

**Documentation of Environmental Indicator Determination
in accordance with EPA Interim Final Guidance 2/5/99**

**RCRA Corrective Action
Environmental Indicator (EI) RCRA Info Code (CA750)**

Migration of Contaminated Groundwater Under Control

Facility Name: Kerr-McGee Chemical Corporation
Facility Address: 2300 Oakland, Kansas City, Missouri
Facility EPA ID #: MOD 007 128 978

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 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 EIs 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 EIs 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 Determination status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info 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):

Creosote free product and dissolved contaminants of concern (COCs) are present beneath SRA I and SRA IV at concentrations above the groundwater protection standards (GPS) for COCs established for this site in Special Condition XXIII.C.3 of the Part I RCRA Permit. Maps of the site are located in the attached Figures 1 through 4, and a list of COCs at this site are in the attached Table I. Per Special Permit Condition XXIII.C.3, the GPS is equivalent to the method detection limit (MDL) for each COC in accordance with the appropriate SW-846 analytical method. For those sample analyses exhibiting matrix interference, MDL's are less than or equal to the practical quantitation limits for each parameter as identified in the appropriate SW-846 test method.

It should be noted that the Permit will be modified soon and the GPS are likely to be modified at that time. The likely new GPS are listed in Table I. The current concentrations of COCs in the groundwater at this facility are above the proposed modified GPS. Please see Tables III and IV for the February 2003 COC concentrations.

The hazardous constituent o-toluidine has been detected in groundwater at this site and will be included in the modified permit in the list of groundwater monitoring hazardous constituents.

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)?

- 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):

Historical source areas for groundwater contamination have essentially all been removed/remediated. Groundwater reports indicate that the plume has been stable for at least ten years (see Figures 3 and 4 for plume locations and see Figures 5 and 6 for potentiometric information). The groundwater pump, treat, and monitoring program at this facility will track long-term contaminant migration and trends in contaminant concentrations.

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?

 X If yes - continue after identifying potentially affected surface water bodies.

 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):

There are two impacted groundwater zones at the facility - a shallow zone and a deeper zone. The Blue River and the 23rd Street Viaduct drainage channel appear to be the local discharge point for the groundwater system (see Figures 5 and 6 for potentiometric information).

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times the appropriate groundwater “level,” and there are no other conditions (e.g., the nature or 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)?

 X If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ 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 concentration³ 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 concentrations³ greater than 100 times the 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):

The COCs plume in the groundwater extends to the Blue River and to the 23rd Street Viaduct drainage channel. However, discharge of COCs to surface water is expected to be minimal because of the influence of the groundwater/DNAPL recovery system. Further, groundwater elevations at the site have dropped from 10 - 20 feet across the site since the Blue River rechannelization project, resulting in less hydraulic head to cause contamination migration, thus lessening potential discharge to the Blue River. Also, the majority of the 23rd Street Viaduct drainage channel is concreted, which impedes the discharge of COC contaminated groundwater to surface water.

Free product and dissolved phase COCs are present in the shallow and deep zone, however, based on surface water and sediment sampling in the Blue River, no statistically significant evidence of groundwater impacts to surface water have been demonstrated.

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 implemented⁴)?

_____ 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 specialist(s), 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 cannot 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):

Special Permit Condition XXIII of the RCRA Part I Permit for this site requires KMCC to design, install, and maintain a groundwater monitoring system for the length of the compliance period, and states that this system shall continue until the GPS concentration limits have not been exceeded at or beyond the point of compliance for a period of three consecutive years. The groundwater monitoring system includes semi-annual analyses of samples from 28 compliance and boundary control wells, and one background well, for the constituents listed in Table I, except o-toluidine. This constituent has recently been detected in groundwater at this site and will be included in the modified permit in the list of groundwater monitoring hazardous constituents. Please see Table II for a list of the wells to be sampled and Figure 2 for the location of these wells.

8. Check the appropriate RCRA Info 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 Kerr-McGee Chemical Corporation, EPA ID # MOD 007 128 978, located at Kansas City, Missouri. 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 9/30/03
(Print) Julie Pearson, P.E.
(Title) Environmental Engineer, Corrective Action Unit

Supervisor: (Signature) Original signed by _____ Date 9/30/03
(Print) Richard A. Nussbaum, P.E., R.G.
(Title) Chief, Corrective Action Unit
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Locations where References may be found:

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Table I
Groundwater Protection Standards

| Groundwater Monitoring Constituent | Maximum Concentration Limit (µg/l) | Detection Limit (µg/l)• |
|------------------------------------|------------------------------------|-------------------------|
| Acenaphthene | 20 (b,f) | 10 |
| Acenaphthylene | 10 (e,f) | 10 |
| Anthracene | 9600 (b,f) | 10 |
| Benzene | 5 (a) | 5 |
| Benzo (a) anthracene | 10 (e) | 10 |
| Benzo (b) fluoranthene | 10 (e) | 10 |
| Benzo (k) fluoranthene | 10 (e) | 10 |
| Benzo (a) pyrene | 10 (e) | 10 |
| Benzo (g,h,l) perylene | 10 (e,f) | 10 |
| Carbazole | 10 (e,f) | 10 |
| Chrysene | 10 (e) | 10 |
| Dibenzofuran | 12 (c,f) | 10 |
| Dibenz(a,h)anthracene | 10 (d) | 10 |
| 2,4-Dimethylphenol | 540 (b) | 10 |
| Fluoranthene | 300 (b) | 10 |
| Fluorene | 1300 (b,f) | 10 |
| Indeno (1,2,3-cd)pyrene | 10 (e) | 10 |
| 2-methylnaphthalene | 120 (c,f) | 10 |
| Naphthalene | 6.5(c) | 10 |
| Phenanthrene | 10 (e,f) | 10 |
| Phenol | 100 (b) | 10 |
| Pyrene | 960 (b,f) | 10 |
| Toluene | 1000 (a) | 5 |
| o-Toluidine | 10 (c,d,e) | 10 |

- The lower of Practical Quantitation Limits (PQLs) contained in the latest version of the EPA publication entitled: Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846) or method specific detection limits routinely achieved by Permittee's laboratory.

(a) Denotes limits derived from state (10 CSR 60 Chapter 4) and federal public drinkingwater regulations.

(b) Denotes limits derived from Missouri Water Quality Standards (10 CSR 20-7.031) for protection of groundwater.

(c) Denotes limits derived from risk-based concentration values for tap water as contained in the EPA Region III Risk-Based Concentration Table dated April 25, 2003.

(d) Denotes limits derived from risk-based concentration values for tap water as contained in the EPA Region IX Preliminary Remediation Goals Table dated October 1, 2002.

- (e) Health- and/or environmental-based levels are lower than the ability of current analytical technology to routinely attain detection limits at or below such levels. These constituents and their health- and/or environmental-based criteria are listed below.

| Groundwater Monitoring Maximum Concentration | | |
|--|--------------|--------|
| Hazardous Constituent | Limit (µg/l) | Source |
| Acenaphthylene | 0.0044 | (b) |
| Benzo (a) anthracene | 0.0044 | (b) |
| Benzo (b) fluoranthene | 0.092 | (c) |
| Benzo (k) fluoranthene | 0.0044 | (b) |
| Benzo (g,h,l) perylene | 0.0044 | (b) |
| Benzo (a) pyrene | 0.2 | (b) |
| Carbazole | 3.4 | (c) |
| Chrysene | 0.0044 | (b) |
| Dibenzo (a,h) anthracene | 0.0092 | (b) |
| Indeno (1,2,3-cd) pyrene | 0.0044 | (b) |
| Phenanthrene | 0.0044 | (b) |
| o-Toluidine | 0.28 | (c,d) |

- (f) Denotes a chemical which is not a hazardous constituent as defined in the definitions section of this Permit, but is a groundwater monitoring constituent defined in 40 CFR Part 264 Appendix IX and a chemical compound which is a plume indicator. Maximum concentration limits are defined for these compounds where available.

Table II

Groundwater Monitoring System Wells

| | | |
|--|--|---|
| Shallow Compliance Wells | KC-03 KC-05 KC-15 | KC-21A KC-22 KC-23 |
| Shallow Boundary Control Wells | KCSS-2A KCSS-3 KCSS-11 KCSS-15 KCSS-16 | KCSS-18 KCSS-22A KCSS-21 KCSS-24 KCSS-23B |
| Shallow Corrective Action Effectiveness Well | KCSS-16 | |
| Shallow Background Well | KCSS-1 | |
| Deep Compliance Wells | KC-02 KC-04 KC-06 KC-07 | KC-09 KC-12 KC-13 |
| Deep Boundary Control Wells | KCSS-12 KCSS-17 KCSS-19 | KCSS-20 KCSS-25 |
| Deep Corrective Action Effectiveness Wells | RW-08* RW-10* | |

* Denotes recovery wells. Due to the free product in recovery wells, samples from these wells are not analyzed for constituents of concern.

Table III

February 2003
 Constituents of Concern Concentrations
 In Shallow Monitoring Wells near the
 Blue River and 23rd Street Viaduct Drainage Channel

| Groundwater Monitoring Constituent | KCSS-16 Shallow Boundary Well near Blue River | KCSS-21 Shallow Boundary Well 100' north of 23rd Street Viaduct Drainage Channel | KC-15 Shallow Boundary Well 300' south of 23rd Street Viaduct Drainage Channel | Maximum Concentration Limit (µg/l) |
|--|---|--|--|--|
| Acenaphthene | ND | ND | 570 | 20 |
| Acenaphthylene | ND | ND | 110 J | 10 |
| Anthracene | ND | ND | 100 J | 9600 |
| Benzene | ND | ND | 2900 | 5 |
| Benzo (a) anthracenene | ND | ND | 68 J | 10 |
| Benzo (b) fluoranthene | ND | ND | 37 J | 10 |
| Benzo (k) fluoranthene | ND | ND | 14 J | 10 |
| Benzo (a) pyrene | ND | ND | 27 J | 10 |
| Benzo (g,h,l) perylene | ND | ND | ND | 10 |
| Carbazole | ND | ND | 420 | 10 |
| Chrysene | ND | ND | 65 J | 10 |
| Dibenzofuran | ND | ND | 450 | 12 |
| Dibenz(a,h)anthracene | ND | ND | ND | 10 |
| 2,4-Dimethylphenol | ND | ND | 13000 | 540 |
| Fluoranthene | ND | ND | 300 | 300 |
| Fluorene | ND | ND | 500 | 1300 |
| Indeno (1,2,3-cd)pyrene | ND | ND | ND | 10 |
| 2-methylnaphthalene | ND | ND | 1700 J | 120 |
| Naphthalene | ND | ND | 20000 | 6.5 |
| Phenanthrene | ND | ND | 630 | 10 |
| Phenol | ND | ND | 2200 J | 100 |
| Pyrene | ND | ND | 180 | 960 |
| Toluene | ND | ND | 980 | 1000 |
| o-Toluidine | na | na | na | 10 |

J - Estimated value

ND - not detected

na - not analyzed

Table IV

February 2003
 Constituents of Concern Concentrations
 In Deep Monitoring Wells near the
 Blue River and 23rd Street Viaduct Drainage Channel

| Groundwater Monitoring Constituent | KCSS-17 Deep Boundary Well near Blue River | KCSS-19 Deep Boundary Well south bank of 23rd Street Viaduct Drainage Channel | KCSS-20 Boundary Well north bank of 23rd Street Viaduct Drainage Channel | Maximum Concentration Limit (µg/l) |
|--|--|---|--|--|
| Acenaphthene | 17 | 4 J | ND | 20 |
| Acenaphthylene | ND | ND | ND | 10 |
| Anthracene | ND | ND | ND | 9600 |
| Benzene | ND | 9.1 | ND | 5 |
| Benzo (a) anthracenene | ND | ND | ND | 10 |
| Benzo (b) fluoranthene | ND | ND | ND | 10 |
| Benzo (k) fluoranthene | ND | ND | ND | 10 |
| Benzo (a) pyrene | ND | ND | ND | 10 |
| Benzo (g,h,l) perylene | ND | ND | ND | 10 |
| Carbazole | ND | 5 J | ND | 10 |
| Chrysene | ND | ND | ND | 10 |
| Dibenzofuran | ND | 2 J | ND | 12 |
| Dibenz(a,h)anthracene | ND | ND | ND | 10 |
| 2,4-Dimethylphenol | ND | ND | ND | 540 |
| Fluoranthene | 4 J | 1 J | ND | 300 |
| Fluorene | 4 J | 2 J | ND | 1300 |
| Indeno (1,2,3-cd)pyrene | ND | ND | ND | 10 |
| 2-methylnaphthalene | ND | ND | ND | 120 |
| Naphthalene | ND | 2 J | ND | 6.5 |
| Phenanthrene | 2 J | 5 J | ND | 10 |
| Phenol | ND | ND | ND | 100 |
| Pyrene | 4 J | ND | ND | 960 |
| Toluene | ND | ND | ND | 1000 |
| o-Toluidine | na | na | ND | 10 |

J - Estimated value

ND - not detected

na - not analyzed