

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: Formosa Plastics Corporation, Louisiana
Facility Address: Gulf States Road, P.O. Box 271, Baton Rouge, La. 70821-0271
Facility EPA ID #: LAD 041224932

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 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).

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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)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	<u>X</u>	___	___	<u>Groundwater impact/chlorinated hydrocarbons</u>
Air (indoors) ²	<u>X</u>	___	___	<u>Suspected impacts in building over soil contamination</u>
Surface Soil (e.g., <2 ft)	<u>X</u>	___	___	<u>Surface soil impact/chlorinated hydrocarbons, high pH, and sulfate</u>
Surface Water	<u>X</u>	___	___	<u>Suspected contaminated gw to surface water release</u>
Sediment	<u>X</u>	___	___	<u>Sediment impact/chlorinated hydrocarbons</u>
Subsurf. Soil (e.g., >2 ft)	<u>X</u>	___	___	<u>Subsurface soil impact/chlorinated hydrocarbons</u>
Air (outdoors)	___	<u>X</u>	___	<u>Emissions from soil not likely due to large areas covered with concrete</u>

___ 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):

Groundwater: In 1979, a RCRA groundwater monitoring system was proposed for the facility. Initial sampling of the monitoring wells, which were screened in the uppermost water-bearing zone (30-foot), located near the Wastewater Stripper Pond and Neutralization Basin indicated levels of ethylene dichloride (EDC). In 1983-84, water samples from deep process wells (400-foot Aquifer) also indicated the presence of EDC. Formosa Plastics Corporation, Louisiana (Formosa) converted a monitoring well to a recovery well in 1984 and later in 1987 to 1990 converted 9 additional wells to recover EDC in the shallow groundwater. For the 400-foot Aquifer, Formosa converted monitoring well MW-18CR to a recovery well. Additional monitoring wells and/or piezometers were installed for the shallow water-bearing zones (30-foot, 60-foot, 90-foot, and 120-foot zones), 200-foot Sand, 400-foot Sand, and 600-foot Sand. The main contaminants of concern (COCs) include EDC, cis-1,2-dichloroethene, vinyl chloride, carbon tetrachloride, and trichloroethylene. Free phase chlorinated hydrocarbons may be present in areas of the site. Formosa conducts quarterly sampling of the RCRA monitoring and recovery wells. Currently, there are 79 monitoring wells, recovery wells and piezometers at the site. Further investigation will be conducted to delineate the horizontal and vertical extent of groundwater contamination. Attachment 1 contains tables providing information on the monitoring and recovery well construction and summary tables for the First Quarter 2004 sampling event (Groundwater Monitoring Report, dated May 29, 2004). Potentiometric maps for the shallow water-bearings and 400-foot Sand and EDC concentration map for the 30-foot and 60-foot zones are also provided in the attachment 1. The Louisiana Department of Environmental Quality (LDEQ) Risk Evaluation Corrective Action (RECAP) program, screening standards for soil and groundwater are included in attachment 1.

Air (indoors): It is reasonably suspected that indoor air may be impacted in enclosed structures located over areas of soil impacted with volatile compounds (< 15 ft below grade). One occupied building, the former EDC/Vinyl I Control Room, was identified as being located above soil with volatile contaminants.

Surface Soil: As part of the RCRA Facility Investigation (RFI), surface soils (<2 ft) were evaluated in the following main areas of the site: Caustic Storage Tank area, Sulfuric Acid Tanks area, EDC Tank Farm Sump, Historical Surface Water Drainages, and the Marine/EDC Tank Farm area. In the Caustic Storage Tank area, soils with high pH (greater than 9) were found in the upper 2 feet of soil. Sulfate concentrations greater than background (230 mg/kg) were indicated in areas of the Sulfuric Acid Tank farm. The other investigated areas showed concentrations of EDC in the shallow soils. Refer to the attachment 2 for tables summarizing contaminant concentrations detected in surface soil samples and figures indicating sample locations and extent of EDC impacted soil (0-2 ft below grade).

Surface Water: It is suspected that shallow groundwater contaminated with volatile organic compounds may be discharging into the Monte Sano Bayou and Mississippi River. Surface water samples were collected from five locations in the Monte Sano Bayou (northern boundary of the site) and analyzed for only EDC (refer to attachment 3 for table and map showing sample locations). This sampling was conducted during the RFI work in 1991 and indicates levels of EDC ranging from 0.0027 to 0.0065 mg/L. However, the shallow groundwater-surface water interaction has not been evaluated. Additional investigation will be required.

Sediment: Samples of sediment were also collected during the RFI activities in 1991. These sediment samples were collected from the same locations as the surface water samples in the Monte Sano Bayou (refer to attachment 3). EDC concentrations detected in the sediment samples ranged from <0.005 to 0.012 mg/kg. Additional assessment will be required.

Subsurface Soil: Contaminated subsurface soils (>2 ft) have been identified in many areas of the plant. Main contaminants are chlorinated hydrocarbons. Refer to the attachment 4 for figures and tables describing EDC impacted subsurface soil data and attachment 2 for the pH and sulfate data. Additional investigation will be conducted to determine the horizontal and vertical extent of subsurface soil impact.

Air (outdoors): Because the facility's waste management units are closed and under post-closure care, and there are concreted areas covering much of the site, outdoor air impacts are not likely at the facility.

References:

EcoScience Resource Group, LLC, 2004. RCRA First Quarter 2004 Groundwater Monitoring Report, Formosa Plastics Corporation, Baton Rouge, La., dated May 29, 2004

Formosa Plastics Corporation, Louisiana, 1994. RFI Assessment Report – Marine Tank Farm, February 10, 1994

Formosa Plastics Corporation, Louisiana, 1995. Marine Tank Farm, RFI Assessment Report – Addendum, January 18, 1995

Geraghty & Miller, 1991. Final RCRA Facility Investigation Field Program, Formosa Plastics Corporation, Louisiana, September 25, 1991

Geraghty & Miller, 1992. Final Additional Assessment Activities, Historical Surface Water Drainage Areas, RFI, Formosa Plastics Corporation, Louisiana, July 9, 1992

Geraghty & Miller, 1992. Task 2 Hydrogeological and Analytical Evaluation, Groundwater Corrective Action Program, RFI, Volume I, Formosa Plastics Corporation, Louisiana, August 1992

Louisiana Department of Environmental Quality, 2003. Risk Evaluation and Corrective Action Program Document, October 20, 2003

MFG, Inc., 2003. Conceptual Site Model, Formosa Plastics Corporation, Baton Rouge, La., dated June 20, 2003

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.

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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)

<u>"Contaminated" Media</u>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
Air (indoors)	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
Soil (surface, e.g., <2 ft)	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
Surface Water	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>	<u>yes</u>	<u>yes</u>	<u>yes</u>
Sediment	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>	<u>yes</u>	<u>yes</u>	<u>yes</u>
Soil (subsurface e.g., >2 ft)	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>	<u>no</u>	<u>no</u>	<u>no</u>
Air (outdoors)							

Instructions for Summary Exposure Pathway Evaluation Table:

- Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.
- 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):

Residents: The residents pathway is incomplete because there are no residential areas located in the areas of contaminated media. The 400-foot Aquifer, which is contaminated with volatile organic compounds, is probably defined as a groundwater classification 1B under RECAP and could potentially provide drinking water to a public water supply. There are no known public or domestic water wells screened in the 400-foot Aquifer within a one-mile radius of the facility. Only industrial, process wells (400-foot Aquifer) are used by Formosa and the surrounding industrial facilities.

Worker: The worker pathway is considered to be complete for all media, except air (outdoors).

Day-Care: The day-care pathway is incomplete due to the lack of a day-care facility located within or near the Formosa site.

Construction: There is a complete pathway between all media, except air (outdoors), and construction workers at the site.

Trespassers: The trespassers pathway is incomplete for groundwater, air (indoors), and surface and subsurface soils; however, it is reasonably complete for surface water and sediment. Most of the Formosa site is enclosed within a fence(s) or by the Monte Sano Bayou ravine, which would prevent trespassers from entering the facility site. Formosa controls access to the facility with guardhouse staff and a gated entrance. There are also numerous security cameras at the facility to allow for monitoring of the facility's borders. In particular, one camera is located on Formosa's Mississippi River dock and one is located in the southwest corner area. These cameras provide views of the Mississippi River and Monte Sano Bayou bank areas, located outside of the fencing. Refer to attachment 5 for site map and photographs of the fencing along the northern and western boundaries of the site.

Recreation: The potential human receptors associated with recreation are potentially complete for surface water and sediment and incomplete for the other media. No recreational activities are possible on site due to access security controls and fencing.

Food: The food (indirect pathway/receptor) pathway is complete for surface water and sediment, but not expected for the other media. No agricultural or dairy farming activities occur on or near the site. It is possible that fish may be exposed to contaminated surface water and sediment.

References:

EcoScience Resource Group, LLC, 2004. RCRA First Quarter 2004 Groundwater Monitoring Report, Formosa Plastics Corporation, Baton Rouge, La., dated May 29, 2004

MFG, Inc., 2003. Conceptual Site Model, Formosa Plastics Corporation, Baton Rouge, La., dated June 20, 2003.

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

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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)?

 X 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):

Workers and Construction: The contaminant concentrations in groundwater and shallow and deep soil are above the acceptable levels thereby potentially resulting in unacceptable risks to workers, especially during construction and maintenance activities. However, Formosa does require excavation permits and general work permits which would limit significant exposures to workers and construction workers at the plant. Proper safety measures would be taken during activities to limit exposures to soils, shallow groundwater, surface water, and sediments. Potable water is provided by a 1,200-foot well, which is not contaminated, and a bottled water company supplies drinking water for plant employees. Exposures to indoor air in the former EDC/Vinyl I Control Room is not reasonably expected to be significant to workers. The EDC/Vinyl I unit has been shut down and the control room is currently used by maintenance workers as an office (refer to site map in attachment 5 for location of control room). The building was constructed in the late 1960s and is of concrete construction with a concrete foundation. There is plumbing (sinks, showers, toilets) and central air conditioning for the building. Most likely the room is maintained with positive pressure. There appears to be no other occupied enclosed structures located over impacted soil (< 15' below grade) at the site. Groundwater is generally encountered deeper than 15 feet below grade at the site.

Trespassers, Recreation, and Food: The Formosa site and Monte Sano Bayou are located in an industrial area and activities such as farming, dairy animal grazing, fishing, swimming, canoeing, hunting and other recreational activities are not likely to occur in the area. Exposures to surface water in Monte Sano Bayou and Mississippi River for trespassers, recreational users and food are not likely to be significant due to access controls (fences, security cameras, dock worker monitoring, Coast Guard Monitoring of the Baton Rouge Industrial area along the Mississippi River). Formosa does not allow any boat to dock on their property and workers are aware of this policy. These control measures should limit trespassers, recreational users, and fishermen along bank areas of the Monte Sano Bayou and Mississippi River. In addition, much of the areas outside of Formosa's old fence along the bank of the Mississippi River are wooded thereby reducing the likelihood of trespassers or recreational users, such as fishermen. See attachment 5 for photographs of fencing, dock area, and bank areas.

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.

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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 - 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 Formosa Plastics Corporation facility, EPA ID # LAD041224932, located at Baton Rouge, Louisiana 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) Celeste Bonnecaze Date 6/25/04
(print) Celeste Bonnecaze
Geologist 3

Supervisor (signature) Douglas Bradley Date 6/25/04
(print) Douglas Bradley
Geologist Supervisor
Louisiana Department of Environmental Quality,
Environmental Technology Division

Locations where References may be found:

Formosa Plastics Corporation,
Gulf States Road, Baton Rouge, La.

Louisiana Department of Environmental Quality
Public Records Room
602 N. Fifth Street, Baton Rouge, La. 70802

Contact telephone and e-mail numbers

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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.

ATTACHMENT 1

Well Construction Details

Summary of First Quarter 2004 Sampling Event Tables

Potentiometric Maps

EDC Concentration Map

LDEQ RECAP Table – Screening Standards for Soil and Groundwater

Attachments Available
Upon Request