

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: Engelhard Corporation

Facility Address: 30 Taunton Street (Route 152), Plainville, Massachusetts 02762

Facility EPA ID #: MAD001190644

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

If yes - check here and continue with #2 below.

If no - re-evaluate existing data, or

if data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

FACILITY BACKGROUND INFORMATION

The Engelhard site is a metal fabrication and finishing manufacturing facility located on approximately 14 acres in Plainville, Massachusetts. The facility was constructed in 1957 on land previously used for agricultural purposes. Between 1957 and 1962, the plant had two primary functions: rolling and fabricating steel and titanium, and fabricating uranium fuel elements for the U.S. Atomic Energy Commission (AEC), consisting of the handling of natural, depleted and enriched uranium. Cooling waters from the uranium fabrication operations were discharged into leachfields located on the southeastern side of the facility. In 1962, Engelhard shut down its nuclear fuel business and conducted decontamination procedures on affected buildings and equipment. All nuclear materials and equipment were sold and removed from the facility, and in June 1963, the AEC conducted a close-out inspection confirming that Engelhard's decontamination efforts met AEC closure standards.

From the early 1960's until the facility closed in 1993, operations primarily consisted of metal fabrication and finishing, using mostly silver and gold, into wire and flatstock, primarily for the jewelry and electronics industries. Manufacturing processes included melting raw metals, mixing metals to make alloys, and shaping, heat treating, and finishing metals. Wastes generated at various times as a result of these processes included: cyanide, chromium, and acid/alkaline waste streams; solvents; pollution control dust; and metal hydroxide sludge. A wastewater treatment plant operated from 1973 to 1981. Due to frequent malfunctioning and insufficient capacity, the system was replaced by the wastewater pretreatment plant that is currently operating. In 1998, a new, smaller manufacturing business began operating at the site. Currently, the site continues to be used for metal fabrication and finishing purposes.

The Engelhard facility is located on Route 152 (Taunton Street), approximately 0.5 mile northeast of the center of Plainville, Massachusetts. The site is bordered to the west and south by Turnpike Lake, a shallow man-made impoundment covering approximately 115 acres. The Town of Plainville operates three municipal wells located adjacent to the southwest corner of the lake, approximately 0.4 mile southwest (hydrologically upgradient) from the facility. The wells vary in depth from 30 to 52 feet bgs. Wetlands and residential properties border the site to the south and across Route 152 southeast of the site. Five vacant residential lots owned by Engelhard are located across Route 152 east of the site, and an abandoned drive-in theater owned by Engelhard is located northeast of the site. A nature conservancy (Natural Resources Trust of Plainville) is a forested and wetland area located north of the site. Turnpike Lake has two surface outlets, one from the embayment bordering the site to the south, and one approximately 0.13 miles to the north. Both outlets form small unnamed streams that flow to the low lying areas east of Route 152. Drainage from the low-lying area enters Lake Mirimichi, located approximately 0.9 miles northeast of the site.

INVESTIGATION HISTORY

In March 1986, EPA issued a RCRA 3007 letter to the facility requesting information about SWMUs and releases of hazardous constituents to the environment. The facility submitted a 3007 letter response in September 1986. Three phases of environmental investigations were conducted voluntarily by Engelhard beginning in October, 1987. The Phase I report details a preliminary study to assess possible impacts to soil, surface water, and ground water from past releases. The Phase II investigation was conducted during the summer of 1988 to further characterize conditions at the site, including soil and surface water sampling, installation and sampling of additional overburden and bedrock monitoring wells, and sampling and analysis of soil gas.

The Phase III field work was conducted in 1989. Investigations included installation of overburden and bedrock wells, sampling and analysis of soil, soil gas, groundwater, surface water, and fish, and aquifer testing and ground water modeling.

In addition, Engelhard surveyed existing private water wells in the vicinity of the site. Bedrock wells from the 94 homes identified in the survey were sampled and analyzed for volatile organic compounds (VOCs). In summary, only a very low level of one site contaminant was detected in one well. Engelhard also sampled indoor air in six homes located on Route 152 immediately east of the facility. Concentrations of 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, and other non site related VOCs were detected in the homes. Engelhard later purchased five of the homes and demolished them. Only the southern most home sampled, located at 31 Taunton Street, remains in use.

EPA prepared an RFA for the site in 1991 which included a review of state and local files, EPA Region I files, the 3007 letter response, and Visual Site Inspections which were conducted on May 26, 1988 and March 25, 1991.

In 1993, EPA and Engelhard signed a RCRA 3008(h) Consent Order requiring Engelhard to conduct an RFI and risk assessment, and implement the following four stabilization measures: 1) removal, treatment, and/or capping of contaminated soils at the south side (AOC B) of the facility; 2) reduction or elimination of roof drain runoff to Turnpike Lake; 3) installation of a ground water pump and treat system to significantly reduce the mass of contaminated ground water migrating from the facility; and 4) installation of a fence at Turnpike Lake to restrict access to the facility property by recreational users of the lake. To date, Engelhard has successfully completed three of the four Stabilization Measures. A chain link fence was constructed in 1995 which restricts access to the facility. In the mid to late 1990's, most of the buildings, including all buildings with roof drains which empty into Turnpike Lake, were demolished, eliminating the roof drain runoff into the lake. In 1997, a groundwater pump and treat system was installed and began operating. The system consists of a 540 foot long HDPE barrier wall installed into the top of bedrock (approximately 25 - 30 feet deep) and six groundwater extraction wells installed in bedrock. The treatment system includes an air stripper and carbon adsorption, and treated groundwater is discharged to Turnpike Lake.

In January 1997, Engelhard submitted a Conceptual Design for the stabilization of contaminated soils in AOC B. In July 2001, Engelhard submitted a Preliminary Design to EPA and Massachusetts Department of Public Health (MADPH), which oversees the radiological component of the site investigation and cleanup. EPA and MADPH recently commented on the Preliminary Design. Engelhard is currently preparing plans to stabilize AOC B soils.

In September 1999, Engelhard submitted the Draft Final RFI Report which discusses and evaluates the extensive groundwater, surface water, soil, soil gas, and fish sampling data collected during phases 1 and 2 of the RFI between 1995 and 1999. EPA issued comments on the Draft Final Report in February 2002, identifying problems with the human health and ecological risk assessment, gaps in understanding the transport and fate of contaminants in groundwater and the effect of the groundwater extraction system on contaminant flow. Engelhard is currently preparing a work plan to conduct additional groundwater, soil, sediment, and indoor air sampling investigations and will submit a revised RFI report.

In September 2001, Engelhard conducted air sampling inside two of the three remaining facility buildings and at outdoor background locations. The results were submitted to EPA in November 2001. Engelhard has indicated that additional indoor air sampling will be conducted in the future to better assess risks to workers from exposure to indoor air.

RADIONUCLIDES

The Facility was licensed to handle radioactive materials in the late 1950s and early 1960s by the AEC. Sampling and analysis of soils has detected radioactive contamination, which is subject to regulation by the Nuclear Regulatory Commission (NRC), and which has further been delegated to the MADPH. Mixed wastes (which are both hazardous and radioactive) located in AOCs B and 7 are subject to joint regulation by MADPH and EPA.

EPA and MADPH have been working together with Engelhard to coordinate efforts on the investigation and cleanup of hazardous and radiological contamination.

In 1993-1994, Engelhard submitted information to NRC detailing radiological investigations of the interior and exterior of the Engelhard facility. In October 1995, Engelhard submitted the report Site Characterization Program, Exterior of Plainville, MA Plant to NRC which provided the results of radiological contaminant investigation of the exterior of the facility. In June 1997, Engelhard submitted the Decommissioning Work Plan for Soils and Sediments to MADPH. In July 2001, Engelhard submitted a Preliminary Design for the AOC B cleanup to both MADPH and EPA. EPA and MADPH have recently issued comments on the Preliminary Design.

HYDROGEOLOGIC SETTING

The site geology includes 18 to 36 feet of glacial till overlying fractured bedrock. Depth to groundwater varies from approximately 13 feet on the west side of the facility to approximately 2 feet in the wetlands to the east of Route 152. Two lithologies were observed in bedrock borings: a dark shale and a feldspathic sandstone (graywacke), with interbedding of the two rock types. The dip of the fractures ranged from 45 degrees to nearly vertical. The bedrock surface slopes downward to the east toward the low-lying area, mimicking the surface topography. It is believed that the Mirimichi fault extends into this low lying area.

Groundwater flow direction is controlled by recharge from Turnpike Lake and discharge of shallow groundwater into the streams and low-lying area east of Route 152. Shallow groundwater flows in an easterly to northeasterly direction. Deeper groundwater may also be controlled by the north/south trending Mirimichi fault, and flows in a generally northeast to northerly direction. Beneath the facility there is a generally downward hydraulic gradient, and in the low-lying area to the east gradients are generally upward. Groundwater in bedrock may flow beneath the low-lying area, northeast toward Lake Mirimichi.

In March 1989, approximately 78 private wells were determined to be located to the northeast (downgradient) of the facility. The wells are believed to be less than 120 feet in depth and generally produce water from bedrock zones.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “contaminated”¹ above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	<u>_X_</u>	<u>___</u>	<u>___</u>	VOCs
Air (indoors) ²	<u>_X_</u>	<u>___</u>	<u>___</u>	VOCs
Surface Soil (e.g., <2 ft)	<u>_X_</u>	<u>___</u>	<u>___</u>	Metals, PCBs.
Surface Water	<u>_X_</u>	<u>___</u>	<u>___</u>	VOCs
Sediment	<u>_X_</u>	<u>___</u>	<u>___</u>	arsenic, cadmium, vinyl chloride, PCBs
Subsurf. Soil (e.g., >2 ft)	<u>_X_</u>	<u>___</u>	<u>___</u>	Metals, PCBs
Air (outdoors)	<u>___</u>	<u>_X_</u>	<u>___</u>	

- _____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.
- X If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.
- _____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Groundwater: The entire area is considered a potentially productive high yield aquifer by MADEP, although the facility and all nearby properties are serviced with municipal water. Groundwater in the bedrock, which is contained almost entirely in secondary fractures, such as joints and faults within the upper 200 feet of bedrock, is used as private residential water supplies in areas east and northeast of the facility. The depths of the private wells shown on attached figure 4.4.11 are not known, but are believed to be less than 120 feet in depth and generally produce water from bedrock zones.

The "appropriate levels" being used to compare groundwater quality for Question 2 are MCLs.

Several VOCs are present in overburden, shallow bedrock, and deep bedrock groundwater both on and off-site above MCLs, including 1,1,1-TCA, PCE, TCE, 1,1-DCA, and 1,1-DCE. Some scattered exceedences of MCLs for metals (antimony, cadmium, lead, chromium, and nickel) have also been detected but results are inconsistent between monitoring events.

EPA concludes that groundwater is contaminated with VOCs.

Indoor Air: The "appropriate levels" being used to compare indoor air concentrations for Question 2 are Region IX PRGs for ambient air, which are based on inhalation exposures to a residential population.

31 Taunton Street. Several rounds of groundwater samples have been collected from monitoring well pair MW30A and MW30B, which are located on the 31 Taunton Street property approximately 100 feet north of the residence. VOCs have not been detected in the shallow well MW30A. Although concentrations of TCE up to 250 ppb have been detected in the bedrock well MW30B, the relatively low levels of VOCs found in the bedrock well are at levels which are below the MADEP Method 1 GW-2 standards (the GW-2 standard for TCE is 500 ppb), which are protective of groundwater contamination volatilizing into indoor air. EPA concludes that based on the groundwater data from these wells, it is not likely that contamination in groundwater is volatilizing into indoor air at significant concentrations.

In March 1989, ENSR conducted indoor air sampling at six residential homes across Route 152 (east of the facility) at 31, 33, 35, 37, 39, and 41 Taunton Street (five of the six homes have since been purchased by Engelhard and demolished; only 31 Taunton Street is still privately owned and occupied). Test results indicated that concentrations of the site contaminants 1,1,1 TCA, PCE, and TCE were much lower in indoor air samples from 31 Taunton Street than the other five homes. This result was not surprising since 31 Taunton Street was the southern most home, and lies along the southern edge of the groundwater plume.

Follow up air sampling was conducted at the 31 Taunton Street residence in January 1993 and in April 2001. Results of the most recent sampling were that only relatively low levels of site related chlorinated

VOCs were detected. PCE was detected in indoor air samples at concentrations up to 1.29 ug/m³ (or less than half the Region IX PRG of 3.3 ug/m³). Methylene chloride was detected at a concentration of up to 1.77 ug/m³ (the Region IX PRG is 4.1 ug/m³). Therefore, EPA concludes that indoor air at 31 Taunton Street is not “contaminated”.

Existing Facility Buildings. Concentrations of VOCs in groundwater beneath the facility Building #8 exceed the MADEP MCP method 1 GW-2 levels for several contaminants (including TCE, PCE, and 1,1,1 TCA). Soil gas sampling conducted during the RFI indicated possible source areas beneath the Building #8 slab.

In September 2001, air sampling was conducted to determine whether VOCs in soil and groundwater were migrating into buildings 8 and 10 at the facility and to determine background concentrations in the nature conservancy north to northwest of the site. A total of seven eight-hour samples were collected inside the buildings and at the nature conservancy. The results are described in a letter report dated November 20, 2001. Air samples were analyzed for six target VOCs: 1,1,1 TCA, 1,1 DCA, 1,1 DCE, PCE, TCE, and vinyl chloride. As a result, five of the six compounds were detected in the buildings. Only vinyl chloride was not detected in any of the samples. The maximum estimated concentration of 1,1 DCE was 0.022 ppb in building 8 (the PRG for 1,1 DCE is 0.0094 ppb). The maximum detected concentration of PCE was 1.1 ppb in building 8 (the PRG for PCE is 0.479 ppb).

EPA concludes that indoor air in building 8 is contaminated with VOCs.

Surface Soil: The “appropriate levels” being used to compare surficial soil concentrations for Question 2 are Region IX PRGs for soils at industrial sites.

Metals. The 95% UCL for arsenic in surficial soils was calculated to be 3.87 ppm, above the PRG of 2.7 ppm, although the 95% UCL of background concentrations was calculated to be 4.45 ppm. Arsenic appears to be consistent with a background condition.

The highest concentrations of metals contamination in surficial soils is generally limited to cadmium (PRG is 810 ppm) in a significant portion of AOC B. Some of the soils, though not all, are covered by pavement.

PCBs. Concentrations of PCBs above the PRG of 1 ppm are found throughout a large portion of AOC B in both paved and unpaved areas and in an area of AOC 7.

VOCs. Although VOCs were detected, none were at levels above the PRGs.

EPA concludes that surficial soils in AOC B are contaminated with cadmium and PCBs, and surficial soils in AOC 7 are contaminated with PCBs above PRGs.

Surface Water: Surface water runoff across most of the facility discharges to Turnpike Lake, a shallow artificial lake approximately 115 acres in size with a mean depth of approximately 1.5 feet. At one time, most surface runoff from roof surfaces and AOC B entered the south embayment from drains and direct runoff. Engelhard has since demolished most of the buildings, and currently roof drain and parking lot runoff is to retention ponds. Surface runoff from the east and northeast portions of the site drains toward the low lying areas across Route 152. Under the State stream classification system, the unnamed streams are classified as Class B High Quality.

The “appropriate levels” being used for this question are Ambient Water Quality Criteria (AWQC) for human consumption of aquatic organisms. Surface water samples were analyzed for metals, PCBs, and VOCs. Some constituents analyzed had detection limits above the AWQC.

Metals. Metals were not detected above the AWQC for human consumption of organisms, although in some cases, detection limits were above the criteria.

VOCs. VOCs were detected above AWQC in the unnamed streams located downgradient of the facility. PCE was detected at a concentration of 2,000 ppb in one surface water sample (the AWQC for human health is 8.85 ppb).

PCBs. No PCBs were detected above detection limits.

EPA concludes that surface water is contaminated with VOCs.

Sediment: The “appropriate levels” being used to compare sediment concentrations for Question 2 are Region IX PRGs for soils at residential sites. Sediment samples were collected in several areas of Turnpike Lake and in the unnamed streams located downgradient from the facility.

Metals. Several metals were detected above background. Arsenic was detected at concentrations above background and above the PRG of 0.39 ppm. The maximum concentration of arsenic was 12.8 ppm detected in sample SD-02 from the unnamed stream. Cadmium was also detected at concentrations above the PRG of 37 ppm. The maximum concentration of cadmium was estimated at 260 ppm in SD-28, located in the south embayment. In most sediment samples, the detection limits for thallium were above the PRG of 5.2 ppm.

PCBs. Concentrations of 52 ppm of Aroclor 1242 and 44 ppm of Aroclor 1254 were detected above the PRG of 0.2 ppm in sample SD-1 from the south embayment.

VOCs. Although ppm levels of VOCs were detected in sediment samples, only vinyl chloride exceeded the PRG of 0.15 ppm in one sample (SD-02 contained vinyl chloride at a concentration of 0.34 ppm).

SVOCs. Only relatively low concentrations of SVOCs were detected.

EPA concludes that sediments at the site are contaminated with arsenic, cadmium, PCBs, and vinyl chloride.

Subsurface Soil: The “appropriate levels” being used to compare subsurface soil concentrations for Question 2 are Region IX PRGs for soils at industrial sites. Elevated concentrations of PCBs, metals and VOCs have been detected in subsurface soils in several AOCs.

Metals. Elevated concentrations of metals (primarily cadmium) were detected in subsurface soils within AOC B. In addition, the maximum concentration of arsenic was 6.2 ppm, above the PRG of 2.7 ppm.

VOCs. Although concentrations of VOCs in the ppm range were detected at several locations, the concentrations detected were below PRGs.

PCBs. The maximum detected concentration of Aroclor 1248 was 84 ppm. The maximum concentration of Aroclor 1254 was 160 ppm. Elevated concentrations of PCBs (above the PRG of 1 ppm) are found throughout much of AOC B and in an area of AOC 7.

EPA concludes that subsurface soils at the site are contaminated with metals and PCBs.

Footnotes:

¹ “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

² Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential Human Receptors (Under Current Conditions)

<u>“Contaminated” Media</u>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	N	N	N	Y	N	N	N
Air (indoors)	N	Y	N	Y	N	N	N
Soil (surface, e.g., <2 ft)	N	N	N	Y	N	N	N
Surface Water	N	N	N	N	N	Y	Y
Sediment	N	N	N	Y	N	Y	Y
Soil (subsurface e.g., >2 ft)	N	N	N	Y	N	N	N

Air (outdoors)

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors’ spaces for Media which are not “contaminated”) as identified in #2 above.
2. enter “yes” or “no” for potential “completeness” under each “Contaminated” Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“___”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from

each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Groundwater: Groundwater flow in the overburden is across the facility to the east and northeast where it discharges to the low lying area (and unnamed streams) east and northeast of the facility boundary. Groundwater in bedrock flows east to northeast across the facility toward the low lying area, where it then flows north in the general direction of the unnamed stream, which coincides with the bedrock low and Mirimichi fault (see the potentiometric groundwater surface map on attached figure 2.2.9 from the draft RFI). The RFI did not define the northern (downgradient) extent of groundwater contamination in bedrock. Engelhard has agreed that one or more additional wells will be installed to further delineate the northern extent of groundwater contamination as part of a third phase of the RFI.

The facility and surrounding properties are serviced by a municipal water supply, so it is reasonably expected that there is not a complete exposure pathway from contaminated groundwater to facility workers or nearby residents.

There are numerous private wells located to the east, northeast, and north of the site. In March 1989, Engelhard collected ground water samples from 94 private homes within one mile north and east of the site. Laboratory results indicated that one ground water sample from a private well located approximately 3,000 feet north of the facility boundary contained 1,1,1-TCA at a concentration of 6 ppb (the MCL for 1,1,1 TCA is 200 ppb). Based on the groundwater flow direction, this private well is not likely directly downgradient from contaminated groundwater at the facility. No other site related contaminants were detected in samples from the remaining 93 homes.

The nearest private wells are located approximately 0.4 miles north, and 0.5 miles east of the facility boundary (see private wells 80 and 88 to the north, and 43 and 53 to the east in attached figure 4.4.11 from the draft RFI). The private wells located approximately 0.5 mile east of the site are not reasonably expected to be impacted by groundwater contamination from the site because contaminated shallow groundwater discharges into the low lying area located between the private wells and the site, and deeper groundwater flows to the north in the vicinity of the low lying area.

The private wells near the southwestern shore of Lake Mirimichi, are located northeast of the site. There are also a few private wells north of the site, which may lie in the direction of deeper groundwater flow. However, these wells are located approximately 0.4 miles north of the furthest downgradient bedrock well (MW-20B) which exhibits concentrations of VOCs approximately 2 times their respective MCLs. The private wells and MW-20B are separated by an extensive swampy low lying area where contaminants in bedrock groundwater may be discharging.

Therefore, based on the relatively minor exceedance of MCLs in the furthest downgradient bedrock monitoring well and the relatively large wetland area between MW-20B and the nearest private wells, and the absence of contamination detected in private wells in 1989, EPA concludes that it is not reasonably expected that contaminated groundwater from the site is currently impacting private drinking water wells. However, Engelhard has agreed to install one or more additional monitoring wells to determine the northern extent of contaminated groundwater in bedrock during the next phase of investigation and will incorporate the results in a revised RFI.

There are three relatively shallow municipal wells located approximately 0.4 miles southwest of the site on the opposite side of Turnpike Lake. It is not reasonably expected that the municipal well field could be impacted by the site since it is hydraulically upgradient and is separated from the site by Turnpike Lake. In addition, there are plans for developing a new municipal well field adjacent to Lake Mirimichi, although it is not known if or when this will be developed.

Construction workers are the only potential receptors which could be reasonably expected to directly contact contaminated groundwater.

Indoor air: Currently, there are no private residences that are located above a shallow groundwater contaminant plume. As discussed in Question 2 above, EPA has concluded that the indoor air in 31 Taunton Street is not “contaminated”. Results of recent indoor air testing in facility buildings detected exceedences of the PRGs for 1,1 DCE and PCE. Therefore it is reasonably expected that on-site workers and construction workers in building 8 are the only people likely to be exposed to indoor air contamination.

Surface soil: It is not reasonably expected that trespassers and on-site workers are likely to be exposed to contaminated surface soils at the facility. A large portion of the site is paved or covered with buildings or former building foundation slabs. Surficial contamination in unpaved areas is limited to bare dirt areas at the south/southwest corner (AOC B) of the site. AOC B and AOC 7 (which is entirely paved or covered with former building slabs) are closed off from the street, Turnpike Lake, and the most of the facility by an 8 foot high chain link fence topped with barbed wire. “No Trespassing” signs are posted on the fence at 100 foot intervals. Therefore, trespassers are unlikely to have significant exposure to contaminated surface soils. According to the current tenant’s Facility Manager Don Chabot, current employees (with the exception of security personnel who have access to the entire site), work in the (opposite) northern end of the facility, and do not enter AOC 7 or AOC B because the door accessing AOC 7 is kept locked, and there is no reason for them to enter the area.

Therefore, only construction workers are likely to have a complete exposure pathway to contaminated surface soils.

Surface Water: There is a complete pathway between recreational users of the unnamed streams to contaminants found in surface water.

Sediment: There is a complete pathway between construction workers and recreational users of Turnpike lake, and recreational users of the unnamed streams, to contaminated sediments.

Subsurface soil: There is a complete pathway for construction workers to be exposed to contaminated subsurface soils at the site.

Fish: The “appropriate levels” being used to compare contaminants in fish samples for Question 2 are Region III Risk Based Concentrations (RBCs). The RBCs are based on a person eating 54 grams of fish per day, or about 2 fish meals per week. In phases I and II of the RFI, fish samples were collected from the south embayment of Turnpike Lake and from the private impoundment at 31 Taunton Street, and from a background location (Old Mill Pond). The highest PCB concentrations detected were for Aroclor 1254, which had a maximum concentration of 1200 ppb in an offal sample. Muscle samples from a total of 12 bottom feeders (bullhead) and game (large mouth bass, yellow perch, pickerel) species from the site were analyzed for metals, PCBs, and lipids in order to evaluate risks to humans from consuming fish.

Metals. Concentrations of metals were below RBCs.

PCBs. The highest PCB concentrations detected in muscle tissue were for Aroclor 1254, which had a maximum concentration of 530 ppb in a bottom feeder from the south embayment. The highest PCB concentration detected in a muscle tissue sample from the private impoundment was 160 ppb of Aroclor

1254. The maximum concentration of Aroclor 1254 detected in a muscle sample from a background bottom feeder was 14 ppb.

EPA concludes that fish are contaminated with PCBs, and that there is a complete pathway for people consuming fish caught in the south embayment and private impoundment.

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be “**significant**”⁴ (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?

If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

Rationale and Reference(s):

Groundwater: Construction workers could be expected to contact contaminated groundwater on-site. In the Draft RFI risk assessment, Engelhard used conservative assumptions to determine that PCE in groundwater could pose a risk to a future construction worker of 1×10^{-4} excess cancer risk, which is within the acceptable risk range of 10^{-4} to 10^{-6} . However, from the standpoint of current conditions, the risk assessment used very conservative assumptions in the calculation of risk. For example, the exposure scenario in the risk assessment assumed that a construction worker is exposed to the most highly contaminated groundwater found at the site for one hour each day for a total of 120 days. Actual exposures by construction workers are likely to be significantly less. Engelhard has no current plans for major construction projects at the site. Under current site conditions, it is unlikely that a construction worker would be exposed to groundwater for such an extended period. Groundwater beneath much of the facility is greater than 10 feet bgs. Also, because of the known chemical and radionuclide wastes on site, Engelhard would require that construction work would proceed under a health and safety plan incorporating appropriate PPE.

EPA concludes that current exposures by construction workers to groundwater are not reasonably expected to be significant.

Indoor air: On-site workers would be expected to be exposed to VOCs emanating from groundwater and subsurface soils into building 8. Air sampling was recently conducted to determine whether VOCs in soil

and groundwater were migrating into buildings 8 and 10 at the facility and to determine background concentrations in the nature conservancy (Natural Resources Trust of Plainville) north to northwest of the site. The maximum concentration of 1,1 DCE was estimated to be 0.022 ppb in building 8 (more than double the PRG for 1,1 DCE of 0.0094 ppb). The maximum detected concentration of PCE was 1.1 ppb in building 8 (more than double the PRG for PCE of 0.479 ppb). The PRGs are concentrations which are protective for residential exposures.

In order to determine “de minimis” concentrations for an industrial use scenario, Engelhard developed risk based concentrations (RBCs) and compared them to the 95% UCL of the indoor air samples. The RBCs were developed to represent the concentration that a contaminant could be present in indoor air and pose a de minimis risk (an excess cancer risk of one in a million and a hazard index of 1). EPA has not approved the RBCs developed by Engelhard as Media Protection Standards or cleanup standards. For purposes of this Environmental Indicator Evaluation, the RBCs can be considered protective of current workers in the buildings. EPA expects that Engelhard will perform additional indoor air sampling and submit the results in a revised RFI and Media Protection Standards proposal.

Results of the indoor air sampling were that four of the five chemicals detected had 95% UCLs below the calculated RBC. The 95% UCL for PCE slightly exceeded the RBC, but the actual concentration of only one of the four samples exceeded the RBC. In addition, 1,1 DCE was detected at a concentration in one sample which slightly exceeded the RBC.

EPA does not expect that significant exposures are occurring to current workers inside the facility. EPA expects that current risks to workers inside building 8 fall within the acceptable risk range of 10⁻⁴ to 10⁻⁶. The risks to construction workers would be significantly less than those to the on-site worker. However, EPA has identified several issues concerning interpretation of the indoor air sampling results. For example, the sampling was performed during September, although indoor air concentrations are generally higher during the winter months. Engelhard has agreed to conduct additional indoor air monitoring, including at least one event during the winter, and the results should be evaluated to determine whether any actions are necessary (e.g. protection of workers, re-assessment of this EI Determination).

Surface soil. For (future) construction workers (Engelhard did not calculate risks for current construction workers because there is no major construction planned for the site), Engelhard calculated a cancer risk in the draft RFI (for exposure to combined surface and subsurface soils) of 2×10^{-5} , and an HI of 29 due primarily to PCBs. However, from the standpoint of current conditions, the risk assessment used very conservative assumptions in the calculation of risk and were intended to represent upper bound estimates of potential exposure. For example the construction worker was assumed to be exposed to facility related constituents eight hours per day, five days per week, for six months. This scenario is considered very conservative under current conditions because there are no major construction plans for the site other than remediation of AOC B and AOC 7 which would be conducted with a Health and Safety Plan and utilize monitoring and PPE equipment.

Therefore, EPA does not reasonably expect that construction workers would have significant exposures to contaminated surface soils under current conditions.

Surface Water: Recreational users of the unnamed streams could be exposed to contaminants found in surface water. The Draft RFI risk assessment used conservative assumptions to calculate a risk for recreational users who are directly exposed to surface water in the unnamed streams and to groundwater seeps found in the area. The calculated risk from direct exposure to surface water is 3×10^{-6} . The calculated risk from direct exposure to seeps is 1×10^{-4} , with an HI of 2 for children. The risks were primarily due to PCE. The risk assessment used conservative assumptions that are not likely realistic

under current site conditions. For example, the recreational adult and child were assumed to be dermally exposed to surface water for 1 hour per day for 20 days per year.

The unnamed streams were observed by Bob Brackett of EPA on August 1, 2002. Based on this site visit and on general knowledge of the site, it is considered unlikely that the unnamed streams, under current conditions, would be attractive to people for swimming, wading, or fishing on a regular basis. The unnamed streams are located in a remote wooded area and are surrounded by an extensive swamp, and thus are not likely to be an attractive recreational area to either adults or children.

Therefore, EPA does not reasonably expect that recreational users would have significant exposures to contaminated surface water under current conditions.

Sediment: Recreational users could be exposed to contaminated sediments in Turnpike Lake and the unnamed streams downgradient from the facility. The Draft RFI risk assessment used conservative assumptions to calculate current risks from these pathways. The highest risk was for the recreational user of the south embayment of Turnpike Lake. Engelhard calculated the cancer risk from direct exposure to contaminated sediment of 6×10^{-5} , with a non-cancer HI of 4 for children, primarily due to PCBs in the sediments.

Turnpike Lake and the unnamed streams were observed by Bob Brackett of EPA on August 1, 2002. Based on this site visit and on general knowledge of the site, it is considered unlikely that Turnpike Lake and the unnamed streams, under current conditions, would be attractive to people for swimming, wading, or fishing where they would come into contact with sediment on a regular basis. Turnpike Lake is shallow and was choked with vegetation at the time of the site visit. Nobody was observed on or around the lake. The unnamed streams are located in a remote wooded area and are surrounded by an extensive swamp, and thus are not likely to be an attractive recreation area to either adults or children.

Therefore, EPA does not reasonably expect that recreational users would have significant exposures to contaminated sediments under current conditions.

Subsurface soil: Construction workers could be exposed to contaminated subsurface soils at the site. In the Draft RFI risk assessment, Engelhard used conservative assumptions to calculate risks to construction workers from the combined exposure to surface and subsurface soils. Engelhard calculated an excess cancer risk of 2×10^{-5} from PCBs and cadmium, and a non-cancer HI of 29 from PCBs and manganese. However, from the standpoint of current conditions, the risk assessment used very conservative assumptions in the calculation of risk and were intended to represent upper bound estimates of potential exposure. For example the construction worker was assumed to be exposed to facility related constituents eight hours per day, five days per week, for six months. This scenario is considered very conservative under current conditions because there are no major construction plans for the site other than remediation of AOC B and AOC 7 which would be conducted with a Health and Safety Plan and utilize monitoring and PPE equipment.

Therefore, EPA does not reasonably expect that construction workers would have significant exposures to contaminated subsurface soils under current conditions.

Fish: The highest PCB concentrations detected in muscle tissue (edible fillet) were for Aroclor 1254, which had a maximum concentration of 530 ppb in a bottom feeder from the south embayment, which is hydraulically downgradient from the rest of the Lake. The highest PCB concentration detected in a muscle tissue sample from the private impoundment was 160 ppb of Aroclor 1254. The Region III RBC is 1.6 ppb, which is based on a person eating 54 grams of fish per day, or about 2 fish meals per week.

In the draft RFI, Engelhard used more realistic assumptions to calculate the risks to adults and children from consuming fish caught from either Turnpike Lake or the private impoundment east of Taunton Street. The risk assessment assumed that an adult would ingest 6.7 grams of fish per day and a child would ingest 3.4 grams of fish per day, or approximately one meal per month. Engelhard calculated an excess cancer risk of 2×10^{-5} from eating fish from either the private impoundment or the south embayment. The estimated HI for adults was 1. For children, the HI was 2 for the private impoundment, and 3 for the south embayment of Turnpike Lake, primarily due to PCBs in fish tissue.

Turnpike Lake and the private impoundment were observed by Bob Brackett of EPA on August 1, 2002. Based on this site visit and on general knowledge of the site, it is considered unlikely that most of Turnpike Lake, under current conditions, would be an attractive location to people for fishing. Turnpike Lake is shallow (mean depth is 1.5 feet) and was choked with vegetation at the time of the site visit. Most of the lake is surrounded by thick vegetation, and nobody was observed on or around the lake at the time of the site visit.

However, it is known that people do fish at the northern portion of the Lake, on Shepard Street where the road bisects the Lake. This area is hydraulically upgradient of the south embayment because it is fed by streams from the north which are unaffected by the contamination in the south embayment, and drained by the two surface water outlets, one just north of the facility and the other in the south embayment (see figure 4,4,11). Although fish have not been sampled or analyzed from the Shepard Street area, surface water and sediments have been sampled and are not "contaminated". It is possible that fish caught in this hydraulically upgradient location are less contaminated than fish caught in the south embayment, although this should be verified through additional fish sampling.

Concentrations of PCBs in fish collected from the private impoundment located at the 31 Taunton Street were less than the south embayment of Turnpike Lake. On March 29, 2002, Bob Brackett of EPA met with the owners of 31 Taunton Street, Mike and Teri Caccipaglia, to discuss developments at the site. The owners indicated that they do not eat fish from the impoundment.

In conclusion, the site specific risk assessment indicates that the risk to a person eating one meal per month of fish caught from the south embayment would likely fall within the acceptable risk range of 10^{-4} to 10^{-6} excess cancer risk. The risk assessment also calculated a hazard index of 3 for a child eating one meal per month. However, EPA does not reasonably expect that this exposure route is significant for the following two reasons. First, the Massachusetts Department of Public Health has issued a statewide fish consumption advisory for pregnant women, women of child bearing age who may become pregnant, nursing mothers, and children under 12 to avoid eating fish from all freshwater bodies due to concerns about mercury contamination. Thus, it is likely that people catching fish at the Shepard Street location are not eating the fish. Second, the risk was calculated based on fish caught in the south embayment, where PCB contaminated sediments have been detected, and which are being planned for removal as part of the Stabilization Measure for AOC B. It is possible that fish caught at the opposite, hydraulically upgradient portion of the lake may have a lower PCB body burden. This possibility should be evaluated through additional fish sampling and analysis.

⁴ If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" exposures (identified in #4) be shown to be within acceptable limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying

why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

X YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Engelhard facility, EPA ID # MAD001190644, located at 30 Taunton Street (Route 152) in Plainville, MA under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

_____ NO - "Current Human Exposures" are NOT "Under Control."

_____ IN - More information is needed to make a determination.

Completed by (signature) Robert W. Brackett Date 9/5/02
(print) Robert W. Brackett
(title) RCRA Facility Manager

Supervisor (signature) Matthew R. Hoagland Date 9/10/02
(print) Matthew R. Hoagland
(title) Chief, RCRA Corrective Action Section
(EPA Region or State) EPA New England

REFERENCES. The references listed below are located in the EPA RCRA Records Center located on the first floor of 1 Congress Street, Boston.

Letter dated November 20, 2001 titled "Air Sampling Conducted at Engelhard Facility, Plainville, Ma.

Indoor Air Quality Sampling Report, Cacciapaglia Residence, 31 Taunton Street, Plainville, MA.

Media Protection Standards Proposal, dated September 30, 1999.

Draft RFI, Engelhard Corp. September 1999.

RCRA Facility Assessment. September 1991.

Site Characterization Program, Exterior of Plainville, MA Plant, Engelhard Corp. October 1995.

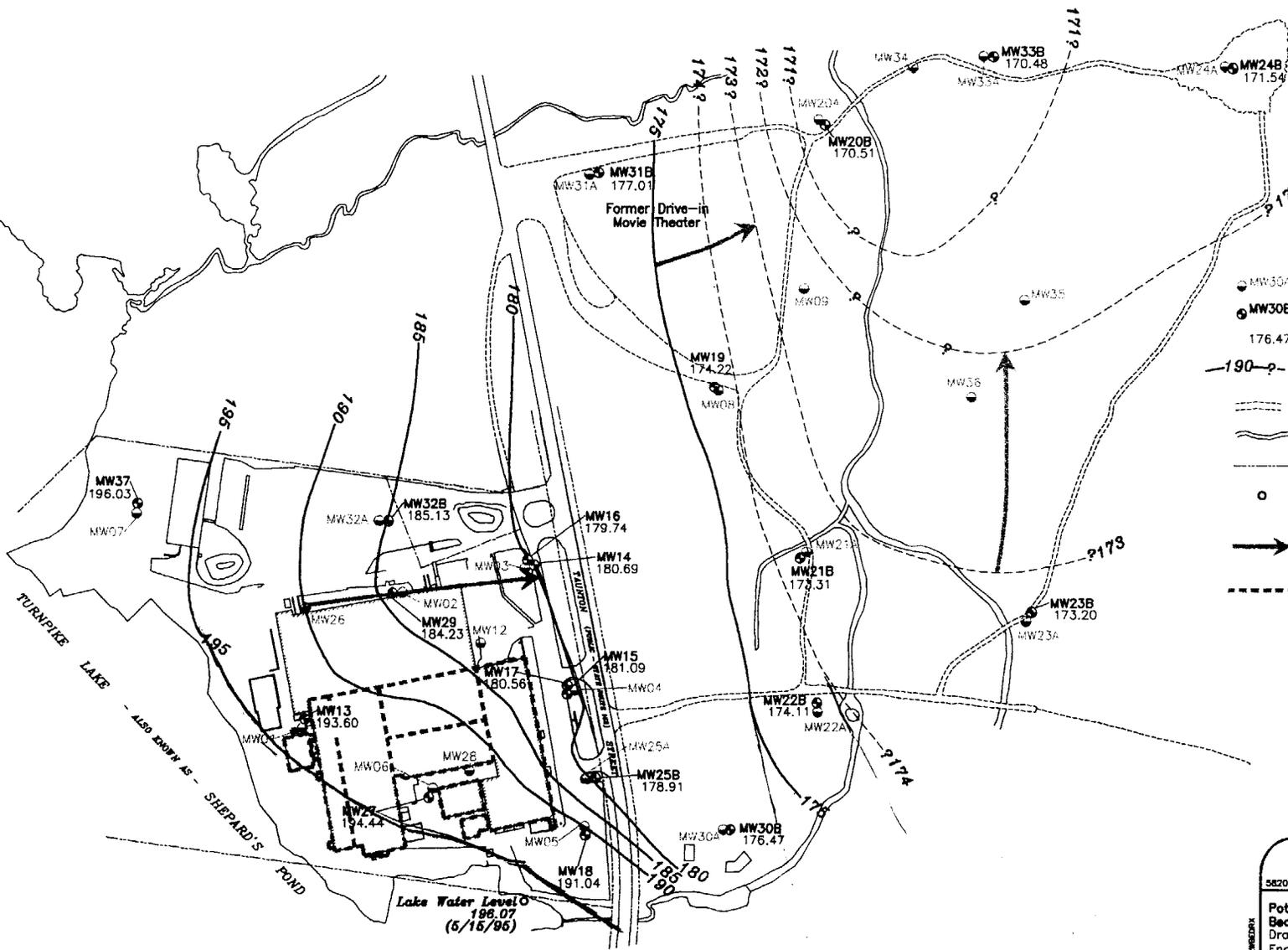
Decommissioning Work Plan For Soils And Sediments at the Engelhard Corp., Plainville, MA Facility. June 1997.

Preliminary Design Report For Soil Remediation Project. July 2001.

Contact telephone and e-mail numbers

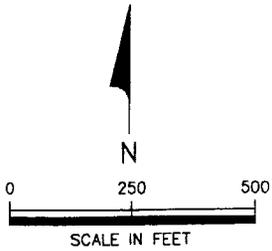
(name) Robert W. Brackett _____
(phone #) 617-918-1364 _____
(e-mail) brackett.bob@epa.gov _____

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.



EXPLANATION

- MW30A Overburden Monitoring Well
- MW30B Bedrock Monitoring Well
- 176.47 Ground Water Elevation in Feet MSL
- 190-p- Ground Water Elevation in Feet MSL, Queried where inferred.
- Unpaved Road
- ~~~ Creek
- - - Property Boundary
- Staff Gauge in Lake. Elevation in Feet MSL.
- Estimated Direction of Ground Water Flow
- - - - - Building Demolished

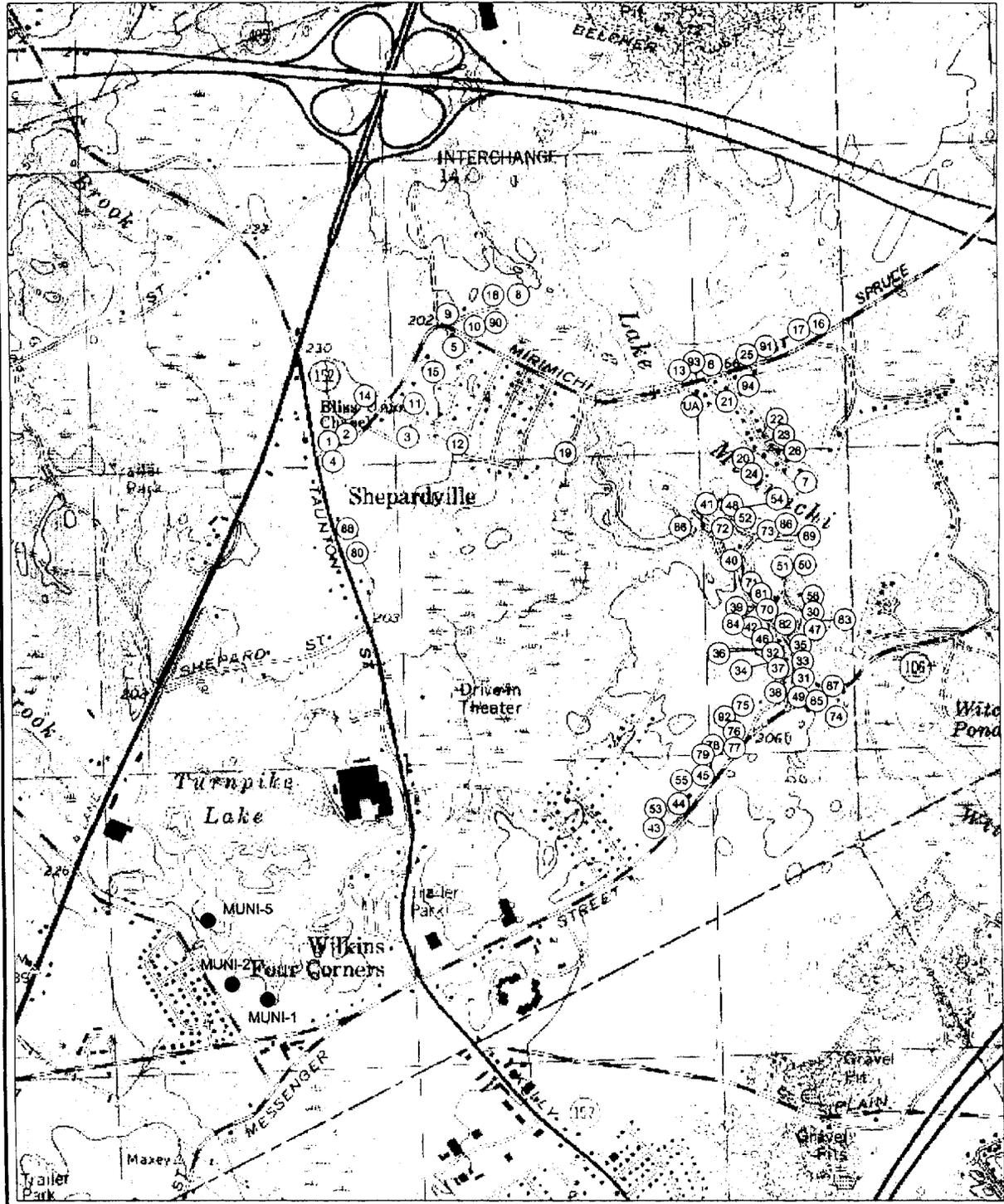


ENVIRON
 5820 Shelburne Street, Suite 700, Emeryville, California 94608

Potentiometric Surface Map of the
 Bedrock Zone, April 26, 1995
 Draft RCRA Facility Investigation Report
 Engelhard Corporation
 Plainville, Massachusetts

DATE 6/29/98	CONTRACT NUMBER 03-5077K	FIGURE 2.29
DRAWN RS	APPROVED	REVISIONS

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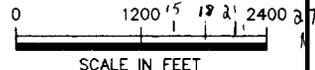
EXPLANATION

④ Private drinking water wells surveyed by state in March 1989. Refer to Table 4.3.2 for addresses. With the exception of the well marked UA, all wells number are assigned by the State.

● MUNI-5 Town of Plainville, MA municipal drinking water well. Refer to Table 4.3.3 for a description of well construction and pumping schedule.

Note: Locations noted are approximate.

Source: Private wells locations provided by State of Massachusetts Department of Environmental Protection. Municipal wells locations provided by the Town of Plainville, MA Department of Water and Sewer. Locations superimposed on USGS 7.5 minute series (Topographic) Wrentham Quadrangle, Massachusetts, Photorevised 1979.



ENVIRON

5820 Shellmound St., Suite 700, Emeryville, CA 94608

Location of Private and Municipal Wells Within a One-Mile Radius
 Draft RCRA Facility Investigation Report
 Engelhard Corporation
 Plainville, Massachusetts

Figure

4.4.11