

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action

Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Cytec Engineered Materials Inc.
Facility Address: 1300 Revolution Street, Havre de Grace, MD 21078
Facility EPA ID #: MDD 00 307 5942

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, 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?

 X 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 "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "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 "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

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).

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2. Is **groundwater** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

- If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.
- If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”
- If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

A volatile organic compound (VOC) contaminated plume, consisting of 1,2-dichloroethane (1,2-DCA), 1,1,2-trichloroethane (1,1,2-TCA), trichloroethene (TCE) and chloroform, extends offsite to the east/southeast towards the Chesapeake Bay. The main contaminant in groundwater is 1,2-DCA. Maximum concentrations of groundwater contaminants (listed in µg/l) from sampling performed in March 2003 are presented below:

	Maximum Concentration (µg/l)	Screening Criteria
1,2- DCA	15,000 (MW-3)	5
1,1,2-TCA	13 (MW-13D)	5
TCE	120 (MWBR-1)	5
Chloroform	2.7 (MWBR-1)	0.15
Vinyl Chloride	15 (MW-BR-4)	2

Note: Applicable screening criteria for groundwater at this site is either the EPA Maximum Contaminant Level (MCL) or the EPA Region 3 tapwater Risk Based Concentration (RBC).

[See the 2003 Annual Site Monitoring Report, Phase I and Phase II RFI Reports]

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 appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

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3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”² as defined by the monitoring locations designated at the time of this determination)?

- If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination”²).
- If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”²) - skip to #8 and enter “NO” status code, after providing an explanation.
- If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

During the groundwater investigation activities, Cytec installed groundwater monitoring wells both on and off-site in the shallow and deep portions of the aquifer, as well as in bedrock to determine the extent of the VOC-contaminated groundwater plume.

In April 2002, Cytec activated a groundwater extraction system in an effort to stabilize the plume that extends from the facility towards the east/southeast towards the Chesapeake. Groundwater is extracted from MW-10D, which is located in the most impacted area of the overburden aquifer and is screened within a high-permeability zone. The extracted groundwater is then pumped approximately 2,500 feet from Cytec’s property to the City of Havre de Grace Publicly Owned Treatment Works (POTW) for treatment through a dedicated, double-contained pipeline. The system is designed to operate at an average flow rate of 7.5 gallons per minute to the POTW.

The purpose of the groundwater extraction system is two-fold: (1) pump groundwater from the most impacted area to reduce mass loading of VOC contaminants to the downgradient groundwater and (2) gain hydraulic control of the main portion of the plume and stem migration of impacted groundwater off-site. Cytec has monitored various parameters during the first year of operation which suggest that the extraction system is performing as designed. Monitoring data also suggest that monitored natural attenuation processes are controlling the downgradient end of the plume through reductive dechlorination and oxidation.

Therefore, the groundwater extraction system, combined with natural attenuation, has stabilized the plume’s migration.

² “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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4. Does “contaminated” groundwater **discharge** into **surface water** bodies?

 X If yes - continue after identifying potentially affected surface water bodies.

 If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.

 If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

Groundwater flows generally eastward towards the Chesapeake Bay, which is located approximately ½ mile from the site. Monitoring wells installed near the area where groundwater is expected to discharge to the Chesapeake Bay show that the extent of the contaminated plume currently reaches the surface water body.

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5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

 X If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

 If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

 If unknown - enter “IN” status code in #8.

Rationale and Reference(s):

The only contaminant detected during the most recent sampling event (March 2003) in the groundwater monitoring wells located adjacent to the Chesapeake Bay was 1,2-Dichloroethane (1,2-DCA) at a concentration of 280 µg/l. The “appropriate groundwater level” to screen this value against is the Federal Water Quality Criteria (WQC) for 1,2-DCA - 99 µg/l for fish consumption only. Using a 10-fold dilution factor for the WQC, the applicable screening criteria would be 990 µg/l. The concentration of 1,2-DCA discharging from groundwater to surface water is less than the applicable screening criteria and is therefore “insignificant.”

Also, as discussed in Question #3, Cytex has been operating a groundwater extraction system since April 2002 to contain and treat the most impacted groundwater at the site. By minimizing or eliminating further mass loading of VOC contaminants to the downgradient area, the contaminant levels in groundwater that is discharging to surface water should decrease in the wells.

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR
2) providing or referencing an interim-assessment,⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter “IN” status code.

Rationale and Reference(s):

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

 X If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

 If no - enter “NO” status code in #8.

 If unknown - enter “IN” status code in #8.

Rationale and Reference(s):

Water level elevations are collected on a quarterly basis from site wells. Groundwater sampling will continue on a semi-annual basis using passive diffusion bag sampling techniques at all monitoring wells in the EPA-approved monitoring program. (MW-4, MW-6, MW-8S, MW-8D, MW-12S, MW-12D, MW-13S, MW-13D, MW-15, MW-18, MW-19D1, MW-19D2, MW-20D2, MW-21, MW-22S, and MW-22D) Natural attenuation parameters are collected on a bi-annual schedule from the four wells along the extraction system flowpath (MW-3, MW-14, MW-23, MW-20D1) and in background well MW-22D. The four bedrock monitoring wells are sampled annually.

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8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

- X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Cytec Engineered Materials Inc. facility, EPA ID # MDD 00 307 5942, located at 1300 Revolution Street, Havre de Grace, MD 21078. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.
- NO - Unacceptable migration of contaminated groundwater is observed or expected.
- IN - More information is needed to make a determination.

Completed by (signature) _____ /s/ _____ Date 9/16/03
 (print) Jennifer L. Shoemaker
 (title) Remedial Project Manager

Supervisor (signature) _____ /s/ _____ Date 9/16/03
 (print) Robert E. Greaves
 (title) Chief, General Operations Branch
 (EPA Region or State) EPA Region III

Locations where References may be found:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103

Contact telephone and e-mail numbers

(name) Jennifer L. Shoemaker
(phone #) (215)814-2772
(e-mail) shoemaker.jennifer@epa.gov