**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:** | 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 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?

   **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 "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).

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)?

| | Yes | No | ? | Rationale / Key Contaminants |
|---|---|---|---|---|
| Groundwater | X | | | Primary constituents are nitrate nitrogen, bis(2-ethylhexyl)phthalate, arsenic & lead. See below. |
| Air (indoors)[2] | | X | | See below. |
| Surface Soil (e.g., <2 ft) | | X | | See below. |
| Surface Water | X | | | 2,5-dinitrotoluene and cadmium. See below. |
| Sediment | X | | | See below. |
| Subsurf. Soil (e.g., >2 ft) | | X | | See below. |
| Air (outdoors) | | X | | See below. |

___ 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:** 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). The analytical results for groundwater were compared to Federal MCLs or EPA Region III Tap Water 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, down gradient 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, 2002; Phase I RA/RFI). The data reveal 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. (For more information, please see Section 4.3 of the PRW CA-725 Report)

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). 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.

**Air (Indoor):** There are no occupied buildings located near areas of groundwater contamination and therefore no indoor air has been sampled at Potomac River Works. However, several VOCs and SVOCs were detected in groundwater (Table 5.4A and 5.4B; Phase I RA/RFI). These constituents are listed in Table 1 of EPA's *Draft Guidance For Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils, November 200*2. Therefore, screening levels for these constituents were developed using the methodology from the subsurface vapor guidance (Appendix D) and OSHA PELs, as well the American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit values (TLVs), using the calculations described in Appendix D of the draft guidance (USEPA, 2002). The maximum concentrations of each VOC and SVOC detected in groundwater were compared to the calculated screening levels. None of the detected concentrations exceeded their respective screening concentration. Therefore, vapor intrusion of VOCs and SVOCs from groundwater to indoor air is not expected to be a potential concern. (For more information, please see Section 4.5 of the PRW CA-725 Report)

**Surface Soils:** Surface soils were taken near eight SWMU areas (4, 10, 11, 16, 22B and 23, 24, 25,and 44) and AOC A. Soils were analyzed for volatile organic constituents (VOCs), semi-volatile organic constituents (SVOCs), metals, cyanide, sulfide, dioxins and furans, pesticides and explosive constituents. Complete analytical data tables for soil are provided in the RA/RFI report (Tables 5.15A through 5.22D; Phase I RA/RFI). None of the surface soils analyzed had concentration of organic compounds (volatile and semi-volatile), pesticides or explosive constituents that exceeded the EPA Region III Soil Industrial RBCs. Arsenic was the primary metal that exceeded RBCs. However, all arsenic concentrations measured are lower than the 95% upper tolerance limits (UTL) calculated for each metal from site-specific background soil. Dioxin and furan results were converted to toxicity equivalencies (TEQs) using toxicity factors (Tables 5.14A, 5.14B, and 5.15F; Phase I RA/RFI). The TEQs were then summed and the total compared to values described in OSWER 9200.4-26 *Approach for Addressing Dioxins in Soils* (USEPA, 1998). None of the results for dioxin and furan exceeded the screening criteria. In summary, since no constituents in surface soils were identified as a potential concern, surface soil was not considered to be a "contaminated media" for the EI. (For more information, please see Section 4.1 of the PRW CA-725 Report)

**Surface Water**: Six surface-water samples were collected from on-site streams near SWMUs and were analyzed for VOCs, SVOCs, metals, cyanide, sulfide, acrolein, acrylonitrile, TOC, TOX, TSS, and hardness. Samples collected from Stream 5 and Stream 9 were also analyzed for nitrate nitrogen, nitrite nitrogen, and explosives. Complete analytical data tables are provided in the RA/RFI report (Tables 5.24A through 5.24E; Phase I RA/RFI). On-site stream surface-water results were compared to West Virginia Human Health 46CSR1, Federal Water Quality, Region III RBC Tap Water, and Federal MCLs. A single exceedence of dinitrotoluene in Stream SS (located near the active manufacturing area) and a single exceedence of cadmium in Stream 5 (located in the floodplain near the Potomac River) were identified. Surface water from the Potomac River, which lies adjacent to the site, was not sampled. (For more information, please see Section 4.4 of the PRW CA-725 Report)

**Sediment**: Seven streambed samples and one duplicate were collected from on-site streams near SWMUs and were analyzed for VOCs, SVOCs, metals, cyanide and sulfide. Complete analytical data tables are provided in the RA/RFI report (Tables 5.23A through 5.23E; Phase I RA/RFI). Benzo(a)pyrene and dibenzo(a,h)anthracene were detected slightly above screening criteria in Ditch 1. Arsenic was detected in all sediment samples at levels exceeding the screening criteria. However, the concentrations observed were lower than the 95% UTL.

**Subsurface Soils:** Subsurface soils were taken from near SWMU 44 and AOC A. Soils were analyzed for VOCs, SVOCs, metals cyanide, sulfide, dioxins and furans, pesticides and explosive constituents. Complete analytical data tables for soil are provided in the RA/RFI report (Tables 5.15A through 5.22D; Phase I RA/RFI). None of the subsurface soils have VOCs, SVOCs, pesticides or explosive constituents that exceeded the EPA Region III Soil Industrial RBCs. Arsenic was the primary metal that exceeded RBCs. However, all arsenic concentrations measured are lower than the 95% UTL. Dioxin and furan results were converted to TEQs and were then summed and the total compared to values described in OSWER 9200.4-26 *Approach for Addressing Dioxins in Soils* (USEPA, 1998). None of the results for dioxin and furan exceeded the screening criteria. In summary, since no constituents in subsurface soils were identified as a potential concern, subsurface soil was not considered to be a "contaminated media" for the EI. (For more information, please see Section 4.2 of the PRW CA-725 Report)

**Air (Outdoor)**:. Outdoor air sampling has not been performed at the Potomac River Works facility. However, this pathway is not considered to be a significant exposure pathway because surface and subsurface soils are not a media of concern. In addition, because no significant concentrations of contaminants are anticipated at the facility in indoor air, it is highly unlikely that with the greater dispersive characteristic of outdoor air, outdoor concentrations could result in potential human exposure. Further, there has been no evidence of the potential for human exposure to contaminants in outdoor air or reasonable likelihood for this medium to represent a significant exposure pathway.

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)

| **"Contaminated" Media** | Residents | Workers | Day-Care | Construction | Trespassers | Recreation | Food[3] |
|---|---|---|---|---|---|---|---|
| Groundwater | No | Yes | No | Yes | No | No | No |
| ~~Air (indoors)~~ | | | | | | | |
| ~~Soil (surface, e.g., <2 ft)~~ | | | | | | | |
| Surface Water | No | Yes | No | Yes | Yes | Yes | Yes |
| Sediment | No | Yes | No | Yes | No | No | No |
| ~~Soil (subsurface e.g., >2 ft)~~ | | | | | | | |
| ~~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).

**X** 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):

**Potential Human Receptors:**

**Workers:** The Potomac River Works facility is an active industrial facility, and this use will continue into the future. Workers who sample groundwater, surface water or sediments have the potential to be directly exposed to impacted groundwater in the site aquifer or with impacted surface water or sediments located near the current manufacturing facilities.

**Day-Care Facilities:** There are no day-care facilities located at the Potomac River Works or within one mile of the facility. Therefore, day-care workers and users are not currently considered to be potential receptors and this scenario is not considered further.

**Construction workers:** Construction workers on-site could potentially be exposed to impacted groundwater in the site aquifer, particularly in areas of the site underlain by shale because depth to water is shallow in areas where residium overlies shale. Construction workers could also potentially be exposed to impacted surface water or sediments.

**Trespassers:** The Potomac River Works site is fenced along all property boundaries except along the riverbank. Steep slopes and heavy vegetation prevent trespasser access to the site along the riverbank where the central limestone belt and the western shale belt meet the river. Heavy vegetation also restricts access in the upland areas of the site and exposure to impacted surface water or sediments near the manufacturing area. However, trespasser access to the site along the floodplain riverbank is possible. Therefore, exposure to impacted surface water near the riverbank is possible.

**Recreation**: The Potomac River is used for recreation, including sport fishing and water skiing. Impacted groundwater from the site aquifer discharges to the Potomac River. Therefore, recreational users of the Potomac River are considered to be potential receptors.

**Food:** The potential indirect human health exposure pathway via ingested plants or animals is not possible because there are no agricultural crops grown on-site and there is no hunting on the Potomac River Works property. However, sport fishing is conducted in the Potomac River, therefore, consumers of fish as potential receptors is possible.

**Potential Exposure Pathways by Medi**a:
**Groundwate**r: Groundwater from the site is not used as a potable water resource. Direct exposure to impacted groundwater in the site aquifer via dermal contact or inhalation are potentially complete exposure pathways for workers and construction workers. The workers who might have direct contact with groundwater are those individuals that sample the wells or construction workers, if excavation activities were to be conducted to depths great enough to reach groundwater. However, personal protective equipment is worn by groundwater samplers to avoid direct contact with groundwater and proactive measures such as a Health and Safety Plan (HASP) and site health and safety practices are followed by workers and construction workers. These controls greatly reduce the possibility of direct dermal or inhalation exposure to impacted groundwater.

Trespassers are not expected to have direct dermal contact with groundwater (at depth). In addition, recreational users of the Potomac River are not likely to have direct dermal contact with groundwater in the aquifer.

**Surface Water:** Surface water from the site is not used as a potable water resource. Direct exposure via dermal contact or inhalation to impacted surface water at the site is a potentially complete exposure pathway for workers and construction workers. However, personal protective equipment is worn by groundwater samplers to avoid direct contact with groundwater and proactive measures such as a HASP and site health and safety practices are followed by workers and construction workers. These controls greatly reduce the possibility of direct dermal exposure to impacted groundwater.

Trespasser contact with impacted surface water in streams located near the manufacturing area is unlikely due to the large distance between the floodplain where trespassers might access the site and the manufacturing area. Contact with impacted surface water near the riverbank is possible.

Recreational users are likely come in contact with Potomac River water. Because nitrate nitrogen-impacted groundwater discharges from the site aquifer to the river, this exposure pathway is potentially complete for recreational users. Because fish from the Potomac River are consumed, food as a potential exposure pathway is also possible.

**Sediments:** Direct exposure to impacted sediments at the site is a potentially complete exposure pathway for workers and construction workers. However, personal protective equipment is worn by samplers to avoid direct contact with sediment and proactive measures such as a HASP and site health and safety practices are followed by workers and construction workers. These controls greatly reduce the possibility of exposure to impacted sediments.

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)?

**X** 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 Exposure Pathways:** Direct exposure to impacted groundwater in the site aquifer via dermal contact or inhalation is a potentially complete exposure pathway for workers or construction workers. However, the exposure point concentration for all constituents exceeding screening criteria depends on location. Frequency and duration of dermal contact are low because sampling is currently done on a quarterly basis. In addition, controls are in place (HASPs, monitoring equipment, and personal protection equipment, etc.) that greatly reduce the potential for dermal contact during sampling activities. Therefore, this potential exposure pathway to workers is not considered to be significant. For construction workers, exposure point concentration may be higher or lower depending on location as described above. Again, because frequency and duration of contact would also be low and due to the controls in place, the exposure pathway for construction workers is not considered to be significant.

**Surface Water Exposure Pathways:** Direct exposure via dermal contact or inhalation of impacted surface water near the current manufacturing area is also a potentially complete exposure pathway for workers and construction workers. Trespassers exposure to impacted surface waters in this area of the site are not expected given the great distance between the trespassers access point to the site, along the flood plain, and the manufacturing area. In addition, the heavy vegetation restricts access to the manufacturing area of the site. For workers and construction workers, the exposure point concentration for dinitrotoluene is 10 µg/L, orders of magnitude higher than the screening level of 0.098 µg/L. However, frequency and duration of dermal contact or inhalation are expected to be low for workers and construction workers because of controls in place that limit exposure. In addition, because surface water is not consumed, the potential for exposure is reduced further. Therefore, the surface water exposure pathway near the manufacturing area is also not considered to be significant for workers and construction workers.

[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.

The exposure point concentration for workers, construction workers and trespassers from impacted surface waters near the riverbank for cadmium is 6.7 µg/L, just slightly above the screening level of 5 µg/L. Frequency and duration of dermal contact or inhalation are expected to be low for workers and construction workers because of controls in place that limit exposure. Frequency and duration for trespassers is also expected to be low. Therefore, the surface water exposure pathway near the riverbank is also not considered to be significant for workers, construction workers and trespassers. For recreational users of the Potomac River and fish in the Potomac River, the impacted groundwater discharging to the river exposure pathway is not considered to be significant because of the very large dilution ratio, $5.4 \times 10^{5}$ , determined for the Potomac River (Appendix H; Phase I RA/RFI).

**Sediment Exposure Pathways:** Direct exposure to impacted sediment near the current manufacturing area is also a potentially complete exposure pathway for workers and construction workers. For workers and construction workers, the exposure point concentrations for benzo(a)pyrene and dibenzo(a,h)anthracene (0.47 mg/kg and 0.1J mg/kg, respectively, are just slightly higher than the screening concentrations. In addition, the frequency and duration of potential exposure are expected to be low for workers and construction workers because of controls in place that limit exposure. Therefore, the sediment exposure pathway near the manufacturing area is also not considered to be significant for workers and construction workers.

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 DuPont Potomac River Works facility, EPA ID # WVD041952714, located at 447 DuPont Road, Martinsburg, WV 25401 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) /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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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.