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:	Dana Corporation, Boston Weatherhead Division
Facility Address:	5278 U.S. 24 East, Antwerp, OH
Facility EPA ID #:	OHD 005 039 730

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).

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?

X 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.

References:

RCRA Facility Investigation Report (Volumes I & II). August 2005. RMT, Inc.
RCRA CA725 Environmental Indicator Determination. September 29, 2005. EPA.
2005 Annual Report on Quarterly Groundwater Sampling. April 24, 2006. RMT, Inc.
RCRA Corrective Measures Study. November 2006. RMT, Inc.
November 2006 Monthly Progress Report. December 8, 2006. RMT, Inc.

Rationale: A lacustrine clay unit extends from the surface to 10 to 15-feet below ground surface (bgs). The clay is heavily fractured down to approximately 12-feet bgs. The lacustrine unit is underlain by a dense clayey till to approximately 37-feet bgs. The upper few feet of clayey till is fractured. A sandy outwash is found at 37 to 45-feet bgs. It is underlain by limestone bedrock which is used as a water source for the Village of Antwerp and by private well owners. There is a strong downward vertical gradient from the surficial clay units to the outwash/bedrock. Monitoring wells screened solely within the clay till unit are typically dry, producing no water for sampling. The two zones monitored at the site are the upper fractured clay units (0 to15-feet bgs) and the outwash/bedrock units (37 to 50-feet bgs)

A groundwater contaminant plume is present in the southeast quadrant of the facility. The plume consists of TCE and its degradation products (DCE and vinyl chloride) and generally occurs in the surficial fractured lacustrine clay/clayey till units down to approximately 15-feet bgs. The plume extends downward at a few locations through the clay till and into the outwash and bedrock units. The areal extent in the deep aquifers is much less than that found in the fractured lacustrine clay/clay till units. In the bedrock unit, vinyl chloride is found in a small area at the former TCE Storage Area at the southern portion of the facility. Groundwater contaminants exceeding maximum contaminant levels (MCLs) for drinking water are predominantly cis-1,2-DCE, TCE, and vinyl chloride. Maximum concentrations of VOCs detected in the various units underlying the facility and their corresponding MCLs (exceedances in **bold**) are:

[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).

Groundwater Contaminant	Maximum Concentration (µg/l)	MCL (µg/l)
Lacustrine/Till Unit		
Benzene	**1,200**	5
1,1-dichloroethene	**437**	7
cis-1,2-dichloroethene	**370,000**	70
trans-1,2-dichloroethene	**1,720**	100
1,1,2-trichloroethane	**50**	5
Trichloroethene	**470,000**	5
Vinyl chloride	**14,500**	2

Groundwater Contaminant	Maximum Concentration (µg/l)	MCL (µg/l)
Outwash Unit		
Benzene	<1	5
1,1-dichloroethene	<1	7
cis-1,2-dichloroethene	12	70
trans-1,2-dichloroethene	<1	100
1,1,2-trichloroethane	<1	5
Trichloroethene	**29**	5
Vinyl chloride	1	2

Groundwater Contaminant	Maximum Concentration (µg/l)	MCL (µg/l)
Bedrock Unit		
Benzene	<1	5
1,1-dichloroethene	<1	7
cis-1,2-dichloroethene	**230**	70

trans-1,2-dichloroethene	5.2	100
1,1,2-trichloroethane	<1	5
Trichloroethene	1.5	5
Vinyl chloride	**300**	2

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)?

X 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.

References:

RCRA Facility Investigation Report (Volumes I & II). August 2005. RMT, Inc.
RCRA Corrective Measures Study. November 2006. RMT, Inc.
November 2006 Monthly Progress Report. December 8, 2006. RMT, Inc.

Rationale: The Dana plant has been shutdown since April 2003 and the use of TCE at the facility ended in 1989. TCE was historically spilled and/or leaked into the surface lacustrine clay unit where NAPL is likely present at some locations. The TCE was able to migrate downward through fractured clay to approximately 15-feet bgs. Investigations show that some TCE was able to penetrate deeper (down to 40-feet) at a few isolated monitoring well locations through the lacustrine/till unit into the underlying outwash unit and dolomite bedrock aquifer. The transport mechanism is believed to be manmade penetrations through the till, such as drag-down or migration along improperly installed well casings, that penetrated into the lower outwash and bedrock units. This mechanism is supported by plume data. Dana has proposed to abandon 14 wells screened in outwash and bedrock that continue to provide a possible pathway for VOCs to migrate downward from the lacustrine/clay till unit. In addition, the East Production Well provided a pathway for

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[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.

the vertical migration of VOCs (mainly vinyl chloride) from the lacustrine/till unit to bedrock. When the well was abandoned in 2004, groundwater was displaced allowing vinyl chloride to migrate approximately 100-feet to the south and slightly off-site.

MNA parameters, such as very low dissolved oxygen, a negative oxygen reduction potential ,low nitrate concentrations, high sulfate concentrations, the presence of ethene, and the presence of volatile fatty acids, provide evidence that TCE is breaking down through a reductive dechlorination process within the lacustrine unit. Similar conditions are present in bedrock along with naturally occurring asphaltic hydrocarbons that provide a source of carbon for microbial growth. Reductive dechlorination further retards the ability for TCE to migrate.

A groundwater monitoring program is in place that defines the extent of VOCs in groundwater within the lacustrine/till, outwash, and bedrock units. In the lacustrine/till unit, contamination is confined on-site in source areas of soil contamination (i.e., Former TCE Storage Area, Former Plating Area, Former Clarifier Area, Former Empty Drum Storage Area, and AOC A). Monitoring wells at the perimeter of these areas are consistently non-detect for VOCs or below MCLs. In outwash, only one monitoring well currently exceeds the MCL for TCE (5.3 µg/l concentration vs the MCL of 5µg/l) . In bedrock, there has been no appreciable offsite contaminant migration in the vicinity of the abandoned East Production Well. The existing well network is adequate to monitor any potential horizontal and vertical migration in the bedrock aquifer. Three downgradient bedrock monitoring wells (CA-MW-54D, CA-MW-55D, and CA-MW-56D) form the point of compliance just off-site and south of the facility boundary. Vinyl chloride concentrations currently range from <1 to 4.5 µg/l.

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

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

X 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.

References:

Maumee Cemetery Ditch Monitoring Well Installation Letter. Sept. 7, 2006. RMT, Inc.
Maumee Cemetery Ditch Monitoring Well Sampling e-mail. Dec. 7, 2006. RMT, Inc.

Rationale: An area of TCE-contaminated sediment was remediated in the off-site Cemetery Ditch in late-2005. Cemetery Ditch is the only surface water body in the area that has been impacted by the Dana facility. The source of contamination was thought to be from storm sewer discharge. Three monitoring wells were installed in the fractured lacustrine clay in the vicinity of this contaminated area of the ditch to confirm that a groundwater contaminant plume was not the source of contamination. The first round of sampling was performed on Oct. 3, 2006. One well was dry and the other two wells were non-detect for all VOCs. All three wells were dry during the second sampling round on Nov. 15, 2006. A third round of sampling was attempted on December 13, 2006, but all three wells remained dry.

Based on this data, contaminated groundwater does not appear to be discharging into Cemetery Ditch. The wells will continue to be monitored as part of the facility groundwater monitoring program.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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)?

____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] 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 concentration[3] 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 concentrations[3] 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):

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

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 implemented[4])?

____ 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):

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[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.

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.

References:

2005 Annual Report on Quarterly Groundwater Sampling. April 24, 2006. RMT, Inc.
Maumee Cemetery Ditch Monitoring Well Installation Letter. Sept. 7, 2006. RMT, Inc.
RCRA Corrective Measures Study. November 2006. RMT, Inc.
November 2006 Monthly Progress Report. December 8, 2006. RMT, Inc.

Rationale: A groundwater monitoring program is in place and a long-term groundwater monitoring program is proposed in the CMS. Currently, eighteen (18) monitoring wells screened in the fractured lacustrineclay/clay till units and twenty-four (24) monitoring wells screened in the outwash/bedrock units are sampled quarterly. A final groundwater monitoring program will be memorialized in the final remedy expected in summer 2007.

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 Dana Corporation facility , EPA ID # OHD 005 039 730, located at Antwerp, Ohio. 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) Kenneth S. Bardo Date 12/22/06
(print) Kenneth S. Bardo
(title) Environmental Scientist

Supervisor (signature) George Hamper Date 12-22-06
(print) George Hamper
(title) Section Chief
(EPA Region or State) Region 5

Locations where References may be found:

RCRA 7th Floor File room - Administrative Record for RCRA 3008(h) Consent Order.

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