# RECORD OF DECISION

## Emmell's Septic Landfill Site

## Galloway Township, Atlantic County, New Jersey

September 2003

## DECLARATION FOR THE RECORD OF DECISION

### SITE NAME AND LOCATION

Emmell's Septic Landfill
Galloway Township, Atlantic County, New Jersey
EPA ID #NJD980772727
Operable Unit One

### STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Interim Remedy for the Emmell's Septic Landfill site, in Galloway Township, Atlantic County, New Jersey, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record file for this site (see Appendix IV).

The State of New Jersey concurs with the Selected Interim Remedy (see Appendix V).

### ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

### DESCRIPTION OF THE SELECTED INTERIM REMEDY

The interim remedial action described in this document represents the first phase, or operable unit, for the Emmell's Septic Landfill site. This interim remedial action will control further off-site migration of groundwater contaminants near the disposal area of the site while the site-wide Remedial Investigation is being conducted. A final remedy for groundwater contamination and contamination in other media at the site, including any identified source material, will be the subject of future operable units.

The major components of the Selected Interim Remedy include the following:

- Extraction of contaminated groundwater, as necessary to control migration of contaminants off of the site property;

- Treatment of extracted groundwater using a treatment system that will include an air stripper, for removal of volatile organic contaminants (VOCs); and

- Discharge of the treated groundwater to a recharge basin to be constructed at the site, or to an off-site surface water body.

**STATUTORY DETERMINATIONS**

This interim action is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed; complies with (or waives) those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost-effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus supports that statutory mandate. Because this action does not constitute the final remedy for the site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by conditions at this site.

Because this remedy will result in hazardous substances remaining on the site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of the site and remedy will be ongoing as EPA continues to develop remedial alternatives for the site.

**ROD DATA CERTIFICATION CHECKLIST**

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern and their respective concentrations.
- Baseline risk represented by the chemicals of concern.

- Cleanup levels established for chemicals of concern and the basis for these levels. However, because groundwater restoration is not the remedial action objective of this interim action, EPA does not expect this action to achieve these cleanup levels.
- Current and reasonably anticipated future land use assumptions and current and potential future uses of groundwater utilized in the baseline risk assessment and ROD.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factors that led to selecting the remedy.

Implementation of the Selected Interim Remedy will not address potential soil contamination at the site and is not expected to restore groundwater quality. Therefore, no new potential land or groundwater use is expected to result due to implementation of this interim remedy. Furthermore, the Decision Summary clarifies that any remaining source materials which constitute a principal threat will be addressed as part of the final remedy for the site.

Jane M. Kenny
Regional Administrator

9/30/3
Date



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RECORD OF DECISION

DECISION SUMMARY

**Emmell's Septic Landfill Site**
Galloway Township, Atlantic County
New Jersey

U.S. Environmental Protection Agency
Region II
New York, New York
September 2003

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Appendices

## DECISION SUMMARY

### SITE NAME, LOCATION AND DESCRIPTION

The 38-acre Emmell's Septic Landfill (Emmell's) site, EPA ID #NJD980772727, is located at 28 South Zurich Avenue in a predominantly rural area of Galloway Township, Atlantic County, New Jersey. The Emmell's site is bounded on the northwest by Zurich Avenue, residential properties located along Liebig Street to the northeast, and undeveloped and heavily wooded areas to the immediate south (Figure 1). Further to the south and southeast of the site is the Morses Mill Stream and its associated wetlands and surface impoundments. The campus of Stockton State College is located approximately 0.8 mile east of the site. Residents in the vicinity of the site currently have private wells and use groundwater as their primary source of drinking water. The college also uses groundwater as a source of potable water.

The U.S. Environmental Protection Agency (EPA) has been designated as the lead agency for cleanup of the site, with the New Jersey Department of Environmental Protection (NJDEP) functioning in a support role. To date, EPA's investigations and cleanup actions at the site have been conducted using funds from the Superfund trust fund.

### SITE HISTORY AND ENFORCEMENT ACTIVITIES

From 1967 to 1979, the site was used for disposal of septic wastes and sewage sludge which were reportedly disposed of in trenches and lagoons. Other wastes, including chemical wastes, drums of paint sludge, gas cylinders, household garbage, and construction debris, were also disposed of at the site.

An April 1975 solid waste facility permit issued by NJDEP indicated that the site was to be used for land application of septic wastes and sewerage sludge. This permit required that the fields used for waste application be disced (plowed) daily. From 1976 to 1980, a number of enforcement actions were taken by NJDEP concerning disposal activities at the site. Violations were noted for improper disposal of septic wastes, surface pooling of septic waste, and improper registration for disposal of chemical waste. Operations at the site ceased in August 1979.

Sampling conducted at the site in 1984 by NJDEP indicated the presence of soil and groundwater contamination. Also in 1984, the Atlantic County Health Department (ACHD) sampled residential wells in the vicinity of the site. Results of this sampling indicated the presence of elevated concentrations of volatile organic compounds (VOCs) in five residential wells. Concentrations of vinyl chloride, tetrachloroethene (PCE), and trichloroethene (TCE) exceeded EPA's Safe Drinking Water Act Maximum Contaminant Levels (MCLs) in four residential wells located northeast of the site along Lisa Drive. Based on the results of the residential well sampling, the ACHD recommended that the affected wells not be used for cooking or drinking purposes. The contaminated wells were subsequently closed and replaced with deeper wells.

In 1996, NJDEP and consultants for Galloway Township conducted additional investigations at the site. Results for groundwater samples collected from monitoring wells installed by Galloway Township's consultant indicated the presence of VOCs at levels exceeding New Jersey Groundwater Quality Standards (NJGQSs). VOCs were also detected in samples from temporary well points and monitoring wells installed at the site by NJDEP. An Expanded Site Inspection Report prepared for NJDEP in 1997 confirmed the presence of site-related groundwater contamination.

In 1997 and 1998, EPA's Removal Action Branch (RAB) and Environmental Response Team conducted soil and groundwater investigations at the site to evaluate potential sources of VOC contamination found in former residential wells and to determine whether a removal action was warranted. A number of VOCs were detected in soil, soil gas, and groundwater samples, including TCE and its associated degradation products, and various chlorinated benzene compounds. Waste materials, including paint-like substances, sludge, and drums, were observed in test pit excavations. The results of this investigation indicated that waste materials at the site were a continuing source of groundwater contamination.

In May 1999, EPA's RAB collected groundwater samples from 26 residential wells in the vicinity of the site. Sample results indicated the presence of lead in two residential wells at levels exceeding EPA's Action Level. In addition, the methylene chloride concentration in one residential well sample exceeded NJGQSs, but was less than EPA's MCL. In August 1999, EPA's RAB resampled residential wells in the vicinity of the site. Lead was detected at levels in excess of EPA's Action Level in three additional residential wells during this sampling effort. Subsequently, EPA conducted a lead isotope study which concluded that the lead detected in these five wells was attributable to household plumbing rather than the site.

The site was proposed for inclusion on the National Priority List (NPL) in April 1999, and was placed on the NPL on July 22, 1999.

In July 1999, EPA's RAB initiated a removal action at the site to address buried drums and waste material which was continuing to serve as a source of groundwater contamination. This removal action, which was completed in February 2000, resulted in the excavation and off-site disposal of 435 drums, eleven compressed gas cylinders and approximately 28,000 cubic yards of contaminated soil.

EPA issued request for information letters, pursuant to Section 104(e) of CERCLA, to 11 parties in May 1999. The responses to these letters indicated that none of the recipients had substantial involvement with the site. To date, EPA has failed to identify any viable potentially responsible parties for the site.

From February 2000 through May 2003, EPA conducted a Focused Feasibility Study (FFS) involving groundwater contamination at the site. The FFS was intended to evaluate whether it is appropriate to implement an interim remedy for groundwater contamination while the site-wide remedial investigation and feasibility study (RI/FS) is being conducted. During performance of the FFS, EPA sampled residential wells in the vicinity of the site to ensure that residents were not being exposed to elevated levels of site-related contaminants. Based upon the results of residential well sampling, in January 2001, EPA installed a water treatment system at one residence where site-related contaminants were detected at elevated levels. The site-wide RI/FS, which was initiated in March 2002 to evaluate the nature and extent of site-related contamination and to develop appropriate cleanup alternatives, is ongoing.

Groundwater investigations conducted during the FFS indicated that residential wells in the vicinity of the site were in danger of being impacted by site-related groundwater contamination. Therefore, EPA's RAB began connecting these residences to the municipal water supply during the Summer of 2003.

**COMMUNITY PARTICIPATION**

The FFS Report and the Proposed Plan for the site were released to the public for comment on August 6, 2003. These documents were made available to the public in the administrative record file maintained at the Atlantic County Library, Galloway Township Branch, and at the EPA Region II Records Center in New York City. The notice of availability for these documents was published in The Press of Atlantic City on August 6, 2003. A public comment period on these documents was held from August 6, 2003 through September 5, 2003.

In addition, on August 13, 2003, a public meeting was conducted at the Galloway Township Municipal Building to discuss the findings of the FFS and to present EPA's Proposed Plan to local officials and the community. At this meeting, EPA representatives answered questions about the remedial alternatives developed as part of the FFS. Comments which were received by EPA during the public comment period are addressed in the Responsiveness Summary (see Appendix III).

**SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION**

EPA intends to address the cleanup of the site by implementing removal actions to address situations which present an imminent threat to human health, and a long-term cleanup. Removal actions which have been implemented to date include: the removal of 435 drums and their contents, eleven compressed gas cylinders and approximately 28,000 cubic yards of contaminated soil from the disposal area of the site; and the installation of water treatment systems for two residences impacted by site-related groundwater contaminants above health-based levels. In addition, EPA is currently connecting 35 residences threatened by site-related groundwater contamination to the municipal water supply.

The long-term cleanup will be conducted in at least two discrete phases, or Operable Units. Operable Unit One (OU1), which is the subject of this ROD, will provide for implementation of an interim groundwater remedy to control further off-site migration of groundwater contaminants near the disposal area of the site while the site-wide RI is being conducted. Implementation of the OU1 remedy will help to mitigate the migration of site-related groundwater contamination and, therefore, reduce the likelihood of additional residential wells being impacted by site-related contamination while the RI is being performed. The interim remedy selected in this ROD will be consistent with the final cleanup action(s) selected for this site.

EPA anticipates that future Operable Unit(s) will select a final remedy for groundwater contamination, and contamination of other media at the site, including any source materials identified during the performance of the RI.

## SITE CHARACTERISTICS

In general, the topography in the area of the site is flat and slopes toward the southeast. Surface water infiltrates into the ground very rapidly due to the well sorted sandy soil on the site. Consequently, there is little runoff from the site and there are no well-defined overland drainage pathways from the site to nearby surface waters. Overall, drainage in the area of the site is to the southeast toward the Atlantic Ocean. A small wetland area, consisting exclusively of phragmites, is present at the site. This wetland area will be delineated as part of the site-wide RI.

The site is generally rural and is surrounded by heavily-wooded areas and residential properties. Water in the vicinity of the site is supplied by private water wells. The Richard Stockton College of New Jersey (College) is located to the southeast within a mile of the site; dormitories are located within 0.5 mile of the site. The College has two supply wells located approximately one mile southeast of the site which supply water to the College.

Galloway Township, which encompasses 115 square miles, has a population of approximately 23,330 people. Approximately 100 people live within one-half mile of the site.

### Geology

The site is located within the New Jersey Coastal Plain Physiographic Province. The Coastal Plain geology is composed of a seaward (eastward)-thickening wedge of unconsolidated sediments, which ranges in thickness from zero feet on the northwestern margin of the Coastal Plain to more than 6,000 feet at the Atlantic Ocean shoreline. The Coastal Plain strata dip gently to the east and southeast from 10 feet per mile in the Upper Cenozoic strata to 60 feet per mile in the Lower Cenozoic strata.

The two significant formations in the site's vicinity are the Cohansey Sand and the underlying Kirkwood Formation. The combined thickness of these two formations is over 400 feet and production wells in the area typically are installed in either of these two formations, with the Cohansey Sand being the aquifer more commonly tapped, since it is shallower. The results of the FFS investigations indicate that the lithology in the vicinity of the site is dominated by yellow to brownish gray to gray fine to medium sand. In addition, finer-grained layers (silt and clay) were also encountered.

Three hydrostratigraphic units were identified during the FFS based on the site geology: the shallow zone (land surface to approximately -30 feet mean sea level [msl]), the low permeability layer (approximately -30 to -40 feet msl), and the deep zone (below approximately -40 feet msl). Typically, a fine-grained low permeability layer may act as a confining or semi-confining unit to the movement of water. However, site investigations indicate that the low permeability layer is less than 5 feet thick or absent between the disposal area and the eastern site boundary. Therefore, the low permeability layer is not considered to be a semi-confining or confining unit. This determination is supported by the results of hydrogeologic testing conducted during the FFS, as well as chemical data which indicates the presence of site-related VOCs in groundwater samples collected from both the shallow and deep zones of the aquifer.

**Groundwater Screening Investigation**

From March 7 through 28, 2001, a total of 185 groundwater screening samples were collected in the shallow zone of the aquifer from 24 locations along 5 north-south trending transects oriented perpendicular to the estimated groundwater flow direction, and from 2 additional locations selected to provide further definition of the groundwater contaminant plume (see Figure 2). To establish the vertical contaminant profile, at each groundwater screening location, one groundwater sample was collected at a depth of approximately 2 feet below the water table and at 10-foot intervals to the top of the low permeability zone. The groundwater screening samples were analyzed for VOCs using an on-site laboratory.

The results of the groundwater screening indicated the presence of a groundwater contaminant plume, comprised of VOCs, in the shallow zone of the aquifer beneath and to the east of the former landfill. VOCs detected in the groundwater screening samples can be grouped into three main categories: chlorinated VOCs associated with the degradation of trichloroethene; the petroleum-related compounds benzene, toluene, and xylene; and several di- and tri-chlorinated benzene compounds. Specifically, VOCs detected during the groundwater screening program included: vinyl chloride; 1,1-dichloroethene; trans-1,2-dichloroethene; 1,1-dichloroethane; 1,2-dichloroethene; 1,2-dichloroethane; 1,1,1-trichloroethane; trichloroethene; 1,1,2-trichloroethane; toluene; benzene; o-xylene; chlorobenzene; 1,3-dichlorobenzene; 1,2-dichlorobenzene; 1,4-dichlorobenzene; and 1,2,4-trichlorobenzene.

Based on the groundwater elevation data collected during the investigation, groundwater flow in the shallow zone of the aquifer is eastward. Furthermore, as the groundwater contamination migrates eastward, it appears to be migrating downward, toward the top of the low permeability layer. Most site-related contamination detected during the groundwater screening program was present in samples collected at 60 feet below ground surface (bgs) and deeper. Due to the depth limitations of the direct push drilling technique used to collect the groundwater screening samples, screening samples were not collected below the low permeability layer.

**Monitoring Wells**

As part of the FFS, 11 monitoring wells were installed at 8 locations; 6 wells were installed in the shallow zone of the aquifer and 5 wells were installed in the deep zone (see Figure 2). Monitoring well locations were selected based upon the results of the groundwater screening investigation and available geologic information.

Two rounds of groundwater samples were collected from site monitoring wells during the FFS. In December 2000, groundwater samples were collected from 12 existing monitoring wells which were installed during previous site investigations. In December 2001, groundwater samples were collected from 24 monitoring wells, including the 11 newly-installed monitoring wells and 1 existing monitoring well that was located after the December 2000 sampling round. Groundwater samples during both sampling rounds were analyzed for Target Compound List (TCL) VOCs, semivolatile organic contaminants, pesticides and polychlorinated biphenyls, and inorganics. Groundwater screening criteria were developed for these compounds by using the more stringent of the Federal MCL, New Jersey MCL, or the NJGWQS for Class I-PL groundwaters, and are summarized in Table 1.

During the first sampling round, almost all VOCs detected above screening criteria in the shallow zone of the aquifer were found in wells NJDEP-MW1 and NJDEP-MW2, which are located 800 and 1,300 feet east of the site's property line. In particular, vinyl chloride, cis-1,2-dichloroethene (cis-1,2-DCE) and TCE were detected at concentrations of 3000 parts per billion (ppb), 2100 ppb and 9 ppb, respectively, in samples collected from well NJDEP-MW1 during this sampling round. Furthermore, vinyl chloride and cis-1,2-DCE were detected at concentrations of 330 ppb and 410 ppb, respectively, in samples collected from well NJDEP-MW2 during this sampling round. These concentrations exceeded the screening criteria established for vinyl chloride, cis-1,2-DCE and TCE of 2 ppb, 2 ppb and 1 ppb, respectively.

Similarly, during the second sampling round, VOCs were detected above screening criteria in the shallow zone primarily in samples collected from wells NJDEP-MW1 and NJDEP-MW2. During this sampling round, vinyl chloride, cis-1,2-DCE and TCE were detected in the samples collected from well NJDEP-MW1 at concentrations of 2700 ppb, 5000 ppb and 11 ppb, respectively. Vinyl chloride, cis-1,2-DCE and TCE were detected in the samples collected from well NJDEP-MW2 during this sampling round at concentrations of 370 ppb, 340 ppb and 9 ppb, respectively.

During the first sampling round, primary metal contaminants were not detected in shallow zone monitoring wells located downgradient of the site property. However, lead was detected at a concentration of 10.9 ppb in the sample collected from on-site well CH-MW7 during this sampling round, which exceeds its screening criterion of 10 ppb. In addition, chromium was detected at a concentration of 16.1 ppb in the sample collected from well CH-MW6, which exceeds its screening criterion of 10 ppb.

During the second sampling round, primary metal contaminants were detected at their highest concentrations in the shallow zone in the sample collected from on-site well CH-MW7. Specifically, chromium, lead, nickel, arsenic and antimony were detected at concentrations of 280 ppb, 140 ppb, 140 ppb, 99 ppb and 13 ppb, respectively, in the sample collected from this well. It should be noted, however, that of these contaminants, only chromium and nickel were detected above applicable screening criteria in samples collected from shallow zone monitoring wells located downgradient of the site property. Lead was also detected at a concentration of 21 ppb in the sample collected from on-site shallow zone well CH-MW6 during this sampling round.

During the first sampling round, three VOCs exceeded their screening criteria in samples collected from the deep zone of the aquifer. Cis-1,2-DCE, 1,1-dichloroethane and 1,1,1-trichloroethane were detected at concentrations of 17 ppb, 1.6 ppb and 1.3 ppb, respectively, in the sample collected from well REAC-MW-101 during this sampling event, which exceed the applicable criteria of 2 ppb, 1 ppb, and 1 ppb, respectively. The primary inorganic contaminants arsenic, chromium and nickel were also detected at concentrations in excess of their screening criteria during this sampling round.

During the second sampling round, 15 VOCs were detected above their screening criteria in samples collected from wells screened in the deep zone of the aquifer downgradient of the site property line. Vinyl chloride, cis-1,2-DCE, chlorobenzene and 1,1-dichloroethane were detected at concentrations of 360 ppb, 250 ppb, 95 ppb and 50 ppb, respectively. In addition, 1,1-dichloroethene, benzene, 1,1,1-trichloroethane, xylenes, TCE, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, cyclohexane, 1,2-dichlorobenzene, 1,1,2-trichloroethane, and chloroethane were detected above their screening criteria. Furthermore, the primary inorganic contaminants nickel, lead and chromium were detected at concentrations up to 150 ppb, 13 ppb and 25 ppb, respectively, in samples collected from deep zone wells during this sampling round.

**Residential Wells**

During performance of the FFS, three rounds of samples were collected from residential wells in the vicinity of the site. These residential well samples were analyzed for TCL VOCs and metals.

Samples collected from these residential wells during all three sampling rounds did not indicate the presence of VOCs at levels in excess of MCLs established for drinking water.

Samples collected from residential wells during the first sampling round indicated the presence of arsenic in excess of its MCL in 10 of the 30 residences sampled. The maximum detected concentration of arsenic during this sampling round was 13.6 ppb, which exceeds the applicable MCL of 10 ppb. In addition, lead exceeded EPA's action level of 15 ppb in samples collected from three wells, with a maximum detected concentration of 61.8 ppb.

During the second residential well sampling round, lead was detected above EPA's action level in samples collected from four residences, with a maximum detected concentration of 33 ppb. Similarly, during the third residential well sampling round, lead exceeded EPA's action level in samples collected from six residences, with a maximum detected concentration of 190 ppb.

**Summary**

Based upon review of all data generated during the FFS, it is apparent that VOCs are the primary groundwater contaminants at the site. This data also indicates that a plume of VOC contamination, consisting primarily of chlorinated VOCs associated with the degradation of trichloroethene; the petroleum-related compounds benzene, toluene, and xylene; and several di- and tri-chlorinated benzene compounds; extends from the site property eastward beyond Lisa Drive. As the groundwater contaminant plume moves east, it moves downward toward the low permeability layer. Furthermore, the presence of elevated levels of site-related VOCs in groundwater samples collected from monitoring wells screened in the deep zone of the aquifer indicates that site-related contaminants are migrating into the deep zone of the aquifer.

**CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES**

Land Uses: Currently, the site property is abandoned. The site is located in a relatively rural area of Galloway Township, with only residential use of land in the vicinity of the site. Therefore, future residential use of the site is anticipated.

Ground and Surface Water Uses: Currently, groundwater in the vicinity of the site is used for potable purposes. Although EPA is currently connecting residences in the immediate vicinity of the site to the municipal water supply, the groundwater contaminant plume may continue to migrate and threaten additional potable wells located downgradient of the site.

## SUMMARY OF SITE RISKS

Human Health Risk Assessment:

As part of the FFS process, a baseline Human Health Risk Assessment (HHRA) was developed to characterize potential health risks associated with ingestion of groundwater in the area surrounding the site, if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

As indicated above, land use in the vicinity of the site is predominantly residential and is expected to remain so in the future. Furthermore, groundwater in the vicinity of the site is currently utilized as a potable water source by residences and the Richard Stockton College of New Jersey. Therefore, potential receptors of impacted groundwater were assumed to be future residents who obtain water from either the shallow or deep zones of the aquifer in the vicinity of the site. Potential receptors also include current residents near the site with private wells drawing water from the deep zone of the aquifer.

Potential receptors of contaminants in groundwater at the site may be exposed through ingestion of or dermal contact with contaminated groundwater. Residents may also be exposed by inhalation of VOCs in groundwater during washing, bathing, showering, laundering or cooking. While all of these exposure pathways are potentially complete, EPA chose to evaluate only the ingestion pathway in the HHRA, because EPA believed that the potential risk associated with this pathway alone would be unacceptable to EPA. Therefore, while evaluation of only the ingestion pathway may underestimate potential risk due to exposure to contaminants in groundwater, inclusion of other potentially completed pathways would not change the conclusions of the HHRA.

The HHRA evaluated cancer risks and non-cancer hazards for future adult and child residents using groundwater from the shallow and the deep zone of the aquifer; and current and future adult and child residents using water from existing private wells in proximity to the site. Several of the residents near the site have installed water softeners or other water treatment systems to remove compounds, such as calcium, magnesium, iron or lead, from their water prior to use. Therefore, the HHRA evaluates risks due to exposure to both treated and untreated water from existing private wells. As previously indicated, EPA is currently conducting a removal action to connect residences in the vicinity of the site to the municipal water supply. Therefore, any current site-related risks due to use of water from existing private wells in close proximity to the site should be mitigated in the near future.

There are numerous chemical contaminants present in groundwater beneath the site. To determine which chemicals are of concern at the site for purposes of the risk assessment, each chemical detected was compared against risk-based screening levels. In addition, detection frequency, chemical toxicity and history of detected chemical concentrations were considered in identification of chemicals of concern. The chemicals of concern for the shallow and deep zones of the aquifer and for treated and untreated private well water are presented in Tables 2a-2d. The concentrations of the chemicals of concern to which people might be exposed, known as the exposure point concentrations, are also presented in Tables 2a-2d.

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

Risk = CDI x SF

where: risk = a unitless probability (e.g., $2x10^{-5}$) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$.

These risks are probabilities that usually are expressed in scientific notation (e.g., $1x10^{-6}$). An excess lifetime cancer risk of $1x10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is $10^{-4}$ to $10^{-6}$. The potential cancer risks associated with exposure to site contaminants in groundwater and residential well water are presented in Tables 5a-5h.

EPA's risk analysis indicates that total excess lifetime cancer risk for residential use of groundwater from the shallow zone of the aquifer for the reasonably maximally exposed population is $3 \times 10^{-2}$ (three in one hundred), assuming exposure for a period of 30 years. The cancer risk for the average exposure is $9 \times 10^{-3}$ (nine in one thousand). Both risks are greater than EPA's acceptable risk range and are primarily associated with exposure to vinyl chloride.

Total excess lifetime cancer risk for residential use of groundwater from the deep zone of the aquifer for the reasonably maximally exposed population is $6 \times 10^{-3}$ (six in one thousand). The cancer risk for the average exposure is $2 \times 10^{-3}$ (two in one thousand). Both risks are greater than EPA's acceptable risk range and are primarily associated with exposure to vinyl chloride.

EPA also calculated cancer risk associated with exposure to untreated water from private wells, using the results from water samples collected in December 2000, June 2001 and December 2001. The cancer risk for the reasonably maximally exposed population is $3 \times 10^{-4}$ (three in ten thousand). The cancer risk for the average exposure is $1.3 \times 10^{-4}$. Both risks are marginally greater than EPA's acceptable risk range and are primarily associated with exposure to arsenic.

Cancer risk associated with exposure to treated water from private wells for the reasonably maximally exposed population is $3 \times 10^{-4}$ (three in ten thousand). The cancer risk for the average exposure is $8.9 \times 10^{-5}$. Therefore, the risk to the reasonably maximally exposed population using treated water from private wells is marginally greater than EPA's acceptable risk range and is primarily associated with exposure to arsenic. However, arsenic was only detected in private wells during the December 2000 sampling event. Therefore, these calculations likely overestimate cancer risk associated with ingestion of untreated and treated water from private wells.

The potential for non-carcinogenic effects was evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ < 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemicals of concern that affect the same target organ or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI < 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where:

CDI = chronic daily intake
RfD = reference dose.

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term). The HIs and HQs associated with exposure to site contaminants in groundwater and residential well water are presented in Tables 5a-5h.

For residents exposed to groundwater from the shallow zone of the aquifer, the HI for the reasonably maximally exposed individual is 45 for adult residents and 100 for child residents. The HI for average exposure is 31 for adult residents and 73 for child residents. All of these HIs are above the threshold of 1 for non-cancer effects. Based on these HIs, there is the potential for non-cancer health effects to occur from residential use of groundwater from the shallow zone of the aquifer at the site.

For residents exposed to groundwater from the deep zone of the aquifer, the HI for the reasonably maximally exposed individual is 8 for adult residents and 17 for child residents. The HI for average exposure is 6 for adult residents and 17 for child residents. All of these HIs are above the threshold of 1 for non-cancer effects. Based on these HIs, there is the potential for non-cancer health effects to occur from residential use of groundwater from the deep zone of the aquifer at the site.

For residential exposure to water from treated and untreated private wells, total risks across chemicals (i.e., HIs) were not calculated because risks associated with exposure to each chemical were estimated using the maximum detected concentrations from different private wells. Residents would not be routinely exposed to water from multiple wells.

For residents exposed to untreated water from private wells, two HQs for reasonably maximally exposed individuals exceeded 1, indicating a potential for non-cancer health effects. The HQs which exceeded 1 were the HQs for arsenic for adults (HQ=1.2) and children (HQ=2.9). The HQ for arsenic also exceeded 1 for children under average exposure assumptions.

For residents exposed to treated water from private wells, two HQs for reasonably maximally exposed individuals exceeded 1, indicating a potential for non-cancer health effects. The HQs which exceeded 1 were the HQs for arsenic for adults (HQ=1.2) and children (HQ=2.7). The HQ for arsenic also exceeded 1 for children under average exposure assumptions. As noted above, arsenic was only detected in private wells during the December 2000 sampling event. Therefore, these calculations likely overestimate non-cancer risk associated with ingestion of untreated and treated water from private wells.

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

<u>Discussion of Uncertainties</u>

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

- environmental sampling and analysis
- exposure parameter assumptions
- toxicological data

Uncertainty in environmental sample analysis may stem from errors inherent in the analytical methods and characteristics of the matrix being sampled. Additional uncertainty is associated with chemicals reported in samples at concentrations below the reported quantitation limits, but still included in the analysis. These values are estimated and may result in the over- or under-estimation of risk.

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

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

Ecological Risks:

Performance of an ecological risk assessment was determined to be unnecessary to support selection of the interim remedy. Therefore, potential ecological risks will be assessed as part of the future operable unit(s) for this site.

**REMEDIAL ACTION OBJECTIVE**

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are developed considering exposure routes; human, ecological, and environmental receptors; protection of ground water resources; and potential future land use. The RAO established for this interim action is:

- Prevent or minimize further migration of groundwater contamination beneath the site property (source control).

New Jersey groundwater regulations and Federal and New Jersey State primary drinking water regulations are applicable or relevant and appropriate requirements (ARARs) for this interim action. Therefore, Preliminary Remediation Goals (PRGs) for each groundwater contaminant have been identified as the most stringent of these requirements.

As stated in the RAO, the goal of this action is hydraulic source control, not groundwater restoration. Therefore, the effectiveness of this interim action will be determined by evaluating potentiometric data and water quality data to ensure that hydraulic plume control is being maintained.

**DESCRIPTION OF ALTERNATIVES**

CERCLA generally requires that the selected site remedy be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances. It should be noted, however, that CERCLA allows for the selection of interim remedies that will not attain ARARs, where the final remedy will attain ARARs upon completion.

The FFS evaluates in detail three remedial alternatives to achieve the RAO established for this interim action. Since this is an interim action, it has been estimated that the selected alternative would operate for a period of five years. A discussion of these remedial alternatives follows.

<u>Alternative GW1: No Action</u>

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

The National Contingency Plan require that a No Action alternative be evaluated at every site to provide a baseline against which other remedial alternatives may be compared. Under this alternative, EPA would take no interim action at the site to control the migration of groundwater contamination off of the site property.

Alternative GW2: Hydraulic Source Control Using Extraction Wells

Estimated Capital Cost $2.4 million
Estimated Annual O&M Cost $1.2 million
Estimated Present Worth Cost $4.8 - 4.9 million
Estimated Construction Timeframe: 9 - 12 months

Under this alternative, it is estimated that three pairs of groundwater extraction wells would need to be installed at locations necessary to hydraulically control contaminant migration in the shallow and deep zone of the aquifer along the downgradient property line. It is expected that each extraction well pair would consist of one well screened directly above and one well screened directly below the low-permeability layer.

Once extracted, the contaminated groundwater would be treated on-site using a treatment train for the removal of VOCs. It is assumed that the groundwater treatment system would consist of the following steps: sequesterant dosing; influent flow equalization; bag filtration; air stripping; and off-gas treatment with activated carbon and potassium permanganate. Furthermore, it is estimated that the groundwater treatment system would be sized with an operating range of 150 to 300 gallons per minute (gpm). After treatment, the groundwater would be discharged to either a recharge basin to be constructed at the site, or to an off-site surface water body. A potential discharge point for treated groundwater is the Morses Mill Stream, located about 4200 feet from the anticipated location of the treatment system.

During the remedial design phase, a detailed analysis would be conducted to determine the appropriate components of the groundwater treatment train. Furthermore, the number and configuration of extraction wells to be installed at the site, the need for installation of extraction wells in the deep zone of the aquifer, and the pumping rates of the wells would be subjected to further evaluation and refinement during the remedial design. In addition, the number, location and depth of monitoring wells and monitoring requirements necessary to ensure hydraulic source control would be evaluated during the remedial design.

Alternative GW3: Hydraulic Source Control Using Vertical Barrier Walls and Extraction Wells

Estimated Capital Cost $9.2 million
Estimated Annual O&M Cost $371,000 - $373,000
Estimated Present Worth Cost $10.8 million
Estimated Construction Timeframe: 9 - 12 Months

The components and requirements of this alternative are the same as those described for Alternative GW2, with the exception that vertical barrier walls would be installed along the site property line for added source containment and there would be a reduction in the amount of groundwater pumping required to achieve hydraulic source control. It is assumed that either sheet piling or slurry would be used to construct the barrier walls, and that approximately 1,000 feet of barrier wall would need to be installed to a depth of approximately 80 feet below the ground surface. Furthermore, it is estimated that the groundwater treatment system would be sized according to a reduced operating range of 20 to 160 gpm.

As with Alternative GW2, a detailed analysis would be conducted during the design phase to determine the appropriate components of the groundwater treatment train. Furthermore, the number and configuration of extraction wells to be installed at the site and the pumping rates of the wells would be subjected to further evaluation and refinement during the remedial design.

**SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES**

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria, namely, overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; cost; and State and community acceptance.

The evaluation criteria are described below:

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and requirements 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 evaluates a remedy's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

- Short-term effectiveness considers the length of time needed to implement a remedy and the risks the remedy poses to workers, residents, and the environment during implementation.

- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost includes estimated capital, and operation and maintenance costs, and net present worth costs. Present worth cost is the total cost of a remedy over time in terms of today's dollar value.

- State acceptance indicates whether, based on its review of the FFS report and Proposed Plan, NJDEP concurs, opposes, or has no comment on the selected remedy.

- Community acceptance summarizes the public's general response to the response measures described in the Proposed Plan and the FFS report. This assessment includes determining which of the response measures the community supports, opposes, and/or has reservations about.

The following presents a comparative analysis of the alternatives for the Emmell's site based upon the evaluation criteria noted above.

Overall Protection of Human Health and the Environment

EPA has attempted to alleviate current risks to human health associated with the site by installing wellhead treatment systems at residences impacted by site-related groundwater contamination. In addition, EPA is currently conducting a removal action to connect residences threatened by site-related groundwater contamination to the municipal water supply. Alternatives GW2 and GW3 are expected to provide for additional protection of human health by preventing groundwater contamination beneath the site property from migrating and potentially impacting other potable wells. The No Action Alternative would not provide for containment of groundwater contamination beneath the site property, and, therefore, would provide for no additional protection of human health.

Alternatives GW2 and GW3 would also achieve comparable protection of the environment through hydraulic source control. The No Action Alternative would not be protective of the environment as contamination would persist in groundwater and possibly increase, if dynamic equilibrium has not yet been reached for the groundwater contaminant plume.

Compliance with ARARs

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements (ARARs) of federal and state law, or provide grounds for invoking a waiver of these requirements. These include chemical-specific, location-specific and action-specific ARARs. However, Section 121(d)(4) of CERCLA allows selection of interim remedies that do not attain chemical-specific ARARs.

No location- or action-specific ARARs are associated with Alternative GW1, since no action would be taken. Alternatives GW2 and GW3 would comply with location- and action-specific ARARs, such as Clean Water Act Water Quality Standards (40 CFR 131), New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B), National Emissions Standards for Hazardous Air Pollutants (40 CFR 61), Standards for Performance of New Stationary Sources (40 CFR 60), Effluent Standards for the Point Source Category (40 CFR 414), The New Jersey Pollutant Discharge Elimination System (N.J.A.C. 7:14A) and Air Pollution Control (N.J.A.C. 7:27). Given that the RAO of this interim action is to control further off-site migration of groundwater contaminants rather than to restore the aquifer to drinking water standards, it is expected that all three alternatives would not comply with chemical-specific ARARs, as contaminated groundwater would likely persist.

Overall, Alternatives GW2 and GW3 would meet the RAO of hydraulic control of the source area, while Alternative GW1 would not.

Long-term Effectiveness and Permanence

Alternative GW1 would not have any long-term effectiveness or permanence as contaminated groundwater would continue to migrate off-site.

Alternatives GW2 and GW3 would achieve comparable levels of long-term effectiveness and permanence for maintaining hydraulic source control, as both employ groundwater extraction and ex-situ treatment, which has been widely demonstrated to be effective over the long term for maintaining hydraulic source control. Furthermore, both alternatives would utilize reliable ex-situ treatment technologies which have been recognized by EPA as presumptive remedies. Alternative GW3 will also employ barrier walls which have been widely and effectively used for hydraulic control applications. Some degradation of the barrier wall could occur over time due to chemical attack, resulting in localized breaches or increased wall permeability. However, any such changes could be compensated for with increased pumping. While Alternatives GW2 and GW3 are not intended to be permanent remedies, either of these alternatives could be potentially integrated into the permanent, site-wide groundwater remedy, which will be evaluated as part of the site-wide RI/FS.

Reduction of Toxicity, Mobility or Volume of Contaminants Through Treatment

Alternative GW1 would not achieve any reduction in the toxicity, mobility or volume (TMV) of groundwater contamination, because contaminated groundwater would not be treated or contained.

Alternatives GW2 and GW3 would achieve comparable levels of contaminant mobility reduction via hydraulic source control. In addition, a minor amount of TMV reduction would also be achieved through treatment of extracted groundwater.

Short-term Effectiveness

Under Alternative GW1, there would be no potential risks imposed on construction workers, the community, or the environment associated with construction and implementation of an active remedy.

Alternative GW2 would have minimal short-term impact. Construction workers would not be subjected to significant exposure risks during construction, because the contaminated groundwater is located well below the ground surface, and only a limited amount of intrusive work extending into the contaminated zone (i.e., well drilling) would be required. General construction risks would be effectively managed via implementation of standard engineering controls (e.g., dust suppression) and health and safety procedures/protocol (e.g., ambient air monitoring). This alternative would not have significant impacts to the community, because heavy construction would not be required.

Alternative GW3 would have the greatest short-term impacts, since construction workers would be subjected to some exposure risks if a slurry wall is constructed, because significant excavation and processing of soils from the contaminated zone would be required. However, implementation of standard health and safety measures should mitigate these risks. There would not be significant exposure risks associated with sheet pile wall installation, since the sheet piles would be vibrated/driven into the ground.

Construction of barrier walls would also result in impacts to the local community. During the installation of sheet piling, the local community would be subjected to significant noise and vibration. If slurry walls were constructed, the delivery of slurry wall materials and the disposal of excavated soil would increase construction traffic in the area.

It is estimated that construction and initial startup of Alternatives GW2 and GW3 could be completed within nine to twelve months. Therefore, Alternatives GW2 and GW3 would achieve hydraulic source control within similar timeframes.

Implementability

Alternative GW1 would be the most implementable, because it requires no action and does not have any associated technical or administrative requirements.

Alternative GW2 would be implementable, because construction and O&M can be completed using conventional heavy construction and wastewater treatment equipment/services, which are readily available on the commercial market. The surface water discharge option for treatment plant effluent could require a significant amount of effort to obtain the required property access agreements and permit approvals for construction and implementation. In addition, the surface water discharge option may require supplemental treatment to meet more stringent effluent discharge standards for inorganic constituents.

Alternative GW3 would be the least implementable, because installation of barrier walls at this site would be more technically intensive than typical barrier wall applications, due to the depth of installation (80 feet) that would be required. Furthermore, regulatory requirements may be administratively problematic due to potential community impacts. Alternative GW3 would also involve the same implementation issues as Alternative GW2.

Cost

Alternative GW1 has the lowest cost because no action is required, while Alternative GW3 has the highest cost due to the high capital cost of the vertical barrier. Alternative GW2 is expected to have a lower present worth cost ($4.8-4.9 million) than Alternative GW3 ($10.8 million). Cost estimates for Alternatives GW2 and GW3 can be found in Tables 6 & 7.

State/Support Agency Acceptance

The State of New Jersey supports the interim remedy selected in this ROD.

Community Acceptance

A review of public comments received on the Proposed Plan does not indicate that the community is opposed to EPA's implementation of the selected interim remedy. Public comments received during the public comment period are addressed in the Responsiveness Summary (see Appendix III).

**PRINCIPAL THREAT WASTES**

The interim remedy will not address principal threat wastes, as it will only serve to control further off-site migration of groundwater contaminants until a final remedy is implemented for the site. It should be noted that EPA addressed principal threat wastes through the removal of buried drums and waste material during a removal action conducted from July 1999 through February 2000. Investigations conducted to date as part of the FFS and the site-wide RI have failed to identify any principal threat wastes remaining at the site. Therefore, EPA intends to conduct further investigations during performance of the RI to attempt to locate potential source areas. Remediation of any source areas identified during the RI which present a principal threat will be addressed in a subsequent ROD which will select a final remedy for the site.

**SELECTED REMEDY**

After reviewing the alternatives and public comments, EPA and NJDEP have determined that Alternative GW2, Hydraulic Source Control Using Extraction Wells, is the most appropriate remedial alternative for control of further off-site migration of groundwater contaminants from the site property. Specifically, Alternative GW2 was selected because it is expected to achieve the remedial action objective in a cost-effective and readily implementable manner with minimal impact on the community. The major components of the Selected Remedy include the following:

- Extraction of contaminated groundwater, as necessary to control migration of contaminants off of the site property;

- Treatment of extracted groundwater using a treatment train that will include an air stripper, for removal of volatile organic contaminants; and

- Discharge of the treated groundwater to a recharge basin to be constructed at the site, or to an off-site surface water body.

Based upon preliminary design calculations conducted as part of the FFS, it is estimated that three nested pairs of groundwater extraction wells, placed 200 feet on center, would need to be installed as part of this interim remedy. Each extraction well pair would consist of one well screened directly above and one well screened directly below the low-permeability layer in order to hydraulically control known or potential groundwater contamination in the shallow and deep zones of the aquifer along the downgradient site property line. Furthermore, it is estimated that 50 to 75 gpm of total groundwater pumping from each paired well location would be necessary to maintain hydraulic control of groundwater contamination. In terms of operation, pumping at each well pair would be balanced to optimize hydraulic capture and to maintain a slight upward gradient between the wells.

Once extracted, the contaminated groundwater would be treated on-site using a treatment train for the removal of VOCs. EPA currently anticipates that the groundwater treatment system will consist of the following steps: sequesterant dosing - a polyphosphate based sequesterent would be injected into the extraction wells to prevent dissolved solids from precipitating on the pumps, interior walls of the piping and the air stripper trays; influent flow equalization - an equalization tank would be used to stabilize the influent flow rate and water quality to the treatment plant. In addition, the tank would allow for some settling of suspended solids, such as iron particulates; bag filtration - two filters placed in parallel would serve to remove suspended solids from the groundwater influent; air stripping - air strippers would be used to reduce groundwater VOC concentrations to acceptable levels; and off-gas treatment with activated carbon and potassium permanganate to remove VOCs from the air stream prior to discharge. It is estimated that the groundwater treatment system would be sized with an operating range of 150 to 300 gallons per minute (gpm).

After treatment, the groundwater would be discharged to either a recharge basin to be constructed at the site, or to an off-site surface water body. Preliminary design calculations indicate that a 210,000 square foot recharge basin would be required, assuming a flow rate of 300 gpm. A potential surface water discharge point for treated groundwater is the Morses Mill Stream, located about 4200 feet from the anticipated location of the treatment system.

During the remedial design phase, a detailed analysis would be conducted to determine the appropriate components of the groundwater treatment train. Furthermore, the number and configuration of extraction wells to be installed at the site, the need for installation of extraction wells in the deep zone of the aquifer, and the pumping rates of the wells would be subjected to further evaluation and refinement during the remedial design. In addition, the number, location and depth of monitoring wells and monitoring requirements necessary to ensure hydraulic source control would be evaluated during the remedial design.

Detailed cost estimates for the selected remedy are provided in Tables 7a & 7b. The total present worth cost of this remedy is estimated to be between $4,800,000 and $4,900,000, depending upon whether the treated water is discharged to a nearby surface water body or to an on-site recharge basin. The capital cost is estimated to be $2,400,000. Annual O&M Costs are estimated at $1,200,000.

**STATUTORY DETERMINATIONS**

Section 121 of CERCLA mandates that a remedial action be protective of human health and the environment, cost effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Section 121 also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, and mobility of the hazardous substances, pollutants, or contaminants at a site. CERCLA further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4). The following sections discuss how the Selected Remedy meets, or waives, these statutory requirements.

**Protection of Human Health and the Environment**

The Selected Remedy will be protective of human health, because EPA has already installed wellhead treatment systems at residences impacted by site-related groundwater contamination. Furthermore, EPA is currently connecting residences threatened by site-related groundwater contamination to the municipal water supply. The Selected Remedy will also provide for protection of the environment through hydraulic source control, until a final remedy for groundwater contamination can be implemented.

**Compliance with Applicable or Relevant and Appropriate Requirements**

EPA expects that the Selected Remedy will not comply with chemical-specific ARARs, given that the objective of this interim action is to control further off-site migration of groundwater contaminants rather than to restore the aquifer water quality to drinking water standards. However, Section 121(d)(4) of CERCLA allows for selection of interim remedies that do not attain chemical-specific ARARs. The Selected Remedy will comply with location- and action-specific ARARs, such as Clean Water Act Water Quality Standards (40 CFR 131), New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B), National Emissions Standards for Hazardous Air Pollutants (40 CFR 61), Standards for Performance of New Stationary Sources (40 CFR 60), Effluent Standards for the Point Source Category (40 CFR 414), The New Jersey Pollutant Discharge Elimination System (N.J.A.C. 7:14A) and Air Pollution Control (N.J.A.C. 7:27).

**Cost-Effectiveness**

Of the alternatives that meet the remedial action objective of control of further off-site migration of groundwater contaminants, the Selected Remedy provides for overall effectiveness in proportion to its cost. The present worth value of the Selected Remedy is between $4,800,000 and $4,900,000.

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

The Selected Remedy will provide for the extraction and treatment of contaminated groundwater. Therefore, although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus supports that statutory mandate.

**Preference for Treatment as a Principal Element**

The Selected Remedy will provide for the extraction and treatment of contaminated groundwater. Therefore, although this interim action is not intended to address fully the statutory preference for remedies that employ treatment as a principal element, this interim action does utilize treatment and thus supports that statutory preference.

**Five-Year Review Requirements**

Since the Selected Remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of the site and remedy will be ongoing as EPA continues to develop remedial alternatives for the site.

**DOCUMENTATION OF SIGNIFICANT CHANGES**

There are no significant changes in the preferred alternative, Alternative GW2, Hydraulic Source Control Using Extraction Wells, as presented in the Proposed Plan.

## APPENDIX I - FIGURES

500037

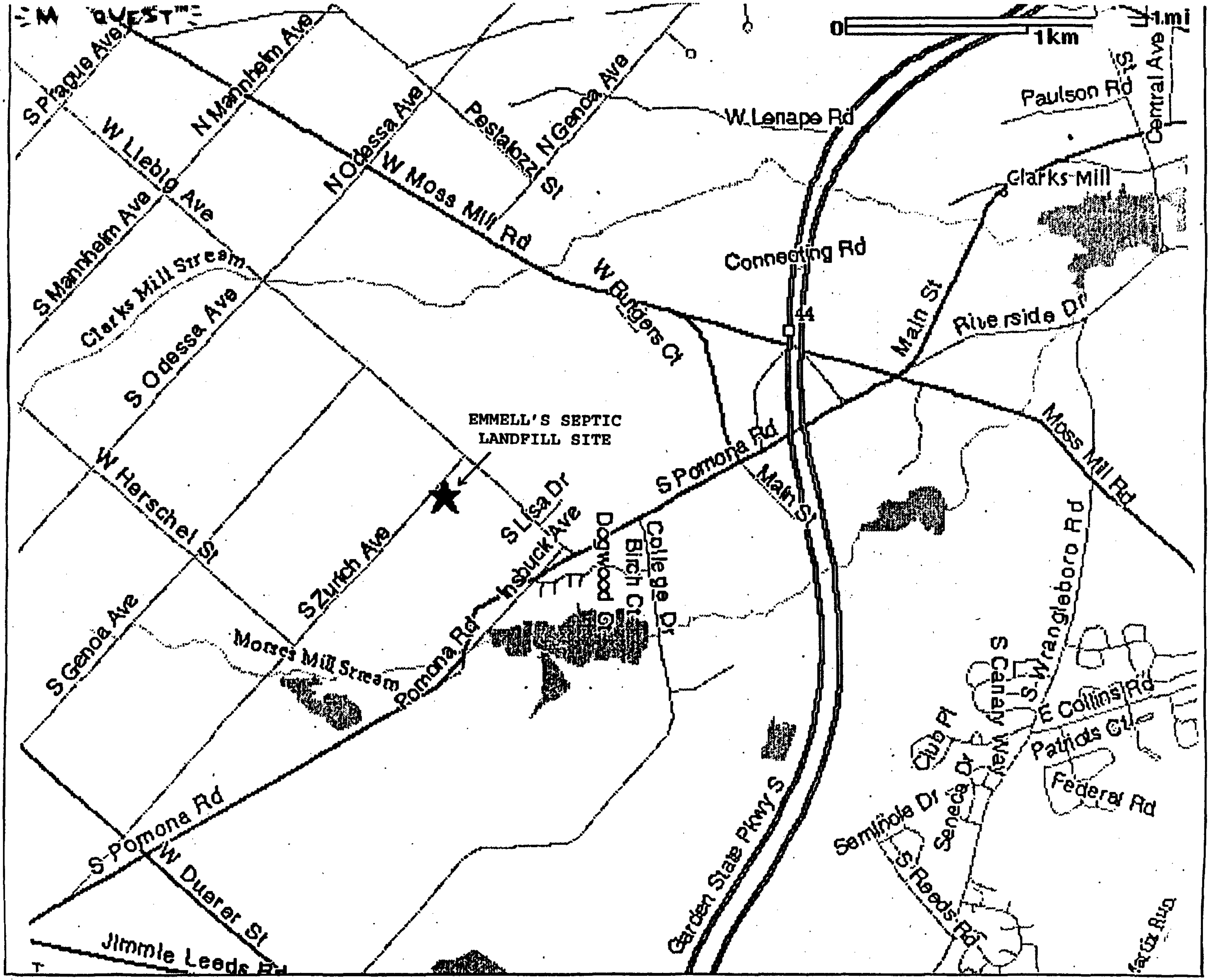
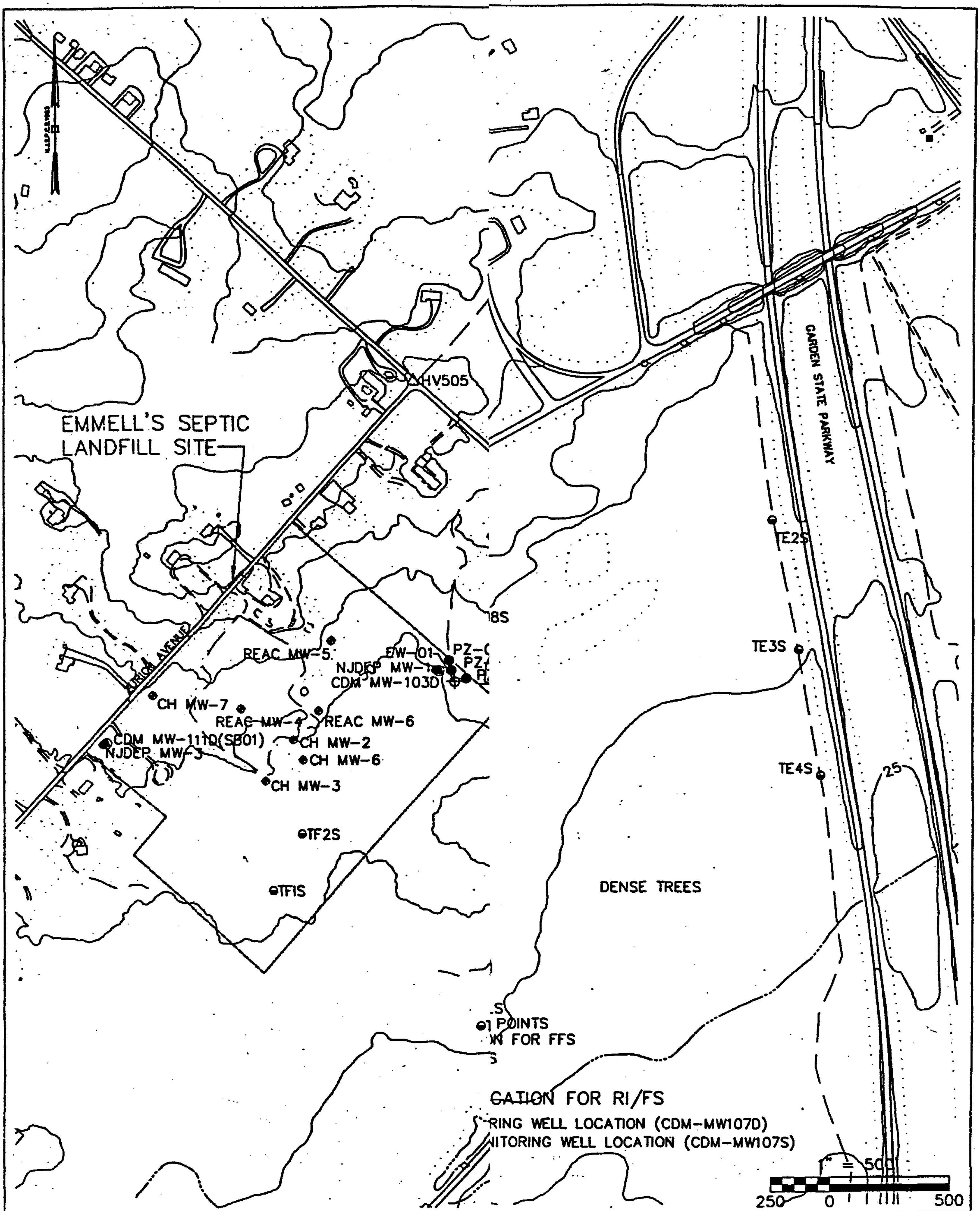
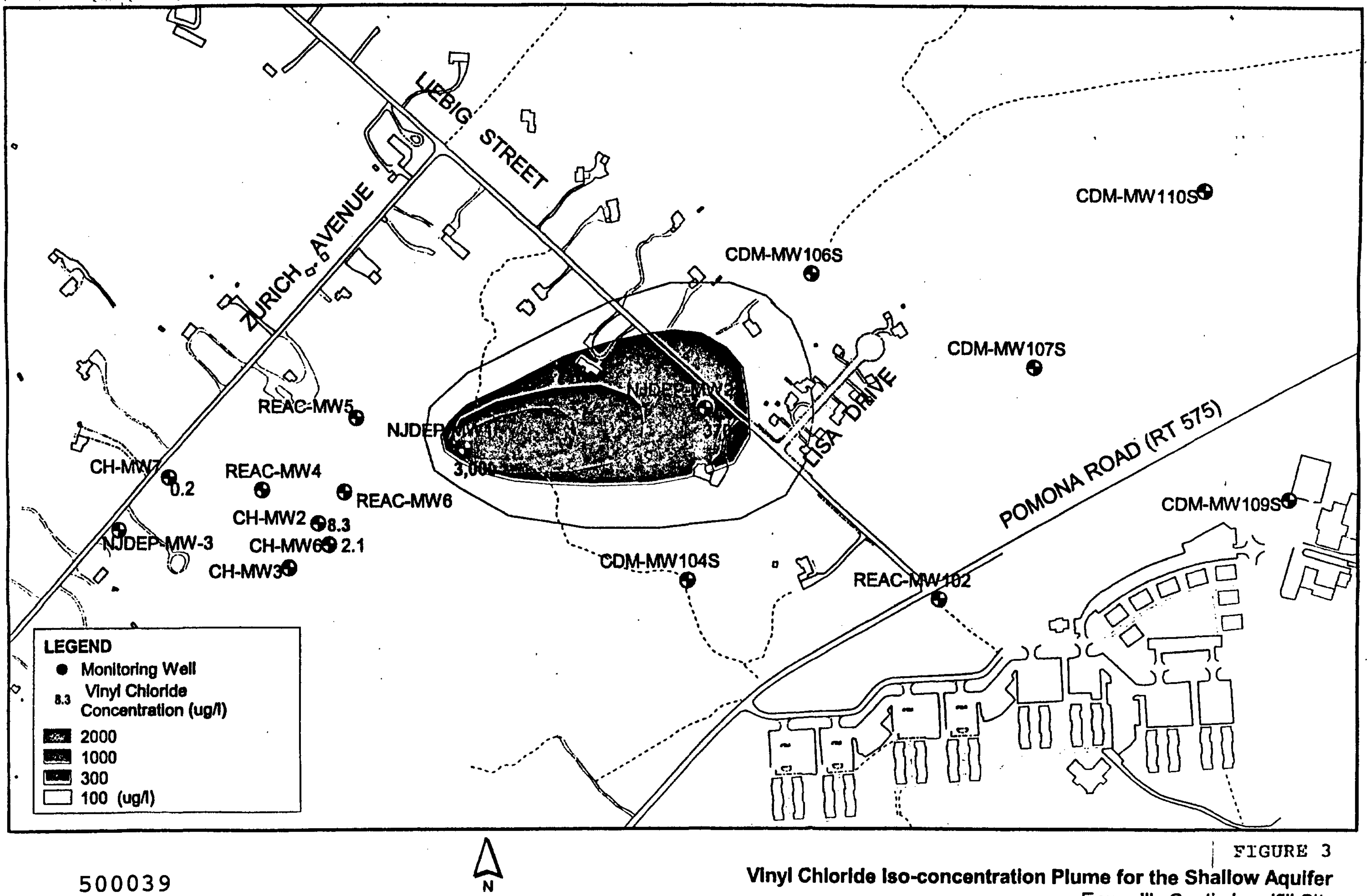



FIGURE 1 - SITE LOCATION MAP




500038

FIGURE 2




500039

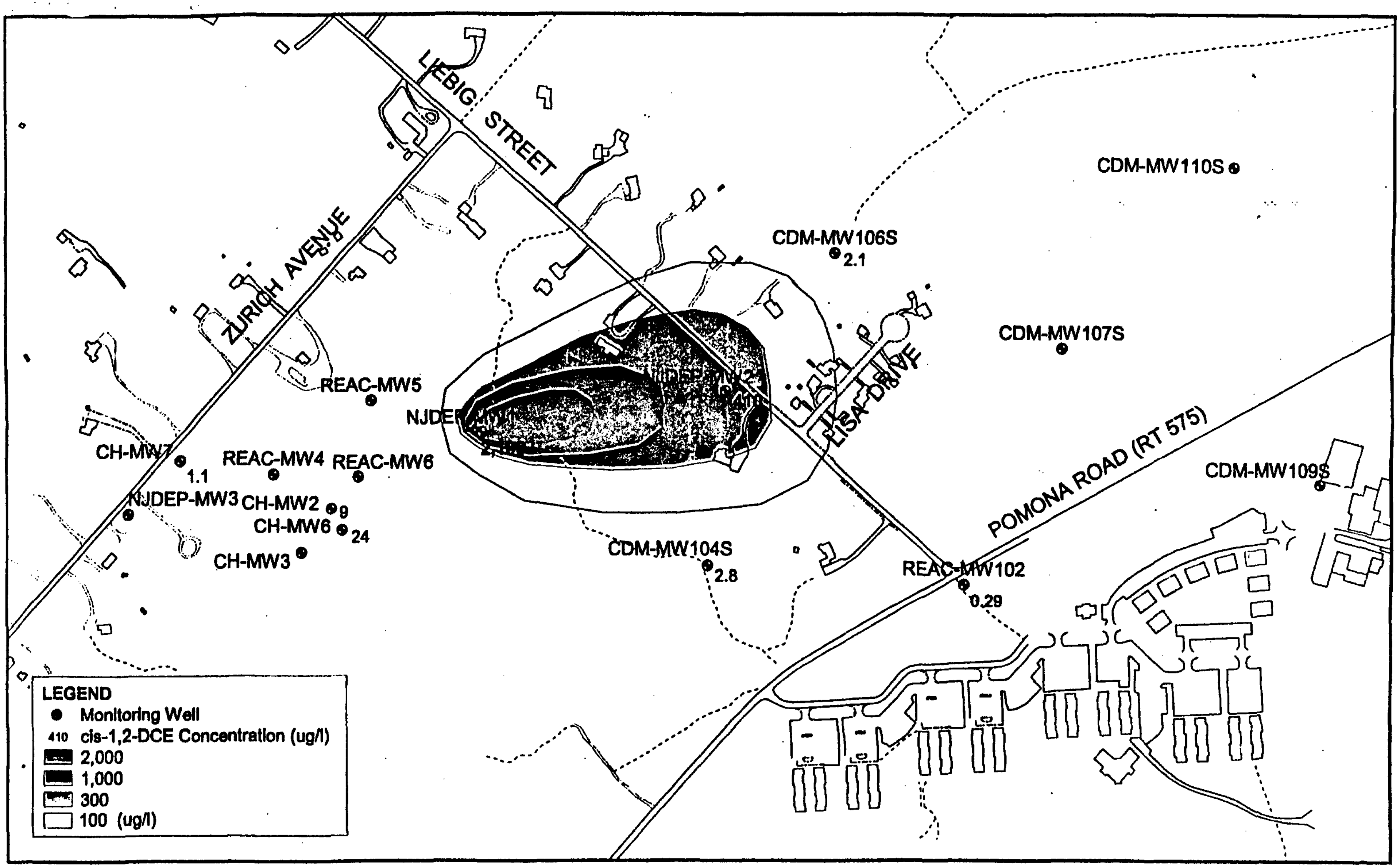
FIGURE 3

**Vinyl Chloride Iso-concentration Plume for the Shallow Aquifer**

Emmell's Septic Landfill Site

Galloway Township, New Jersey

**CDM**




500040

N

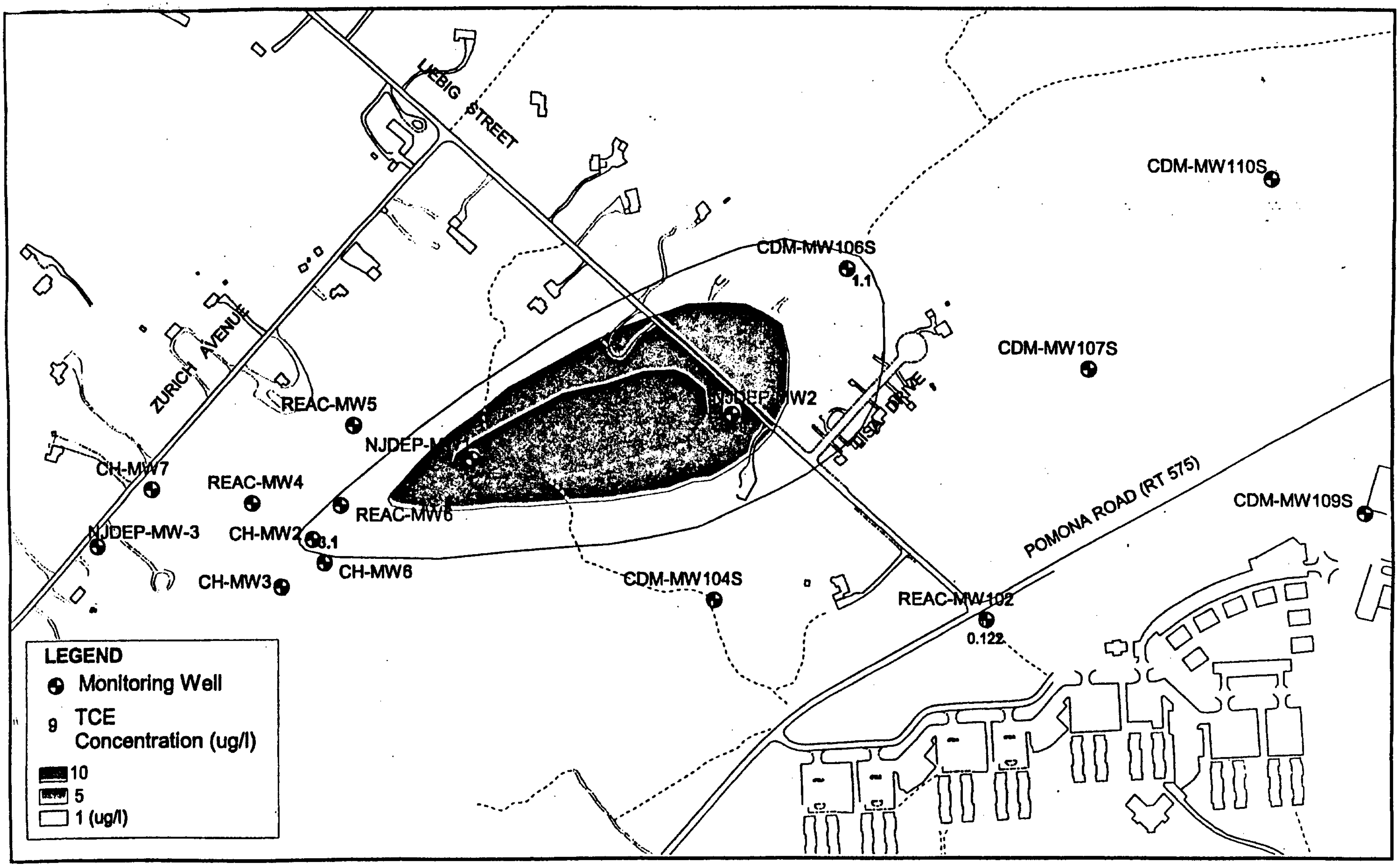
0 500 1000 Feet

FIGURE 4

**cis-1,2-DCE Iso-concentration Plume for the Shallow Aquifer**

Emmell's Septic Landfill Site
Galloway Township, New Jersey

CDM



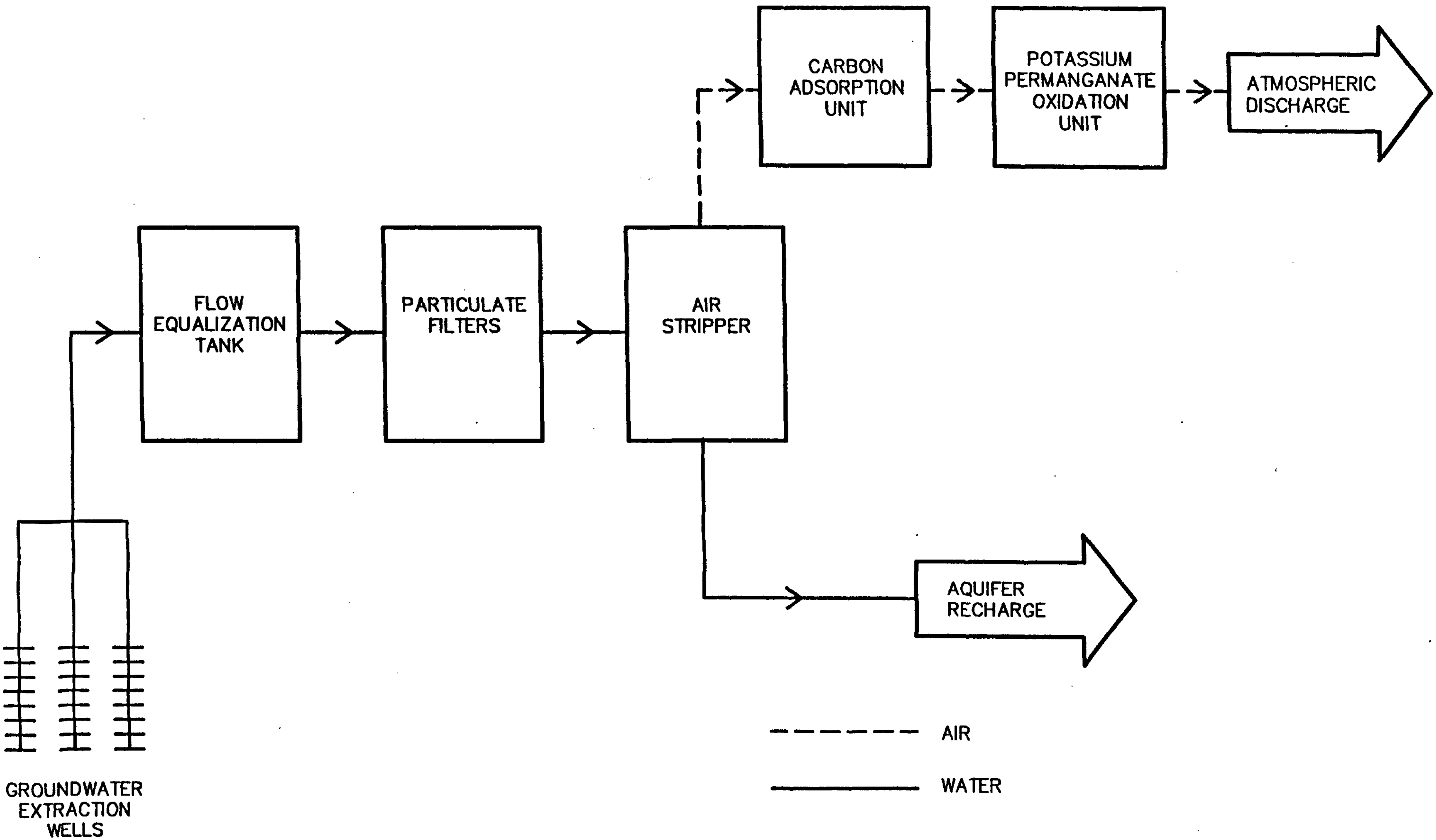

N

0 500 1000 Feet

500041

FIGURE 5
**TCE Iso-concentration Plume for the Shallow Aquifer**
Emmell's Septic Landfill Site
Galloway Township, New Jersey
**CDM**

# GROUNDWATER TREATMENT TRAIN
# EMMELLS SEPTIC LANDFILL




CDM

500042

FIGURE 6

APPENDIX II - TABLES

**Table 1**
**Groundwater Screening Criteria**
**Emmell's Septic Landfill Site**
**Galloway Township, New Jersey**


| Cas Rn | Chemical Name | Analytic Method | Unit | National Primary Drinking Water Standards (1) (EPA MCL) | New Jersey Practical Quantitation Levels (PQLs) (2) | New Jersey Drinking Water Standards (3) (NJ MCL) | Background Well NJDEP MW-3 December 2000 Results | Background Well NJDEP MW-3 December 2001 Results | Emmell's Groundwater Screening Criteria (4) | Source of Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| Low Detection Limit Volatile Organic Compounds - OLC03.2 | | | | | | | VOC OLCO2.1 | VOC OLCO3.1 | | |
| 75-71-8 | Dichlorodifluoromethane | OLC03-2-V | ug/l | NL | 0.5 (is)+++ | NL | NA | 0.5 UJ | 0.5 | PQL |
| 74-87-3 | Chloromethane | OLC03-2-V | ug/l | NL | 2 | NL | 1 U | 0.5 U | 2 | PQL |
| 75-01-4 | Vinyl Chloride | OLC03-2-V | ug/l | 2 | 5 | 2 | 1 U | 0.5 U | 2 | EPA/NJ MCL |
| 74-83-9 | Bromomethane | OLC03-2-V | ug/l | NL | 2 | NL | 1 U | 0.5 U | 2 | PQL |
| 75-00-3 | Chloroethane | OLC03-2-V | ug/l | NL | 0.5 (ignc)+++ | NL | 1 U | 0.5 U | 0.5 | PQL |
| 75-69-4 | Trichlorofluoromethane | OLC03-2-V | ug/l | NL | 10 (is)+++ | NL | NA | 0.5 U | 10 | PQL |
| 75-35-4 | 1,1-Dichloroethene | OLC03-2-V | ug/l | 7 | 2 | 2 | 1 U | 0.5 U | 2 | PQL, NJ MCL |
| 76-13-1 | 1,1,2-Trichloro-1,2,2-trifluoroethane | OLC03-2-V | ug/l | NL | NL | NL | NA | 0.5 U | NL | |
| 67-64-1 | Acetone | OLC03-2-V | ug/l | NL | NA | NL | 5 R | 5 U | NL | |
| 75-15-0 | Carbon Disulfide | OLC03-2-V | ug/l | NL | 10 (is)+++ | NL | 1 U | 0.5 U | 10 | PQL |
| 79-20-9 | Methyl Acetate | OLC03-2-V | ug/l | NL | 5000 (is)+++ | NL | NA | 0.5 R | 5000 | PQL |
| 75-09-2 | Methylene Chloride | OLC03-2-V | ug/l | 5 | 2 | 3 | 2 U | 0.5 U | 2 | PQL |
| 156-60-5 | trans-1,2-Dichloroethene | OLC03-2-V | ug/l | 100 | 2 | 100 | 1 U | 0.5 U | 2 | PQL |
| 1634-04-4 | Methyl Tert-Butyl Ether | OLC03-2-V | ug/l | NL | 1 (ism)+++ | 70 | NA | 0.5 U | 1 | PQL |
| 75-34-3 | 1,1-Dichloroethane | OLC03-2-V | ug/l | NL | 1 (ism)+++ | 50 | 1 U | 0.5 U | 1 | PQL |
| 156-59-2 | cis-1,2-Dichloroethene | OLC03-2-V | ug/l | 70 | 2 | 70 | 1 U | 0.5 U | 2 | PQL |
| 78-93-3 | 2-Butanone | OLC03-2-V | ug/l | NL | NA | NL | 5 R | 5 U | NL | |
| 74-97-5 | Bromochloromethane | OLC03-2-V | ug/l | NL | NL | NL | 1 U | 0.5 U | NL | |
| 67-66-3 | Chloroform | OLC03-2-V | ug/l | 80 @ | 1 | NL | 2 | 1.3 | 2 (7) | Background Dec 2000 |
| 71-55-6 | 1,1,1-Trichloroethane | OLC03-2-V | ug/l | 200 | 1 | 30 | 1 U | 0.5 U | 1 | PQL |
| 110-82-7 | Cyclohexane | OLC03-2-V | ug/l | NL | 5 (ignc)+++ | NL | NA | 0.5 U | 5 | PQL |
| 56-23-5 | Carbon Tetrachloride | OLC03-2-V | ug/l | 5 | 2 | 2 | 1 U | 0.5 U | 2 | PQL |
| 71-43-2 | Benzene | OLC03-2-V | ug/l | 5 | 1 | 1 | 1 U | 0.5 U | 1 | PQL, NJ MCL |
| 107-06-2 | 1,2-Dichloroethane | OLC03-2-V | ug/l | 5 | 2 | 2 | 1 U | 0.5 U | 2 | PQL, NJ MCL |
| 79-01-6 | Trichloroethene | OLC03-2-V | ug/l | 5 | 1 | 1 | 1 U | 0.5 U | 1 | PQL, NJ MCL |
| 108-87-2 | Methylcyclohexane | OLC03-2-V | ug/l | NL | NL | NL | NA | 0.5 U | NL | |
| 78-87-5 | 1,2-Dichloropropane | OLC03-2-V | ug/l | 5 | 1 | 5 | 1 U | 0.5 U | 1 | PQL |
| 75-27-4 | Bromodichloromethane | OLC03-2-V | ug/l | 80 @ | 1 | NL | 1 U | 0.5 U | 1 | PQL |
| 10061-01-5 | cis-1,3-Dichloropropene | OLC03-2-V | ug/l | NL | 5 | NL | 1 U | 0.5 U | 5 | PQL |
| 108-10-1 | 4-Methyl-2-pentanone | OLC03-2-V | ug/l | NL | NA | NL | 1 U | 5 U | NL | |
| 108-88-3 | Toluene | OLC03-2-V | ug/l | 1000 | 5 | 1000 | 1 U | 0.5 U | 5 | PQL |
| 10061-02-6 | Trans-1,3-Dichloropropene | OLC03-2-V | ug/l | NL | 7 | NL | 1 U | 0.5 U | 7 | PQL |
| 79-00-5 | 1,1,2-Trichloroethane | OLC03-2-V | ug/l | 5 | 2 | 3 | 1 U | 0.5 U | 2 | PQL |
| 127-18-4 | Tetrachloroethene | OLC03-2-V | ug/l | 5 | 1 | 1 | 1 U | 0.5 U | 1 | PQL, NJ MCL |
| 591-78-6 | 2-Hexanone | OLC03-2-V | ug/l | NL | 2 (ignc)+++ | NL | 1 U | 5 U | 2 | PQL |
| 124-48-1 | Dibromochloromethane | OLC03-2-V | ug/l | 80 @ | 1 | NL | 1 U | 0.5 U | 1 | PQL |
| 106-93-4 | 1,2-Dibromoethane (or ethylene dibromide) | OLC03-2-V | ug/l | 0.05 | 0.05 | NL | 1 U | 0.5 U | 0.05 | EPA/NJ MCL, PQL |
| 108-90-7 | Chlorobenzene | OLC03-2-V | ug/l | 100 | 1 (ism)+++ | NL | 1 U | 0.5 U | 1 | PQL |
| 100-41-4 | Ethylbenzene | OLC03-2-V | ug/l | 700 | 5 | 700 | 1 U | 0.5 U | 5 | PQL |
| 1330-20-7 | Xylenes (total) | OLC03-2-V | ug/l | 10000 | 2 | 1000 | 1 U | 0.5 U | 2 | PQL |
| 100-42-5 | Styrene | OLC03-2-V | ug/l | 100 | 5 | 100 | 1 U | 0.5 U | 5 | PQL |
| 75-25-2 | Bromoform | OLC03-2-V | ug/l | 80 @ | 0.8 | NL | 1 U | 0.5 U | 0.8 | PQL |
| 98-82-8 | Isopropylbenzene | OLC03-2-V | ug/l | NL | 0.8 (is)+++ | NL | NA | 0.5 U | 0.8 | PQL |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | OLC03-2-V | ug/l | NL | 1 | 1 | 1 U | 0.5 U | 1 | PQL, NJ MCL |
| 541-73-1 | 1,3-Dichlorobenzene | OLC03-2-V | ug/l | NL | 5 | 600 | 1 U | 0.5 U | 5 | PQL |
| 106-46-7 | 1,4-Dichlorobenzene | OLC03-2-V | ug/l | 75 | 5 | 75 | 1 U | 0.5 U | 5 | PQL |
| 95-50-1 | 1,2-Dichlorobenzene | OLC03-2-V | ug/l | 600 | 5 | 600 | 1 U | 0.5 U | 5 | PQL |
| 96-12-8 | 1,2-Dibromo-3-chloropropane | OLC03-2-V | ug/l | 0.2 | 1 (is)+++ | NL | 1 R | 0.5 U | 0.2 | EPA MCL |
| 120-82-1 | 1,2,4-Trichlorobenzene | OLC03-2-V | ug/l | 70 | 1 | 9 | 1 U | 0.5 U | 1 | PQL |
| 87-61-6 | 1,2,3-Trichlorobenzene | OLC03-2-V | ug/l | NL | NL | NL | NA | 0.5 U | NL | |

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**Table 1**
**Groundwater Screening Criteria**
**Emmell's Septic Landfill Site**
**Galloway Township, New Jersey**


| Cas Rn | Chemical Name | Analytic Method | Unit | National Primary Drinking Water Standards (1) (EPA MCL) | New Jersey Practical Quantitation Levels (PQLs) (2) | New Jersey Drinking Water Standards (3) (NJ MCL) | Background Well NJDEP MW-3 December 2000 Results | Background Well NJDEP MW-3 December 2001 Results | Emmell's Groundwater Screening Criteria (4) | Source of Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| Semi-Volatile Organics - OLM04.2 | | | | | | | | | | |
| 100-52-7 | Benzaldehyde | OLM04-2-SV | ug/l | NL | NL | NL | 10 UJ | 10 U | NL | |
| 108-95-2 | Phenol | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 111-44-4 | bis(2-Chloroethyl)ether | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 95-57-8 | 2-Chlorophenol | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |
| 95-48-7 | 2-Methylphenol | OLM04-2-SV | ug/l | NL | NL | NL | 10 U | 10 U | NL | |
| 108-60-1 | 2,2'-oxybis(1-Chloropropane) | OLM04-2-SV | ug/l | NL | NL | NL | 10 U | 10 U | NL | |
| 98-86-2 | Acetophenone | OLM04-2-SV | ug/l | NL | 10 (is)+++ | NL | 10 U | 10 U | 10 | PQL |
| 106-44-5 | 4-Methylphenol | OLM04-2-SV | ug/l | NL | NL | NL | 10 U | 10 U | NL | |
| 621-64-7 | N-Nitroso-di-n-propylamine | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |
| 67-72-1 | Hexachloroethane | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 98-95-3 | Nitrobenzene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 78-59-1 | Isophorone | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 88-75-5 | 2-Nitrophenol | OLM04-2-SV | ug/l | NL | 20 (ignc)+++ | NL | 10 U | 10 U | 20 | PQL |
| 105-67-9 | 2,4-Dimethylphenol | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |
| 111-91-1 | bis(2-Chloroethoxy)methane | OLM04-2-SV | ug/l | NL | 10 (ignc)+++ | NL | 10 U | 10 U | 10 | PQL |
| 120-83-2 | 2,4-Dichlorophenol | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 91-20-3 | Naphthalene | OLM04-2-SV | ug/l | NL | 2 (ism)+++ | 300 | 10 U | 10 U | 2 | PQL |
| 106-47-8 | 4-Chloroaniline | OLM04-2-SV | ug/l | NL | 10 (is)+++ | NL | 10 U | 10 U | 10 | PQL |
| 87-68-3 | Hexachlorobutadiene | OLM04-2-SV | ug/l | NL | 1 | NL | 10 U | 10 UJ | 1 | PQL |
| 105-60-2 | Caprolactam | OLM04-2-SV | ug/l | NL | NL | NL | 10 U | 10 UJ | NL | |
| 59-50-7 | 4-Chloro-3-methylphenol | OLM04-2-SV | ug/l | NL | 20 (ignc)+++ | NL | 10 U | 10 U | 20 | PQL |
| 91-57-6 | 2-Methylnaphthalene | OLM04-2-SV | ug/l | NL | 10 (ignc)+++ | NL | 10 U | 10 U | 10 | PQL |
| 77-47-4 | Hexachlorocyclopentadiene | OLM04-2-SV | ug/l | 50 | 10 | 50 | 10 U | 10 UJ | 10 | PQL |
| 88-06-2 | 2,4,6-Trichlorophenol | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |
| 95-95-4 | 2,4,5-Trichlorophenol | OLM04-2-SV | ug/l | NL | 10 | NL | 25 U | 25 U | 10 | PQL |
| 92-52-4 | 1,1'-Biphenyl | OLM04-2-SV | ug/l | NL | 10 (is)+++ | NL | 10 U | 10 U | 10 | PQL |
| 91-58-7 | 2-Chloronaphthalene | OLM04-2-SV | ug/l | NL | 10 (is)+++ | NL | 10 U | 10 U | 10 | PQL |
| 88-74-4 | 2-Nitroaniline | OLM04-2-SV | ug/l | NL | NL | NL | 25 U | 25 U | NL | |
| 131-11-3 | Dimethylphthalate | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 606-20-2 | 2,6-Dinitrotoluene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 UJ | 10 | PQL |
| 208-96-8 | Acenaphthylene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 99-09-2 | 3-Nitroaniline | OLM04-2-SV | ug/l | NL | NL | NL | 25 U | 25 U | NL | |
| 83-32-9 | Acenaphthene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 51-28-5 | 2,4-Dinitrophenol | OLM04-2-SV | ug/l | NL | 40 | NL | 25 U | 25 UJ | 40 | PQL |
| 100-02-7 | 4-Nitrophenol | OLM04-2-SV | ug/l | NL | 50 (ignc)+++ | NL | 25 U | 25 UJ | 50 | PQL |
| 132-64-9 | Dibenzofuran | OLM04-2-SV | ug/l | NL | 10 (ignc)+++ | NL | 10 U | 10 U | 10 | PQL |
| 121-14-2 | 2,4-Dinitrotoluene | OLM04-2-SV | ug/l | NL | 10 # | NL | 10 U | 10 UJ | 10 | PQL |
| 84-66-2 | Diethylphthalate | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 86-73-7 | Fluorene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 7005-72-3 | 4-Chlorophenyl-phenylether | OLM04-2-SV | ug/l | NL | 10 (ignc)+++ | NL | 10 U | 10 UJ | 10 | PQL |
| 100-01-6 | 4-Nitroaniline | OLM04-2-SV | ug/l | NL | NL | NL | 25 U | 25 UJ | NL | |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | OLM04-2-SV | ug/l | NL | 60 | NL | 25 U | 25 U | 60 | PQL |
| 86-30-6 | N-Nitrosodiphenylamine | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |
| 101-55-3 | 4-Bromophenyl-phenylether | OLM04-2-SV | ug/l | NL | NL | NL | 10 U | 10 U | NL | |
| 118-74-1 | Hexachlorobenzene | OLM04-2-SV | ug/l | 1 | 10 | 1 | 10 U | 10 U | 1 | EPA/NJ MCL |
| 1912-24-9 | Atrazine | OLM04-2-SV | ug/l | 3 | 1 | 3 | 10 U | 10 UJ | 1 | PQL |
| 87-86-5 | Pentachlorophenol | OLM04-2-SV | ug/l | 1 | 1 | 1 | 25 U | 25 UJ | 1 | EPA/NJ MCL, PQL |
| 85-01-8 | Phenanthrene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 120-12-7 | Anthracene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 86-74-8 | Carbazole | OLM04-2-SV | ug/l | NL | NL | NL | 10 U | 10 U | NL | |
| 84-74-2 | Di-n-butylphthalate | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |
| 206-44-0 | Fluoranthene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 129-00-0 | Pyrene | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 10 U | 20 | PQL |

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**Table 1**
**Groundwater Screening Criteria**
**Emmell's Septic Landfill Site**
**Galloway Township, New Jersey**


| Cas Rn | Chemical Name | Analytic Method | Unit | National Primary Drinking Water Standards (1) (EPA MCL) | New Jersey Practical Quantitation Levels (PQLs) (2) | New Jersey Drinking Water Standards (3) (NJ MCL) | Background Well NJDEP MW-3 December 2000 Results | Background Well NJDEP MW-3 December 2001 Results | Emmell's Groundwater Screening Criteria (4) | Source of Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| 85-68-7 | Butylbenzylphthalate | OLM04-2-SV | ug/l | NL | 20 | NL | 10 U | 0.2 J | 20 (6) | PQL |
| 91-94-1 | 3,3'-Dichlorobenzidine | OLM04-2-SV | ug/l | NL | 60 | NL | 10 U | 10 UJ | 60 | PQL |
| 56-55-3 | Benzo(a)anthracene | OLM04-2-SV | ug/l | NL | 0.2 (is)+++ | NL | 10 U | 10 U | 0.2 | PQL |
| 218-01-9 | Chrysene | OLM04-2-SV | ug/l | NL | 0.2 (is)+++ | NL | 10 U | 10 U | 0.2 | PQL |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | OLM04-2-SV | ug/l | 6 | 30 | 6 | 10 U | 10 U | 6 | EPA/NJ MCL |
| 117-84-0 | Di-n-octyl phthalate | OLM04-2-SV | ug/l | NL | NA | NL | 10 U | 10 U | NL | |
| 205-99-2 | Benzo(b)fluoranthene | OLM04-2-SV | ug/l | NL | 10 | NL | 10 U | 10 U | 10 | PQL |
| 207-08-9 | Benzo(k)fluoranthene | OLM04-2-SV | ug/l | NL | 1 (is)+++ | NL | 10 U | 10 U | 1 | PQL |
| 50-32-8 | Benzo(a)pyrene | OLM04-2-SV | ug/l | 0.2 | 0.2 (is)+++ | 0.2 | 10 U | 10 U | 0.2 | EPA/NJ MCL, PQL |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | OLM04-2-SV | ug/l | NL | 10 (is)+++ | NL | 10 U | 10 U | 10 | PQL |
| 53-70-3 | Dibenz(a,h)anthracene | OLM04-2-SV | ug/l | NL | 0.5 (is)+++ | NL | 10 U | 10 U | 0.5 | PQL |
| 191-24-2 | Benzo(g,h,i)perylene | OLM04-2-SV | ug/l | NL | 0.3 (ignc)+++ | NL | 10 U | 10 U | 0.3 | PQL |
| **Pesticides/PCBs - OLM04.2** | | | | | | | | | | |
| 319-84-6 | Alpha-BHC | OLM04-2-PP | ug/l | NL | 0.02 | NL | 0.05 UJ | 0.053 U | 0.02 | PQL |
| 319-85-7 | Beta-BHC | OLM04-2-PP | ug/l | NL | 0.04 | NL | 0.05 U | 0.053 U | 0.04 | PQL |
| 319-86-8 | Delta-BHC | OLM04-2-PP | ug/l | NL | 0.03 (ignc)+++ | NL | 0.05 U | 0.053 U | 0.3 | PQL |
| 58-89-9 | gamma-BHC (Lindane) | OLM04-2-PP | ug/l | 0.2 | 0.2 | 0.2 | 0.05 UJ | 0.053 U | 0.2 | EPA/NJ MCL, PQL |
| 76-44-8 | Heptachlor | OLM04-2-PP | ug/l | 0.4 | 0.4 | 0.4 | 0.05 U | 0.053 U | 0.4 | EPA/NJ MCL, PQL |
| 309-00-2 | Aldrin | OLM04-2-PP | ug/l | NL | 0.04 | NL | 0.05 U | 0.053 U | 0.04 | PQL |
| 1024-57-3 | Heptachlor epoxide | OLM04-2-PP | ug/l | 0.2 | 0.2 | 0.2 | 0.05 U | 0.053 U | 0.2 | EPA/NJ MCL, PQL |
| 959-98-8 | Endosulfan I | OLM04-2-PP | ug/l | NL | 0.02 | NL | 0.05 U | 0.053 U | 0.02 | PQL |
| 60-57-1 | Dieldrin | OLM04-2-PP | ug/l | NL | 0.03 | NL | 0.1 U | 0.11 U | 0.03 | PQL |
| 72-55-9 | 4,4'-DDE | OLM04-2-PP | ug/l | NL | 0.04 | NL | 0.1 U | 0.11 U | 0.04 | PQL |
| 72-20-8 | Endrin | OLM04-2-PP | ug/l | 2 | 0.04 | 2 | 0.1 U | 0.11 U | 0.04 | PQL |
| 33213-65-9 | Endosulfan II | OLM04-2-PP | ug/l | NL | 0.04 | NL | 0.1 U | 0.11 U | 0.04 | PQL |
| 72-54-8 | 4,4'-DDD | OLM04-2-PP | ug/l | NL | 0.04 | NL | 0.1 U | 0.11 U | 0.04 | PQL |
| 1031-07-8 | Endosulfan sulfate | OLM04-2-PP | ug/l | NL | 0.08 | NL | 0.1 U | 0.11 U | 0.08 | PQL |
| 50-29-3 | 4,4'-DDT | OLM04-2-PP | ug/l | NL | 0.06 | NL | 0.1 U | 0.11 U | 0.06 | PQL |
| 72-43-5 | Methoxychlor | OLM04-2-PP | ug/l | 40 | 10 | 40 | 0.5 U | 0.53 U | 10 | PQL |
| 53494-70-5 | Endrin ketone | OLM04-2-PP | ug/l | NL | NL | NL | 0.1 U | 0.11 U | NL | |
| 7421-93-4 | Endrin aldehyde | OLM04-2-PP | ug/l | NL | NL | NL | 0.1 U | 0.11 U | NL | |
| 5103-71-9 | alpha-Chlordane | OLM04-2-PP | ug/l | 2 ## | 0.5 ## | 0.5 ## | 0.05 U | 0.053 U | 0.5 | NJ MCL, PQL |
| 5103-74-2 | gamma-Chlordane | OLM04-2-PP | ug/l | 2 ## | 0.5 ## | 0.5 ## | 0.05 U | 0.053 U | 0.5 | NJ MCL, PQL |
| 8001-35-2 | Toxaphene | OLM04-2-PP | ug/l | 3 | 3 | 3 | 5 U | 5.3 U | 3 | EPA/NJ MCL, PQL |
| 12674-11-2 | Aroclor-1016 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 1 U | 1.1 U | 0.5 | EPA/NJ MCL, PQL |
| 11104-28-2 | Aroclor-1221 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 2 U | 2.1 U | 0.5 | EPA/NJ MCL, PQL |
| 11141-16-5 | Aroclor-1232 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 1 U | 1.1 U | 0.5 | EPA/NJ MCL, PQL |
| 53469-21-9 | Aroclor-1242 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 1 U | 1.1 U | 0.5 | EPA/NJ MCL, PQL |
| 12672-29-6 | Aroclor-1248 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 1 U | 1.1 U | 0.5 | EPA/NJ MCL, PQL |
| 11097-69-1 | Aroclor-1254 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 1 U | 1.1 U | 0.5 | EPA/NJ MCL, PQL |
| 11096-82-5 | Aroclor-1260 | OLM04-2-PP | ug/l | 0.5 | 0.5 | 0.5 | 1 U | 1.1 U | 0.5 | EPA/NJ MCL, PQL |
| **Inorganic Analytes - ILM04.1** | | | | | | | | | | |
| 7429-90-5 | Aluminum | ILM04-1-M | ug/l | NL | 200 | 200 ** | 235 J | 200 U | 235 (7) | Background Dec 2000 |
| 7440-36-0 | Antimony | ILM04-1-M | ug/l | 6 | 20 | 6 | 3.6 U | 5 U | 6 | EPA/NJ MCL |
| 7440-38-2 | Arsenic | ILM04-1-M | ug/l | 10 @ | 8 | 10 | 9.5 BJ | 8 U | 9.5 (7) | Background Dec 2000 |
| 7440-39-3 | Barium | ILM04-1-M | ug/l | 2000 | 200 | 2000 | 40.9 B | 200 U | 200 (6) | PQL |
| 7440-41-7 | Beryllium | ILM04-1-M | ug/l | 4 | 20 | 4 | 0.5 B | 4 U | 4 (6) | EPA/NJ MCL |
| 7440-43-9 | Cadmium | ILM04-1-M | ug/l | 5 | 2 | 5 | 0.5 U | 0.2 U | 2 | PQL |
| 7440-70-2 | Calcium | ILM04-1-M | ug/l | NL | NL | NL | 1570 B | 5000 U | 1570 (7) | Background Dec 2000 |
| 7440-47-3 | Chromium | ILM04-1-M | ug/l | 100 | 10 | 100 | 7.1 B | 10 U | 10 (6) | PQL |
| 7440-48-4 | Cobalt | ILM04-1-M | ug/l | NL | 35 (ignc)+++ | NL | 1.2 U | 50 U | 35 | PQL |
| 7440-50-8 | Copper | ILM04-1-M | ug/l | 1300 TT | 1000 | 1300 [AL]* | 23.6 BR | 25 U | 1000 | PQL |

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**Table 1**
**Groundwater Screening Criteria**
**Emmell's Septic Landfill Site**
**Galloway Township, New Jersey**


| Cas Rn | Chemical Name | Analytic Method | Unit | National Primary Drinking Water Standards (1) (EPA MCL) | New Jersey Practical Quantitation Levels (PQLs) (2) | New Jersey Drinking Water Standards (3) (NJ MCL) | Background Well NJDEP MW-3 December 2000 Results | Background Well NJDEP MW-3 December 2001 Results | Emmell's Groundwater Screening Criteria (4) | Source of Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| 7439-89-6 | Iron | ILM04-1-M | ug/l | NL | 100 | 300 ** | 71.4 B | 100 U | 100 (6) | PQL |
| 7439-92-1 | Lead | ILM04-1-M | ug/l | 15 TT | 10 | 15 [AL]* | 2.3 U | 3 U | 10 | PQL |
| 7439-95-4 | Magnesium | ILM04-1-M | ug/l | NL | NL | NL | 1510 B | 5000 U | 1510 (7) | Background Dec 2000 |
| 7439-96-5 | Manganese | ILM04-1-M | ug/l | NL | 6 | 50 ** | 15 B | 15 U | 15 (7) | Background Dec 2000 |
| 7439-97-6 | Mercury | ILM04-1-M | ug/l | 2 | 0.5 | 2 | 0.1 UJ | 0.2 U | 0.5 | PQL |
| 7440-02-0 | Nickel | ILM04-1-M | ug/l | NL | 10 | ### | 11.9 B | 40 U | 11.9 (7) | Background Dec 2000 |
| 7440-09-7 | Potassium | ILM04-1-M | ug/l | NL | NL | NL | 536 B | 5000 U | 536 (7) | Background Dec 2000 |
| 7782-49-2 | Selenium | ILM04-1-M | ug/l | 50 | 10 | 50 | 3.9 U | 5 U | 10 | PQL |
| 7440-22-4 | Silver | ILM04-1-M | ug/l | NL | 10 (is)+++ | 100 ** | 1.4 BJ | 10 U | 10 (6) | PQL |
| 7440-23-5 | Sodium | ILM04-1-M | ug/l | NL | 400 | 50000 ** | 3690 B | 5000 U | 3690 (7) | Background Dec 2000 |
| 7440-28-0 | Thallium | ILM04-1-M | ug/l | 2 | 10 | 2 | 1 U | 1 U | 2 | EPA/NJ MCL |
| 7440-62-2 | Vanadium | ILM04-1-M | ug/l | NL | NL | NL | 0.8 U | 50 U | NL | |
| 7440-66-6 | Zinc | ILM04-1-M | ug/l | NL | 30 | 5000 ** | 37.4 R | 20 U | 30 | PQL |
| 57-12-5 | Cyanide | ILM04-1-CN | ug/l | 200 | 40 | 200 | 8 U | 0.5 U | 40 | PQL |

Notes:
1. EPA National Primary Drinking Water Standards, EPA 816-F-02-013, July 2002
2. New Jersey Practical Quantitaion Levels, January 2002 (http://www.state.nj.us/dep/wmm/bfbm/gwqa_table1.html)
3. New Jersey Drinking Water Standards, January 2002 (http://www.state.nj.us/dep/wmm/bfbm/gwqa_table1.html)
4. New Emmell's Groundwater Screening Criteria is the lowest value of the EPA National Primary Drinking Water Standards, New Jersey Drinking Water Standards, New Jersey Class I-PL which is equivalent to site background detects or the New Jersey Practical Quantitation Levels if no background level is available.
6. If background is less than the PQL, EPA MCL or NJ MCL the lowest of the PQL, EPA MCL or NJ MCL was used as the criteria.
7. If background is greater than the PQL, then the highest background value was used as the criteria.

[AL] - Action Level
(is) - Interim Specific Criteria provided by New Jersey Department of Environmental Protection (NJDEP)
(ignc) - Interim Generic Non-Carcinogenic Criteria provided by NJDEP (100 ppb default for non-carcinogenic synthetic organic chemical)
(ism) - Interim Specific Criteria provided by NJDEP, but expressly indicated to ensure consistency with Safe Drinking Water Act MCL; may differ from specific criteria in the New Jersey Ground Water Quality Standards.
MCL - Maximum Contaminant Level
NA - Chemical name listed but no value available
NL - Chemical name not listed
TT - Treatment Technique

@ Natioal Primary Drinking Water Standard changed from the March 2001 to the current July 2002 version.
+++ New Jersey Interim Specific & Generic Groundwater Quality Criteria (web site), November 18, 2002
# Criteria is for a mixture of 2,4-Dinitrotoluene and 2,6-Dinitrotoluene
## Criteria is for chlordane
### No MCL-monitoring required
* An Action Level is not an MCL. It is a trigger point at which remedial action is to take place.
** Secondary Standards

Organic Data Qualifiers:
J - Estimated data due to exceeded quality control criteria.
R - Data is rejected due to exceeded quality control criteria.
U - Compound was analyzed for but not detected. The associated numerical value is the sample quantitation limit.

Inorganic Data Qualifiers:
B - Reported value was obtained from a reading that was less than the Contracted Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection lmit (IDL)
J - Estimated data due to exceeded quality control criteria.
R - Data is rejected
U - Analyte was analyzed for but not detected.

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TABLE 2a

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Emmells Septic Landfill - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Shallow Groundwater |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL of Distribution | Maximum Concentration (Qualifier) | Exposure Point Concentrations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale (1) |
| Monitoring Wells Shallow | **VOCs** | | | | | | | | |
| | 1,1,2-Trichloroethane | ug/L | 3.0E+00 | 1.0E+01 | 13 | 1.0E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | 1,1-Dichloroethene | ug/L | 6.3E+00 | 2.4E+01 | 50 J | 2.4E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | 1,4-Dichlorobenzene | ug/L | 5.2E+00 | 1.8E+01 | 40 D | 1.8E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Benzene | ug/L | 6.1E+00 | 2.3E+01 | 55 D | 2.3E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Chlorobenzene | ug/L | 3.2E+01 | 1.6E+02 | 270 D | 1.6E+02 | ug/L | UCL-NP | 99% Chebyshev (mean,std) |
| | Chloroform | ug/L | 4.8E+00 | 7.7E+00 | 4.6 | 4.6E+00 | ug/L | Max | 95% H-UCL |
| | cis-1,2-Dichloroethene | ug/L | 4.3E+02 | 2.7E+03 | 4,600 D | 2.7E+03 | ug/L | UCL-NP | 99% Chebyshev (mean,std) |
| | Methyl Tert-Butyl Ether | ug/L | 9.5E-01 | 2.3E+00 | 6 | 2.3E+00 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Toluene | ug/L | 9.8E+02 | 6.5E+03 | 10,500 D | 6.5E+03 | ug/L | UCL-NP | 99% Chebyshev (mean,std) |
| | trans-1,2-Dichloroethene | ug/L | 3.0E+00 | 1.2E+01 | 23 J | 1.2E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Trichloroethene | ug/L | 2.8E+00 | 9.3E+00 | 10 | 9.3E+00 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Vinyl Chloride | ug/L | 3.0E+02 | 1.8E+03 | 2,550 D | 1.8E+03 | ug/L | UCL-NP | 99% Chebyshev (mean,std) |
| | Xylenes (total) | ug/L | 4.6E+01 | 3.1E+02 | 570 D | 3.1E+02 | ug/L | UCL-NP | 99% Chebyshev (mean,std) |
| | **SVOCs** | | | | | | | | |
| | 4-Methylphenol | ug/L | 7.3E+00 | 1.4E+01 | 32 | 1.4E+01 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | bis(2-Ethylhexyl)phthalate | ug/L | 5.6E+00 | 7.3E+00 | 15 | 7.3E+00 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Pentachlorophenol | ug/L | 1.2E+01 | 1.4E+01 | 7 J | 7.0E+00 | ug/L | Max | 95% Chebyshev (mean,std) |
| | **P/PCBs** | | | | | | | | |
| | Aroclor-1254 | ug/L | 5.3E-01 | 6.4E-01 | 1.1 | 6.4E-01 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | **INORGANICs** | | | | | | | | |
| | Aluminum | ug/L | 2.1E+04 | 1.2E+05 | 420,000 | 1.2E+05 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Antimony | ug/L | 2.7E+00 | 4.6E+00 | 13 | 4.6E+00 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Arsenic | ug/L | 8.3E+00 | 2.6E+01 | 99 | 2.6E+01 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Barium | ug/L | 1.1E+02 | 1.8E+02 | 540 | 1.8E+02 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Cadmium | ug/L | 3.0E-01 | 6.2E-01 | 1.9 | 6.2E-01 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Chromium | ug/L | 2.5E+01 | 9.7E+01 | 280 | 9.7E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |

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# TABLE 2a

## MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Emmells Septic Landfill - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Shallow Groundwater |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL of Distribution | Maximum Concentration (Qualifier) | Exposure Point Concentrations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale (1) |
| | Copper | ug/L | 2.9E+01 | 7.5E+01 | 140 | 7.5E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Iron | ug/L | 1.5E+04 | 4.0E+05 | 90,000 | 9.0E+04 | ug/L | Max | 99% Chebyshev (MVUE) UCL |
| | Lead | ug/L | 8.6E+00 | 4.2E+01 | 140 | 4.2E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Manganese | ug/L | 8.7E+01 | 1.9E+02 | 280 | 1.9E+02 | ug/L | UCL-T | 95% H-UCL |
| | Thallium | ug/L | 7.6E-01 | 1.0E+00 | 29.15 J | 1.0E+00 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Vanadium | ug/L | 2.9E+01 | 1.4E+02 | 300 | 1.4E+02 | ug/L | UCL-NP | 99% Chebyshev (mean,std) |

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (UCL-N); 95% UCL of Log-transformed Data (UCL-T);Non-parametric UCL (UCL-NP).

(1) The Shapiro-Wilk test was used to test the normality/ lognormality of all data sets at the 0.05 significance level. The UCL procedures listed were selected based on the recommendations in the ProUCL User's Guide and based on the results of the W Test, the number of samples, and the standard deviation of the log-transformed data.

D = Compound is identified at a secondary dilution factor.

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**TABLE 2b**

**MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY**

**Emmells Septic Landfill - Galloway Township, New Jersey**

| | |
|---|---|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Deep Groundwater |

| Exposure Point | Chemical of *Potential Concern* | Units | Arithmetic Mean | 95% UCL of Distribution | Maximum Concentration (Qualifier) | Exposure Point Concentrations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale (1) |
| Monitoring Wells | **VOCs** | | | | | | | | |
| Deep | 1,1,2-Trichloroethane | ug/L | 5.3E+00 | 2.9E+01 | 38 D | 2.9E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | 1,1-Dichloroethene | ug/L | 1.0E+00 | 3.0E+00 | 5.1 | 3.0E+00 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | 1,4-Dichlorobenzene | ug/L | 3.4E+00 | 1.4E+01 | 15 | 1.4E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Benzene | ug/L | 2.2E+00 | 1.1E+01 | 15 | 1.1E+01 | ug/L | UCL-NP | 97.5% Chebyshev (mean,std) |
| | Chlorobenzene | ug/L | 1.9E+01 | 1.2E+02 | 92.5 D | 9.3E+01 | ug/L | Max | 99% Chebyshev (mean,std) |
| | Chloroform | ug/L | 8.4E-01 | 1.1E+00 | 1.3 | 1.1E+00 | ug/L | UCL-N | Student's t |
| | cis-1,2-Dichloroethene | ug/L | 4.0E+01 | 4.8E+02 | 250 D | 2.5E+02 | ug/L | Max | 99% Chebyshev (MVUE) UCL |
| | Trichloroethene | ug/L | 1.9E+00 | 6.6E+00 | 5.7 | 5.7E+00 | ug/L | Max | 97.5% Chebyshev (mean,std) |
| | Vinyl Chloride | ug/L | 4.1E+01 | 4.0E+02 | 360 D | 3.6E+02 | ug/L | Max | 99% Chebyshev (mean,std) |
| | **SVOCs** | | | | | | | | |
| | Pentachlorophenol | ug/L | -- | -- | 2 J | 2.0E+00 | ug/L | Max | < 10 Samples |
| | ***P/PCBs*** | | | | | | | | |
| | Heptachlor | ug/L | -- | -- | 0.52 J | 5.2E-01 | ug/L | Max | < 10 Samples |
| | **INORGANICs** | | | | | | | | |
| | Aluminum | ug/L | 4.5E+03 | 2.2E+04 | 32,000 | 2.2E+04 | ug/L | UCL-T | 99% Chebyshev (MVUE) UCL |
| | Arsenic | ug/L | 4.9E+00 | 9.2E+00 | 12.8 | 9.2E+00 | ug/L | UCL-NP | 95% Chebyshev (mean,std) |
| | Iron | ug/L | 3.7E+03 | 1.2E+04 | 11,000 | 1.1E+04 | ug/L | Max | 95% Chebyshev (MVUE) UCL |
| | Manganese | ug/L | 6.7E+01 | 1.9E+02 | 200 | 1.9E+02 | ug/L | UCL-T | 95% Chebyshev (MVUE) UCL |

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (UCL-N); 95% UCL of Log-transformed Data (UCL-T);Non-parametric UCL (UCL-NP).

(1) The Shapiro-Wilk test was used to test the normality/ lognormality of all data sets at the 0.05 significance level. The UCL procedures listed were selected based on the recommendations in the ProUCL User's Guide and based on the results of the W Test, the number of samples, and the standard deviation of the log-transformed data.

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TABLE 2c

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Emmells Septic Landfill - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Residential Wells, Treatment System Off |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL of Distribution | Maximum Concentration (Qualifier) | Exposure Point Concentrations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale (1) |
| Untreated Tap Water | **VOCs** | | | | | | | | |
| | 1,1,2-Trichloroethane | ug/L | -- | -- | 2 | 2.0E+00 | ug/L | Max | <10 samples |
| | 1,2-Dichloroethane | ug/L | -- | -- | 0.9 J | 9.0E-01 | ug/L | Max | <10 samples |
| | 1,2-Dichloropropane | ug/L | -- | -- | 2 | 2.0E+00 | ug/L | Max | <10 samples |
| | Chloroform | ug/L | -- | -- | 12 | 1.2E+01 | ug/L | Max | <10 samples |
| | **INORGANICS** | | | | | | | | |
| | Arsenic | ug/L | -- | -- | 13.6 J | 1.4E+01 | ug/L | Max | <10 samples |
| | Barium | ug/L | -- | -- | 307 | 3.1E+02 | ug/L | Max | <10 samples |
| | Copper | ug/L | -- | -- | 539 | 5.4E+02 | ug/L | Max | <10 samples |
| | Iron | ug/L | -- | -- | 4700 | 4.7E+03 | ug/L | Max | <10 samples |
| | Lead | ug/L | -- | -- | 190 | 1.9E+02 | ug/L | Max | <10 samples |

Max = Maximum detected concentration

(1) Less than ten samples were collected in each residential well, so statistics were not calculated. Value shown is the maximum from among all untreated residential well results.

TABLE 2d

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Emmells Septic Landfill - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Residential Wells, Treatment System On |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL of Distribution | Maximum Concentration (Qualifier) | Exposure Point Concentrations | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale (1) |
| Treated Tap Water | **VOCs** | | | | | | | | |
| | Chloroform | ug/L | -- | -- | 2 | 2.0E+00 | ug/L | Max | <10 samples |
| | **INORGANICS** | | | | | | | | |
| | Arsenic | ug/L | -- | -- | 12.7 | 1.3E+01 | ug/L | Max | <10 samples |
| | Copper | ug/L | -- | -- | 267 | 2.7E+02 | ug/L | Max | <10 samples |

Max = Maximum detected concentration

(1) Less than ten samples were collected in each residential well, so statistics were not calculated. Value shown is the maximum from among all treated residential well results.

TABLE 3

CANCER TOXICITY DATA – ORAL/DERMAL

Emmell's Septic Landfill Site - Galloway Township, New Jersey

| Chemical of Potential Concern | Oral Cancer Slope Factor | | Oral Absorption Efficiency for Dermal (1) | Absorbed Cancer Slope Factor for Dermal (1) | | Weight of Evidence/ Cancer Guideline Description | Oral CSF | |
|---|---|---|---|---|---|---|---|---|
| | Value | Units | | Value | Units | | Source(s) | Date(s) (2) |
| **VOCs** | | | | | | | | |
| 1,1,1-Trichloroethane | NA | NA | – | NA | NA | D | IRIS | 6/7/2002 |
| 1,1,2-Trichloroethane | 5.7E-02 | (mg/kg/day)-1 | – | 5.7E-02 | (mg/kg/day)-1 | C | IRIS | 6/7/2002 |
| 1,1-Dichloroethane | NA | NA | – | NA | NA | C | IRIS | 6/7/2002 |
| 1,1-Dichloroethene | 6.0E-01 | (mg/kg/day)-1 | – | 6.0E-01 | (mg/kg/day)-1 | C | IRIS | 6/7/2002 |
| 1,2,4-Trichlorobenzene | NA | NA | – | NA | NA | D | IRIS | 6/7/2002 |
| 1,2-Dichloroethane | 9.1E-02 | (mg/kg/day)-1 | – | 9.1E-02 | (mg/kg/day)-1 | B2 | IRIS | 6/7/2002 |
| 1,2-Dichloropropane | 6.8E-02 | (mg/kg/day)-1 | – | 6.8E-02 | (mg/kg/day)-1 | B2 | HEAST | 1997 |
| 1,3-Dichlorobenzene | NA | NA | – | NA | NA | NA | NA | NA |
| 1,4-Dichlorobenzene | 2.4E-02 | (mg/kg/day)-1 | – | 2.4E-02 | (mg/kg/day)-1 | C | HEAST | 1997 |
| Benzene | 5.5E-02 | (mg/kg/day)-1 | – | 5.5E-02 | (mg/kg/day)-1 | A | IRIS | 4/1/2002 |
| Chlorobenzene | NA | NA | – | NA | NA | D | IRIS | 6/7/2002 |
| ** Chloroform | NA | NA | – | NA | NA | B2 | IRIS | 4/1/2002 |
| cis-1,2-Dichloroethene | NA | NA | – | NA | NA | NA | NA | NA |
| Methyl Tert-Butly Ether | 3.3E-03 | (mg/kg/day)-1 | – | 3.3E-03 | (mg/kg/day)-1 | NA | EPA REG9 | 10/1/2002 |
| Toluene | NA | NA | – | NA | NA | D | IRIS | 6/7/2002 |
| trans-1,2-Dichloroethene | NA | NA | – | NA | NA | NA | NA | NA |
| Trichloroethene | 4.0E-01 | (mg/kg/day)-1 | – | 4.0E-01 | (mg/kg/day)-1 | Not stated | NCEA | 8/1/2001 |
| *** Vinyl Chloride (child/adult) | 1.4E+00 | (mg/kg/day)-1 | – | 1.4E+00 | (mg/kg/day)-1 | A | IRIS | 6/7/2002 |
| Xylenes (total) | NA | NA | – | NA | NA | D | IRIS | 6/7/2002 |
| **SVOCs** | | | | | | | | |
| 4-Methylphenol | NA | NA | – | NA | NA | NA | NA | NA |
| bis(2-Ethylhexyl)phthalate | 1.4E-02 | (mg/kg/day)-1 | – | 1.4E-02 | (mg/kg/day)-1 | B2 | IRIS | 6/7/2002 |
| Naphthalene | NA | NA | – | NA | NA | C | IRIS | 6/7/2002 |
| Pentachlorophenol | 1.2E-01 | (mg/kg/day)-1 | – | 1.2E-01 | (mg/kg/day)-1 | B2 | IRIS | 6/7/2002 |
| **Pesticides/PCBs** | | | | | | | | |
| Aroclor-1254 | 2.0E+00 | (mg/kg/day)-1 | – | 2.0E+00 | (mg/kg/day)-1 | B2 | IRIS | 4/1/2002 |
| Heptachlor | 4.5E+00 | (mg/kg/day)-1 | – | 4.5E+00 | (mg/kg/day)-1 | B2 | IRIS | 6/7/2002 |
| **Inorganics** | | | – | | | | | |
| Aluminum | NA | NA | – | NA | NA | D | NCEA | 5/1/2002 |
| Antimony | NA | NA | – | NA | NA | D | NCEA | 5/1/2002 |
| Arsenic | 1.5E+00 | (mg/kg/day)-1 | – | 1.5E+00 | (mg/kg/day)-1 | A | IRIS | 4/1/2002 |
| Barium | NA | NA | – | NA | NA | D | IRIS | 6/7/2002 |
| Cadmium | NA | NA | – | NA | NA | NA | NA | NA |
| * Chromium | NA | NA | – | NA | NA | D | IRIS | 4/1/2002 |
| Copper | NA | NA | – | NA | NA | D | IRIS | 4/1/2002 |
| Iron | NA | NA | – | NA | NA | – | IRIS | 4/1/2002 |
| Lead | NA | NA | – | NA | NA | B2 | IRIS | 4/1/2002 |
| Manganese | NA | NA | – | NA | NA | D | IRIS | 05/20/02 |
| Nickel | NA | NA | – | NA | NA | NA | NA | NA |
| Thallium | NA | NA | – | NA | NA | D | IRIS | 05/20/02 |
| Vanadium | NA | NA | – | NA | NA | – | IRIS | 4/1/2002 |

NCEA - National Center for Environmental Assessment

IRIS = Integrated Risk Information System: April 2002

HEAST = Health Effects Assessment Summary Tables: July 1997

CSF = Cancer slope factor

EPA REG9 = EPA Region 9 Primary Remediation Goals (PRGs) Table. http://www.epa.gov/region09/waste/sfund/prg/

(1) The dermal Cancer Slope Factor was assumed to equal the oral Cancer Slope Factor.
No adjustment factor was applied.

(2) IRIS values were confirmed against the EPA's online database, June 2002.
NCEA values were pulled from the EPA Region 9 PRG table, 2000 update

EPA Weight of Evidence:

A - Human Carcinogen

B1 - Probable human carcinogen - indicates that limited human

B2 - Probable human carcinogen - indicates sufficient evidence
and inadequate or no evidence in humans.

C - Possible human carcinogen

D - Not classifiable as human carcinogen

E - Evidence of noncarcinogenicity

VOCs = Volatile Organic Compounds

SVOCs = Semi Volatile Organic Compounds

* Chromium VI is an A carcinogen by the inhalation route, but a D carcinogen by the oral route.

** For chloroform, IRIS states that a dose of 1e-2 mg/kg/day, equal to the noncancer RfD, can be considered protective against cancer risk.

*** IRIS provides two oral cancer slope factors for vinyl chloride: 1.4 (mg/kg/day)-1 for continuous lifetime exposure from birth and 0.72 (mg/kg/day)-1

# TABLE 4

NON-CANCER TOXICITY DATA – ORAL/DERMAL

Emmell's Septic Landfill Site - Galloway Township, New Jersey

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD | | Oral Absorption Efficiency for Dermal (1) | Absorbed RfD for Dermal (1) | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfD: Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | | Value | Units | | | Source(s) | Date(s) (2) (MM/DD/YYYY) |
| VOCs | | | | | | | | | | |
| 1,1,1-Trichloroethane | Chronic | 2.0E-02 | mg/kg/day | – | 2.0E-02 | mg/kg-day | – | – | NCEA | – |
| 1,1,2-Trichloroethane | Chronic | 4.0E-03 | mg/kg/day | – | 4.0E-03 | mg/kg-day | Serum | 1000 | IRIS | 6/7/2002 |
| 1,1-Dichloroethane | Chronic | 1.0E-01 | mg/kg/day | – | 1.0E-01 | mg/kg-day | None | 1000 | HEAST | 1997 |
| 1,1-Dichloroethene | Chronic | 9.0E-03 | mg/kg/day | – | 9.0E-03 | mg/kg-day | Liver | 1000 | IRIS | 6/7/2002 |
| 1,2,4-Trichlorobenzene | Chronic | 1.0E-02 | mg/kg/day | – | 1.0E-02 | mg/kg-day | Adrenal; cortex | 1000 | IRIS | 6/7/2002 |
| 1,2-Dichloroethene | Chronic | 3.0E-02 | mg/kg/day | – | 3.0E-02 | mg/kg-day | – | – | NCEA | – |
| 1,2-Dichloropropane | NA | NA | NA | – | NA | NA | NA | NA | NA | NA |
| 1,3-Dichlorobenzene | Chronic | 9.0E-04 | mg/kg/day | – | 9.0E-04 | mg/kg-day | – | – | NCEA | – |
| 1,4-Dichlorobenzene | Chronic | 3.0E-02 | mg/kg/day | – | 3.0E-02 | mg/kg-day | – | – | NCEA | – |
| Benzene | Chronic | 3.0E-03 | mg/kg/day | – | 3.0E-03 | mg/kg-day | Blood | 3000 | NCEA | 5/1/2002 |
| Chlorobenzene | Chronic | 2.0E-02 | mg/kg/day | – | 2.0E-02 | mg/kg-day | Liver | 1000 | IRIS | 6/7/2002 |
| Chloroform | Chronic | 1.0E-02 | mg/kg/day | – | 1.0E-02 | mg/kg-day | Liver | 100 | IRIS | 4/1/2002 |
| cis-1,2-Dichloroethene | Chronic | 1.0E-02 | mg/kg/day | – | 1.0E-02 | mg/kg-day | Blood | 3000 | HEAST | 1997 |
| Methyl Tert-Butyl Ether | Chronic | 8.6E-01 | mg/kg/day | – | 8.6E-01 | mg/kg-day | – | – | EPA REG9 | 10/1/2002 |
| Toluene | Chronic | 2.0E-01 | mg/kg/day | – | 2.0E-01 | mg/kg-day | Liver, kidney | 1000 | IRIS | 6/7/2002 |
| trans-1,2-Dichloroethene | Chronic | 2.0E-02 | mg/kg/day | – | 2.0E-02 | mg/kg-day | Serum | 1000 | IRIS | 6/7/2002 |
| Trichloroethene | Chronic | 3.0E-04 | mg/kg/day | – | 3.0E-04 | mg/kg-day | Liver, kidney, fetus | Not stated | NCEA | 8/1/2001 |
| Vinyl Chloride (child/adult) | Chronic | 3.0E-03 | mg/kg/day | – | 3.0E-03 | mg/kg-day | Liver | 30 | IRIS | 6/7/2002 |
| Xylenes (total) | Chronic | 2.0E+00 | mg/kg/day | – | 2.0E+00 | mg/kg-day | Hyperactivity | 100 | IRIS | 6/7/2002 |
| SVOCs | | | | – | | | | | | |
| 4-Methylphenol | Chronic | 5.0E-03 | mg/kg/day | – | 5.0E-03 | mg/kg-day | Central Nervous System | 1000 | HEAST | 1997 |
| bis(2-Ethylhexyl)phthalate | Chronic | 2.0E-02 | mg/kg/day | – | 2.0E-02 | mg/kg-day | Liver | 1000 | IRIS | 06/07/02 |
| Napthalene | Chronic | 2.0E-02 | mg/kg/day | – | 2.0E-02 | mg/kg-day | Whole Body | 3000 | IRIS | 04/01/02 |
| Pentachlorophenol | Chronic | 3.0E-02 | mg/kg/day | – | 3.0E-02 | mg/kg-day | Liver, kidney | 100 | IRIS | 06/07/02 |
| Pesticides/PCBs | | | | – | | | | | | |
| Aroclor-1254 | Chronic | 2.0E-05 | mg/kg/day | – | 2.0E-05 | mg/kg-day | Eye/Skin/Nails | 300 | IRIS | 4/1/2002 |
| Heptachlor | Chronic | 5.0E-04 | mg/kg/day | – | 5.0E-04 | mg/kg-day | Liver | 300 | IRIS | 6/7/2002 |
| Inorganics | | | | | | | | | | |
| …nium | Chronic | 1.0E+00 | mg/kg/day | – | 1.0E+00 | mg/kg-day | GI Tract/CNS | 100 | NCEA | 5/1/2002 |
| …ony | Chronic | 4.0E-04 | mg/kg/day | 15% | 6.0E-05 | mg/kg-day | Whole Body/Blood | 1000 | IRIS | 4/1/2002 |
| …enic | Chronic | 3.0E-04 | mg/kg/day | – | 3.0E-04 | mg/kg-day | Skin | 3 | IRIS | 4/1/2002 |
| Barium | Chronic | 7.0E-02 | mg/kg/day | 7% | 4.9E-03 | mg/kg-day | Kidney | 3 | IRIS | 6/7/2002 |
| * Cadmium | Chronic | 5.0E-04 | mg/kg/day | 2.5% | 1.3E-05 | mg/kg-day | Kidney | 10 | IRIS | 4/1/2002 |
| ** Chromium | Chronic | 3.0E-03 | mg/kg/day | 2.5% | 7.5E-05 | mg/kg-day | GI Tract | 900 | IRIS | 4/1/2002 |
| Copper | Chronic | 4.0E-02 | mg/kg/day | – | 4.0E-02 | mg/kg-day | GI Tract | – | HEAST | 7/1/1997 |
| Iron | Chronic | 3.0E-01 | mg/kg/day | – | 3.0E-01 | mg/kg-day | GI Tract/Liver | 1 | NCEA | 5/1/2002 |
| Lead | NA | NA | NA | – | NA | NA | NA | NA | NA | NA |
| *** Manganese | Chronic | 2.0E-02 | mg/kg/day | 4% | 8.0E-04 | mg/kg/day | Central Nervous System | 3 | IRIS | 05/20/02 |
| Nickel | Chronic | 2.0E-02 | mg/kg/day | 4% | 8.0E-04 | mg/kg-day | Whole Body | 300 | IRIS | 4/1/2002 |
| Thallium | Chronic | 8.0E-05 | mg/kg/day | – | 8.0E-05 | mg/kg-day | Blood chemistry | 3000 | IRIS | 5/20/2002 |
| Vanadium | Chronic | 7.0E-03 | mg/kg/day | 2.6% | 1.8E-04 | mg/kg-day | None | 100 | HEAST | 7/1/1997 |

NCEA = National Center for Environmental Assessment
IRIS = Integrated Risk Information System; June 2002
HEAST = Health Effects Assessment Summary Tables; July 1997
RfD = Reference dose
EPA REG9 = EPA Region 9 Primary Remediation Goals (PRGs) Table. http://www.epa.gov/region09/waste/sfund/prg/

VOCs = Volatile Organic Compounds
SVOCs = Semi Volatile Organic Compounds

(1) The dermal RfD was assumed to equal the oral RfD, unless an adjustment factor was found in Exhibit 4.1 of EPA 2001d.
(2) IRIS values were confirmed against the EPA's online database, June 2002.
NCEA values were pulled from the EPA Region 9 PRG table, 2000 update
* IRIS provides two RfDs for cadmium: 5e-4 mg/kg/day for cadmium in drinking water and 1e-3 mg/kg/day for cadmium in food.
** The RfD for hexavalent chromium has been applied to total chromium
*** The RfD of 2e-2 mg/kg/day applies to nondietary exposures, and was calculated from the IRIS RfD of 1.4e-1 mg/kg/day as recommended in IRIS.

## TABLE 5a

RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Receptor Population: | Resident |
| Receptor: | Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Shallow Groundwater | Tap Water | 1,1,2-Trichloroethane | 5.4E-06 | NA | NA | 5.4E-06 | Serum | 7.0E-02 | NA | NA | 7.0E-02 |
| | | | 1,1-Dichloroethene | 1.4E-04 | NA | NA | 1.4E-04 | Liver | 7.3E-02 | NA | NA | 7.3E-02 |
| | | | 1,4-Dichlorobenzene | 4.1E-06 | NA | NA | 4.1E-06 | – | 1.7E-02 | NA | NA | 1.7E-02 |
| | | | Benzene | 1.2E-05 | NA | NA | 1.2E-05 | Blood | 2.1E-01 | NA | NA | 2.1E-01 |
| | | | Chlorobenzene | NA | NA | NA | NA | Liver | 2.3E-01 | NA | NA | 2.3E-01 |
| | | | Chloroform | NA | NA | NA | NA | Liver | 1.3E-02 | NA | NA | 1.3E-02 |
| | | | cis-1,2-Dichloroethene | NA | NA | NA | NA | Blood | 7.5E+00 | NA | NA | 7.5E+00 |
| | | | Methyl Tert-Butyl Ether | 7.0E-08 | NA | NA | 7.0E-08 | – | 7.2E-05 | NA | NA | 7.2E-05 |
| | | | Toluene | NA | NA | NA | NA | Liver, kidney | 8.9E-01 | NA | NA | 8.9E-01 |
| | | | trans-1,2-Dichloroethene | NA | NA | NA | NA | Serum | 1.6E-02 | NA | NA | 1.6E-02 |
| | | | Trichloroethene | 3.5E-05 | NA | NA | 3.5E-05 | Liver, kidney, fetus | 8.5E-01 | NA | NA | 8.5E-01 |
| | | | Vinyl Chloride | 1.2E-02 | NA | NA | 1.2E-02 | Liver | 1.7E+01 | NA | NA | 1.7E+01 |
| | | | Xylenes (total) | NA | NA | NA | NA | Hyperactivity | 4.3E-03 | NA | NA | 4.3E-03 |
| | | | 4-Methylphenol | NA | NA | NA | NA | Central Nervous System | 7.5E-02 | NA | NA | 7.5E-02 |
| | | | bis(2-Ethylhexyl)phthalate | 9.6E-07 | NA | NA | 9.6E-07 | Liver | 1.0E-02 | NA | NA | 1.0E-02 |
| | | | Pentachlorophenol | 7.9E-06 | NA | NA | 7.9E-06 | Liver, kidney | 6.4E-03 | NA | NA | 6.4E-03 |
| | | | Aroclor-1254 | 1.2E-05 | NA | NA | 1.2E-05 | Eye/Skin/Nails | 8.7E-01 | NA | NA | 8.7E-01 |
| | | | Aluminum | NA | NA | NA | NA | GI Tract/CNS | 3.3E+00 | NA | NA | 3.3E+00 |
| | | | Antimony | NA | NA | NA | NA | Whole Body/Blood | 3.1E-01 | NA | NA | 3.1E-01 |
| | | | Arsenic | 3.6E-04 | NA | NA | 3.6E-04 | Skin | 2.3E+00 | NA | NA | 2.3E+00 |
| | | | Barium | NA | NA | NA | NA | Kidney | 7.2E-02 | NA | NA | 7.2E-02 |
| | | | Cadmium | NA | NA | NA | NA | Kidney | 3.4E-02 | NA | NA | 3.4E-02 |
| | | | Chromium | NA | NA | NA | NA | GI Tract | 8.9E-01 | NA | NA | 8.9E-01 |
| | | | Copper | NA | NA | NA | NA | GI Tract | 5.1E-02 | NA | NA | 5.1E-02 |
| | | | Iron | NA | NA | NA | NA | GI Tract/Liver | 8.2E+00 | NA | NA | 8.2E+00 |
| | | | Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | | | Manganese | NA | NA | NA | NA | Central Nervous System | 2.6E-01 | NA | NA | 2.6E-01 |
| | | | Thallium | NA | NA | NA | NA | Blood chemistry | 3.5E-01 | NA | NA | 3.5E-01 |
| | | | Vanadium | NA | NA | NA | NA | None | 5.5E-01 | NA | NA | 5.5E-01 |
| | | | Chemical Total | 1.3E-02 | NA | NA | 1.3E-02 | | 4.5E+01 | NA | NA | 4.5E+01 |
| | | Exposure Point Total | | | | | 1.3E-02 | | | | | 4.5E+01 |
| | Exposure Medium Total | | | | | | 1.3E-02 | | | | | 4.5E+01 |
| Groundwater Total | | | | | | | 1.3E-02 | | | | | 4.5E+01 |
| Receptor Total | | | | | | | 1.3E-02 | | | | | 4.5E+01 |

Total Risk Across All Media = 1.3E-02

Total Hazard Across All Media = 4.5E+01

| | |
|---|---|
| Total Liver HI Across All Media = | 2.7E+01 |
| Total Kidney HI Across All Media = | 1.9E+00 |
| Total Fetus HI Across All Media = | 6.5E-01 |
| Total GI Tract HI Across All Media = | 1.2E+01 |
| Total Central Nervous System HI Across All Media = | 3.7E+00 |
| Total Blood HI Across All Media = | 6.5E+00 |
| Total Whole Body HI Across All Media = | 4.1E-01 |
| Total Skin HI Across All Media = | 3.2E+00 |
| Total adrenal/cortex HI Across All Media = | 3.4E-02 |

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.
However, the total risks and HIs shown here are based on all COPCs (see Tables 9.1a through 9.4c for full list of COPCs, risks, and HIs).

# TABLE 5b

RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Receptor Population: | Resident |
| Receptor: | Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Shallow Groundwater | Tap Water | 1,1,2-Trichloroethane | 3.2E-06 | NA | NA | 3.2E-06 | Serum | 1.6E-01 | NA | NA | 1.6E-01 |
| | | | 1,1-Dichloroethene | 7.9E-05 | NA | NA | 7.9E-05 | Liver | 1.7E-01 | NA | NA | 1.7E-01 |
| | | | 1,4-Dichlorobenzene | 2.4E-06 | NA | NA | 2.4E-06 | – | 3.9E-02 | NA | NA | 3.9E-02 |
| | | | Benzene | 7.0E-06 | NA | NA | 7.0E-06 | Blood | 4.9E-01 | NA | NA | 4.9E-01 |
| | | | Chlorobenzene | NA | NA | NA | NA | Liver | 5.3E-01 | NA | NA | 5.3E-01 |
| | | | Chloroform | NA | NA | NA | NA | Liver | 2.9E-02 | NA | NA | 2.9E-02 |
| | | | cis-1,2-Dichloroethene | NA | NA | NA | NA | Blood | 1.8E+01 | NA | NA | 1.8E+01 |
| | | | Methyl Tert-Butyl Ether | 4.1E-08 | NA | NA | 4.1E-08 | – | 1.7E-04 | NA | NA | 1.7E-04 |
| | | | Toluene | NA | NA | NA | NA | Liver, kidney | 2.1E+00 | NA | NA | 2.1E+00 |
| | | | trans-1,2-Dichloroethene | NA | NA | NA | NA | Serum | 3.7E-02 | NA | NA | 3.7E-02 |
| | | | Trichloroethene | 2.0E-05 | NA | NA | 2.0E-05 | Liver, kidney, fetus | 2.0E+00 | NA | NA | 2.0E+00 |
| | | | Vinyl Chloride | 1.4E-02 | NA | NA | 1.4E-02 | Liver | 3.9E+01 | NA | NA | 3.9E+01 |
| | | | 4-Methylphenol | NA | NA | NA | NA | Central Nervous System | 1.8E-01 | NA | NA | 1.8E-01 |
| | | | bis(2-Ethylhexyl)phthalate | 5.6E-07 | NA | NA | 5.6E-07 | Liver | 2.3E-02 | NA | NA | 2.3E-02 |
| | | | Naphthalene | NA | NA | NA | NA | Whole Body | 5.0E-02 | NA | NA | 5.0E-02 |
| | | | Pentachlorophenol | 4.6E-06 | NA | NA | 4.6E-06 | Liver, kidney | 1.5E-02 | NA | NA | 1.5E-02 |
| | | | Aroclor-1254 | 7.0E-06 | NA | NA | 7.0E-06 | Eye/Skin/Nails | 2.0E+00 | NA | NA | 2.0E+00 |
| | | | Aluminum | NA | NA | NA | NA | GI Tract/CNS | 7.8E+00 | NA | NA | 7.8E+00 |
| | | | Antimony | NA | NA | NA | NA | Whole Body/Blood | 7.3E-01 | NA | NA | 7.3E-01 |
| | | | Arsenic | 2.1E-04 | NA | NA | 2.1E-04 | Skin | 5.5E+00 | NA | NA | 5.5E+00 |
| | | | Barium | NA | NA | NA | NA | Kidney | 1.7E-01 | NA | NA | 1.7E-01 |
| | | | Cadmium | NA | NA | NA | NA | Kidney | 7.9E-02 | NA | NA | 7.9E-02 |
| | | | Chromium | NA | NA | NA | NA | GI Tract | 2.1E+00 | NA | NA | 2.1E+00 |
| | | | Copper | NA | NA | NA | NA | GI Tract | 1.2E-01 | NA | NA | 1.2E-01 |
| | | | Iron | NA | NA | NA | NA | GI Tract/Liver | 1.9E+01 | NA | NA | 1.9E+01 |
| | | | Manganese | NA | NA | NA | NA | Central Nervous System | 6.1E-01 | NA | NA | 6.1E-01 |
| | | | Nickel | NA | NA | NA | NA | Whole Body | 2.2E-01 | NA | NA | 2.2E-01 |
| | | | Thallium | NA | NA | NA | NA | Blood chemistry | 8.1E-01 | NA | NA | 8.1E-01 |
| | | | Vanadium | NA | NA | NA | NA | None | 1.3E+00 | NA | NA | 1.3E+00 |
| | | | Chemical Total | 1.4E-02 | NA | NA | 1.4E-02 | | 1.0E+02 | NA | NA | 1.0E+02 |
| | | Exposure Point Total | | | | | 1.4E-02 | | | | | 1.0E+02 |
| | Exposure Medium Total | | | | | | 1.4E-02 | | | | | 1.0E+02 |
| Groundwater Total | | | | | | | 1.4E-02 | | | | | 1.0E+02 |
| Receptor Total | | | | | | | 1.4E-02 | | | | | 1.0E+02 |

Total Risk Across All Media = 1E-02

Total Hazard Across All Media = 1.0E+02

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.
However, the total risks and HIs shown here are based on all COPCs (see Tables 9.1a through 9.4c for full list of COPCs, risks, and HIs).

| | |
|---|---|
| Total Liver HI Across All Media = | 6.3E+01 |
| Total Kidney HI Across All Media = | 4.3E+00 |
| Total GI Tract HI Across All Media = | 2.9E+01 |
| Total Central Nervous System HI Across All Media = | 6.6E+00 |
| Total Blood HI Across All Media = | 2.0E+01 |
| Total Whole Body HI Across All Media = | 9.5E-01 |
| Total Skin HI Across All Media = | 7.5E+00 |
| Total adrenal/cortex HI Across All Media = | 7.9E-02 |

# TABLE 5c

RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Future |
| Receptor Population: | Resident |
| Receptor: | Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Deep Groundwater | Tap Water | 1,1,2-Trichloroethane | 1.6E-05 | NA | NA | 1.6E-05 | Serum | 2.0E-01 | NA | NA | 2.0E-01 |
| | | | 1,1-Dichloroethene | 1.7E-05 | NA | NA | 1.7E-05 | Liver | 9.3E-03 | NA | NA | 9.3E-03 |
| | | | 1,4-Dichlorobenzene | 3.1E-06 | NA | NA | 3.1E-06 | -- | 1.3E-02 | NA | NA | 1.3E-02 |
| | | | Benzene | 5.9E-06 | NA | NA | 5.9E-06 | Blood | 1.0E-01 | NA | NA | 1.0E-01 |
| | | | Chlorobenzene | NA | NA | NA | NA | Liver | 1.3E-01 | NA | NA | 1.3E-01 |
| | | | Chloroform | NA | NA | NA | NA | Liver | 3.0E-03 | NA | NA | 3.0E-03 |
| | | | cis-1,2-Dichloroethene | NA | NA | NA | NA | Blood | 6.8E-01 | NA | NA | 6.8E-01 |
| | | | Trichloroethene | 2.1E-05 | NA | NA | 2.1E-05 | Liver, kidney, fetus | 5.2E-01 | NA | NA | 5.2E-01 |
| | | | Vinyl Chloride | 2.4E-03 | NA | NA | 2.4E-03 | Liver | 3.3E+00 | NA | NA | 3.3E+00 |
| | | | Pentachlorophenol | 2.3E-06 | NA | NA | 2.3E-06 | Liver, kidney | 1.8E-03 | NA | NA | 1.8E-03 |
| | | | Heptachlor | 2.2E-05 | NA | NA | 2.2E-05 | Liver | 2.8E-02 | NA | NA | 2.8E-02 |
| | | | Aluminum | NA | NA | NA | NA | GI Tract/CNS | 5.9E-01 | NA | NA | 5.9E-01 |
| | | | Arsenic | 1.3E-04 | NA | NA | 1.3E-04 | Skin | 8.4E-01 | NA | NA | 8.4E-01 |
| | | | Iron | NA | NA | NA | NA | GI Tract/Liver | 1.0E+00 | NA | NA | 1.0E+00 |
| | | | Manganese | NA | NA | NA | NA | Central Nervous System | 2.6E-01 | NA | NA | 2.6E-01 |
| | | | Chemical Total | 2.7E-03 | NA | NA | 2.7E-03 | | 8.1E+00 | NA | NA | 8.1E+00 |
| | | Exposure Point Total | | | | | 2.7E-03 | | | | | 8.1E+00 |
| | Exposure Medium Total | | | | | | 2.7E-03 | | | | | 8.1E+00 |
| Groundwater Total | | | | | | | 2.7E-03 | | | | | 8.1E+00 |
| Receptor Total | | | | | | | 2.7E-03 | | | | | 8.1E+00 |

Total Risk Across All Media = 3E-03

Total Hazard Across All Media = 8.1E+00

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.
However, the total risks and HIs shown here are based on all COPCs (see Tables 9.1a through 9.4c for full list of COPCs, risks, and HIs).

| | |
|---|---|
| Total Liver HI Across All Media = | 5.0E+00 |
| Total Kidney HI Across All Media = | 5.2E-01 |
| Total Fetus HI Across All Media = | 5.2E-01 |
| Total GI Tract HI Across All Media = | 1.7E+00 |
| Total Central Nervous System HI Across All Media = | 6.5E-01 |
| Total Blood HI Across All Media = | 7.9E-01 |
| Total Whole Body HI Across All Media = | 1.4E-01 |
| Total Skin HI Across All Media = | 8.4E-01 |

TABLE 5d

RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
*Emmell's Septic Landfill Site - Galloway Township, New Jersey*

| | |
|---|---|
| Scenario Timeframe: | Future |
| Receptor Population: | Resident |
| Receptor: | Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Deep Groundwater | Tap Water | 1,1,2-Trichloroethane | 9.1E-06 | NA | NA | 9.1E-06 | Serum | 4.6E-01 | NA | NA | 4.6E-01 |
| | | | 1,1-Dichloroethene | 1.0E-05 | NA | NA | 1.0E-05 | Liver | 2.2E-02 | NA | NA | 2.2E-02 |
| | | | 1,4-Dichlorobenzene | 1.8E-06 | NA | NA | 1.8E-06 | -- | 3.0E-02 | NA | NA | 3.0E-02 |
| | | | Benzene | 3.4E-06 | NA | NA | 3.4E-06 | Blood | 2.4E-01 | NA | NA | 2.4E-01 |
| | | | Chlorobenzene | NA | NA | NA | NA | Liver | 3.0E-01 | NA | NA | 3.0E-01 |
| | | | Chloroform | NA | NA | NA | NA | Liver | 7.0E-03 | NA | NA | 7.0E-03 |
| | | | cis-1,2-Dichloroethene | NA | NA | NA | NA | Blood | 1.6E+00 | NA | NA | 1.6E+00 |
| | | | Trichloroethene | 1.2E-05 | NA | NA | 1.2E-05 | Liver, kidney, fetus | 1.2E+00 | NA | NA | 1.2E+00 |
| | | | Vinyl Chloride | 2.8E-03 | NA | NA | 2.8E-03 | Liver | 7.7E+00 | NA | NA | 7.7E+00 |
| | | | Pentachlorophenol | 1.3E-06 | NA | NA | 1.3E-06 | Liver, kidney | 4.3E-03 | NA | NA | 4.3E-03 |
| | | | Heptachlor | 1.3E-05 | NA | NA | 1.3E-05 | Liver | 6.6E-02 | NA | NA | 6.6E-02 |
| | | | Aluminum | NA | NA | NA | NA | GI Tract/CNS | 1.4E+00 | NA | NA | 1.4E+00 |
| | | | Arsenic | 7.6E-05 | NA | NA | 7.6E-05 | Skin | 2.0E+00 | NA | NA | 2.0E+00 |
| | | | Iron | NA | NA | NA | NA | GI Tract/Liver | NA | NA | NA | NA |
| | | | Manganese | NA | NA | NA | NA | Central Nervous System | 6.1E-01 | NA | NA | 6.1E-01 |
| | | | Chemical Total | 2.9E-03 | NA | NA | 2.9E-03 | | 1.7E+01 | NA | NA | 1.7E+01 |
| | | Exposure Point Total | | | | | 2.9E-03 | | | | | 1.7E+01 |
| | Exposure Medium Total | | | | | | 2.9E-03 | | | | | 1.7E+01 |
| Groundwater Total | | | | | | | 2.9E-03 | | | | | 1.7E+01 |
| Receptor Total | | | | | | | 2.9E-03 | | | | | 1.7E+01 |

Total Risk Across All Media = 3E-03

Total Hazard Across All Media = 1.7E+01

| | |
|---|---|
| Total Liver HI Across All Media = | 9.3E+00 |
| Total Kidney HI Across All Media = | 1.2E+00 |
| Total GI Tract HI Across All Media = | 1.7E+00 |
| Total Central Nervous System HI Across All Media = | 2.0E+00 |
| Total Blood HI Across All Media = | 1.8E+00 |
| Total Whole Body HI Across All Media = | 3.3E-01 |
| Total Skin HI Across All Media = | 2.0E+00 |

NA = Not Available

This table provides a summary of the COPCs that may trigger the need for cleanup.

Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are s

However, the total risks and HIs shown here are based on all COPCs (see Tables 9.1a through 9.4c for full list of COPCs, risks, and HIs).

TABLE 5e

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Current/Future |
| Receptor Population: | Resident |
| Receptor: | Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Untreated Tap Water | Tap Water | VOCs | | | | | | | | | |
| | | | 1,1,2-Trichloroethane | 1.1E-06 | NA | NA | 1.1E-06 | Serum | 1.4E-02 | NA | NA | 1.4E-02 |
| | | | 1,2-Dichloropropane | 1.3E-06 | NA | NA | 1.3E-06 | NA | NA | NA | NA | NA |
| | | | INORGANICS | | | | | | | | | |
| | | | Arsenic | 1.9E-04 | NA | NA | 1.9E-04 | Skin | 1.2E+00 | NA | NA | 1.2E+00 |

Total risks across chemicals were not calculated because risks are based on maximum concentrations from different private wells. Individual receptors would not be exposed to water from multiple wells.

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.

TABLE 5f

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Current/Future |
| Receptor Population: | Resident |
| Receptor: | Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Untreated Tap Water | Tap Water | **VOCs** | | | | | | | | | |
| | | | 1,2-Dichloropropane | 7.5E-07 | NA | NA | 7.5E-07 | NA | NA | NA | NA | NA |
| | | | **INORGANICS** | | | | | | | | | |
| | | | Arsenic | 1.1E-04 | NA | NA | 1.1E-04 | Skin | 2.9E+00 | NA | NA | 2.9E+00 |
| | | | Copper | NA | NA | NA | NA | GI Tract | 8.6E-01 | NA | NA | 8.6E-01 |
| | | | Iron | NA | NA | NA | NA | GI Tract/Liver | 1.0E+00 | NA | NA | 1.0E+00 |

Total risks across chemicals were not calculated because risks are based on maximum concentrations from different private wells. Individual receptors would not be exposed to water from multiple wells.

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.

TABLE 5g

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Current/Future |
| Receptor Population: | Resident |
| Receptor: | Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Treated Tap Water | Tap Water | INORGANICS | | | | | | | | | |
| | | | Arsenic | 1.8E-04 | NA | NA | 1.8E-04 | Skin | 1.2E+00 | NA | NA | 1.2E+00 |

Total risks across chemicals were not calculated because risks are based on maximum concentrations from different private wells. Individual receptors would not be exposed to water from multiple wells.

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.

TABLE 5h

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Emmell's Septic Landfill Site - Galloway Township, New Jersey

| | |
|---|---|
| Scenario Timeframe: | Current/Future |
| Receptor Population: | Resident |
| Receptor: | Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic-Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Treated Tap Water | Tap Water | INORGANICS | | | | | | | | | |
| | | | Arsenic | 1.0E-04 | NA | NA | 1.0E-04 | Skin | 2.7E+00 | NA | NA | 2.7E+00 |

Total risks across chemicals were not calculated because risks are based on maximum concentrations from different private wells. Individual receptors would not be exposed to water from multiple wells.

NA = Not Available
This table provides a summary of the COPCs that may trigger the need for cleanup.
Only those COPCs with a cancer risk > 1E-6 (one in a million) or causing a noncancer hazard index > 1 are shown.

TAB( i

**SUMMARY OF RISKS AND HAZARDS**

**REASONABLE MAXIMUM EXPOSURE**

Emmell's Septic Landfill Site - Galloway Township, New Jersey

| Receptor | Cancer Risk | Cancer Risk Note | Noncancer Hazard Index (HI) | Noncancer HI Note |
|---|---|---|---|---|
| **Future: Shallow** | | | | |
| Resident - Adult | 1E-02 | Vinyl chloride (risk= 1.2E-02) accounted for 96% of the cancer risk. Arsenic (risk = 3.6 E-04) accounted for 3% of the cancer risk. | 45 | HIs for liver, kidney, GI tract, blood, CNS and skin exceed 1. |
| Resident - Child | 1E-02 | Vinyl chloride (risk= 1.4E-02) accounted for 98% of the cancer risk. Arsenic (risk = 2.1E-04) accounted for 2% of cancer risk). | 100 | HIs for liver, kidney, GI tract, blood, CNS and skin exceed 1. |
| Resident - Adult/child combined | 3E-02 | See notes above. | NA | HI values for adult and child receptors should not be combined. |
| **Future: Deep** | | | | |
| Resident - Adult | 3E-03 | Vinyl chloride (risk= 2.4E-03) accounted for 92% of the cancer risk. Arsenic (risk= 1.3E-04) accounted for 5%. | 8 | HIs for liver and GI tract exceed 1. |
| Resident - Child | 3E-03 | Vinyl chloride (risk= 2.8E-03) accounted for 96% of the cancer risk. Arsenic (risk= 7.6E-05) accounted for 3%. | 17 | HIs for liver, kidney, GI tract, blood, CNS, and skin exceed 1. |
| Resident - Adult/child combined | 6E-03 | See notes above. | NA | HI values for adult and child receptors should not be combined. |
| **Future: Untreated Wells** | | | | |
| Resident - Adult | 2E-04 | Arsenic (risk= 1.9E-4) was the only chemical with a cancer risk greater than $10^{-5}$. | 1 | HI for skin exceeds 1. |
| Resident - Child | 1E-04 | Arsenic (risk= 1.1E-4) was the only chemical with a cancer risk greater than $10^{-5}$. | 3 | HIs for skin, GI tract, and liver exceed 1. |
| Resident - Adult/child combined | 3E-04 | See notes above. | NA | HI values for adult and child receptors should not be combined. |
| **Future: Treated Wells** | | | | |
| Resident - Adult | 2E-04 | Arsenic (risk= 1.8E-4) was the only chemical with a cancer risk greater than $10^{-5}$. | 1 | HI for skin exceeds 1. |
| Resident - Child | 1E-04 | Arsenic (risk= 1.0E-04) was the only chemical with a cancer risk greater than $10^{-5}$. | 3 | HI for skin exceeds 1. |
| Resident - Adult/child combined | 3E-04 | See notes above. | NA | HI values for adult and child receptors should not be combined. |

**Cancer risks**: An excess lifetime cancer risk of 1E-06 indicates that an individual experiencing the reasonable maximum exposure has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 1E-06 to 1E-04 (one in one million to one in ten thousand).

**Noncancer hazards**: EPA Risk Assessment Guidance for Superfund (EPA 1989) states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects.

TABLE 6a

**Cost Estimate for Alternative GW2**

**Hydraulic Source Control and Treatment using Extraction Wells and Recharge Basin**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (1) Work Plan Preparation | 1 | $35,300 | LS | $35,300 | | |
| Assume 2 persons for 1 month | | | | | | |
| Assume salary rate of ($35/hr) | | | | | | |
| Assume salary multiplier of 3 | | | | | | |
| Subtotal (1) | | | | $35,300 | | |
| (2) Mobilization/ Demobilization | 1 | $30,000 | LS | $30,000 | | |
| Subtotal (2) | | | | $30,000 | | |
| *(3) Groundwater Extraction Well Installation* | | | | | | |
| Shallow Extraction Wells (3 Wells at a depth of 80 feet) | | | | | | |
| (a) 10-inch borehole drilling | 80 | $22 | LF | $1,760 | | |
| (b) 6-inch stainless steel casing | 60 | $30 | LF | $1,800 | | |
| (c) Well completion materials | 80 | $8 | LF | $640 | | |
| (d) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (e) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (f) Well development | 3 | $160 | HR | $480 | | |
| (g) Decon of equipment | 1 | $180 | HR | $180 | | |
| (h) Drum (Assume 4 per boring, includes staging) | 4 | $100 | EA | $400 | | |
| Total for One Shallow Well | | | | $6,560 | | |
| Total for 3 Shallow Wells at this site | | | | $19,680 | | |
| Deep Groundwater Extraction Wells (3 Wells at a depth of 110 feet) | | | | | | |
| (a) 12-inch borehole drilling | 80 | $26 | LF | $2,080 | | |
| (b) 10-inch borehole drilling | 30 | $22 | LF | $660 | | |
| (e) 10-inch carbon steel casing | 80 | $30 | LF | $2,400 | | |
| (f) 6-inch SS casing | 90 | $30 | LF | $2,700 | | |
| (g) Well completion materials | 110 | $8 | LF | $880 | | |
| (h) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (i) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (j) Well development | 4 | $160 | HR | $640 | | |
| (k) Decon of equipment | 1 | $180 | HR | $180 | | |
| (l) Drum (Assume 6 per boring, includes staging) | 6 | $100 | EA | $600 | | |
| Total for One Deep Well | | | | $11,440 | | |
| Total for 3 Deep Wells at this site | | | | $34,320 | | |
| (k) Misc. Items | | | | | | |
| (1) Drum disposal | 30 | $120 | EA | $3,600 | | |
| (2) Decon water & decon fluid disposal | 20,000 | $0.35 | gal | $7,000 | | |
| (3) Driller oversight | 8 | $1,000 | d | $8,000 | | |
| (4) Driller mobilization | 1 | $2,000 | EA | $2,000 | | |
| (5) Baker tank rental | 1 | $8,000 | EA | $8,000 | | |
| (6) Contingency | 1 | $1,000 | EA | $1,000 | | |
| Total Misc. for set of wells | | | | $29,600 | | |
| (l) Misc. Items | | | | | | |
| (1) Extraction pumps | 6 | $3,000 | EA | $18,000 | | |
| (2) for every well: transducer, pitless adaptor, valve box, etc. | 6 | $6,000 | EA | $36,000 | | |
| Total Misc. for set of wells | | | | $54,000 | | |
| Subtotal (3) | | | | $137,600 | | |

TABLE 6a

**Cost Estimate for Alternative GW2**

**Hydraulic Source Control and Treatment using Extraction Wells and Recharge Basin**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (4) Groundwater Treatment System | | | | | | |
| (a) Collection Trench & Piping from Extraction Wells to Treatment System | 1,000 | $45 | LF | $45,000 | | |
| (b) Prefabricated Building for Treatment System | 1,500 | $68 | SF | $102,000 | | |
| (c) Process Piping | 1 | $50,000 | LS | $50,000 | | |
| (d) Misc. Instrumentation and Control | 1 | $50,000 | LS | $50,000 | | |
| (e) Equilization Tank | | | | | | |
| Average Flow Rate = 150 gpm | | | | | | |
| Equilization time = 1 hour | | | | | | |
| Volume required = 9,000 gallons | | | | | | |
| use 10,000 gallon tank | | | | | | |
| Cost of Tanks | 1 | $8,000 | LS | $8,000 | | |
| (f) Bag Filters (2) | 2 | $5,000 | EA | $10,000 | | |
| (g) Sequesterant Dosing | 1 | $20,000 | LS | $20,000 | | |
| (h) Air Strippers (2 units) | 2 | $50,000 | EA | $100,000 | | |
| (i) Carbon Adsorption Unit (off gas) | 2 | $15,000 | EA | $30,000 | | |
| (j) Potassium Permanganate Unit | 1 | $15,000 | EA | $15,000 | | |
| (k) Piping for discharge | 700 | $20 | LF | $14,000 | | |
| (l) Transfer pump for discharge | 1 | $2,500 | EA | $2,500 | | |
| (m) Installation and Incidentals (piping, electrical, HVAC) (1.5 times equipment costs, not including piping) | 1.5 | $387,500 | EA | $581,250 | | |
| Subtotal (4) | | | | $1,027,750 | | |
| (5) Vertical Barrier Wall | N/A | | | | | |
| Subtotal (5) | | | | $0 | | |
| (6) Excavation of Recharge Basin | | | | | | |
| Assume 210,000 SF basin, (300 by 700), depth of 10 feet | 77,778 | $0.81 | CY | $63,000 | | |
| Grass | 5 | $500.00 | Acres | $2,410 | | |
| Fencing | 2,000 | $20.95 | LF | $41,900 | | |
| Subtotal (6) | | | | $107,310 | | |
| CONSTRUCTION SUBTOTAL | | | | $1,337,960 | | |
| Contractor Overhead & Profit | 30% of Construction Total | | | $401,388 | | |
| Permitting and Legal | 2% of Construction Total | | | $26,759 | | |
| Resident Engineering/Inspection | 10% of Construction Total | | | $133,796 | | |
| Remedial Design | 10% of Construction Total | | | $133,796 | | |
| Services During Construction | 5% of Construction Total | | | $66,898 | | |
| Health and Safety | 5% of Construction Total | | | $66,898 | | |
| Contingency | 20% of Construction Total | | | $267,592 | | |
| TOTAL CAPITAL COSTS | | | | $2,435,088 | | |

## TABLE 6a

**Cost Estimate for Alternative GW2**

**Hydraulic Source Control and Treatment using Extraction Wells and Recharge Basin**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost Annual | O&M Cost Present Worth |
|---|---|---|---|---|---|---|
| (7) Treatment Plant Annual Operation and Maintenance Cost | | | | | | |
| Labor Cost | 1 | $96,000 | LS | | $96,000 | $393,619 |
| Analysis Cost | 1 | $28,286 | LS | | $28,286 | $115,978 |
| Power Cost - Assume 50 KW/hr; Assume 8760 hrs a year. | 438,000 | $0.10 | KW | | $43,800 | $179,589 |
| Potassium Permanganate | 365 | $100 | CF | | $36,500 | $149,657 |
| Assume 1 CF/day | | | | | | |
| Carbon Regeneration Cost | 365,000 | $2 | LB | | $730,000 | $682,243 |
| Calculate 2000 lbs Carbon per day | | | | | | |
| Maintenance Cost | 1 | $30,833 | LS | | $30,833 | $126,419 |
| 3% of Groundwater Treatment System Total | | | | | | |
| Sludge Disposal Cost | | | | | | |
| Potassium Permanganate | 10.8 | $200 | TONS | | $2,160 | $8,856 |
| TSS Sludge | 3.3 | $200 | TONS | | $655 | $2,686 |
| Subtotal (7) | | | | | | $1,659,047 |
| (8) Long-term Groundwater Monitoring | | | | | | |
| (a) Quarterly (10 wells, years 1 through 5) | | | | | | |
| (1) Organization of Event | 4 | $1,700 | Event | | $6,800 | $27,881 |
| (2) Sampling Labor | 4 | $13,500 | Event | | $54,000 | $221,411 |
| (3) Sampling Equipment | 4 | $4,550 | Event | | $18,200 | $74,624 |
| (4) Sampling Analysis and Validation | 4 | $10,345 | Event | | $41,380 | $169,666 |
| (5) Data Review and Reporting | 4 | $16,800 | Event | | $67,200 | $275,533 |
| Subtotal (8) | | | | | | $769,115 |
| TOTAL OPERATION & MAINTENANCE SUBTOTAL | | | | | | $2,428,162 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL CAPITAL COSTS | | | | $2,435,088 | | |
| TOTAL OPERATION & MAINTENANCE COSTS | | | | | | $2,428,162 |
| TOTAL ESTIMATED COSTS | | | | $2,435,088 | | $2,428,162 |
| NET PRESENT WORTH OF COSTS | | | | $4,863,250 | | |

The information in this cost estimate table is based upon the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements would likely occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

TABLE 6b

**Cost Estimate for Alternative GW2**

**Hydraulic Source Control and Treatment using Extraction Wells and Discharge to Stream**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (1) Work Plan Preparation | 1 | $35,300 | LS | $35,300 | | |
| Assume 2 persons for 1 month | | | | | | |
| Assume salary rate of ($35/hr) | | | | | | |
| Assume salary multiplier of 3 | | | | | | |
| Subtotal (1) | | | | $35,300 | | |
| (2) Mobilization/ Demobilization | 1 | $30,000 | LS | $30,000 | | |
| Subtotal (2) | | | | $30,000 | | |
| (3) Groundwater Extraction Well Installation | | | | | | |
| Shallow Extraction Wells (3 Wells at a depth of 80 feet) | | | | | | |
| (a) 10-inch borehole drilling | 80 | $22 | LF | $1,760 | | |
| (b) 6-inch stainless steel casing | 60 | $30 | LF | $1,800 | | |
| (c) Well completion materials | 80 | $8 | LF | $640 | | |
| (d) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (e) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (f) Well development | 3 | $160 | HR | $480 | | |
| (g) Decon of equipment | 1 | $180 | HR | $180 | | |
| (h) Drum (Assume 4 per boring, includes staging) | 4 | $100 | EA | $400 | | |
| Total for One Shallow Well | | | | $6,560 | | |
| Total for 3 Shallow Wells at this site | | | | $19,680 | | |
| Deep Groundwater Extraction Wells (3 Wells at a depth of 110 feet) | | | | | | |
| (a) 12-inch borehole drilling | 80 | $26 | LF | $2,080 | | |
| (b) 10-inch borehole drilling | 30 | $22 | LF | $660 | | |
| (e) 10-inch carbon steel casing | 80 | $30 | LF | $2,400 | | |
| (f) 6-inch SS casing | 90 | $30 | LF | $2,700 | | |
| (g) Well completion materials | 110 | $8 | LF | $880 | | |
| (h) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (i) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (j) Well development | 4 | $160 | HR | $640 | | |
| (k) Decon of equipment | 1 | $180 | HR | $180 | | |
| (l) Drum (Assume 6 per boring, includes staging) | 6 | $100 | EA | $600 | | |
| Total for One Deep Well | | | | $11,440 | | |
| Total for 3 Deep Wells at this site | | | | $34,320 | | |
| (k) Misc. Items | | | | | | |
| (1) Drum disposal | 30 | $120 | EA | $3,600 | | |
| (2) Decon water & decon fluid disposal | 20,000 | $0.35 | gal | $7,000 | | |
| (3) Driller oversight | 8 | $1,000 | d | $8,000 | | |
| (4) Driller mobilization | 1 | $2,000 | EA | $2,000 | | |
| (5) Baker tank rental | 1 | $8,000 | EA | $8,000 | | |
| (6) Contingency | 1 | $1,000 | EA | $1,000 | | |
| Total Misc. for set of wells | | | | $29,600 | | |
| (l) Misc. Items | | | | | | |
| (1) Extraction pumps | 6 | $3,000 | EA | $18,000 | | |
| (2) for every well: transducer, pitless adaptor, valve box, etc. | 6 | $6,000 | EA | $36,000 | | |
| Total Misc. for set of wells | | | | $54,000 | | |
| Subtotal (3) | | | | $137,600 | | |

TABLE 6b

**Cost Estimate for Alternative GW2.**

**Hydraulic Source Control and Treatment using Extraction Wells and Discharge to Stream**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (4) Groundwater Treatment System | | | | | | |
| (a) Collection Trench & Piping from Extraction Wells to Treatment System | 1,000 | $45 | LF | $45,000 | | |
| (b) Prefabricated Building for Treatment System | 1,500 | $68 | SF | $102,000 | | |
| (c) Process Piping | 1 | $50,000 | LS | $50,000 | | |
| (d) Misc. Instrumentation and Control | 1 | $50,000 | LS | $50,000 | | |
| (e) Equilization Tank | | | | | | |
| Average Flow Rate = 150 gpm | | | | | | |
| Equilization time = 1 hour | | | | | | |
| Volume required = 9,000 gallons | | | | | | |
| use 10,000 gallon tank | | | | | | |
| Cost of Tanks | 1 | $8,000 | LS | $8,000 | | |
| (f) Bag Filters (2) | 2 | $5,000 | EA | $10,000 | | |
| (g) Sequesterant Dosing | 1 | $20,000 | LS | $20,000 | | |
| (h) Air Strippers (2 units) | 2 | $50,000 | EA | $100,000 | | |
| (i) Carbon Adsorption Unit (off gas) | 2 | $15,000 | EA | $30,000 | | |
| (j) Potassium Permanganate Unit | 1 | $15,000 | EA | $15,000 | | |
| (k) Piping for discharge to stream | 4,200 | $20 | LF | $84,000 | | |
| (l) Transfer pump for discharge | 1 | $3,000 | EA | $3,000 | | |
| (m) Installation and Incidentals (piping, electrical, HVAC) (1.5 times equipment costs, not including piping) | 1.5 | $388,000 | EA | $582,000 | | |
| Subtotal (4) | | | | $1,099,000 | | |
| (5) Vertical Barrier Wall | N/A | | | | | |
| Subtotal (5) | | | | $0 | | |
| (6) Excavation of Recharge Basin | N/A | | | | | |
| Subtotal (6) | | | | $0 | | |
| CONSTRUCTION SUBTOTAL | | | | $1,301,900 | | |
| Contractor Overhead & Profit | 30% of Construction Total | | | $390,570 | | |
| Permitting and Legal | 2% of Construction Total | | | $26,038 | | |
| Resident Engineering/Inspection | 10% of Construction Total | | | $130,190 | | |
| Remedial Design | 10% of Construction Total | | | $130,190 | | |
| Services During Construction | 5% of Construction Total | | | $65,095 | | |
| Health and Safety | 5% of Construction Total | | | $65,095 | | |
| Contingency | 20% of Construction Total | | | $260,380 | | |
| TOTAL CAPITAL COSTS | | | | $2,369,458 | | |

TABLE 6b

**Cost Estimate for Alternative GW2**

**Hydraulic Source Control and Treatment using Extraction Wells and Discharge to Stream**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost Annual | O&M Cost Present Worth |
|---|---|---|---|---|---|---|
| (7) Treatment Plant Annual Operation and Maintenance Cost | | | | | | |
| Labor Cost | 1 | $96,000 | LS | | $96,000 | $393,619 |
| Analysis Cost | 1 | $28,286 | LS | | $28,286 | $115,978 |
| Power Cost - Assume 50 KW/hr; Assume 8760 hrs a year. | 438,000 | $0.10 | KW | | $43,800 | $179,589 |
| Potassium Permanganate | 365 | $100 | CF | | $36,500 | $149,657 |
| Assume 1 CF/day | | | | | | |
| Carbon Regeneration Cost | 365,000 | $2 | LB | | $730,000 | $682,243 |
| Calculate 2000 lbs Carbon per day | | | | | | |
| Maintenance Cost | 1 | $32,970 | LS | | $32,970 | $135,184 |
| 3% of Groundwater Treatment System Total | | | | | | |
| Sludge Disposal Cost | | | | | | |
| Potassium Permanganate | 10.8 | $200 | TONS | | $2,160 | $8,856 |
| TSS Sludge | 3.3 | $200 | TONS | | $655 | $2,686 |
| Subtotal (7) | | | | | | $1,667,812 |
| (8) Long-term Groundwater Monitoring | | | | | | |
| (a) Quarterly (10 wells, years 1 through 5) | | | | | | |
| (1) Organization of Event | 4 | $1,700 | Event | | $6,800 | $27,881 |
| (2) Sampling Labor | 4 | $13,500 | Event | | $54,000 | $221,411 |
| (3) Sampling Equipment | 4 | $4,550 | Event | | $18,200 | $74,624 |
| (4) Sampling Analysis and Validation | 4 | $10,345 | Event | | $41,380 | $169,666 |
| (5) Data Review and Reporting | 4 | $16,800 | Event | | $67,200 | $275,533 |
| Subtotal (8) | | | | | | $769,115 |
| TOTAL OPERATION & MAINTENANCE SUBTOTAL | | | | | | $2,436,927 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL CAPITAL COSTS | | | | $2,369,458 | | |
| TOTAL OPERATION & MAINTENANCE COSTS | | | | | | $2,436,927 |
| TOTAL ESTIMATED COSTS | | | | $2,369,458 | | $2,436,927 |
| NET PRESENT WORTH OF COSTS | | | | $4,806,385 | | |

The information in this cost estimate table is based upon the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements would likely occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

TABLE 7a

**Cost Estimate for Alternative GW3**

**Hydraulic Source Control and Treatment using Extraction Wells, Vertical Barrier Walls, and Recharge Basin**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (1) Work Plan Preparation | 1 | $35,300 | LS | $35,300 | | |
| Assume 2 persons for 1 month | | | | | | |
| Assume salary rate of ($35/hr) | | | | | | |
| Assume salary multiplier of 3 | | | | | | |
| Subtotal (1) | | | | $35,300 | | |
| (2) Mobilization/ Demobilizaton | 1 | $30,000 | LS | $30,000 | | |
| Subtotal (2) | | | | $30,000 | | |
| (3) Groundwater Extraction Well Installation | | | | | | |
| Shallow Extraction Wells (3 Wells at a depth of 80 feet) | | | | | | |
| (a) 10-inch borehole drilling | 80 | $22 | LF | $1,760 | | |
| (b) 6-inch stainless steel casing | 60 | $30 | LF | $1,800 | | |
| (c) Well completion materials | 80 | $8 | LF | $640 | | |
| (d) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (e) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (f) Well development | 3 | $160 | HR | $480 | | |
| (g) Decon of equipment | 1 | $180 | HR | $180 | | |
| (h) Drum (Assume 4 per boring, includes staging) | 4 | $100 | EA | $400 | | |
| Total for One Shallow Well | | | | $6,560 | | |
| Total for 3 Shallow Wells at this site | | | | $19,680 | | |
| Deep Groundwater Extraction Wells (3 Wells at a depth of 110 feet) | | | | | | |
| (a) 12-inch borehole drilling | 80 | $26 | LF | $2,080 | | |
| (b) 10-inch borehole drilling | 30 | $22 | LF | $660 | | |
| (e) 10-inch carbon steel casing | 80 | $30 | LF | $2,400 | | |
| (f) 6-inch SS casing | 90 | $30 | LF | $2,700 | | |
| (g) Well completion materials | 110 | $8 | LF | $880 | | |
| (h) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (i) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (j) Well development | 4 | $160 | HR | $640 | | |
| (k) Decon of equipment | 1 | $180 | HR | $180 | | |
| (l) Drum (Assume 6 per boring, includes staging) | 6 | $100 | EA | $600 | | |
| Total for One Deep Well | | | | $11,440 | | |
| Total for 3 Deep Wells at this site | | | | $34,320 | | |
| (k) Misc. Items | | | | | | |
| (1) Drum disposal | 30 | $120 | EA | $3,600 | | |
| (2) Decon water & decon fluid disposal | 20,000 | $0.35 | gal | $7,000 | | |
| (3) Driller oversight | 8 | $1,000 | d | $8,000 | | |
| (4) Driller mobilization | 1 | $2,000 | EA | $2,000 | | |
| (5) Baker tank rental | 1 | $8,000 | EA | $8,000 | | |
| (6) Contingency | 1 | $1,000 | EA | $1,000 | | |
| Total Misc. for set of wells | | | | $29,600 | | |
| (l) Misc. Items | | | | | | |
| (1) Extraction pumps | 6 | $3,000 | EA | $18,000 | | |
| (2) for every well: transducer, pitless adaptor, valve box, etc. | 6 | $6,000 | EA | $36,000 | | |
| Total Misc. for set of wells | | | | $54,000 | | |
| Subtotal (3) | | | | $137,600 | | |



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TABLE 7a

**Cost Estimate for Alternative GW3**

**Hydraulic Source Control and Treatment using Extraction Wells, Vertical Barrier Walls, and Recharge Basin**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost Annual | O&M Cost Present Worth |
|---|---|---|---|---|---|---|
| (4) Groundwater Treatment System | | | | | | |
| (a) Collection Trench & Piping from Extraction Wells to Treatment System | 1,000 | $45 | LF | $45,000 | | |
| (b) Prefabricated Building for Treatment System | 1,500 | $68 | SF | $102,000 | | |
| (c) Process Piping | 1 | $50,000 | LS | $50,000 | | |
| (d) Misc. Instrumentation and Control | 1 | $50,000 | LS | $50,000 | | |
| (e) Equilization Tank | | | | | | |
| Average Flow Rate = 20 gpm | | | | | | |
| Equilization time = 1 hour | | | | | | |
| Volume required = 1,200 gallons | | | | | | |
| use 2,000 gallon tank | | | | | | |
| Cost of Tank | 1 | $4,000 | LS | $4,000 | | |
| (f) Bag Filters (2) | 2 | $2,500 | EA | $5,000 | | |
| (g) Sequesterant Dosing | 1 | $20,000 | LS | $20,000 | | |
| (h) Air Strippers (1 unit) | 1 | $50,000 | EA | $50,000 | | |
| (i) Potassium Permanganate Unit | 1 | $15,000 | EA | $15,000 | | |
| (j) Piping for discharge | 700 | $20 | LF | $14,000 | | |
| (k) Transfer pump for discharge | 1 | $2,500 | EA | $2,500 | | |
| (l) Installation and Incidentals (piping, electrical, HVAC) | 1.5 | $298,500 | EA | $447,750 | | |
| (1.5 times equipment costs, not including piping) | | | | | | |
| Subtotal (4) | | | | $805,250 | | |
| (5) Vertical Barrier Walls (Sheet Piling) | 80,000 | $50 | SF | $4,000,000 | | |
| Cost includes installation and removal. | | | | | | |
| Subtotal (5) | | | | $4,000,000 | | |
| (6) Excavation of Recharge Basin | | | | | | |
| Assume 112,500 SF basin, (300 by 375), depth of 10 feet | 41,667 | $0.81 | CY | $33,750 | | |
| Grass | 3 | $500.00 | Acres | $1,291 | | |
| Fencing | 1,350 | $20.95 | LF | $28,283 | | |
| Subtotal (6) | | | | $63,324 | | |
| CONSTRUCTION SUBTOTAL | | | | $5,071,474 | | |
| Contractor Overhead & Profit | 30% of Construction Total | | | $1,521,442 | | |
| Permitting and Legal | 2% of Construction Total | | | $101,429 | | |
| Resident Engineering/Inspection | 10% of Construction Total | | | $507,147 | | |
| Remedial Design | 10% of Construction Total | | | $507,147 | | |
| Services During Construction | 5% of Construction Total | | | $253,574 | | |
| Health and Safety | 5% of Construction Total | | | $253,574 | | |
| Contingency | 20% of Construction Total | | | $1,014,295 | | |
| TOTAL CAPITAL COSTS | | | | $9,230,082 | | |

TABLE 7a

**Cost Estimate for Alternative GW3**

**Hydraulic Source Control and Treatment using Extraction Wells, Vertical Barrier Walls, and Recharge Basin**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost Annual | O&M Cost Present Worth |
|---|---|---|---|---|---|---|
| (7) Treatment Plant Annual Operation and Maintenance Cost | | | | | | |
| Labor Cost | 1 | $96,000 | LS | | $96,000 | $393,619 |
| Analysis Cost | 1 | $28,286 | LS | | $28,286 | $115,978 |
| *Power Cost - Assume 30 KW/hr; Assume 8760 hrs a year.* | 262,800 | $0.10 | KW | | $26,280 | $107,753 |
| Potassium Permanganate | 73 | $100 | CF | | $7,300 | $29,931 |
| Assume .2 CF/day | | | | | | |
| Maintenance Cost | 1 | $24,158 | LS | | $24,158 | $99,051 |
| 3% of Groundwater Treatment System Total | | | | | | |
| Sludge Disposal Cost | | | | | | |
| Potassium Permanganate | 2.2 | $200 | TONS | | $440 | $1,804 |
| TSS Sludge | 3.3 | $200 | TONS | | $655 | $2,686 |
| Subtotal (7) | | | | | | $750,822 |
| (8) Long-term Groundwater Monitoring | | | | | | |
| (a) Quarterly (10 wells, years 1 through 5) | | | | | | |
| (1) Organization of Event | 4 | $1,700 | Event | | $6,800 | $27,881 |
| (2) Sampling Labor | 4 | $13,500 | Event | | $54,000 | $221,411 |
| (3) Sampling Equipment | 4 | $4,550 | Event | | $18,200 | $74,624 |
| (4) Sampling Analysis and Validation | 4 | $10,345 | Event | | $41,380 | $169,666 |
| (5) Data Review and Reporting | 4 | $16,800 | Event | | $67,200 | $275,533 |
| Subtotal (8) | | | | | | $769,115 |
| TOTAL OPERATION & MAINTENANCE SUBTOTAL | | | | | | $1,519,937 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL CAPITAL COSTS | | | | $9,230,082 | | |
| TOTAL OPERATION & MAINTENANCE COSTS | | | | | | $1,519,937 |
| TOTAL ESTIMATED COSTS | | | | $9,230,082 | | $1,519,937 |
| NET PRESENT WORTH OF COSTS | | | | $10,750,019 | | |

The information in this cost estimate table is based upon the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements would likely occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

TABLE 7b

**Cost Estimate for Alternative GW3**

**Hydraulic Source Control and Treatment using Extraction Wells, Vertical Barrier Walls, and Discharge to Stream**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (1) Work Plan Preparation | 1 | $35,300 | LS | $35,300 | | |
| *Assume 2 persons for 1 month* | | | | | | |
| Assume salary rate of ($35/hr) | | | | | | |
| Assume salary multiplier of 3 | | | | | | |
| Subtotal (1) | | | | $35,300 | | |
| (2) Mobilization/ Demobilizaton | 1 | $30,000 | LS | $30,000 | | |
| Subtotal (2) | | | | $30,000 | | |
| (3) Groundwater Extraction Well Installation | | | | | | |
| Shallow Extraction Wells (3 Wells at a depth of 80 feet) | | | | | | |
| (a) 10-inch borehole drilling | 80 | $22 | LF | $1,760 | | |
| (b) 6-inch stainless steel casing | 60 | $30 | LF | $1,800 | | |
| (c) Well completion materials | 80 | $8 | LF | $640 | | |
| (d) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (e) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (f) Well development | 3 | $160 | HR | $480 | | |
| (g) Decon of equipment | 1 | $180 | HR | $180 | | |
| (h) Drum (Assume 4 per boring, includes staging) | 4 | $100 | EA | $400 | | |
| Total for One Shallow Well | | | | $6,560 | | |
| Total for 3 Shallow Wells at this site | | | | $19,680 | | |
| Deep Groundwater Extraction Wells (3 Wells at a depth of 110 feet) | | | | | | |
| (a) 12-inch borehole drilling | 80 | $26 | LF | $2,080 | | |
| (b) 10-inch borehole drilling | 30 | $22 | LF | $660 | | |
| (e) 10-inch carbon steel casing | 80 | $30 | LF | $2,400 | | |
| (f) 6-inch SS casing | 90 | $30 | LF | $2,700 | | |
| (g) Well completion materials | 110 | $8 | LF | $880 | | |
| (h) 10 slot screen | 20 | $55 | LF | $1,100 | | |
| (i) 5- Steel protective casing | 1 | $200 | EA | $200 | | |
| (j) Well development | 4 | $160 | HR | $640 | | |
| (k) Decon of equipment | 1 | $180 | HR | $180 | | |
| (l) Drum (Assume 6 per boring, includes staging) | 6 | $100 | EA | $600 | | |
| Total for One Deep Well | | | | $11,440 | | |
| Total for 3 Deep Wells at this site | | | | $34,320 | | |
| (k) Misc. Items | | | | | | |
| (1) Drum disposal | 30 | $120 | EA | $3,600 | | |
| (2) Decon water & decon fluid disposal | 20,000 | $0.35 | gal | $7,000 | | |
| (3) Driller oversight | 8 | $1,000 | d | $8,000 | | |
| (4) Driller mobilization | 1 | $2,000 | EA | $2,000 | | |
| (5) Baker tank rental | 1 | $8,000 | EA | $8,000 | | |
| (6) Contingency | 1 | $1,000 | EA | $1,000 | | |
| Total Misc. for set of wells | | | | $29,600 | | |
| (l) Misc. Items | | | | | | |
| (1) Extraction pumps | 6 | $3,000 | EA | $18,000 | | |
| (2) for every well: transducer, pitless adaptor, valve box, etc. | 6 | $6,000 | EA | $36,000 | | |
| Total Misc. for set of wells | | | | $54,000 | | |
| Subtotal (3) | | | | $137,600 | | |

TABLE 7b

**Cost Estimate for Alternative GW3.**

**Hydraulic Source Control and Treatment using Extraction Wells, Vertical Barrier Walls, and Discharge to Stream**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (4) Groundwater Treatment System | | | | | | |
| (a) Collection Trench & Piping from Extraction Wells to Treatment System | 1,000 | $45 | LF | $45,000 | | |
| (b) Prefabricated Building for Treatment System | 1,500 | $68 | SF | $102,000 | | |
| (c) Process Piping | 1 | $50,000 | LS | $50,000 | | |
| (d) Misc. Instrumentation and Control | 1 | $50,000 | LS | $50,000 | | |
| (e) Equilization Tank | | | | | | |
| Average Flow Rate = 20 gpm | | | | | | |
| Equilization time = 1 hour | | | | | | |
| Volume required = 1,200 gallons | | | | | | |
| use 2,000 gallon tank | | | | | | |
| Cost of Tank | 1 | $4,000 | LS | $4,000 | | |
| (f) Bag Filters (2) | 2 | $2,500 | EA | $5,000 | | |
| (g) Sequesterant Dosing | 1 | $20,000 | LS | $20,000 | | |
| (h) Air Strippers (1 unit) | 1 | $50,000 | EA | $50,000 | | |
| (i) Potassium Permanganate Unit | 1 | $15,000 | EA | $15,000 | | |
| (j) Piping for discharge | 4,200 | $20 | LF | $84,000 | | |
| (k) Transfer pump for discharge | 1 | $2,500 | EA | $2,500 | | |
| (l) Installation and Incidentals (piping, electrical, HVAC) (1.5 times equipment costs, not including piping) | 1.5 | $298,500 | EA | $447,750 | | |
| Subtotal (4) | | | | $875,250 | | |
| (5) Vertical Barrier Walls (Sheet Piling) Cost includes installation and removal. | 80,000 | $50 | SF | $4,000,000 | | |
| Subtotal (5) | | | | $4,000,000 | | |
| (6) Excavation of Recharge Basin | N/A | | | | | |
| Subtotal (6) | | | | $0 | | |
| CONSTRUCTION SUBTOTAL | | | | $5,078,150 | | |
| Contractor Overhead & Profit | 30% of Construction Total | | | $1,523,445 | | |
| Permitting and Legal | 2% of Construction Total | | | $101,563 | | |
| Resident Engineering/Inspection | 10% of Construction Total | | | $507,815 | | |
| Remedial Design | 10% of Construction Total | | | $507,815 | | |
| Services During Construction | 5% of Construction Total | | | $253,908 | | |
| Health and Safety | 5% of Construction Total | | | $253,908 | | |
| Contingency | 20% of Construction Total | | | $1,015,630 | | |
| TOTAL CAPITAL COSTS | | | | $9,242,233 | | |

TABLE 7b

**Cost Estimate for Alternative GW3.**

**Hydraulic Source Control and Treatment using Extraction Wells, Vertical Barrier Walls, and Discharge to Stream**

| Item | Quantity | Unit Cost | Units | Capital Cost | O&M Cost | |
|---|---|---|---|---|---|---|
| | | | | | Annual | Present Worth |
| (8) Treatment Plant Annual Operation and Maintenance Cost | | | | | | |
| Labor Cost | 1 | $96,000 | LS | | $96,000 | $393,619 |
| Analysis Cost | 1 | $28,286 | LS | | $28,286 | $115,978 |
| Power Cost - Assume 30 KW/hr; Assume 8760 hrs a year. | 262,800 | $0.10 | KW | | $26,280 | $107,753 |
| Potassium Permanganate | 73 | $100 | CF | | $7,300 | $29,931 |
| Assume .2 CF/day | | | | | | |
| Maintenance Cost | 1 | $26,258 | LS | | $26,258 | $107,661 |
| 3% of Groundwater Treatment System Total | | | | | | |
| Sludge Disposal Cost | | | | | | |
| Potassium Permanganate | 2.2 | $200 | TONS | | $440 | $1,804 |
| TSS Sludge | 3.3 | $200 | TONS | | $655 | $2,686 |
| Subtotal (8) | | | | | | $759,432 |
| (9) Long-term Groundwater Monitoring | | | | | | |
| (a) Quarterly (10 wells, years 1 through 5) | | | | | | |
| (1) Organization of Event | 4 | $1,700 | Event | | $6,800 | $27,881 |
| (2) Sampling Labor | 4 | $13,500 | Event | | $54,000 | $221,411 |
| (3) Sampling Equipment | 4 | $4,550 | Event | | $18,200 | $74,624 |
| (4) Sampling Analysis and Validation | 4 | $10,345 | Event | | $41,380 | $169,666 |
| (5) Data Review and Reporting | 4 | $16,800 | Event | | $67,200 | $275,533 |
| Subtotal (9) | | | | | | $769,115 |
| TOTAL OPERATION & MAINTENANCE SUBTOTAL | | | | | | $1,528,547 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL CAPITAL COSTS | | | | $9,242,233 | | |
| TOTAL OPERATION & MAINTENANCE COSTS | | | | | | $1,528,547 |
| TOTAL ESTIMATED COSTS | | | | $9,242,233 | | $1,528,547 |
| NET PRESENT WORTH OF COSTS | | | | $10,770,780 | | |

The information in this cost estimate table is based upon the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements would likely occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

# APPENDIX III - RESPONSIVENESS SUMMARY

APPENDIX III

RESPONSIVENESS SUMMARY

Emmell's Septic Landfill Superfund Site

## INTRODUCTION

As required by Superfund policy, this Responsiveness Summary provides a summary of the citizens' comments and concerns regarding the Proposed Plan for the Emmell's Septic Landfill (Emmell's) Superfund Site, and the U.S. Environmental Protection Agency's (EPA's) responses to those comments and concerns. At the time of the public comment period, EPA proposed an interim action for control of further off-site migration of groundwater contaminants, which has been designated as Operable Unit 1 (OU1). All comments summarized in this document have been considered in EPA's final decision for selection of a remedial alternative for OU1.

This Responsiveness Summary is divided into the following sections:

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community involvement and concerns regarding the Emmell's site.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES: This section includes summaries of oral comments received by EPA at the August 13, 2003 public meeting and EPA's responses to these comments. No written comments were received during the public comment period.

The Responsiveness Summary includes attachments which document public participation in the remedy selection process for the Emmell's site. These attachments are as follows:

- Attachment A - August 2003 Proposed Plan for the Emmell's Septic Landfill Site;
- Attachment B - Public Notice published in The Press of Atlantic City;
- Attachment C - August 13, 2003 Public Meeting Attendance Sheet; and
- Attachment D - Transcript of the August 13, 2003 Public Meeting.

## I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Residents in the vicinity of the Emmell's site first became aware of potential public health impacts related to operations conducted at the site in 1984, when the Atlantic County Health Department sampled their potable wells. The results of this sampling event indicated that elevated levels of volatile organic contaminants were present in water samples collected from five wells. These wells were subsequently closed and replaced with deeper wells.

Community concerns regarding the Emmell's site peaked in 1999 and 2000, shortly after the site was included on the National Priorities List (NPL). Many residents expressed concern about the potential of their potable wells being contaminated by site-related groundwater contamination. Residents were also concerned about the potential negative impacts that adding the Emmell's site to the NPL might have on the value of their property. EPA is currently connecting residents threatened by site-related groundwater contamination to the municipal water supply as part of a removal action, which should alleviate residents' concerns regarding the potential for contamination of their wells.

Since inclusion of the Emmell's site on the NPL, EPA has implemented a community relations program designed to inform the community of site-related Superfund activities and to solicit input from the community regarding site-related concerns and questions. These activities have included disseminating fact sheets, as well as conducting public meetings and public availability sessions.

EPA's Proposed Plan for the OU1 interim action was released to the public on August 6, 2003. A copy of the Proposed Plan, Focused Feasibility Study, Baseline Human Health Risk Assessment and other documents which comprise the administrative record file were made available to the public in the information repository at the Atlantic County Library, Galloway Township Branch. A public notice was published in The Press of Atlantic City on August 6, 2003, advising the public of the availability of the Proposed Plan. This notice also announced the opening of a 30-day public comment period and invited interested parties to attend an upcoming public meeting. This public meeting, during which EPA presented the preferred alternative for the OU1 interim action, answered questions regarding the site, and accepted verbal comments regarding the Proposed Plan, was held on August 13, 2003 at the Galloway Township Municipal Building, 300 East Jimmie Leeds Road, Galloway Township, New Jersey.

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

This section summarizes comments received from the public during the public comment period, and EPA's responses to those comments. No written comments concerning the Proposed Plan were received during the public comment period. Verbal comments received during the August 13, 2003 public meeting, and EPA's responses to those comments, follow.

**Comment #1:** A citizen asked whether Alternative GW2 would involve the treatment of contaminated groundwater at the site.

**EPA Response:** Alternative GW2 will involve the treatment of contaminated groundwater at the site. The extracted groundwater will be passed through a treatment system, to be constructed at the site, to remove contaminants prior to discharge of the treated water to either an on-site recharge basin or to an off-site surface water body.

**Comment #2:** A citizen sought clarification as to whether Alternative GW3 may be more protective than Alternative GW2, because it would allow less groundwater contamination to migrate off of the site property.

**EPA Response:** EPA believes that Alternatives GW2 and GW3 are equally protective of human health and the environment. Alternative GW3 would involve the same components as Alternative GW2, with the exception that vertical barrier walls would be installed along the site property line under Alternative GW3, to aid in the containment of contaminated groundwater. The installation of these barrier walls would not prevent the off-site migration of contaminated groundwater, but would minimize the amount of groundwater that would need to be extracted to achieve containment. Alternative GW2 will be designed to achieve the same degree of containment of contaminated groundwater through the extraction of greater quantities of groundwater. EPA selected Alternative GW2 over Alternative GW3 because it is expected to provide the same degree of protection of human health and the environment in a more implementable and cost-effective manner, while creating less disturbance for nearby residents.

**Comment #3:** A citizen asked whether EPA has considered providing municipal water to residents in the area of the site who may be threatened by site-related groundwater contamination, other than those residences on Zurich Avenue, Liebig Street and Lisa Drive which EPA is currently connected to the municipal water supply.

**EPA Response:** EPA has identified a small number of residences downgradient of the site, outside of the area currently being connected to the municipal water supply, which have the potential of being impacted by site-related groundwater contamination. EPA sampled potable wells at all of these residences, with the exception of one where access was not provided, in April 2003. Volatile organic contaminants were detected above drinking water standards in the sample from one of these wells. EPA has since installed a water treatment system on this impacted well to ensure that the residents are not exposed to elevated levels of site-related contaminants. EPA intends to resample these residences on a periodic basis, and will provide an alternate water supply for those residences with elevated levels of site-related contaminants in their well water.

**Comment #4:** A citizen asked whether implementation of Alternative GW2 will result in site-related groundwater contamination being drawn deeper into the aquifer.

**EPA Response:** The exact setup of the extraction well network to be installed under Alternative GW2 will be determined during design of this interim remedy. However, this remedy will be designed in a manner that does not exacerbate the spread of site-related groundwater contamination. EPA currently anticipates that extraction wells installed in the shallow zone of the aquifer will be pumped at greater rates than wells installed in the deep zone of the aquifer, in order to ensure an upward flow direction between these wells.

**Comment #5:** A citizen asked how long EPA would be monitoring the interim remedy, once it is completed.

**EPA Response:** EPA will monitor groundwater quality at the site during operation of the interim groundwater extraction and treatment system. EPA currently estimates that the interim remedy will operate for a period of 5 years before a final groundwater remedy is constructed. EPA will then continue to monitor groundwater quality in the vicinity of the site during operation of the final groundwater remedy.

**Comment #6:** A citizen asked whether EPA has pursued the previous owner/operators of the site for contribution to cleanup costs, given that chemical waste was illegally disposed of at the site.

**EPA Response:** EPA has determined that the former owner/operators of the site are deceased. Furthermore, EPA has determined that the current owners of the property which comprises the site are not financially able to pay for cleanup of the site.

**Comment #7:** A citizen asked whether the owner/operators of the site maintained insurance policies against which a claim for damages could be filed.

**EPA Response:** EPA is aware that the Emmell's Cesspool Service did maintain a $300,000 Comprehensive Liability Insurance Policy during its period of operation at the site. EPA is currently evaluating whether this insurance policy contains a pollution exclusion which would preclude the filing of an environmental claim for reimbursement of site-related response costs.

**Comment #8:** A citizen asked whether EPA had identified any names or numbers on the drums disposed of at the site which would allow EPA to determine which chemical company they came from.

**EPA Response:** EPA identified the name or markings of one company on 5 of the 435 drums excavated from the site. A chemical analysis of the contents of each of these 5 drums was conducted by EPA, to be used to attempt to determine the origin of the waste material. Based upon EPA's evaluation of this chemical data, EPA was unable to determine the source of this waste material. In 1999, EPA issued a Request for Information letter to the company identified on these drums, pursuant to Section 104(e) of CERCLA. In its response to this Request for Information, this company indicated that it did not have any records indicating that waste was sent to the site, and was unaware of any of its facilities which would have sent material to the site.

ATTACHMENT A

Superfund Program
Proposed Plan

U.S. Environmental Protection Agency, Region II

# Emmell's Septic Landfill Site

August 2003

## EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for the interim remedy for contaminated groundwater at the Emmell's Septic Landfill (Emmell's) Site, hereafter referred to as the "Site," located in Galloway Township, Atlantic County, New Jersey, and provides the rationale for this preference. In addition, this Proposed Plan includes summaries of the other alternatives evaluated for use at this Site. The preferred alternative calls for the extraction and ex-situ treatment of contaminated groundwater downgradient of the disposal area, with discharge of the treated groundwater to either an on-Site recharge basin or to a nearby surface water body.

This document is issued by the U.S. Environmental Protection Agency (EPA), the lead agency for Site activities. The New Jersey Department of Environmental Protection (NJDEP) is the support agency for the Site. EPA, in consultation with the NJDEP, will select an interim remedy for contaminated groundwater after reviewing and considering all information submitted during the 30-day public comment period. EPA, in consultation with NJDEP, may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in the Proposed Plan. A final remedy for groundwater, as well as any remedies necessary for other media at the Site, will be addressed in a future Proposed Plan and Record of Decision.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the documents contained in the Administrative Record file for this Site. EPA and the NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted at the Site.

Dates to remember:
**MARK YOUR CALENDAR**

**PUBLIC COMMENT PERIOD:**
August 6 - September 5, 2003

**PUBLIC MEETING:**
**August 13, 2003, 7pm**
U.S. EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Focused Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at:

Galloway Township Municipal Building (Court Room)
300 E. Jimmie Leeds Road
Galloway Township, NJ

**For more information, see the Administrative Record at the following locations:**

Atlantic County Library
Galloway Township Branch
306 East Jimmie Leeds Road
Galloway Township, NJ 08205
(609) 652-2352

Hours M-Th 9:00am - 8:00pm
Fri & Sat 9:00am -5:00pm

And

U.S. EPA Records Center, Region II
290 Broadway, 18th Floor
New York, New York 10007-1866
(212)-637-3261
Hours M-F 9 a.m. to 5 p.m.

## SITE HISTORY

The 38-acre Site is located at 28 South Zurich Avenue in a predominantly rural area of Galloway Township, Atlantic County, New Jersey. The Site is bounded on the northwest by Zurich Avenue, residential properties located along Liebig Street to the northeast, and undeveloped and heavily wooded areas to the immediate south (Figure 1). Further to the south and southeast of the Site is the Morses Mill Stream and its associated wetlands and surface impoundments. The campus of Stockton State College is located approximately 0.8 mile east of the Site. Residents in the vicinity of the Site currently have private wells and use groundwater as their primary source of drinking water.

The college also uses groundwater as a source of potable water.

From 1967 to 1979 the Site was used for disposal of septic wastes and sewage sludge which were reportedly disposed of in trenches and lagoons. Other wastes, including chemical wastes, drums of paint sludge, gas cylinders, household garbage, and construction debris, were also disposed of at the Site.

An April 1975 solid waste facility permit issued by NJDEP indicated that the Site was to be used for land application of septic wastes and sewerage sludge. This permit required that the fields used for waste application be disced (plowed) daily. From 1976 to 1980, a number of enforcement actions were taken by NJDEP concerning disposal activities at the Site. Violations were noted for improper disposal of septic wastes, surface pooling of septic waste, and improper registration for disposal of chemical waste. Operations at the Site ceased in August 1979.

Sampling conducted at the Site in 1984 by NJDEP indicated the presence of soil and groundwater contamination. Also in 1984, the Atlantic County Health Department (ACHD) sampled residential wells in the vicinity of the Site. Results of this sampling indicated the presence of elevated concentrations of volatile organic compounds (VOCs) in five residential wells. Concentrations of vinyl chloride, tetrachloroethene (PCE), and trichloroethene (TCE) exceeded EPA's Maximum Contaminant Levels (MCLs) in four residential wells located northeast of the Site along Lisa Drive. Based on the results of the residential well sampling, the ACHD recommended that the affected wells not be used for cooking or drinking purposes. The contaminated wells were subsequently closed and replaced with deeper wells.

In 1996, NJDEP and consultants for Galloway Township conducted additional investigations at the Site. Results for groundwater samples collected from monitoring wells installed by Galloway Township's consultant indicated the presence of VOCs at levels exceeding New Jersey Groundwater Quality Standards (NJGQSs). VOCs were also detected in samples from temporary well points and monitoring wells installed at the Site by NJDEP. An Expanded Site Inspection Report prepared for NJDEP in 1997 confirmed the presence of Site-related groundwater contamination.

In 1997 and 1998 EPA's Removal Action Branch (RAB) and Environmental Response Team conducted soil and groundwater investigations at the Site to evaluate potential sources of VOC contamination found in former residential wells and to determine whether a removal action was warranted. A number of VOCs were detected in soil, soil gas, and groundwater samples, including TCE and its associated degradation products, and various chlorinated benzene compounds. Waste materials, including paint-like substances, sludge, and drums, were observed in test pit excavations. The results of this investigation indicated that waste materials at the Site were a continuing source of groundwater contamination.

In May 1999, EPA's RAB collected groundwater samples from 26 residential wells in the vicinity of the Site. Sample results indicate the presence of lead in two residential wells at levels exceeding EPA's Action Level. In addition, the methylene chloride concentration in one residential well sample exceeded NJGQSs, but was less than EPA's MCL. Subsequently, EPA conducted a lead isotope study which concluded that the lead detected in these wells was attributable to household plumbing rather than the Site.

The Site was proposed for inclusion on the National Priority List (NPL) in April 1999, and was placed on the NPL on July 22, 1999, making it eligible for Superfund cleanup.

In July 1999, EPA's RAB initiated a removal action at the Site to address buried drums and waste material which was continuing to serve as a source of groundwater contamination. This removal action, which was completed in February 2000, resulted in the excavation and off-Site disposal of 435 drums, eleven compressed gas cylinders and approximately 28,000 cubic yards of contaminated soil.

On February 16, 2000, EPA initiated a Focused Feasibility Study (FFS) for groundwater contamination at the Site. The FFS was intended to evaluate whether it is appropriate to implement an interim remedy for groundwater contamination while the Site-wide remedial investigation/feasibility study (RI/FS) is being conducted.

Groundwater investigations conducted during the FFS indicated that residential wells in the vicinity of the Site are in danger of being impacted by Site-related groundwater contamination. Therefore, EPA signed an Action Memorandum on July 30, 2002, which authorizes the installation of an alternate water supply for residences in the vicinity of the Site. EPA's RAB is currently connecting these residences to the municipal water supply.

## SITE CHARACTERISTICS

In general, the topography in the area of the Site is flat and slopes toward the southeast. Surface water infiltrates into the ground very rapidly due to the well sorted sandy soil on the Site. Consequently, there is little runoff from the Site and there are no well-defined overland drainage pathways from the Site to nearby surface waters. However, a small wetland area, consisting exclusively of phragmites, is present at the Site. This wetland area will be delineated as part of the Site-wide RI.

The Site is generally rural and is surrounded by heavily wooded areas and residential properties. Water in the vicinity of the Site is supplied by private water wells. The Richard Stockton College of New Jersey (College) is located to the southeast within a mile of the Site; dormitories are located within 0.5 mile of the Site. The College has two supply wells located approximately one mile southeast of the Site which supply water to the College.

Galloway Township, which encompasses 297 square kilometers, has a population of approximately 23,330 people. Approximately 100 people live within one-half mile of the Site.

The results of the FFS investigations indicate that the lithology in the vicinity of the Site is dominated by yellow to brownish gray to gray fine to medium sand. In addition, finer grained layers (silt and clay) were also encountered.

Three hydrostratigraphic units were identified during the FFS based on the Site geology: the shallow zone, the low permeability layer, and the deep zone. Typically, a fine grained low permeability layer may act as a confining or semi-confining unit to the movement of water. However, Site investigations indicate that the low permeability layer is less than 5 feet thick or absent between the disposal area and the eastern Site boundary. Therefore, the low permeability layer is not considered to be a semi-confining or confining unit. This determination is supported by the results of hydrogeologic test conducted during the FFS, as well as chemical data which indicates the presence of Site-related VOCs in groundwater samples collected from both the shallow and deep zones of the aquifer.

During the FFS field investigation, 185 groundwater screening samples were collected from 26 locations in order to preliminarily define the nature and extent of groundwater contamination in the shallow zone of the aquifer. To establish the vertical contaminant profile, at each groundwater screening location, one groundwater sample was collected at a depth of approximately 2 feet below the water table and at 10-foot intervals to the top of the low permeability layer.

The results of groundwater screening indicated the presence of a groundwater contaminant plume, comprised of VOCs, in the shallow zone of the aquifer beneath and to the east of the former landfill. VOCs detected in the groundwater screening samples can be grouped into three main categories: Chlorinated VOCs associated with the degradation of TCE; the petroleum-related compounds benzene, toluene, and xylene; and several di- and tri-chlorinated benzene compounds. Furthermore, as the groundwater contamination in the shallow zone of the aquifer migrates eastward, it appears to be migrating downward, toward the top of the low permeability layer.

The results of groundwater samples collected from monitoring wells installed in the deep zone of the aquifer during the FFS field investigations indicate the presence of VOCs at levels above MCLs and NJGWQSs. VOCs detected in the deep zone of the aquifer correlate with VOCs detected in the shallow zone of the aquifer, supporting the determination that Site-related contamination has also impacted the deep zone of the aquifer (See Table 1). The groundwater contaminant plume in the deep zone of the aquifer, which was not delineated as part of the FFS field investigations, is being further investigated as part of the Site-wide RI.

**WHAT IS A "PRINCIPAL THREAT"?**

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in ground water may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The buried drums and waste material which were removed from the Site as part of a removal action conducted from July 1999 through February 2000 were considered "Principal Threat" wastes. The waste material addressed during this removal action contained elevated levels of VOCs which, if not remediated, would have continued to serve as a source of groundwater contamination. Furthermore, as part of the Site-wide RI currently underway, EPA has conducted additional investigations in an attempt to identify any remaining source areas which may present a principal threat. Investigations conducted to date have failed to identify the location and extent of any remaining source of the groundwater contamination.

Therefore, further investigations will be conducted during performance of the RI to attempt to locate potential source areas. Remediation of any source areas identified during the RI/FS which present a principal threat will be addressed n a subsequent Proposed Plan and Record of Decision which will determine the permanent remedial actions for the Site.

## SCOPE AND ROLE OF THE ACTION

EPA intends to address the cleanup of the Site by implementing immediate actions to address situations which present an imminent threat to human health, and a long-term cleanup. Immediate actions, known as removal actions, which have been implemented to date include: the removal of 435 drums, eleven compressed gas cylinders and approximately 28,000 cubic yards of contaminated soil from the disposal area of the Site; and the installation of a water treatment system for a residence which was impacted by Site-related groundwater contaminants above health-based levels. In addition, EPA is currently conducting a removal action which involves the connection of residences threatened by Site-related groundwater contamination to the municipal water supply.

The long-term cleanup will be conducted in at least two discrete phases, or Operable Units. Operable Unit One (OU1), which is the subject of this Proposed Plan, will provide for implementation of an interim groundwater remedy to control further off-Site migration of groundwater contaminants near the disposal area of the Site while the Site-wide RI is being conducted. EPA anticipates that future Operable Units will select a final remedy for groundwater contamination, and contamination of other media at the Site, including additional source materials if identified.

## SUMMARY OF SITE RISKS

### Human Health Risks

As part of the FFS process, a baseline Human Health Risk Assessment (HHRA) was developed to characterize potential health risks associated with ingestion of groundwater in the area surrounding the Site. Land-use in the vicinity of the Site is predominantly residential and is expected to remain so in the future. Furthermore, groundwater in the vicinity of the Site is currently utilized as a potable water source by residences and the Richard Stockton College of New Jersey. Therefore, potential receptors of impacted groundwater were assumed to be future residents who obtain water from either the shallow or deep zones of the aquifer in the vicinity of the Site. Potential receptors also include current residents near the Site with private wells drawing water from the deep zone of the aquifer.

Potential receptors of contaminants in groundwater at the Site may be exposed through ingestion of or dermal contact with contaminated groundwater. Residents may also be exposed by inhalation of VOCs in groundwater during washing, bathing, showering, laundering or cooking. While all of these exposure pathways are potentially complete, only ingestion of groundwater was evaluated in the HHRA. While evaluation of only the ingestion pathway may underestimate potential risk due to exposure to contaminants in groundwater, inclusion of other potentially completed pathways would not change the conclusions of the HHRA.

The HHRA evaluated cancer risks and non-cancer hazards for future adult and child residents using groundwater from the shallow and the deep zone of the aquifer; and current and future adult and child residents using water from existing private wells in proximity to the Site. Several of the residents near the Site have installed water softeners or other water treatment systems to remove compounds, such as calcium, magnesium, iron or lead, from their water prior to use. Therefore, the HHRA evaluates risks due to exposure to both treated and untreated water from existing private wells. As previously indicated, EPA is currently conducting a removal action to connect residences in the vicinity of the Site to the municipal water supply. Therefore, any Site-related risks due to use of water from existing private wells in close proximity to the Site should be mitigated in the near future.

**WHAT ARE THE "CONTAMINANTS OF CONCERN"?**

EPA has identified VOCs in groundwater beneath the Site as chemicals of concern as they pose the greatest potential risk to human health due to exposure to groundwater contaminants at this Site.

Site-related VOCs were found at their highest concentrations in the shallow zone of the watertable aquifer. VOCs were detected at concentrations up to 20,300 parts per billion (ppb) in groundwater beneath the Site. The VOCs of concern include: trichloroethene, 1,2-dichloroethene (cis), vinyl chloride, 1,1,2-trichloroethane, 1,1-dichloroethene, benzene and 1,4-dichlorobenzene. The VOCs of concern include a number of known human carcinogens (e.g., vinyl chloride and benzene) and possible human carcinogens (e.g., 1,1,2-trichloroethane, 1,1-dichloroethene, and 1,4-dichlorobenzene). In addition to their carcinogenic potential, some of these chemicals may also cause non-cancer health effects including impacts on the liver, kidneys and blood at high doses.

There are numerous chemical contaminants present in groundwater beneath the Site. To determine which contaminants are of concern at the Site for purposes of the risk assessment, each chemical detected was compared against risk-based screening levels. In addition, detection frequency, chemical toxicity and history of detected chemical concentrations were considered in identification of contaminants of concern. The contaminants of concern were determined to be primarily VOCs related to waste disposal practices at the Site. These contaminants of concern are evaluated in the HHRA. For known or suspected carcinogens, EPA has established an acceptable cancer risk range of one-in-a-million ($1 \times 10^{-6}$) to one-in-ten-thousand ($1 \times 10^{-4}$). Action is generally warranted when excess lifetime cancer risk exceeds one-in-ten-thousand. In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to Site contaminants. An extra cancer case means that one more person could develop cancer than would normally be expected.

**WHAT IS RISK AND HOW IS IT CALCULATED?**

A Superfund human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of a health problem occurring if no clean up actions were taken at a site. To estimate this baseline risk at a Superfund site, a four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure (RME) scenarios and central tendency exposure (CT) scenarios.

*Data Collection and Evaluation/Hazard Identification:* In this step, the data which have been gathered at the site are assessed, and the contaminants of concern at the site are identified based on several factors such as toxicity, frequency of occurrence, and concentration of contamination in various media.

*Exposure Assessment:* Under this step, the different ways that people might be exposed to the contaminants identified in the previous step, such as ingestion of contaminated soil or groundwater, inhalation of contaminated air, and ingestion of contaminated fish, are identified. Also, the concentrations to which people might be exposed, and the potential frequency and duration of exposure are considered. Using this information, the "reasonable maximum exposure" scenario, which identifies the highest level of human exposure that could reasonably be expected to occur, and the "central tendency" scenario, which represents the average human exposure, are evaluated.

*Toxicity Assessment:* The toxicity assessment determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). Two distinct types of health effects are considered, carcinogenic effects, and non-carcinogenic, or systemic, effects.

*Risk Characterization:* This step summarizes and combines the results of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Two types of risk—cancer risk and non-cancer hazards are evaluated. The likelihood of any kind of cancer resulting from a site is expressed as a probability. For example, a $10^{-4}$ cancer risk means that one additional person *may* develop cancer within a population of 10,000 people exposed under conditions identified in the exposure assessment. Superfund law states that acceptable exposures are an individual lifetime excess carcinogenic risk in the range of $10^{-6}$ to $10^{-4}$ (corresponding to a one-in-one-million to a one-in-ten-thousand excess lifetime risk of developing cancer). For non-cancer health effects, a "hazard index" (HI) is calculated which looks at exposure to multiple chemicals through multiple exposure pathways (such as ingestion of *and* dermal contact with contaminated soils). The key concept here is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

EPA's risk analysis indicates that total excess lifetime cancer risk for residential use of groundwater from the shallow zone of the aquifer for the reasonably maximally exposed individual is $3 \times 10^{-2}$ (three in one hundred), assuming exposure for a period of 30 years. The cancer risk for the average exposure is $9 \times 10^{-3}$ (nine in one thousand). Both risks are greater than EPA's acceptable risk range and are primarily associated with exposure to vinyl chloride.

Total excess lifetime cancer risk for residential use of groundwater from the deep zone of the aquifer for the reasonably maximally exposed individual is $6 \times 10^{-3}$ (six in one thousand). The cancer risk for the average exposure is $2 \times 10^{-3}$ (two in one thousand). Both risks are greater than EPA's acceptable risk range and are primarily associated with exposure to vinyl chloride.

EPA also calculated cancer risk associated with exposure to untreated water from private wells, using the results from water samples collected in December 2000, June 2001 and December 2001. The cancer risk for the reasonably maximally exposed individual is $3 \times 10^{-4}$ (three in ten thousand). The cancer risk for the average exposure is $1.3 \times 10^{-4}$. Both risks are marginally greater than EPA's acceptable risk range and are primarily associated with exposure to arsenic.

Cancer risk associated with exposure to treated water from private wells for the reasonably maximally exposed individual is $3 \times 10^{-4}$ (three in ten thousand). The cancer risk for the average exposure is $8.9 \times 10^{-5}$. Therefore, the risk to the reasonably maximally exposed individual using treated water from private wells is marginally greater than EPA's acceptable risk range and is primarily associated with exposure to arsenic. However, arsenic was only detected in private wells during the December 2000 sampling event. Therefore, these calculations likely overestimate cancer risk associated with ingestion of untreated and treated water from private wells.

The HHRA also evaluated non-cancer health effects to the same populations evaluated during the cancer assessment above. For the non-cancer assessment, an exposure level over a specified period of time is compared to a reference dose that is designed to be protective of the general population including adults and children. This ratio of exposure to toxicity is referred to as a hazard quotient (HQ). The hazard index (HI) is the sum of hazard quotients from individual chemicals. The exceedence of a HI of 1 indicates an increased level of concern.

For residents exposed to groundwater from the shallow zone of the aquifer, the HI for the reasonably maximally exposed individual is 45 for adult residents and 100 for child residents. The HI for average exposure is 31 for adult residents and 73 for child residents. All of these HIs are above the threshold of 1 for non-cancer effects. Based on these HIs, there is the potential for non-cancer health effects to occur from residential use of groundwater from the shallow zone of the aquifer at the Site.

For residents exposed to groundwater from the deep zone of the aquifer, the HI for the reasonably maximally exposed individual is 8 for adult residents and 17 for child residents. The HI for average exposure is 6 for adult residents and 17 for child residents. All of these HIs are above the threshold of 1 for non-cancer effects. Based on these HIs, there is the potential for non-cancer health effects to occur from residential use of groundwater from the deep zone of the aquifer at the Site.

For residential exposure to water from treated and untreated private wells, total risks across chemicals (i.e., HIs) were not calculated because risks associated with exposure to each chemical were estimated using the maximum detected concentrations from different private wells. Residents would not be routinely exposed to water from multiple wells.

For residents exposed to untreated water from private wells, two HQs for reasonably maximally exposed individuals exceeded 1, indicating a potential for non-cancer health effects. The HQs which exceeded 1 were the HQs for arsenic for adults (HQ=1.2) and children (HQ=2.9). The HQ for arsenic also exceeded 1 for children under average exposure assumptions.

For residents exposed to treated water from private wells, two HQs for reasonably maximally exposed individuals exceeded 1, indicating a potential for non-cancer health effects. The HQs which exceeded 1 were the HQs for arsenic for adults (HQ=1.2) and children (HQ=2.7). The HQ for arsenic also exceeded 1 for children under average exposure assumptions. As noted above, arsenic was only detected in private wells during the December 2000 sampling event. Therefore, these calculations likely overestimate non-cancer risk associated with ingestion of untreated and treated water from private wells.

It is EPA's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

**Ecological Risks**

An ecological risk assessment was determined to be unnecessary for the interim remedy. Therefore, potential ecological risks will be addressed as part of future Operable Units.

## REMEDIAL ACTION OBJECTIVE

The Remedial Action Objective (RAO) of this interim action is:

- Control of further off-Site migration of groundwater contaminants near the source area exceeding Preliminary Remediation Goals (PRGs).

New Jersey groundwater regulations and Federal and New Jersey State primary drinking water regulations are applicable or relevant and appropriate requirements (ARARs) for this interim action. Therefore, PRGs for each groundwater contaminant have been identified as the most stringent of these requirements.

As stated in the RAO, the goal of this action is hydraulic source control, not groundwater restoration. Therefore, the effectiveness of this interim action will be determined by evaluating potentiometric data to ensure that contaminated groundwater is not migrating off of the Site property.

## SUMMARY OF REMEDIAL ALTERNATIVES

Remedial Alternatives for the Site are presented below. The alternatives are numbered to correspond with the numbers in the FFS Report.

Alternative GW1: No Action

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

Regulations governing the Superfund program generally require that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action at the Site to control migration of the groundwater contamination.

Alternative GW2: Hydraulic Source Control Using Extraction Wells

Estimated Capital Cost $2.4 million
Estimated Annual O&M Cost $1.2 million
Estimated Present Worth Cost $4.8 - 4.9 million
Estimated Construction Timeframe: 9 - 12 months

Three pairs of groundwater extraction wells would be installed at locations necessary to hydraulically control contaminant migration in the shallow and deep zone of the aquifer along the downgradient property line. It is expected that each extraction well pair would consist of one well screened directly above and one well screened directly below the low-permeability layer.

Once extracted, the contaminated groundwater would be treated on-Site using a treatment train that would include an air stripper for removal of VOCs. The treated groundwater would then be discharged to either a recharge basin to be constructed at the Site, or to an off-Site surface water body. A potential discharge point for treated groundwater is the Morses Mill Stream, located about 4200 feet from the anticipated location of the treatment system.

During the remedial design phase, a detailed analysis would be conducted to determine the appropriate components of the groundwater treatment train. Furthermore, the number and configuration of extraction wells to be installed at the Site, the need for installation of extraction wells in the deep zone of the aquifer, and the pumping rates of the wells would be subjected to further evaluation and refinement during the remedial design. In addition, the number, location and depth of monitoring wells and monitoring requirements necessary to ensure hydraulic source control would be evaluated during the remedial design.

Alternative GW3: Hydraulic Source Control Using Vertical Barrier Walls and Extraction Wells

Estimated Capital Cost $9.2 million
Estimated Annual O&M Cost $371,000 - $373,000
Estimated Present Worth Cost $10.8 million
Estimated Construction Timeframe: 9 - 12 Months

The components and requirements of this alternative are the same as those described for Alternative GW2, with the exception that vertical barrier walls would be installed along the Site property line for added source containment and there would be a reduction in the amount of groundwater pumping required to achieve hydraulic source control. It is assumed that either sheet piling or slurry may be used to construct the barrier walls.

As with Alternative GW2, a detailed analysis would be conducted during the design phase to determine the appropriate components of the groundwater treatment train. Furthermore, the number and configuration of extraction wells to be installed at the Site and the pumping rates of the wells would be subjected to further evaluation and refinement during the remedial design.

## EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against one another in order to select the best alternative. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. A more detailed analysis of the presented alternatives can be found in the FFS.

### 1. Overall Protection of Human Health and the Environment

All of the alternatives would achieve comparable protection of human health, as residences impacted by Site-related groundwater contamination have been or are in the process of being equipped with wellhead treatment systems. In addition, EPA is currently conducting a removal action to connect residences threatened by Site-related groundwater contamination to the municipal water supply.

Alternatives GW2 and GW3 would achieve comparable protection of the environment through hydraulic source control. The No Action Alternative would not be protective of the environment as groundwater contaminants would tend to persist and may continue to spread.

### 2. Compliance with ARARs

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements (ARARs) of federal and state law, or provide grounds for invoking a waiver of these requirements. These include chemical-specific, location-specific and action-specific ARARs. However, Section 121(b)(4) of CERCLA allows selection of interim remedies that do not attain chemical-specific ARARs.

No location- or action-specific ARARs are associated with Alternative GW1, since no action would be taken. Alternatives GW2 and GW3 would comply with location- and action-specific ARARs, such as Floodplain Management Executive Order 11988, the National Historic Preservation Act, National Emissions Standards for Hazardous Air Pollutants (40 CFR 60), and Clean Water Act Water Quality Standards (40 CFR 131). Given that the Remedial Action Objective of this interim action is to control further off-Site migration of groundwater contaminants rather than to restore the aquifer to drinking water standards, it is expected that all three alternatives would not comply with chemical-specific ARARs, as contaminated groundwater would likely persist.

Overall, Alternatives GW2 and GW3 would meet the Remedial Action Objective of hydraulic control of the ource area, while Alternative GW1 would not.

**3. Long-term Effectiveness and Permanence**

Alternative GW1 would not have any long-term effectiveness or permanence as contaminated groundwater would continue to migrate off-Site.

Alternatives GW2 and GW3 would achieve comparable levels of long-term effectiveness and permanence for maintaining hydraulic source control, as both employ groundwater extraction and ex-situ treatment, which has been widely demonstrated to be effective over the long term for maintaining hydraulic source control. Furthermore, both alternatives would utilize reliable ex-situ treatment technologies which have been recognized by EPA as presumptive remedies. While Alternatives GW2 and GW3 are not intended to be permanent remedies, either of these alternatives could be potentially integrated into the permanent, Site-wide groundwater remedy, which will be evaluated as part of the Site-wide RI/FS.

**4. Reduction of Toxicity, Mobility or Volume of Contaminants Through Treatment**

Alternative GW1 would not achieve any reduction in the toxicity, mobility or volume (TMV) of groundwater contamination.

Alternatives GW2 and GW3 would achieve comparable levels of contaminant mobility reduction via hydraulic source control. In addition, a minor amount of TMV reduction would also be achieved through treatment of extracted groundwater.

**5. Short-term Effectiveness**

Under Alternative GW1, there would be no potential risks imposed on construction workers, the community, or the environment associated with construction and implementation of an active remedy.

Alternative GW2 would have minimal short-term impact. Construction workers would not be subjected to significant exposure risks during construction, because the contaminated groundwater is located well below the ground surface, and only a limited amount of intrusive work extending into the contaminated zone (i.e., well drilling) would be required. General construction risks would be effectively managed via implementation of standard engineering controls (e.g., dust suppression) and health and safety procedures/protocol (e.g., ambient air monitoring). This alternative would not have significant impacts to the community, because heavy construction would not be required.

Alternative GW3 would have the greatest short-term impacts, since construction workers would be subjected to

| EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES |
| --- |
| ***Overall Protectiveness of Human Health and the Environment*** determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment. |
| ***Compliance with ARARs*** evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified. |
| ***Long-term Effectiveness and Permanence*** considers the ability of an alternative to maintain protection of human health and the environment over time. |
| ***Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment*** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present. |
| ***Short-term Effectiveness*** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation. |
| ***Implementability*** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. |
| ***Cost*** includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent. |
| ***State Support Agency Acceptance*** considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and the Proposed Plan. |

some exposure risks if a slurry wall is constructed, because significant excavation and processing of soils from the contaminated zone would be required. However, implementation of standard health and safety measures should mitigate these risks. There would not be significant exposure risks associated with sheet pile wall installation, since the sheet piles would be vibrated/driven into the ground.

Construction of barrier walls would also result in impacts to the local community. During the installation of sheet piling, the local community would be subjected to significant noise and vibration. If slurry walls were constructed, the delivery of slurry wall materials and the disposal of excavated soil would increase construction traffic in the area.

It is estimated that construction and initial startup of Alternatives GW2 and GW3 could be completed within nine to twelve months. Therefore, Alternatives GW2 and GW3 would achieve hydraulic source control within similar timeframes.

**6. Implementability**

Alternative GW1 would be the most implementable, because it requires No Action.

Alternative GW2 would be implementable, because construction and O&M can be completed using conventional heavy construction and wastewater treatment equipment/services, which are readily available on the commercial market. The surface water discharge option for treatment plant effluent could require a significant amount of effort to obtain the required property access agreements and permit approvals for construction and implementation. In addition, the surface water discharge option may require supplemental treatment to meet more stringent effluent discharge standards for inorganic constituents.

Alternative GW3 would be the least implementable, because installation of barrier walls would be more technically intensive than typical barrier wall applications, due to the depth of installation (80 feet) that would be required at the Site. Furthermore, regulatory requirements may be administratively problematic due to potential community impacts. Alternative GW3 would also involve the same implementation issues as Alternative GW2.

**7. Cost**

Alternative GW1 has the lowest cost because No Action is required, while Alternative GW3 has the highest cost due to the high capital cost of the vertical barrier. Alternative GW2 is expected to have a lower present worth cost ($4.8-4.9 million) than Alternative GW3 ($10.8 million).

**8. State/Support Agency Acceptance**

The State of New Jersey agrees with the preferred alternative in this Proposed Plan.

**9. Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the Site.

## SUMMARY OF THE PREFERRED ALTERNATIVE

The Preferred Alternative for hydraulic source control at the Emmell's Site in Galloway Township, New Jersey is Alternative GW2 (Hydraulic Source Control Using Extraction Wells), hereafter referred to as the Preferred Alternative.

The Preferred Alternative was selected over the other alternatives because it is expected to control further off-Site migration of groundwater contaminants near the source area of the Site in a cost-effective and readily implementable manner with minimal impact on the community.

Based on the information available at this time, EPA and NJDEP believe that the Preferred Alternative is protective of human health and the environment in the short term and provides adequate protection until a final remedy is selected; complies with (or waives) those federal and state requirements that are ARARs for this limited-scope action; and is cost-effective. Although the Preferred Alternative is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim remedy will utilize treatment and thus supports that statutory mandate. Because the Preferred Alternative will not constitute the final remedy for the Site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed by the Preferred Alternative, will be addressed by the final remedy.

Additional data concerning Site-related contamination, to be generated during the RI, may become available prior to implementation of the Preferred Alternative. This data will be considered during the design of the Preferred Alternative.

The Preferred Alternative will result in hazardous substances remaining on-Site above health-based levels. Therefore, a review will be conducted to ensure that the interim remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. The Preferred Alternative may change in response to public comment or new information.

## COMMUNITY PARTICIPATION

EPA and NJDEP provide information regarding cleanup of the Emmell's Site to the public through public meetings and availability sessions, the Administrative Record File for the Site, fact sheets, and announcements published in the Press of Atlantic City New Jersey newspaper. EPA and NJDEP encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site.

The dates for the public comment period; the date, location, and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan

**For further information on the Emmell's Site, please contact:**


Joe Gowers
Remedial Project Manager
(212) 637-4413
gowers.joe@epa.gov

Cecilia Echols
Community Relations Coordinator
(212) 637-3678

**U.S. EPA**
290 Broadway 19th Floor.
New York, New York 10007-1866

## GLOSSARY OF TERMS

Specialized terms used in this Proposed Plan are defined below:

**Applicable or relevant and appropriate requirements (ARARs)** - the Federal and State environmental laws that a selected remedy will meet, unless grounds for invoking a waiver of these requirements is provided. These requirements may vary among sites and alternatives.

**Aquifer** - A permeable geologic stratum or formation that can both store and transmit water in significant quantities.

**Ex situ** - the removal of a medium (for example, water or soil) from its original place, as through extraction, in order to perform the remedial action.

**Groundwater** - underground water that fills the pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

**Hydrostratigraphic Unit** - a formation, part of formation or group of formations that can be grouped into aquifers and associated confining layers.

**Maximum Contaminant Level (MCL)** - The maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

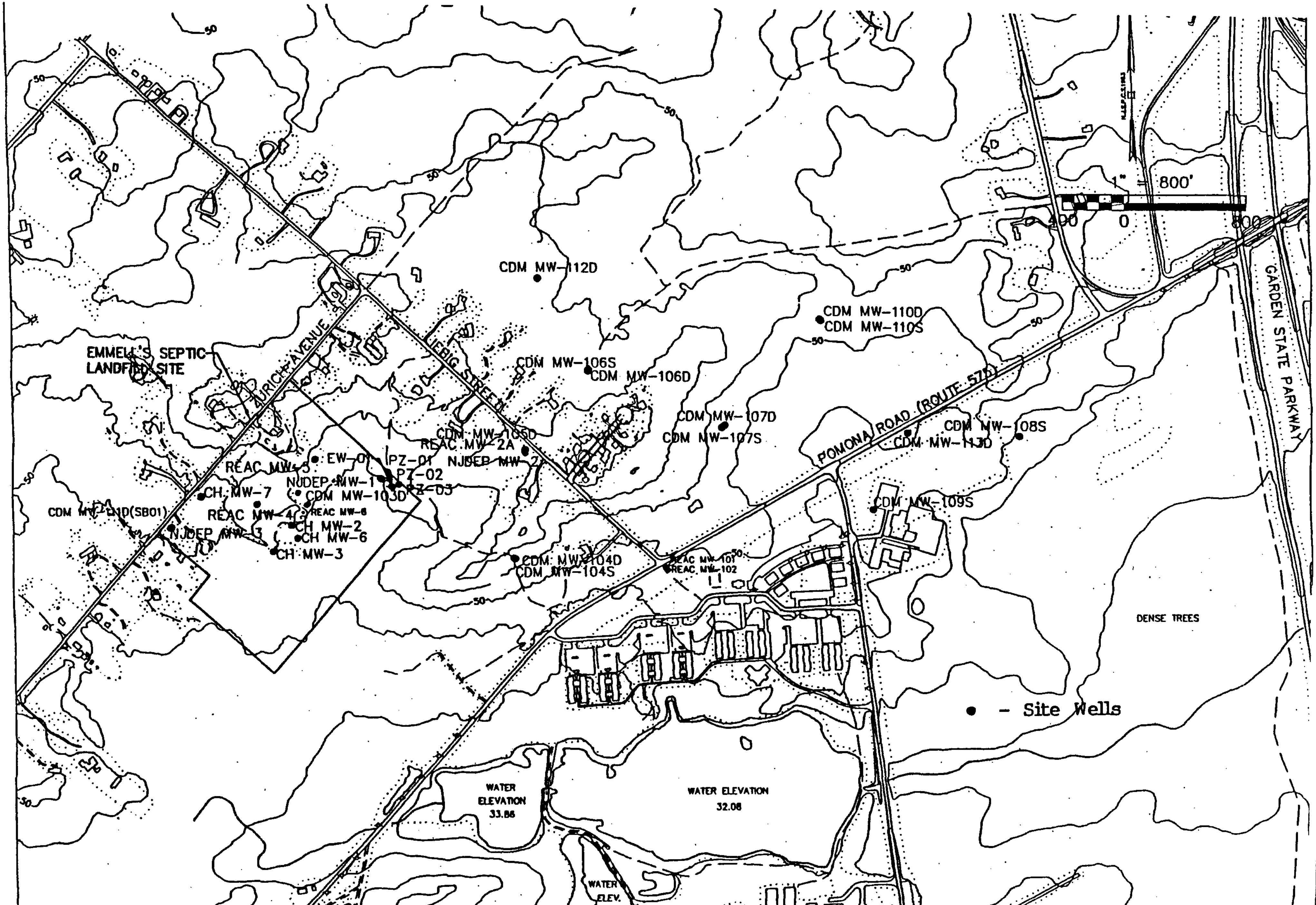
**New Jersey Groundwater Quality Standards (NJGQSs)** - State of New Jersey standards that are used as regulatory requirements to govern and protect groundwater quality in the State of New Jersey.

**Presumptive Remedy** - A cleanup technology which EPA has found to be effective through experience at numerous Superfund sites for remediation of similar sites. Consideration of presumptive remedies at applicable sites narrows down cleanup choices, which can expedite cleanup of the site by reducing site investigation and data collection efforts.

**Volatile Organic Compounds (VOCs)** - A class of compounds that have a high vapor pressure and low water solubility. VOCs are typically human-made chemicals that are often components of petroleum fuels, hydraulic fluids, paint thinners and dry cleaning agents.

TABLE 1 - VOC CONCENTRATIONS IN GROUNDWATER

| VOLATILE ORGANIC COMPOUND | MAXIMUM DETECTED CONCENTRATION SHALLOW ZONE MONITORING WELLS (ug/L) | MAXIMUM DETECTED CONCENTRATION DEEP ZONE MONITORING WELLS (ug/L) |
|---|---|---|
| 1,1,1-Trichloroethane | 650 | 10 |
| 1,1,2-Trichloroethane | 13 | 38 |
| 1,1-Dichloroethane | 170 | 50 |
| 1,1-Dichloroethene | 50 | 5.1 |
| 1,2,3-Trichlorobenzene | 9 | 2.5 |
| 1,2,4-Trichlorobenzene | 22.5 | 4.1 |
| 1,2-Dichlorobenzene | 17.5 | 10 |
| 1,2-Dichloroethane | 2 | ND |
| 1,3-Dichlorobenzene | 13.5 | 6.9 |
| 1,4-Dichlorobenzene | 40 | 15 |
| Benzene | 55 | 15 |
| Carbon Disulfide | 0.65 | 0.33 |
| Chlorobenzene | 270 | 92.5 |
| Chloroethane | 1 | ND |
| Chloroform | 4.6 | 1.3 |
| cis-1,2-Dichloroethene | 4600 | 250 |
| Cyclohexane | 510 | 13 |
| Ethylbenzene | 94 | ND |
| Isopropylbenzene | 8.9 | 2.2 |
| Methyl Tert-Butyl Ether | 5.9 | ND |
| Methylcyclohexane | 0.2 | 0.17 |
| Methylene Chloride | 0.14 | 0.375 |
| Tetrachloroethene | 0.55 | 0.45 |
| Toluene | 10500 | 0.75 |
| trans-1,2-Dichloroethene | 23 | 5.6 |
| Trichloroethene | 10 | 5.7 |
| Vinyl Chloride | 2550 | 360 |
| Xylenes | 570 | 15 |




# FIGURE 1
## SITE LOCATION MAP

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ATTACHMENT B

**The United States Environmental Protection Agency**
**Invites Public Comment on the**
**Proposed Remedial Alternatives for the**
**EMMELL'S SEPTIC LANDFILL SUPERFUND SITE**
**Galloway Township, New Jersey**

The 38 acre Emmell's Septic Landfill Superfund Site is located at 28 South Zurich Avenue in a predominantly rural area of Galloway Township, Atlantic County, New Jersey. The United States Environmental Protection Agency (EPA), in consultation with the New Jersey Department of Environmental Protection, recently completed a Focused Feasibility Study to identify and evaluate remedial alternatives to control further off-site migration of groundwater contaminants near the disposal area at the site while the extent of contamination related to the site is being defined . At this time, EPA is recommending an interim remedy for this site. EPA's recommended alternative is extraction and treatment of contaminated groundwater downgradient of the disposal area at the site, with discharge of the treated groundwater to either an on-site recharge basin or to a nearby surface water body.

EPA's Proposed Plan, the document that describes the basis for EPA's preference, and other site-related documents are contained in the information repositories established for the site, which are available for public review at the following locations:

**Atlantic County Library**
Galloway Township Branch
306 East Jimmie Leeds Road
Galloway Township, NJ 08205
(609) 652-2352

Hours: M-Th, 9am - 8pm
Fri & Sat, 9am - 5pm

**EPA Region II**
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
(212) 637-3261

Hours: M-F, 9am - 5pm

**EPA relies on public input to ensure that the selected remedy for each Superfund Site meets the needs and concerns of the local community. A 30-day period for public comment runs from August 6, 2003 through September 5, 2003. EPA will hold a public meeting to discuss the Proposed Plan for the site on August 13, 2003, at 7:00pm at the Galloway Township Municipal Building (Court Room). During this meeting, public comments will be received.**

Written comments and questions regarding the Emmell's Septic Landfill Site, postmarked no later than September 5, 2003, may be sent to:

Joe Gowers, Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866
Telephone: (212) 637-4413
Fax: (212) 637-4429

Please note that although EPA has identified a preferred interim remedy for the site, a final decision will not be made until EPA has considered all public comments received during the public comment period. EPA will summarize these comments along with EPA's responses in a Responsiveness Summary, which will be included in the Record of Decision, the document which formalizes the selection of the remedy.

ATTACHMENT C

**EPA**
Region II

***EMMELL'S SEPTIC LANDFILL SUPERFUND SITE***
***PROPOSED PLAN PUBLIC MEETING***

*Wednesday, August 13, 2003 @ 7:00PM til 9:00PM*

***ATTENDEES***
***(Please Print Clearly)***

| NAME | STREET | CITY | ZIP | PHONE | REPRESENTING | Are you currently on the list? |
|---|---|---|---|---|---|---|
| PAT ARNEY | ATLANTIC CITY PRESS | | | | | |
| AL DESIMONE | 619TH B. 8TH AVE | GALLOWAY, N.J. | | 609-652-0493 | GALLOWAY | |
| Michael WASZTY | 25 ZURICH AVE | | | | | |
| Tom HENSHAW | TOWNSHIP OF GALLOWAY · 300 E JIM LEEDS RD | GALLOWAY | | | TWP. MANAGER | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

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**ATTACHMENT D**

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

- - - - - - - - - - - - - - - - - - - - - - - - -x

PUBLIC MEETING ON THE PROPOSED :
PLAN FOR HYDRAULIC CONTROL OF
CONTAMINATED GROUNDWATER AT :
THE EMMELL'S SEPTIC LANDFILL SITE,
GALLOWAY TOWNSHIP, NEW JERSEY :

x

Wednesday, August 13, 2003

7:10 o'clock p.m.
300 Jimmy Leeds Road
Galloway, New Jersey

P R E S E N T:

Cecelia Echols, Community Involvement Coordinator Intergovernmental and Community Affairs Branch

Joseph Gowers, Project Manager, Southern New Jersey Remediation Section

Daniel Harkay, On-scene Coordinator

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MS. ECHOLS: I'm Cecelia Echols, the community involvement coordinator. We have with us Joe Gowers, he's the remedial project manager. And Dan Harkay, he is sitting in for Mark Payne, the on-scene coordinator for the Emmell's Septic Landfill Superfund Site which is what we're going to discuss here tonight. We're here to discuss the proposed plan. I hope everyone picked up one from the back of the room. You all received one in the mail. It is a proposed plan of action for the preferred alternative for interim remedy for contaminated groundwater at the site.

What community involvement entails is getting the community involved in the decision-making process to get the site cleaned up. There's a lot of different facets that take part in getting the site cleaned up and we also need input from the community to make sure we're cleaning it up to your standards and that you have some input into this whole process.

Since there aren't many people here tonight, we'll have Joe go right ahead to his presentation and we'll hold questions till the end of his presentation. I hope everyone signed in with their address. At the end of this public comment period which is September 5th, Joe will be putting together a responsiveness summary to all of your questions that come in, written as well as verbal today.

We also have a stenographer here who's documenting everything that's being said today. And when it's your turn to speak, please say your names clearly for her to record them accurately. And I'll leave it over to Joe now.

MR. GOWERS: Thank you, Cecelia. As Cecelia had indicated, we're here to discuss the interim remedy for contaminated water at the Emmell's Septic Landfill Site, the remedy the EPA is proposing.

Before going into the remedy and the studies that led up to the results of those studies, we thought it would be beneficial to go in to just provide an overview of the Superfund process. First of all, for those who are not aware, Superfund was a law enacted in 1980 and we authorized in 1986 to provide for the clean up of abandoned hazardous waste sites. So basically any Superfund site starts off, first of all, has to be discovered, site discovery, information from concerned citizens, local and state authorities may lead to the discovery of the site. Once the site's discovered, a preliminary assessment is conducted to determine whether there are any potential hazards related to the site based upon existing background information. If that preliminary assessment indicates there might have been a potential for a hazard a site inspection might be conducted at the site to collect some additional information to evaluate the hazards related to that site. That information is used to right the site based upon its relative threat using EPA's hazard ranking system. If it ranks high enough it could be proposed to the national priorities list. If it makes the national priorities list the site would be eligible for Superfund clean up.

MS. ECHOLS: These handouts are also provided for you. I hope you pick them up from the table.

MR. GOWERS: Once a Superfund site becomes a Superfund site, the first step in the clean up process is actually conducting what's known as a remedial investigation and facility study. The remedial investigation consists of basically a lot of data is collected at the site to determine the nature and extent of groundwater contamination or soil contamination at the site and a feasibility study evaluates cleanup alternatives to address that contamination. In certain cases where the agency determines that basically the process needs to be accelerated to address one component of the site, we may conduct what's known as a focus feasibility study which is the case for the Emmell's Septic Landfill site.

Once the remedial investigation and feasibility study is completed or the focus feasibility study is completed, we begin the remedy selection process and that would first begin with releasing the focus feasibility study or RIFS to public and releasing a proposed plan to the public and basically looking for comments on a proposed plan before

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we formalize selection of the remedy in a document which is known as the Record of Decision.

Once we select a remedy of course design, the remedy and remedial design basically details how the clean up action will be engineered and constructed.

Once the remedy is designed, the remedy is then constructed and implemented and once all the site clean up actions have been implemented, all the clean up goals have been met and all the monitoring requirements have been satisfied, then the site can be proposed for deletion from the national priorities list. For anyone not aware of where the Emmell's Septic Landfill site's located, it's located at 28 South Zurich Avenue, right here in Galloway Township, New Jersey, and this map shows the exact location of the site fairly close to the intersection of

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Zurich Avenue and Libec Street.

The site was used from like 1967 through 1979 for disposal of septic waste and sewerage sludge. It was actually permitted for those uses from the New Jersey Department of Environmental Protection. However, during operations at the site, other chemical wastes were illegally disposed of at that site and disposal operations at the site ceased in August 1979.

In 1984, the Atlantic County Health Department did some sampling of residential wells in the vicinity of the site and based upon that sampling determined that five wells had volatile organic contaminants at elevated levels. Those wells were, therefore, subsequently closed and deeper, clean wells were installed for the residents.

In 1997 and 1998, EPA's removal action branch conducted an

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investigation at the site to try to locate the source of contamination in those former residential wells and to determine whether removal action at the site would be warranted. The results of that investigation basically indicated the site, and some of the waste at the site were still a continuing source of groundwater contamination.

The site was then placed in the national priorities list, I believe in April of 1999 and was included on the national priorities list in July of 1999, making it eligible for Superfund clean up.

From July 1999 through February 2000, EPAs removal action branch conducted a removal action at the site and as part of that removal action, removed 435 drums and the drum contents, 28,000 cubic yards or approximately 28,000 cubic yards of contaminated soil and 11 compressed

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gas cylinders.

EPA initiated a focus feasibility study at the site in February 2000 in order to evaluate whether implementing an interim remedy for groundwater contamination was warranted while the remedial investigation feasibility study process was being conducted at the site.

During that focus feasibility study, EPA determined that there were three distinct layers to the groundwater aquifer in the vicinity of the site and if you look at this diagram, this is a cross-section of the sub-surface starting at the property line of the Emmell's Septic Landfill site and proceeding east. If you look at this you can see where the shallow zone of the aquifer is, the low permeability layer and the deep zone. The low permeability layer would impede the downward movement of groundwater and groundwater contamination. The one thing you may notice is that near the site property line the low permeability layer is virtually nonexistent.

In March 2001, EPA conducted a groundwater screening program in the vicinity of the site in order to try to delineate or preliminarily delineate the extent of groundwater contamination of the shallow zone of the aquifer. As part of that study the EPA installed 26 temporary well points and collected in the area of 185 groundwater samples to try to delineate plume.

Subsequent to that groundwater screening study, EPA, from September through November of 2001 went back to the site and installed 11 new groundwater monitoring wells, permanent monitoring wells, six of them in the shallow zone were screened in the shallow zone of the aquifer there and five screened in the deep zone of the aquifer. The six in the shallow aquifer were there to basically monitor the groundwater contaminated plume which had been preliminarily delineated as part of the groundwater study. The five Deep wells were basically installed to begin investigating whether or not the deep aquifer had been impacted by the site. And also in November and December of 2001 EPA conducted an aquifer test at the site to try to determine some hydrogeologic characteristics of the aquifer which is dated that would be able to properly evaluate alternatives for the site and also ultimately a groundwater system for this site.

Some of the findings of that focus feasibility study were, first of all, that we confirmed that groundwater in the vicinity of the site blows in an easterly direction.

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Also, we identified a groundwater contaminant plume comprised primarily of alloid contaminants which is present in the shallow zone of the aquifer, beneath the site and moving to the east of the site.

This diagram basically shows, this, being, Emmell's Septic Landfill site, provides a visual presentation of the groundwater contamination from one of the contaminants at the site vinyl chloride, basically it shows the highest concentrations and the area where they are and where they're blowing. Likewise, we have diagrams or figures showing for two other contaminants the contaminant levels for those contaminants at the site.

So, you could see groundwater contamination is moving off site to the east and is in the shallow zone there.

The final finding of the focus feasible the study is that volatile organic contaminants were also present in the deep zone of the aquifer in the vicinity of the site east of the site and that that groundwater contamination is actually we found it right below the low permeability layer which is at the depth that's shallower than most of the residential wells which are installed in the area.

Based upon those findings we determined it would be appropriate to try to control further off site migration of groundwater contamination at the site. Just wanted to point out to that the goal of the cleanup would be to control off site migration, not clean up the entire groundwater aquifer. That would be something that would be considered as part of the site-wide remedial investigation and feasibility study.

Several alternatives were developed as part of the focused feasibility study for addressing the groundwater contamination problem. The first alternative, No Action, as the name indicates it's no action, the EPA will take no action at the site to control groundwater contaminant migration. The only reason we really considered this no-action alternative is it's required by our regulations so it is it serves as a baseline comparison with the other alternatives.

Second alternative developed is number two, hydraulic source control using extraction wells. According to this remedy, groundwater extraction wells would be installed at the site to basically try to control off-site groundwater migration. The contaminated would be extracted, treated with a groundwater treatment system which would be constructed at the site and the treated groundwater would either be discharged to an on-site recharge basin which would be

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constructed or to a nearby surface water body.

The final alternative developed for the site is hydraulic source control using both vertical barrier walls and extraction wells. This alternative would include the same components as alternative two, but in addition would involve the installation of vertical barrier walls made with either steel or slurry which would be installed along the property line which would help control off-site groundwater migration and also it would minimize the amount of groundwater that would need to be extracted and treated.

Based upon the evaluation of the pros and cons of each of these alternatives, the EPA is recommending that Alternative Number 2, hydraulic source control using extraction wells, be implemented at the site. And this is just a general figure showing some of the components that you would expect to see, of course you would see groundwater extraction wells the water would be extracted pumped to a number of pretreatment steps that would then be pumped to an airstripper where the volatile organic contaminants would be removed, they would be stripped out into the air stream, the clean groundwater would then be discharged either on-site to the recharge basin or discharged to a nearby surface water body. The contaminated air stream would then be treated to remove or destroy the volatile organic contaminants before being discharged to the atmosphere.

Just wanted to do point out that the EPAs reason for selecting this preferred alternative is that it's expected to meet that remedial action objective in a cost effective and readily implementable fashion and to result in minimal impact on the community.

And at this point, I've completed my presentation and we would like to, I guess, open the floor up with any questions, comments which you may have.

MS. ECHOLS: State your name and who you're affiliated with.

MR. DI SIMONE: AL DiSimone, Councilman, Galloway Township. The water you said either would be treated at the site or I didn't hear what you said?

MR. GOWERS: Yeah, the water would be, under either of those alternatives it would be treated at the site. The variable is where it's being discharged. It can either be discharged on site to a recharge basin which is basically an on-site pond that would be reconstructed to allow the clean water to re-infiltrate back can into the aquifer. The other alternative is that it could be piped into a nearby surface water body and be discharged there. Those are the two alternatives for discharge of the treated groundwater.

MR. DI SIMONE: Okay. You said option 3 is a better option because less would seep away from the site. How much less?

MR. GOWERS: Option 3, we indicated would entail installation of vertical barrier walls in addition to the extraction system. That would help, in terms of it wouldn't completely prevent any contaminated water from running off-site but it's more of a idea to funnel that contaminated water to less extraction wells and it would help keep some of the contaminated groundwater from flowing off site.

We were not recommending selection of that alternative, one reason is that you're going to have to have to have a lot of construction equipment in there to basically dig trenches down to 80 feet deep to put in a slurry, a lot of noise, vibrate the sheet metal basically into the ground creates a lot of noise for the community, so we were thinking along those lines. Also, the remedy, it was estimated, would cost twice as much as simply controlling the level of contamination with just extraction.

MR. DI SIMONE: Have studies been done in past history on how much percentage were to stay on the site if we went with Option 3?

MR. GOWERS: Basically, whichever option we go with, the system would be designed to try to keep any kind perimeter of migration of groundwater contaminants which are at elevated levels from coming off the site. It's just a matter of where you put your extraction wells and the rate that you pump at.

With Alternative 2, we're

probably going to need more extraction wells and pump at a higher rate than we would with Alternative 3.

MR. DI SIMONE: Okay, I'm still not following you. With Alternative 3 --

MR. GOWERS: Alternative 3 has a barrier --

MR. DI SIMONE: Has a much better chance of it spreading out away from the site.

MR. GOWERS: No, basically Alternative 3 -- let me put up a figure for the site and we could -- do we have anything there? Basically, on the eastern portion of the property what would be installed under Alternative 3 which is the vertical barrier walls with the extraction wells, along the site property on the eastern side there would be vertical barrier walls installed over a portion of that site to try to restrict and kind of funnel the groundwater towards another area where there wouldn't be a barrier wall but there would be extraction wells installed so you're basically funneling the contaminated groundwater to extraction wells. Whereas, under Alternative 2, along the property line we would have to space out the extraction wells and probably pump at a higher rate to try to achieve the same sort of containment. Now, the reason we're recommending Alternative 2, is because first of all, it's more readily implementable, it's easier to basically put in, there's less impact on the community, the community's not going to have to tolerate heavy equipment in their in terms of digging trenches, mixing slurry walls down to 80 feet and having equipment in to basically make a lot of noise and vibration to vibrate sheet of metal into the ground. And the third benefit is that Alternative 2 is estimated to cost half as much as Alternative 3. Either way, either alternative is going to achieve, would be designed to achieve the same amount of control to basically try to keep the same contaminants from migrating off the site.

The remedy, however, wouldn't go the extra step of trying to capture anything that's already migrated off of the site. That is something we're going to be dealing with as part of the site-wide remedy, the site-wide remedial investigation and feasibility study.

MR. DI SIMONE: Thank you.

MS. ECHOLS: State your name and affiliation.

MR. HENSHAW: Tom Henshaw, Township Manager of Galloway. Out at Lisa Drive, we're putting in water, the New Jersey American Water which the EPA is paying for. As far as the other residents in the area, knowing that this plume is going to spread, is there any ideas about running water to other residents in that area to like pro-act instead of waiting until the wells get contaminated?

MR. GOWERS: As far as other residents in the area, we're essentially offering water to everybody who seems to be threatened on Libec Street, possibly on Zurich Avenue, those residents are also being offered water, and Lisa drive. The next nearest block heading in the direction of the plume is West Moss Mill Road. As part of our remedial investigation we did turn you up one residential well was impacted and we have point of entry treatment system I believe actually yesterday you had that installed on that residential well. So if a home is threatened or a home is impacted we're going to take steps to address that, we're not going to let people drink contaminated

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groundwater.

MR. DI SIMONE: How far is that house you just mentioned from?

MR. GOWERS: It's about two-thirds of a mile from the site and that is in the deep aquifer, the well is screened in the area of about 120 feet, to below that permeability layer.

MR. DI SIMONE: So for right now you're going to use POET systems?

MR. GOWERS: That's what we're going to do right now. We'll use POET systems, there are a limited number of residents right there, I believe seven homes are potentially threatened there.

MR. HENSHAW: Another question, all the wells you're going to put in, is that going to access a contamination of leakage down below?

MR. GOWERS: No, the well, the exact setup of those wells is going to be determined during the remedial design phase but considering the fact that most of the contamination appears to be in the upper aquifer at that point near the site property boundary, most of those wells would probably been screened in the upper aquifer or the upper portion of the aquifer, the upper zone so that I wouldn't anticipate would add to the --

MR. HENSHAW: How long do you think you'll be monitoring this project once you've completed it?

MR. GOWERS: You mean once this system is constructed, how long will we be monitoring? This is an interim remedy which is basically a precursor to a final remedy, which would have to be selected for groundwater contamination. This is to control the problem until we get the final remedy selected, so during that period we're going to continue to monitor this problem and that problem will be picked up as part of the final remedy.

MR. HENSHAW: One more question. Back in 1979 when you closed this site, the people responsible, have you ever done anything to go out to them knowing that they criminally dumped illegal chemicals in that area and I know this is probably before you're time, but I'm just curious to see if anything was ever done.

MR. GOWERS: We've identified the previous owners and based upon our information people who currently part of the Emmells family who currently technically owns the property, it's in their name we looked into it and we haven't considered them financially viable in order to basically pay for a multi-million dollar remedy.

MR. DI SIMONE: Repeat that, you --

MR. GOWERS: We've looked into parties who currently own that property and as far as we can tell they don't appear to be financially viable.

MR. DI SIMONE: If he was licensed by the State of New Jersey as a landfill it had to be required to have X-amount of insurance if he was licensed by the State.

MR. GOWERS: First of all, the person who owns the property now is not the person who operated the site at the time. Second of all, we're with the federal government, we're not with the State, we're not the people who licensed them or regulated them at the time, so.

MR. DI SIMONE: Is there any communication with the State Department? Even though he's not operating now, they had insurance then, his insurance company should be liable to a certain degree for what he did.

MR. GOWERS: I am not aware of

the insurance that he has at this point or had at that point in time. I do know that we looked into it and our determination was the party isn't really financially viable. And the State of New Jersey actually looked into this matter for a number of years and determined the same thing, that they're not financially viable and there wasn't anything they could do or to get from these parties.

MR. HENSHAW: You couldn't get any names or numbers to follow up and find out which chemical companies they came from?

MR. GOWERS: Simply having a name on the drum is not enough to --

MR. HENSHAW: You know, which companies make certain chemicals. I'm just asking because these are questions that are going to be asked of me.

MR. GOWERS: We actually did a fair analysis. Before we got rid of those drumsus we did a thorough analysis of what was inside, tried to have experts look at that and try to match it up with all the different chemicals, all the different companies, waste products produced by these companies. They couldn't even say that the drums -- there were a few that had a name or some markings on them contained the same material from the same company, there was no way, they could not link that material to any product for any of these companies. And as I indicated, just simply having the company's name on it is not enough, because the company was approached and basically said they had no knowledge of it, no knowledge of it, and of course, said, "We could have sold a product to somebody that could have used it to dispose of their material." It's not enough to incriminate.

MS. ECHOLS: Anymore

questions?

(Negative response.)

MS. ECHOLS: Fine. Well, we're going to end the meeting. We would like to thank you all for coming out tonight. If you have anymore questions or comments, you can write Joe Gowers, his business card is here if you would like it or you can call me or write me and all of these questions are going to be part of the responsiveness summary which will then be part of the record of decision signed by the regional administrator. Once a decision is made about this alternative being put in place, whichever alternative we decide will be put in place.

COMMUNITY MEMBER: The deadline for comments is September 5th and then how soon after the deadline will the EPA make public its decision?

MS. ECHOLS: It's usually

within like two weeks.

MR. GOWERS: Depends upon the amount of comments we get. We have to address all of those comments, it becomes part of the record of decision. I would estimate that by the end of September we should have a record of decision.

MS. ECHOLS: That's it, I guess. Thank you for coming. Thank you very much.

(Time noted: 7:40 o'clock p.m.)

CERTIFICATE

STATE OF NEW YORK )
) ss.
COUNTY OF NEW YORK )

I, DEBRA DI BENEDETTO, a Shorthand (Stenotype) Reporter and Notary Public of the State of New York, do hereby certify that the foregoing PROCEEDINGS, taken at the time and place aforesaid, is a true and correct transcription of my shorthand notes.

I further certify that I am neither counsel for nor related to any party to said action, nor in any wise interested in the result or outcome thereof.

IN WITNESS WHEREOF, I have hereunto set my hand this 21st day of August, 2003.

Debra Di Benedetto

DEBRA DI BENEDETTO

# APPENDIX IV - ADMINISTRATIVE RECORD INDEX

EMMELL'S SEPTIC LANDFILL
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

**1.0 SITE IDENTIFICATION**

**1.2 Notification/Site Inspection Reports**

P. 100001 - 100268 Report: Final Site Inspection Prioritization Report, Emmmell's Septic Landfill, Galloway Township, New Jersey, prepared by Roy F. Weston, Inc., prepared for U. S. EPA Region 2, November 12, 1993.

**1.4 Site Investigation Reports**

P. 100269 - 100738 Report: Expanded Site Investigation, Emmell's Septic Landfill, Galloway Township, Atlantic County, prepared by New Jersey Department of Environmental Protection, Division of Publicly Funded Site Remediation, Environmental Measurements and Site Assessment Section, April 15, 1997.

P. 100739 - 101244 Memorandum to Mr. George Prince, U.S. EPA/ERTC Work Assignment Manager, Roy F. Weston, Inc., from Charles Perry, REAC Task Leader, Roy F. Weston, Inc., re: Document Transmittal Under Work Assignment 3-310, June 20, 1998. (Attachment: Technical Memorandum, Emmell's Septic Landfill Site, Site Activity Report, June 1998.)

**4.0 FEASIBILITY STUDY**

**4.2 Feasibility Study Work Plans**

P. 400001 - 400133 Report: Final Work Plan, Volume I, Emmell's Septic Landfill, Remedial Investigation/Feasibility Study, Atlantic County, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, August 1, 2000.

### 4.3 Feasibility Study Reports

P. 400134 - 400595 Report: Groundwater Focused Feasibility Study; Final Quality Assurance Project Plan, Emmell's Septic Landfill, Remedial Investigation/Feasibility Study, Galloway's Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, September 12, 2000.

P. 400596 - 400733 Report: Final Technical Memorandum for Groundwater, Emmell's Septic Landfill, Groundwater Focused Feasibility Study, Galloway Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, August 3, 2001.

P. 400734 - 400902 Report: Revised Final Groundwater Focused Feasibility Study, Emmell's Septic Landfill Site, Remedial Investigation/Feasibility Study, Galloway Township, New Jersey, Volume I, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, May 1, 2003.

P. 400903 - 401403 Report: Revised Final Groundwater Focused Feasibility Study, Emmell's Septic Landfill Site, Remedial Investigation/Feasibility Study, Galloway Township, New Jersey, Volume II, Appendix A-M, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, May 1, 2003.

P. 401404 - 402255 Report: Revised Final Groundwater Focused Feasibility Study, Emmell's Septic Landfill Site, Remedial Investigation/Feasibility Study, Galloway Township, New Jersey, Volume III, Appendix N, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, May 1, 2003.

P. 402256 - 402400 Report: Revised Final HHRA for Focus Feasibility Study, Emmell's Septic Landfill Site, Remedial Investigation/Feasibility Study, Atlantic County, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U. S. EPA Region 2, May 2, 2003.

## 6.0 STATE COORDINATION

### 6.3 Correspondence

P. 600001 - 600004 Letter to Mr. Joseph A. Gowers, Project Manager, CERCLA-Southern New Jersey Remediation Program, U. S. EPA Region 2, from Mr. Gary Lipsius, Site Manager, Bureau of Site Management, New Jersey Department of Environmental Protection, re: Emmell's Septic Landfill Site, Galloway Township, Atlantic County, Focused Feasibility Study (FFS) Volume I and ATSDR Draft Public Health Risk Assessment Dated June 6, 2000, June 15, 2000.

P. 600005 - 600006 Letter to Mr. Joseph A. Gowers, Project Manager, CERCLA-Southern New Jersey Remediation Program, U. S. EPA Region 2, from Mr. Gary Lipsius, Site Manager, Bureau of Case Management, New Jersey Department of Environmental Protection, re: Emmell's Septic Landfill Site, Galloway Township, Atlantic County, Groundwater Focused Feasibility Study (FFS) Dated February 2003, June 2, 2003.

P. 600007 - 600008 Letter to Mr. Joseph A. Gowers, Project Manager, CERCLA-Southern New Jersey Remediation Program, U. S. EPA Region 2, from Mr. Gary Lipsius, Site Manager, Bureau of Case Management, New Jersey Department of Environmental Protection, re: Emmell's Septic Landfill Site, Galloway Township, Atlantic County, Interim Remedial Measures (IRM) Proposed Plan, July 28, 2003.

## 8.0 HEALTH ASSESSMENTS

### 8.1 ATSDR Health Assessments

P. 800001 - 800045 Report: <u>Public Health Assessment for Emmell's Septic Landfill, Galloway Township, Atlantic County, New Jersey</u>, prepared by New Jersey Department of Health and Senior Services, Hazardous Site Health Evaluation Program, Consumer and Environmental Health Services, Division of Epidemiology, Environmental, and Occupational Health, under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry, March 1, 2002.

## 10.0 PUBLIC PARTICIPATION

### 10.2 Community Relations Plans

P. 10.00001- 10.00005 Mailing List - Emmell's Septic Landfill, undated.

### 10.4 Public Meeting Transcripts

P. 10.00006- 10.00038 Transcipt of the U. S. EPA Public Meeting on the Proposed Plan for Hydraulic Control of Contaminated Groundwater at the Emmell's Septic Landfill Site, Galloway Township, New Jersey, prepared by Fink & Carney Reporting and Video Services, August 13, 2003.

### 10.6 Fact Sheets and Press Releases

P. 10.00039- 10.00040 Fact Sheet: EPA to Begin Sampling Activities at Emmell's Septic Landfill Site, prepared by U. S. EPA Region 2, December 2000.

P. 10.00041- 10.00044 Fact Sheet: EPA Completes Initial Sampling at Emmell's Septic Landfill Site, prepared by U. S. EPA Region 2, October 2001.

P. 10.00045- 10.00046 Press release: EPA Proposes Interim Cleanup Plan for Galloway's Superfund Site, prepared by U. S. EPA Region 2, August 7, 2003.

### 10.9 Proposed Plan

P. 10.00047- 10.00059 Superfund Program Proposed Plan, Emmell's Septic Landfill Site, prepared by U. S. EPA Region 2, August 2003.

APPENDIX V - STATE LETTER OF CONCURRENCE

State of New Jersey

Department of Environmental Protection

James E. McGreevey
*Governor*

Bradley M. Campbell
Commissioner

SEP 30 2003

Ms. Jane M. Kenny
Regional Administrator
Region 2
290 Broadway
New York, N.Y. 10007-1866

Dear Administrator Kenny:

The New Jersey Department of Environmental Protection has evaluated and concurs with the Operable Unit Number One Record of Decision (ROD) for the interim source area pump and treat remedy for the Emmels Septic Landfill Site, located in Galloway Township, Atlantic County. This interim remedy will include the following items:

- Extraction of contaminated groundwater near the suspected source of the contamination ;
- Treatment of the extracted groundwater; and
- Discharge of the treated groundwater to a recharge basin to be constructed at the site.

Concurrent with the implementation of the interim remedy, ongoing delineation of the source of the contamination will be implemented in conjunction with the sitewide Remedial Investigation.

The State of New Jersey appreciates the opportunity to participate in the decision making process and looks forward to future cooperation with the USEPA.

Sincerely,

Evan Van Hook,
Assistant Commissioner