DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name: Valero Bill Greehey Refinery
Facility Address: 1147 Cantwell Lane, Corpus Christi, TX 78407
Facility EPA ID #: TXD008132268

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, 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 "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future landor groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

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

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2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	x			Groundwater PCLE zone/NAPL, VOC, SVOC
Air (indoors)[2]		x		NA
Surface Soil (e.g., <2 ft)	x			Surface soil PCLE zone/VOC, SVOC
Surface Water		x		N/A
Sediment		x		N/A
Subsurf. Soil (e.g., >2 ft)	x			Subsurface soil PCLE zone/VOC, SVOC
Air (outdoors)		x		NA

☐ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

☒ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

☐ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Rationale Groundwater – Affected groundwater and a groundwater protective concentration level exceedance (PCLE) zone were delineated at the refinery. Key contaminants in groundwater are NAPL, volatile organic and semi-volatile organic chemicals of concern (COCs). The COCs exceeding risk-based levels include LNAPL and benzene. Site investigation reports have been submitted to the TCEQ that describe the extent of affected groundwater (ENSR 1999, RMT/JN 1996, JDC 1999, H2A 2004).

Rationale Indoor Air - Indoor air was monitored at refinery buildings located over groundwater and soil PCLE zones (e.g. administration building) and no concerns were identified (RMT/JN 1999, H2A 2004). These buildings have since been demolished as part of a refinery construction project. Several years ago,

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) suggests 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.

employees were relocated to new buildings on Cantwell Lane and Up River Road that are not located over affected groundwater. See "outdoor air" for additional discussion regarding employee monitoring.

Rationale Surface Soil (<2 ft) and Subsurface Soil (>2ft) - Affected soils were identified during site investigations. Key contaminants in soils are inorganic, volatile organic, and semi-volatile organic COCs. In general, the COCs exceeding risk-based levels are PAH such as benzo(a)pyrene. Site investigation reports have been submitted to the TCEQ that describe the extent of affected soils (ENSR 1999a, RMT/JN 1996, JDC 1999, JDC 2000, JDC 2001, JDC 2003, JDC 2003a-d, JDC 2005).

Rationale Surface Water and Sediment - Migration of COCs in groundwater is controlled by the corrective action system and surface water and sediments are not affected by the release (H2A 2004).

Rationale Outdoor Air- Employee monitoring is on-going at the refinery under the health and safety plan. Employees with a potential for exposure to COCs are monitored (e.g. employees in the process units and control rooms), and procedures are in place to protect individuals from unacceptable workplace exposures. No concerns have been identified.

References - The listed reports were submitted to the TCEQ or predecessor agencies.

JDC 1999, *Revised Remedial Investigation, Baseline Risk Assessment and Corrective Measures Study, Petroleum Impacted Soils* (March 1999)

RMT/JN 1996, *Remedial Investigation, Baseline Risk Assessment and Corrective Measures Study, Petroleum Impacted Soils* (October 1996)

CRMI 2000, Response to Notice of Deficiency to *Remedial Investigation, Baseline Risk Assessment and Corrective Measures Study, Petroleum Impacted Soils (July 12, 2000)*

ENSR 1999, *Final Report, Groundwater Contamination Delineation, Coastal Refining & Marketing, Inc.* (June 1999)

ENSR 1999a, *Final Soil Investigation Report, Coastal Refining & Marketing, Inc.* (June 1999)

H2A 2004, *Affected Property Assessment Report, Groundwater AOC*, January 2004

JDC 2000, *RCRA Facility Investigation Report* (September 2000)

JDC 2001, *RFI Addendum* (September 2001)

JDC 2003, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 1, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530* (January 9, 2004)

JDC 2003a, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 2, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530* (January 9, 2004)

JDC 2003b, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 3, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530* (January 9, 2004)

JDC 2003c, *Affected Property Assessment Report, Soil Area of Concern (AOC) – Area 4* (January 9, 2004)

JDC 2003d, *Affected Property Assessment Report, Soil Area of Concern (AOC), Areas 5 through 14* (January 9, 2002)

JDC 2005, *Affected Property Assessment Report, Soil Area of Concern (AOC) – Area 4, Revised*, (May 10, 2005)

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3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	No	No	No	No			No
~~Air (indoors)~~	---	---	---				
Soil (surface, e.g., <2 ft)	No	Yes	No	Yes	No	No	No
~~Surface Water~~	---	---			---	---	---
~~Sediment~~	---	---			---	---	---
Soil (subsurface e.g., >2 ft)				Yes			No
~~Air (outdoors)~~	---	---	---	---		---	

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.
2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

☐ If no (pathways are not complete for any contaminated media-receptor combination) skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

☒ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

☐ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code.

Footnotes:

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Rationale and Reference(s):

Rationale Groundwater - Exposure to groundwater is not a potential exposure pathway. Groundwater is classified as a Class 3 resource due to high concentrations of total dissolved solids, and it is unusable as a drinking water source or for use in irrigation purposes (RMT/JN 1996, H2A 2004, H2A 2005). A groundwater corrective action system is in place to remove and control the migration of LNAPL and the migration of dissolved phase COCs in groundwater and protect the point of exposure. Deed recordation under State regulations will prevent the use of affected groundwater.

Rationale Soil (surface) - The current and future land use at the site is commercial/industrial. Direct exposure to COCs in surface soil by residents, individuals at day care facilities, individuals engaged in recreational activities, or human exposure indirectly through food (gardening) are not potential exposure pathways. Deed recordation under State regulations will prevent future residential use of the property and limit the site to industrial use. Trespassers are prevented access to the site by perimeter fencing. Access to the site is controlled at gates that are guarded by refinery personnel 24 hours/day and 7 days/week and is limited to workers and contractors that have the appropriate safety training. There is a potential for refinery workers and construction workers to be exposed to COCs in surface soil (RMT/JN 1996, JDC 1999, JDC 2003, JDC 2003a-d, JDC 2005).

Rationale Soil (subsurface) - The current and future land use at the site is commercial/industrial. Indirect human exposure to COCs in subsurface soil through food (gardening) is not a potential exposure pathway. Deed recordation under State regulations will prevent future residential use of the property. There is a potential for construction workers to be exposed to COCs in subsurface soil (RMT/JN 1996, JDC 1999, JDC 2003, JDC 2003a-d, JDC 2005).

References. The listed reports were submitted to the TCEQ or predecessor agencies.

H2A 2005, *Revised Affected Property Assessment Report, Groundwater AOC*, July 2005

H2A 2004, *Affected Property Assessment Report, Groundwater AOC*, January 2004

JDC 1999, *Revised Remedial Investigation, Baseline Risk Assessment and Corrective Measures Study, Petroleum Impacted Soils* (March 1999)

JDC 2003, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 1, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530* (January 9, 2004)

JDC 2003a, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 2, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530* (January 9, 2004)

JDC 2003b, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 3, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530* (January 9, 2004)

JDC 2003c, *Affected Property Assessment Report, Soil Area of Concern (AOC) – Area 4* (January 9, 2004)

JDC 2003d, *Affected Property Assessment Report, Soil Area of Concern (AOC), Areas 5 through 14* (January 9, 2002)

JDC 2005, *Affected Property Assessment Report, Soil Area of Concern (AOC) – Area 4, Revised*, (May 10, 2005)

RMT/JN 1996, *Remedial Investigation, Baseline Risk Assessment and Corrective Measures Study, Petroleum Impacted Soils* (October 1996)

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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

☒ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

☐ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

☐ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Rationale Soil (surface and subsurface) - Exposure to soils is not expected to be significant since the concentrations of COCs in soils at the affected areas meet TRRP Remedy Standard A critical protective concentration levels (PCLs). Closure under TRRP Remedy Standard A requires that COC concentration meet critical PCLs for the applicable land use. Critical PCLs for soils are developed to be protective from adverse effects related to direct exposure to COCs in soils (i.e., ingestion, inhalation, dermal exposure pathways), and related to indirect exposure pathways (i.e., soil-to-groundwater and soil-to-air exposure pathways) resulting from the migration of COCs in soils to other media.

As noted, there is a potential for refinery workers and construction workers to be exposed to COCs in affected surface soils, and for construction workers to be exposed to affected subsurface soils that were delineated during investigations that were conducted under RFI and the Agreed Final Judgment (AFJ). A total of 18 SWMUs were investigated under the RFI. After TCEQ approval of the RFI on November 30, 2001, a response action completion report (RACR) was submitted for the following 16 RFI Units:

- SWMUs 10, 13, 14, 15, 16, 17, 18, 19 - Wastewater Treatment Plant;
- SWMU 24 – No. 1 South Impoundment;
- SWMU 36 – Former Spent Caustic Storage Tank;

Footnotes:

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

- SWMU 38 – HF Alkylation Neutralization Sump;
- AOC-B Transfer Station;
- AOC-C Leaded Gas Tank No. 91;
- AOC-D Merox Process Spill Area (same as Area 10 Merox Treater East Plant);
- AOC-E Slop Oil Tank No. 19; and
- AOC-F Slop Oil Tank No. 500.

As described in the RACR, the concentrations of COCs in soils at these SWMUs and AOCs meet critical protective concentration levels under TRRP Remedy Standard A (JDC 2002). The RACR was approved by the TCEQ on July 22, 2002. Soils at sites at the following 14 areas were investigated under the AFJ:

- Area 1 West Plant Tank Farm;
- Area 2 East Plant South Tank Farm Spill Sites;
- Area 3 East Plant North Tank Farm Spill Sites (includes SWMU 30 & 31 – CPI Separator Bottoms Tanks 217 and 217);
- Area 4 Quintana North Tank Farm Spill Sites;
- Area 5 MTBE Fractionator EP North;
- Area 6 Old Tank 9;
- Area 7 ACC Port Area;
- Areas 8 East Plant Caustic Treater;
- Area 9 East Plant Caustic Treater fire monitor;
- Area 10 East Plant Merox Caustic Treater;
- Area 11 Pipe Yard;
- Area 12 West Plant Tank 9;
- Area 13 Nixon Tract; and
- Area 14 HEB Cleaning Area.

Affected property assessment reports (APARs) were submitted to the TCEQ (JDC 2004a-d). The APARs for Areas 3 through 14 were approved by the TCEQ on September 29 and October 2, 2006. Self-implementation notices for closure under TRRP Remedy Standard A were submitted to the TCEQ on March 6, 2007. Remedy Standard A RACRs for the affected properties are to be submitted to the TCEQ within 180 days.

Reference(s)/Reports - The listed reports were submitted to the TCEQ or predecessor agencies.

JDC 2002, *RFI Response Action Completion Report* (January 28, 2002)

JDC 2007, *Self Implementation Notice, Area 3 East Plant North Tank Farm Spill Sites*, March 6, 2007

JDC 2007, *Self Implementation Notice, Area 4 Quintana North Tank Farm Spill Sites*, March 6, 2007

JDC 2007, *Self Implementation Notice, Area 5, 6, 8, 9, and 11 through 14 Spill Sites*, March 6, 2007

Reference(s)/Approval - The listed letters of approval were received from the TCEQ.

TCEQ 2001, Correspondence Re: *Approval with Modifications to RCRA Facility Investigation Report*, November 30, 2001

TCEQ 2002, *Correspondence Re: Response Action Completion Report, Remedy A RFI Units, Approval*, July 22, 2002

TCEQ 2006, Correspondence Re: Approval, *Soil Affected Property Assessment Report, Soil Area of Concern (AOC) - Area 3, Valero Refining – Texas, L.P., Corpus Christi, Texas, East Plant ISW Reg. No. 30530 - January 9, 2004* (September 29, 2006)

TCEQ 2006, Correspondence Re: Approval with Comment, *Affected Property Assessment Report, Soil Area of Concern (AOC) – Area 4,* dated May 10, 2005, Valero Refining – Texas, L.P. (September 29, 2006)

TCEQ 2006, Correspondence, Re: Approval, *Affected Property Assessment Report, Soil Area of Concern (AOC), Areas 5 through 14* - January 9, 2002 (October 2, 2006)

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4. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

N/A

☐ If yes (all "significant" exposures have been shown to be within acceptable limits) continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

☐ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

☐ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

Rationale - Not applicable. As described in #4, concentrations of COCs in soils meet protective levels and exposures are not expected to be significant.

Reference(s) – Not applicable

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X___ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Valero Vill Greehey Refinery facility, EPA ID #TXD008132268, located at 1147 Cantwell Lane, Corpus Christi, Texas under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) Todd Counter Date 1/22/09
(print) Todd Counter
(title) Project Manager

Supervisor (signature) Jason Wang Date 1/22/09
(print) Jason Wang
(title) Team Leader
Texas Commission on Environmental Quality

Locations where References may be found:

TCEQ Central Records, Austin, TX

Contact telephone and e-mail numbers:

Project Manager listed above
(512) 239-2200
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Final Note: The purpose of the Human Exposures EI is to qualitatively screen exposures based on current land and groundwater use. A "YE" determination does not constitute a screening tool that ends the corrective action process. The "YE" determination may be changed at any time as new information becomes available.