

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: NOVA Chemical / Lyondell Chemical Beaver Valley Plant  
(formerly ARCO Chemical)  
Facility Address: 400 Frankfort Road, Monaca, PA 15067  
Facility EPA ID #: PAD 068 730 225

- 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 #8 and enter “IN” (more information needed) status code

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

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

Definition of "Current Human Exposures Under Controls" 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 "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

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

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2. Is **groundwater** known or reasonably suspected to be "contaminated"<sup>1</sup> 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 anywhere at, or from, the facility?

<u>  X  </u>	If yes – continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.
<u>      </u>	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."
<u>      </u>	If unknown (for any media) – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

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**See following pages for response to Question #2 (Rationale and Reference(s)).**

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<sup>1</sup>"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).

## QUESTION #2 - MIGRATION OF CONTAMINATED GROUNDWATER (RATIONALE AND REFERENCE(S))

### RESPONSE

Six Areas of historic contamination were identified at the site. These areas are the Central Plant / Styrene II Area, the Over-the-Hill (OTH) Tank Farm Area, Raccoon Creek Area, West Landfill / Dravo Quarry Area, East Landfill Area, and Phthalic Anhydride Area.

#### Groundwater

Groundwater throughout the facility is contaminated with various VOCs and SVOCs. Remedial investigations conducted in the late 1980s and early 1990s determined that the primary contaminants included benzene, toluene, ethyl benzene, xylenes, and styrene (BTEXS). An approximately 25-acre Non-Aqueous Phase Liquid (NAPL) plume was identified approximately 72 feet beneath the Central Plant / Styrene II Area. Similar plumes of smaller size (less than 5 acres) were identified in the OTH Tank Farm Area, Raccoon Creek Area, and West Landfill / Dravo Quarry Area. Maximum contaminant concentrations detected in each of these areas during the remedial investigations or subsequent sampling events are listed in the table below.

Constituent	Central Plant Area	Over the Hill Area	Raccoon Creek Area	West Landfill Area	East Landfill Area	Phthalic Anhydride Area	EPA MCL
Benzene	<b>410</b>	<b>345</b>	<b>410</b>	<b>240</b>	<b>11</b>	<b>0.006</b>	0.005
Toluene	<b>3.4</b>	<b>8.4</b>	<b>31</b>	<b>130</b>	<b>3.5</b>	ND	1
Ethyl Benzene	<b>280</b>	<b>94.5</b>	<b>0.89</b>	<b>14</b>	0.65	ND	0.7
Xylenes	<b>44</b>	0.85	2.6	<b>20</b>	0.47	ND	10
Styrene	<b>0.68</b>	0.038	<b>1.2</b>	<b>6.3</b>	<b>0.93</b>	ND	0.1

All results in mg/L.

ND – not detected

**Bold** – exceedance of EPA Maximum Contaminant Level

Reference: Environmental Indicator Inspection Report for NOVA Chemical, prepared by Foster Wheeler Environmental Corporation, June 2003

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3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"<sup>1</sup> 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"<sup>2</sup>)
- If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"<sup>2</sup>) - 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):

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Annual sampling of select wells in the Over-the-Hill Tank Farm Area have continued as part of the facility's wastewater treatment system monitoring requirements; results from this area demonstrate that contaminant concentration trends in groundwater are stable or decreasing. Analysis of four quarters of sampling six Raccoon Creek Area wells from 2015-16 also demonstrate stable or decreasing concentration trends. Confirmation sampling from two wells in the East Landfill Area in 2014 and four river wells within the former Ohio Sparge Curtain in the Central Plant / Styrene II Area in 2016 also suggest that contaminant concentrations are stable or decreasing beneath the facility.

References: Groundwater Sampling Results, Le Petomane East Landfill Area, prepared by Environmental Resources Management, April 2014.

River Well Location, Repair, Replacement, Sampling, and Analysis – NOVA Chemicals, prepared by KU Resources, October 2016.

Raccoon Creek Groundwater Sampling Report – Fourth Quarter 2016, prepared by Tetra Tech, February 2017.

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<sup>1</sup> "Existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all contaminated groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

- \_\_\_\_\_ If yes - continue after identifying potentially affected surface water bodies.  
X  
\_\_\_\_\_ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.  
\_\_\_\_\_ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

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Recent sampling suggested that contaminated groundwater no longer discharges into surface water: Raccoon Creek Area groundwater contours demonstrated that Raccoon Creek is a losing stream along this stretch of the Raccoon Creek Area, and groundwater samples from the four river wells in the Central Plant / Styrene II Area did not indicate any BTEXS contamination. However, it is likely that the elevation of the Ohio River, which is controlled by dams, affects the direction of groundwater flow and thus any groundwater discharge to surface water in the vicinity. In times of low Ohio River elevation when groundwater beneath the facility may discharge to surface water, any contaminated discharge is likely to be insignificant since modeled discharge to surface water was shown to meet surface water quality standards in area risk assessments performed under Act 2 in the late 1990s, and as a result of the stable or decreasing contaminant trends more recently demonstrated in groundwater beneath the facility.

References: Environmental Indicator Inspection Report for NOVA Chemical, prepared by Foster Wheeler Environmental Corporation, June 2003.  
River Well Location, Repair, Replacement, Sampling, and Analysis – NOVA Chemicals, prepared by KU Resources, October 2016.  
Raccoon Creek Groundwater Sampling Report – Fourth Quarter 2016, prepared by Tetra Tech, February 2017.

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5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration<sup>2</sup> of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

\_\_\_\_\_ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> 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 judgment/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 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<sup>3</sup> greater than 100 times their appropriate "level(s)," and if 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):

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<sup>2</sup> As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented<sup>3</sup>)?

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<sup>4</sup> 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.

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If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") – skip to #8 and enter a "NO" status, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

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

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Rationale and Reference(s):

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<sup>3</sup> 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.

<sup>4</sup> The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

    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):

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At a minimum, groundwater beneath the Over-the-Hill Tank Farm Area will continue to be monitored to ensure that contaminant concentrations do not increase to a level to which Raccoon Creek or the Ohio River may be impacted above appropriate surface water quality criteria.

Reference: 2009 Annual Report – Groundwater Monitoring Data for Surface Impoundments Adjacent to the Over-the-Hill Tank Farm Area, prepared by Aurora Environmental, July 2009.



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8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

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 NOVA Chemical (aka NOVA Chemical Cattwo, Beaver Valley Plant, formerly ARCO Chemical) facility, EPA ID PAD 068 730 225, located at 400 Frankfort Road, Monaca, PA 15067. 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.

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NO - Unacceptable migration of contaminated groundwater is observed or expected.

IN - More information is needed to make a determination.

Completed by:      (signature) /Griff E. Miller/                      Date      7/5/17  
   (print) Griff Miller  
   (title) Remedial Project Manager

Supervisor:              (signature) /Paul Gotthold/                      Date      7/5/17  
   (print) Paul Gotthold  
   (title) Associate Director  
   (EPA Region or State) EPA Region 3

Locations where References may be found:

All reference documents are appended to the EI Report, which can be found at the USEPA  
Region III Office in Philadelphia and the PADEP Southwest Regional Office in  
Pittsburgh.  
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