DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 09/24/01

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: **E.I. du Pont de Nemours and Company**
Facility Address: **801 35th Street, Fort Madison, Iowa**
Facility EPA ID #: **IAD005272398**

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.

The following Solid Waste Management Units (SWMU) for the E.I. du Pont de Nemours and Company (DuPont) facility in Fort Madison, Iowa were identified in the facility's Corrective Action Stabilization Questionnaire (DuPont 1992a), Summary of SWMU Management Strategy (DuPont 1992b), and modified Operating Permit (DuPont 1996).

SWMU 1	Landfill Burning Ground
SWMU 2	Settling Pond (Surface Impoundment No. 1)
SWMU 3	Surface Impoundment No. 2
SWMU 4	Surface Impoundment No. 3
SWMU 5	60 Pad Waste Pile
SWMU 6	Settling Pond Sludge Staging Area
SWMU 7	Sawdust Mixer
SWMU 8	Waste Water Treatment Unit
SWMU 9	Steam Distillation Unit
SWMU 10	Paint Sludge Disposal Area
SWMU 11	Building 38 Expansion Area
SWMU 12	West Construction Debris Pile
SWMU 13	Soil and Concrete Debris Pile #1
SWMU 14	Soil and Concrete Debris Pile #2
SWMU 15	Old Spent Solvent Tank
SWMU 16	Trailer #1
SWMU 17	Trailer #2

SWMU 18	Trailer #3
SWMU 19	Container Storage Pad (West Fence)
SWMU 20	Building 58 Container Storage Area
SWMU 21	Building 20 Container Storage Area
SWMU 22	Building 58 Sludge Tank
SWMU 23	Building 58 Paint Tank
SWMU 24	Scrap Metal Staging Area
SWMU 25	Scrap Metal Accumulation Area
SWMU 26	Trailer #4
SWMU 27	Old Sludge Tank
SWMU 28	Building 53 Container Storage Area

Section V.A.2. of the modified Operating Permit for DuPont requires the facility to "conduct further investigations and take corrective action as deemed appropriate by EPA (U.S. Environmental Protection Agency) on the releases or potential releases" at 15 of the SWMUs listed above (DuPont 1996). The 15 SWMUs are described in detail below, as are three Areas of Concern (AOC) and one additional SWMU (SWMU 29 - Debris Pit) identified in phased Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFI) at DuPont (Corporate Remediation Group [CRG] 1997, 2000, 2001). Attachment 1 indicates the location of each SWMU or AOC.

SWMU 1- Landfill Burning Ground: SWMU 1 is a former landfill burning ground located on the northwest edge of the facility. SWMU 1 was active from 1940 until 1972, and was officially closed by DuPont in 1975. DuPont closed the SWMU by covering one 6-foot deep and two 12-foot deep disposal trenches with soil. No additional capping or grading was completed on the 170-foot by 320-foot SWMU; however, the area is fenced. Paints that did not meet specifications, paint sludge, resin waste, Budium™ still bottoms, filter media, and ash from wood burning were all disposed of in the three trenches (Metcalf & Eddy 1989). Four monitoring wells were installed around the SWMU in 1979. As part of a 1992 Stabilization Measures Investigation (SMI), CH2M-Hill collected groundwater and soil samples from SWMU 1 and concluded that interim remedial measures were not warranted (CH2M-Hill 1993). A Phase I RFI conducted at DuPont included a geophysical survey, trench excavation, and sampling soil, waste, and groundwater. The Phase I RFI concluded that waste material located in the trenches exceeded impact to groundwater (IGW) screening criteria, that rates of contaminant migration were slow because IGW were not exceeded in deeper soil samples, and that groundwater was not significantly contaminated by the SWMU (CRG 2000). In light of the concentrations of waste in the trenches and their close proximity to an intermittent stream and a residential trailer park, a May 2000 removal action was initiated at SWMU 1 to decrease the risk of exposure. During the removal action, 34,000 gallons of paint materials, 298 55-gallon drums, 273 85-gallon drums, and 37,065,201 pounds of nonhazardous materials were removed from the SWMU (CRG 2001b). Data for historical groundwater samples and post excavation groundwater samples continue to indicate that the SWMU has not significantly affected groundwater. Groundwater samples collected in September 2000, immediately after the removal, revealed no detectable organic compounds and detectable metal concentrations below EPA maximum contaminant levels (MCL). Post excavation soil sample concentrations were below appropriate soil screening levels (SSLs) (URS 2001). For this SWMU 1 investigation, the SSLs were EPA Region III Risk Based Concentrations (RBCs) for residential soils and Impact to Groundwater (IGW) Criteria from *Soil Screening Guidance: Technical Background Document* (EPA 1996). For most other SWMU investigations, the SSLs are EPA Region III RBCs for industrial soils and IGW.

SWMU 2-Settling Pond (Surface Impoundment Number 1): SWMU 2 is a 60-foot by 460-foot settling pond, with a depth of 3 feet and a capacity of approximately 700 cubic yards. The pond is located north

of and adjacent to DuPont Buildings 51 and 53. Historically, aqueous wastes that contained washes and residues from water-based paints, paint and resin still bottoms, and sludge were discharged to the pond to allow the solids to settle. The pond was dredged annually. Solid materials were sent to the City of Fort Madison Sanitary Landfill, and liquids were sent to the Fort Madison Publicly Owned Treatment Works (Metcalf & Eddy 1989). Seven monitoring wells were installed around the pond in 1979, and the pond was formally closed on November 16, 1980. The pond sludge was excavated and disposed of in a secure landfill, and the pond was backfilled and capped with clay. During the Phase I RFI, groundwater and soil samples from the area of SWMU 2 contained organic compounds, indicating a release. Bis(2-ethylhexyl)phthalate was the only organic analyte detected in groundwater and was attributed to laboratory contamination. One soil sample near SWMU 2 exceeded the SSL for arsenic (CRG 2000).

SWMU 3-Surface Impoundment Number 2: SWMU 3 was used in 1980 and 1981 as a temporary impoundment to store wastes from the Strunk Farm site. SWMU 3, located south of DuPont Building 60 and under 60 Pad (SWMU 5), is approximately 80 feet by 40 feet with a capacity of 300,000 cubic yards. Wastes from the Strunk Farm site consisted of paint and resin still bottoms mixed with sludge and sawdust. These wastes were removed and disposed of, and the unit was certified closed by the Iowa Department of Environmental Quality (IDEQ) in 1982. Given the close proximity of SWMU 5 and SWMU 3, contaminants detected at the two sites are difficult to distinguish. Heavy metals were detected in the soil beneath and adjacent to 60 Pad during an attempt to close SWMU 5. During the Phase I RFI, soil samples collected near SWMU 3 contained various organic compounds. These detections may have been the result of historical activities at either SWMU 3 or the SWMU 5. None of the analytes detected was at a concentration that exceeded SSLs. Bis(2-ethylhexyl)phthalate was the only organic analyte detected in groundwater and was attributed to laboratory contamination (CRG 2000).

SWMU 4-Surface Impoundment Number 3: SWMU 4 was used for 3 to 4 months during late 1980 and early 1981 as a temporary impoundment to store wastes from the Strunk Farm site. The unit is located southeast of SWMU 1 and west of the West Fence Container Storage Unit (SWMU 19). SWMU 4 is about 200 feet by 200 feet, with a capacity of 5,000 to 7,500 cubic yards. Wastes from the Strunk Farm site consisted of paint and resin still bottoms mixed with sludge and sawdust. These wastes were removed and disposed of, and IDEQ certified the unit closed in 1982. During the Phase I RFI, soil and groundwater samples collected near SWMU 4 contained various organic and metal compounds. Bis(2-ethylhexyl)phthalate was the only organic analyte detected in groundwater and was attributed to laboratory contamination. Chromium in soil was the only analyte detected at a concentration that exceeded SSLs (CRG 2000).

SWMU 5-60 Pad Waste Pile: SWMU 5 is an uncovered concrete storage pad equipped with two 1,000-gallon sumps to collect precipitation runoff. The SWMU is located south and slightly west of Building 60 and overlies most of SWMU 3. The pad is 80 feet by 125 feet, and operated from 1981 to 1984 and briefly in 1990. Materials stored at SWMU 5 included still bottoms mixed with sawdust from the sawdust mixer (SWMU 7) and roll-off containers that contained sludge and soil excavated from the paint sludge disposal area (SWMU 10). In October 1996, the hazardous waste storage unit was decontaminated in accordance with the approved RCRA Closure Plan (DuPont 1996, EPA 1996a). The subsurface investigation to delineate potential contamination in soil and groundwater was conducted during the RFI. Groundwater and soil samples were collected during the Phase I RFI. Bis(2-ethylhexyl)phthalate was the only organic analyte detected in groundwater and was attributed to

laboratory contamination. The soil samples contained various organic compounds; however, none of the analytes detected was at a concentration that exceeded the SSLs (CRG 2000).

SWMU 6-Settling Pond (SWMU 2) Sludge Staging Area: Sludge dredged from SWMU 2 was stored at SWMU 6 during 1980. SWMU 6 is located northwest of DuPont Building 38 and encompasses the area around the retention basin. Wastes were removed from the 100-foot by 140-foot staging area in 1981, and a clay cap was put in place. Elevated concentrations of lead and mercury were detected in samples collected near SWMU 6 during a planned expansion of Building 38 in 1991. Various organic compounds and arsenic were detected in soil samples during the Phase I RFI. Arsenic was detected in soil samples at concentrations above SSLs; however, these concentrations may be indicative of background arsenic in the soil (CRG 2000).

SWMU 10-Paint Sludge Disposal Area: During the 1940s and 1950s, SWMU 10 was a disposal area for paint sludge, powerhouse cinders, dilute caustics from tank cleaning, and solid paint waste. A 1959 plant map shows SWMU10 as a settling pond between DuPont Buildings 53 and 38. The disposal area was discovered and partially excavated during construction of a new tank farm in 1990 (DuPont 1991b). Soil samples from the excavation contained elevated concentrations of lead , but confirmation samples met the cleanup goal for lead of 100 milligrams per kilogram (mg/kg). During the Phase I RFI, a geophysical survey was completed to delineate the boundaries of the paint sludge disposal area. This information, combined with the analytical results for groundwater and waste samples, led CRG to conclude that a residual layer of soil staining was present at the interface between clean fill and residual soil. Concentrations of chromium and benzene, ethylbenzene, toluene, and xylene (BTEX) in soil exceeded SSLs at one location each. Bis(2-ethylhexyl)phthalate was the only organic analyte detected in groundwater and was attributed to laboratory contamination (CRG 2000).

SWMU 11-Building 38 Expansion Area: SWMU 11, the Building 38 expansion area, is a 95-foot by 95-foot property that includes the location of the former thinner storage tanks and adjacent land. The former tank area, which operated 1963 until 1990, had concrete dikes for fire control but no concrete bottom. Analytical results from a preconstruction environmental assessment for the expansion of Building 38 revealed low concentrations of BTEX in soil and groundwater (DuPont 1991a). Soil and groundwater samples were collected again during the Phase 1 RFI. Various organic compounds were detected in the soil samples, and the concentration of benzene exceeded the SSL at one location. The groundwater samples also contained detectable concentrations of organic compounds, some of which exceeded MCLs. Whether the source of these contaminants was SWMU 11 or a load/unload platform immediately upgradient of the monitoring well (P-14) was not determined in the Phase 1 RFI (CRG 2000).

SWMU 12-West Construction Debris Pile: From 1976 until 1991, SWMU 12 was a disposal site for construction debris that included brick, concrete, sand, and soil. The unit is located along the western boundary of the plant , south of SWMU 1. An RFI by DuPont Environmental Remediation Services characterized the wastes at SWMU 12 as nonhazardous. No release was detected (DuPont 1993).

SWMU 13-Soil and Concrete Debris Pile No. 1: SWMU 13 was used in 1990 and 1991 to stage soil and concrete excavated from SWMUs 10 and 11 for disposal. SWMU 13 is located north of DuPont Buildings 51 and 53 and partially overlaps the southern edge of SWMU 2. The waste from SWMU 13 was removed by 1991, but soil samples collected for disposal characterization indicated that elevated concentrations of lead and arsenic remained (DuPont 1991c). During the Phase I RFI, various organic

compounds were detected in soil samples, indicating that a release had occurred. None of the concentrations detected exceeded SSLs (CRG 2000).

SWMU 14-Soil and Concrete Debris Pile No. 2: SWMU 14 was used for a short time during 1990 and 1991 to stage soil and concrete excavated from SWMUs 10 and 11 for disposal. This 60-foot by 90-foot area is located northeast of DuPont Building 53 and SWMU 13. Soil samples collected for disposal characterization indicated that elevated concentrations of lead and arsenic remained (DuPont 1991c). During the Phase I RFI, various organic compounds were detected in the soil samples, indicating that a release had occurred. The concentrations of organic compounds detected were significantly less than the SSLs (CRG 2000).

SWMU 19-West Fence Container Storage Area: SWMU 19 is an uncovered, 15-foot by 100-foot concrete pad that is curbed along three sides. The pad, which is located 50 feet west of DuPont Building 60, drains precipitation runoff to three 1,000-gallon sumps. The pad was used for storage of paint wastes that contained solvents and metals from 1981 until DuPont received its RCRA permit in November 1992. The hazardous waste storage unit was decontaminated in accordance with the approved RCRA Closure Plan in October 1996 (DuPont 1996, EPA 1996a). The subsurface investigation to delineate potential soil and groundwater contamination was conducted during the RFI. During the Phase 1 RFI, soil samples collected near SWMU 19 contained various organic compounds, and some were at concentrations that exceeded SSLs.

SWMU 24-Scrap Metal Staging Area: SWMU 24 has been a scrap metal staging area from 1988 to present. The 40-foot by 45-foot SWMU is located on a 6-inch thick concrete pad between DuPont Buildings 20 and 58. Scrap metal derived from paint cans is temporarily stored in dumpsters at SWMU 24 for disposal. Some paint residue leaked from the dumpster onto the concrete pad and then onto the adjacent soil. During the 1992 SMI, the soil adjacent to the concrete was excavated and disposed of (CH2M-Hill 1993). Confirmation soil samples collected from the bottom of the excavation revealed 1,2-dichloropropane and 1,2,3-trichloropropane at concentrations below SSLs.

SWMU 25-Scrap Metal Accumulation Area: Dumpsters at SWMU 25 have been used to accumulate, drain, and dry metal shards from paint cans from 1988 to the present. SWMU 25 is located on a 6-inch concrete pad near the southeast outside corner of DuPont Building 58. Surface evidence indicates that spills have occurred on both the concrete and the soil. The soil adjacent to the concrete was excavated and disposed of during the 1992 SMI. Analysis of confirmation soil samples detected one volatile organic compound, tetrachloroethene (PCE), and one semivolatile organic compound, dibenzofuran, at concentrations less than SSLs (CH2M-Hill 1993).

SWMU 27-Old Sludge Tank: SWMU 27 is a 4,450-gallon tank formerly used to store still bottoms, waste paint, spent wash solvents, and resin. The SWMU is located southwest of DuPont Building 10 and is bordered by a concrete containment walls on three sides and by the wall of an adjacent building on the fourth side. SWMU 27 was in operation from 1981 until 1988. The hazardous waste storage unit was decontaminated in accordance with the approved RCRA Closure Plan in October 1996 (DuPont 1996, EPA 1996a). The subsurface investigation to delineate potential contamination in soil and groundwater was conducted during the RFI. Soil and groundwater samples were collected during the Phase 1 RFI, and various organic compounds were detected in both media, indicating that a release had occurred and

had contaminated groundwater. None of the groundwater samples contained concentrations exceeding MCLs, but soil sample concentrations exceeded SSLs for ethylbenzene, toluene, and xylene (CRG 2000).

SWMU 29-Debris Pit: SWMU 29, discovered in October 1993, was used to discard and burn gallon, quart, and pint paint containers. The SWMU is located at the southwest corner of Building 51. The history and areal dimensions of the SWMU are unknown; however, the unit is believed to be about 15 feet long and 3 to 4 feet deep. Excavated wastes were analyzed for 2-butanone and RCRA metals. The material was determined to be nonhazardous and was disposed of in a local nonhazardous landfill (DuPont 1993). During the Phase I RFI, soil sampling and a geophysical survey were completed at SWMU 29. Various organic compounds were detected in the soil samples, and stained soil was evident within the SWMU, indicating that a release had occurred. A number of metal and organic compound concentrations in soil exceeded SSLs (CRG 2000).

AOC 1-Railcar Unloading Area: AOC 1 is an unloading area for raw materials used in the manufacture of commercial paint products. The AOC is located south of SWMU 10. A release was discovered in November 1996 during excavation for construction of concrete piers. The release has been attributed to spills when railcars were loaded and unloaded. An 8-foot by 8-foot by 3-foot area of stained soil was excavated and disposed of at a nonhazardous landfill. The trench was backfilled and covered with gravel and concrete. The AOC had been sampled previously, during the pre-construction environmental assessment of the proposed Building 38 expansion in 1991, but revealed no contamination at that time. Soil and groundwater samples were collected again during the Phase 1 RFI. The groundwater samples revealed no detections of volatile constituents and all metals detected were below the MCL. Various organic compounds were found in the soil samples but none of the concentrations detected exceeded SSLs (CRG 2000).

AOC 2-Flare Tower: AOC 2 was a Flare Tower that burned waste butadiene vapors from the late 1950s to the early 1980s. The area is located 300 feet south of SWMU 19 and adjacent to the stormwater containment basins. A flame-out at the Flare Tower caused a release to soil. Approximately 27 cubic yards of visibly stained soil were excavated from a 12-foot by 12-foot area, and the excavated soil was disposed of at a nonhazardous landfill. The excavation area was then backfilled with clean soil. Soil samples collected during the Phase I RFI revealed detections of various organic compounds. None of the analyte concentrations exceeded SSLs (CRG 2000).

AOC 3-Underground Fire Water Lines: AOC 3 was created in August 1999 when organic odors were detected that were associated with excavated and stockpiled soils from maintenance of underground fire water lines. The AOC is located in the latex manufacturing area on the south side of DuPont Building 125. The building has always been used to manufacture water-borne latex and Budium®. A railroad track once crossed the area. Visible soil staining was encountered about 18 inches below ground surface (bgs) and appeared to be 18 to 24 inches thick. The excavation to remove the stained soil was 900 feet square and 7 feet deep. Plastic sheeting was laid in the excavation before it was backfilled with clean fill. Excavated soils were held on plastic sheeting and then transferred to roll-off boxes. Analysis of soil samples from the excavation indicated that the soil was nonhazardous, so the soils were disposed of in the LaGrange municipal landfill (CRG 2000).

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 [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) 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):

DuPont is on the northwestern edge of the city of Fort Madison in Lee County, Iowa. The facility is located about 3,000 feet north-northwest of the Mississippi River and is bounded by agricultural lands and undeveloped woodlands to the north and west, a trailer park to the northwest, and residential property to the east and south.

DuPont began producing paint at its Fort Madison facility in 1938, and numerous manufacturing and waste management structures have been constructed at the facility since it was established. Wastes generated at DuPont originate from routine production practices such as tank and instrument cleaning, construction, sludge collected from transfer lines in the tank system, and disposal of quality assurance/quality control laboratory samples. Wastes are also generated when paints or other products prove to be physically unsatisfactory for commercial use and are not reworkable.

In July 1998, January 1999, and April 1999, groundwater samples were collected from wells across the facility in support of the DuPont Phase 1 RFI (CRG 2000). Subsequently, groundwater samples were collected in support of removal activities at SWMU 1 during September 2000 (CRG 2001b), and cone penetrometer test (CPT) groundwater samples were collected near SWMUs 11 and 27 during September and August 2001 (URS 2001). Positive analytical results for these sampling events were screened against MCLs. Seven metals and four volatile organic compounds were detected at concentrations that exceeded MCLs. Table 1 contains a summary of groundwater analytes that exceeded MCLs. Attachment 2 contains a complete list of analytes detected in samples for these groundwater sampling periods.

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).

TABLE 1

SUMMARY OF GROUNDWATER ANALYTES
IN EXCEEDENCE OF MAXIMUM CONTAMINANT LIMIT

Contaminant	MCL (mg/L)	Times Detected Above MCL	Maximum Detection (mg/L)	Date of Maximum Detection	Well or CPT Location	SWMU(s) Associated with Well or CPT
Antimony (Dissolved)	0.006	1	0.0066 J	01/99	P-08	1
Arsenic	0.05	2	0.104	04/99	P-14	11
Arsenic (Dissolved)	0.05	2	0.099	04/99	P-14	11
Barium	2	1	2.96	08/01	S11-SB5	11
Cadmium (Dissolved)	0.005	1	0.0055	07/01	S11-SB7	11
Chromium	0.1	4	0.259	08/01	S11-SB5	11
Lead	0.015	8	0.174	08/01	S27-SB6	27
Thallium	0.0005	2	0.023	08/01	S11-SB5	11
Bis(1-ethylhexyl) phthalate	0.006	16	0.070	04/99	P-03	2, 6, 10, 13, 14, 29
Benzene	0.005	2	0.065	04/99	P-14	11
Ethylbenzene	0.700	2	1.300	04/99	P-14	11
Toluene	1.000	2	2.200	01/99	P-14	11

Note: mg/L = Milligrams per liter

Surface and subsurface soil samples were collected during July 1998, January 1999, and April 1999 in support of the DuPont Phase 1 RFI (CRG 2000). Additionally, post-excavation soil samples were collected in support of SWMU 1 removal activities during September 2000 (CRG 2001b). Soil samples were compared to Impact to Groundwater (IGW) Criteria from *Soil Screening Guidance: Technical Background Document* (EPA 1996). Table 2 lists the contaminants found above IGWs for soil. Attachment C contains the complete list of positive soil detections for these sampling periods.

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):

Migration of contaminated groundwater can be expected to have stabilized (such that contaminated groundwater can be reasonably expected to remain within the horizontal and vertical dimensions of the "existing area of contaminated groundwater"[2]) based on the physical evidence and understanding of the environmental conditions discussed below. The expectation of no further migration of groundwater contamination is also based on the knowledge that the primary sources of contamination have been addressed through interim measures and removal actions that should significantly reduce contaminant concentrations being introduced to groundwater.

The hydrogeology beneath the DuPont facility in Fort Madison, Iowa, consists of an unconsolidated surficial aquifer over three major bedrock aquifers. The bedrock aquifers are, from shallowest to deepest, the Mississipian aquifer, the Devonian aquifer, and the Cambrian-Ordovician aquifer. An aquiclude of Pennsylvanian shale separates these bedrock aquifers from the surficial aquifer deposits. The surficial aquifer deposits consist of an upper and lower water bearing zone. The upper water bearing zone consists of alluvium and sand and gravel lenses within glacial till. This zone is locally unconfined, with water table depths between 25 and 35 feet below ground surface. Groundwater flow is toward the south. DuPont's system of 17 monitoring wells is completed within the alluvium of the upper water-bearing zone. The lower water-bearing zone is a coarse sand and gravel buried channel aquifer, separated from the upper water bearing zone by the clay-rich glacial till. DuPont production wells are completed in the buried channel aquifer. Static water level elevations measured in the production wells in 1997 were approximately 25 to 35 feet above the top of the aquifer, indicating that the zone is confined. When pumping is not influencing groundwater movement, flow is southeast toward the Mississippi River. The aquifer may be hydraulically connected with the Mississippi River.

The surface lithology at the site is a sandy, silty clay which will tend to inhibit contaminant migration (CRG 2000). The hydraulic conductivity of silt ranges from $1x10^{-9}$ to $2x10^{-5}$ meters per second (m/s), the hydraulic conductivity of clay ranges from $1x10^{-11}$ to $4.7x10^{-9}$ m/s (Domenico and Schwartz 1990). A sandy, silty clay would have a hydraulic conductivity near $1x10^{-9}$ m/s, indicating that groundwater moving through the surface lithology at the site would travel in the downgradient direction at a rate of

just over a foot a year. Contamination within the surface lithology is not likely to migrate far from its source. The surface water bearing unit consists of alluvium and sand and gravel lenses. The hydraulic conductivity of coarse sand ranges from $9x10^{-7}$ to $6x10^{-3}$ m/s, indicating that groundwater moving through the surface water bearing unit would travel in the downgradient direction at a rate between 2.5 feet per day (ft/day) and 17,000 ft/day. Given the age of the release and the limited distance that the contaminant plume has expanded in the groundwater within that time, it is reasonable to expect that the dissolved contaminant plume is stable.

During a Phase I RFI, soil samples were collected at DuPont to characterize the extent of contamination remaining at the site, and because soil contamination may act as a source for groundwater contamination. Surface and subsurface soil samples were evaluated for migration to groundwater pathways by comparison of analytical results to EPA IGWs. A summary of those soil samples exceeding IGWs is provided in Table 2 above. Barium concentrations consistently exceeded IGWs in soil samples collected near SWMU 29 and across the DuPont facility. However, concentrations of barium MCLs have not been detected in any groundwater monitoring well at the DuPont facility. Soil samples collected near SWMU 1 produced maximum concentrations of cadmium, chromium, and selenium, exceeding TGWs. Concentrations of these metals in exceedence of MCLs have not been detected in any groundwater monitoring well at the DuPont facility. Maximum concentrations of mercury and a number of volatile compounds were detected in soils samples collected near SWMU2. Groundwater monitoring wells surrounding SWMU 2 (P-01, P-02, P-03, P-04R, P-05, P-06) do not reveal concentrations of any of these volatile compounds. Benzene was detected at a concentration exceeding its IGW in one soil sample collected near SWMU 11, and benzene was detected at a concentration exceeding its MCL in two groundwater samples collected from monitoring well P-14, immediately south and downgradient of SWMU 11. Concentrations of ethylbenzene, toluene, and xylene exceeding IGWs were observed in soil samples collected near SWMU 27, and detectable concentrations of these compounds below MCLs were observed in groundwater samples collected from monitoring well P-17, immediately south and downgradient of SWMU 27. With the exception of monitoring wells P-14 and P-17, no other DuPont monitoring wells have been impacted by these volatile compounds detected in soils. CPT groundwater samples collected near SWMUs 11 and 27 during August of 2001 revealed no volatile compound detections.

In July 1998, January 1999, and April 1999, groundwater samples were collected from wells across the facility in support of the DuPont Phase 1 RFI (CRG 2000). Subsequently, groundwater samples were collected in support of removal activities at SWMU 1 during September 2000 (CRG 2001b), and cone penetrometer test (CPT) groundwater samples were collected near SWMUs 11 and 27 during September and August 2001 (URS 2001). The samples were analyzed for VOCs, SVOCs, and metals. Both filtered and unfiltered CPT groundwater samples were analyzed for metals. Although unfiltered samples are typically preferred for groundwater monitoring, the CPT samples were collected from soil borings and not developed monitoring wells. Samples collected using this method can be expected to have a greater volume of fine sediment mixed with the groundwater samples. Thus, analytical results from filtered groundwater samples may be more representative of actual groundwater and less representative of groundwater and sediment exchanges during sample collection, preservation, and storage.

Groundwater samples collected from DuPont's groundwater monitoirng well system from July 1998 to April 1999 reveal almost no analyte detections above MCLs. A limited number of wells produced

TABLE 2

SUMMARY OF SURFACE SOIL ANALYTES
IN EXCEEDENCE OF INDUSTRIAL RISK BASED CONCENTRATIONS

Contaminant	IGW (mg/kg)	Times Detected Above IGW	Maximum Detection (mg/kg)	Soil Boring Location	Sample Collection Depth (ft)	SWMU(s) Associated with Soil Boring
Barium	1,600	3	2,520	S29-SB1	0-2	29
Cadmium	8	9	70.1	S1-SB4	0-2	1
Chromium	38	4	272	S1-SB8	0-2	1
Mercury	2	2	3.59	S2-SB1	10-11	2
Selenium	5	4	14.7	S1-SB8	0-2	1
Acetone	16	1	34,000	S2-SB1	10-11	2
Benzene	0.03	8	3,600 J	S2-SB3	5-6	2
Ethylbenzene	13	9	890,000	S2-SB1	10-11	2
Isophorone	0.5	1	5,800	S2-SB2	5-6	2
Methylene Chloride	0.02	1	5,800	S2-SB1	10-11	2
Naphthalene	84	1	110,000	S2-SB3	5-6	2
Toluene	12	6	2,000,000	S2-SB1	10-11	2
Xylene	190	8	5,100,000	S2-SB1	10-11	2

Note: mg/kg = Milligrams per kilogram

one-time detections of metals above MCLs. Antimony was detected in monitoring well P-08, north of SWMU 1, and in monitoring well P-01, west of SWMU 13, at a levels of 6.6 mg/l and an estimated8.7 mg/l, respectively. These January 1999 detections exceed the MCL for antimony of 6 mg/l. During April 2001 post-removal groundwater sampling at SWMU 1, thallium was detected in monitoring wells P-07R and P-09 at estimated concentrations of 9.1 and 8.8 mg/l, respectively. These concentrations were in exceedence of the MCL for thallium of 2 mg/l. During an April 1999 sampling event, thallium was also detected at an estimated 12.1 mg/l at monitoring well P-02, located over 500 feet side gradient of SWMU 1 and upgradient of all other SWMUs on the DuPont property. With the exception of these one-time exceedences, no other metals were detected at levels above MCLs in any of the DuPont groundwater monitoring wells. During May 2000, six soil samples were collected to determine the concentrations of metals in background soils. Sample analysis detected concentrations of arsenic, barium, chromium, and lead. Thallium and antimony were not included in the analysis; however, elevated concentrations of these metals in upgradient monitoring wells implies that the source of metals may be existing background concentrations or an upgradient source not associated with the DuPont SWMUs. Metals were detected at levels above MCLs in CPT samples collected near SWMUs 11 and 27; however, these exceedences were only evident in the sediment-rich unfiltered samples, which may have been affected by groundwater and sediment exchange during sample collection, preservation, or storage.

In all of DuPont's 17 monitoring wells except P-14, located south and downgradient of SWMU 11, and P-17, located south and downgradient of P-17, the only volatile compound detected was bis(2-ethylhexyl)phthalate. Similarly, in post-removal groundwater sampling of the monitoring wells surrounding SWMU 1 (P-07R, P-08, P-09, P10) from September 2000 to April 2001, bis(2-ethylhexyl)phthalate was the only volatile compound detected. This compound, which is a common laboratory contaminant, was considered to be not detected due to blank contamination. Bis(2-ethylhexyl)phthalate was also detected and disregarded in monitoring wells P-14 and P-17. Benzene, ethylbenzene, and toluene were detected in monitoring well P-14, directly south and downgradient of SWMU 11, at levels exceeding their MCLs. Available quarterly groundwater monitoring data for this well does not indicate a consistent increase or decrease in the concentrations of these volatile compounds. These compounds were also detected at monitoring well P-11, directly south and downgradient of SWMU 27, but not at levels exceeding their MCLs. Available quarterly groundwater monitoring data for this well does not indicate a consistent increase or decrease in the concentrations of these volatile compounds. CPT groundwater samples collected near SWMUs 11 and 27 during August of 2001 revealed no volatile compound detections.

[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.

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 and Reference(s):

Surface water and sediment sampling activities have not been conducted at DuPont. However, the only surface water body present on the property or near vicinity is an intermittent stream located west of SWMU 1. Removal activities have been conducted at SWMU 1. Post excavation soil samples revealed no analyte detections in exceedence of SSLs, and continued groundwater sampling at SWMU 1 indicates that the aquifer has not been significantly impacted by contamination (CRG 2000, CRG 2001b). Because the soil and groundwater immediately surrounding SWMU 1 have not been impacted, the surface water and stream sediment are not likely to be impacted either.

Groundwater contaminated above SSLs is not reasonably expected to discharge into the Mississippi River, the nearest off-site body of surface water. The contaminant plume terminates within DuPont property boundaries, about 3,000 feet north of the Mississippi River.

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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_____ 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):

[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):

Verification data will be collected to ensure that contaminated groundwater has remained within the horizontal and vertical dimensions of the "existing area of contaminated groundwater." Activities under the ongoing Phase II RFI at DuPont include a survey of site structures, soil sampling, monitoring well installation, and groundwater sampling (CRG 2001a).

Soil sampling, as proposed, will be conducted from four to five borings each at SWMUs 10, 11, 27, and 29. At each boring location, samples will be collected at three depths — 0 to 2 feet bgs, the interval of greatest concern (or 6 to 8 feet bgs if none exists), and 18 to 20 feet bgs — to measure the vertical and areal extent of soil contamination. Soil samples will also be collected from AOC 3, though at only two depths, 1.5 to 3.5 feet bgs and 8 to 10 feet bgs. The soil samples will be analyzed for metals, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs) (CRG 2001a).

The proposed groundwater investigation will include installation of four new monitoring wells. Two wells will be installed in the vicinity of and downgradient of SWMUs 11 and 27, and two wells will be installed in the vicinity of and downgradient of SWMUs 10 and 29. A minimum of one soil sample will be collected at each monitoring well installation, and the soil samples will be analyzed for VOCs, SVOCs, and metals. As proposed, groundwater samples from the four monitoring wells surrounding SWMU 1 (MW-07R, MW-08, MW-09, and MW-10) will be collected for four quarters following removal activities at the SWMU. Three of the four quarterly sampling events have been completed to date, although only the first set of results is available. These samples are being collected to ensure that SWMU 1 removal activities are not impacting groundwater. Samples will be analyzed for metals, SVOCs, and VOCs. Each of the new monitoring wells will be sampled twice in the three months following installation. Additional wells will be included in these sampling events to ensure representative sampling event for SWMUs 10, 11, and 27.

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 facility , EPA ID # IAD005272398, located at 801 35th Street, Fort Madison, Iowa. 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) Original signed by Date 9/27/01
(print) Patricia Murrow
(title) Project Manager

Supervisor (signature) Original signed by Date 9/27/01
(print) John Smith
(title) Chief, RCAP Branch
(EPA Region or State) EPA Region 7

Locations where References may be found:

Records Center
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901 North 5th Street
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Contact telephone and e-mail numbers

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ATTACHMENT 1

LOCATION OF SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN

(1 SHEET)

ATTACHMENT 2

POSITIVE ANALYTE DETECTIONS IN GROUNDWATER

(84 SHEETS)

ATTACHMENT 3

POSITIVE ANALYTE DETECTIONS IN GROUNDWATER

(62 SHEETS)

ATTACHMENT 4

BACKGROUND SOIL CONCENTRATIONS
AND PERCENT UPPER THRESHOLD LIMITS

(2 SHEETS)