Draft Submittal Date 12/23/2022

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:	CITGO Terminal
Facility Address:	2500 East Chicago Avenue, East Chicago, Indiana
Facility EPA ID #:	IND 095 267 381

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?

  X 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 land- or 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).

2. Is 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			Metals, SVOCs, VOCs, LNAPL
Air (indoors)[2]		X		
Surface Soil (e.g., <2 ft)	X			Metals, SVOCs
Surface Water		X		
Sediment		X		
Subsurf. Soil (e.g., >2 ft)		X		
Air (outdoors)		X		

_____ 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

__X__ 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):

"Contamination" has been identified through comparison of the RFI soil and groundwater characterization data with conservative risk-based screening levels.

Data for this EI includes RFI soil and groundwater data collected between July 2020 and June 2021. As discussed in Section 4 of the RFI Report, the screening levels are based on a combination of the 2019 Indiana Department of Environmental Management (IDEM) screening levels and EPA Maximum Contaminant Levels (EPA MCLs), in accordance with the Site's Corrective Action Framework (CAF). Perimeter sample results were initially evaluated/screened using residential criteria to identify the potential for off-site migration. Sample locations that are internal to the property were screened using industrial screening levels, because the current use of the property is commercial/industrial.

Surface soil results were evaluated as either perimeter or interior samples. In accordance with the CAF, perimeter soil samples were compared to the following screening levels:

Footnotes:

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

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

- IDEM, 2019 Screening Level Table A-6, Direct Contact Soil Exposure, Residential
- IDEM, 2019 Screening Level Table A-6, Direct Contact Soil Exposure, Commercial/Industrial

In accordance with the CAF, interior soil samples were compared to the following screening levels:

- IDEM, 2019 Screening Level Table A-6, Direct Contact Soil Exposure, Commercial/Industrial

Groundwater results were similarly evaluated as either perimeter or interior samples. In accordance with the CAF, perimeter groundwater sample results were compared to the following screening levels:

- U.S. EPA Maximum Contaminant Level (MCL) or, if an MCL was not available the IDEM 2019 Screening Level Table A-6, Groundwater, Tap, Residential
- IDEM, 2019 Screening Level Table A-6, Vapor Exposure, Groundwater, Residential
- IDEM, 2019 Screening Level Table A-6, Vapor Exposure, Groundwater, Commercial/Industrial

In accordance with the CAF, interior groundwater samples were compared to the following screening levels:

- IDEM, 2019 Screening Level Table A-6, Vapor Exposure, Groundwater, Commercial/Industrial

The perimeter locations defined in the RFI are as follows: CITGO-MW01-20, CITGO-MW02-20, CITGO-MW03-20, CITGO-MW04-20, CITGO-MW06-20, CITGO-MW08-20, CITGO-MW09-20, CITGO-MW10-20, CITGO-MW11-20, CITGO-MW13-20, CITGO-MW15-20, CITGO-MW17-20, CITGO-MW18-20, and CITGO-MW19-20.

The interior locations defined in the RFI are as follows: CITGO-MW05-20, CITGO-MW07-20, CITGO-MW12-20, CITGO-MW14-20, CITGO-MW16-20, and CITGO-MW20-20.

The perimeter and interior soil sampling results were compared to the above screening levels and the results are presented in the RFI Report in Table 5.1a and Table 5.1b, respectively. Soil concentrations that exceed the screening levels and therefore meet the definition of contamination are shown in the tables. Two metals (lead and manganese) and four SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene) exceeded the residential soil criteria at the perimeter of the Site. There were two exceedances of IDEM Industrial Direct Contact Screening value for benzo(a)pyrene at perimeter sample location CITGO-MW15-20 and interior sample location CITGO-MW16-20. Three 10-ft step-out borings were completed at CITGO-MW15-20. SB-East provided delineation of benzo(a)pyrene to the IDEM Industrial Direct Contact Screening value at the property boundary. Interior sample location CITGO-MW16-20 was delineated to IDEM Industrial Direct Contact Screening values at the property boundary by perimeter sample locations CITGO-MW18-20 and CITGO-MW17-20. Therefore, at the property boundary there are no exceedances of IDEM Industrial Direct Contact Screening levels for benzo(a)pyrene. There were exceedances of various other metals and SVOCs at the property boundary. However, the location of the exceedances is adjacent to other industrial/commercial properties and are not located near the residential areas to the west, so no further delineation was proposed, and contaminated soil is not expected to migrate off-site to residential areas.

Groundwater samples were collected as part of the RFI (August 2020, November 2020, March 2021, and June 2021). The perimeter and interior groundwater sampling results were compared to the screening levels listed above and are presented in the RFI Report in Table 5.2a and Table 5.2b, respectively. Groundwater concentrations that exceed the screening levels and therefore meet the definition of contamination are shown in the tables. Four metals (arsenic, manganese, thallium, and iron), five SVOCs (naphthalene, 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, and dibenzofuran), and one VOC (benzene) exceeded the groundwater screening levels at the perimeter of the Site. One VOC (benzene) exceeded the groundwater screening levels at the interior of the Site. There was one exceedance of IDEM-Industrial Vapor value for benzene at one interior well CITGO-MW16-20 during the first quarterly event. This exceedance is likely attributed to the presence of LNAPL, which was measured in the well in all three of the subsequent quarterly monitoring events. This exceedance was delineated to the MCLs at downgradient monitoring locations CITGO-MW18-20 and CITGO-MW17-20. Therefore, there are no exceedances of IDEM-Industrial Vapor values at the property boundary. The remaining exceedances of metals and SVOCs at the property boundary were generally stable or decreasing. Consistent with the CAF, the Site and surrounding area are mostly zoned industrial, the planned future use is to remain industrial, and there are four other properties within a mile that are undergoing corrective active. Thus, it is unlikely that groundwater would be used for drinking water at or near the Site, and migration of contaminated groundwater to off-site residents is not expected.

Additional samples collected post-RFI (between October 2021 and June 2022) were consistent with the RFI data.

LNAPL was only observed in one interior monitoring well (CITGO-MW16-20) during the November 2020, March 2021, and June 2021 sampling events, as discussed in Section 5.3 of the RFI Report. Since the completion of the RFI, there have been 3 additional rounds of groundwater monitoring. LNAPL continued to be present at CITGO-MW16-20 and trace amounts were also identified at CITGO-MW15-20 and CITGO-MW13-20. LNAPL was measured at CITGO-MW16-20 with sufficient volume that transmissivity testing could be completed. Transmissivity testing was completed in January 2022 and the results were indicative of 'de minimus' conditions (extremely low LNAPL transmissivity). The viscosity of LNAPL in CITGO-MW16-20 is similar to that of LNAPL in CITGO-MW15-20 and CITGO-MW13-20, and the in-well thicknesses of LNAPL in CITGO-MW15-20 and CITGO-MW13-20 are well below recommended minimum thicknesses for evaluating LNAPL transmissivity, therefore, LNAPL transmissivity at CITGO-MW15-20 and CITGO-MW13-20 are also 'de minimus.' No further evaluation is warranted. Additionally, LNAPL has not been observed in several wells to the east of the Site immediately across Cline Avenue.

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	Yes	No	Yes			No
~~Air (indoors)~~	--	--	--				
Soil (surface, e.g., <2 ft)	No	Yes	No	Yes	Yes	No	No
~~Surface Water~~	--	--			--	--	--
~~Sediment~~	--	--			--	--	--
~~Soil (subsurface e.g., >2 ft)~~				--			--
~~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).

__X__ 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.

Rationale and Reference(s):

Soil
Complete potential exposure pathways:
- Incidental ingestion and dermal contact by routine workers, maintenance workers, construction workers, and trespasser
- Inhalation of vapor and particulates by routine workers, maintenance workers, construction workers, and trespassers

Incomplete potential exposure pathways (not carried forward in analysis):
- Inhalation of vapor and particulates by off-site residents was not considered a complete pathway because

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

contaminated soil does not extend off-site to residential areas.

- Vapor intrusion by routine workers was not considered a complete pathway because, as shown in the RFI Report in Table 5.1a and Table 5.1b, few VOCs were detected in the soil at the site, and the detected concentrations of these constituents were well below generic screening criteria for soil.

Groundwater

Complete potential exposure pathways:

- Incidental ingestion and dermal contact by maintenance workers and construction workers
- Inhalation of vapor outdoors by routine workers, maintenance workers, construction workers, and trespassers

Incomplete potential exposure pathways (not carried forward in analysis):

- Inhalation of vapor outdoors by off-site residents was not considered a complete pathway because contaminants that volatilize do not extend off-site to residential areas
- Vapor intrusion (indoor air) by routine workers and off-site residents was not considered a complete pathway because, while benzene did exceed the drinking water criteria at three monitoring wells at the site, it only exceeded the drinking water criterion in the most recent sample at one well, CITGO-MW16-20, which is not located at the property boundary, is bounded by other monitoring wells where benzene did not exceed drinking water criteria, and there are no routinely occupiable buildings at or in the vicinity of this location.
- Potable and non-potable water use by routine workers and off-site residents were not considered complete pathways because the groundwater is not currently used, and institutional controls will be established as part of corrective measures to prevent exposure for on-site routine workers. Additionally, there are also no drinking wells within one mile of the Site so contaminated groundwater is not expected to impact off-site residents.

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)?

__X__ If no (exposures cannot 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):

Soil exposures
The significance of potential exposure for each receptor to soil was evaluated by developing cumulative cancer risk and hazard index (HI) estimates and comparing them with USEPA's acceptable cumulative cancer risk and HI limits of 10^{-4} and 1, respectively, for reasonable maximum exposures (RME). As shown in Appendix I (baseline human health risk assessment) of the RFI Report, none of the receptor populations had an upper-bound cumulative cancer risk or HI that exceeds USEPA's RME limits. For this assessment, routine workers are conservative surrogates for trespassers because the risk and HI estimates for trespassers are expected to be no higher than the upper-bound soil risk estimates for routine worker exposures outdoors.

Groundwater exposures
Cumulative cancer risk and HI estimates were also calculated for potential RME to groundwater. As shown in Appendix I (baseline human health risk assessment) of the RFI Report, neither of these receptor populations had an upper-bound cumulative cancer risk or HI that exceeds USEPA's RME limits. Inhalation of vapor outdoors was not included in calculations for routine workers or trespassers. Maintenance workers and construction workers act as conservative surrogates for these receptors for the inhalation of vapor in outdoor air exposure pathway because they are only exposed to the ground surface while maintenance and construction workers are exposed beneath the surface (closer to groundwater). In addition, benzene is the only VOC detected above screening levels in groundwater so vapor emission into outdoor air would be minimal for routine workers and trespassers.

[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.

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

_____ 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):

Skipped because of answer to Question 4

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):

YE 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 **CITGO Terminal** facility, EPA ID # **IND 095 267 381**, located at **2500 East Chicago Avenue, East Chicago, Indiana** 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) RENEE WAWCZAK Digitally signed by RENEE WAWCZAK Date: 2022.12.23 08:51:16 -06'00' Date _____
(print)
(title)

Supervisor (signature) Date _____
(print) MICHAEL BEEDLE Digitally signed by MICHAEL BEEDLE Date: 2022.12.23 09:10:43 -06'00'
(title)
(EPA Region or State)

Locations where References may be found:

RFI Report

Contact telephone and e-mail numbers

(name) _____
(phone #) _____
(e-mail) _____

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.