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:	Cytec Industries Inc.
Facility Address:	1 Heilman Avenue Willow Island, WV 26134
Facility EPA ID #:	WVD004341491

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

 __X__ If yes – check here and continue with #2 below.

 _____ If no – re-evaluate existing data, or

 _____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be "**contaminated**" [1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

__X__ If yes – continue after identifying key contaminants, citing appropriate "levels", and referencing supporting documentation.

_____ If no – skip to #8 and enter "YE" status code, after citing appropriate "levels", and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

_____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Investigations of soil and groundwater have been performed at the facility since the early 1990s. An RFI Report was submitted in 1994, and a Phase II RFI was submitted in 2009. Several other investigations and interim measures have been undertaken and reported at the facility and are summarized in a Groundwater Summary Report, which was prepared in 2009. These investigations determined the nature and extent of contaminated groundwater at the facility. Routine groundwater monitoring is also performed at several RCRA units and elsewhere at the facility in accordance the facility's RCRA permit, NPDES permit and other consent orders/agreements.

Historical data have been summarized in the attached tables and compared to appropriate criteria to evaluate contaminants above protective screening levels; groundwater sampling locations are shown on Figure 1. Laboratory analytical reports from more recent routine groundwater monitoring events available on file at the Facility were also reviewed during the development of this environmental indicator determination.

Site Areas

Due to the size and physical characteristics of the facility, it has been divided into three distinct areas for the purposes of various evaluations: the Plant Area, the Area West of Cow Creek and the Area South of Route 2. These areas are illustrated on Figure 1. The following subsections describe the conditions for each area of the facility.

Plant Area

The following constituents have been detected in Plant Area groundwater at concentrations greater than federal MCLs, and/or West Virginia's Region III tap water RBCs, and/or West Virginia's De Minimis criteria at some point during the sampling history of the facility. Plant Area groundwater sampling results are provided in Table 1. For groundwater sample locations, please see Figure 1.

Organic Constituents

- Benzene exceeded groundwater criteria.

The following Inorganic Constituents exceeded Groundwater Criteria:

- Antimony
- Cobalt

- Lead
- Manganese
- Mercury
- Cyanide
- Vanadium

Lead has only been detected at concentrations slightly above the MCL of 15 ug/L in wells 103 and 107 located at the western edge of the Plant Area. These detections were reported in unfiltered samples with elevated turbidity, and are therefore not considered representative of lead levels in groundwater.

West of Cow Creek

The following constituents have been detected at concentrations above federal MCLs, and/or West Virginia Region III tap water RBCs, and/or West Virginia De Minimis criteria in groundwater West of Cow Creek at some point during the sampling history of the facility. Groundwater sample results for the Area West of Cow Creek are provided in Tables 2 and 3. Groundwater sample locations are shown on Figure 1.

The following Organic Constituents exceeded Groundwater Criteria

- 1,4-Dichlorobenzene
- 2,4-Dinitrotoluene
- 4-Chloroaniline
- 4-Methylphenol
- Benzene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Bis(2-ethylhexyl) phthalate
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Methylene chloride
- Naphthalene
- Nitrobenzene
- N-nitrosodiphenylamine
- Toluene

The following Inorganic Constituents exceeded Groundwater Criteria

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Total Chromium
- Chromium VI
- Cobalt
- Iron

- Lead
- Manganese
- Mercury
- Nickel
- Potassium
- Thallium
- Vanadium
- Cyanide

Area South of Route 2 Groundwater

The following compounds have been detected at concentrations above federal MCLs, and/or USEPA Region III tap water RBCs, and/or West Virginia De Minimis criteria in groundwater near waste management areas South of Route 2 at some point during the sampling history of the facility. Groundwater sample results from the Area South of Route 2 are provided in Table 4. Groundwater sample locations are shown on Figure 1.

The following Organic Constituents exceeded Groundwater Criteria

- Benzene
- Bis(2-ethylhexyl) Phthalate

The following Inorganic Constituents exceeded Groundwater Criteria

- Lead
- Vanadium

References

Arcadis. 2009a. Groundwater Summary Report.
Arcadis. 2009b. Phase II RFI SWMU GG-2 and GG-3 Report.
McLaren/Hart. 1994. Phase I RFI SWMU GG-2 and GG-3 Report.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the migration of contaminated groundwater stabilized (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

 __X__ If yes – continue after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

 _____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) – skip to #8 and enter "NO" status code, after providing an explanation.

 _____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Plant Area

As shown on the potentiometric surface maps on Figures 2, 3 and 4, the Ohio River and Cow Creek form the downgradient boundaries for overburden groundwater beneath the Plant Area. Data collected over time (Table 1) demonstrate that the groundwater from monitoring points along the downgradient boundaries with these surface water bodies are not contaminated and impacts within the Plant Area are not migrating into Cow Creek or the Ohio River. The data show that within the Plant Area, concentrations in groundwater over time are stable or decreasing. To demonstrate this, Figure 7 presents the depiction of benzene in groundwater and shows that benzene in the Plant Area has reduced considerably over the past 30 years.

Cyanide concentrations in Plant Area groundwater are generally stable. Exceedances of cyanide groundwater criteria are limited to interior portions of the Plant Area, and do not extend down-gradient. Cyanide was detected above groundwater criteria in well 71 downgradient from the main plant area once in 2011, but this result is considered anomalous, as it the only reported exceedance for cyanide at well 71, and concentrations are otherwise mostly non-detect. Antimony, cobalt, manganese, mercury, and vanadium have been detected above groundwater criteria within the Plant Area historically; but these detections are generally isolated, low level, and not indicative of a migrating plume.

Lead detections above the MCL in groundwater samples from the western portion of the Plant Area, near Cow Creek, are associated with high sample turbidity, and are therefore not representative of groundwater quality. Samples collected from these wells with low turbidity show that lead is not above the RBC.

Area West of Cow Creek

Groundwater impacts in the area west of Cow Creek are associated with SWMUs GG-2 and GG-3. As illustrated by the potentiometric surface maps in Figures 5 and 6, groundwater flow patterns within the silt and clay and sand and gravel zones beneath this area of the site are complex due to the proximity of the Ohio River, Cow Creek, the Oxbow Lake, and the Willow Island Lock and Dam, all of which significantly influence the direction of groundwater flow in one or both zones. The Ohio River and Cow Creek form the downgradient boundaries for groundwater flow within both the sand and gravel and silt and clay zones.

As shown in Table 3, concentrations of constituents in groundwater at SWMU GG-2 are mostly either non-detect or detected at low concentrations, with only few constituents slightly exceeding groundwater criteria. The GG-2 area wells were sampled during the 1994 Phase I RFI at SWMUs GG-2 and GG-3, and these data are provided in the Phase I RFI Summary Report of SWMUs GG-2 and GG-3 (McLaren/Hart 1994). Comparing the historical groundwater data from the Phase I RFI with the more recent data in Table 3 shows that constituent concentrations are relatively stable in groundwater at GG-2 and do not appear to be migrating downgradient.

As shown in Table 3, groundwater within both the silt and clay and sand and gravel zones at SWMU GG-3 is impacted predominantly by VOCs and SVOCs (mainly benzene, toluene, and nitrobenzene). The highest concentrations of these constituents occur beneath the northwestern corner of GG-3 and slightly down-gradient. As shown in Table 3, constituent concentrations appear to be mostly stable or decreasing in GG-3 groundwater.

Groundwater elevation data indicate that a downward vertical hydraulic gradient exists through the saturated overburden (Arcadis 2009b); however, there appears to be limited potential for constituents present in the sand and gravel aquifer to migrate downward into underlying siltstone and shale bedrock groundwater. Data from the 1994 Phase I RFI show that constituents are either non-detect or do not exceed groundwater criteria in bedrock groundwater west of Cow Creek (McLaren/Hart 1994). The Phase I RFI Report (McLaren/Hart 1994) and Phase II RFI Report for SWMUs GG-2 and GG-3 (Arcadis 2009b) both also indicate that a neutral to slightly upward vertical hydraulic gradient exists between the bedrock and sand and gravel water-bearing units beneath the area west of Cow Creek.

Area South of Route 2

The bedrock surface rises with the land in the Area South of Route 2. As a result, overburden groundwater is not present beneath this area of the Site and the uppermost water-bearing unit occurs within the bedrock (Arcadis 2009a). Figures illustrating groundwater flow are not available for the Landfill Area as groundwater elevations within the bedrock are too variable and inconsistent to develop contour plots. This area is a topographic high and is at the crest of a hill; available groundwater information indicates that groundwater beneath the units ultimately discharges to local drainage features which then flows to Robbins Run and Cow Creek (Arcadis 2009a). As shown in Table 4, constituents have only been detected at concentrations slightly exceeding groundwater criteria in bedrock groundwater at the Landfill Area on a couple of occasions during the past 17 years. Constituents are generally non-detect in groundwater at this area of the Site, which indicates that concentrations are stable and not migrating.

References

Arcadis. 2009a. Groundwater Summary Report.
Arcadis. 2009b. Phase II RFI SWMU GG-2 and GG-3 Report.
McLaren/Hart. 1994. Phase I RFI SWMU GG-2 and GG-3 Report.

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.

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):

Groundwater data from monitoring wells situated along the Site's downgradient boundaries with the Ohio River and Cow Creek (receiving surface water bodies) are screened against West Virginia Surface Water Standards (West Virginia SWS) and USEPA Region III BTAG Freshwater Screening Benchmarks (EPA BTAG Benchmarks) in Tables 1, 2 and 3. Locations where constituents are detected in groundwater above these surface water criteria upgradient from receiving surface water bodies are then evaluated to determine whether contaminated groundwater is potentially discharging to surface water. Data from surface water samples collected from these receiving water bodies are also considered in the evaluation where available.

Plant Area

As shown by the groundwater contour plots in Figure 4, groundwater discharges to Cow Creek from the shallow silt and clay water-bearing unit that occurs at the west side of the Plant Area. As shown in Figures 2 and 3, groundwater from the overburden/sand and gravel zones discharges to the Ohio River elsewhere within the Plant Area. Groundwater data from the following wells were used to evaluate the potential for groundwater discharge to the Ohio River and to Cow Creek:

- Ohio River – Overburden/sand and gravel zone wells: 2, 15, 29, 71, 504, 505 and Tecon
- Cow Creek – Shallow silt and clay zone wells: 105, 106, 107 and 109

As shown in Table 1, the following constituents have been detected above either West Virginia SWS or EPA BTAG Benchmarks in these downgradient Plant Area monitoring wells.

Organic Constituents:

- Toluene

Inorganic Constituents:

- Barium
- Beryllium
- Copper
- Cyanide
- Mercury
- Lead

Toluene was detected at 140 ug/L in Well 505 in 2002 (Table 1), which is above the EPA BTAG Benchmark of 2 ug/L. Well 505 is located approximately 350 feet from the Ohio River, and therefore it is likely that toluene concentrations attenuate to levels below BTAG criteria in groundwater upgradient from the point of discharge to the river. The toluene detection at Well 505 is also below the West Virginia SWS of 200 ug/L.

Detections of cyanide above surface water criteria in down-gradient Plant Area wells screening the overburden/sand and gravel zone adjacent to the Ohio River, are infrequent and generally low level. As shown in Table 1, cyanide is non-detect in most the samples collected from these wells. This suggests that the dissolved-phase cyanide groundwater plume beneath the Plant Area does not extend to the down-gradient boundary with the Ohio River, and that cyanide is likely not discharging into the River at concentrations above surface water criteria.

Barium and Beryllium were both detected slightly above surface water criteria in downgradient Plant Area Wells 504 and 505 in 2002 (Table 1), but these detections were associated with laboratory blank contamination, and are therefore not considered representative of actual groundwater quality near the Ohio River.

Cyanide has been detected above surface water criteria sporadically in shallow silt and clay zone groundwater at the down-gradient boundary of the Plant Area near Cow Creek, but these exceedances are infrequent and generally low level. As shown in Table 1, cyanide is non-detect in most of the samples from these wells. Surface water samples were collected from Cow Creek historically as part of routine site monitoring activities. Samples were collected from the locations shown on Figure 1, and analyzed for cyanide and benzene to evaluate surface water quality in the Creek upstream and downstream from the Site. Surface water sampling results are provided in Table 5. These data show that cyanide has occasionally been detected in Cow Creek at concentrations slightly above surface water criteria both upstream and downstream from the site, but was typically non-detect. These observations suggest that that dissolved-phase cyanide in Plant Area groundwater is not discharging to surface water in Cow Creek.

Barium, copper, mercury, and lead have also been detected above surface water criteria in shallow silt and clay zone groundwater adjacent to Cow Creek. As with cyanide, these exceedances are generally low level, and sporadic in nature, and therefore do not indicate that contaminated groundwater is discharging from the Plant Area to Cow Creek.

Based on these observations it does not appear that contaminated groundwater is discharging to surface water in the Plant area.

Area West of Cow Creek

Data from the following downgradient wells in the Area West of Cow Creek are screened against surface water criteria in Table 3.

- Overburden/sand and gravel zone wells: 340, 344, 345, 346, 352, 353, 354, PZ8D, PZ9D – Evaluate potential for groundwater discharge to the Ohio River

- Shallow silt and clay zone wells: 310R, 314 - Evaluate potential for groundwater discharge to Cow Creek

As shown by the groundwater contour plots in Figures 4 and 5, shallow silt and clay zone groundwater discharges to Cow Creek near the eastern boundary of SWMU GG-2, and to the Ohio River at other locations where constituents are detected in groundwater West of Cow Creek. As shown in Figure 6, sand and gravel zone groundwater discharges to the Ohio River across the entire area west of Cow Creek. Additionally, as discussed in the 2009 Phase II RFI Report for SWMUs GG-2 and GG-3, dissolved-phase constituents are transported under a downward hydraulic gradient from the shallow silt and clay zone to the underlying sand and gravel zone at SWMU GG-3 (Arcadis 2009a). Therefore, wells screening the sand and gravel zone are used to evaluate the potential for contaminated groundwater to discharge to the Ohio River down-gradient from SWMU GG-3.

The following constituents have been detected above either West Virginia SWS or EPA BTAG Benchmarks in these downgradient monitoring wells west of Cow Creek (Table 3).

Organic Constituents:

- Benzene
- Chlorobenzene
- Toluene
- 4-Chloroaniline
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Fluoranthene
- Pyrene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Naphthalene

Inorganic Constituents:

- Aluminum
- Arsenic
- Barium
- Beryllium
- Cadmium
- Copper
- Cyanide
- Hexavalent Chromium
- Iron
- Lead
- Manganese

- Selenium
- Zinc

As discussed under Question 3 above, constituent concentrations appear to be mostly stable or decreasing in GG-3 groundwater. VOCs and SVOCs (benzene, toluene, nitrobenzene) are still present in groundwater at the north (downgradient) boundary of GG-3, but these concentrations decrease rapidly with distance further downgradient (see Table 3 and Figure 6 for reference). Concentrations are mostly either below or only slightly above surface water criteria in the row of monitoring wells closest to the river. Since these furthest downgradient wells are approximately 200 feet from the Ohio River, it is reasonable to assume that concentrations should decrease below surface water criteria before groundwater reaches the river. Therefore, is does not appear that contaminated groundwater from the Site is discharging to Ohio River surface water in the area West of Cow Creek, or that it will in the future.

Discharge of contaminated groundwater from GG-2 to surface water in Cow Creek does not appear to be a concern. As discussed under Question 3 above, constituent concentrations in shallow silty and clay groundwater beneath the eastern portion of GG-2 are generally stable, with only a few constituents detected slightly above surface water criteria. Potential migration of groundwater containing elevated concentrations of constituents from GG-2 toward Cow Creek is also limited by the low permeability of the silt and clay unit, which has an estimated horizontal hydraulic conductivity of 5.51×10^{-7} cm/s based on testing performed during the Phase I RFI at SWMUs GG-2 and GG-3 (McLaren/Hart 1994).

Area South of Route 2

Discharge of contaminated groundwater to surface water is not a concern in the area south of Route 2 because constituent concentrations are generally non-detect.

References

Arcadis. 2009a. Groundwater Summary Report.
Arcadis. 2009b. Phase II RFI SWMU GG-2 and GG-3 Report.
McLaren/Hart. 1994. Phase I RFI SWMU GG-2 and GG-3 Report.

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)?

Rationale and Reference(s):

______ 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 <u>key</u> 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 <u>each</u> 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 – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Footnotes:

[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 ecosystems), 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 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 – 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.

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. 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):

Periodic groundwater monitoring is currently performed at several RCRA units in the plant area and the area south of Route 2 under the Facility's Resource Conservation and Recovery Act (RCRA) permit (WVDEP 2013), and National Pollution Discharge Elimination System permit. Periodic groundwater monitoring of plant area groundwater is also performed in accordance with a Consent Decree associated with the benzene groundwater plume, and a 1987 letter from WVDEP requesting monitoring of cyanide in site groundwater. Details on the groundwater monitoring programs are provided below. Groundwater monitoring will continue at the current frequency under these programs for the foreseeable future. No additional groundwater monitoring is currently planned for the site.

RCRA Permit Groundwater Monitoring

- Equalization Basin and Aeration Basin – Semiannual monitoring of wells 101 through 113
- Incinerator Ash Impoundment – Semiannual monitoring of wells 201 and 401 through 410
- Sludge Impoundment – Semiannual monitoring of wells 201 through 208 and 210 through 214

NPDES Permit Groundwater Monitoring

- SWMU EE-1 - Semiannual monitoring of wells 501 through 503

Benzene and Cyanide Groundwater Monitoring

- Quarterly monitoring of wells 7, 8, 13, 70, 71, 110 and Tecon

References:

United States of America and State of West Virginia. 1985. Consent Decree, Civil Action No. 83-260-C.

WVDEP. 2013. RCRA Operating Permit WVD 004 341 491 for Cytec Corporation, Inc. Willow Island, WV Plant, effective April 24, 2013

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 Cytec Industries Inc. Willow Island facility, EPA ID # WVD004341491, located at 1 Heilman Avenue, Willow Island, WV 26134.

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) Signature on Original Document Date: 9/28/2017

(Print) Kenan Cetin, Ph.D.
(Title) Project Manager, Superfund/RCRA Corrective Action Unit

Supervisor (Signature) Signature on Original Document Date: 9/29/17

(Print) Jason S. McDougal
(Title) Superfund/RCRA CA Program Manager
(EPA Region or State) Region III / WV

Locations where References may be found:

Division of Land Restoration, Office of Environmental Remediation
West Virginia Department of Environmental Protection (WVDEP)
601 57th Street SE Room 1077
Charleston WV 25304

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