists under unconfined conditions. Ground water flow in this zone is through fractures, joints, and weathered seams. Based on the seasonal nature of the shallow and intermediate zones and the contaminant levels observed in the deep wells, it is believed that the primary zone of ground water transport of contamination is the deep water-bearing zone. Ground water flow in the deep aquifer is to the north-northwest. Linear ground water velocities in the deep zone are relatively high-9 ft/day. Therefore, residences located along the linear fracture traces would have received ground water that passed under the site within a 9-month period. This fact also points out the dilution of leachate infiltration to the deep-flow zone. The relatively high transmissivity range calculated for the aquifer ranges from 4,840 to 8,470 gpd/ft.

The resultant average concentrations observed in the monitoring wells at the site are presented in Figure 3. The average concentrations of the most soluble/mobile constituents are at or below the contract required detection limits (CRDLs) for those compounds. These constituents also averaged concentrations marginally above the MCLs. Therefore, minimal ground water dilution will result in concentrations below MCLs. Based on the low concentrations, no offsite ground water modeling was conducted, and concentrations observed in the monitoring wells at the site were used for input to the risk assessment.

It is EPA's Superfund policy to use EPA's Groundwater Protection Strategy and Groundwater Classification Guidelines to assist in determining the appropriate type of remediation for a Superfund site. Three classes of ground water have been established on the basis of ground water value and vulnerability to contamination. The deep aquifer at the site is a Class II aquifer. A Class II aquifer is one which is a current or potential source of drinking water and water having other beneficial uses.

Surface Water and Sediment

Surface water and sediment samples are grouped together because of the close association between the two groups. Populations at risk are wildlife and aquatic life that may be impacted by the surface water and sediment contamination.

The site is situated within the Susquehanna River Basin and lies at the divide of the Codorus and Kreutz Creek watersheds to the west and southeast, respectively. Subsurface drainage is channeled via two tributaries. Both drainage density and patterns are controlled by geologic features (i.e., topography, bedding, and jointing). Near the site, the dominant drainage pattern is semirectangular to the south and east and semiradial to the west. Figure 5 shows the general surface water flow patterns at the site.

Surface water runoff and seepage of leachate from the eastern portion of the fill are currently channeled to a perimeter ditch along the southwestern boundary, which in turn empties into a surface water/leachate collection pond at the southeastern corner of the site.

Surface water runoff and seepage of leachate from the western portion of the fill are collected along the southwestern site boundary by a shallow ditch and channeled to a large diameter corrugated pipe, which in turn is connected to the Doersam Woods Subdivision storm sewer system. Surface water runoff from the central portion of the fill is directed toward a depression near the center of the fill where, during the later winter months, it remains ponded.

Analytical results for surface water samples collected at the seeps at the southeast and western portions of the fill showed limited contribution of contaminants from the waste fill. The only detected organics in the leachate seep were acetone, benzoic acid, lindane, xylenes, and bis(2-ethylhexyl)phthalate, all at very low levels.

The metals concentrations for the west leachate seep were generally higher than the southeast leachate seep. Elevated inorganics included copper, manganese, and mercury. The potential impacts, however, appear minimal based on the following:

copper	Perennial upstream concentrations were higher than downstream concentrations
manganese	downstream concentrations, from both seeps, were the same relative concentrations as the background upstream

mercury no detectable levels were observed downstream

Also to assess potential partitioning of contaminants into the sediments at the leachate seeps and possible downstream waters, samples were collected at observed seeps and local surface waters. Since background sediment concentrations were not available, the sediment samples were compared to background soil concentrations and average soil concentrations for Southeastern Pennsylvania. Comparison of average sediment concentrations to regional background levels show that, with the exception of cadmium in the southeast leachate sediment sample, all average sediment concentrations were within or below the range of regional concentrations. For cadmium, concentrations above 1.8 mg/kg were observed in the leachate watercourse sediment and the southeast leachate pond.

No pesticides or PCBs found in the fill were detected in any of the surface water samples. One pesticide, 4,4-DDE, was detected in a composite sediment sample from the southeast leachate pond watercourse. No other pesticides were identified in the sediment samples. PCBs were identified in two sediment samples. Arochlor 1016 was detected in two composite sediment samples from the southeast leachate pond watercourse at 100 ppb (a very low level).

Surficial Soil

The results of the samples indicate the presence of only background levels of metals, and levels of volatil and semivolatile contaminants were less than the contr required quantification limits.

SUMMARY OF SITE RISKS

The purpose of the risk assessment performed for the East Mount Zion landfill site was to evaluate the human health risk posed by any releases from the site. In order to estimate the human health risk, the risk assessment focused on the following: (1) the contaminants detected during the remedial investigation at the site; (2) the potential environmental pathways by which populations might be exposed to compounds released from the site; (3) the estimated exposure point concentrations of the compounds of concern; (4) applicable or relevant and appropriate requirements (ARARs), criteria, and advisories; (5) the estimated intake levels of the compounds of concern; and (6) the toxicity values of the compounds of concern. The level of risk that the site poses to human health was then quantified.

It was determined that the number of compounds detected at the site was small enough that a subset of the constituents did

not need to be selected for use in the risk assessment, i,e., selection of indicator chemicals was not necessary. Therefore, all compounds that could be quantitatively evaluated were included.

Exposure Assessment

This step in the risk assessment process involves determining the potential routes of exposure to the human population, the estimated concentrations to which the population is exposed, and the population at risk. The baseline risk assessment at the East Mount Zion site considered the potential exposure routes, including ground water (drinking water), surface water (and sediment), air, and direct contact. Of these routes of exposure, ingestion of ground water (drinking water) was the only significant human health exposure route identified.

Exposure Point Concentrations

As indicated in previous sections ground water samples were collected from monitoring wells onsite, from nearby offsite residential wells, and from two offsite nonresidential wells (i,e., the Abandoned Park Well and the Old Park Well).

The ground water data from the wells located at the site (Figure 3) are indicative of releases occurring to ground water from the contamination at the site, but are not indicative of the contamination to which the population is currently being exposed given that there are no domestic wells at the site. These monitoring well data, however, will be used to evaluate the potential risk associated with hypothetical ingestion of ground water at the site. Data from the residential wells (Table 3) are the best available indicators of current risk to the neighboring population. The two nonresidential wells (the Abandoned Park Well and the Old Park Well) can be used as potential indicators of offsite migration, but neither is an actual monitoring well built to current construction specifications and neither is currently used as a source of drinking water. These two wells could, potentially be used as drinking water sources. However, PADER has notified the well owners that these wells need to be abandoned. Therefore, the exposure of individuals ingesting water from these wells is not expected, and the data must be evaluated within this context.

For the monitoring wells, two exposure cases, an average case and a reasonable worst-case, were considered based on the average and reasonable worst-case concentrations detected in these wells. To calculate these two exposure point concentrations, the average individual well concentration over the time period sampled (April to September in most cases) was calculated first. One-half the instrument detection limit (IDL) was used in these calculations when a chemical was not detected.

An arithmetic mean was then calculated using the individual well average concentrations to obtain an estimate of the most likely concentration of chemicals in onsite monitoring well ground water. The reasonable worst-case concentration of chemicals in the monitoring wells was defined for the purpose of this risk assessment as the highest average individual well concentration. Average and reasonable worst-case monitoring well concentrations are presented in Tables 4 and 5.

For the residential wells and nonresidential (i.e., the Old Park Well and the Abandoned Park Well) offsite wells, each of which had one valid sample, exposure point concentrations were considered to be the concentrations of chemicals detected in each well (i.e., each well was evaluated separately). These concentrations (corrected for blank contamination and samples considered invalid) are presented in Table 3. The reasonable worst-case concentrations of chemicals in any residential well were also determined and are presented in Table 6.

Comparison to Applicable or Relevant and Appropriate Requirements

In the case of ground water concentrations, the appropriate ARARs are the Drinking Water Standards and Health Advisories, given that the ground water is used as a source of drinking water in the area. The pertinent standards are the Primary Maximum Contaminant Levels (MCLs), the Secondary Maximum Contaminant Levels (SMCLs) and the Lifetime Health Advisories (HAs). The MCLs are based upon health, technological feasibility and cost concerns, and carry regulatory authority for public water supply systems. They have also been considered in many cases to be appropriate standards for ground water that is used for drinking water. SMCLs have been established based upon aesthetic qualities, i.e., odor and taste. They do not carry regulatory authority, but are meant to serve as reasonable goals for drinking water quality. The Lifetime HAs are based upon health concerns and have been established for many compounds which do not have MCLs. They do not have regulatory authority and are meant to serve as guidelines for government officials responsible for protecting public health in the case of spills or contamination situations.

Concentrations of compounds detected in the ground water at the site and in wells in the neighboring vicinity of the site, and MCLs, SMCLs, and Lifetime HAs are presented in Tables 4 and 7. In the case of ground water in monitoring wells at the site only reasonable worst case concentrations of vinyl chloride and benzene marginally exceeded their MCLs. Average concentrations of these two chemicals were less than their respective MCLs. Average and reasonable worst-case iron and manganese concentrations exceeded the aesthetically-based SMCLs.

Estimation of Daily Intake

Because there are not health-based ARARs for each contaminant of toxicological concern detected in the ground water, the daily intake of each contaminant was estimated in order to be used in conjunction with appropriate risk values to determine the total potential risk posed by the site to the surrounding population. In order to calculate the estimated daily intake levels (EDIs), the U.S. EPA's standard assumption of ingestion of 2 L of drinking water per day for an adult with a body weight of 70 kg was used in the following equation (U.S. EPA 1986a and 1988a)

$$\text{EDI (mg/kg/day)} = \frac{(C)\ (IR)}{(BW)}$$

Where
- C = concentration of contaminant in ground water (mg/L)
- IR = daily drinking water ingestion rate (L/day)
- BW = body weight (kg)

The EDIs for the contaminants of concern are presented in Tables 5 and 6. It should also be noted that it was not necessary to calculate exposure to the residential population via volatilization of constituents from their well water (e.g., while showering) given that no volatiles were detected in any residential water samples.

Toxicity Assessment

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of (mg/kg-day) -1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are exposure levels for humans, including sensitive individuals, that is not likely to be without an appreciable risk of adverse health effects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the Rfd. Rfds are derived

from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainly factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

The carcinogenic potency factors for carcinogenic compounds and RfDs for noncarcinogenic compounds are presented in Tables 5 and 6.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1x10-6 or 1E-6). An excess lifetime cancer risk of 1E-6 indicates that, as a plausible upper bound, an individual has a one in million 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 a site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonable be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across medi

In the case of contaminants det ed in the monitoring wells at the site, the total HI exceeds on i.e., 1.5, only under reasonable worst-case exposure condi s (Table 5). Cadmium and manganese are the compounds having the greatest impact on the HI, i.e., 3.4E-1 and 1.0E+0, respectively. The estimated daily intake of either compound does not exceed respective RfD, although manganese is clearly at its RfD. Risks are assumed to be additive within type of critical effect. The critical toxic effects for cadmium are renal effects, and for manganese, nervous system effects. Therefore, additivity is not assumed for these compounds. Based on this, the only noncarcinogen of potential concern is manganese, which under reasonable worst-case conditions is just at a concentration which would result in a daily intake equal to its RfD.

For carcinogens detected in the monitoring wells, the total carcinogenic risks u r average and reasonable worst-case exposure conditions a 1.7E-4 and 3.8E-4, respectively (Tabl 5). These values ar st outside the target range of 1E-4 t 1E-6 which is used b e U.S. EPA for selecting remedies at CERCLA sites. Arsen and vinyl chloride are the contaminants most significantly contributing to total cancer risk estimates.

There is some concern, however, about the certainty of the data and the concentrations used to calculate the carcinogenic risks. In the case of arsenic, it should be noted that the maximum concentration of 1.8 ug/L is well below the current drinking water standard of 50 ug/L. In reviewing the data on arsenic, one sees that arsenic was detected in only one valid sample in only one well, EA-4D. On the other two sampling occasions at EA-4D, no arsenic was detected. It should also be noted that for the one sampling event in which arsenic was detected at EA-4D, the analyte was detected below the contract required detection limit (CRDL), but above the instrument detection limit (IDL). In evaluating the metals detected in the onsite and surficial soil at East Mount Zion, arsenic levels do not appear to be of concern in soil.

In reviewing the vinyl chloride data, this compound was detected in only two wells, EA-4D and EA-6D, and only during the first of three sampling rounds at each well. Both times that vinyl chloride was detected, it was at a level below the CRDL, but above the IDL. Therefore, the concentration was estimated each time. It should also be noted that vinyl chloride was not detected in the waste or surficial soil samples at the site.

Two other compounds that potentially contribute in a less significant manner to the total carcinogenic risk are 1,1-dichloroethane and bis(2-ethylhexyl)phthalate, which were associated with carcinogenic risks of 1.4E-5 and 2.7E-6, respectively, at reasonable worst-case concentrations, and 2.5E-6 and 6.2E-6, respectively, for average concentrations. In evaluating the monitoring well data, these compounds were consistently detected in the waste samples (Figure 3).

Benzene at reasonable worst-case concentrations marginally exceeds its MCL, i.e., 5.3 ug/L versus 5 ug/L. The average benzene concentration of 1.1 ug/L, however, is well below the MCL. The only well where benzene was consistently detected was EA-4D (Figure 3). Benzene was also detected during the soil vapor survey.

In the case of residential wells, risk values were available only for the noncarcinogenic effects associated with the detected compounds. Therefore, potential carcinogenic effects could not be quantified. The total HI for all compounds, regardless of critical effect, was less than one for each individual residential well. Using the maximum concentration of chemicals detected in any residential well, the HI was still less than one (i.e., 4.2E-1) (Table 6). Therefore, no deleterious effects associated with the residential wells are expected.

In the case of the two nonresidential wells, neither of which is used as a source of drinking water, all the compounds for which risk values were available were associated with

noncarcinogenic effects. The HIs for the Abandoned Park Well and the Old Park Well were 2E-1 and 6.7E-2, respectively, which are less than 1. Therefore, no deleterious effects associated with ingestion of ground water in the area of each well are expected based on the compounds evaluated. However, as indicated previously, lead in the Old Park Well was detected at a concentration which exceeds the existing and proposed drinking water standards. This does not appear to be related to the landfill given that lead was detected in only one monitoring well at the site at a concentration well below the existing MCL and just equal to the proposed MCL. Also, the levels of lead detected in waste and surficial soil samples did not indicate that lead was a contaminant of concern at the site.

In summary, exposure pathways quantitatively evaluated in this risk assessment were for ingestion of ground water from onsite monitoring wells, residential wells, and non-residential wells. Evaluation of the monitoring well data indicates that there would be potential risk associated with ingestion of ground water onsite and at the site perimeter. The noncarcinogenic compound of greatest concern is manganese. The carcinogenic compounds potentially of concern are arsenic, vinyl chloride, benzene, 1,1,-dichloroethane, and bis(2-ethylhexyl)phthalate. As previously noted, arsenic was detected in only one well (below the CRDL) and only during one of three sampling rounds in that well. In one shallow monitoring well, the concentration of lead was less than its MCL and just equal to the proposed MCL.

Evaluation of the residential and nonresidential wells in the neighboring area indicates that there is no significant risk being posed to the population ingesting ground water based on the samples, chemicals and exposure pathways evaluated. For residential ground water, the hazard index was less than one even under reasonable worst case conditions. No carcinogenic chemicals of concern were identified. Lead concentrations in all residential wells were less than the MCL, although levels in some wells exceeded the proposed MCL. The only compound of concern in the nonresidential wells was lead detected in the Old Park well sample. The source of the lead problem in the well is unknown, but it does not appear to be associated with the contamination at the site based on the sample results of the RI. It should also be noted that the Old Park well is not used as a source of drinking water. No carcinogenic chemicals of concern were identified in the nonresidential wells.

Environmental Assessment

Surface water samples were collected from the southeast and west leachate seeps, east and west intermittent streams, and the east and west perennial streams. The samples collected were analyzed for metals and organics. The observed concentrations were compared to Pennsylvania Water Quality Criteria for Toxic

Substances and the Federal Ambient Water Quality Criteria. Analytical results for surface water samples collected at the southeast and western leachate seeps showed limited contribution of contaminants from the waste fill. Comparison of the inorganic data to the appropriate criteria resulted in the identification of two compounds that exceeded acute and chronic water criteria. These compounds were copper and mercury. However, these compounds were not found in elevated levels downstream of the site.

In evaluating the surface water organics data, only those compounds with established Pennsylvania or EPA water quality criteria were reviewed (Table 8). This evaluation indicated that none of the organics identified were observed to exceed any aquatic life criteria.

Sediment samples were collected within the leachate seeps and analyzed for metals and organics. There were no organics detected in the sediment that were of concern. Comparison of average sediment concentrations to Regional background concentrations show that, with the exception of cadmium in the southeast leachate sediment samples, all average sediment concentrations were within or below the range of regional concentrations, For cadmium, concentrations above 1.8 mg/kg were observed in the southeast leachate pond and watercourse sediments. The southeast leachate watercourse sediment had the highest concentration of cadmium at 6.5 mg\kg. No aquatic toxicological significance is known to be associated with these elevated levels of cadmium sediment values.

In summary, several compounds were observed to exceed identified water quality or sediment quality criteria, these compounds are not expected to adversely impact aquatic systems because of the flow restrictions placed on the leachate seeps. The west leachate seep flows into the Doersam Woods storm drainage system where it is impounded in a sediment pond. Extensive dilution is expected within this system prior to its eventual discharge during storm events. Similarly, leachate from the southeast portion of the landfill is impounded in the surface water/leachate collection pond. Any flow from the southeast leachate pond is expected to be diluted prior to combining with Kreutz Creek, thereby minimizing any aquatic life impacts.

In assessing potential impacts to terrestrial life which may use surficial waters in the site vicinity as drinking water, health and risk based calculations have revealed that the utilization of surficial waters associated with the site by local populations of wild or feral vertebrate animals would not elicit any cancerous risk or noncancerous health threat to these animals. These calculations assumed combined impacts from contaminants found in the surface waters and the sediments and employed health-based criteria normally used in risk calculations

in humans. Except for occasional transient species, no federally listed or proposed threatened or endangered species are known to exist in the East Mt. Zion site area.

DESCRIPTION OF ALTERNATIVES

The remedial action objectives for the East Mt. Zion site are (1) to prevent ingestion of ground water which has concentrations (that are related to the East Mt. Zion site) greater than established MCLs and (2) protect downstream water quality to assure concentrations of parameters that are associated with the site meet Federal and State Water Quality criteria. Applicable or relevant and appropriate requirements which pertain to the alternatives below are listed in Table 10. There are no historical or archeological sites in the East Mt. Zion site vicinity that would be impacted by implementation of the following alternatives.

Based on these remedial action objectives, the alternatives developed to address contamination at the East Mt. Zion site are:

Alternative #1 No Action

The Superfund program is required to evaluate the No Action alternative. Under this alternative, no remedial action would be taken to address contaminant sources or their potential migration pathways, and any site posed risk would remain unchanged. This alternative would be selected only if the site posed little or no risk to public health or the environment from hazardous substances as addressed in the Superfund law. Long-term monitoring (30-years) of the ground water, surface water, sediment, and soil would be performed.

There are no capital costs associated with the no action alternative. The sampling costs are estimated to be $320,000 for the first year and $80,000 for each subsequent year for thirty years. Present net worth for 30 years at 8% interest would be $1,220,000.

Alternative #2 Restricted Access with Environmental Monitoring

Under this alternative a chain link fence would be installed around the landfill so that public access to the landfill would be restricted. Also, a long-term (30-year) monitoring program consisting of ground water, surface water, sediment and soil sampling would be implemented. Land restrictions would also be implemented to limit future use of the site.

The capital cost for installation of the fence is estimated to be $45,000. The sampling costs are estimated to be $320,000 for the first year (quarterly sampling at $80,000 per event) and

$80,000 for each subsequent year for thirty years. Present net worth cost for this alternative for 30 years at 8% interest would be $1,265,000.

Alternative #3 Multilayer Cap with Methane Venting

Under this alternative, the landfill would be closed as a municipal waste landfill under Pennsylvania Municipal Waste Regulations. This alternative consists of surface water diversions, methane venting through gas vents, constructing a multilayer cap consisting of a clay layer or synthetic liner, sand drainage layer, and a soil cover. In conjunction with cap installation, regrading of the fill may be necessary due to the steepness of the slopes on the south and west sides of the fill. This alternative would act to inhibit the mobility of contaminants. Ground water monitoring and deed restrictions would be integral components of this alternative. A chain-link fence would be installed around the site so that public access to the site would be restricted.

The estimated capital expenditure for this alternative would be $1,945,000. The operation and maintenance expenditures are estimated to be $100,000 for ground water monitoring for the first year (quarterly at $25,000 per event) and $25,000 annually thereafter for thirty years. Present net worth cost for this alternative for 30 years at 8% interest would be $2,230,000.

Alternative #4 Excavation and OffSite Incineration

This alternative would involve the excavation and disposal of the waste material at a municipal incinerator. This alternative would require the excavation and disposal of approximately 300,000 cubic yards of waste material. Incineration involves the thermal destruction of organic compounds to a nonhazardous product. Treatability testing of the waste may be required to determine the ability of the incinerator to handle the physical properties of the waste involved and to effectively destroy the waste based on its chemical properties. Metal contaminants will remain in the incinerator ash and will require disposal in a secure offsite facility. Also large bulk items in the fill may be unsuitable for incineration and require offsite landfill disposal. A staging area for the waste material would be required. After excavation, clean fill would be imported to bring the site back to grade. The existing cover material would be stripped, stockpiled, and then backfilled.

Based on existing waste characterization, the landfill waste is not believed to be RCRA hazardous waste. This would be confirmed prior to offsite incineration or disposal.

The estimated capital expenditure for this alternative would be $12,830,000. No operation and maintenance expenditures are

expected for this alternative. Present net worth cost for this alternative therefore would be $12,830,000.

Alternative #5 Excavation and Off-Site Landfilling

This alternative is similar to alternative 4 with the exception that offsite disposal would be by landfilling and not incineration.

The estimated capital expenditure for this alternative would be $13,260,000. No operation and maintenance expenditures are expected for this alternative. Present net worth cost for this alternative therefore would be $13,620,000.

Alternative #6 Regrading

This alternative consists of regrading ares of the landfill which do not facilitate surface water runoff from the site. This would entail importing fill material and soil from offsite and providing slopes to promote runoff. The reduction of infiltration to the fill material will reduce the leachate production at the site thereby alleviating the ground water contamination at the site. Ground water monitoring and deed restrictions to limit future use of the site would also be included as components of this alternative. A fence would also be installed at the site to restrict public access.

The estimated capital expenditure for this site would be $115,000. Ground water sampling costs are estimated to be $100,000 for the first year (quarterly at $25,000 per sampling event) and $25,000 for each subsequent year for thirty years. Present net worth cost for this alternative for 30-years at 8% interest would be $460,000.

COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the six alternatives using the nine evaluation criteria presented in Table 9 in order to select a remedy. The following is a summary of the comparison of each alternatives' strength and weakness with respect to the nine evaluation criteria.

Overall Protection of Public Health and the Environment

All of the remedial alternatives considered for the East Mt. Zion site, except for Alternative 1 (no action), 2 (restricted access with environmental monitoring), and 6 (regrading) are protective of human health and the environment by eliminating reducing, or controlling risks through various combinations o treatment and engineering controls and/or institutional contr s. Current site conditions can be expected to persist should the no action or restricted access with monitoring alternatives be

chosen. Calculations for leachate reduction by regrading the fill reveal that only a 10% reduction in leachate contamination can be expected. MCLs would not be achieved under the regrading alternative, therefore the remedy is not protective of human health and the environment. As the no action, restricted access with environmental monitoring, and regrading alternatives do not provide for protection of human health and the environment for ground water at the site perimeter, they are not eligible for selection and shall not be discussed further in this document.

Alternatives 4 and 5 both involve the excavation and off-site disposal of the waste material from the landfill. However, alternative 4 requires incineration of the waste material as a component. Residual ash would then be disposed of in a secure facility. Under alternative 5 the excavated waste would be containerized and transported to a secure facility without any further treatment prior to disposal. Based on current information, the waste in the fill is not a RCRA hazardous waste. However, prior to implementation of alternatives 4 or 5, the waste would have to be characterized and handled appropriately. Complete removal of the waste would eliminate the risk of any future ground water contamination at the site. Residual risks associated with the site would be much less than 1E-6 at completion.

Alternative 3 entails the installation of an impervious cap at the site. The cap would effectively reduce infiltration to the fill thereby alleviating ground water contamination at the site and site perimeter resulting in achievement of background levels of contaminants in the ground water. Access and deed restrictions would be components of alternative 3. If, as assumed, capping eliminates leachate generation, residual ground water risks are estimated at much less than 1E-6.

Compliance with ARARs

SARA requires that remedial actions meet applicable or relevant and appropriate requirements (ARARs) of other environmental laws. These laws may include: the Toxic Substances Control Act, the Clean Water Act, the Resource Conservation and Recovery Act, and any state law which has stricter requirements than the corresponding federal law.

A "legally applicable" requirement is one which would legally apply to the response action if that action were not taken pursuant to Sections 104, 106, or 122 of CERCLA. A "relevant and appropriate" requirement is one that, while not "applicable", is designed to apply to problems sufficiently similar that their application is appropriate. A list of ARARs for each of the considered alternatives is presented in Table 10.

Alternatives 3, 4 ,and 5 will comply with their respective ARARs identified in Table 10. Alternatives 1, 2, and 6 would not comply with all respective ARARs identified in Table 10 and are not protective of human health and the environment.

Long-Term Effectiveness and Permanence

Each of the alternatives considered addresses the ground water contamination at the site. By eliminating the source of contaminants to the ground water each alternative achieves a certain degree of long-term effectiveness and permanence. The difference between the alternatives with regard to long-term effectiveness and permanence is directly related to how each alternative addresses ground water contamination at the site.

Alternatives 4 and 5 provide the greatest degree of permanence. They both involve the excavation and offsite transport of the fill material. Alternative 4 requires the incineration of the fill material and subsequent disposal of residual ash in a secure offsite landfill. Under alternative 5, the excavated material would be transported to an offsite facility without prior treatment.

Alternative 3, while not removing the contaminants, also offers long-term effectiveness by reducing the mobility of the contaminants. This alternative includes an impermeable multilayer cap that will limit the infiltration of precipitation through the fill material and preclude the leaching of contaminants into the ground water.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 4 provides for the complete reduction/elimination of toxicity, mobility, and volume by completely removing the source of the contamination and incinerating the waste fill material. Incineration involves the thermal destruction of the organic constituents of the fill material to a nonhazardous product. Alternative 5, while eliminating the toxicity, mobility, and volume of the waste material at the site itself, does not provide for the overall reduction of toxicity, mobility, and volume since the waste is not treated prior to landfilling. Alternative 3 does not provide treatment of the waste material directly and, therefore, does not reduce the toxicity or volume. The mobility of the contaminants in the fill, however, is significantly reduced or eliminated by the cap and thereby the site's impact to the ground water is reduced. Assuming that infiltration to the fill is the sole source of leachate which subsequently migrates through the fill, the migration of the constituents to the ground water will be eliminated.

Short-Term Effectiveness

Alternatives 4 and 5 would involve the excavation of the cover material and the waste, the removal of the waste offsite, and backfilling with clean fill. The risks associated with the excavation are associated with potential volatilization from the waste and potential dust emissions from the cover material. Wind erosion from the cover material may cause a problem with fugitive dust emissions. The waste material, however, is expected to be partially saturated and moist and is therefore expected to emit almost no dust at all. These emissions are of concern (1) for worker exposure and (2) for potential migration to neighboring housing developments.

Because portions of the fill and existing cover material will be significantly disturbed under alternative 3, there is also potential for increased volatilization from the waste and fugitive dust emissions from the cover material under this alternative also. Clearing, excavation, and redistribution of the waste under alternative 3 is expected to take 3 to 4 months. Short-term exposure therefore would be primarily limited to that duration in contrast to the possible 3-4 years for total excavation of the waste under alternatives 4 and 5. Based on average waste characteristics, the daily emission rates for the volatile compounds in the fill are very low. These emission rates conservatively assume complete volatilization of the compound in the waste excavated in a day which was estimated at 300 yd3/day. Fugitive dust emission from the fill material is expected to be minimal since it is currently partially saturated.

In addition to volatile emissions from the site, it is also expected that short-term odoriferous emissions are extremely likely during the excavation.

Implementability

While all the alternatives considered are implementable, some alternatives are technically easier to implement than others.

Alternative 3 is the easiest to implement. Capping is a well established technology which is commonly used in municipal and hazardous waste site closures. Removal of the existing vegetation and regrading of the site may be necessary. Regrading of the landfill would require a cut volume of approximately 20,000 cubic yards. Clearing, excavation, and redistribution of the waste is expected to take 3-4 months. Total cap installation is expected to be complete within a year after construction begins.

Alternatives 4 and 5 both involve excavation of the waste material currently in the fill. The quantity of waste estimated

to be excavated is 300,000 cubic yards. Total excavation of the waste is expected to take 3-4 years. Additional clean fill would have to be hauled back to the site to bring the site back to grade. The difference between alternatives 4 and 5 is how the waste will be disposed of once it is excavated. Under alternative 4, which includes incineration of the waste, an incinerator with adequate capacity to handle the volume of waste would have to be found prior to implementation of the alternative. Residual ash from the incineration process would then have to be taken to a secure offsite facility for disposal. Alternative 5 would involve transporting the excavated waste directly to an offsite facility. In order to implement both alternatives 4 and 5, a suitable disposal facility would have to be identified prior to disposal of the waste.

Cost

This evaluation examines the estimated costs for implementing the remedial alternatives. Capital and annual O&M costs are used to calculate estimated present worth costs for each alternative. Alternative 3, multilayer cap with methane venting, has a moderate capital cost and annual costs which results in an estimated present worth of $2,230,000. Alternative 4, excavation and offsite incineration, has a high capital cost which results in an estimated present worth cost of $12,830,000. Alternative 5, excavation and offsite landfilling, also has a high capital cost which results in a present worth cost of $13,620,000. No annual O&M costs are expected for either alternative 4 or 5.

State Acceptance

Pennsylvania has concurred with the selected remedial alternative.

Community Acceptance

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides a thorough review of the public comments received on the RI/FS and the Proposed Plan, and U.S. EPA's and PADER's responses to the comments received.

DESCRIPTION OF THE SELECTED REMEDY

The results of the RI/FS and base line risk assessment led to the conclusion that the East Mt. Zion site has resulted in the contamination of the ground water onsite and at the site perimeter, and may pose an endangerment to human health and the environment. The deep aquifer in the site vicinity is currently

used as a source of drinking water by some area residents. The principles used to select the remedy were based on the following and supported by the comparative analysis:

(1) excess cancer risk for ingestion of the ground water at the site perimeter is 3.8E-4

(2) the Hazard Index associated with noncarcinogenic effects from the ingestion of ground water at the site perimeter is 1.5

(3) there is no current impact to aquatic life downstream of the site and there is no current impact to terrestrial habitat using onsite surface water as drinking water

Remedial action goals for the East Mt. zion site are (1) to prevent ingestion of ground water which has concentrations (that are related to the East Mt. Zion site) greater than the MCL and (2) protect downstream water quality to assure concentrations of parameters associated with the East Mt. Zion site meet Federal and State Water Quality Criteria.

Based upon consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, EPA and PADER have selected alternative 3, multilayer cap with methane venting.

A cap provides a relatively impermeable barrier that isolates infiltration to buried wastes, thereby minimizing the potential for the leaching of contaminants to the ground water. It will also significantly reduce leachate production and will likely extend the periods where the leachate pond in the southeastern corner of the site is dry.

Construction of the cap would conform with the PADER capping requirements under the Pennsylvania Municipal Waste Regulations. These include, but are not limited to, the following:

- a cap consisting of a 1-ft clay layer or a 30-mil synthetic liner
- a maximum cap permeability of 10-7 cm/sec
- a drainage layer over the cap
- a 2-ft soil layer over the drainage layer
- a minimum surface slope of 3 percent
- a maximum slope of 33 percent

- minimization of soil erosion and sedimentation

- stormwater management based on a 24-hour, 25-year storm event

The site work prior to installation of the cap is likely to include site and slope clearing; excavation; redistribution and compaction; and cover with appropriate loam as required by PADER regulations. Access to clear the slopes is limited and may only be possible by clearing a road access through the park and/or the Doersam Woods lots adjacent to the site. Purchase of property may be necessary to ensure efficient access during construction.

In addition to capping, venting will be required to provide methane and/or VOC off-gassing. Emissions from the gas vents will be monitored, and if they are over acceptable levels, a control system will be installed. Also, fencing and future site use (i.e., deed restrictions) will be required to protect the cap's integrity. Total installation is expected to be complete within 1 year after construction begins.

The only long-term operation and maintenance costs associated with this alternative are the inspection, maintenance, and repair of the cap. Also, ground water monitoring would be required to monitor the natural attenuation of contaminants in the ground water. The monitoring wells currently in place at the site would be used for the ground water monitoring of the contaminant attenuation. Samples would be taken quarterly the first year after completion of the cap and then annually thereafter. Based on ground water velocity and the elimination of the source, ground water concentrations at the landfill perimeter are expected to meet background levels within five years through natural attenuation. Residual risk for the ingestion of ground water at the site perimeter is estimated to be much less than 1E-6. Present net worth costs for this alternative are estimated to be $2,230,000. A summary of the capping costs is presented in Table 11.

STATUTORY DETERMINATIONS

Protection of Human Health and the Environment

The baseline risk assessment performed during the RI identified one pathway of concern--ingestion of ground water at the site perimeter. As previously discussed, the risks identified in the baseline risk assessment are marginally outside the 1E-4 to 1E-6 cancer risk range for average ground water concentrations at the site perimeter. No significant risks were identified for residential water supplies as they relate to the East Mt. Zion site. The only quantifiable risks associated with the site are limited to the scenario that ground water at the site perimeter would be used as a drinking water supply.

Therefore, the risk reduction objectives and criteria are based on reduction of those risks associated with the ingestion of ground water at the site perimeter and protection of the deep aquifer from further contamination.

Samples collected from the leachate seeps had two trace metal concentrations (mercury and copper) which exceeded the aquatic water quality criteria. These constituents, although not detected in downstream samples, are of concern because they exceeded the ambient water quality criteria in the seeps. Although ambient water quality criteria in general do not apply to such seeps, which are seasonal in nature, as a conservative approach, the attainment of the aquatic water quality criteria for copper and mercury were also remedial action objectives for the East Mt. Zion site.

A cap provides a relatively impermeable barrier to isolate stormwater infiltration from buried wastes, thereby minimizing the potential for the leaching of contaminants into the ground water and the potential for the migration of the contaminants offsite. It will also reduce leachate production and will likely extend the periods where the leachate pond in the southeastern corner of the site will remain dry. Regrading of the site will also promote better surface water runoff further alleviating on-site ponding and migration of the contaminants offsite. Residual risk associated with the ingestion of ground water at the site perimeter is estimated at much less than 1E-6 once the cap is complete. Therefore the remedial action objectives are met with this alternative.

There will be no unacceptable short-term risks or cross-media impacts caused by implementation of this remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy of a multilayer cap with methane venting and ground water monitoring will comply with all applicable or relevant and appropriate chemical, action, and location specific requirements (ARARs). A complete list of ARARs is presented in Table 10. RCRA land ban is not an ARAR for this alternative since the waste is being capped in place.

The Pennsylvania ARAR for ground water for hazardous substances is that all groundwater must be remediated to "background" quality as specified by 25 Pa. Code Chapter 75.264(n). The Commonwealth of Pennsylvania also maintains that the requirement to remediate to background is also found in other legal authorities.

ARARs specific to the selected remedy are presented below:

- o Chemical-specific ARARs
  - 25 Pa Code Chapter 123.1(c), Pennsylvania Air Quality Standards
  - 25 Pa Code Chapter 127.12, Construction, Modification, Reactivation and Operation of Sources
  - 25 Pa Code Chapter 93.1 et. seq., Pennsylvania Water Quality Standards
  - 25 Pa Code Chapter 75.264(n), "background" quality for ground water remediation
- o Location-specific ARARs
  - none
- o Action-specific ARARs
  - 25 Pa Code Chapter 271.113, Pennsylvania Municipal Waste Regulations
  - 29 USC Parts 1910 and 1926 and 29 CFR Part 1910, Occupational Health and Safety Act requirements are applicable to all response activities

All the ARARs listed above will be met by the selected remedy.

Cost-Effectiveness

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $2,230,000. The selected remedy is the least costly of the alternatives 3, 4, and 5 which are equally protective of human health and the environment.

Utilization of Permanent Solutions to the Maximum Extent Practicable

The EPA has determined that the selected remedy represents the maximum extent to which permanent treatment technologies can be utilized in a cost effective manner for the East Mt. Zion site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the EPA has determined that the selected remedy provides the best balance in terms of short-term effectiveness; implementability; cost; reduction in

toxicity, mobility, and volume; and long-term effectiveness.

The selected remedy does not offer as high a degree of long-term effectiveness as the excavation and disposal options, however, it will significantly reduce the risks to human health and the environment posed by the contaminated ground water at the site. The excess human cancer risk at the site has been estimated to be 3.8E-4, which is above EPA's recommended upper bound of 1E-4 to 1E-6. Due to the relatively low risk associated with the site, EPA has determined that the use of more costly treatment technologies at the East Mt. Zion site are not justifiable. Because alternatives 3, 4, and 5 offer a comparable level of protection of human health and the environment, the EPA has selected alternative 3, which can be implemented quickly; will have little or no adverse effects on the surrounding community; and will cost considerably less than the other alternatives.

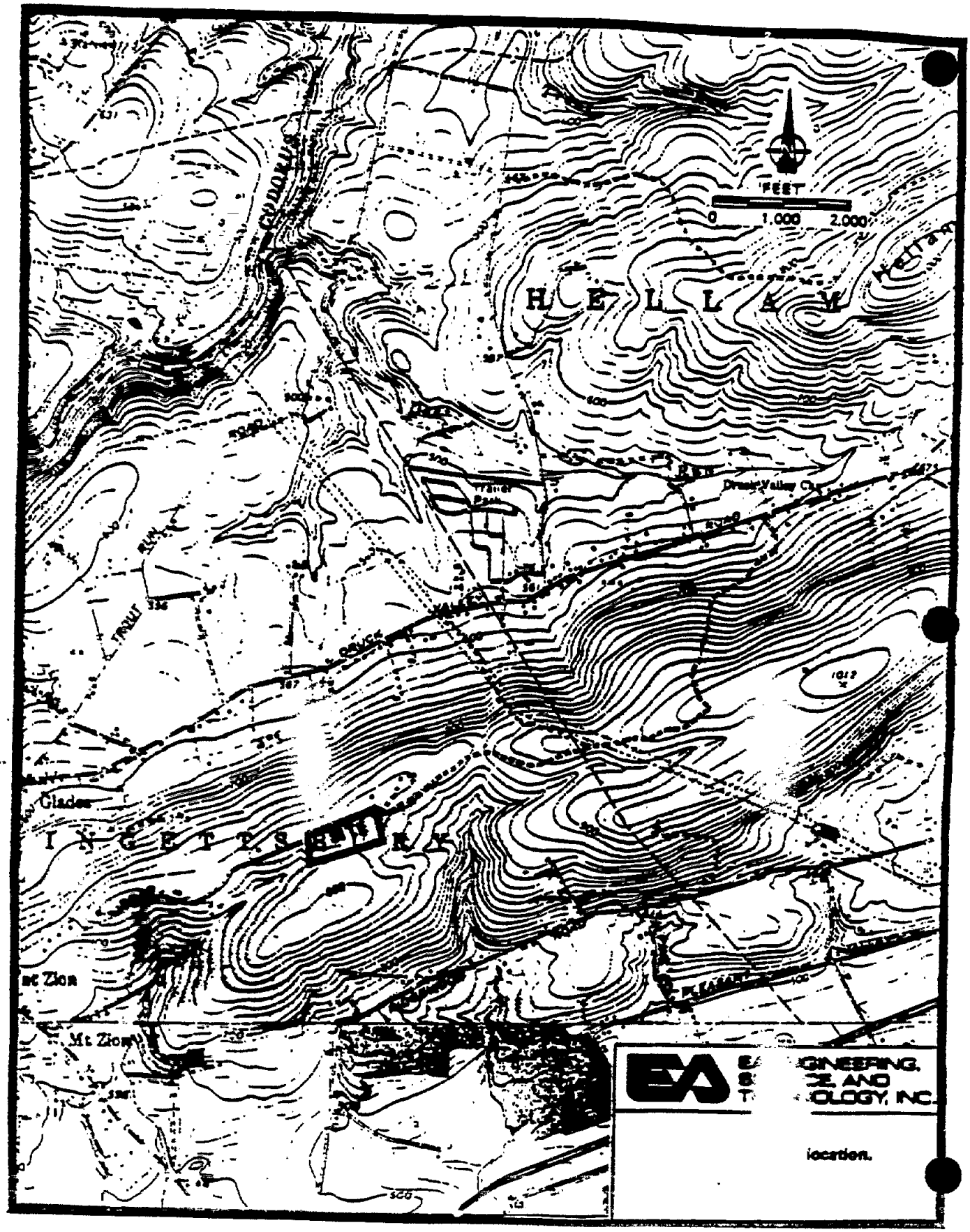
Preference for Treatment as a Principal Element

The statutory preference for remedial alternatives that employ treatment as the principal element has been determined by the EPA to be impracticable at the East Mt. Zion site. Due to the relatively low risk to human health and the environment, and the nature and extent of the contamination, the EPA has determined that alternative 3, including monitoring, access restrictions, institutional controls, and installation of an impermeable multilayer cap, can be implemented more quickly and cost effectively than the other alternatives while still providing an adequate level of protection to human health and the environment.

EXPLANATION OF SIGNIFICANT CHANGES

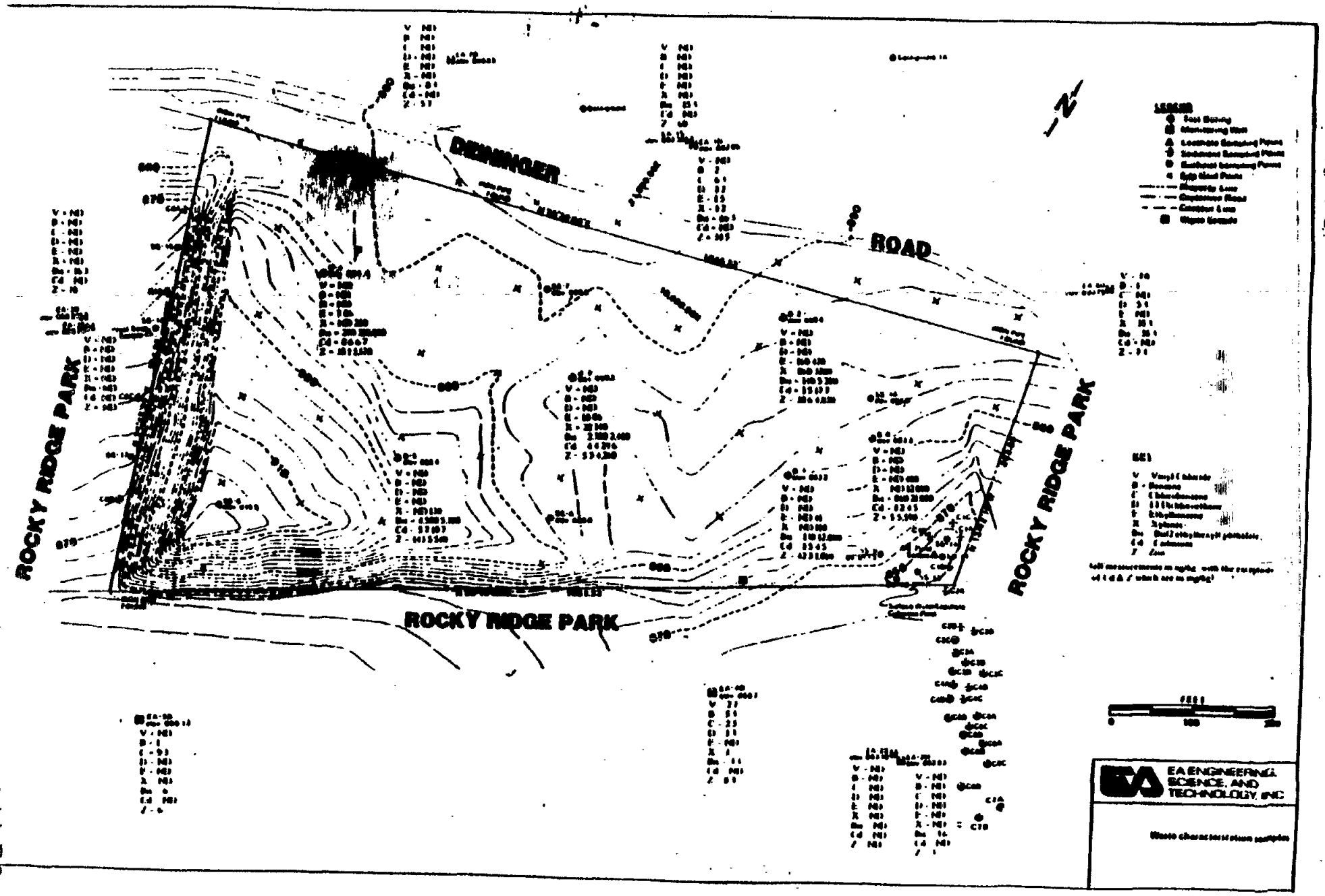
The Proposed Plan for the East Mt. Zion site was released for comment in May 1990. The Proposed Plan identified EPA's and PADER's preferred alternative. EPA reviewed all of the comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

FIGURE 1



AR301449

FIGURE 3



AR301450

FIGURE 2

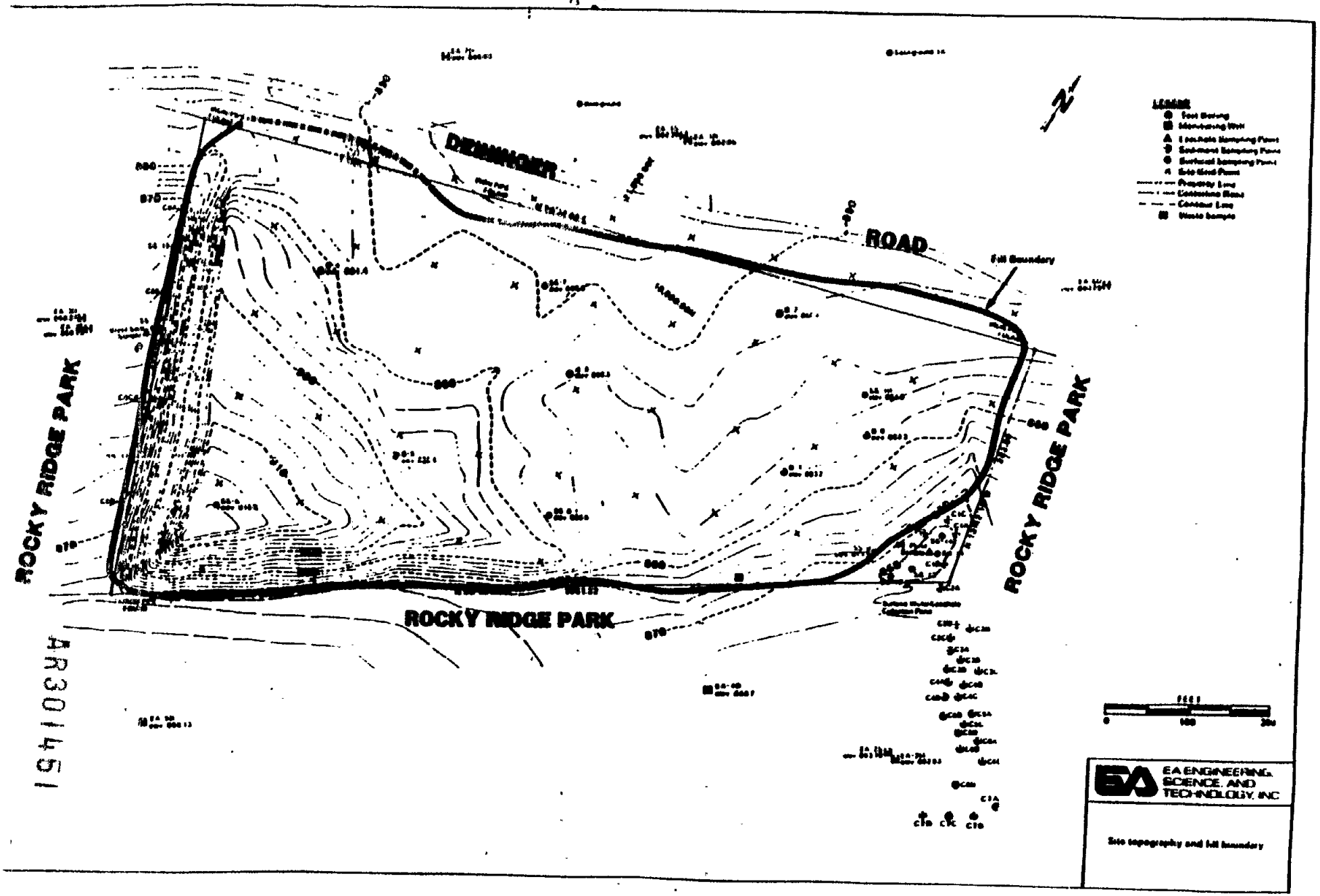


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FIGURE

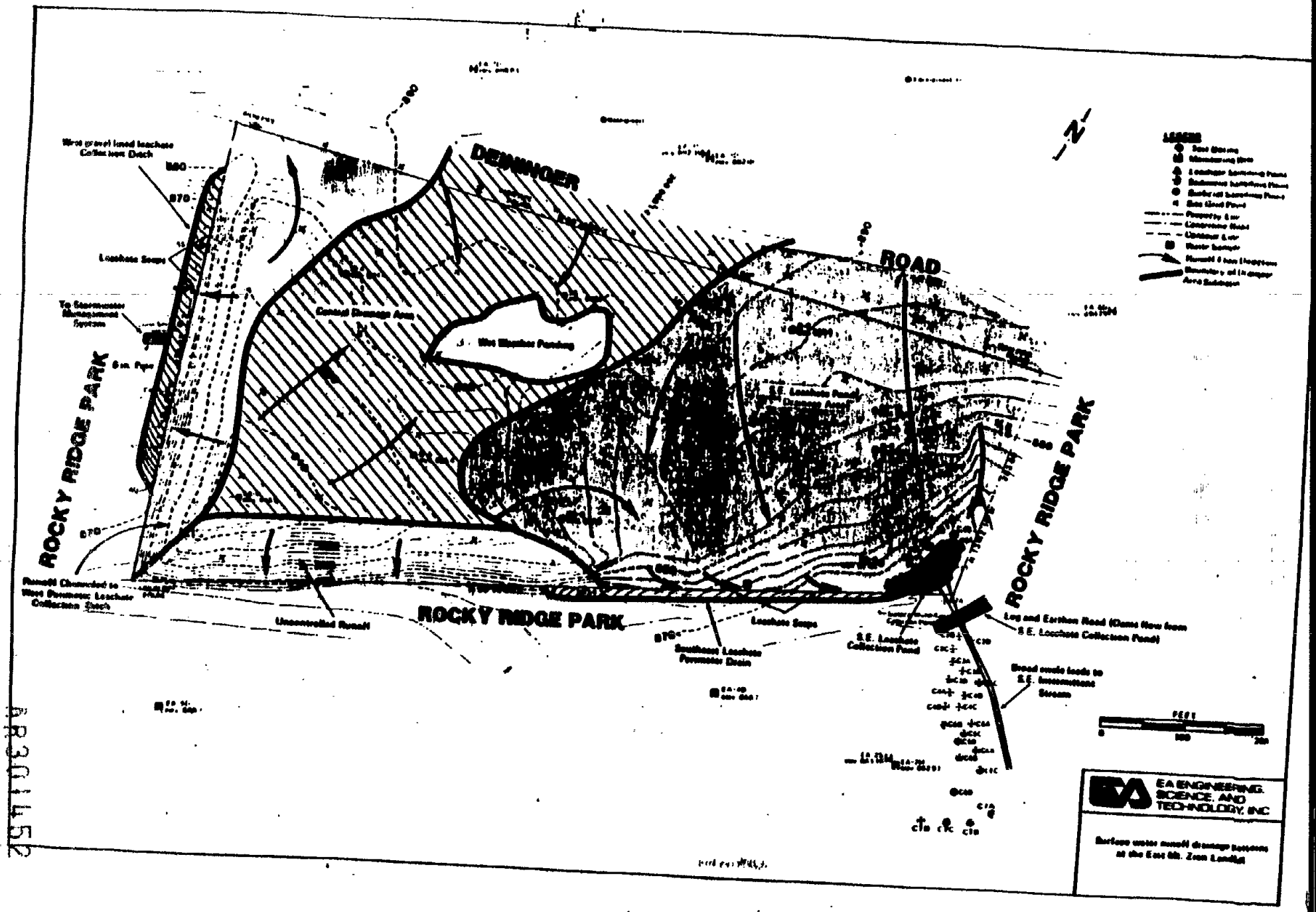

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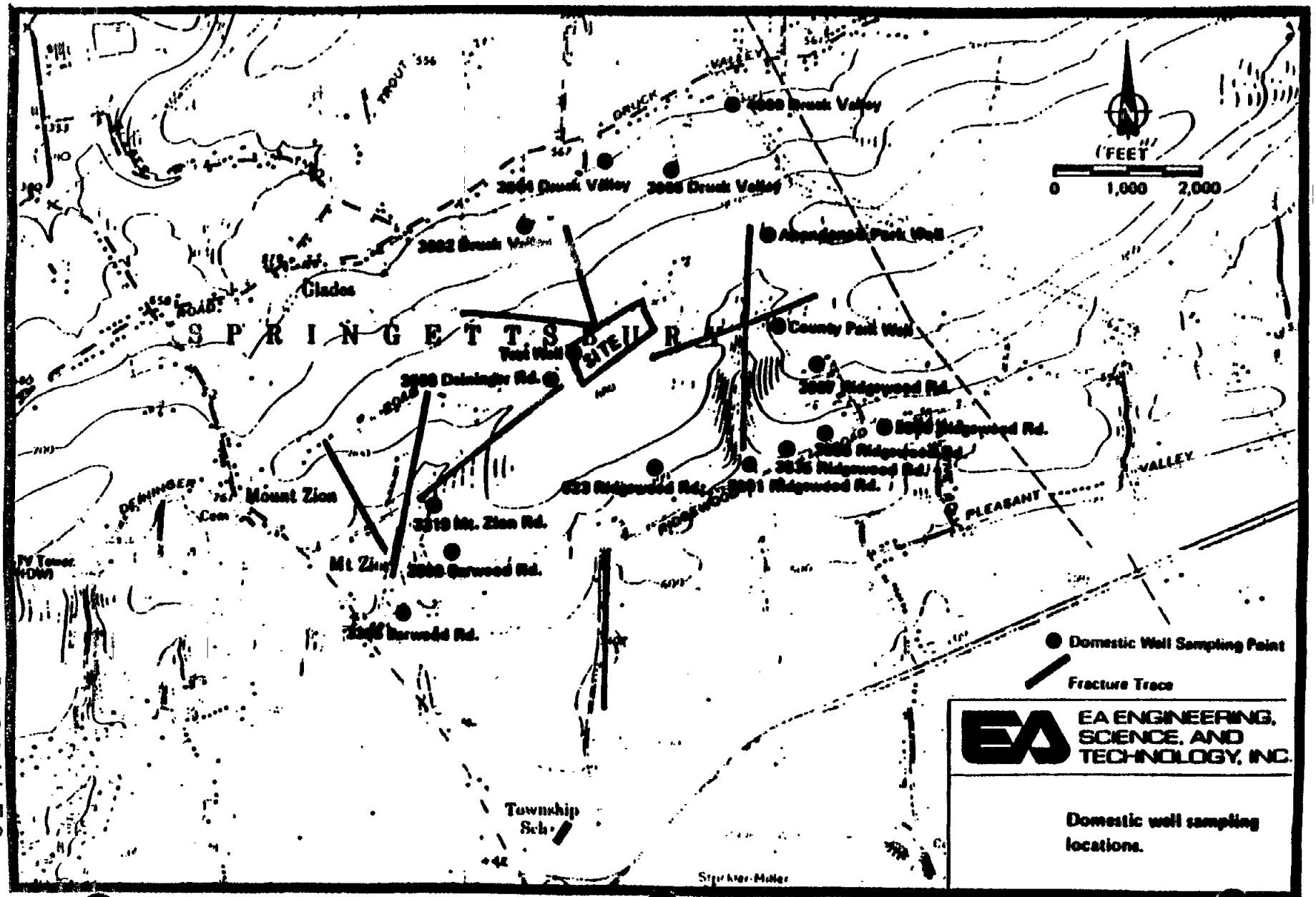
FIGURE 4



AR301453

TABLE 1 WASTE CHARACTERIZATION RESULTS

	Range	Average
Trace Metals (mg/kg)		
Aluminum	1,400-93,700	10,885
Antimony	ND-6.9	0.6
Arsenic	0.34-72.1	2.04
Barium	141-268	57.5
Beryllium	ND-0.88	0.21
Cadmium	0.61-26.5	7.9
Chromium	1.8-154	26.1
Cobalt	1.0-12.6	3.7
Copper	ND-3,150	228
Iron	656-939,000	761,546
Lead	ND-490	130
Manganese	3.4-593	103
Mercury	0.57-1.7	0.85
Nickel	ND-208	20.1
Silver	ND-98.8	5.6
Tin	ND-343	26
Vanadium	1.7-104	19
Zinc	5.3-5,540	1,645
Pesticides (µg/kg)		
Dieldrin	ND-716.1	39.8
4,4'-DDE	ND-542	61.8
Endrin	ND-10.2	1.1
4,4'-DDD	ND-120	8.6
4,4'-DDT	ND-1,380	78.2
PCBs (µg/kg)		
Aroclor [illegible]	ND-1,600	266
Aroclor [illegible]	ND-1,900	273
Aroclor 1260	ND-141	27.7
Volatiles (µg/kg)		
Methylene Chloride	ND-94	20
Acetone	ND-1,300	195
2-butanone	ND-1,800	200
2-hexanone	ND-20	1.0
2-methyl-2-pentanone	ND-72	3.8

TABLE 1 (Cont.)

	Range	Average
Volatiles (Cont.)		
Toluene	ND-3,200	176
Chlorobenzene	ND-400	29
Ethylbenzene	ND-2,600	188
Xylenes	ND-12,000	885
Semivolatiles (ug/kg)		
1,4-Dichlorobenzene	ND-2,000	345
4-Methylphenol	ND-1,600	206
1,2,4-Trichlorobenzene	ND-700	46
Naphthalene	ND-2,400	327
2-Methylnaphthalene	ND-1,100	131
Acenaphthene	ND-350	18
Dibenzofuran	ND-280	17
Diethylphthalate	ND-840	89
Fluorene	ND-580	31
N-Nitrosodiphenylamine	ND-930	49
Phenanthrene	ND-5,500	472
Anthracene	ND-1,300	68
Di-n-Butylphthalate	ND-1,400	452
Fluoranthene	ND-7,600	526
Pyrene	ND-6,100	469
Butylbenzylphthalate	ND-780	12[illegible]
bis(2-ethylhexyl)phthalate	ND-310,000	29,3[illegible]
Chrysene	ND-4,700	29[illegible]
Di-n-Octyl Phthalate	ND-110	5.8
Benzo(b)fluoranthene	ND-4,000	210
Benzo(k)fluoranthene	ND-840	44
Benzo(a)pyrene	ND-3,800	200
Indeno(1,2,3-cd)pyrene	ND-2,400	126
Benzo(g,h,i)perylene	ND-2,300	121
Pentachlorophenol	ND-9,300	489

TA[illegible] 2

ANALYTICAL RESULTS (µg/L) FOR EAST MOUNT ZION DOMESTIC WELL SAMPLES COLLECTED 30 AUGUST 1988 AND 30 MARCH 1989

	3986 Druck Valley Road	3987 Ridgewood	3623 Ridgewood	3399[a] Barwood	3885[a] Ridgewood	3881[a] Ridgewood	3884[a] Druck Valley	4000[a] Druck Valley	3692[a] Druck Valley	3500 Deintager
METALS (TOTAL)										
Aluminum	[illegible]	120B	426	159B		100		255		
Antimony										
Arsenic										
Barium	[illegible]	3.3B	7.4B	49.0	15.5	1.3	3.6	1.9B	33.5	57.1
Beryllium										
Cadmium										
Calcium	3,530	1,700B	5,400	1,540B	7,510	11,500	650B	3,000B	1,620B	4,260B
Chromium	12.6	16.1		15.5	21.7				17.5	
Cobalt										
Copper		29.2		121	200					23.2B
Iron	6,010	36.3	500	40	385	69	6,160	2,710	37.6	80.1
Cyanide									69	67.1B
Lead	10.0		11.9	14.6	0.5	0.9B	3.0B	2.5B	7.9	5.7
Magnesium	1,470B	900B	1,630B	3,710B	3,140B	4,700B	400B	1,200B	1,670B	4,000B
Manganese	44.6	7.2B	7.7B	47.1	13.9B	0.3B	83.4	36.1	22.0	561
Mercury	1.6	0.0								
Nickel										
Potassium	1,310B	872B	1,030B	2,640B	361B	750B	720B	1,170B	21.4B 1,540B	3,500B
Selenium										
Silver										
Sodium	2,710B	1,190B	696B	21,600	6,900	2,430B	1,030B	1,720B	3,000B	30,900
Thallium		0.1	0.6	0.3	1.0	1.6	0.0	0.0	1.0	1.0
Vanadium										
Zinc	10.0		45.6				65			4.5
Tin				17.5B			11.6B			20.7B
PESTICIDES										
(None detected)										
PCBs										
(None detected)										
VOLATILES										
(None detected)										
SEMIVOLATILES										
Di-n-butyl phthalate	63B									

(a) Lead, mercury, and zinc concentrations are results from 30 March 1989 sampling; all other values are from 30 August 1988 sampling.
(b) Well went dry during confirmation sampling on 30 March 1989.
(c) Average value of sample and duplicate sample taken 30 March 1989.
B = Concentration below certified detection limit, but above instrument detection limit.
J = Estimated quantity.

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TABLE 2

EXTENDED

	3319[a] Mt. Zion	old[a] Park Well	3858[a] Ridgewood	3835[a] Ridgewood	3366 Barwood	Abandoned Park Well	Test Well
METALS (TOTAL)							
Aluminum		128B				887	161B
Antimony							
Arsenic							
Barium	2.9	1.1	44.2	6.1	27.4B	22.4	38.9
Beryllium							
Cadmium							
Calcium	1,500B	2,970B	6,040	6,730	13,300	1,130B	2,590B
Chromium						31.3	
Cobalt					16.4B		44.9B
Copper	124	511	331	35.3	117	22.7B	
Iron	67	4,76B	33	12.6	7,536	3,500	29,500
Cyanide							
Lead	2.0B	99[c]	5.3	1.4B	(b)	12.4	4.1B
Magnesium	1,400B	1,540B	3,640B	3,090B	6,940	850B	2,630B
Manganese	6.3B	12.7B	11.7B	7.1B	97.5	75.6	1,330
Mercury		0.28[c]			(b)		
Nickel	20.6B	25.3B					
Potassium	1,080B	612B	2,040B	522B	2,300B	1,990B	3,590B
Selenium		2.5U			2.5U		
Silver		1.0U			1.0U		
Sodium	1,040B	1,030B	5,920	2,160B	11,100	2,000B	12,600
Thallium	0.6	1.0	1.0		0.6	0.7	0.2
Vanadium							
Zinc					18.6		7.4
Tin		29.0B	11.4B		12.3B	11.4	13.3B
PESTICIDES							
(None detected)							
PCBs							
(None detected)							
VOLATILES							
(None detected)							
SEMIVOLATILES							
Di-n-butyl phthalate	63B						

AR301457

TABLE 3

COMPOUNDS USED IN THE RISK ASSESSMENT THAT WERE DETECTED IN RESIDENTIAL AND NONRESIDENTIAL WELL SAMPLES (µg/L) NEAR EAST MOUNT ZION (COLLECTED 30 AUGUST 1988)

	3906 Druck Valley	3987 Ridgewood	3623 Ridgewood	3399 Barwood[a]	3885 Ridgewood[a]	3881 Ridgewood[a]	3884 Druck Valley[a]	4000 Druck Valley[a]	3692 Druck Valley[a]
METALS (TOTAL)									
Barium				49.8	15.5	1.3	3.8	1.9	33.5
Chromium	12.6	14.1		15.5	21.7				17.5
Copper		20.2		121	290				37.4
Iron	6,018	26.3	598	48	385	69	6,160	2,718	69
Lead	10.0	1.0	11.9	14.6	8.5	0.9	3.0	2.5	7.9
Manganese	44.4	7.2	7.7	47.1	13.9	8.2	83.4	34.1	22.4
Mercury	1.6	0.8				0.1			
Nickel									21.4
Thallium		0.1	0.6	0.3	1.0	1.4	0.8	0.8	1.0
Tin				17.5			11.6		
Zinc	10.8		45.6				65		
SEMIVOLATILES									
Di-n-butylphthalate	6								

(a) Values for lead, mercury, and zinc were from samples collected 30 March 1989.
(b) Value is the arithmetic mean of duplicate samples.

AR301458

TABLE 3

EXTENDED

	3508 Deininger	3319 Mt. Zion[a]	3850 Ridgewood[a]	3835 Ridgewood[a]	3366 Barwood	Abandoned Park Well	Old Park Well[a]
METALS (TOTAL)							
Barium	57.3	2.9	44.2	6.1	27.4	22.4	1.1
Chromium					31.3		
Copper	88.2	124	331	35.3	117	22.7	511
Iron	67	33	12.6	7,530	3,448	4,768	
Lead	5.7	2.8	5.3	1.4	2.4	7.0	99[b]
Manganese	543	6.3	11.7	7.1	97.5	75.6	12.7
Mercury							0.28[b]
Nickel	28.6					25.3	
Thallium	1.0	0.6	1.0		0.6	0.7	1.0
Tin	39.7	11.4		12.3	11.4	29.0	
Zinc				18.6			
SEMIVOLATILES							
Di-n-buthylphthalate							

AR301459

TABLE 4

GROUND-WATER CONCENTRATIONS DETECTED IN ONSITE MONITORING WELLS AT EAST MOUNT ZION COMPARED TO DRINKING WATER STANDARDS AND CRITERIA[c]

Metals	Average Concentration (µg/L)	Well Location with Reasonable Worst Case Concentrations	Reasonable Worst Case Concentrations[b] (µg/L)	MCL (µg/L)	Lifetime Health Advisory (µg/L)	SMCL (µg/L)
Arsenic	1.3	EA-4D	1.8	50		
Barium	25	EA-5D	46	1,000		
Cadmium	2.8	EA-3D	5.8	10		
Iron	5,450	Test Well	29,448[a]			300
Lead	2.6	EA-2S	3.8	50		
Manganese	1,460	EA-3S	7,310[a]	5[d]		50
Mercury	0.10	EA-6D	0.15	2		
Nickel	12.5	EA-5D	24		150	
Zinc	17	EA-1S	60			5,000
Volatiles						
Vinyl chloride	1.4	EA-6D	3	2		
Benzene	1.1	EA-4D	5.3	5		
Chlorobenzene	4.1	EA-4D	23		300	
Ethylbenzene	1.0	EA-1D	2		680	
Xylenes, o- & p-	1.0	EA-1D	1.2		400	
Semivolatiles						
1,4-Dichlorobenzene	2.3	EA-4D	12.7 75			

(a) This concentration represents one single sampling event for the well and is not an average.
(b) Reasonable worst case concentrations are the highest average concentrations in any one well. Individual well concentrations were determined by averaging the samples collected from each particular well.
(c) This table presents only those chemicals for which MCLs, HAs, or SMCLs are available.
(d) Proposed MCL.

AR301460

TABLE 4

GROUND-WATER CONCENTRATIONS DETECTED IN ONSITE MONITORING WELLS AT EAST MOUNT ZION COMPARED TO DRINKING WATER STANDARDS AND CRITERIA[c]

Metals	Average Concentration (µg/L)	Well Location with Reasonable Worst Case Concentrations	Reasonable Worst Case Concentrations[b] (µg/L)	MCL (µg/L)	Lifetime Health Advisory (µg/L)	SMCL (µg/L)
Arsenic	1.3	EA-4D	1.8	50		
Barium	25	EA-5D	46	1,000		
Cadmium	2.8	EA-3D	5.8	10		
Iron	5,450	Test Well	29,448[a]			300
Lead	2.6	EA-2S	3.8	50		
Manganese	1,460	EA-3S	7,310[a]	5[d]		50
Mercury	0.10	EA-6D	0.15	2		
Nickel	12.5	EA-5D	24		150	
Zinc	17	EA-1S	60			5,000
Volatiles						
Vinyl chloride	1.4	EA-6D	3	2		
Benzene	1.1	EA-4D	5.3	5		
Chlorobenzene	4.1	EA-4D	23		300	
Ethylbenzene	1.0	EA-1D	2		680	
Xylenes, o- & p-	1.0	EA-1D	1.2		400	
Semivolatiles						
1,4-Dichlorobenzene	2.3	EA-4D	12.7 75			

(a) This concentration represents one single sampling event for the well and is not an average.
(b) Reasonable worst case concentrations are the highest average concentrations in any one well. Individual well concentrations were determined by averaging the samples collected from each particular well.
(c) This table presents only those chemicals for which MCLs, HAs, or SMCLs are available.
(d) Proposed MCL.

AR301461

TABLE 5

ESTIMATED DAILY INTAKES AND RISK VALUES FOR CONTAMINANTS DETECTED IN GROUND WATER AT EAST MOUNT ZION

Metals	Well Location[g]	Concentration Average (µg/L)	Concentration RWC[f] (µg/L)	Estimated Daily Intake Average (mg/kg/day)	Estimated Daily Intake Maximum (mg/kg/day)	RfD (mg/kg/day)	Hazard Index Average	Hazard Index Maximum	Cancer Potency Factor (mg/kg/day)$^{-1}$	Carcinogenic Risk Average	Carcinogenic Risk Maximum
Arsenic	EA-4D	1.3	1.8	3.7E-5	5.1E-5				1.8E+0	6.7E-5	9.3E-5
Barium	EA-5D	125	46	7.1E-4	1.3E-3	5E-2	1.4E-2	2.6E-2			
Cadmium	EA-3D	2.8	5.8	8.0E-5	1.7E-4	5E-4	1.6E-1	3.4E-1			
Manganese	EA-3S	1,460	7,310[a]	4.2E-2	2.1E-1	3E-1	2.0E-1	1.0E+0			
Mercury	EA-6D	0.10	0.15	2.8E-6	4.3E-6	3E-4[b]	9.5E-3	1.4E-2			
Nickel	EA-5D	12.5	24	3.6E-4	6.9E-4	2E-2	1.8E-2	3.4E-2			
Thallium	EA-6D	1.2	2.0	3.4E-5	8.0E-5	7E-2	4.9E-4	1.1E-3			
Tin	Test Well	5.0	13.3[a]	1.4E-4	3.8E-4	6E-1	2.0E-4	6.3E-4			
Zinc	EA-1S	17	60	4.8E-4	1.7E-3	2E-1	2.4E-3	8.5E-3			
Volatiles											
Vinyl chloride	EA-6D	1.4	3	4.0E-5	8.6E-5				2.3E+0	9.2E-5	2.0E-4
Methylene chloride	EA-2S, EA-3D, EA-6D	1.0	1.3	2.8E-5	3.7E-5				1.64E-3[c]	4.6E-8	6.1E-8
Acetone	EA-5D	4.4	8.3	1.2E-4	2.4E-4	1E-1	1.2E-3	2.4E-3			
Carbon disulfide	EA-4D	4.8	14.7	1.4E-4	4.2E-4	1E-1	1.4E-3	4.2E-3			
1,1-Dichloroethane	EA-6D	1.0	5.3	2.8E-5	1.5E-4				9.1E-2	2.5E-6	1.4E-5
trans-1,2-Dichloroethene	EA-6D	0.6	1.2	1.7E-5	3.4E-5				9.1E-2	1.6E-6	3.1E-6
Benzene	EA-4D	1.1	5.3	3.1E-5	1.5E-4				2.9E-2	9.1E-7	4.4E-6
Chlorobenzene	EA-4D	4.1	23	1.2E-4	6.6E-4	3E-2	3.9E-3	2.2E-2			
Ethylbenzene	EA-1D	1.0	2.0	2.8E-5	5.7E-5	1E-1	2.8E-4	5.7E-4			
Xylenes, o- & p-	EA-1D	1.0	1.2	2.8E-5	3.4E-5	2E+0	1.4E-5	1.7E-5			
Ethyl ether	EA-1D	1.0	4.3[d]	5.1E-5	1.2E-4	9E-1	1.0E-4	2.4E-4			

Source of RfDs and carcinogenic potency factors: U.S. EPA 1989a and b.

(a) This concentration represents one single sampling event and is not an average
(b) No distinction was made as to whether mercury was in the organic or inorganic form. Therefore, the RfD for organic (methyl) mercury was used instead of the RfD for inorganic mercury because it is lower, i.e., more protective.
(c) The carcinogenic potency factor for methylene chloride is currently undergoing review within EPA. A revised potency factor of 1.64E-3 is being considered. EPA staff have indicated that the revised potency factor is the most appropriate one to use at this time (U.S. EPA 1989c).
(d) No instrument detection limit was available for ethyl ether. Therefore, the value for a non-detected sample was assumed to be zero for purposes of averaging the numbers.
(e) No RfD was available for 2-methylnaphthalene, but based on its similarity to naphthalene, the RfD for naphthalene was used as a substitute.
(f) Reasonable worst case (RWC) concentrations are the highest concentrations in one well averaged over different sampling periods.
(g) Well location of reasonable worst case concentration

RH3D1462

TABLE 5(EXTENDED)

Metals	Well Location[g]	Concentration Average (µg/L)	Concentration MAC[f] (µg/L)	Estimated Daily Intake Average (mg/kg/day)	Estimated Daily Intake Maximum (mg/kg/day)	RfD (mg/kg/day)	Hazard Index Average	Hazard Index Maximum	Cancer Potency Factor (mg/kg/day)$^{-1}$	Carcinogenic Risk Average	Carcinogenic Risk Maximum
Semivolatiles											
1,4-Dichlorobenzene	EA-4D	2.3	12.7	6.5E-5	3.6E-4				2.4E-2	1.6E-6	8.6E-6
Benzoic acid	EA-4D	1.3	3.7	3.7E-5	1.1E-4	4E+0	9.3E-6	2.8E-5			
Naphthalene	EA-4D	1.1	2	3.1E-5	5.7E-5	4E-1	7.8E-5	1.4E-4			
2-Methylnaphthalene	EA-4D	1.6	8	4.6E-5	2.3E-4	4E-1[e]	1.1E-4	5.8E-4			
Diethylphthalate	EA-2M	5.0	6	1.4E-5	1.7E-4	8E-1	1.8E-4	2.1E-4			
Di-n-butylphthalate	EA-2M	1.3	4.3	3.7E-5	1.2E-4	1E-1	3.7E-4	1.2E-3			
Bis(2-ethylhexyl) phthalate	EA-1D	15.4	66	4.4E-4	1.9E-3				1.4E-2	6.2E-6	2.7E-5
Pesticides											
Endosulfan sulfate	EA-5D	0.012	0.020	3.4E-7	5.8E-7	5E-5	6.8E-2	1.6E-2			
TOTAL							4.8E-1	1.5E+0		1.7E-4	3.8E-4

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TABLE 6

MAXIMUM ESTIMATED DAILY INTAKES AND RISK VALUES FOR CONTAMINANTS DETECTED IN DOMESTIC WELLS AT EAST MOUNT ZION

Metals	Maximum Residential Concentration (µg/L)	Well Location	Estimated Daily Intake (mg/kg/day)	RfD (mg/kg/day)	Hazard Index
Barium	87.3	3508 Deininger	1.6E-3	5E-2	3.2E-2
Chromium	21.7	3885 Ridgewood	6.2E-4	5E-3[b]	1.2E-1
Manganese	563	3508 Deininger	1.6E-2	2E-1	8.0E-2
Mercury	1.6	3906 Druck Valley	4.6E-5	3E-4[c]	1.5E-1
Nickel	21.4	3692 Druck Valley	6.1E-4	2E-2	3.0E-2
Thallium	1.4	3801 Ridgewood	4.0E-5	7E-2	5.7E-4
Tin	20.7	3508 Deininger	5.9E-4	6E-1	9.8E-4
Zinc	45.6	3623 Ridgewood	1.3E-3	2E-1	6.5E-3
Semivolatiles					
Di-n-butylphthalate	6		1.7E-4	1E-1	1.7E-3
TOTAL					4.2E-1

Source of RfDs and carcinogenic potency factors: U.S. EPA 1989a and b.

(a) Non-residential wells include the Old Park Well and the Monitor Well.
(b) No distinction was made as to whether the chromium was in the hexavalent or trivalent form. Therefore, the RfD for hexavalent chromium was used instead of the RfD for trivalent chromium because it is lower, i.e., more protective.
(c) No distinction was made as to whether mercury was in the organic or inorganic form. Therefore, the RfD for organic (methyl) mercury was used instead of the RfD for inorganic mercury because it is lower, i.e., more protective.

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TABLE 6

EXTENDEND

Metals	Maximum Non-residential Concentration[a] (µg/L)	Well Location	Estimated Daily Intake (mg/kg/day)	Hazard Index
Barium	28.4	Monitor Well	6.4E-4	1.3E-2
Chromium	31.3	Monitor Well	8.9E-4	1.8E-1
Manganese	75.6	Monitor Well	2.2E-3	1.1E-2
Mercury	ND			
Nickel	25.3	Old Park Well	7.2E-4	3.6E-2
Thallium	1.0	Old Park Well	2.9E-5	4.1E-4
Tin	29	Old Park Well	8.3E-4	1.4E-3
Zinc	432.9	Old Park Well	1.2E-2	6.0E-2
Semivolatiles				
Di-n-butylphthalate	ND			
TOTAL				3.0E-1

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TABLE 7

CONCENTRATIONS (µg/L) OF COMPOUNDS DETECTED IN DOMESTIC WELLS AT EAST MOUNT ZION COMPARED TO DRINKING WATER STANDARDS AND CRITERIA (µg/L)

Metals	Range for Residential Wells	Range for Non-residential Wells[a]	MCL	Lifetime Health Advisory	SMCL
Barium	ND-57.3	1.1-22.4	1,000		
Chromium	ND-21.7	ND-31.3	50		
Copper	ND-331	22.7-511	1,300(b)		1,000
Iron	ND-7,538	3,448-4,768			300
Lead	ND-14.6	7.0-99	50		
			5[b]		
Manganese	6.3-543	12.7-75.6			50
Mercury	ND-1.6	ND-0.28	2		
Nickel	ND-21.4	ND-25.3		150	
Thallium	ND-1.4	0.7-1.0			
Tin	ND-20.7	11.4-29.0			
Zinc	ND-65	ND			5,000
Semivolatiles					
Di-n-butylphthalate	ND-6	ND			

(a) Non-residential wells include the Old Park Well and the Abandoned Well.
(b) Proposed MCL.

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TABLE 8

AVERAGE GROUND-WATER AND LEACHATE CONCENTRATIONS (µg/L) AND APPROPRIATE WATER QUALITY CRITERIA (µg/L)

	Ground Water	Leachate	MCLs or Proposed MCLs	Water Quality Criteria: Acute EPA	Acute PaDER	Chronic EPA	Chronic PaDER	Human Health EPA	Human Health PaDER
Vinyl Chloride	1.4	ND	2	--	--	--	--	2	0.02
Benzene	1.[illegible]	ND	5	640	--	120	--	1	--
Chlorobenzene	4.1	ND	--	250*	1,180	50*	236	488*	20
Ethylbenzene	1.0	ND	700	32,000	3,900	--	580+	--	1400
Xylenes	1.0	4	10,000	1,120	1,055	763	211	--	300+
1,4-Dichlorobenzene	2.3	ND	--	--	730	--	146	--	400
Phthalate Esters	--	--	--	940	--	3	--	--	--
Aluminum	70	ND	--	750	--	87	--	--	--
Antimony	ND	ND	--	1005	--	219	--	145	--
Arsenic	1.3	ND	50	360	--	190	--	50	--
Barium	25	100	1000	--	20,500	--	4,100	--	1,000
Beryllium	ND	ND	--	130	--	5.3	--	0.007	--
Cadmium	2.0	ND	10	3.9-8.6**	--	1.1-2.0**	--	2.0	10
Chromium	<1	ND	100	1716-3116**	--	221-381**	--		170,050
Copper	<1	68	--	18-34**	--	12-21**	--	1000	--
Iron	5450	ND	--	--	--	1000	--	300	--
Lead	2.6	2.7	50	82-200**	--	3.2-7.7**	--	50	--
Manganese	1460	737	--	--	--	--	--	--	--
Mercury	0.1	0.3	2	2.4	--	0.012	--	0.144	--
Nickel	12.5	ND	--	1400-2500**	--	160-280**	--	632	--
Zinc	17	21	--	120-210**	--	110-190**	--	5000	--

* Chlorinated benzenes water quality criteria.
** Hardness based criteria; assumes hardness 100 mg/L to 200 mg/L as $CaCO_3$.
\+ Proposed PaDER criteria.

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Table 9 DESCRIPTION OF EVALUATION CRITERIA

Overall Protection of Human Health and the Environment - addresses whether or not a remedy will: cleanup a site to within the risk range; result in any unacceptable impacts; control the inherent hazards (e.g., toxicity and mobility) associated with a site; and minimize the short-term impacts associated with cleaning up the site.

Compliance with ARAR's - addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statues and/or provide grounds for invoking a waiver.

Long-term Effectiveness and Permanence - refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume through Treatment - refers to the anticipated performance of the treatment technologies that may be employed in a remedy.

Short-term Effectiveness - refers to the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Implementability - describes the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Cost - includes the capital for materials, equipment, etc. and the operation and maintenance costs.

Support Agency Acceptance - indicates whether, based on its review of the RI, FS and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

Community Acceptance - will be assessed in the Record of Decision following a review of the public comments received on the RI, FS, and the Proposed Plan.

TABLE 10

FEDERAL ACTION SPEICIFIC ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
*Resource Conservation Recovery Act	42 U.S.C. 6901-6987			
Standards Applicable to Generators of Hazardous Waste	40 C.F.R. Part 262 Subparts A-E	Establishes standards for generators of hazardous waste	No/Yes	ARAR for Alterantives 4 and 5, if remedial action alternative involves offsite transportation of either soil or source material for treatment or disposal.
Standards Applicable to Transporters of Hazardous Waste	40 C.F.R. Part 263	Establishes Standards which apply to transporters of hazardous waste within the U.S.	No/Yes	ARAR for Alternative 4 and 5. If remedial action involves offsite transportation of soil or source material for treatment or disposal.
Placement of Waste in a Land Disposal Unit	40 C.F.R. Part 268	Establishes land disposal restrictions for hazardous waste	No/Yes	ARAR for Alternatives 4 and 5. Would be applicable if waste was determined to be RCRA waste and waste was to be placed in a landfill unit.
Standards Applicable for landf[illegible]	40 C.F.R. Section 264.110-120	Establishes standards for clo[illegible] of landfills	No/Yes	ARAR for Alternative 3.
Standards Applicable to incineration of hazardous waste	40 C.F.R. Section 264.340-351	Establishes standards for incinerators	No/Yes	ARAR for Alterative 4.

* Since the waste has not yet been characterized [illegible] RCRA hazardous waste, the standards are [illegible] not a[illegible]licable. However, since hazardous subst[illegible]es are involved, the standards are relev[illegible]t and appropriate.

TABLE 10 (EXTENDED)

FEDERAL ACTION SPECIFIC ARARS

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Discussion
Occupational Safety and Health Act	29 U.S.C. 1910 & 1926	Regulates worker health and safety in industry and construction.	Yes/No	ARAR for Alternatives 3,4, and 5. Under 40 C.F.R. 360.38, requirements, of the Act apply to all response activities under the NCP.
	29 CFR 1910-120 or 54 FR 9294	Health and Safety standards for employees engaged in hazardous waste operations.	Yes/No	Applies to all response activities. ARAR for Alternatives 3,4, and 5.
Hazardous Materials Transportation Act	49 U.S.C. 1801-1813			
Hazardous Materials Transportation Regulations	49 C.F.R. Parts 107, 171-177	Regulates transporation of hazardous materials.	Yes/No	Only if an alternative developed would involve transportation of hazardous materials. ARAR for Alternative 4 and 5.

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TABELE 10 (EXTENTED)

STATE ARARs

Standard, Requirement Criteria, or Limiation	Citation	Description	Applicable/ Relevant and Appropriate	Discussion
		CHEMICAL-SPECIFIC ARARs		
Pa Water Quality Criteria	25 Pa Code Chapter 93.1 et.seq.	Establishes water quality criteria as determined by the discharge point and point of first aquatic use	No/Yes	WQCs for contaminants of concern are relevant and appropriate for alternatives 3,4,and 5.
Pa Air Quality Standards	25 Pa Code Chapter 123.1(c)	Establishes requirements for fugitive dust emissions	Yes/No	ARAR for alternatives 3,4, and 5. Applicable since fill will be regraded or excavated.
"Background" Quality for Ground Water	25 Pa Code Chapter 75.264(n)	Hazardous substances in ground water must be remediated to "background" quality	Yes/No	ARAR for alternative 3,4, and 5 since contaminants of concern exceed background
		ACTION-SPECIFIC ARARs		
Pa Municipal Waste Regulations	25 Pa Code Chapter 271.113	Applies to closure of municipal landfills	Yes/No	ARAR for alternative 3
	25 Pa Code Chapter 283.303	Establishes requirements for municipal waste incineration	Yes/No	ARAR for alternative 4. Applicable since remedial action takes place after effective date of regulation
Construction, Modification, Reactivation and Operation of Sour	25 Pa Code Chapter 127.12	Establishes requirements for municipal landfill gas venting and incineration	Yes/No	ARAR for alternative 3 and 4

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TABLE 11

SUMMARY OF CAPPING COSTS

LIGHT CLEAR AND GRUB	$28,000
HEAVY CLEAR AND GRUB	$25,100
EXCAVATION AND REGRADING OF 20,000 CY WASTE	$284,000
7,000 CY FILL	
- MATERIAL	$38,150
- DELIVERY	$130,550
- BACKFILL/COMPACT	$23,870
GAS VENTING SYSTEM	$7,000
30 MIL MEMBRANE	$113,256
GEONET	$121,968
GEOTEXTILE	$48,400
FINAL COVER	
- MATERIAL	$201,875
- DELIVERY	$602,395
- BACKFILL/COMPACT	$110,143
REVEGETATION	$16,553
STORMWATER MANAGEMENT	$25,000
TOTAL	$1,776,660
ASSUME	$1,800,000
FENCING	$45,000
GROUNDWATER MONITORING - FIRST YEAR(QUARTERLY)	$100,000
GRAND TOTAL	$1,945,000
GROUNDWATER MONITORING -SUBSEQUENT YEARS FOR 30 YEARS	$25,000 (ANNUALLY)

PRESENT WORTH COST FOR 30 YEARS AT 8% = $2,230,000

RESPONSIVENESS SUMMARY

This community relations responsiveness summary is divided into the following sections:

Section I — Overview - A discussion of EPA's preferred remedial alternative and the public's response to this alternative.

Section II — Background of Community Involvement and Concerns - A discussion of the history of community interest and concerns raised during remedial planning activities at the East Mt. Zion Superfund Site.

Section III — Summary of Major Comments Received During the Public Comment Period and Agency Responses - A summary of comments and responses categorized by topic.

I. OVERVIEW

EPA's preferred alternative for the East Mt. Zion Site is Alternative 3 as outlined in EPA's Proposed Remedial Action Plan.

Under this alternative an impervious cap would be placed on the landfill. The cap would provide a relatively impermeable barrier to infiltration, thereby minimizing the potential for leaching of contaminants into the groundwater. Surface water controls would be included in the cap design. This alternative would also include groundwater monitoring to ensure the effectiveness of the cap and to monitor the natural attenuation of the contaminants in the groundwater. Groundwater sampling will be performed and analyzed quarterly the first year, and annually thereafter. A formal review of the site will be conducted within five years. If during this time, additional contamination is detected, the risk posed by that contamination would be determined and appropriate action taken. Deed restrictions and construction of a chain-like fence would be included as components of this alternative to limit future use of the Site and restrict access to the Site.

Based on currently available information, EPA anticipates this alternative will be protective of human health and the environment.

During the public comment period, all written comments regarding the selection of a remedial alternative were received from law firms representing potentially responsible parties. These comments focused on the preference for the no action alternative and raised specific questions on various aspects of the RI/FS report.
A public meeting was held on May 30, 1990 and comments from residents at the meeting centered around who was responsible for

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the costs of the clean up, future use of the Site, and any possible health effects to residents. Limited comments were made at the public meeting concerning EPA's preferred alternative. Since the current human health risk is negligible, several residents did question why action needed to be taken. EPA staff explained that their goal is also to protect the environment and that was the main concern at the Site.

II. BACKGROUND OF COMMUNITY INVOLVEMENT AND CONCERNS

Community interest in the East Mount Zion Superfund Site dates back to the 1970's when a group of citizens first expressed concern about the landfill to their local officials. Since that time, community concern and involvement have grown.

In 1983 EPA conducted a Preliminary Assessment and Site Inspection at the Site. The Site Inspection revealed trace levels of trichloroethylene in groundwater samples. Benzene was reported in a leachate sample, and dichlorobenzene was found in a leachate and pond sediment samples.

When these findings threatened to hold up the construction of the Doersam Woods housing development, residents and officials voiced their concerns and participated in public meetings. Major concerns expressed at that time related to stagnant pools of water around the landfill, debris which had worked its way to the surface of the landfill, and contamination of the area water supply.

In 1986 Springettsbury Township installed a municipal water supply. While this eased community concern to a degree, some residences along portions of Druck Valley and Ridgewood Roads are still using ground water obtained from private wells.

These concerns, along with comments about EPA's preferred alternative, and EPA's responses are described below.

III. SUMMARY OF MAJOR COMMENTS RECEIVED DURING THE COMMENT PERIOD AND AGENCY RESPONSES.

Comments raised during the East Mt. Zion Superfund Site public comment period on the RI/FS and the Proposed Remedial Action Plan are summarized below. The comment period was held from May 18, 1990 to June 18, 1990. The comments are categorized by relevant topic.

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EPA's Preferred Alternative

1. At the public meeting, a question was raised as to what happens with the water that is running off the landfill and whether or not it was getting into residents' wells or into the different streams in the Rocky Ridge Park.

   EPA Response: While the runoff is going into the different streams, the contaminant levels are within acceptable ranges. EPA's preferred alternative calls for putting an impermeable cap over top of the landfill and thus prevent surface water from getting into the landfill and contaminating the deep aquifer. The leachate areas will be eliminated as a result of capping the Site.

2. A concern was raised as to whether EPA's preferred alternative would present any dangers to residents and what safeguards would be in place to monitor emissions.

   EPA Response: A decision will be made during the remedial design stage as to whether it is necessary to construct a cap over the entire Site or whether a partial cap is sufficient. In addition, modeling has been done to estimate the volatile emission and it is expected to be insignificant. Nor are significant dust emissions expected. Also, monitoring will be done during implementation of the remedial action.

3. A question was raised on the life expectancy of the synthetic liner, the type of liner to be used and whether the cap has been used before.

   EPA Response: The life expectancy of the synthetic liner is in excess of 50 years. There are also clay materials that meet the same permeability requirements that synthetic materials do and this is something that would be looked at during the remedial design stage. Capping is an established technology which is often used for closing municipal and hazardous waste sites.

4. A comment was raised on the FS, specifically, would a more technically adequate RI reveal significant differences in the nature and extent of contamination and thus generate a different remedial design alternative.

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EPA response: EPA feels that this RI represents a technically adequate investigation and that the findings have allowed the Agency to assess the remedial alternatives and select the best option. Additionally, there will be continuing monitoring and review of data annually to assess the performance of the selected alternative.

5. A comment was raised that the design parameters for the selected remedial alternative are not adequately supported and, in some cases, have not been evaluated at all., i.e. methane extraction is proposed but the volume of methane gas generation is not discussed.

EPA response: The design parameters for the selected alternative will be developed during the design phase of the remedial process. Specifics concerning methane generation and the development of a collection and venting system will be addressed during this next phase of the process.

Remedial Alternative Preference

1. A comment was made that the recommended alternative be Alternative No. 6 due to its lowest cost or the No Action alternative.

EPA response: See response to comment #2 below. Specifically, the regrading option was evaluated in the detailed analysis section of the FS.

2. A comment was made that the recommended alternative be No Action or Limited Action Alternative No. 1.

EPA response: All the alternative remedial action scenarios were evaluated according to the screening and detailed analysis requirements of the National Contingency Plan (NCP) and the alternative that provided the best overall acceptance of the nine criteria was selected. One single criteria is not highly weighted, but each are considered separately. Community and state acceptance, implementability, long term effectiveness, as well as cost are considered. Alternative number 3, capping and methane venting, was selected as the alternative that best fulfilled all the criteria.

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3. At the public meeting, a question was raised as to whether in situ treatment was considered.

EPA Response: The feasibility study did look at some in situ treatments. However, it was determined that they either were not feasible or insufficient evidence existed on their effectiveness; thus they were screened out.

Remedial Investigation/Feasibility Study

1. A comment was made on the sampling results and the compounds driving the action.

EPA response: Anytime there is a sampling result which indicates that the maximum contaminant level (MCL) has been exceeded, the EPA is triggered into taking an action to evaluate the cause and likely extent of the contamination. At this site the MCL was exceeded for vinyl chloride and benzene, which are the compounds that have triggered the action.

Sampling results of specific wells over a three-round sampling period, for both arsenic and vinyl chloride were evaluated by using an averaging technique involving identifying 1/2 the detection limit when there was a non-detect during a sampling occasion.

2. A comment was made as to the ARARs (applicable or relevant and appropriate requirements), i.e., that the Pennsylvania Municipal Waste Management Regulations are not an ARAR as they did not go into effect until 1988.

EPA response: Because the regulation is presently in effect all cleanup options or actions at the Site must consider the regulation as an ARAR. The Pennsylvania Municipal Waste Regulations are an ARAR for capping and closure due to non compliance with the Solid Waste Regulations in effect at the time initial closure was ordered.

3. A comment was made that the Feasibility Study does not set forth the specific monitoring requirements associated with any of the remedial alternatives.

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EPA response: Sampling costs are an important item in the present worth analysis of all the alternative options. Specific monitoring procedures may not have been documented in the FS but estimates were provided for the range of associated costs involved with monitoring programs related to each alternative.

4. Comments were raised concerning the mismanagement of data collection, failure to adjust to field conditions, and failure to collect an optimal amount of information via a particular method.

- mismanagement of data collected

EPA response: Aerial photography was used to evaluate past waste disposal practices and assist in scoping the work at the Site. Specifically, a 1955 image was reviewed to identify site conditions and activities at the earliest stage.

Geophysical techniques are a standard practice used to remotely assess subsurface site conditions. A range of techniques are usually selected to provide overlapping and supporting data that can be analyzed individually to provide confirmation (or negative evidence) of an evaluation. At a highly disturbed and complex site, such as a landfill, resistivity and conductivity surveys provide a "gross" analysis of physical aspects of site conditions, the extent of disturbed conditions, and an approximation of the direction or trend of potential offsite migration of contaminated fluids. In short geophysics are one of the many tools used at a site for characterization, with the potential to provide valuable data. At this site, geophysical data was used to help decide on the location of selected soil borings.

Ground water mounding was proposed at the site and is based on two lines of evidence: (1) contamination was identified in the deep monitoring wells on both the "upgradient" perimeter wells and in the "downgradient" monitoring wells, and (2) professional judgement and evaluation that mounding commonly occurs below saturated landfills and surface impoundments.

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Subsurface data was collected during drilling; including one rock core, that was completely described, descriptions of lithology, based on cuttings and presented on boring logs, and additional data provided by drilling rates. Fracture analysis was provided by data from the core description, and evaluation of the subsurface flow characteristics. Fracture analysis was helpful in monitoring well placement. Soil and borehole logs were prepared for the report and are available.

The test borings in the fill were grouted almost immediately after sampling to protect the health and safety of the public. This was necessary because of excess methane levels, sometimes exceeding 60%.

The purpose of the pump test at the site was to demonstrate the hydrologic interconnection between the different flow zones and to identify any potential hydrogeologic barrier that would restrict flow at the site. The pump test was successful in both these areas: showing the response in all three bedrock flow zones and by indicating that a barrier does exist, that affects the amount of recharge or flow to the site, thereby defining a limited aquifer. Specific aquifer characteristics, such as accurate storage coefficient and transmissivity values, would have been an extra piece of information for the site, but this data may not be needed with the alternative selected.

5. Comments were made concerning the development of poor analytical data.

EPA response: Field analytical results such as pH, specific conductivity, temperature and the results of method blanks should have been included in the appendix of the RI report. This information is reported in Section 2 of the report in Tables 2-5, 2-6, and 2-7.

The phthalates, reported from many of the field samples also were reported from the method blanks, indicating possible laboratory contamination.

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All the composite sampling of the waste indicates an iron rich metalliferous waste. Inorganic and organic analyses are presented in the RI indicating the compounds may leach from the waste into the ground water.

Compositing can effect the results of volatiles and semi-volatiles, however, for indicating the characterization of the waste, compositing is a reliable indicator of the potential for all compounds that may migrate from the waste.

Detection limits are presented for the organics on Table 6-2 and for inorganics in the tables of Appendix G. Appendix G presents the results as they were reported while tables 4-1 to 4-11 report results that are corrected for detections in field, trip, or rinsate blanks. Modifiers, "B" and "U" are defined on most of the tables in the Appendix and the text.

Early in the investigation, it was decided to use the method of subtracting the concentrations detected in field blanks from the sample results and reporting the final result. Both the raw results and the reported results are included in the RI report.

The lack of a QA/QC section in the RI report is a shortcoming. The QA/QC data is available, and the analytical results on field blanks is presented in Appendix G.

6. Comments were received concerning the failure to report or collect significant information. Examples of this include:

- decontamination procedures

EPA response: Decontamination procedures are presented in the Field Operations Plan (FOP).

- procedures for compositing

EPA response: These procedures are presented in the FOP or Field Sampling Plan and in Table 2-2 of the RI for waste characterization.

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- no documentation of PID readings or how taken

EPA response: The methods for taking PID reading and the frequency of taking the reading are in the Quality Assurance Project Plan (QAPjP) or the FOP. The results should be available in the field logbook.

- poor detail in lithology for monitoring wells.

EPA response: Boring logs for all the wells are prepared and detailed core log was prepared for well EA-1D. This information is available.

- rock quality designation (RQD) collected but not reported

EPA response: RQD was prepared for the core from well EA-1D and is available on the core log.

- background concentrations not cited

EPA response: Soil background concentrations are presented in Section 4, Tables 4-8 and 4-9.

- no detection limits on analyses tables

EPA response: Detection limits are presented in other sections of the report and in the Sampling and Analysis Plan.

7. Comments were received concerning specific comments in the remedial investigation report.

Page 2-19: "Each Monitoring Well Was Developed By Air Surge Method." Air surging when sampling for volatile or semi-volatile organics is highly inappropriate in that air could volatilize many of the organics in the ground water and subsequent samples could be unrepresentative.

EPA response: Sampling of the monitoring wells took place long after development. This time lag allowed the wells to re-equilibrate to the surrounding ground water conditions and the samples are representative of those conditions. At this site, sampling events took place several months after development.

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Page 2-30: "Typically, corrections are made when drawdown in the pumping well exceed(sic) 20 percent of the total saturated thickness..." No case was made in the text that the saturated thickness of any of the water-bearing zones was of a definite thickness. A correction for 20 percent of the undefined thickness is inappropriate.

EPA response: EPA agrees that 20% of an undefined thickness is inappropriate. However, the corrections this statement refers to are for an unconfined water table condition with a known thickness of saturated aquifer. The drawdown in the pump test at the site did not use this 20% correcting value.

Page 2-24 to 2-38: The analyses of the ground water and the analytical section has many problems. Without going into detail, the analysis presented is not sufficiently supported by good data and the arguments and correction factors used to justify the poor results render the results very questionable.

EPA response: EPA disagrees with the final conclusion of this comment. The raw results are presented in Appendix G, including the analytical data for the trip and field blanks.

Page 3-13: Re: Test borings in fill; "..., borings were not left open a sufficient amount of time to allow for water level stabilization ... to keep methane expulsion to a minimum." "Nonetheless, it can be assumed that the majority of the fill is saturated at least on a seasonal basis." There is no basis for this assumption.

EPA response: EPA disagrees. The fill material was partially saturated during the field investigation and based on projection, during a wet season the fill would continue as partial to fully saturated.

Page 3-14: "... a northeast-southwest trending trench is apparent in the east-central portion of the site. This feature is illustrated on the isopachous map by the 10-, 15-, and 20-foot isopach contour configurations." Looking at the map, this appears to be a bench.

EPA response: The contours show the distribution of thickness of waste as interpreted from geophysical soundings. The change in contours in a northeast to southwest trend shows a

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thickening of waste, which may represent a trench.

Page 3-15: "Ash material, incendiary in nature, is also prevalent throughout (the fill)." Knowing that part of the proposed remediation is exhumation and regrading, this statement had best be explained and proven. There is no ignitability testing reported in this report. This could present a significant hazard if regrading of the landfill is part of the remediation.

EPA response: The selected alternative does not include excavation, nor removal of the waste materials in the landfill. If areas of the landfill need to be excavated during regrading, then ignitability testing will be part of the design phase.

Page 3-18: "...Drilling cuttings and drill stem advancement rates were the only method of lithology identification for these boreholes." Very poor methodology. This was done for all monitoring wells except one.

EPA response: The description of the drill cuttings was compared to the detailed core description prepared for well EA-1D.

"Semischist" is not a rock type.

EPA response: EPA agrees with this comment.

Page 3-21: "On the basis of this information, well EA-1D was located at the intersection of 2 linears just north of the site." There is no mention of whether they thought they had intersected these linears and there was certainly no basis for comparison with other test borings.

EPA response: The well location was selected to test an area with the potential for intercepting fractures. Fracture analysis of the site indicated fractures were present and may affect the flow of ground water. One objective of well location EA-1D was to detect fracture and a second objective was to provide a means to determine if the flow zones were interconnected. The density of the fractures encountered were reported on page 3-39 and 3-42.

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Page 3-27: This section presents a discussion of leachate generation and the fact that landfill is unlined and in direct contact with bedrock and residual soil. Recognition of this fact and the assumption that significant amounts of leachate is generated during wet weather periods is reasonable, but can not be substantiated by the data generated in this report.

EPA response: EPA believes that it is reasonable to assume that leachate is generated during wet weather and could contact the saturated bedrock.

Page 3-20: "Based on unforeseen conditions encountered during the drilling and installation of EA-1D and EA-2D a modification in deep well design was implemented." Section 2.1.6.2 details the drilling activities at the two wells when it was realized that there was water cascading into the wells from fractures above the zones they proposed to monitor. An attempt was made to grout these zones, EA-1D was lost, had to be grouted shut and was redrilled; EA-2D was converted to a medium depth well. In view of the discussion on page 3-27, cited previously, there were indications in the field that shallow to medium depth water-bearing units existed and only one well was completed in order to investigate the intermediate zone. This is a very poor response to some significant information.

EPA response: The major aquifer in this area, and the one commonly supplying water to the residents in the area is the deep zone. One of the prime objectives of the investigation was to determine if this zone was contaminated.

Page 3-31: "...Water-bearing fractures were common throughout the entire cored sequence, indicative of some degree of vertical hydraulic interconnection. It was also anticipated that even the shallow (seasonal) perched water within the overburden/saprolite may, in part, eventually migrate vertically towards the deeper zone. If this was truly anticipated, it went unheeded during the planning stage of this project.

EPA response: This information was developed after the drilling and coring of well EA-1D. The planning stage of the projects was mostly complete at this time, however one of the reasons for drilling at location EA-1D was to determine the interconnection provided by the

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proposed fractures. This objective was developed in the planning stage.

Page 3-33: "Deterministic characterization of the hydraulic properties of the fracture system was not within the scope of work." The paragraph following this sentence goes on to make unsupported assumptions about the fracture system for purposes of characterizing the aquifer.

EPA response: The main objective of the investigation was not to determine accurate hydraulic properties of the fracture system but to determine how the fracture network affected the site hydrogeology. Some of the assumptions concerning the fracture are based on professional judgement.

Page 3-34: "...Potentiometric level fluctuations greater than 40 feet were observed." This may be due to the fact that more than one water-bearing zone is being monitored in the deep zone. No distinct zones were shown in this report.

EPA response: This magnitude of potentiometric level fluctuation can occur as recharge conditions change and the levels are reaching a new equilibrium. Another explanation for this change in water level is that the site is located near a ground water divide and there is a limited aquifer to resupply to zone beneath the site.

Page 3-37: "Recovery data were non existent in wells EA-3D, EA-4D, and EA-5D, and incomplete in wells EA-6D, EA-7D and EA-1D." This statement gives us an indication that the pumping well EA-1D was over pumped and the aquifer never approached a steady state condition. As a result, calculations of transmissivity, storativity and permeability are of doubtful accuracy.

EPA response: See response to comment #4 of this section.

Page 3-40: "The shallow ground water zone is in direct hydraulic communication with water mounded beneath the landfill." This is an important concept if it is correct; there is no data to substantiate this statement.

EPA response: See response to comment #4 of this section.

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Page 3-41: "No effort was made to construct a water table map of the shallow zone since waste characterization boring water levels were inconsistent and taken at a time before the shallow wells were installed." A missed opportunity to obtain information that would substantiate the claim that there is radial flow to the underlying water-bearing zones below the fill. This observation hints at the possibility that the landfill may contain distinct zones, some saturated, others not. This would naturally be important information to collect, and was not done on this project.

EPA response: EPA understands that, if the field circumstances concerning methane gas problems were different, ground water elevation measurements of test borings in the fill at the same time as measurements in the shallow wells would have been a good opportunity to demonstrate the potential mounding effect. The test borings in the fill had to be grouted because they posed a hazard. EPA also understands that at any disturbed site there might be zones of differing saturation as well as different permeabilities. However, this information does not affect the selected remedy.

Page 3-43: "Intermediate depth water-bearing zones were also encountered during several other deep well drilling operations at locations EA-7D, EA-6D, and EA-4D, ... intervals were encountered at 62-72, 47, and 38 feet, respectively. EA-7 was the only location to exhibit a significant yield from this intermediate zone." A second, intermediate water-bearing zone is for all purposes encountered and ignored. Significant flow is recognized. This section does not mention the intermediate zones encountered in EA-1D and EA-2D.

EPA response: Only one of the deep wells reported significant yield from the intermediate zone, well EA-7. The other four wells did not find the important flow that would characterize a major flow zone. One intermediate well was installed in this intermediate zone, well EA-2M.

Page 3-44: "It is uncertain whether the drop in water level in EA-2M during the 72 hours pumping test was associated with pumping or was a result of local water table lowering." This is an apparent effort to explain away the fact that the intermediate depth well responded better than the shallow wells during the pumping test. The shallow wells responded,

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but to a lesser degree. This information reveals that EA placed only one well in the "intermediate zone," the one hydrostatigraphic zone of greatest vulnerability.

EPA response: EPA does not agree with the last statement. There is no evidence that the intermediate zone is a major flow zone or that it is at greatest vulnerability. This zone was monitored and did respond to pump tests in the lower aquifer, demonstrating some interconnection between the two zones.

Page 3-46, 47: "The vertical flow patterns at the site are not well defined. Vertical gradients within the deep zone were not characterized. Vertical migration from the shallow zone to deeper zones is evident and is the primary source of ground water recharge to the deep zone." The three sentences all occur in the same paragraph. This continues EA's pattern of statements continuously being made with no information to back it up. The conclusions appear reasonable, but no effort was made to see if they are correct.

EPA response: EPA disagrees with the format of this comment. The statements were taken out of context of the paragraph in which they occur. Each statement is followed by an explanation of the methods or limited analysis used to assess the site conditions.

Page 5-1: "In summary, waste characteristics for organic compounds identified include ...bis(2-ethylhexyl)phthalate (310,000 ug/kg)." This phthalate was found in method blanks and is a common laboratory contaminant. It is Remcor's understanding that this phthalate was left out of the contaminants of concern mentioned during the EPA meeting on May 30, 1990.

EPA response: EPA agrees that phthalate is a common laboratory contaminant and that this high concentration was detected in sample Comp 3RE of test boring number four. EPA feels that while the phthalate is of concern, it was not the compound that triggered the site response action. Benzene and vinyl chloride are the two important compounds that have triggered the action.

Page 5-1: "Elevated metal concentrations were observed...iron (939,000 mg/kg). Obviously a piece of metal was collected in the sample, and the laboratory analyzed it and found it to

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consist of 93.9% iron. Metal fragments are to be expected in landfill.

EPA response: EPA agrees that metal fragments are expected in a landfill. Sampling in a complex landfill can identify metalliferous waste.

Page 5-1: "...The primary mechanisms of contaminant loading into the surround environments is leachate generation from water percolating into the fill." There is no data available regarding the waters in the fill nor is there any leachate derived from the fill collected.

EPA response: Water levels were observed in the test boring in the fill. There are diversion ditches and pond to control the water (leachate) that seeps out near the border of the slope. Two leachate seeps, one at the southeast corner and one at the western slope of the fill, were sampled during the investigation.

Page 5-3: "The intermediate zone is not really extensive, as it was not encountered in all monitoring well borings." This statement contradicts information in previous sections.

EPA response: EPA disagrees with this comment. Previous sections discuss the extent and hydrologic flow characteristic of the intermediate zone across the site.

Page 5-3: "The deeper water-bearing zone...is under semi-confined conditions." There is no data to substantiate this information.

EPA response: EPA agrees that the word "semi-confined" may be a misleading term.

Page 5-3, 4: "...The ground water transport scenario is composed of...pulsed leachate generation...radial flow away from the landfill...the intermediate ground water zone...appears not to be an important transport mechanism...however...data suggests that water in the immediate zone moves downward to deeper water zones." It is important in the three items characterizing the ground water flow below the fill, not one statement can be substantiated by information collected during the ground water investigation.

EPA response: Water level data, boring logs, a core description, and hydrographs all suggest there

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is a dominant vertically downward migration of infiltration.

Page 5-5: "The relative absence of volatile compounds above detectable levels in the shallow wells suggests that the majority of leachate is migrating vertically rather than...moving laterally in the shallow zone,...detailed modeling of ground water transport is not warranted at this site." This states the case that the monitoring of the intermediate zone is of paramount importance in determining ground water flow and comes to the conclusion that it is not important; when in truth there was so little significant information collected. No modeling is possible.

EPA response: EPA disagrees. As the report states, the low-level of volatiles detected in the monitoring wells proximal to the site, would not justify a costly, data intensive ground water flow or transport model.

- Pages 1-9 and 1-20 - Manganese was not proven to be site related.

EPA response: Manganese does occur in the sample results from the waste and the groundwater. The association with the site may not be proven but seems to be indicated.

8. A comment was raised on the available technologies for site remediation.

- Pages 2-6 and 2-7 - Permitting is discussed during the ARARs presentation, but actual permit requirements for the site were not presented.

EPA response: The discussion refers to the requirement for an NPDES permit to discharge the effluent from onsite ground water treatment processes. The selected alternative does not require pumping or treating of ground water so the actual permit requirements are not fully presented.

- Pages 2-12 - The remedial objective for vinyl chloride and benzene have been met for two of three sampling rounds. More information is required before certain benzene and vinyl chloride concentrations become the remedial goal of the site.

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EPA response: Continued monitoring of the ground water at the site, after implementation of the selected alternative will determine the effectiveness of the actions in reaching the remedial goals.

- Page 2-14 - Technologies are supposed to be initially screened on implementability only. A second screening then accounts for administrative implementability, effectiveness, and cost. This procedure was not followed.

EPA response: The procedures for evaluating potential remedial alternatives is presented in the RI/FS Guidance (Oct. 1988). The initial screening of alternatives involves three criteria: implementability, effectiveness, and cost.

- Page 2-17 - The 30-mil listed in the capping technology is not in accordance with current guidance documents.

EPA response: The 30-mil lining is exactly what is required by the Pennsylvania municipal landfill regulation. A recent EPA technical guidance document (EPA 530-SW-89-047) lists a 20-mil minimum thickness for these liners.

- Page 2-19 - Vertical and horizontal barriers are not technically implementable at this site.

EPA response: EPA agrees

- Page 2-26 - The excavation and disposal option for 300,000 cubic yards (yd^3) of material is unrealistic.

EPA response: EPA agrees.

- Page 2-26 - Cost should also include:

  - Excavation
  - Soil erosion and sediment controls
  - Regrading site at completion
  - Site administration
  - Air controls
  - Design (engineering cost).

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EPA response: EPA agrees that these are valid costs to be considered for the excavation option. During the screening review of alternatives, basic costs are considered for each option and compared to the basic costs for the other alternatives.

- Page 2-26 - Daily cover would be required over the excavated portion of the landfill to comply with Pennsylvania municipal waste regulations.

EPA Response: EPA agrees.

- Page 2-27 - Incineration did not consider sorting the wastes.

EPA Response: EPA does not agree. During the discussion of remedial section alternatives, on page 3-5 the issue of bulk items was discussed.

- Page 2-28 - Several important points were neglected when considering in-situ vitrification ISV including:

  - Is power available to perform this project?
  - The technology does not work below the water table.
  - Metals in the landfill could prohibit the use of this technology.
  - The short-term hazards are high.
  - The cost of in-situ vitrification is typically $400 to $500 per yd^3 and not $100 to $250 per yd^3, as is assumed.

EPA response: All these items are important considerations to assess the implementability of ISV. EPA recognizes these issues and considered the ISV alternative as a costly, and impractical alternative for this site.

- Page 2-31 - Ground water pumping and treatment will only l[illegible]t the mobility of the contaminants in the fracture s[illegible]ms intercepted by the wells. This will do nothing t[illegible]mediate the perched ground water.

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EPA response: EPA agrees with this comment. Ground water pumping with either onsite or offsite treatment would require additional "design-phase" site assessment wells.

9. A comment was made that the alternatives presented are not in full compliance with Pennsylvania municipal landfill closure regulations unless daily cover, etc is to be included in the action.

   EPA response: EPA agrees that all alternatives would indeed require a daily cover placed on the exposed site to bring the alternative into compliance with the regulation. Some of the alternatives have a cover already designed in the option, such as the selected alternative.

10. Alternative numbers changed identification numbers going from Chapter 3 to Chapter 4. It is difficult to follow the text due to this detail.

    EPA response: This is regrettable, EPA hopes there were no major problems.

11. A limited action alternative entitled regrading was added to the list of alternatives but was not discussed in the previous chapters.

    EPA response: This is true; the limited action alternative is, as the name implies, a slightly different version of the no action alternative. Because of the slight difference between the two options the limited action alternative was assumed to pass the screening review and was considered only under the detailed review.

12. Page 4-6 - The use of the word "sponge" is not a technical term.

    EPA response: EPA agrees, but as a conceptual aid, the term describes the processes and occurence of fluids within a landfill.

13. Page 4-8 - Costs are lower than Remcor's recent experience with FSs would indicate. Several factors have not been considered, specifically:

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- Wastes must be sorted prior to incineration

- The longer construction schedule reduces efficiency, therefore, increases cost

- Engineering costs have not been included

- Site administration costs have not been included.

EPA response: The identified costs associated with each alternative are just estimates based on the range of acceptable cost associated with construction activities developed at other Superfund sites. The cost factor for each alternative is one component of the selection process that is evaluated in a relative sense to the other potential alternatives.

14. A comment was made that the conceptual cap grades and sections are not realistic for placing a multi-layer cap over the landfill.

EPA response: EPA considers these comments to be design considerations and will properly address all specific design parameters during the design phase. The final grade at the site will meet the requirements of Pennsylvania municipal landfill regulations. The diagrams presented in the FS report were presented as conceptual aid to understand the proposed remedial action.

15. A comment was made that the assumption that the waste being partially saturated will lower the dust emissions is not realistic; as soils are exposed and handled, they will dry quickly.

EPA response: The EPA agrees with this assessment. The selected alternative's design and implementation will include a plan for dust control activities.

16. A comment was made that there will be increased mobility of contaminants, not decreased, as the landfill will be exposed for four years, and the surface will be irregular.

EPA response: EPA agrees that in the short term, during the four years of excavation proposed under the

source removal alternative, there would be increased mobility of contaminants due to wind erosion and ponding on the irregular surface of the landfill. However, the selected alternative will not excavate materials, and contamination will last less than two years.

17. A comment was made that the RI/FS failed to procure an adequate basis for evaluating remedial alternatives.

EPA response: EPA disagrees with this comment. The RI identified the critical site characterization data needed to evaluate the potential remedial alternatives. All the criteria, referenced in the NCP, were reviewed for each option and with state concurrence. The best overall alternative was selected.

18. A question was raised as to what the ambient air tests showed.

EPA Response: No contamination was detected.

19. Residents asked if there was a possibility of offsite contamination.

EPA Response: From the information currently available, there appears to be no offsite contamination above any kind of risk levels. The only contamination found was immediately adjacent to the Site and no one is drinking that water.

20. A question was raised as to whether there was any testing for dioxins and what the results of such testing showed.

EPA Response: A high level dioxin test was done and no dioxin was found. It is not a significant concern at this time.

Risk Assessment

1. Page 1-9 - The selection of parameters and justification for their use in determining risks can be questioned. Use of the instrument detection limit (IDL) has no bearing on risk assessment. Vinyl chloride and 1,1-dichloroethane do not belong in the risk assessment because they were found in both upgradient and downgradient wells.

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EPA response: At this site the "upgradient" wells are most likely affected, at least infrequently, by contaminants from the site because of possible mounding of the shallow ground water. There are no other potential sources of contaminants in the "upgradient" direction, that being towards the top of the ridge.

2. Page 1-13 - Ingestion of ground water (drinking water) was the only significant human health exposure route identified and is not adequately developed.

EPA response: EPA disagrees with the comment that the ingestion exposure route was not adequately developed.

3. Page 1-14 - Carcinogen risks are driven by compounds that are significantly below maximum contaminant levels (MCLs). Bis(2-ethylhexyl)phthalate is the only compound that belongs in the risk assessment.

EPA response: EPA feels that the compounds driving the potential risk at this site are vinyl chloride, benzene, and arsenic.

4. A comment was made on the calculation of the average and worst case exposure concentrations and the analysis based on those calculations.

EPA response: In evaluating and interpreting analytical sampling results, it is common practice to treat non-detect or less than limit of detection events as 1/2 the detection limit (EPA, RCRA TEGD 1986.) Additionally the arithmetic average (or mean) of the concentration is regarded as a reasonable estimate of the concentration likely to be contacted over the exposure period (EPA Risk Assessment Guidance Volume 1 December 1989).

5. A comment was made on the conservatism of the risk assessment in the use of worst-case assumptions to analyze the risk to human health, e.g., the worst-case scenario that monitoring wells at the Site perimeter would be used for drinking water and even if they were so used the level of consumption calculated was too high.

EPA response: EPA recognizes that monitoring wells will not be used as drinking water wells, however these

wells demonstrated that groundwater contamination exists outside the landfill perimeter boundary. The assumption that the concentration of contaminants detected below the site serves as a worst-case scenario for potential risk to future use of the aquifer.

Worst case assumptions concerning ingestion of groundwater at a rate of 2 liter per day for 70 years was the conventional standard used for risk assessments as of late 1988. By March 1989, reasonable worst-case exposure scenarios used an average ingestion rate of 1.4 liters per/day for only 30 years. This is the average ingestion rate and length of time people live in a single house. This analysis has no impact on the alternative that has been chosen for the site.

6. A comment was made on the use of the methodology for potential excess cancer risk and non-carcinogenic hazard index.

   EPA response: EPA accepts methodology used in this report for potential excess cancer risk and non-carcinogenic hazard index. The procedures used are an acceptable method for risk assessment.

7. A comment was raised as to the accuracy of the Risk Assessment based on questions raised on the analytical results.

   EPA response: The assumption that maximum concentrations for all contaminants are located in one well and that on-site wells are used as a drinking water source is a worst-case scenario and the EPA concedes that it is unlikely to occur. However, the risk assessment worst-case analysis is an important step to evaluate the potential range of possible exposure to contaminants and groundwater intakes.

<u>Cost of the Remedial Action</u>

1. A question was raised at the public meeting as to who would be paying for the cost of the remedial action.

   EPA Response: EPA has identified 11 potentially responsible parties and is continuing its efforts to negotiate with these parties regarding the

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cost of the actions taken at the Site. The RI/FS was paid for from "Superfund" through a cooperative agreement with the State. Should the potentially responsible parties not reach agreement with EPA for the remedial design and remedial action, Superfund money would again be used and EPA would then attempt to later recover the costs from these potentially responsible parties.

Future Use of the Site

1. Residents questioned how the Site could be used in the future.

   EPA Response: As part of the remediation the Site, there would be deed restrictions placed on the Site to limit entry and a chain link fence put up to protect the integrity of the cap.

2. A question was raised at the public meeting as to whether or not any future construction activity in the area could have any negative effects.

   EPA Response: Future construction activity would have minimal effect. The remedial action would dry out the landfill and thus eliminate the source of contamination from migrating offsite. In addition, the groundwater will be monitored.

3. A resident asked what the Site would look like upon completion.

   EPA Response: There will be a vegetative cover on top of the cap. It will look like a field with some methane vents.

Remaining Concerns

1. A comment was made that Mr. Clyde Zeigler has been improperly designated as a potentially responsible party.

   EPA response: This is an issue that will be reviewed and evaluated at a later time. At present, this issue does not affect the selection of an appropriate remedial alternative.

2. A comment was made that the East Mount Zion Site has been improperly designated as a Superfund Site on the National

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Priorities List and requested the Site be deleted from the National Priorities List.

EPA response: This is also an issue that will be addressed and determined at a later time. At present this site is on the NPL and has been properly evaluated for remedial action.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

Deputy Secretary
Environmental Protection

717-787-5028

June 29, 1990

Mr. Edwin B. Erickson
Regional Administrator
US EPA, Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Record of Decision (ROD) Concurrence
East Mt. Zion, Springettsburg Twp., York Co.
Final Remedy - Groundwater Remediation

Dear Mr. Erickson:

The Record of Decision for the final remedy will address remediation of groundwater contamination at the site perimeter by eliminating or reducing the risks through engineering and institutional controls.

The major components of the selected remedy include:

1. Install and maintain an impermeable cap over the 10 acre landfill.

2. Install and maintain surface water control systems for the cap.

3. Install and maintain a fence around the site.

4. Monitor groundwater contaminant attenuation after installation of the cap.

5. Initiate a deed notification regarding future activities at the site.

I hereby concur with the EPA's proposed remedy, with the following conditions:

* EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.

* The Department will be given the opportunity to concur with decisions related to the design of the remedial action, to assure compliance with DER design specific ARARs.

* The Department's position is that its design standards are ARARs pursuant to SARA Section 121, and we will reserve our right to enforce those design standards.

* The Department will reserve our right and responsibility to take independent enforcement actions pursuant to state and federal law.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

If you have any questions regarding this matter please do not hesitate to contact me.

Sincerely,

Mark H. McClellan
Deputy Secretary
Environmental Protection