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:	BASF Corporation
Facility Address:	471 Howard Avenue, Holland, MI
Facility EPA ID #:	MID 048 223 986

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. 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)?

	Ye	No	?	Rationale / Key Contaminants
Groundwater	X			Chlorobenzenes (see below)
Air (indoors)		X		
Surface Soil (e.g., <2 ft)	X			PCBs (see below)
Surface Water	X			1,4-Dichlorobenzene and arsenic (see below)
Sediment	X			Benzo(a)pyrene and arsenic (see below)
Subsurf. Soil (e.g., >2 ft)	X			Chlorobenzenes and PCBs (see below)
Air (outdoors)	X			

__ [2]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):

[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.

Based on the conclusions in the BASF December 2002, Final RFI Report and the August 2003, Corrective Measures Study Work Plan, Groundwater beneath the site contains the following hazardous constituents of interest (COI), 1,2,4-trichlorobenzene, 1,3- and 1,4-dichlorobenzene, and chlorobenzene, at levels that exceed Michigan Part 201 Industrial Drinking Water, Groundwater Contact and/or Solubility Criteria between the former OCM Building and Lake Macatawa. Surface and subsurface soil beneath the site contains potential COI, primarily chlorobenzenes at levels that exceed Michigan Part 201 Industrial Drinking Water protection criteria and Direct Contact Criteria. PCBs and chlordecone were the only potential COI detected in soils at levels that exceed Michigan Part 201 direct contact/or Infinite Source Volatile Soil Inhalation criteria for ambient air. However, these PCBs and chlordecone occur in soils beneath concrete/asphalt at 3 isolated locations of the site; SWMU 2- Former Non-hazardous Waste AST, SWMU 4- Former Preinjection System Dike AST and SWMU 12- Former Non-Hazardous Waste Storage Pad. Potential COI detected in site soil and groundwater did not exceed Michigan Part 201 criteria protective of volatilization to indoor air. Therefore, this medium is not contaminated above appropriately protective risk-based levels for human health.

Surface water in Lake Macatawa adjacent to the site contains 1,4-dichlorobenzene and arsenic at levels that exceed U.S. EPA Region 9 Preliminary Remediation Goals (PRGs). Near-shore sediment in Lake Macatawa adjacent to the site contains benzo(a)pyrene and arsenic at levels that exceed U.S. EPA Region 9 PRGs.

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_	_NA__	_YES__	NO	NO	NA
~~Air (indoors)~~			___				
Soil (surface, e.g., <2 ft)	__NO_	_NO__	_NA__	_NO__	NO	NO	NA
Surface Water	__NO_	_YES_	_NA__	_NO__	YES	YES	YE
Sediment	__NO_	_NO__	_NA__	_NO__	YES	YES	YE
Soil (subsurface e.g., >2 ft)	__NO_	_NO__	_NA__	_YES_	NO	NO	NA
Air (outdoors)	__NO_	–NO--	_NA__	_NO__	__NO__	NO	NA

Instructions for Summary Exposure Pathway Evaluation Table:

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

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):

The current owner/operator of the facility (Flint Ink) produces groundwater from one of three water supply wells (WW-10) constructed at the site and uses the water for floor wash and scrubber makeup water, but not drinking water. Therefore, the exposure to groundwater through direct contact and inhalation pathways to onsite workers are complete. The City of Holland provides drinking water for the facility and residents surrounding the facility. The exposure to groundwater through consumption pathway to residents is incomplete. COI that were detected in site groundwater at levels above Part 201 Groundwater Contact and Solubility Criteria were not in the groundwater located at or near the water supply wells used by the facility.

Lake Macatawa, which adjoins the site to the south, is designated for recreational use. Therefore, the pathways for human exposure to sediment and surface water via direct contact and ingestion of fish are complete.

Only two potential COI (PCBs and chlordecone) were detected in site soil at levels that exceed Michigan Part 201 Direct Contact and/or Inhalation Criteria. These COI were detected in areas that are currently covered by asphalt/concrete pavement and are not accessible to humans. Based on the presence of an asphalt/concrete barrier over contaminated

soil, inhalation or direct contact with soil are not currently complete exposure pathways. In addition between 1986 and 1989, approximately a total of 1,325 tons of soil and 886 tons of concrete contaminated with trichlorobenzene, 3,3'-dichclorobenzidine, toluene, chlorobenzene, trichloroethane, ethylbenzene, chloroform, copper, lead, fluorene, naphthalene from the former settling basin were removed and disposed of off-site.

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."

X 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):

1,2,4-trichlorobenzene, 1,3- and 1,4-dichlorobenzene, and chlorobenzene, were detected in the groundwater beneath the facility at levels that exceed Michigan Part 201 Industrial Drinking Water, Groundwater Contact and/or Solubility Criteria between the former OCM Building and Lake Macatawa.

Two potential COI (PCBs and chlordecone) were detected in site soil at levels that exceed Michigan Part 201 Direct Contact and/or Inhalation Criteria. 1,4-dichlorobenzene and arsenic were also detected in surface water at levels above U.S. EPA Region 9 PRGs, which are based on human consumption of tap water.

[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.

Benzo(a)pyrene and arsenic were detected at concentrations of 0.36mg/kg and 10.2 mg/kg in the near-shore Lake Macatawa sediments adjacent to the facility. These levels are above the U.S. EPA Region 9 Industrial soil levels.

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

X — 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):

Although exposure pathway for construction workers with respect to direct contact is complete, the workers will be required to follow all Health and Safety plans, including the use of protective gears. Therefore, the exposure risk to construction workers will be reduced.

Of the potential COI detected in site groundwater at levels above Michigan Part 201 Criteria, only 1,4-dichlorobenzene and arsenic were detected in surface water at levels above U.S. EPA Region 9 PRGs, which are based on human consumption of tap water. However, no compounds were detected in surface water at concentrations that exceed Michigan Rule 57 Surface Water Quality Values for Drinking Water. Arsenic is the only compound detected above its U.S. EPA Human Health Ambient Water Quality Criteria (HHAWQC), which is based on consumption of water and organisms (fish) from a water body. However, it should be noted that the levels of arsenic detected in surface water were below the Maximum Contaminant Level (MCL) for arsenic of 10 ug/L, and the 1,4-dichlorobenzene levels were within ten times the tap water PRG. Based on the fact that surface water in Lake Macatawa is not currently used for drinking water and given the dispersion and dilution that occurs with increasing distance from the site, it does not appear that the levels of potential COI detected in surface water adjacent to the site present an unacceptable risk to human health based on the current recreational (dermal contact and ingestion of fish) exposure scenario.

The potential COI detected in near-shore Lake Macatawa sediment adjacent to the facility were evaluated using U.S. EPA Region 9 PRGs for industrial soil. Industrial soil PRGs are conservative benchmarks for evaluating the type of incidental sediment exposure expected to occur during recreational use of the lake. The industrial soil PRGs are derived to be protective

of a worker who may ingest and dermally contact soil on a daily basis. Only benzo(a)pyrene and arsenic are present in sediment at levels above industrial soil PRGs (maximum benzo(a)pyrene sediment concentration of 0.36 mg/kg vs. PRG of 0.21 mg/kg and maximum arsenic sediment concentration of 10.2 mg/kg vs. PRG of 1.6 mg/kg). These concentrations were compared to Recreational Sediment Direct Contact Screening Levels calculated by MDEQ for a similar exposure scenario (dermal contact or ingestion of sediment at a boat launch). Assuming that a child 2 to 12 years of age is exposed to the sediment via dermal contact or ingestion for 52 days per year (4 days/week June through August and 2 days/week during May and September) over 10 years, the Recreational Sediment Direct Contact Screening Levels calculated by MDEQ for benzo(a)pyrene and arsenic are 16 mg/kg and 71 mg/kg, respectively. The levels of these constituents detected in near-shore sediment are less than the calculated risk-based screening levels, indicating that there is no significant health risk associated with recreational exposure (dermal contact or ingestion) to sediment in Lake Macatawa near the site. Thus, based on the comparison of sediment data to conservative risk-based criteria for a potential recreational sediment exposure scenario, it does not appear that the levels of potential COI detected in sediment adjacent to the site present an unacceptable risk to human health based on the current exposure scenario.

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 Former BASF facility, EPA ID # MID 006 411 953 and MID 048 223 986, located at 471 Howard Avenue, Holland, MI 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)		Date	
	(print)	JONATHAN ADENUGA		
	(title)			

Supervisor	(signature)		Date	
	(print)	GEORGE HAMPER		
	(title)	ECAB Chief		
	(EPA Region or State)	Reg. 5		

Locations where References may be found:
U.S. EPA 7th Floor Record Center 77 West Jackson Blvd Chicago, Illinois

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.