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:	DuPont Potomac River Works
Facility Address:	447 DuPont Road, Martinsburg, WV 25401
Facility EPA ID #:	WVD 04 195 2714

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.

Rationale and Reference(s):

Groundwater was sampled from 45 wells. Groundwater was analyzed for various VOCs, SVOCs, metals, acrolein/acrylonitrile, cyanide, sulfide, TOC, TOX, explosives, nitrate nitrogen, and nitrite nitrogen. Complete analytical data tables are provided in the RA/RFI report (Tables 5.4 through 5.10D; Phase I RA/RFI Report). The analytical results for groundwater were compared to Federal MCLs or EPA Region III Tap Water Risk Based Concentrations (RBCs) for compounds with no MCL.

Nine different organics (VOCs, SVOCs, pesticides, and other) exceed screening criteria. All of the exceedences, with the exception of nitrate nitrogen and bis(2-ethylhexyl)phthalate, generally were isolated detections. Nitrate nitrogen was detected in 20 of 31 wells sampled and exceeded screening criteria in 13 of the 31 wells. Nitrate nitrogen is generally ubiquitous in groundwater, particularly in a rural setting as characterizes the site. However, the RFI data indicates that nitrate nitrogen may also be associated with SWMU 11, SWMU 16, SWMUs 21A, B, and C, and/or SWMU 46. Eight of the 13 wells that exceed screening criteria are located within the northeastern portion of the site near SWMU 11, downgradient of SWMUs 21A, B, and C. Four wells exceeding screening criteria are located in the northwestern portion of the site, down gradient of SWMUs 46 and 16. The remaining well exceeding screening criteria is located within the plant area and the area of SWMU 11.

Bis(2-ethylhexyl)phthalate was detected at levels above screening criteria in eight of 45 wells. Six of these eight wells are located downgradient of SWMUs 11, 21A, 21B and 21C. The other two wells are located downgradient of SWMUs 4 and 22A. Other organics exceeding screening concentrations include 1,2-DCA (WW-1 and W-21), RDX (W-25 and W-47), methylene chloride (W-21), and chloroform (W-45; Table 5.25, Phase I RA/RFI Report). The data suggest that such exceedences appear to be isolated and not indicative of widespread impact.

For many groundwater samples, analytical results showed differences in the measured metals concentrations between the two rounds of groundwater sampling indicating that turbidity may be influencing some of the analytical results and that these data may not be truly representative of groundwater quality. The data show that the majority of the metals with exceedences in both rounds of sampling are due to arsenic and lead (Table 5.25, Phase I RA/RFI Report). Shallow monitoring wells W-36 and W-40 and deep well W-20 showed exceedences of other metals, including selenium, copper, chromium, beryllium, and cadmium.

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).

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.

Rationale and Reference(s):

One area of nitrate nitrogen contamination in groundwater and the major area of bis(2-ethylhexyl)phthalate groundwater contamination overlap and are located in the region downgradient of SWMUs 21A, 21B, and 21C and upgradient of SWMU 11 (Figures 5.7 and 5.9A; Phase I RA/RFI Report). The source of the nitrate nitrogen and the bis(2-ethylhexyl)phthalate contaminated areas is thought to be SWMUs 21A, 21B, and 21C. The edges of the nitrate nitrogen and bis(2-ethylhexyl)phthalate contaminated areas are defined by surrounding uncontaminated monitoring wells. Data suggest that contaminated groundwater in the area between SWMUs 21A, 21B, 21C and 11 is expected to remain within this existing area of contamination. Monitoring wells located adjacent to and downgradient of this plume (W-1, W-2, W-3, W-5, W-6, W-8, W-23, W-42 and W-43) have consistently shown no nitrate nitrogen or show decreasing trends in the concentrations of nitrate nitrogen detected (W-10 and W-12). Two other wells located directly downgradient of the plume, W-24 and W-25, have detectable concentrations of nitrate nitrogen that have been consistent over time. In addition, the location of the source is known, the direction of groundwater flow is known (northeast towards the Potomac River) and is expected to remain constant over time, and the distance between the SWMUs and the plume discharge point into Potomac River is short (approximately 1700 feet). This information suggests that the nitrate nitrogen plume will remain stable for the foreseeable future.

The other area of bis(2-ethylhexyl)phthalate groundwater contamination is defined by two exceedences in shallow wells, W-14 and W-17, located near SWMUs 4, 22A, and 22C (Figure 5.7; Phase I RA/RFI Report).SWMUs, 4, 22A and/or 22C are thought to be the source of contamination in these two wells. The edges of this area of groundwater contamination are defined by surrounding uncontaminated monitoring wells. There are two additional, isolated exceedences of nitrate nitrogen at the site, W-36 and W-47, that are not thought to be indicative of contamination plumes. However, the highest concentration of nitrate nitrogen detected at the site, 109,000 µg/l, was measured in W-47. W-47 is located approximately 200 feet upgradient of the Potomac River and groundwater in this area discharges to the Potomac River. Nitrate nitrogen contamination in W-47 potentially could be coming from SWMUs 10 and/or 45 based on the interpreted direction of groundwater flow in this part of the site. Monitoring wells near W-47 are uncontaminated by nitrate nitrogen suggesting an isolated occurrence and not a contaminant plume.

[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.

Other organics exceeding screening concentrations in both sampling rounds include 1,2-DCA (W-1 and W-21), RDX (W-25 and W-47), and chloroform (W-45) (Figure 5.7; Phase I RA/RFI Report). These exceedences are isolated and do not appear to be indicative of groundwater contamination plumes. Metals exceedences in both sampling rounds include lead in six wells that are not located near each other, and single isolated exceedences of selenium, copper, chromium, beryllium, and cadmium. These metals exceedences do not appear to be indicative of a contamination plume due to their isolated occurrences.

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 in the site aquifer discharges to streams on-site. In areas of the site underlain by the Martinsburg Formation, there are small perennial and intermittent streams, which flow in well defined, continuous channels. Baseflow is supported by groundwater discharge via channel seeps and springs, and by overland flow or stormwater runoff following storm events. In addition, groundwater from the site discharges to the Potomac River. Therefore, streams on-site and the Potomac River could potentially be impacted by site-related constituents.

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)?

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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 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):

Analytical results for on-site stream samples provide data that can be used to evaluate the effects of nitrate nitrogen and bis(2-ethylhexyl)phthalate-impacted groundwater discharging to these streams. Nitrate nitrogen and bis(2-ethylhexyl)phthalate was not detected in any of the stream samples. These results indicate that current nitrate nitrogen and bis(2-ethylhexyl)phthalate-impacted groundwater discharging from the site aquifer to these streams appears to be insignificant.

Samples from only a single well at the site, W-47, had nitrate nitrogen concentrations in excess of the screening criteria (MCL using DAF of 10x). W-47 is located approximately 200 feet upgradient of the Potomac River. To further evaluate the significance of nitrate nitrogen-impacted groundwater discharging from the site aquifer to the river in the area of W-47, a simple mass loading/dilutional model was used. Details of the modeling results were presented in detail in Appendix H of the RFI (DuPont, 2002). Using the model and site and available data for the Potomac River, a dilution ratio of 5.4×10^5 is derived, indicating a potential Potomac River nitrate concentration of 0.02 µg/L. This concentration is orders of magnitude less that the nitrate nitrogen Federal Ambient Water Quality Criteria of 10,000 µg/L for human health for consumption of water and organisms. Based on the modeling work, nitrate nitrogen-impacted groundwater discharging from the site aquifer to this river appears to be insignificant.

Samples from two wells at the site, W-12 and W-17, had bis(2-ethylhexyl)phthalate concentrations in excess of the screening criteria of 60 µg/l (MCL using DAF of 10x). However, for each of these samples, only one round of sampling is greater than the screening criteria. Although these measured concentration of bis(2- ethylhexyl)phthalate are higher than the screening criteria they are deemed insignificant

[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):

[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.

Rationale and Reference(s):

DuPont will continue groundwater monitoring activities, including resampling all on-site wells, to further investigate if turbidity has effected metals results. Nitrate nitrogen in groundwater is already monitored quarterly or semi-annually at Potomac River Works as required by National Pollutant Discharge Elimination System (NPDES) permits WV0005509 and WV0077071. Two of the wells exceeding screening criteria for nitrate nitrogen, W-13 and W-26, are already included in the NPDES permit monitoring. If the other two wells that exceeded screening criteria for nitrate nitrogen, W-36 and W-47, still exceed criteria when the wells are resampled, DuPont will sample these two wells for nitrate nitrogen on an annual basis.

The groundwater monitoring plan to ensure conditions remain the same will be further refined after the well resampling event. This Environmental Indicator determination will be reevaluated if information gathered at a later date suggest conditions have changed at the site.

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 Dupont Potomac River Works facility, EPA ID # WVD 04 195 2714, located at 447 Dupont Road, Martinsburg, WV 25401. 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 9/29/03
(print) Jennifer L. Shoemaker
(title) Remedial Project Manager

Supervisor (signature) /s/ Date 9/29/03
(print) Robert E. Greaves
(title) Chief, RCRA General Operations Branch
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Locations where References may be found:

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