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: BP Amoco Petroleum Products, Salt Lake City Refinery
Facility Address: 474 West 900 North, Salt Lake City, Utah 84103-1494
Facility EPA ID #: UTD 000826362

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 "Migration of Contaminated Groundwater Under Control" EI

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

Relationship of EI to Final Remedies

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

Duration / Applicability of EI Determinations

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

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

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

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

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

Rationale and Reference(s):
As stated in the Amoco Salt Lake City Refinery, RCRA Facility Investigation Report, April 30, 1998, "The main source of contamination for the shallow aquifer are free-phase hydrocarbons in the soil and groundwater which occur over much of the central part of the Refinery. BETX and TPH components dissolve into groundwater where groundwater and free-phase hydrocarbons are in contact."

Media	Contaminant	Levels of Concern[2]	Max. Detected	Location
Groundwater	Benzene	5 ug/l	Free-product	Tank Storage Area
Groundwater	Ethylbenzene	700 ug/l	Free-product	Tank Storage Area
Groundwater	Toluene	1,000 ug/l	Free-product	Tank Storage Area
Groundwater	Xylenes (total)	10,000 ug/l	Free-product	Tank Storage Area
Groundwater	Arsenic	50 ug/l	340 ug/l	MW-92-33
Groundwater	Lead	15 ug/l	34.3 ug/l	MW-61

[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).

[2] Levels of Concern for Groundwater Contaminant come from the Water Quality Maximum Contaminant Levels (MCL's) Rule R309-103, Utah Division of Drinking Water.

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

__X__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[3]).

_____ 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):

History of Groundwater Corrective Action at the Amoco Refinery:

Commencing in 1984 Amoco installed a groundwater recovery system consisting of three interceptor trenches. The three recovery trenches began pumping contaminated groundwater in December, 1984. Petroleum products were recovered from the trenches and groundwater was processed by Amoco's Waste Water Treatment System prior to discharge to the Salt Lake City POTW.

A review of the recovery trench system recommended installation of a fourth trench. In October, 1990 a fourth trench was installed and pumping commenced the first week of December, 1990.

Hydraulic control of contaminated groundwater was lacking in the southwest area near the Marketing Terminal. Amoco installed recovery well RS-W1 in the southwest corner of the Amoco property in late December, 1991. The well was pumped continuously from February 10 to April 13, 1992 as part of a pump test and has been pumping since then at about 15 gpm.

As a result of contaminated groundwater and free-phase hydrocarbon seepage into the Salt Lake City stormwater sewer located on the Union Pacific Railroad, Amoco installed three additional trenches along the west perimeter fence line adjacent to the Union Pacific property. Construction on the trenches was from May 13, to May 31, 1996. The recovery trenches began operations on June 3, 1996.

Currently, all groundwater flow paths that cross the refinery are captured by BP Amoco's recovery system, with the exception of an area where no recovery systems have been installed located north of the recovery system RS-W1 near the south end of the refinery. This area of no hydraulic control is also evident from the quarterly monitoring of groundwater levels in the area. Groundwater analysis data

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[3] "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.

indicate that no groundwater contaminants have been detected either at the refinery or at the downgradient Union Pacific Railroad yard in this area of no hydraulic control. Furthermore, groundwater analysis data from monitoring wells along Warm Springs Road, located downgradient of the Union Pacific Railroad yard also show no indication of groundwater contamination by petroleum hydrocarbons. Data collected from 1996 to 1998 indicate that the zone of hydraulic control extends about 350 feet west from the refinery perimeter into the Union Pacific Railroad yard.

Groundwater has an upward flow component beneath the Refinery. This upward flow together with fine-grained sediments beneath the Refinery prevents downward migration of contaminants below depths of 20 to 25 feet below ground. No contaminants have been found at depths below 25 feet.

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):

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)?

_____ 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[4] 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):

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[4] 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[5])?

_____ 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,[6] 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):

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[5] 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.

[6] 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):

BP Amoco is conducting groundwater monitoring on a semi-annual basis in accordance with the Stipulated Consent Order No. 8708447, dated March 4, 1992.

The following shallow, groundwater monitoring wells at the Refinery are sampled on a semi-annual basis: MW-B2, MW-B3, UP-96-5, UP-96-6, MW-92-21S, MW-92-29S, MW-92-1S, MW-92-2S, MW-92-3S, and MW-92-4S.

The following medium depth, groundwater monitoring wells are monitored on an annual basis to determine the extent of vertical migration of contaminant constituents: MW-92-21M, MW-920-29M, MW-92-1M, MW-92-2M, MW-92-3M, and MW-92-4W.

The following shallow, groundwater monitoring wells are downgradient and sampled on a semi-annual basis to determine if contamination has migrated off-site: #53, NW-92-23S, NW-92-24S, NW-92-25S, NW-92-26S, NW-92-27S, and NW-92-28S.

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 Chevron Salt Lake City Refinery facility, EPA ID #UTD092029768, located at Salt Lake City, Utah,. 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) Edward J. Deputy Date: Nov. 17, 2000
(print) Edward J. Deputy
(title) Environmental Scientist

Supervisor (signature) Allan Moore Date 11/27/00
(print) Allan Moore
(title) Hazardous Waste Section Manager
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