

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99
Revised 9/20/02

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: Coffeyville Resources Refining and Marketing Refinery (formerly Farmland Industries, Coffeyville)
Facility Address: 400 N. Linden Street, Coffeyville, Kansas, 67337
Facility EPA ID #: KSD007138605

DETERMINATION RESULT: YE

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.

The Coffeyville Resources Refining and Marketing (CRRM) Refinery (formerly Farmland Industries, Coffeyville refinery) is located on about 400 acres in Coffeyville, Kansas (see Figure 1). The facility has gone through a number of ownership changes since the National Refining Company began operations there in 1906 (Farmland Industries, Inc. [Farmland] 1999). It was purchased by Consumers Cooperative Association in 1944 and merged with Farmland in 1982 (Farmland 1999). In 1999, Farmland merged its refinery assets with those of National Cooperative Refinery Association (Farmland 1999). After Farmland declared bankruptcy, CRRM purchased the refinery in March 2004 (Environmental Strategies Consulting [ESC] 2005c).

The CRRM Refinery processes crude oil received by pipeline. It produces propane, gasoline, distillate fuels, fuel oil, and petroleum coke (Farmland 1999). Finished products leave by truck, rail, and pipeline (Farmland 1999). The facility also stores raw materials and finished products in aboveground storage tanks (AST) (Farmland 1999). Manufacturing processes have included isomerization, desulfurization, distillation, catalytic cracking, and alkylation (ESC 2005c). Before the CRRM refinery was constructed, the land was used for mineral extraction and industrial activity (Farmland 1999). The CRRM refinery property east of Sunflower Road formerly was used as a municipal landfill (Farmland 1999). The CRRM refinery discharges wastewater and storm runoff into the Verdigris River under a National Pollutant Discharge Elimination System (NPDES) permit (Farmland 1999).

Residential areas are west and south of the refinery; agricultural land is east, north, and northwest of the CRRM refinery; and the Verdigris River bisects the property (Farmland 1999). Adjacent properties are mostly industrial (ESC 2005b). Adjacent industrial facilities include the Coffeyville Resources Nitrogen Fertilizers facility, the Tessenderlo-KERLEY fertilizer plant, a Kansas Gas and Electric substation, the Coffeyville Concrete ready-mix plant, a Magellan Pipeline pumping station, and the BOC Gases facility to the south (ESC 2005b). Most of the CRRM refinery is surrounded by a fence, except for AOC I and the northern portion of AOC II, both along the banks of the Verdigris River (ESC 2005b).

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In 1994, Farmland entered into an administrative order on consent with the U.S. Environmental Protection Agency (EPA), which required a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI), a corrective measures study (CMS), and assessments of the need for interim measures before the CMS (Farmland 1999). When CRRM purchased the refinery in 2004, it assumed the obligations of the order (ESC 2005c). Four interim measures plans were submitted to EPA in 1994 and 1995: the Refinery Expansion Investigation and Remediation Workplan, the Groundwater Monitoring Workplan, the Free Product Recovery Workplan, and the Cutoff Trench Workplan (Farmland 1999). The draft RFI was completed in 1999, with a RFI addendum submitted to EPA in 2005 (Farmland 1999; ESC 2005b).

The 234 solid waste management units (SWMU) at the facility have been grouped into six areas of concern (AOC) based on geographic location and groundwater flow characteristics (Farmland 1999). Attachment 1 includes a list of all SWMUs at the facility. The AOCs are described in more detail below, and are shown on Figure 2.

AOC I is located north of the Verdigris River, west of Sunflower Road, and east of the railroad tracks (Farmland 1999). Groundwater in this area flows south, toward river (Farmland 1999). The area was purchased in 1956. It was in agricultural production until the 1970s, when aeration lagoons were constructed (Farmland 1999). The area encompasses three SWMUs (Farmland 1999). The RFI did not find any significant contamination in soil or groundwater in this AOC (Farmland 1999).

AOC II is located south of the Verdigris River and west of the railroad tracks (Farmland 1999). Groundwater in this area flows north, to the Verdigris River, but is generally deeper than in the rest of the facility as a result of groundwater extraction from SWMU 194 (the Cutoff Trench). The property was purchased in 1951 and converted into a holding pond for phenolic wastes and, later, into a series of lagoons known as the “oily ponds” (Farmland 1999). The area is now used to store product in ASTs and as the construction debris landfill (Farmland 1999). The area encompasses 16 SWMUs, some of which have soil contaminated with volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and total petroleum hydrocarbons (TPH). In addition, the AOC is also the location of several alkylation polymer seeps into the Verdigris River, probably derived from SWMU 110 (Tarry Sludge Pit), SWMU 111 (Polymer Sludge Pit), and SWMU 112 (Farmland 1999; ESC 2004b). Groundwater in the area is contaminated with SVOCs, metals, and TPH (Farmland 1999).

AOC III is the northern half of the main part of refinery, between Sunflower Road and the railroad tracks (Farmland 1999). Groundwater in this area flows north, toward the Verdigris River (Farmland 1999). The property was purchased in 1906 and 1911 (Farmland 1999). The area is used for product and raw material storage and for ponds and equipment related to the wastewater treatment plant (WWTP) (Farmland 1999). The area encompasses 34 SWMUs, some of which have soil contaminated with VOCs, SVOCs, and TPH (Farmland 1999). Groundwater in the area is contaminated with VOCs, SVOCs, metals, and TPH (Farmland 1999).

AOC IV is the southern half of the main part of refinery, bounded by two sets of railroad tracks and Sunflower Road (Farmland 1999). Groundwater in this area has relatively flat gradients, with flow generally to the north (Farmland 1999). The property was purchased in 1905 and 1913 (Farmland 1999). All of the CRRM refinery’s process units and offices are located in this area, except the WWTP. The southwestern part of the area is an AST tank farm (Farmland 1999). The area encompasses 139 SWMUs, some of which have soil contaminated with VOCs, SVOCs, and metals (Farmland 1999). Groundwater in the area is contaminated with VOCs, SVOCs, metals, and TPH (Farmland 1999).

AOC V is the area southeast of the railroad tracks and west of Sunflower Road (Farmland 1999). Groundwater in this area flows southeast away from facility (Farmland 1999). The property was purchased in 1942 (Farmland 1999). The area is used primarily to store product and to load and unload railcars and trucks (Farmland 1999). The area encompasses 23 SWMUs, some of which have soil contaminated with VOCs and SVOCs (Farmland 1999). Groundwater in the area is contaminated with VOCs, metals, and TPH (Farmland 1999).

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AOC VI is the area southeast of the main facility and east of Sunflower Road (Farmland 1999). Groundwater in this area flows southeast, with a steeper gradient than that of AOC V (Farmland 1999). The property was purchased in 1976, and it was used previously as a municipal landfill and an oil production area (Farmland 1999). Farmland has used the area for disposal of slag and ash, for landfarming petroleum wastes, and for storing products in ASTs (Farmland 1999). The RFI did not find any significant contamination in soil or groundwater in this AOC (Farmland 1999).

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 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).

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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):

The CRRM refinery is underlain by Quaternary alluvial deposits that overlie interbedded Pennsylvanian limestone, shale, and sandstone; both the alluvial material and bedrock host groundwater (Farmland 1999). The alluvial deposits consist of, from top to bottom, an upper clay unit, a clayey silt, and a basal sand and gravel unit (Farmland 1999). The clayey silt and basal unit forming the alluvial aquifer can be as thick as 40 feet and, locally, can exhibit semi-confined conditions (Farmland 1999). The bedrock aquifer is part of a large, regional groundwater system in Pennsylvanian-age sandstones and fractured and weathered shales and limestones. Across most of the facility, the uppermost water-bearing bedrock units (the Seminole Formation and Checkerboard Limestone) are in communication with the basal alluvial deposits (Farmland 1999). A confining layer (the Holdenville Shale) underlies all of the facility, at a depth of about 80 feet below ground surface (bgs) (Farmland 1999).

Groundwater can be encountered at depths as shallow as 2 feet bgs (Farmland 1999; ESC 2005a). Groundwater across most of the facility flows toward and discharges into the Verdigris River (see Figure 3) (Farmland 1999). In AOC II, at least three groundwater seeps have been observed between the Cutoff Trench and the river (Farmland 1999).

Groundwater at the CRRM refinery is contaminated with metals, VOCs, SVOCs, and TPH. Light nonaqueous-phase liquid (LNAPL) is also present under much of the facility, particularly under AOC IV. The CRRM refinery has had at least 130 monitoring wells, although, as of the most recent sampling events, only 54 wells are regularly sampled (Farmland 1999; ESC 2005a). The monitoring well network is shown in Figure 4. Groundwater samples are collected quarterly and analyzed for VOCs, SVOCs, total metals, and TPH (ESC 2005a). In addition, the thickness of LNAPL is measured at least quarterly, if not monthly, in all monitored wells (ESC 2005a).

The most contaminated groundwater samples have been collected from the wells in AOCs III, IV, and V. Table 1 shows groundwater impacts reported in the RFI, and Table 2 shows the maximum concentrations of hazardous constituents in groundwater reported in the most recent semiannual report. The highest concentrations of hazardous constituents are near or downgradient of the largest LNAPL plumes (see Attachment 2). Two metals—arsenic and barium—exceeded their industrial risk-based standards for Kansas (RSK) values for groundwater. Three VOCs—benzene, ethylbenzene, and toluene—exceeded their industrial RSK concentrations. Four SVOCs—benzo(a)pyrene, 2,4-dimethylphenol, 2-methylphenol, and 3-methylphenol—exceeded their industrial RSK concentrations. Two SVOCs—naphthalene and phenol—exceeded their residential RSK concentrations. However, because of high

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).

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concentrations of VOCs and SVOCs, detection limits for some VOCs and SVOCs were above their RSK concentrations in the most affected wells (MW-22 and RMW-104) (ESC 2005a). Concentrations of arsenic and benzene in groundwater exceed MCL over much of the CRRM refinery.

TABLE 1

GROUNDWATER IMPACT REPORTED IN RCRA FACILITY INVESTIGATION

Area of Concern	Hydrocarbon Impact	VOC Impact	SVOC Impact	Metals Impact
I	None	None	None	Yes, cadmium
II	Yes, total purgeable hydrocarbons, semivolatiles hydrocarbons	None	Yes, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, DEHP, fluoranthene, pyrene	Yes, arsenic, barium, beryllium, cadmium, chromium, lead
III	Yes, total purgeable hydrocarbons, semivolatiles hydrocarbons	Yes, benzene, ethylbenzene, toluene, xylene	Yes, benzo(a)anthracene, benzo(a)pyrene, chrysene, DEHP, di-n-octylphthalate, fluoranthene, pyrene	Yes, arsenic, beryllium, cadmium, chromium, lead
IV	Yes, total purgeable hydrocarbons, semivolatiles hydrocarbons	Yes, benzene, carbon disulfide, 1,1-DCE, 1,2-DCA, ethylbenzene, toluene	Yes, acenaphthalene, benzo(a)pyrene, DEHP, fluorene, naphthalene, 1- and 2-methylnaphthalene, phenanthrene	Yes, arsenic, beryllium, cadmium, chromium, lead
V	Yes, total purgeable hydrocarbons, semivolatiles hydrocarbons	Yes, benzene, ethylbenzene, toluene, xylene	Yes, benzo(a)pyrene, DEHP, naphthalene, 1- and 2-methylnaphthalene, phenanthrene	Yes, arsenic, beryllium, chromium, lead, selenium
VI	Yes, semivolatiles hydrocarbons	None	None	Yes, antimony, beryllium, chromium, lead

Notes:

Table derived from the RCRA Facility Investigation (Farmland Industries 1999). Determination of impact is based on exceeding available U.S. Environmental Protection Agency's maximum contaminant level or Kansas Department of Health and Environment risk-based standards, when known.

- DCE Dichloroethene
- DCA Dichloroethane
- DEHP Bis(2-ethylhexyl)phthalate
- RCRA Resource Conservation and Recovery Act
- SVOC Semivolatiles organic compound
- VOC Volatiles organic compound

TABLE 2

**MAXIMUM CONCENTRATIONS OF HAZARDOUS CONSTITUENTS IN GROUNDWATER
OCTOBER 2004 – MARCH 2005**

Constituent	Concentration (mg/L)	Well	EPA MCL (mg/L)	Industrial RSK (mg/L)	Other Wells Exceeding MCL
Total Metals					
Arsenic	0.428	RMW-166	0.05	0.01	MW-24, MW-34, RMW-104, RMW-108, RMW-168

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TABLE 2

**MAXIMUM CONCENTRATIONS OF HAZARDOUS CONSTITUENTS IN GROUNDWATER
OCTOBER 2004 – MARCH 2005**

Constituent	Concentration (mg/L)	Well	EPA MCL (mg/L)	Industrial RSK (mg/L)	Other Wells Exceeding MCL
Barium	3.7	RMW-302	2	2	RMW-304
Chromium	0.01	RMW-015	0.1	0.1	
Lead	0.01	MW-21	0.015*	0.015	
Volatile Organic Compounds					
Benzene	20.2	RMW-104	0.005	0.005	MW-22, RMW-010, RMW-107, RMW-108, RMW-131, RMW-141, RMW-149, RMW-166, RMW-169
1,2-Dichloroethene	0.0582 J	RMW-010	0.07	0.07	
Ethylbenzene	1.16	RMW-010	0.7	0.7	MW-22, RMW-104
Toluene	3.57	MW-22	1	1	RMW-104, RMW-108
Xylenes, total	6.69	MW-22	10	10	
Semivolatile Organic Compounds					
Acenaphthene	0.021	RMW-107	0.13**	0.49	
Benzo(a)pyrene	0.002	MW-30	0.0002	0.0002	
2,4-Dimethylphenol	29	MW-22	0.28**	1.8	
Fluorene	0.024	RMW-166	0.07**	0.28	
1-Methylnaphthalene	0.26	RMW-107	NA	NA	
2-Methylnaphthalene	0.29	RMW-166	NA	NA	
2-Methylphenol (o-cresol)	69	MW-22	0.74**	4.7	
3-Methylphenol (m-cresol)	180	RMW-104	0.74**	4.7	MW-22
Naphthalene	0.32	RMW-149	0.1**	0.35	RMW-104, RMW-107, RMW-108
Phenanthrene	0.038	RMW-166	NA	NA	
Phenol	57	MW-22	9.0**	58	
Petroleum Hydrocarbons					
Total Purgeable Hydrocarbons	26	MW-22	NA	NA	
Calculated as Kerosene	12	RMW-010	NA	NA	
Calculated as Diesel	240	MW-22	NA	NA	
Calculated as Motor Oil	21	RMW-010	NA	NA	

Notes:

Table derived from the most recent semi-annual report (Environmental Strategies Consulting 2005a). Concentrations in bold italics exceed the industrial RSK concentration (KDHE 2003). Concentrations in bold exceed the MCL, action level, or residential RSK (EPA 2002; KDHE 2003).

* EPA has not established a MCL for lead. The EPA action level is used (EPA 2002).

** EPA does not specify a MCL for this constituent (EPA 2002). KDHE residential RSK for groundwater is used (KDHE 2003).

EPA U.S. Environmental Protection Agency
 KDHE Kansas Department of Health and Environment
 MCL Maximum contaminant level
 NA Not available
 mg/L Milligrams per liter
 RSK Risk-based Standards for Kansas

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In addition to dissolved contaminants, LNAPL was found in wells in several areas of the facility (see Figure 3). LNAPL at the facility is comprised of a mix of kerosene, diesel, motor oil, and other purgeable and semivolatile petroleum hydrocarbons. The plume in AOC V is primarily leaded gasoline, whereas LNAPL in AOC III and AOC IV is a mixture of light, middle, and heavy distillates (ESC 2005a). Table 3 shows the constituents detected in free product during the RFI sampling (Farmland 1999). The RFI reported a maximum LNAPL thickness of 9.25 feet (in AOC IV) (Farmland 1999). In most recent sampling, the maximum thickness of LNAPL was 5.55 feet, around the RMW-18 well as a result of recently initiated and on-going pumping (ESC 2005a). In 2001, the facility established a new system of LNAPL recovery; 12 wells are pumped weekly to remove LNAPL (Farmland 2001b). An enhanced interim measures LNAPL recovery system will be implemented in the near future.

TABLE 3

CONSTITUENTS DISSOLVED IN FREE PRODUCT

Constituent	Concentration (mg/kg)	Well
Metals		
Arsenic	31.7	RMW-136
Barium	44.8	MW-17
Chromium	128	MW-33
Copper	1.0	MW-26
Lead	6	RMW-119
Selenium	3.8	PZ-1B
Volatile Organic Compounds		
Benzene	6,600	RMW-2
Ethylbenzene	18,000	RMW-2
Toluene	21,000	RMW-1
Xylene	94,000	RMW-2
Semivolatile Organic Compounds		
Acenaphthene	2,400	RMW-1
Anthracene	7	MW-13
Benzo(a)anthracene	1,300	MW-20
Benzo(a)pyrene	650	MW-17
Benzo(b)fluoranthene	670	MW-20
Benzo(k)fluoranthene	6	MW-13
Chrysene	3,500	MW-17
Fluoranthene	640	MW-17
Fluorene	360	MW-20
1-Methylnaphthalene	3,000	RMW-166
2-Methylnaphthalene	7,400	RMW-1
Naphthalene	7,600	RMW-1
Phenanthrene	1,300	MW-20
Pyrene	2,500	MW-20

Notes:

Table derived from the Resource Conservation and Recovery Act Facility Investigation (Farmland 1999).
mg/kg Milligrams per kilogram

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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”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):

Horizontal migration of contaminated groundwater from the facility is stabilized. Groundwater in AOCs Attachment 2 shows isoconcentration maps and maps of LNAPL at the facility for the period from April 2004 to January 2005 (ESC 2004c, 2005a). These maps show that groundwater contaminated with benzene and arsenic is remaining within established boundaries and that the area with groundwater with concentrations above MCL is bounded for each of these contaminants. LNAPL also is not migrating into new areas. Although the area with LNAPL thicker than 0.5 feet has grown as a result of long-term pumping in 2004 from well MW-18, the footprint of the LNAPL plume has not expanded (ESC 2005b).

Contaminated groundwater may be migrating vertically at the CRRM refinery, but water levels in well couplets in alluvial and bedrock aquifers show an upward vertical gradient between bedrock aquifer and basal alluvium (ESC 2005b). Table 4 shows water levels in well clusters at the CRRM refinery from April 2004 to January 2005. With the exception of July 2004, groundwater shows a consistent upward gradient. The July 2004 water level measurements suggest that bedrock recharge in the summer was insufficient to support the upward gradient. Regardless of gradient, however, a confining layer (the Holdenville Shale) underlies all of the facility, at a depth of about 80 feet bgs (Farmland 1999)

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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TABLE 4

WATER LEVELS IN DEEP AND SHALLOW WELLS

Well Cluster	April 2004				July 2004				October 2004				January 2005			
	WL-DP (feet AMSL)	WL-IN (feet AMSL)	WL-SH (feet AMSL)	Move- ment	WL-DP (feet AMSL)	WL-IN (feet AMSL)	WL-SH (feet AMSL)	Move- ment	WL-DP (feet AMSL)	WL-IN (feet AMSL)	WL-SH (feet AMSL)	Move- ment	WL-DP (feet AMSL)	WL-IN (feet AMSL)	WL-SH (feet AMSL)	Move- ment
RMW-129(I) RMW-301(D)*	700.17	698.99	NA	Up	696.33	697.5	NA	Down	697.47	696.3	NA	Up	699.37	698.3	NA	Up
RMW-116(S) RMW-217(I) RMW-302(D)	708.47	707.44	707.49	Up	706.75	708.95	708.67	Down	706.99	706.32	706.37	Up	710.24	710.24	710.29	Down
RMW-173(S) RMW-218(I) RMW-303(D)	716.9	716.76	716.75	Up	714.58	715.77	716.59	Down	715.26	714.84	714.88	Up	717.39	717.28	717.24	Up
RMW-174(S) RMW-219(I) RMW-304(D)	713.4	712.83	712.53	Up	711.73	710.51	712.36	Down	711.96	712.5	711.37	Up	713.65	713.03	712.8	Up

Notes:

Water levels from 2004 and 2005 semi-annual groundwater reports (Environmental Strategies Consulting 2004b, 2005a).

Shaded cells indicate a downward vertical gradient.

* No shallow well installed in this cluster.

AMSL Above mean sea level

NA Not applicable

WL-DP Water level in deep well, installed in bedrock

WL-IN Water level in intermediate well, installed in basal gravel

WL-SH Water level in shallow well, installed in clayey silt

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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):

Most of the CRRM refinery lies in the 500-year floodplain of the Verdigris River, which bisects the facility (see Figure 2) (ESC 2005b). The area east of Sunflower Road is protected by a levee, and the southern portion of the main process area is above the floodplain (ESC 2005b). The CRRM Refinery uses water from the river for industrial purposes. In addition, the City of Coffeyville diverts water for municipal use upstream of the CRRM refinery (ESC 2005b). Surface water runoff from AOCs IV, V, and VI is captured by a site sewer system and channeled into the WWTP before it is discharged to the Verdigris River by a NPDES-permitted outfall (ESC 2005b). Surface water runoff from all other areas at the facility drains directly into the river (ESC 2005b).

The facility also has five permanent surface water bodies. The Cold Water Pond is a 5-acre impoundment on the south side of AOC III, used by the CRRM refinery for storage of clarified river water for industrial processing. It also serves as a source of fire-suppression water (Farmland 1999). A 2-acre impoundment on the east side of the east tank farm (AOC VI) is used as a stormwater detention pond and firefighting reserve (Farmland 1999). Finally, the facility maintains three ponds, totaling 40 acres, on property north of the river and north of AOC I. These ponds are the final polishing/oxidation lagoons for the CRRM refinery’s WWTP before the water is discharged to the river (Farmland 1999).

Groundwater mixed with alkylation polymer as a separate phase does discharge to the Verdigris River from riverbank seeps in AOC II. In December 2002, samples were collected from the alkylation polymer seeps along the Verdigris River banks. One seep sample contained benzo(a)anthracene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, and chrysene at concentrations above their EPA maximum contaminant levels (MCL) or industrial RSKs for groundwater (EPA 2003, Farmland 2003). However, these detects are believed to be the result of analysis of the polymer component of the sample and are not believed to reflect dissolved concentrations. Groundwater samples also are collected regularly from the Cutoff Trench, immediately upgradient of the river. No VOCs or SVOCs have been detected regularly since 2000, and no metals have been detected at concentrations above their MCLs. Bis(2-ethylhexyl)phthalate was detected in the sample collected in 2000, but it was also detected in the method blank (Farmland 2000). However, gasoline-range (GRO) and diesel-range (DRO) TPH have been detected at levels that exceed industrial RSK values (Farmland 2000, 2001, 2002, 2003; ESC 2004a, 2005a). The maximum concentration of TPH-GRO was 1.6 milligrams per liter (mg/L), detected in 2003, and the maximum for TPH-DRO was 3.66 mg/L, detected in 2001 (Farmland 2001, 2003). The industrial RSK value for TPH-GRO and TPH-DRO in groundwater are 0.500 mg/L and 0.720 mg/L, respectively (KDHE 2003).

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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 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)?

 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 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):

Although seeps adjacent to the Verdigris River do discharge groundwater mixed with alkylation polymer, they have not caused significant impact on the river. During the 1999 RFI, when surface water samples were collected from five transects on the Verdigris River, no VOCs or SVOCs were detected in any surface water or sediment sample (Farmland 1999). Metals were detected, but none had concentrations that significantly exceeded background concentrations (Farmland 1999). Furthermore, these alkylation polymer seeps are currently in the process of being eliminated.

Neither surface water nor sediment was collected from the surface water bodies on the CRRM property, but, given their derivation, they are likely not contaminated. The Cold Water Pond is derived from clarified river water. The three polishing ponds are located immediately before discharge to the river and are monitored at the outfall. The stormwater detention pond drains an area with no evidence of surface soil contamination.

³ 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 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-assessment⁵, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

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

_____ If unknown - skip to 8 and enter “IN” status code.

Rationale and Reference(s):

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

⁵The 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):

The CRRM refinery has had at least 130 monitoring wells, although, as of the most recent sampling events, only 54 wells are regularly sampled (Farmland 1999; ESC 2005a). The monitoring well network is shown in Figure 4. Groundwater samples are collected quarterly and analyzed for VOCs, SVOCs, total metals, and TPH (ESC 2005a). In addition, the thickness of LNAPL is measured at least quarterly, if not monthly, in all monitored wells (ESC 2005a).

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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).

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 Coffeyville Resources Refining and Marketing Refinery (formerly Farmland Industries, Coffeyville) facility, EPA ID # KSD007138605, located at 400 N. Linden, Coffeyville, KS 67337. 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 William J. Johnson _____ Date 09/08/05__
(signature)
Jeff Johnson
Project Manager, RCRA Corrective Action & Permits Branch
EPA Region 7

Supervisor Don Toensing _____ Date 09/21/05__
(signature)
Don Toensing
Branch Chief, RCRA Corrective Action & Permits Branch
EPA Region 7

Locations where References may be found:

EPA Region 7 Headquarters
RCRA Files
901 North 5th Street
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FIGURES

(4 pages)

FIGURE 1 – SITE LOCATION MAP

FIGURE 2 – SITE LAYOUT MAP

FIGURE 3 – POTENTIOMETRIC SURFACE AND LNAPL THICKNESS

FIGURE 4 – MONITORING WELL NETWORK

ATTACHMENT 1

LIST OF SOLID WASTE MANAGEMENT UNITS

ATTACHMENT 2

FREE PRODUCT THICKNESS AND ISOCONCENTRATION MAPS