STATEMENT OF BASIS

U.S. Environmental Protection Agency Region 7
BASF CORPORATION – HANNIBAL PLANT
EPA ID # MOD050226075
PALMYRA, MISSOURI

PURPOSE OF THE STATEMENT OF BASIS

This Statement of Basis describes the proposed remedial actions to be taken to address soil and groundwater contamination at the BASF Corporation - Hannibal Plant Site located in Palmyra, Missouri, and explains why these actions are recommended over other remedial alternatives considered in the facility's Corrective Measures Study Report. The U.S. Environmental Protection Agency is recommending including the current Interim Measures (groundwater pump and treat system), Soil Excavation Management Plan and Environmental Covenant as required components for the final remedy at the BASF Site. Reasons for recommending the proposed remedy are provided below. The EPA is issuing this Statement of Basis to encourage public participation under the Resource Conservation and Recovery Act.

This Statement of Basis highlights the information that is presented in more detail in documents in the Facility Administrative Record. The EPA encourages the public to review these documents for a more complete understanding of the BASF Site, the remedial activities that have been conducted and to participate in the remedy selection process.

FACILITY DESCRIPTION AND HISTORY

BASF is located at 3150 Highway JJ, Palmyra, Missouri in Marion County. The BASF property occupies approximately 1,800 acres located in Sections 10, 11, 14, 15, 22 and 23 Township 3 South, Range 5 West and at latitude 91°27'45" longitude 39°51'10"; of which approximately 250 acres is subject to corrective action. The Site is bounded by surface waters to the northwest (South River), the north (Mississippi River), the west (North River), and to the east and southeast (Rock Ridge Slough and the Bay de Charles).

BASF was issued a Part 2 Hazardous and Solid Waste Amendments Permit (Permit), effective date of May 30, 1990, by the EPA and a Part 1 Missouri Hazardous Waste Management Facility Permit, effective date of April 25, 1990, for the operation of a hazardous waste treatment and storage facility. BASF was formerly known as American Cyanamid Company.

The American Cyanamid Company, now known as Wyeth Holding Corporation (and currently owned by Pfizer), purchased the property in 1965. Prior to 1965, the property was used for agricultural purposes. In 1965, the ammonia storage and loading facility, ammonium nitrate production facility and a nitric acid production facility were constructed. Another nitric acid production facility was constructed in 1978. In 1971, the di-calcium phosphate production facility and 12 acres in the north-central portion of the facility were leased to Alpharma who manufactured animal feed intermediates. Alpharma's manufacturing operations at the AFI Plant were discontinued in 2003. The insecticide production area was constructed in 1977. In 1978 and 1979, the herbicide plant area was constructed after an explosion destroyed the original herbicide plant in 1977. The facility currently manufactures agricultural chemicals including herbicides and insecticides.

BASF purchased the facility on July 1, 2000, and is the current owner and operator; however, Wyeth Holdings Corporation (Pfizer) retains financial responsibility for certain historical environmental matters.

SUMMARY OF REGULATORY HISTORY AND SITE INVESTIGATIONS

In November 1980, American Cyanamid filed a RCRA Part A hazardous waste permit application for the Hannibal Plant. The Facility was issued a RCRA hazardous waste permit in April 1990.

In 1987, AT. Kearney under contract to the EPA Region 7, completed a Preliminary Review/Visual Site Inspection Report for the facility. The VSI Report documented the identification and inspection of 42 SWMUs and six areas of concern. The EPA recommended additional action or investigation at three of the SWMUs and four of the AOCs.

SWMU 4, Fire Training Lagoon, was investigated in October 1989. Subsurface samples were collected and analyzed for volatile organic compounds and total petroleum hydrocarbons. No VOCs were detected in the samples, but TPH concentrations ranged from 18 to 147 milligrams per kilogram.

In December 1995 and January 1996, a Geoprobe™ Groundwater Assessment was completed in the eastern half of the Facility (Geraghty & Miller, Incorporated, 1996). The assessment included installation of 50 Geoprobe™ borings, collection of groundwater samples from an average depth of 79 feet below ground surface (bgs), and analysis of 50 groundwater samples for VOCs. Results of the groundwater assessment indicated detectable concentrations of monochlorobenzene (MCB), 1,2-dichloroethane (1,2-DCA), chloroform, ethylbenzene, total xylene, 1,1-dichloroethane (1,1-DCA) and trans-1,2-dichloroethene (trans-1,2-DCE). MCB was detected above the laboratory reporting limit in groundwater samples collected from 22 of 50 Geoprobe™ locations. MCB was also detected above the laboratory reporting limit in Industrial Wells 7 and 8. 1,2-DCA was detected above the laboratory reporting limit in groundwater samples collected from 44 of 50 Geoprobe™ locations and from Industrial Wells 7 and 8.

In a March 23, 2000 letter, the EPA required further investigation of the impacted groundwater containing detectable concentrations of organics that was investigated during the 1995/1996 Geoprobe™ Groundwater Assessment. On behalf of BASF, Arcadis conducted a Phase I RFI Site characterization field investigation from October through November 2003, and from September through March 2005.

A focused source characterization program consisting of 36 source characterization borings was completed based on an extensive review of historical site operations and environmental data from previous investigations. The source area characterization program investigated potential source areas in addition to the abandoned underground wastewater sewers and piping. Direct push borings were the primary investigative tool used during the source area characterization. Shallow groundwater samples from each of the 36 source characterization borings were collected between the 23-to-25 foot bgs interval located in the upper portion of the alluvial aquifer.

Arcadis conducted the Phase II RFI field work from July 2005 through May 2006. The Phase II RFI was a focused source area characterization program consisting of 57 soil source characterization borings. The primary goal of the Phase I and Phase II source area characterization program was to delineate the lateral extent of source areas in the vadose zone and phreatic zone, which might be responsible for the dissolved VOC concentrations detected in groundwater beneath the facility and to confirm the presence of suspected source areas throughout the site based on the results of the Phase I RFI.

During the Phase I RFI, 21 direct push borings were installed across the Site in 2003, and 28 additional direct push borings were installed in 2004 as part of the groundwater characterization program to supplement and compare against groundwater quality data collected during the groundwater assessment in 1995 and 1996.

Based on the results of the RFI conducted at the Site, five confirmed soil source areas were identified. In addition, four possible soil source areas were identified but could not be confirmed because of the presence of shallow groundwater and local elevated shallow groundwater concentrations. The extent of impacted soil is shown on Figure 1. The confirmed and possible soil source areas, and their respective constituents of concern, are summarized in Table 1 below:

Table 1: Soil Source Areas and Constituents of Concern

Confirmed Soil Source Area	**Constituents of Concern**
Herbicide Process Area – "A" Aqueous AST	MCB
Herbicide Process Area – Includes process tanks and buildings, underground wastewater sewers and piping, and sewer sumps	1,2-DCA ; Vinyl Chloride
Herbicide Tank Farm – Eastern portion of organic unloading area	MCB
Herbicide Tank Farm – Former sewer sump/lift station	MCB ; 1,2-DCA ; Vinyl Chloride
CPC Warehouse – Storage tanks and sewer sump/lift station	MCB ; 1,2-DCA
Possible Source Area	**Possible Constituents of Concern**
Herbicide Process Area – "C" Aqueous AST	MCB
Herbicide Process Area – Vicinity of borings SCB-32 and 70	Naphthalene
Herbicide Process Area – Vicinity of boring SCB-35	MCB
Thimet®/Counter® Area – Vicinity of boring DP-30	1,2-DCA

Groundwater sampling conducted during the RFI indicated that two of the constituents of concern (Chlorobenzene, also known as monochlorobenzene or MCB, and 1,2-dichloroethane or 1,2-DCA) are consistently reported in the groundwater at the Site. The concentrations and areal extent of MCB and 1,2-DCA varies between the three primary hydrostratigraphic units (shallow, intermediate and deep) underlying the Site. The extent of groundwater impacts are shown on Figures 2 and 3. The impacted areas of groundwater, the constituents of concern and the related soil source areas are summarized below:

Table 2: Impacted Areas of Groundwater

Impacted Groundwater Areas	**Constituents of Concern**	**Related Soil Source Areas**
Area of former sewer sump to organic unloading area in Herbicide Tank Farm.	MCB	Herbicide Tank Farm – Eastern portion of organic unloading area Potential Source Area – Vicinity of boring SCB-35
"A" and "C" Aqueous ASTs.	MCB	Herbicide Process Area – "A" Aqueous AST
CPC Warehouse	MCB ; 1,2-DCA	CPC Warehouse – Storage tanks and sewer sump/lift station
Herbicide Process Area	1,2-DCA	Herbicide Process Area – Includes process tanks and buildings, underground wastewater sewers and piping and sewer sumps
Area northeast of Thimet®/Counter® Area	1,2-DCA	Potential Source Area – Vicinity of boring DP-30

INTERIM MEASURES

An Interim Groundwater Treatment System was constructed at the BASF facility from November 2009 to July 2010. Minor modifications to the system have been conducted to date, generally to increase the overall removal efficiency of the IGTS.

The IGTS effluent is permitted under a Missouri State Operating Permit/National Pollutant Discharge Elimination System (NPDES); Permit Number MO-0135763. The IGTS treats groundwater using extraction wells that were installed in high constituent concentration locations. Further detail regarding the IGTS is presented in the Interim Groundwater Remediation System Construction Completion Report (dated July 08, 2011), Corrective Measures Study (dated October 14, 2011), and the Final Semi-Annual Remedial System Performance Report (dated May 06, 2014).

The objectives of the IGTS are as follows:

- Remove constituents of concern from the site groundwater; and
- Control migration of source area groundwater and leading edge plume contamination.

PROPOSED REMEDY

Corrective measures alternatives are detailed in the CMS Report. The EPA is proposing the following corrective measures to address contamination at the BASF facility. A more detailed discussion of the proposed remedy is included in the CMS Report and associated documents.

Site Groundwater Contamination

- Operate the current IM pump and treat system that incorporates air stripping technology to remove pollutants from groundwater and to manage groundwater migration.
- Monitored natural attenuation that uses natural degradation processes to reduce contaminant mass.
- Utilize groundwater monitoring wells to document contaminant plume containment and reduction in contaminant concentrations.
- Annual status reports in accordance with Permit conditions.

Site Soil Contamination

- Engineering controls to limit exposure to soil using existing buildings, piping and operational infrastructure.
- Establish work practice controls: Soil Excavation Management Plan and a Safety Work Permit Program to minimize exposure.
- Establish governmental controls following the Missouri Environmental Covenants Act to protect engineering controls.
- Soil source removal and in situ treatment technologies will be used to remove soil contamination during future facility demolition, renovation or other activities that may expose soil contamination.

REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives selected for this site represent the EPA's Regional Screening Levels for Industrial Soils and Maximum Contaminant Levels for groundwater. The RAOs were selected based on an evaluation of current site conditions, future expected site conditions and a letter from BASF to the EPA dated July 23, 2014, referencing land use scenarios and the use of an environmental covenant. RSLs are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. RSLs are considered by the EPA to be protective for human health (including sensitive groups) over a lifetime. A table containing the current RSLs has been included in the Administrative Record. Drinking water standards (MCLs) have been established as the final cleanup goal for groundwater at the site.

MCLs are periodically revised and may be reviewed in the document entitled 2012 Edition of the Drinking Water Standards and Health Advisories, dated April 2012 (a copy has been included in the Administrative Record).

If a contaminant present in groundwater does not have a final MCL an EPA RSL for tap water is used. Tables 3 and 4 below provide the cleanup goals for soil and groundwater; however, it is not expected that on-site groundwater would be used for potable water supply.

Table 3: Remedial Action Objectives for Soil

Compound	RAO	Source of RAO
Chlorobenzene (MCB)	1,300 mg/kg	RSL – Industrial Soil
1,2-Dichloroethane	2.0 mg/kg	RSL – Industrial Soil
Vinyl Chloride	1.7 mg/kg	RSL – Industrial Soil
Naphthalene	17 mg/kg	RSL – Industrial Soil
Toluene	47,000 mg/kg	RSL – Industrial Soil

RAO Remedial Action Objective
mg/kg milligrams per kilogram
RSL The EPA Regional Screening Levels for Industrial Soils

Table 4: Remedial Action Objectives for Groundwater

Compound	RAO	Source of RAO
Chlorobenzene (MCB)	0.1 mg/L	MCL
1,2-Dichloroethane	0.005 mg/L	MCL
Vinyl Chloride	0.002 mg/L	MCL
Naphthalene	0.00017 mg/L	RSL – tap water
Toluene	1.0 mg/L	MCL

RAO Remedial Action Objective
mg/l milligrams per liter
MCL The EPA Maximum Contaminant Level for EPA's Safe Drinking Water Act Regulations and Health Advisories
RSL The EPA Regional Screening Levels for tap water

EVALUATION OF THE PROPOSED REMEDY

A number of corrective measure alternatives were evaluated for soil and groundwater contamination. A detailed evaluation was conducted with respect to the following general standards for corrective measures and selection decision factors.

The four standards that a proposed remedy must satisfy are as follows:

- **Overall Protection of Human Health and the Environment:** provide protection of human health and the environment.
- **Attain Media Cleanup Standards:** achieve media-specific cleanup standards.
- **Control the Sources of Releases:** reduce or eliminate, to the maximum extent possible, further releases.
- **Comply with Standards for Management of Wastes:** management of wastes during corrective measures is conducted in a protective manner.

The five additional factors that are considered, as appropriate, by the EPA in selecting or approving a remedy that meets the four general standards listed above are:

- **Long-term Reliability and Effectiveness:** This factor is used to evaluate the adequacy and reliability of the remedy.
- **Reduction of Toxicity, Mobility or Volume of Wastes:** This factor is used to evaluate the treatment processes used, the amount of hazardous materials destroyed or treated, the degree of expected toxicity reduction, mobility reduction, or reduction in the volume of waste, and the type and quantity of residual contamination remaining after treatment.
- **Short-term Effectiveness:** This factor considers protection of the community and on-site workers during remedy implementation and the environmental impacts of remedy implementation.
- **Implementability:** This factor is used to evaluate the ability to construct and operate the remedial technology, the reliability of the technology, the ease of undertaking additional corrective measures (if it becomes necessary), the ability to monitor the effectiveness of the remedy, coordination with other regulatory agencies and the availability of off-site treatment, storage and disposal services.
- **Cost:** This factor considers both the capital (up-front) remedial costs and the costs of operating and maintaining the remedy.

The following briefly describes how the proposed remedy satisfies the four standards.

Overall Protection of Human Health and the Environment
Engineering and Institutional controls and the appropriate work practices minimize the direct-contact exposure pathway for soils and should be protective of on-site workers. The proposed remedy should reduce the concentration of contaminants in groundwater, prevent off-site migration of contaminated groundwater, prevent discharge of contaminants to nearby rivers and protect the on-site industrial water supply wells.

Attain Media Cleanup Standards
Soil contamination above the EPA Regional Screening Levels for Industrial Soil will be removed under the proposed remedy. Groundwater contaminants will be removed using the proposed remedy to attain MCL standards.

Control the Sources of Releases
Soil and the resulting groundwater contamination was primarily the result of past releases most notably the explosion of the herbicide plant in 1977. Spills and/or releases of contaminants to soil continue to occur from time to time. Any necessary actions to cleanup and remove contamination resulting from future spills and releases are expected to be taken immediately at the time of the incident. Existing plant infrastructure limits infiltration of precipitation and consequently the transfer of contamination from soil into groundwater. Soil source areas will be removed as they become accessible. Hydraulic control and removal of the more highly contaminated groundwater at soil contamination source areas will reduce the extent of the contaminated groundwater plume.

Comply with Standards for Management of Wastes
Contaminated soil from excavation activities will be transported off-site for disposal in accordance with the applicable regulations. Contaminated groundwater removed by the extraction system is treated in accordance with BASF's permit before it is discharged to the Mississippi River.

PUBLIC COMMENT PERIOD

The EPA will accept public comments from August 27, 2014 to September 26, 2014. A public hearing is not scheduled at this time. The EPA will conduct a public hearing and receive both oral and written comments if the public requests a public hearing in writing with a statement of issues to be raised at the hearing. Locations where the public may review the Administrative Record for this Site are identified at the end of this Statement of Basis.

The EPA will select a remedy for the BASF Site only after the public comment period has ended and all comments have been reviewed. Public comment on the proposed remedial activities and other alternatives is important to the remedy selection process. The EPA may modify the proposed remedy or select another remedy based upon new information or comments received from the public during the public comment period.

The EPA solicits input from the community on the proposed corrective measures for the environmental contamination at the BASF Site in Palmyra, Missouri. Please submit written comments before September 26, 2014 to:

Mr. Michael Dandurand
U.S. Environmental Protection Agency
Waste Remediation and Permitting Branch
Air and Waste Management Division
11201 Renner Boulevard
Lenexa, Kansas 66219

Any comments received will be reviewed. Any response to comments prepared will be included in the remedy decision.

MORE INFORMATION

Relevant reports and documents are available in the Site Administrative Record which will be located at the following locations during regular business hours.

Palmyra Bicentennial Public Library 212 S. Main Street Palmyra, Missouri 63461 Phone: (573) 769-2830 Hours: Mon. through Fri. 10 am – 5:30 pm Saturday 10 am – 2 pm Sun. Closed	EPA Region 7 Library Information Resource Center 11201 Renner Boulevard Lenexa, Kansas 66219 Phone: (913) 551-7241 Hours: Mon. through Fri. 9 am - 3 pm Contact Michael Dandurand by phone at (913) 551-7504, or by email at dandurand.michael@epa.gov for additional information.

The information in this document is presented in detail in the RCRA Facility Investigation (RFI) Report (Arcadis 2005), the Phase II RFI Report (Arcadis 2006), the Interim Groundwater Remediation System (IM) Construction Completion Report (July 08, 2011), the CMS Report (dated October 14, 2011), CMS Approval (February 15, 2013), and the Soil Excavation Plan (February 13, 2013) for the BASF Site, letter covenant.

FIGURE 1

FIGURE 2

FIGURE 3