STATEMENT OF BASIS
For
Proposed Soil and Groundwater Cleanup

At
BASF Corporation
741 Howard Avenue
Holland, Michigan

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BASF Corporation
Holland, Michigan

INTRODUCTION

This Statement of Basis (SB) for BASF Corporation (BASF) explains the proposed remedy for the contaminated soil, groundwater, surface water and sediment for the facility and the adjacent Lake Macatawa in Holland, Michigan. In addition, the SB includes summaries of all corrective measure alternatives analyzed by BASF. U.S. EPA will select a final remedy for the facility only after the public comment period has ended and the information provided by the public during this period has been reviewed and substantive comments considered.

U.S. EPA is issuing this SB as part of its public participation responsibilities under the Resource Conservation and Recovery Act (RCRA). The document summarizes information that can be found in greater detail in the June 1999 Current Conditions Report and the December 2002 Final Resource Conservation and Recovery Act. Facility Investigation (RFI) report and other pertinent documents contained in the Administrative Record for this facility. U.S. EPA encourages the public to review these documents in order to gain a more comprehensive understanding of the facility and the RCRA activities that have been conducted. The public can be involved in the remedy selection process by reviewing the documents contained in the Administrative Record.

U.S. EPA may modify the proposed remedy or select another remedy based on new information or public comments. Therefore, the public is encouraged to review and comment on **all** alternatives.

PROPOSED REMEDY

U.S. EPA is proposing that BASF should implement the following remedy to address the contaminated soil, groundwater, surface water and sediment at the BASF facility and the adjacent Lake Macatawa:

- Excavation and off-site disposal of 2000 cubic yards of contaminated soils from Solid Waste Management Unit (SWMU) 2, SWMU 4, and SWMU 12;

- Excavation and off-site disposal of 200 cubic yards of contaminated soils from a portion of Other Potential Source Area (OPSA 5);

- Continued operation of the existing enhanced bioremediation (biosparging) system to remove contaminants from the groundwater, and to prevent on-site groundwater contamination from migrating into Lake Macatawa;

- Monitored natural attenuation of on-site groundwater contamination (upgradient of the biosparging system) with institutional controls;

- Maintaining the existing institutional controls to prohibit the installation of groundwater supply wells in the Pinecrest subdivision;

- Demonstrate that BASF will have adequate funds to complete the construction as well as the operation and maintenance of the selected remedy.

FACILITY BACKGROUND

The BASF Holland, Michigan facility is located on the northwest shoreline of Lake Macatawa in the northwest ¼ of Section 30, Holland Charter Township, Ottawa County, Michigan. Figure 1 identifies the facility's location on a United States Geological Survey (USGS) topographic map, part of the Holland West, 7.5-minute quadrangle (USGS, dated 1972). The facility is located at the western edge of the urbanized area surrounding the City of Holland. The facility itself is zoned industrial with commercial and industrial areas to the north and east and residential to the south. The BASF facility is situated on approximately 30 acres of land. The property is triangularly shaped and is bordered on the north by Douglas Avenue, on the southwest by the Pinecrest residential subdivision, on the southeast by Howard Avenue and on the east by a Warehouse (Figure 2). The facility also includes a smaller parcel of land (included in the 30 acres) on the southeast side of Howard Avenue between the street and Lake Macatawa. This parcel is predominantly green space but is also the location of the facility's Wastewater Treatment Plant (WWTP). Residential land borders the southwest and northeast sides of this parcel and Lake Macatawa.

Approximately 5 to 6 acres of the property are covered by buildings used in production, warehousing and office space which are occupied by Pigments. These facilities are primarily located on the eastern portion of the larger parcel of property between Howard and Douglas Avenues. The central part of the large parcel is mostly undeveloped except for several water supply wells. The principal biological unit of the WWTP, the aeration basin, is located at the far western end of the large parcel. The wastewater treatment plant's laboratory, filtration, clarification and residuals processing units are located between Howard Avenue and Lake Macatawa.

On December 18, 1998, the U.S. EPA and BASF entered into an Administrative Order on Consent (AOC) which requires BASF to determine the nature and extent of the contamination, propose appropriate remedies to U.S. EPA, and implement the final remedies selected by U.S. EPA.

CLEANUP WORK PERFORMED PRIOR TO THE 1998 AOC

The groundwater is contaminated with chlorobenzenes throughout a large portion of the site (see Figure 3). The original source of the chlorobenzenes at the BASF facility was SWMU 7 (the former Orthochloro Metha Toluidine (OCM) Building), which was located at the south end of Building 14. The historical use of trichlorobenzene in the former OCM Building at the BASF facility was a primary source of the contamination.

The OCM Building dimensions were approximately 120 feet by 35 feet. The building had a basement that extended 9 feet below the ground surface. The OCM building was demolished in 1990, and the basement walls and floor were removed. In addition, contaminated soil between the basement and the groundwater level were also removed. Accordingly, 1500 tons of contaminated soil were removed and disposed of off-site. The area was backfilled with clean sand. Only a concrete pad and a storage shed are currently located in this area. Contaminants are probably still adhering to the saturated soil below the groundwater level, and we expect that these contaminants will gradually dissolve into the groundwater, thus serving as an ongoing source of groundwater contamination.

Six other non-SWMU areas, defined as Other Potential Source Areas (OPSAs), were also investigated, but the investigations did not connect them with the site-wide chlorobenzene contamination in the groundwater. The area known as OPSA 5 consists of two settling basins that were located in the southeast corner of the facility near Lake Macatawa. Each basin was approximately 50-feet long by 20-feet wide. The basins were constructed of concrete walls to a depth of approximately 6 feet below ground surface, with soil bottoms. In 1989, the concrete walls, the contents of the basins, and the contaminated soils below the basins were removed to a depth of 3 feet below the footing. In addition, 3 feet of soil was removed beyond the south and west walls of the basins. A total of 1,325 tons of contaminated soil were removed and disposed of off-site as non-hazardous waste.

Altogether, 2825 tons of contaminated soils were removed prior to U.S. EPA involvement, which began in 1998.

As a result of onsite groundwater contamination near the southern property line, BASF undertook a survey of residential wells in the Pincrest Subdivision located south of the facility. Twenty one private drinking water wells were identified and sampled in 1993. Although contaminants were not detected in any of the residential wells sampled, BASF provided municipal water to eight residences of the Pinecrest Subdivision that are located within a 200 foot buffer zone of the facility.

INTERIM MEASURES IMPLEMENTED SINCE THE 1998 AOC

BASF has also constructed the biosparging/enhanced bioremediation system to reduce the concentration of contaminated on-site groundwater from migrating into Lake Macatawa.

Operation began in September 2006. The biosparge system consists of a 350 foot long air sparge curtain near the property boundary with the Lake Macatawa (see Figure 4). It includes 35 air sparge wells in a staggered line perpendicular to groundwater flow. Air is forced into the groundwater at the base of the aquifer, and carries volatile organic compounds upward as it bubbles up through the groundwater.

Operation of the air sparge curtain has resulted in measurable decreasing trends for all contaminants in groundwater downgradient of the curtain. As of March 2007, six months after the biosparging operation began, the air sparge curtain has removed approximately 8.6 pounds of contaminants in shallow groundwater (15 to 25 feet below ground surface), and approximately 3.5 pounds of contaminants in deep groundwater (25 to 35 feet below ground surface) downgradient of the curtain. With the exception of monitoring wells PMW-3D, PZ-1R and PMW-4D, located downgradient of OPSA 5 (a historic source area for contamination in groundwater), the results of air sparge testing conducted at the facility from July 2006 through March 2007 indicate that air sparging is expected to be effective in achieving site-specific media cleanup standards.

SUMMARY OF FACILITY RISKS

Soil and groundwater in several areas at the facility are contaminated at levels above appropriately protective risk-based standards. In addition, sediment in the adjacent Lake Macatawa may also be contaminated. The risk based standards used for this determination are the U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) and the Generic Cleanup Criteria developed under the Part 201 program by the Remediation and Redevelopment Division of the Michigan Department of Environmental Quality (MDEQ, 2000, 2002).

SOIL

- PCBs exceed risk-based cleanup levels in SWMUs 2, 4, and 12 based on the soil direct contact pathway and the volatilization to ambient air pathway (SWMUs 4 and 12 only).

- Toluene, ethylbenzene, and total xylenes exceed the risk-based cleanup levels in a portion of OPSA 5 based on exceedences of MDEQ's Part 201 standards for direct contact.

SWMU 2

SWMU 2 consists of a 10.5-foot diameter by 32-foot long, 22,000-gallon horizontal steel above-ground storage tank (AST) located on a concrete pad surrounded by concrete containment walls approximately 150 feet southeast of the former OCM building. PCBs were detected in 1 of 3 soil samples collected in this SWMU at a concentration of 23,400 ppb, which exceeds the risk based standard of 16,000 ppb (SWMU2-1-(0-4')).

SWMU 4

SWMU 4 consists of 3 diked AST areas and 2 ASTs. Two of the diked AST areas are located west of Building 14. The secondary containment of these diked AST areas is constructed of concrete floors and walls. A third diked AST area is located near former Disposal Well # 3 southeast of the Aeration Basin (SWMU 10). Total PCBs were detected in 2 of 5 soil samples collected in this SWMU at a concentration that exceeds the risk based standard of 16,000 ppb (SWMU4-4-(0-4') and SWMU4-5-(0-4') at concentrations of 102,000 and 310,000 ppb, respectively).

SWMU 12

The Non-Hazardous Waste Storage Pad is an approximately 220-foot by 50-foot concrete pad located roughly 100 feet south of the Former OCM Building. A 4-inch concrete curb surrounds the entire concrete pad. The Hazardous Waste Storage Pad (SWMU 1) is located in the northeast corner of the concrete pad. Total PCBs were detected in 7 of 37 soil samples collected in this SWMU at concentrations that exceed the risk based standard of 16,000 ppb. Concentrations of PCBs range from 18,000 to 570, 000 ppb.

OPSA 5

As stated above, 1325 tons of contaminated soils have already been removed and disposed of. Twenty soil samples were taken of the soils that remained in place after the excavation. The primary contaminants detected in those 20 soil samples were toluene, ethylbenzene and xylenes. The concentrations in 19 of those samples were below the screening levels of 250ppm, 140ppm and 150ppm for direct contact with soil contaminated with toluene, ethylbenzene and xylenes, respectively. In one sample, toluene, ethylbenzene and total xylenes were detected at concentrations of 380ppm, 230ppm and 28ppm, respectively, which exceed the screening criteria. The amount of soil represented by this one sample point that exceeds the state standards is estimated to be about 200 cubic yards. This portion of OPSA5 will be covered in the discussion of the Preferred Alternative.

The concentrations of toluene, ethylbenzene and xylene in this one soil sample exceeded MDEQ's criteria for the protection of groundwater, and so the possibility that contaminated soil might be serving as a source of groundwater contamination must be evaluated. Accordingly, the groundwater has been sampled, and the results indicate that the groundwater beneath OPSA 5 does not contain concentrations of toluene, ethylbenzene or xylene that exceed the Michigan Part 201 generic risk criteria. This indicates that the possibility that soil contaminants might be leaching from the soil to the groundwater is insignificant.

GROUNDWATER

- A plume of groundwater contamination, consisting of chlorobenzenes and other contaminants extends from area near the former OCM Building through the site to

Lake Macatawa. Contaminated soils that remained in place below the level of the basement floor after the 1990 excavation appear to be serving as a source of groundwater contamination. The identified contaminants are based on exceedence of Michigan's leaching-based criteria for protection of groundwater used as drinking water and groundwater that discharges to surface water.

On-site Groundwater

- The concentrations of 1,3-Dichlorobenzene, 1,4-dichlorobenzene, and aldrin exceed the risk-based screening criteria on the groundwater direct contact pathway.

- The concentrations of chlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene exceed ecological screening values based on exceedence of the Groundwater/Surface Water Interface (GSI) criteria.

- Six polynuclear aromatic hydrocarbons (PAH) compounds including benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceed water solubility limits in monitoring well MW-9D.

The plume of chlorobenzenes in groundwater extends southeastward from northwest of the former OCM Building, which is the original source area, to Lake Macatawa. Historically, the plume was drawn northwest of the former OCM Building by four water supply wells (WW-10, WW-12, WW-14 and WW-15) located west of the former OCM Building (Figure 3). Migration of the plume to the northwest is no longer occurring as the water supply wells currently only produce 45,000 to 90,000 gallons per month compared to 100,000 gallons per day produced historically.

The site surficial geology can be described as consisting of two clayey silt intervals separated by a sandy layer. The upper clayey silt layer is 40 feet in thickness and simply referred to as the "Forty-Foot Silt" and the lower clay layer is referred to as the "Fifty-Foot Silt". Based on results of saturated soil samples collected at the base of the 40-foot Silt, the highest concentration of trichlorobenzene detected was 21,000 ppb beneath the former OCM Building. This concentration is less than the EPA Region 9 soil saturation concentration of 30,000 ppb for trichlorobenzene, which indicates that this contaminant does not exist as dense non-aqueous phase liquid (DNAPL) but has sorbed onto and may be releasing from the 40-foot Silt as a continuing source of trichlorobenzene in groundwater.

Off-site Groundwater

Thallium and chlordecone (kepone) were identified in off-site well MW-6 as contaminants of interest on the basis of exceeding residential drinking water criteria. BASF tested the drinking water of residences of Pinecrest Subdivision and found that it met the drinking water standards. Nevertheless, BASF connected the residences to City water as a precautionary measure. Institutional controls have also been established by Ottawa County Health Department to prohibit the installation of groundwater supply wells for use as a drinking water source.

Lake Macatawa

Since the biosparge system began operating in 2006, BASF's contribution to surface water contamination has been greatly reduced. Prior to that, the U.S. EPA, through its Great Lakes National Program Office (GLNPO), funded a study of Lake Macatawa in 2005. Sediment chemistry, solid-phase toxicity, and benthic macro invertebrates were examined near 13 facilities along the Lake, including the BASF facility. A series of 14 sediment core and 13 surface water samples were analyzed for heavy metals, semivolatiles, PCBs and physical characteristics. These samples were taken at various locations around the lake. The study concluded that, with the exception of one of the study areas (Heinz/Petroleum storage), the Probable Effect Concentrations for current sediment quality guidelines were not exceeded. This suggests that the BASF facility may not have contributed significantly to sediment contamination in the Lake.

CORRECTIVE ACTION OBJECTIVES

The Corrective Measures Study (CMS) Report provides the rationale for recommending the corrective measures that should be implemented at each soil and groundwater unit that requires remedial action. In order to accomplish this, Corrective Action Objectives and corresponding Media Cleanup Standards are first developed, which specify the required goals for protecting human health and the environment. Corrective Action Objectives are the media-specific goals required to protect human health and the environment. Corrective Action Objectives were developed both to address potential risk and to address regulatory policy (i.e., the protection of the beneficial uses of groundwater). The various corrective measures alternatives that have the potential for achieving the Corrective Action Objectives are compiled and the alternatives recommended for implementation selected from the list of candidate alternatives through a formal evaluation process. To document that the Corrective Action Objectives have been achieved, compliance with media cleanup standards will be demonstrated at prescribed locations in each environmental media requiring remediation.

Corrective measures alternatives are intended to mitigate potential exposure to, control migration of, and/or remediate the contaminants. A step-wise process was used to select and evaluate corrective measures alternatives for implementation at the former BASF facility. The principal steps of the process were:

- Identification of corrective measures alternatives that may be potentially applicable to specific classes of contaminants (i.e., chlorobenzenes or PCBs) in the soil and groundwater at the facility.

- Preliminary screening of the potentially applicable alternatives to reduce the large number of available technologies to a manageable number for more detailed evaluation.

- Evaluation of each corrective measures alternative using defined standards and selection factors.

- Recommendation of corrective measures for implementation.

The Media Cleanup Standards are as follows:

Contaminant of Interest for SWMUs 2,4 & 12 and OPSA 5	**SURFACE SOIL**	**SUBSURFACE SOIL**
PCBs	10,000 ppb	100,000 ppb
Toluene	250,000 ppb	250,000 ppb
Ethylbenzene	140,000 ppb	140,000 ppb
Xylene	150,000 ppb	150,000 ppb

Contaminant of Interest	**Long-term groundwater cleanup goal (drinking water)**	**Short-term groundwater cleanup goal at groundwater/ surface water interface**	**Surface Water**
1,3-Dichlorobenzene	6.6 ppb	38 ppb	280 ppb
1,4-Dichlorobenzene	75 ppb	13 ppb	170 ppb
3,3-Dichlorobenzidine	1.1 ppb	0.3 ppb	0.3 ppb
1,2,4-Trichlorobenzene	70 ppb	30 ppb	30 ppb
Total Chlorobenzenes	100 ppb	47 ppb	
Tetrachloroethane	8.5 ppb	78 ppb	680 ppb
Barium	2000 ppb	2,000 ppb	40,000 ppb
Arsenic	50 ppb	150 ppb	150 ppb
Lead	4.00 ppb	4.00 ppb	
Zinc	2400 ppb	2,400 ppb	22,000 ppb

The goals of the selected remedy are to eliminate significant exposures that pose threats to human health and the environment, to clean up contaminated soils to levels consistent with current land use, to restore ground water to its maximum beneficial use, and to eliminate risks to human health by meeting the applicable health-based ground water protection standards.

GENERAL CORRECTIVE MEASURES CATEGORIES

Corrective measures alternatives potentially applicable to contaminants at the facility were identified. For PCBs, potentially applicable remedial alternatives were developed primarily from U.S. EPA guidance. For organic compounds, the potentially applicable remedial alternatives were developed primarily from the Treatment Technologies Screening Matrix provided in the Federal Remediation Technologies Roundtable Remediation Technologies Screening Matrix and Reference Guide (http://www.frtr.gov/). In addition, "no action" was included as a baseline for comparison.

The identified alternatives were classified into the following general corrective measure categories for both soils and groundwater

- No action
- Risk and Hazard Management
- Monitored Natural Attenuation
- Containment and Control
- Active Remediation (Treatment/Disposal).

No Action

The no action alternative includes no active remediation of the contaminants, but provides a basis for comparison with the other remedial alternatives. No corrective measures would be implemented. Natural attenuation processes such as biodegradation, dispersion, adsorption, dilution, and volatilization would still occur; however, there would be no means to document the effectiveness of natural attenuation. The no action alternative may be justified in some cases, where implementing a corrective measure is not needed to reduce risks to human health and the environment, or comply with applicable cleanup standards.

Risk and Hazard Management

Institutional controls are instruments that help minimize the potential for human exposure to contamination by limiting the use of the land or groundwater. They include administrative or legal controls, physical barriers or markers, and methods to preserve information and data, and to inform current and future workers of hazards and risks. Also included are operational safety requirements to ensure worker safety and the proper handling of hazardous materials during remedial activities. Institutional controls are generally used when remedies are ongoing and when residual contamination is safe at the expected level of exposure, but might be unsafe if the exposure levels were allowed to increase. They are intended to supplement engineering controls and are rarely the sole remedy at a facility.

Monitored Natural Attenuation

Monitored natural attenuation (MNA) is the stabilization and long-term shrinking of a contaminant plume by natural processes such as microbial degradation. This alternative is generally applicable to dissolved groundwater plumes. In order to implement this alternative, the source of the contamination must first be removed, and the rate of natural degradation processes must be determined. Natural attenuation processes can be demonstrated through several lines of evidence, including measuring decreasing concentrations of contaminants in groundwater monitoring wells over time, changes in the ratios of parent to breakdown products, the presence of bacteria capable of degrading the contaminants, and/or the presence of geochemical indicators of naturally occurring biodegradation.

Under favorable conditions, highly chlorinated hydrocarbons such as 1,2,4-trichlorobenzene will biodegrade to less chlorinated compounds (i.e., 1,3- and 1,4-dichlorobenzene and chlorobenzene). Microorganisms obtain energy for growth and activity from oxidation and reduction reactions. Natural biodegradation of organic compounds causes measurable changes in groundwater geochemistry. The indicator parameters of the oxidation and reduction reactions, including metabolic byproducts can be measured.

The major expense of MNA would be the long-term monitoring program to provide initial and continuing confirmation that the predicted biological activity and/or reductions in the contaminant concentrations occur and remain effective. Risk and hazard management measures may be required to protect human health and the environment during the short term until overall effectiveness can be achieved.

MNA is appropriate as a remedial alternative where natural degradation can be currently documented. MNA is also appropriate as an option for consideration after the source has been removed and monitoring data indicate that natural degradation may be occurring.

Containment and Control

Containment and control measures are not designed to eliminate the contamination, but instead to stop the mobilization and migration of the contaminants. For groundwater, this category includes below-ground barriers, such as groundwater extraction trenches and wells, slurry walls, grout curtains, and permeable reactive barriers. These measures can also be implemented to control the migration of groundwater contaminants from source areas. Above-ground engineered covers and other containment measures (solidification and stabilization) can be used to minimize the leaching of contaminants from soil to groundwater.

Engineering controls can be used to eliminate, or reduce to acceptable levels, the potential risk to human health from processes such as contaminants volatilizing from groundwater and migrating into the indoor air of buildings. These controls could include vapor barriers and or ventilation controls. Engineering controls may also be used to eliminate or reduce the potential for cross-media contaminant transfers or migration of contaminants into cleaner areas.

Containment and hydraulic control measures may be protective of human health and the environment; however, the time frame for contaminant reduction within the containment zone (i.e., upgradient of a below-ground barrier, or below an above-ground cover) would be significantly longer than more active remedial alternatives.

Active Remediation (Treatment/Disposal)

These approaches involve active measures within the contaminant mass to ultimately provide attainment of the media cleanup standards throughout the unit. These remedial technologies are potentially applicable to both soil and groundwater media, and were selected from the following categories:

- In situ treatment
- Extraction/excavation with ex-situ treatment
- Extraction/excavation and off-site disposal.

SUMMARY OF REASONABLE ALTERATIVES FOR BASF

The reasonable alternatives for addressing contamination at the BASF facility are presented below, along with their costs. The alternatives considered for soil contamination and not selected such as soil vapor extraction and enhanced bioremediation were considered to be less effective in treating the COI in the soils. The costs for these technologies do not justify the expenditure for the amount of soil to be remediated. For these reasons, soil vapor extraction and enhanced bioremediation were not selected. Excavation and offsite disposal and institutional control were selected because they can effectively isolate impacted soil, reduce infilteration and prevent direct contact exposure. Chemical oxidation and extraction of contaminated water and treatment in a waste water plant were considered for the onsite contaminated groundwater but were not selected. Based on the ground water extraction modeling, the predicted amount of contaminants that would ultimately be removed did not justify selecting the ground water extraction and treatment alternative. The chemical oxidation alternative was not selected at this time. However, it was retained for future consideration. The air sparing and monitored natural attenuation alternatives were selected .

Description of Reasonable Corrective Action Alternatives	Initial Construct. Cost	Annual OM&M	Projected End Date	Total Cost
Soil Contamination in SWMU 2, SWMU 5 & SWMU 12				
Maintain existing asphalt/concrete surface cap and implement institutional controls to prevent on-site workers from direct contact with contaminated soils	$1000	$1000	2053	$25,000
Excavation & Off-site Disposal of	$1,200,000	$0	2009	$1,200,000

approximately 2000 cubic yards of contaminated soil*				
Soil Contamination in OPSA 5				
Soil Vapor Extraction/ Enhanced Bioremediation	$100,000	$12,000	2013	$160,000
Excavation & Off-site Disposal of approximately 200 cubic yards of contaminated soil*	$120,000	$0	2009	$120,000
Shallow Groundwater Contamination (generally on-site)				
Institutional Controls*	$1000	$0	2023	$1000
Monitored Natural Attenuation*	$50,000	$150,000	2023	$2,025,000
Air Sparging and Enhanced Bioremediation*	Already Constructed	$110,000	2023	$1,650,000
Chemical Oxidation/Reduction	$1,700,000	$230,000	2013	$2,850,000
Extracting contaminated groundwater and treating it in a wastewater treatment plant	$200,000	$100,000	2043	$3,700,000
Deep Groundwater Contamination Off-site				
Institutional Controls*	$1000	$0	2018	$1000
Monitored Natural Attenuation*	$15,000	$50,000	2018	$515,000
Extraction of contaminated groundwater and treatment in a wastewater treatment plant	$100,000	$50,000	2028	$1,100,000

* Preferred Remedy

DESCRIPTION OF PREFERRED ALTERNATIVE

For PCBs in soil at SWMU 2, SWMU 4, and SWMU 12: To the extent that excavation does not adversely impact the structural integrity of Building 14 (SWMU 4 is near the west wall of the building), BASF will excavate and dispose off- site all PCB contaminated soils at SWMUs 2, 4, and 12 exceeding the media cleanup standards (approximately 2000 cubic yards or 300 tons). BASF will implement an institutional control to prevent unacceptable exposures to on-site industrial workers and construction workers. In addition, all contaminated soil that cannot be excavated due to concerns for the structural integrity of Building 14 shall be removed and disposed of at the time in the future when Building 14 is abandoned and demolished. BASF shall place a deed restriction on the land in the area of Building 14 to limit future land use to commercial and/or industrial purposes.

For soils in the OPSA 5-Former settling Basin Area: Soils at OPSA 5 contaminated by toluene, ethylebenzene and xylenes (approximately 200 cubic yards or 300 tons) must be excavated and disposed properly off-site.

For On-site Groundwater: BASF will continue to implement biosparging as the principal means of removing contaminants from the groundwater, and preventing the discharge of contaminated groundwater to Lake Macatawa.

In addition, monitored natural attenuation will be implemented as the principal means of restoring the on-site contaminated groundwater (between the former OCS Building and the air sparge curtain) to its maximum beneficial use in the long term. Monitored natural attenuation must demonstrate natural degradation of contaminants of interest in areas upgradient of the air sparge curtain. Within a reasonable time frame (30 years), we expect that monitored natural attenuation will restore the on-site groundwater such that it would be available for use as a source of commercial or residential drinking water.

Institutional controls are also necessary to prohibit the use of shallow on-site groundwater as a drinking water source and restrict construction activities in on-site areas where humans may come in direct contact with shallow groundwater.

Based on the most recent site-wide groundwater monitoring data and trend analysis conducted, chlorobenzenes in groundwater do not exhibit uniform increasing or decreasing trends at on-site monitoring wells. 1,2,4-Trichlorobenzene exhibits an increasing trend in groundwater at wells MW-8S and PZ-1 located at and down gradient of the former OCM Building, respectively. However, 1,2,4-trichlorobenzene exhibits a decreasing trend in groundwater at well MW-13 located down gradient of the former OCM Building. The concentration of chlorobenzene appears to be increasing in groundwater at wells ASW-1, MW-13 and MP-3 located down gradient of the former OCM Building between Howard Avenue and Lake Macatawa, and WW-10 located west of the former OCM Building. The concentration of chlorobenzene appears to be decreasing in wells MW-8S and WW-12 located at and west of the former OCM Building, respectively. The concentrations of 1,3-dichlorobenzene and 1,4-dichlorobenzene in groundwater appear to follow an increasing trend at wells MP-3 and MW-13 located down gradient of the former OCM Building, but follow a decreasing trend at well ASW-1 located slightly down gradient of well MW-13.

The concentrations of two chemicals, 1,3- and 1,4-dichlorobenzene, currently remain significant since their values are greater than 10 times the screening standard. Concentration tables over time indicate a temporary increase in certain wells (PMW-3D, 4D for 1,4-DCB and PZ1R and PMW-5D for 1,3-DCB) relative to samples analyzed prior to the Interim Measure implementation. It appears that this spike was caused by extreme disequilibrium in the aquifer upon the Interim Measure start-up. The total amount of contamination located downgradient of the sparge wells is not increasing. We therefore anticipate that as the sparging continues, and as additional monitoring well samples are taken, the trend will be toward lower concentrations. Therefore, in conjunction with the implementation of biosparging, BASF shall develop a more comprehensive groundwater monitoring program that will include an expansion of the existing monitoring network, with additional monitoring wells located within and immediately downgradient of the biosparging area. This additional groundwater monitoring program shall be

used to demonstrate the continued effectiveness of biosparging. The Michigan Part 201 goals will be used to determine success of the remediation.

Monitored Natural Attenuation (MNA) is the preferred remedy for the groundwater contamination that exists upgradient of the air sparging system, and the concentrations of those contaminants will decrease over time. Once the contaminant levels upgradient of the air sparging system are low enough to protect Lake Macatawa, the air sparging system will no longer be needed. Accordingly, the operation of the air sparging equipment can be terminated when the media cleanup standards for surface water (described in the table on page 8) are achieved in the groundwater upgradient of the air sparging system. After the air sparging is stopped, the monitored natural attenuation will extend to the shore of Lake Macatawa.

The operation and termination of the air sparging system, and the terms of the MNA and potential implementation of the contingent remedy must be described in the Corrective Measures Implementation (CMI) workplan to be submitted by BASF for approval by U.S. EPA.

Several technologies including chemical oxidation/reduction and groundwater extraction may be equally as effective as biosparging for preventing the discharge of contaminated on-site groundwater to Lake Macatawa. However, based on the results of bench-scale and field pilot testing, enhanced bioremediation or biosparging is the most effective alternative to remediate the contaminated on-site groundwater. Based on the above factors, the continued implementation of biosparging to prevent the discharge of contaminated groundwater into Lake Macatawa is proposed.

Likewise, other alternatives, including chemical oxidation, might be as effective as or more effective than monitored natural attenuation in areas where heavily contaminated soils act as source zones for the groundwater contamination. However, the effectiveness of these alternatives is not known, and would require pilot testing to fully evaluate their effectiveness.

Every five years, BASF must submit a report assessing whether biosparging and MNA is progressing satisfactorily. In the CMI workplan, BASF will propose the criteria for measuring satisfactory progress. The CMI workplan is subject to U.S. EPA approval. If the comprehensive groundwater monitoring program does not demonstrate that monitored natural attenuation is progressing satisfactorily toward achieving the long-term cleanup goal, or if the monitoring shows that biosparging is not performing as expected, then BASF must implement a contingent remedy to achieve the corrective action objectives for this project. The monitored natural attenuation can be terminated when the groundwater samples throughout the plume show that the long-term groundwater cleanup goals (described in the table on page 8) have been achieved consistently, in accordance with terms described in the approved CMI workplan.

The U.S. EPA is proposing that concurrent with the biosparging, BASF shall conduct pilot testing of in-situ oxidation in the potential chlorobenzene source zone beneath the former OCM Building to confirm the effectiveness of this alternative remedy. If the results from the pilot testing indicate that this technology will be more effective in treating the source areas beneath the former

OCM Building, **chemical oxidation** shall be the contingent remedy for the contaminated on-site groundwater.

For Off-site Groundwater: The Ottawa County Environmental Health regulations prohibit the installation of private water supply wells as well as extensive changes to existing wells on any premises within Ottawa County without first obtaining a permit. The Pinecrest Subdivision is within Ottawa County and is subject to this regulation. Although there was no groundwater contamination found in any of the Pinecrest residential wells, Ottowa County will not issue a permit to any person to begin construction of any dwelling requiring an onsite water well supply in the Pinecrest Subdivision without first obtaining approval. Such approvals will not be given as long as there are concerns about the contaminants in that aquifer. The U.S. EPA proposes that this previous corrective measure is an adequate final remedy for off-site groundwater. However, the remedy designed for on-site shallow groundwater will also be implemented to minimize the potential for migration of contaminants into off-site areas.

Institutional Controls: The soils at the site are safe for industrial land use, but not for residential land use. And the groundwater cannot be used as a source of drinking water as long as it remains contaminated. Institutional controls can provide adequate assurance that unacceptable human exposures will be prevented. BASF must make a Declaration of Restrictive Covenant, acceptable to the Michigan Department of Environmental Quality, which will prevent the property from being converted to residential land use in the future. It must also assure that the contaminated groundwater on the site will not be used as a source of drinking water as long as it remains contaminated. In addition, it must assure that if any PCB-contaminated soils cannot be excavated without endangering the structural integrity of a building, then they must be excavated and properly managed in the future, when the building is demolished.

For Financial Assurance: The U.S. EPA is also proposing that BASF must demonstrate that adequate funds will be available to complete the construction as well as the operation and maintenance of the proposed remedy. BASF must provide this financial assurance within 90 days after U.S. EPA selects the remedy and issues its *Final Decision and Response to Comments.* Any of the following financial mechanisms may be used to make this demonstration: financial trust, surety bonds, letters of credit, insurance, or qualification as a self insurer by means of a financial test. After successfully completing the construction, BASF may request that the amount of the financial assurance be reduced to the amount necessary to cover the remaining costs. BASF may make similar requests from time to time as the operation and maintenance phase of the remedy proceeds.

EVALUATION OF THE PREFERRED ALTERNATIVE

The proposed remedies for cleaning up contaminated media at the BASF facility are discussed above in the Preferred Alternative section. These remedial measures are proposed for the following reasons: (a) the facility will not pose acute risks to humans and other ecological receptors when the remedy is complete, (b) the preponderance of wastes at the units in question have been removed or will be treated and disposed off-site, (c) the communities do not use the groundwater as a drinking water source since drinking water supplies are already provided by the local governments in the area and (d) the alternatives do not require frequent or complex operation and maintenance.

The following discussion profiles the performance of the proposed remedy against technical, human health, environmental and institutional criteria.

Protection of Human Health and the Environment

The overall protection of human health is addressed most effectively at the BASF facility by the preferred alternative. The toxicity and volume of the PCBs and other contaminant impacted soil/sediment will be reduced within the units due to treatment and off-site disposal of these materials. Institutional controls have also been established by Ottawa County Health Department to deny applications for the installation of groundwater supply wells for use as a drinking water source. The treatment of contaminated groundwater through biosparging will prevent the discharge of contaminated groundwater to Lake Macatawa. Institutional controls will prevent potential unacceptable exposure of workers to contaminated groundwater. And excavation and off-site disposal of soils/sediments contaminated with PCBs and other contaminants will eliminate the potential for future exposure to on-site workers or environmental receptors. Also included are operational safety requirements implemented to ensure worker safety and the proper handling of hazardous materials during remedial activities.

Attainment of Media Cleanup Standards Set by U.S. EPA

The treatment process will reduce the leachability of contaminants through biosparging or chemical fixation to concentrations below the Media Cleanup Standards. Compliance with applicable ground water protection standards would be addressed by monitoring the existing on-site wells and installation of additional wells to monitor the efficacy of the remedial alternatives, along with a contingent remedy that would be implemented if necessary.

Controlling Sources of Release

BASF has taken some effective steps to stop further environmental degradation by implementing some source control measures. Between 1986 and 1989, 1325 tons contaminated soils and 856 tons of contaminated concrete were excavated and removed for proper off-site disposal. Areas contaminated with PCBs are currently covered by asphalt/concrete barriers. These areas are not accessible through direct contact. Mobility of contaminants through infiltration is reduced.

Compliance with Waste Management Standards

Excavation and removal for off-site disposal of soils contaminated with PCBs must comply with all applicable state and Federal regulations. BASF must provide to U.S. EPA all documentation that offsite disposal of PCB contaminated soils comply with State and Federal regulations. Implementation of the biosparging will provide for proper treatment of the contaminated on-site groundwater prior to discharge into Lake Macatawa.

Long-term Reliability and Effectiveness

These proposed remedies should be able to perform their intended functions of containing, collecting and treating contaminated groundwater. The implementation of the biosparging so far has demonstrated that it is reliable and should require infrequent Operations and Maintenance and have a minimal risk of failure. However, the reliability of these proposed remedies will be evaluated through monitoring requirements and demonstrated reliability.

Reduction of Toxicity, Mobility or Volume of Waste

The biosparging system currently operating on-site has removed approximately 8.6 pounds of contaminants from shallow groundwater, and 3.5 pounds from deep groundwater. This system will continue to control further release from the source. The operation of a 350-foot wide air sparge curtain constructed perpendicular to groundwater flow across the entire width of impacted groundwater promises to achieve the objective of mitigating the dissolved phase of contaminants. The groundwater and continued operation will remove the adsorbed phase of contaminants before groundwater discharges to Lake Macatawa. Should monitoring show that biosparging system is not effective, chemical oxidation will be considered as part of the preferred Alternative

Short-term Effectiveness

These proposed remedies provide the greatest improvement over the shortest period of time. The sparge curtain across the entire length of the contaminated groundwater plume provides instant barrier to groundwater discharge into the Lake.

Implementability

Construction of these remedies does not require state or local approval. Availability of adequate space to operate these remedies is no barrier and as such, the time required for implementation and improvements would not be constrained on the remedies.

Cost

Costs were determined for each alternative. Costs could be considered when deciding between two or more corrective measure alternatives that were equally acceptable when evaluated for

technical, human health, environmental and institutional criteria. Alternative 1 will achieve the corrective action objectives in a cost effective manner and will provide for continued productive use of the property.

PUBLIC PARTICIPATION

U.S. EPA is soliciting comments from the public on the corrective measures alternatives presented in this document for BASF facility. U.S. EPA has scheduled a public comment period from November 25, 2008 – January 13, 2009, in order to encourage public participation in the decision process. During the public comment period, U.S. EPA will accept written comments on the proposed action. The public may submit written comments, questions and request for public meeting to the following address:

Jonathan Adenuga
U.S. Environmental Protection Agency
77 West Jackson Boulevard, LU- 9J
Chicago, Illinois 60604

The Administrative Record for the BASF facility is available at the following location:

Herrick District Library
300 S. River Avenue
Holland, Michigan 49423
(616) 355-3728

U.S. EPA, Region 5
Land and Chemicals Division Records Center
77 West Jackson Boulevard, 7th Floor
Chicago, Illinois 60604
(312) 886-0902
Hours: Mon-Fri, 8:30 a.m. - 5:00 p.m.

After consideration of the comments received, U.S. EPA will select the remedy and document the selection in the Response to Comments (RTC). In addition, comments will be summarized and responses provided in the RTC. The RTC will be drafted at the conclusion of the public comment period and incorporated into the Administrative Record.