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DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
2/5/99 Interim Final
RCRA Corrective Action
Environmental Indicator (EI) RCRIS co[redacted]

Facility Name: **Solutia Inc. – Chocolate Bayou Plant**
Facility Address: **P.O. Box 711, Alvin, TX 77512-0711**
Facility EPA ID#: **TXD001700806**

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

√ If yes – check here and continue with #2 below.
____ If no – re-evaluate existing data, or
____ if data are not available skip to #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 only 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" above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

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

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

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

Rationale and Reference(s):

Injection Well Pretreatment Facility (IWPF): **The Groundwater Protection Standard (GWPS) established for the IWPF site (see Compliance Plan; TNRCC, 1997) are Risk Reduction Standard 2 Medium-Specific Concentrations (MSCs) for groundwater protection at industrial sites (GWP-Ind). The principal groundwater constituents and associated MSCs are: benzene (0.005 mg/L), cyanide (0.94 mg/L), and arsenic (1.1 mg/L) (GSI, 1997a, 1999c,d).**

RCRA Facility Investigation (RFI) Units: **Site investigations have been completed at all RFI Units (i.e., RFI Units A, B, C, D, E, I, J, and 02). Groundwater impacts have been detected in Units A, C, I, J, and 02 (GSI, 1992a,b). No groundwater impacts were detected in Units B, D, and E (GSI, 1992b, 1996f). However, the TNRCC has not approved the "no further action" recommendation for Units B, D, and E presented in the original RFI report (1992b) and in the report for the verification sampling requested by the TNRCC (GSI, 1996f). The baseline risk assessment (BLRA) and Corrective Measure Study (CMS) for the RFI units will be conducted after final approval by the TNRCC of the Phase II RFI for Units A and C (GSI, 1996e). Consequently, no risk assessments or site-specific cleanup standard calculations have been conducted to date for the RFI sites with groundwater impacts. The principal constituents exceeding cleanup levels based, preliminarily, on Risk Reduction Standard 2 MSCs (GWP-Ind) are as follows:**

- **RFI Unit A: Benzene (0.005 mg/L), ethylbenzene (0.7 mg/L), toluene (1.0 mg/L), naphthalene (2.0 mg/L), styrene (0.1 mg/L). *(GSI, 1992a, 1996e, 1997c, 1998).***
- **RFI Unit C: Benzene (0.005 mg/L). *(GSI, 1992b, 1996e, 1997c, 1998).***
- **RFI Unit I: Benzene (0.005 mg/L), ethylbenzene (0.7 mg/L). *(GSI, 1992a, 1996d, 1998).***
- **RFI Unit J: Benzene (0.005 mg/L), ethylbenzene (0.7 mg/L), cumene (10 mg/L), phenol (61 mg/L). *(GSI, 1992a, 1996a,b, 1999a).***
- **RFI Unit 02: Benzene (0.005 mg/L), ethylbenzene (0.7 mg/L), cumene (10 mg/L), phenol (61 mg/L). *(GSI, 1992a, 1996d, 1998).***

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).

References:

GSI, 1992a. "Final Report RCRA Facility Investigation (RFI) for Units A, I, J, and 02, Monsanto Company, Alvin, Texas." Groundwater Services, Inc., GSI Job No. G-1256, June 19, 1992.

GSI, 1992b. "Final Report RCRA Facility Investigation (RFI) for Units B, C, D, and E, Monsanto Company, Alvin, Texas." Groundwater Services, Inc., GSI Job No. G-1256, August 14, 1992.

GSI, 1994. "Addendum to IWPF Corrective Action Program, Injection Well Pretreatment Facility (IWPF) Monsanto Company., Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-1395E, March 4, 1994.

GSI, 1996a. "Phenol Unit Area Corrective Action Program, Voluntary Corrective Action Program, Monsanto Company, Alvin, Texas," Groundwater Services, Inc., GSI Job No. G-1880, July 31, 1996.

GSI, 1996b. "Groundwater Sampling and Testing in Support of Natural Attenuation, Phenol Unit Area, Monsanto Chocolate Bayou Plant, Alvin, Texas," Groundwater Services, Inc., GSI Job No. G-1822, August 9, 1996.

GSI, 1996c. "Plant-Wide Groundwater Modeling Study, Monsanto Chocolate Bayou Plant, Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-1780, August 16, 1996.

GSI, 1996d. "Groundwater Sampling and Testing in Support of Natural Attenuation, Southern Plant Area, Monsanto Chocolate Bayou Plant, Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-1824, December 11, 1996.

GSI, 1996e. "Final Report Supplemental (Phase II) RCRA Facility Investigation RFI Units A and C, Monsanto Company, Alvin, Texas." Groundwater Services, Inc., GSI Job No. G-1858, October 18, 1996.

GSI, 1996f. "Final Report Verification Groundwater Sampling Program RCRA Facility Investigation RFI Units B, D, and E, Monsanto Company, Alvin, Texas." Groundwater Services, Inc., GSI Job No. G-1858, August 16, 1996.

GSI, 1997a. "RCRA Permit Renewal Application, Monsanto RCRA Permit HW-50189-001, Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-1878, April 1, 1997.

GSI, 1997b. "BIOSCREEN Natural Attenuation Modeling for RFI Units 02, A, and C, Solutia Chocolate Bayou Plant, Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2014, October 3, 1997.

GSI, 1997c. "Groundwater Sampling and Testing in Support of Natural Attenuation, RFI Units A and C, Solutia Chocolate Bayou Plant, Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2015, October 3, 1997.

GSI, 1998. "Groundwater Sampling and Testing in Support of Natural Attenuation, RFI Units A, C, I, and 02, Solutia Chocolate Bayou Plant, Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2167, October 23, 1998.

GSI, 1999a. "Annual Report: July 1999, Voluntary Corrective Action Program for Manufacturing Facilities, Solutia Chocolate Bayou Plant, Alvin, Texas", Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2334, July 22, 1999. (This report contains references for the annual reports being prepared for the Phenol Unit Corrective Action area, which overlaps the RFI Unit J corrective action program).

GSI, 1999b. "Non-Aqueous Phase Liquid Recovery and Monitoring, RFI Units A, I, and 02, Solutia Chocolate Bayou Plant, Alvin, Texas", Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2166, September 8, 1999.

GSI, 1999c. "Natural Attenuation Investigation, IWPF Corrective Action Program, Solutia Chocolate Bayou Facility", Alvin, Texas, Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2307, September 22, 1999.

GSI, 1999d. "Semi-Annual Report, January - June 1999, IWPF Corrective Action Program, Solutia Inc., Alvin, Texas," Groundwater Services, Inc., Houston, Texas, GSI Job No. G-2265, July 16, 1999.

TNRCC, 1997. "Compliance Plan No. CP-50189-001, Monsanto Company, Alvin, Texas," TNRCC, January 10, 1997. (First issuance date: September 30, 1987).

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

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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" as defined by the monitoring locations designated at the time of this determination)?

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

_____ 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):

Injection Well Pretreatment Facility (IWPF): **The IWPF site has been undergoing hydraulic control/affected groundwater recovery since 1995 under a corrective action program outlined in the facility Compliance Plan (TNRCC, 1997). In addition, natural attenuation investigations and groundwater modeling indicate that the plume is stable or shrinking (GSI, 1996c,d, 1999c). No offsite impact of potential receptors is expected.**

RCRA Facility Investigation (RFI) Units: **Groundwater impacts were detected in Units A, C, I, J, and 02. Natural attenuation investigations and modeling indicate that all plumes are stable or shrinking (GSI, 1996a,b,c,d; 1997b,c; 1998; 1999a). No offsite impact of potential receptors is expected.**

Footnotes:

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

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

_____ If yes – continue after identifying potentially affected surface water bodies.

√ If no, skip to #7 (and enter "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):

Injection Well Pretreatment Facility (IWPF): **The IWPF site has been undergoing hydraulic control and affected groundwater recovery since 1995 under a corrective action program (TNRCC, 1997). The facility is approximately 2000 ft from Chocolate Bayou, the principal point of potential surface water discharge. Natural attenuation investigations and groundwater modeling indicate that the plume is stable or shrinking (GSI, 1996c,d, 1999c). No discharge into Chocolate Bayou is expected. Concerns about the potential for discharge of the IWPF plume into the MHBA Ditch, and from there to Chocolate Bayou, have been addressed to the TNRCC's satisfaction (GSI, 1994) as part of the agency's approval process of the current Compliance Plan (TNRCC, 1997).**

RCRA Facility Investigation (RFI) Units: **Groundwater impacts were detected in Units A, C, I, J, and 02. The affected groundwater plumes at the RFI sites are over 800 ft (Unit I) or over 2000 ft (Units A, C, J, and 02) from the facility boundary at Chocolate Bayou, the principal point of potential surface water discharge at the plant. Natural attenuation investigations and modeling indicate are plumes are stable or shrinking (GSI, 1996a,b,c,d; 1997b,c; 1998; 1999a,b). Therefore, no discharge into Chocolate Bayou is expected.**

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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)?

Not Applicable

_____ 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):

Not Applicable

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])?

Not Applicable

_____ 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 interm-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):

Not Applicable

Footnotes:

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

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

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

√ If yes – continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no – enter "NO" status code in #8.

_____ If unknown – enter "IN" status code in #8.

Rationale and Reference(s):

Injection Well Pretreatment Facility (IWPF): **The IWPF site is under corrective action implementation, which includes semiannual sampling and testing of 15 groundwater monitoring wells (GSI, 1997a, 1999a). The sampling program will continue as required by the TNRCC**

RCRA Facility Investigation (RFI) Units: **CMS reports have not been completed for RFI Units A, C, I, J, and 02, pending TNRCC approval of the Phase II RFI for Units A and C (GSI, 1996e). Groundwater monitoring for these sites, if needed, will be determined after the completion of the CMS.**

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

YE 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" a at the **Solutia Inc. Chocolate Bayou** facility, EPA ID **#TXD001700806**, located in **Alvin, Texas.** Specifically, this determination indicates that the migration of "contamination" 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) Thomas M Moran, P.E. Date 11-11-99
(print) **Thomas M. Moran**
(title) **Sr. Environmental Specialist**

Supervisor (signature) Don Meade Date 11-11-99
(print) **Don Meade**
(title) **ESH Superintendent**
(EPA Region or State) **Texas**

Locations where References may be found

TNRCC files and/or Solutia Chocolate Bayou Plant files.

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