

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: [Invista Waynesboro Plant](#)
Facility Address: [Waynesboro, Virginia](#)
Facility EPA ID #: [VAD 00 3114832](#)

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?

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

If no - re-evaluate existing data, or

if data are not available, skip to #8 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:

To be consistent with the EI 725 determination for the Waynesboro Plant, the lowest of the USEPA’s Maximum Concentration Levels (MCLs), USEPA Region III Risk-based Screening Concentrations (RBCs) for tap water, and Virginia Groundwater Standards (VGS) were used as screening levels (SLs) to determine groundwater “contamination”. For metals, dissolved concentration data were used as the basis for evaluation because the dissolved-phase is the fraction of the contaminants migrating within the aquifer. Note that use of the drinking water values is a conservative measure since groundwater at the facility is not used for drinking.

Mercury is the primary constituent of interest in all groundwater at the site (see Section 15.0 of the *Phase I RA/RFI Data Summary Report*, DuPont, 2003). Although constituents other than mercury exceeded the screening levels, these constituents are not considered to represent a contamination plume because the detected constituents are localized to one or two wells near current or former operational areas or because the constituents appear to be naturally occurring. Only mercury is present as a definable plume at the site and is thus the only constituent retained for evaluation in this determination.

The hydrogeology of the site is characterized by three distinct zones: the Shallow Flow Zone, the Deep Water-table Zone and the Deep Flow Zone (see *Phase II RFI Data Summary Report*, DuPont 2005). The Shallow Flow Zone and Deep Water-table Zone are hydraulically connected and thus, are impacted by the same constituents. Constituents in the Shallow Flow Zone and Deep Water-Table Zone that were detected above the SLs are shown in Table 1 below:

Table 1. Constituents detected above screening levels in the Shallow Flow Zone and the Deep Water Table Zone.

Analyte	Limit	Max Concentration	Units	Criteria
MERCURY	0.05	9.8	ug/l	VGW
ARSENIC	0.045	213.0	ug/l	REG 3 RBC
CADMIUM	0.4	8.8	ug/l	VGW
ZINC	50	450.0	ug/l	VGW
BARIUM	1000	3,460.0	ug/l	VGW
ANTIMONY	6	25.5	ug/l	MCL
SELENIUM	10	19.9	ug/l	VGW
CHLOROFORM	0.15	20.00	ug/l	REG 3 RBC
BENZENE	0.34	12.50	ug/l	REG 3 RBC
ACETOPHENONE	610	2,500.00	ug/l	REG 3 RBC
4-METHYLPHENOL (P-CRESOL)	180	460.00	ug/l	REG 3 RBC
CHLOROBENZENE	100	170.00	ug/l	MCL
METHYL ETHYL KETONE	7000	7,400.00	ug/l	REG 3 RBC

VGW = Virginia GW Standards, Valley and Ridge Province, 2/2004
 REG 3 RBC = EPA Region III Risk-Based Concentrations for Tap Water, HQ=1, 4/2005
 MCL = Federal Maximum Contamination Levels, 10/10/01

The Deep Flow Zone is not believed to be hydraulically connected to the Shallow Flow Zone and Deep Water-Table Zone. Constituents detected in the Deep Flow Zone at concentrations above the SL's are shown in Table 2 below:

Table 2. Constituents detected above screening levels in the Deep Flow Zone.

Analyte	Limit	Max Concentration	Units	Criteria
ARSENIC	0.045	3.90	ug/l	REG 3 RBC
CADMIUM	0.4	10.30	ug/l	VGW
BARIUM	1000	1660.00	ug/l	VGW

VGW = Virginia GW Standards, Valley and Ridge Province, 2/2004
 REG 3 RBC = EPA Region III Risk-Based Concentrations for Tap Water, HQ=1, 4/2005
 MCL = Federal Maximum Contamination Levels, 10/10/01

References:

- DuPont, 2005: Phase II RFI Data Summary Report (in preparation).*
- DuPont 2003: Phase I RA/RFI Data Summary Report, DuPont Textiles and Interiors (DTI), Waynesboro Plant.*
- DuPont 2005: 2004 Annual Groundwater Monitoring Report, Invista Waynesboro Plant, Waynesboro, VA.*
- DuPont 2003: Environmental Indicator Determination Report Current Human Exposures Under Control (CA 725) for DTI Waynesboro Plant.*

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:

As reported in the *Phase I RA/RFI Data Summary Report*, dissolved mercury has impacted the Shallow Flow Zone at the site. This zone is not believed to be in hydraulic communication with the Deep Flow Zone, which is absent at most of the site with the exception of along the South River bank. As shown in the table above, the Deep Flow Zone is not impacted by dissolved mercury above the SLs.

Subsequent data collected during the Phase II RFI, as well as data obtained from the Routine Groundwater Monitoring program has confirmed that dissolved mercury is restricted to two distinct areas within the Shallow Flow Zone (see Figure 6 of the *2004 Annual Groundwater Monitoring Report*). These areas are in the vicinity of SWMU 4 (Incineration Area) and SWMU 1 (Mercury Recovery Area). To date, no exceedences of site-related constituents have been detected in groundwater at any of the site’s perimeter monitoring wells.

At SWMU 4, plume stability is monitored by downgradient Shallow Flow Zone wells R, MW-27, MW-18, MW-19 and MW-20. Any potential plume migration would be detected in these wells. As seen in Table 3 below, dissolved mercury has not been detected in the downgradient wells above the SL. While trends cannot be discerned from the 2000 data, recent data illustrate that while concentrations fluctuate slightly, they appear to be stable. Further, all concentrations in these wells are below the screening criteria of 50 NG/L (VGS).

Table 3. Dissolved mercury concentrations in SWMU 4 monitoring wells.

Well ID	Limit	Units	Aug-00	Oct-00	May-04	Nov-04	Apr-05
MW-18	50	NG/L	<48	<120	5.94	11.2	2.17
MW-19	50	NG/L	<48	<120	3.34	4.11	2.47
MW-20	50	NG/L	<48	<120	0.91	0.71	1.09
MW-27	50	NG/L	NS	NS	1.56	1	1.16
R	50	NG/L	<48	<120	0.77	0.68	0.80

At SWMU 1, the plume stability is monitored by downgradient Shallow Flow Zone and Deep Water-table Zone wells B, MW-4, MW-10A, MW-23D and MW-25D. As shown in Table 4 below, dissolved mercury concentrations have not been detected in these wells. Recent data illustrate that while concentrations fluctuate slightly, they appear to be stable. Further, dissolved mercury concentrations in these wells are all below the screening criteria of 50 NG/L (VGS).

Table 4. Dissolved mercury concentrations in SWMU 1 monitoring wells.

Well ID	Limit	Units	Aug-00	Oct-00	May-04	Nov-04	Apr-05
B	50	NG/L	NS	NS	5.45	2.8	1.82
MW-10A	50	NG/L	NS	NS	1.34	1.59	1.57
MW-23D	50	NG/L	NS	NS	1.41	1.57	0.99
MW-25D	50	NG/L	NS	NS	2.13	2.16	2.45
MW-4	50	NG/L	<48	<120	4.36	3.79	2.39

References:

DuPont, 2005: Phase II RFI Data Summary Report (in preparation).

DuPont 2003: Phase I RA/RFI Data Summary Report, DuPont Textiles and Interiors (DTI), Waynesboro Plant.

DuPont 2005: 2004 Annual Groundwater Monitoring Report, Invista Waynesboro Plant, Waynesboro, VA.

DuPont 2003: Environmental Indicator Determination Report Current Human Exposures Under Control (CA 725) for DTI Waynesboro Plant.

Footnotes:

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?

_____ 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.

Rationale:

Historically, the South River was impacted by mercury discharges from the former DuPont plant. These discharges were associated with plant sewers rather than groundwater discharges. Recent investigations have shown that the plant sewers are no longer a significant source of mercury to the South River (*Storm Water Monitoring Report, DuPont, 2003*).

As presented in the *Phase I RA/RFI Data Summary Report* (DuPont, 2003), the Shallow Flow Zone groundwater discharges to the South River and Rockfish Run. However, groundwater, which discharges to these surface water bodies does not contain mercury above the SLs. Data from the Phase I and Phase II RFI field investigations as well as the data from the routine groundwater monitoring program has shown that impacted groundwater is stabilized in the vicinity of SWMU 1 and SWMU 4 and does not migrate to the groundwater-surface water interface.

Site perimeter monitoring wells located along the banks of the South River and Rockfish Run monitor the quality of water discharging to surface water. The perimeter well data shown in Table 5 below demonstrate that the groundwater discharging to surface water is below the SL’s:

Table 5. Dissolved mercury concentrations in monitoring wells adjacent to the South River and Rockfish Run.

Well ID	Limit	Units	Aug-00	Oct-00	May-04	Nov-04	Apr-05
F	50	NG/L	<48	<120	4.94	3.43	3.09
H	50	NG/L	<48	<120	3.5	0.6	2.47
H'	50	NG/L	<48	<120	0.21 J	--	0.57
MW-15	50	NG/L	<48	<120	0.46	--	0.38
MW-16	50	NG/L	<48	<120	0.34 J	1.08	0.46
MW-18	50	NG/L	<48	<120	5.94	11.2	2.17
MW-19	50	NG/L	<48	<120	3.34	4.11	2.47
MW-20	50	NG/L	<48	<120	0.91	0.71	1.09

References:

DuPont, 2005: Phase II RFI Data Summary Report (in preparation).

DuPont 2005: 2004 Annual Groundwater Monitoring Report, Invista Waynesboro Plant, Waynesboro, VA.

DuPont 2003: Storm Water Monitoring Report, Invista Waynesboro Plant, Waynesboro, VA.

DuPont 2003: Phase I RA/RFI Data Summary Report, DuPont Textiles and Interiors (DTI), Waynesboro Plant.

DuPont 2003: Environmental Indicator Determination Report Current Human Exposures Under Control (CA 725) for DTI Waynesboro Plant.

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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)?

_____ 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):

Footnotes:

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):

Footnotes:

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?”

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:

In July of 2004, DuPont submitted the *RCRA Routine Groundwater Monitoring Plan* for the Waynesboro Invista Facility, which was subsequently approved by EPA. The objective of the groundwater sampling program is to monitor the site’s groundwater quality on an on-going basis. Periodic sampling of monitoring wells at the site perimeter for mercury will enable confirmation of the Phase I RFI groundwater sampling results and routine verification that the quality of groundwater leaving the site remains consistent with time. Periodic sampling of wells located close to known source areas of mercury to groundwater will provide confirmation that groundwater quality in these areas remains stable with time.

Thirty-eight (38) groundwater monitoring wells are included in the semi-annual monitoring program. Specific well designations and locations are described in detail in the *RCRA Routine Groundwater Monitoring Plan*. Monitoring wells included in the groundwater sampling program were chosen or installed based on the Phase I RFI conclusions or are located near the two known source areas of mercury to groundwater, SWMU 1 - Mercury Recovery and SWMU 4 - Incineration Area. Wells included in the groundwater monitoring program are located as follows:

- Eleven (11) wells on the site's down-gradient boundary along the South River
- Eighteen (18) wells in the eastern portion of the site to monitor groundwater with regard to SWMU 1 - Mercury Recovery
- Six (6) wells within or down-gradient of SWMU 4 - Incineration Area
- Three (3) interior wells

References:

DuPont, 2005: 2004 Annual Groundwater Monitoring Report, Invista Waynesboro Plant, Waynesboro, VA.

DuPont, 2004: RCRA Routine Groundwater Monitoring Plan, Invista Waynesboro Plant, Waynesboro, VA

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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).

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 [Invista Waynesboro Plant, EPA ID # VAD.003114832, located at 400 DuPont Boulevard, Waynesboro, VA 22980](#). 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 9/19/05
(print) Michael Jacobi
(title) EPA Project Manager

Supervisor (signature) _____ /s/ Date 9/19/05
(print) Robert Greaves
(title) Branch Chief
(EPA Region or State) Region III

Locations where References may be found:

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