STATEMENT OF BASIS
FOR
UNIVAR USA INC.
SOUTH BEND, INDIANA

IND 016 627 333

INTRODUCTION

This Statement of Basis (SB) for Univar USA Inc. (Univar) in South Bend, Indiana is being issued by the United States Environmental Protection Agency (U.S. EPA or the Agency) to fulfill public participation responsibilities under the Resource Conservation and Recovery Act (RCRA). The SB explains the proposed remedy at the facility. This remedy is proposed for addressing ground water contamination at the facility and in the areas off-site. In addition, the SB includes summaries of other potential remedies analyzed and considered for this facility. The U.S. EPA will select a final remedy for the facility only after the public comment period has ended and the information submitted during this time has been reviewed and considered.

This document summarizes information that can be found in greater detail in the RCRA Facility Investigation Report, Univar's July 31, 2003, Risk Assessment, the April 30, 2008, Corrective Measures Study, and other documents contained in the administrative record for the Univar facility. U.S. EPA encourages the public to review these other documents in order to gain a more comprehensive understanding of the facility and RCRA activities that have been conducted there.

The 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. The public can be involved in the remedy selection process by reviewing the documents contained in the administrative record. U.S. EPA in this document informs the public of the location and availability of the administrative record.

ABBREVIATIONS USED IN THIS DOCUMENT

ACA – Administrative Control Area
CMS – Corrective Measures Study
EDQLs – Ecological Data Quality Levels
CERCLA – Comprehensive Environmental Response Compensation and Liability Act
COCs – Contaminants of Concern
EAD – Enhanced Anaerobic Dechlorination
ELCR – Excess Lifetime Cancer Risk
HI – Hazard Index
ICs – Institutional Controls
IDEM – Indiana Department of Environmental Management
MCLs – Maximum Contamination Levels
MNA – Monitored Natural Attenuation
RA – Risk Assessment
RCRA – Resource Conservation and Recovery Act
RISC – Risk Integrated System of Closure
RFI – RCRA Facility Investigation
SB – Statement of Basis
SJCHD – St. Joseph County Health Department
SVE – Soil Vapor Extraction
U.S. EPA – United States Environmental Protection Agency
VOCs – Volatile Organic Compounds

LOCATIONS ADDRESSED BY THE CORRECTIVE ACTION

For purposes of the Risk Assessment (RA) and the corrective action at this location, the Univar facility and the properties impacted by it are divided into three areas, as shown on Figure 1 (attached):

Area 1 – The Univar facility

Area 2 – The area north of the Univar facility, which is bounded by the northern Univar property line, the eastern boundary of the Schuman Landfill, Ireland Road to the north, and Market Street to the east. Land use in Area 2 is commercial and light industrial.

Area 3 – The area north of Area 2, which is bounded on the south by Ireland Road, on the west by Mayflower Road, on the north by Cloyd Street, and on the east by a railroad right-of-way. Land use in Area 3 is primarily residential.

FACILITY BACKGROUND

Facility description

The Univar South Bend facility is located at 59865 Market Street in South Bend, at the south end of an industrial park. From 1956 until 2008, the facility was a 5.5-acre chemical distribution center which historically handled both pre-packaged and bulk liquid industrial chemicals. The liquid repackaging process consisted of transferring chemical products, which included acids, bases and chlorinated solvents, from above ground storage tanks located in the southwestern portion of the facility, to 55-gallon drums and other containers. The solvent tanks were removed from service in 1988, and the corrosive liquid tanks were decommissioned in 2006. Chemical repackaging operations at the facility ceased in April 2008. Univar continues to distribute prepackaged chemicals to its customers.

Land Use

Immediately to the north of Univar are a number of other light industrial and commercial facilities (Area 2). Areas immediately south and east of the facility are undeveloped, with heavily wooded hills just south of the property. The right-of-way for the New Jersey, Indiana and Illinois Railroad lies adjacent to the west of the property. This rail is no longer used, and the track has been removed from the area of the Univar facility to approximately 200 feet north of State Road 23. Farther to the west of the former railroad is a wooded marshy area and a former gravel pit which had been used as a disposal site for construction debris and industrial wastes, known as the Schuman Landfill, which is inactive and is not included in Area 2. The area to the north of Ireland Road and State Road 23 is primarily residential with some agricultural use to the northwest (Area 3). This area also includes a small lake, known as Dollar Lake.

Site Geology and Hydrogeology

The Univar facility is located in the Maxinkuckee Moraine aquifer system, consisting of locally thick sand and gravel layers within a glacial till deposit. The previously described Areas 1, 2 and 3 for this corrective action are primarily underlain by sand and gravelly sand deposits which are 40’ to 60’ thick, and are in turn underlain by a stiff clay. To the west and northwest of Univar, Schuman Landfill and the marshy area are underlain by silt and peaty clay that is about 10’ thick, which is underlain by the local sand and gravel. Generally, the sand and gravel deposits are highly permeable and conducive to ground water flow. Data from soil borings indicate that the gravel content and permeability increase with depth.

In the corrective action area, the water table is encountered from 15' to 25' below ground surface. Ground water flow is generally to the north-northwest, although the marshy area to the west of Univar appears to divert the local ground water flow to the north-northeast. This means that ground water flows from beneath the Univar facility (Area 1) toward Area 2 and Area 3.

In Area 3, approximately 400' north of State Road 23 is Dollar Lake, an oval to circular body of water about 4.5 acres in size. The lake is surrounded by residential property with no evidence of development or permanent access points. The perimeter of the lake is marshy and heavily vegetated with tall grass and cattails. There are no known surface water inflows or outflows from the lake, which indicates that it is a ground water "flow-through" body. In the past, peat was dredged from the lake bottom for local sale. No recreational activities, such as swimming or fishing, have been observed at Dollar Lake. .

Facility Regulatory Background

The Univar facility, originally known as Van Waters & Rogers prior to a corporate name change, had a Federal RCRA permit which U.S. EPA issued on February 3, 1991 (RCRA Identification Number IND 016 627 333), which required hazardous waste minimization, corrective action for releases of hazardous wastes, and other portions of the RCRA statute not covered by the State issued RCRA permit for storage of hazardous wastes.

This State RCRA permit, issued on December 28, 1990, regulated the storage of drums of off-specification industrial chemicals (generated on-site or received from other facilities) at two locations at the Facility. In 2002, Univar closed these areas under the oversight of the Indiana Department of Environmental Management (IDEM), which terminated the State RCRA permit.

In 1993, U.S. EPA modified the Federal portion of the RCRA permit when the Agency learned of chlorinated solvent management practices which resulted in the release of VOCs to the soil and ground water at the Univar facility. This modification required Van Waters & Rogers (Univar predecessor) to investigate and address the releases under Sections 3004(u) and 3004(v) of the RCRA statute. In 2001, U.S. EPA modified the Federal RCRA permit to extend the expiration date to 2006, in order to allow time for completion of the corrective action. The Federal RCRA permit expired on November 11, 2006. U.S. EPA and Univar are collaborating to complete corrective action at the site.

Investigations Performed in the Area

- **Schuman Response Group Investigation –** In 1990 the Schuman Response Group, i.e., parties who had disposed of wastes in the Schuman Landfill, contracted with T.A. Gleason and Associates to conduct residential well sampling. Sample analysis detected the following contaminants in residential wells: 1,1,1-Trichloroethane (1,1,1-TCA), cis-1,2 Dichloroethene (cis-1,2-DCE), 1,2-Dichloroethane (1,2-DCA), Vinyl Chloride, Trichloroethene (TCE), trans-1,2-Dichloroethene (trans-1,2-DCE), 1,1-Dichloroethane (1,1-DCA), and 1,1-Dichloroethene (1,1-DCE). It was determined that approximately 40 of the 110 residential wells in Area 3 had been affected by contamination, many with VOC concentrations above their regulatory maximum contaminant levels (MCLs).

  The Schuman Response Group also contracted with ERM Midwest (ERM) to perform a hydrogeological investigation around the Schuman Landfill. The investigation consisted of ground water sampling, a study of aerial photographs, an electromagnetic study, test pit sampling, and the installation of 18 monitoring wells. ERM concluded that the highest concentrations of VOCs in ground water were upgradient of the landfill.

- **Van Waters & Rogers Subsurface Investigation** – In September and October of 1992, a soil gas survey and subsurface investigation was conducted by Geraghty & Miller at the Univar facility. This investigation phase consisted of soil gas sample collection and the installation of six boreholes and six monitoring wells. The highest VOC concentrations were found in soil and ground water on the western side of the Univar facility. It was also determined that ground water beneath the Facility flowed to the northwest.

- **Initial Investigation by U.S. EPA –** In 1993, U.S. EPA responded to inquiries from local citizens and the St. Joseph County Health Department, regarding ground water contamination in Area 3. The Agency investigated waste management practices at the Van Waters & Rogers (Univar) facility by conducting a site visit and by interviewing present and former employees of the company. Based upon the information obtained, U.S. EPA identified areas within the facility where industrial chemicals and/or hazardous wastes were released.

- **Indiana State Department of Health Report –** In 1995, the Indiana State Department of Health issued a report concluding that sensitive populations in the residential area (Area 3) were exposed to water supplies containing industrial chlorinated solvents that could pose a human health risk through dermal exposure, inhalation and oral ingestion. The report concluded that ground water contamination at the Univar facility resulted from past practices of handling industrial chemicals and/or hazardous wastes at the Facility, in particular, the handling of chlorinated industrial solvents.

- **IDEM Investigation** – From 1995 to 1997, the IDEM installed fifteen monitoring wells north and northeast of the site in order to delineate ground water contamination and to determine the directions of ground water flow. Also, IDEM investigated the historical waste management and disposal activities of businesses and property owners in the area. In 1998, IDEM determined that Van Waters & Rogers (Univar) is the sole or predominant source of VOC contamination in the local ground water.

- **Univar RCRA Facility Investigation (RFI)** – From 1995 to 1997, Univar collected soil, ground water, surface water and sediment samples as part of the RFI. Geraghty & Miller, Univar's environmental contractor, installed 26 soil borings and monitoring wells to the north and northwest of the facility. Surface water and sediment samples were taken from a small stream which runs along Univar's southern property boundary. Hydraulic conductivity tests were run at the monitoring wells. Univar's RFI concluded that:

    1. The VOC distribution in the shallow and deep monitoring wells reflected the ground water flow patterns.

    2. Except for two pairs of wells, VOC concentrations were higher in deeper wells than shallow wells downgradient of the facility.

    3. VOCs were not present in surface water or sediment samples from the small creek to the south of the facility (except in one sediment sample from upstream of the facility). Dollar Lake could not be accessed for sampling.

    4. VOCs were present in both deep and shallow wells at the Schuman Landfill and the Market Street area; however additional VOC sources may be present.

- **Off-Site Investigation** – Univar did a post-RFI investigation in 1998, consisting of ground water sampling with a mobile rig and the installation of five new monitoring wells. The study concluded that there had been little change in ground water flow direction since 1992; VOC contamination from the Univar facility extends north of Ireland Road, and that VOC concentrations were decreasing over time.

PREVIOUS REMEDIAL AND ADMINISTRATIVE ACTIONS

In the fall of 1993, a soil vapor extraction system (SVE) was installed on the Univar property. The SVE system became operational when State air release permits were obtained in January 1995, and the system remains operational at present. Initially, the SVE system consisted of two soil vapor extraction wells in the western and southwestern portions of the property. Subsequently, four on-site monitoring wells (VMW-2, VMW-3, VMW-4 and VMW-5) were added to the SVE system, which has removed over 1.13 tons of VOCs from the Univar facility.

In 1996, acting under a CERCLA Administrative Order on Consent, Univar and other responsible parties constructed a water main in order to connect the industrial area north of the Facility and the residential area north and northwest of the Facility to the City of South Bend drinking water supply. Residents connected to the City water supply were required to abandon their private wells. However, several private wells and agricultural wells remain operational in Area 3, and at least one private well remains operational in Area 2.

In 2007, the St. Joseph County Health Department (SJCHD) created an Administrative Control Area (ACA) to reduce or prevent the likelihood of anyone becoming ill from the ground water contamination in the area which encompasses Areas 1, 2 and 3. The boundaries of the ACA encompass the ground water which has been impacted by the Univar facility, along with a surrounding "buffer zone" of uncontaminated ground water. No one within the ACA may install a well for the potable or non-potable use of ground water without the permission of the SJCHD. Based on a 2008 survey by the SJCHD there are 109 parcels in the ACA without a connection to the City drinking water supply. Although 58 of these parcels are currently vacant, others are not and use private wells for their water supply. Only one parcel containing a residential drinking water well was identified within the contaminant plume boundary, at 23007 State Road 23. However, the actual location of the residence and the potable water well is over 750 feet from the plume boundary. City water service is available to the property as the water line extends approximately 500 feet east of the residence.

CONTAMINANTS OF CONCERN

Presently, a plume of VOC contamination in the ground water extends approximately 3,000 feet to the north-northwest from the Univar facility, beneath Area 2 and Area 3. The lateral extent of the plume is approximately 40 acres.

VOCs detected in soil and ground water beneath the Univar facility during the 1992 investigation were:

Acetone	1,1,2,2-tetrachloroethane (1,1,2,2-PCA)
Benzene	Tetrachloroethene (PCE)
1,1-dichloroethane (1,1-DCA)	Toluene
1,1-dichloroethene (1,1-DCE)	1,1,1-trichloroethane (1,1,1-TCA)
1,2-dichloroethene (total 1,2-DCE)	Trichloroethene (TCE)
Ethylbenzene	Vinyl chloride
2-butanone (MEK)	Chloroethane
4-methyl-2-pentanone (MIBK)	Xylenes

In November 2007, Univar sampled the soil beneath its property to evaluate the effectiveness of the SVE system. The following contaminants were detected in the soil at the concentrations given in milligrams per kilogram (mg/kg):

1,2-DCE	0.005
TCE	0.0082 to 0.036
1,1,1-TCA	0.0085
PCE	0.008 to 0.1

All of the concentrations of detected contaminants are below the State of Indiana Risk Integrated System of Closure (RISC) screening values for residential soil, with the exception of PCE. The detected concentrations of PCE are below the RISC screening level for industrial soil (0.64 mg/kg).

The U.S. EPA has set the maximum allowable concentrations (Maximum Contaminant Levels, or MCLs) of organic chemicals for the protection of drinking water. MCLs for contaminants detected in the ground water beneath and downgradient of Univar are (in milligrams per liter, or mg/L):

1,2-DCA	0.005	1,1-DCE	0.007
cis-1,2-DCE	0.07	trans-1,2-DCE	0.1
1,1,1-TCA	0.2	TCE	0.005
PCE	0.005	vinyl chloride	0.002

Presently, there are no MCLs for Chloroethane and 1,1-DCA. However, the State of Indiana has established protective standards for ground water use in residential areas, under the Risk Integrated System for Closure (RISC). The Indiana RISC standards are (in mg/L):

Chloroethane	0.062	1,1-DCA	0.99

The most recent sampling of ground water in the area occurred on November 19, 2008. The maximum concentrations of contaminants (in mg/L) detected in each corrective action area are as follows:

Area 1	cis-1,2-DCE	0.0044
	1,1-DCA	0.0031
	PCE	0.043
	1,1,1-TCA	0.0059
	TCE	0.0097

Area 2	cis-1,2-DCE	0.43
	1,1-DCA	0.019
	trans-1,2-DCE	0.018
	PCE	0.0032
	1,1,1-TCA	0.038
	TCE	0.038
	Chloroethane	0.2
Area 3	1,2-DCA	0.0032
	1,1-DCA	0.023
	cis-1,2-DCE	0.18
	trans-1,2-DCE	0.012
	vinyl chloride	0.18

As noted above, in the residential area (Area 3), the latest monitoring results show concentrations of cis-1,2-DCE and vinyl chloride above their respective MCLs.

UNIVAR'S RISK ASSESSMENT

Univar conducted a risk assessment from 2000 to 2003 based on the assumptions the on-site pavement and structures would remain intact (thereby minimizing the infiltration of precipitation into on-site contaminated soil) through institutional controls and that future land use in the three areas would remain the same for the foreseeable future. During the RCRA Facility Investigation, Univar calculated a Risk Assessment (RA) for the contaminants of concern (COCs) in the subject areas. The RA evaluated the potential effects on human health and the environment by exposure to COCs in soil, soil vapor, ground water and surface water. U.S. EPA approved the RFI and RA on May 30, 2003 subject to Univar filing certain restrictive covenants on its property, preparing an MNA demonstration if monitored natural attenuation was to be a corrective measure, and continuing use of the SVE system to control the source of chemical contamination at the Facility.

Human Health Risks

Potential effects on human health are evaluated in two categories: the Excess Lifetime Cancer Risk (ELCR) and the Hazard Index (HI) for non-cancer health effects. The U.S. EPA's acceptable risk range for ELCR is from 1 in 10,000 (1×10^{-4}) to 1 in 1,000,000 (1×10^{-6}). The Agency's non-cancer risk goal is an HI value of less than 1.

The Univar RA's conclusions for human health risk are as follows:

- COCs at the site are primarily the chlorinated VOCs that were released to the subsurface soils at the Univar facility as a result of past operations. Ground water is the principal impacted medium at the site.

- Exposure scenarios in Area 1 include excavation worker exposure to subsurface soils and worker exposure to VOC vapor migrating from the ground water into the overlying buildings. The ELCR and HI for excavation worker exposure to subsurface soils are 1×10^{-8} and 0.005, respectively. The ELCR and HI for worker exposure to vapors released from the ground water to indoor air are 4×10^{-8} and 8×10^{-5} (0.00008), respectively. These exposure scenarios are within the U.S. EPA's acceptable risk management range.

- The Area 2 exposure scenario assessed worker exposure to VOC vapors migrating from the shallow ground water into the overlying buildings. The ELCR and HI for worker exposure to vapors are 4×10^{-8} and 4×10^{-5} (0.00004), respectively. These exposure scenarios are within the U.S. EPA's acceptable risk management range.

- Area 3 exposure scenarios included vapor intrusion from shallow ground water, future hypothetical potable water exposure (ingestion, dermal contact and inhalation) from residential use, swimming in Dollar Lake, and consumption of fish from Dollar Lake. The ELCR and HI for resident exposure to vapors released to indoor air are 3×10^{-7} and 0.0005, respectively. The ELCR for shallow potable water exposure are 4×10^{-5} and 0.9, respectively. The ELCR and HI for deeper potable water exposure are 6×10^{-4} and 18, respectively. For swimming exposure, the ELCR and HI are 5×10^{-8} and 0.001, respectively. For fish consumption, the ELCR and HI are 2×10^{-7} and 0.02, respectively. All exposure scenarios, except the potable use of deeper ground water, are within the U.S. EPA's acceptable risk management range.

- Cumulative risks (i.e., assuming an Area 3 resident is exposed via vapor intrusion, consumption of shallow ground water, swimming in Dollar Lake, and consumption of fish from Dollar Lake) are within acceptable levels. Cumulative risks including consumption of deeper ground water would be above the acceptable U.S. EPA risk management range.

Ecological Risks

A screening level ecological assessment was conducted for the site. COCs on the Univar property (Area 1) occur in either soil (beneath paved surfaces or buildings) or ground water. The closest potential location for ecological exposure to COCs from the Univar property is Dollar Lake (Area 3), which is on private property. Research of waste disposal activities in the area by U.S. EPA and IDEM Superfund investigators indicates that residential and industrial wastes may have been discarded in and around the lake. During the RCRA Facility Investigation and Risk Assessment Univar personnel were unable to directly sample and investigate Dollar Lake because of the property owner's refusal of access.

In lieu of direct investigation of Dollar Lake, Univar used the concentrations of COCs in nearby ground water monitoring wells and conservative calculations to model COC concentrations in surface water and sediment. The modeled COC concentrations were compared with U.S. EPA Ecological Data Quality Levels for risk screening. For surface water, the HI for the modeled COC concentrations was below 1, which indicates that the group of COCs is unlikely to cause adverse ecological effects. With the exception of the modeled concentration of 1,1-DCA, the modeled sediment concentrations also resulted in an HI below 1. Based upon the results of the ecological assessment, the U.S. EPA has determined that contamination from the Univar facility has not adversely impacted the local ecosystems.

PRELIMINARY ASSESSMENT OF REMEDIAL TECHNOLOGIES

While nearing completion of the RFI and RA, Univar evaluated treatment technologies for the degradation of the chlorinated VOCs which are present in ground water. The degradation process is dechlorination, i.e., the removal of chlorine ions from the contaminant molecules, which forms the non-hazardous end products ethene and ethane. The specific technologies which Univar evaluated are listed and described later in this Statement of Basis.

The technology which appeared the most practical and effective was Enhanced Anaerobic Dechlorination (EAD). This involves adding a nutrient to the contaminated ground water that will stimulate the reproduction and growth of native bacteria which consume chlorinated VOCs, thereby removing the chlorine content and generating ethene and ethane. Univar found a commercial by-product called Molwhey, a combination of molasses and whey, to be an effective nutrient.

EAD Pilot Test

Univar proposed to construct and operate a pilot-scale EAD treatment system on a portion of the contaminant plume downgradient of the facility. On October 6, 2004, U.S. EPA granted permission to conduct the pilot test. Univar constructed the system and started its operation on May 1, 2006.

The soil in the subject area contains bacteria which are native to the soils of Indiana. Some varieties of these bacteria are able to consume VOCs for energy, and this process removes chlorine from the contaminants, ultimately producing non-hazardous compounds such as ethene and ethane. This is the Enhanced Anaerobic Dechlorination process. These bacteria are encouraged to reproduce by providing the Molwhey, a nutrient, to their habitat. Generating and maintaining increased populations of the bacteria within the contaminant plume will progressively break it down into non-hazardous compounds.

The EAD treatment process involves the extraction of contaminated ground water, mixing it with measured amounts of Molwhey, injection of the treated water into the aquifer, and the monitoring of downgradient ground water for evidence of VOC removal. The pilot system (Figure 2) consists of six extraction wells (EW) screened from 19 to 43 feet below the ground surface, thirteen injection wells (IW) screened from 18 to 43 feet below the ground surface, and six performance monitoring wells (R-MW) between the EWs and the IWs screened from 22 to 42 feet below the ground surface. Containers of Molwhey, a mixing tank and blending apparatus are housed in a trailer. The well array is installed along a 250' length of Ireland Road, at the upgradient boundary of Area 3.

Performance of the EAD pilot system was measured by sampling and analyzing the ground water downgradient of the well array. Downgradient wells in Area 3 include VMW-26, VMW-27, IMW-7D and IMW-8. Monitoring wells VMW-26 and VMW-27 are screened 10 to 20 and 40 to 45 feet below ground surface, respectively. The Indiana monitoring wells IMW-7D and IMW-8 are screened 31.5 to 41.5 and 61.5 to 71.5 feet below ground surface, respectively. The concentrations of VOC contaminants were monitored, and the ground water was also analyzed for ethene and ethane, which are evidence of complete degradation of chlorinated VOCs.

The measurements of decreasing concentrations of chlorinated VOCs in the downgradient ground water were used to calculate the efficiency of contaminant removal by the EAD pilot system. Since the initiation of the EAD pilot test on May 1, 2006, total VOC concentration has been reduced by 99.8% in well VMW-27 and by 99.5% in well IMW-7D. The operation of the pilot EAD system has reduced the concentrations of cis-1,2 DCE and 1,1-DCE to below MCLs in wells VMW-27 and IMW-7D. Thus, the EAD treatment technology has been proven capable of reducing VOC contaminant concentrations to MCLs in the Area 3 ground water.

PERFORMANCE STANDARDS FOR CORRECTIVE MEASURES

Univar will address the contamination that originates from its facility through corrective measures which will:

- **Protect Human Health and the Environment** based on reasonably anticipated land uses now and in the future.

- **Achieve Media Cleanup Objectives** appropriate to the assumptions regarding current and reasonably anticipated land use(s) and current and potential beneficial uses of water resources. The cleanup objectives should address media cleanup levels (chemical concentrations), points of compliance (where cleanup levels should be achieved), and remediation time frames (time to implement the remedy and achieve cleanup levels at the points of compliance).

- **Remediate the Sources of Releases** so as to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment, and using treatment to address principal threat wastes (whenever practicable and cost-effective). In this context, "sources" includes both the location of the original release as well as locations where significant mass of contaminants have migrated.

U.S. EPA expects final remedies to return "usable" ground waters to their maximum beneficial use, whenever practicable, within a timeframe that is reasonable given the particular circumstances of the facility. EPA 2004 *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action.* In addition to drinking waters, "usable" ground water may serve a variety of purposes such as agricultural irrigation, car washing and gardening.

FOCUS OF CORRECTIVE MEASURES AND CLEANUP OBJECTIVE

As previously discussed in this Statement of Basis, the RA shows that an unacceptable risk is posed by contamination from the Univar facility through the potable use of ground water in Area 3.

Area 2 is zoned industrial/commercial. This land has been used for these purposes during the 15 years in which U.S. EPA has investigated soil and ground water contamination released from the Univar facility. U.S. EPA anticipates that Area 2 will continue to be used for industrial and commercial purposes through the foreseeable future. Currently, there are no wells in Area 2 which are used as drinking water sources. Soil gas sampling and computer-aided modeling, which were performed for the RA, have shown that no unacceptable risk is posed by vapor intrusion to indoor air from VOC contamination in Area 1, Area 2 and Area 3 ground water.

Exposures to contamination are controlled at the Univar facility (Area 1). The property is completely covered by impermeable pavement, i.e., concrete, asphalt and the foundations of buildings. As an institutional control to prevent human exposure to contaminated soil, and to prevent the mobilization of contaminants to ground water by infiltration of precipitation, Univar will ensure that the integrity of the pavement will be maintained by filing a restrictive covenant on the property. Univar must also ensure that Area 1 ground water will be used for no purpose other than implementation of the corrective measures by restrictive covenant. The restrictive covenants are discussed later.

For these reasons, the cleanup objectives for this corrective action will be the MCLs for the contaminants of concern in the Area 3 ground water. The proposed remedy, which is described later in this document, will include active remediation in Area 1, which will reduce contaminant concentrations in the ground water beneath Areas 1 and 2 and will also ensure that MCLs will be attained in Area 3.

EVALUATION OF CORRECTIVE MEASURES ALTERNATIVES

As part of the final remedy identification and proposal development, several remedial technologies and actions have been evaluated for their ability to meet corrective action objectives for the Univar site. U.S. EPA has focused its corrective action evaluations on the following alternatives:

- Ground water pump and treat approaches, wherein the extracted ground water is treated by activated carbon or air stripping;
- Air sparging in conjunction with vapor extraction;
- Chemical oxidation;
- Aerobic bioremediation; and
- Enhanced anaerobic dechlorination (EAD).

These remedial alternatives are discussed in greater detail below. All the alternatives considered include some natural attenuation (removal of contaminants via existing natural processes in the ground water) component. The extent of monitored natural attenuation (MNA) varies between each alternative.

Alternative 1:
Ground Water Pump and Treat Approaches

The so-called ground water pump and treat system has historically been one of the most widely implemented corrective measures for impacted ground water.

This technology involves pumping ground water from recovery wells and treating it prior to discharge to a sanitary sewer system or other permitted discharge point. Treatment may involve the use of air strippers, activated carbon or a similar medium, thermal or ultraviolet destruction of the stripped vapors, or other methods. Advantages of this technology include establishing capture of contaminated ground water, flow control and the removal of some contamination from the ground water.

Disadvantages of this technology typically include very long timeframes for remediation and high operation and maintenance costs for the treatment system. Although this technology has been widely implemented historically, it is often not capable of meeting cleanup goals in a timely manner, despite the high cost. Implementation of a pump and treat approach at the Univar site would likely involve ground water capture at multiple locations (on-site and off-site) and the treatment of thousands or millions of gallons of ground water with no definitive end to the operation of the system. The City of South Bend sanitary sewer does not extend to the site, which would create a problem for the discharge of treated ground water, because it would have to be transported to a disposal facility. This alternative would not destroy the COCs *in situ*, but would either release

them to the air or require the off-site removal and incineration of the saturated carbon canisters. According to Univar's CMS, costs for implementation of a pump and treat system for the treatment of contaminated ground water would exceed $10,000,000 over 30 years, and may likely exceed these estimates.

Alternative 2:
Air Sparging in Conjunction with Vapor Extraction and Natural Attenuation

Air sparging is a ground water remedial technology that involves the injection of air into VOC-impacted ground water via vertical injection wells with short well screens located at the depth of VOC contamination. Where direct contact with the injected air occurs, the VOCs dissolved in the ground water volatilize into the air being sparged into the aquifer. As the air rises through the water column to the unsaturated (vadose) zone, the VOC-laden air can be captured by an overlying SVE system, or allowed to migrate into the atmosphere. If implemented in an area with high VOC concentrations, the vapors are usually captured and can be treated through various means (carbon adsorption, thermal destruction, oxidation, or other), or discharged directly into the atmosphere.

An advantage of sparging is the ability to operate throughout the plume of impacted ground water, including the source area. Air sparging also removes a significant volume of contamination, particularly in the initial phase of the sparging. In addition, air sparging can enhance ongoing bioremediation for the biotic reactions which require an aerobic environment.

Disadvantages of air sparging include (1) substantially reduced performance in non-homogeneous environments (variable permeability of the soil), (2) the potential to laterally "push" VOC-laden vapors away from the targeted remediation area, rather than capturing them, and (3) the creation of aerobic conditions where anaerobic biodegradation may be the desired treatment mechanism. The large size (over 40 acres) of the Univar plume would require the installation of many air sparge points, along with an overlying SVE system. Air sparging can also create unwanted ground water "mounding" that can lead to migration of impacted ground water into uncontaminated areas. The technical complexities and uncertainties associated with this remedial system make it unlikely to be effective in removing the Univar ground water plume, and according to Univar's CMS, the costs would likely exceed $5,000,000 over 30 years.

Alternative 3:
Chemical Oxidation and Natural Attenuation

In-situ chemical oxidation involves the direct injection of an oxidant into the subsurface at multiple locations. The injected materials chemically oxidize many VOCs present in the ground water and thereby eliminate or reduce the concentrations of the VOCs. The most common types of chemical oxidants are hydrogen peroxide, ozone, persulfate and permanganate. There are sodium and potassium persulfates and permanganates. These oxidants can be injected at points throughout an area, or in a linear area to form a barrier.

In-situ chemical oxidation is a promising technology for those sites with applicable site characteristics (geology, type of containment, facility use, plume size, and soil oxidant demand). This technology is generally applied to small targeted zones of contamination.

The ground water contamination from the Univar facility is dispersed over a large area. Typically, an injection point for an oxidant chemical has a limited zone of influence, and the Univar plume would require hundreds (or thousands) of these points. Safety concerns (fire/explosion hazards of handling the chemicals, and the heat generated by the oxidizing reactions) exist with this technology. Uncertainty would remain whether or not the entire plume would have been treated. Cost estimates in the CMS for a one-time injection event range from $2,000,000 to $5,000,000.

Injection of oxidant chemicals in a linear array (cut-off curtains) could create a 200'-wide zone of influence. There are likely only two locations (Univar property boundary and the Ireland Road pilot test area) where access can be obtained for the installation of cut-off curtains. According to the CMS, assuming that access to these locations can be achieved, the total length of the plume which can be addressed is 650', and the remaining 1,900' of plume length must naturally attenuate. According to Univar's CMS, the cost of repeated cut-off curtain oxidant injections could also exceed $5,000,000. The limited effectiveness and high cost for incomplete remediation make this alternative less desirable.

Alternative 4:
Aerobic Bioremediation and Natural Attenuation

The bulk of the VOCs in the ground water at the Univar site are anaerobic biodegradation products from the breakdown of TCE and PCE. Cis-1,2-DCE is the most prevalent compound in the ground water.

Univar has researched the feasibility of aerobic biodegradation of ground water contamination at the site. The removal of VOCs by aerobic (requiring oxygen) bacteria will not be effective, given the natural chemistry of the ground water and the tendency of chlorinated VOCs to require reducing conditions for degradation. Efficiency of VOC removal could be improved by the injection of flammable gases such as methane, propane or butane; however, aerobic degradation of VOCs would only occur around the injection locations in the plume, and would not have a widespread effect. Univar estimates the implementation cost of this remedy would be $5,000,000 over 30 years, with little certainty of success.

Aerobic bioremediation of the Univar plume will not be pursued because of the minimal VOC removal by aerobic bacteria. The aerobic biodegradation can be enhanced by the injection of the flammable gases listed above; however, the introduction of large volumes of these gases into the soil and aquifer beneath populated areas could present a safety hazard.

Alternative 5:
Enhanced Anaerobic Dechlorination (EAD) and Natural Attenuation

This remedial option consists of active remediation with EAD at strategic locations within the Univar plume and monitored natural attenuation (MNA). MNA will include monitoring ground water for VOCs on a semiannual basis for a period of 15 years.

The EAD application would be similar to what has been successfully implemented during the pilot test and would mostly be a full-scale expansion of the field scale pilot test. EAD application would include addition of appropriate doses of electron donor (likely Molwhey) and bioaugmentation water (water enriched with dechlorinating bacteria) into the ground water. In addition to evaluating EAD technology, Univar had also evaluated nano-scale zero-valent iron (NS-ZVI) in laboratory studies with contaminated ground water from the site. However, the size of the Univar plume, the cost of NS-ZVI ($10 to $50 / lb), and its relatively small zone of influence when injected into ground water make NS-ZVI a less favorable option when compared with EAD technology involving Molwhey, which is substantially less expensive at $0.08 / lb and appears to be more effective at reducing VOC contamination. Univar estimates the cost of the EAD remedy to be $4,000,000 over 20 years, with a likelihood of success.

Amendment distribution would be accomplished in a similar manner as the pilot test, although Univar is testing a modified recirculation pattern. EAD technology has been effective both at the point of injection/recirculation as well as downgradient of the system. Methane that is generated by breakdown of the added electron donor can serve as a co-metabolite for VOC degradation, thus extending the lateral range of the EAD's effectiveness on contamination.

Evaluation of Remedial Alternatives

None of the first four remedial alternatives can achieve media cleanup objectives within 30 – 50 years because of technical limitations. Only Alternatives 1 and 5 can control the source of release with any degree of certainty. Alternative 5 (EAD) appears to be the most cost effective method capable of achieving MCLs in the Area 3 ground water. Methane that is generated during the EAD process can serve as a co-metabolite at the downgradient portions of the Univar plume, where VOC concentrations may be too low to sustain the dechlorinating bacteria populations, thus extending the range of influence of the EAD.

The most effective remedial alternative for the project is EAD, as has been demonstrated during Univar's successful pilot study at the site. EAD will be applied at strategic locations within the plume and in the source area at the Univar facility (Area 1). Univar will continue to remove VOC contamination from the source area through periodic operation of the on-site SVE system as long as 0.1 lb per 24 hour day of VOC are removed, as this removal may also help reduce the time needed for active remediation by EAD. For these reasons, the U.S. EPA proposes this combination of EAD, SVE and monitored natural attenuation as the final corrective measures at the Univar site, to reduce

VOC contaminant concentrations in Area 3 ground water to below MCLs. The Administrative Control Area will help protect ground water in Area 3 during the period of time it takes for the VOCs in the ground water to reach MCLs. Until MCLs are attained, Univar will survey Area 3 every two years to identify possible ACA violations (e.g., new wells drilled) and provide results of this survey to the U.S. EPA in a biannual report.

DESCRIPTION AND ANALYSIS OF THE SELECTED ALTERNATIVE

EAD which involves extraction, amendment of the ground water, and injection of amended ground water represents the most effective technique for bioremediation at the Univar site. The proposed remedy calls for the installation and operation of a series of ground water extraction and injection wells along Ireland Road (Area 3) and along the downgradient property boundary of the Univar facility (Area 1). In addition, the removal of VOC contamination in Area 1 will be augmented by periodic operation (at least once a month) of the on-site SVE system at the Univar facility, as long as the system can remove at least 0.1 pound VOCs per 24 hour day when operating.

New extraction/injection wells were installed along Ireland Road eastward of the existing array which was used for the pilot study (Figure 3). This combined "Ireland Road Segment" spans the width of the Univar ground water contaminant plume, immediately upgradient of the Area 3 boundary (Ireland Road). Ground water will be recirculated between extraction and injection wells, and will be mixed with electron donor and bioaugmentation water on a periodic basis prior to reinjection. The EAD system to be built at the Univar facility will be of similar design and construction.

One modification to the recirculation systems is that ground water will be recirculated from side to side (sidegradient) rather than in upgradient to downgradient fashion. Univar expects this modification to provide effective treatment of contamination with fewer wells, and to reduce the fouling of the well screens. Within 6 months of start-up of the expanded EAD segment along Ireland Road with side-to-side recirculation, Univar will submit to U.S. EPA a report concerning the effectiveness of this newer segment in the reduction of downgradient VOC concentrations. If the U.S. EPA determines that the modified recirculation approach is not as effective as upgradient to downgradient recirculation, Univar will alter the pattern of recirculation into a more effective configuration, or make other adjustments to increase the system's effectiveness.

Univar will install an EAD treatment system at the Univar facility. This "Univar segment" will address residual source area VOCs and Univar estimates operation of this EAD system will allow remediation of the plume approximately 1,400 feet downgradient of the property boundary. Figure 4 depicts the proposed layout of the Univar segment. Univar will operate the expanded Ireland Road segment first for a period of time to test the modified recirculation approach and make adjustments, to be followed by installation of the Univar segment.

Period of Operation of Selected Alternative

The selected alternative includes remediation at the Univar facility (Area 1) in order to shorten the time required to achieve MCLs for the VOC contaminants in Area 3 ground water, and to ensure that ground water contamination in Area 3 remains below these protective levels. Univar estimates it will need to operate the Univar Segment and the Ireland Road Segment EAD treatment systems for three to five years from the date Univar begins operation of the Univar Segment.

Univar will operate the Area 1 SVE system as long as the system removes appreciable amounts of VOCs from the site (i.e., 0.1 lbs of VOC / 24 hour day, operating at 300 scfm).

Univar will operate the EAD systems until the concentrations of all VOC contaminants are reduced to or below MCLs for eight consecutive quarters in the following monitoring wells in Area 3 downgradient of the Ireland Road segment: VMW-25, VMW-26, VMW-27, and TP-1 through TP-17. U.S. EPA thinks eight consecutive quarters at or below MCLs is necessary as U.S. EPA expects that it will take a few years for the relatively higher residual VOC contamination in the northerly section of Area 2 to move through the EAD treatment system at the Area 3 boundary. The Univar EAD segment should considerably reduce the VOC contaminants downgradient of the Area 1 boundary, but at this time U.S. EPA does not know how far downgradient the Univar EAD segment will effectively reduce contaminants within a few years operating time.

Monitoring Program

Univar will monitor the Area 3 point of compliance ground water wells for VOCs, total organic carbon, anions, metals, organic acids and dissolved gases (including ethane and ethene) on a semiannual basis until Univar ceases operation of the EAD systems. The Area 3 point of compliance wells are: IMW-7S/D, IMW-8, IMW-12S/D, VMW-25, VMW-26, VMW-27, VMW-33, and the well cluster which will replace IMW-11. After cessation of EAD operations, Univar will continue monitoring the Area 3 point of compliance wells for VOCs until U.S. EPA determines remedial action is complete as set forth in the next section.

Univar must install a replacement well cluster for IMW-11 so that the outermost boundary of the plume can be delineated. The chlorinated VOCs which make up the plume are denser than water, and are expected to move downward as they migrate outward. Monitoring results have verified this. The well cluster to replace IMW-11 shall be screened at least as deep as IMW-8, or until bedrock or basal clay is encountered, to define the plume geometry and refine the site conceptual model. This replacement well cluster should be located along Cloyd Street (northern boundary of Area 3) to the west of former IMW-11, in order to monitor the axis of the contaminant plume (Ref. Figure 3-6 of the Corrective Measures Study). U.S. EPA expects this well to be installed by summer 2009.

Univar will monitor Area 1 and 2 wells ED-1, ED-2, VMW-2, VMW-4, VMW-5/5D and VMW-10 quarterly for one year after the beginning of operation of the Univar EAD segment. Ground water samples from these wells will be analyzed for VOCs, total organic carbon, anions, metals, organic acids and dissolved gasses (including ethane and ethene). After completion of the one-year sampling period, these wells will be sampled semiannually for VOCs, total organic carbon, anions, metals, organic acids and dissolved gasses (including ethane and ethene) until Univar ceases operation of the EAD systems. Univar shall continue with ground water monitoring of the Area 1 and 2 wells specified above for VOCs until U.S. EPA determines that remediation is complete as set forth in the next section. After cessation of the EAD operations, Univar will include the following Area 2 wells in the semiannual monitoring program for VOCs: VMW-11 and VMW-29.

The semiannual ground water monitoring reports will include performance reports for the SVE system for as long as Univar continues to operate the SVE system. The SVE reports will include pounds of VOCs removed, hours of operation, flow rates, VOC concentrations, and extraction and monitoring well vacuums.

U.S. EPA anticipates that semiannual ground water monitoring will continue for 15 years after the U.S. EPA issues its Notification of Final Decision on the selected remedy for the Univar site. Univar shall continue semiannual monitoring until Univar submits a petition to cease ground water monitoring as set forth below, and U.S. EPA approves this petition. The U.S. EPA considers the period of semiannual monitoring after termination of the active remediation to be the monitored natural attenuation period. To summarize, semiannual monitoring for VOCs as part of the MNA is to be performed on the following wells:

ED-1, ED-2, VMW-2, VMW-4, VMW-5/5D, VMW-11, VMW-25, VMW-26, VMW-27, VMW-29, VMW-33, IMW-7S/D, IMW-8, IMW-12S/D, and the well cluster which will replace IMW-11

Univar may petition the U.S. EPA for a cessation of ground water monitoring as set forth below.

Petition to Cease Ground Water Monitoring

If Univar believes that continued ground water monitoring is no longer necessary, Univar may submit to the U.S. EPA a petition to cease monitoring, which will include:

- An analytical report from a new round of VOC sampling at monitoring wells VMW-12, VMW-13, VMW-14, VMW-15 and (if accessible) VMW-30.

- A demonstration that the on-site SVE system has achieved extraction of VOC contamination at or below the rate of 0.1 lb / 24-hour day for a flow rate of 300 scfpm.

- A demonstration that Area 3 point of compliance wells are at or below MCLs for eight consecutive sampling events (4 years).

U.S. EPA will review the petition and determine if remedial activities at the Univar site are complete. If VOC concentrations in the Area 3 point of compliance monitoring wells remain above MCLs after 15 years of monitoring, Univar will continue the semiannual monitoring and will conduct an MNA study which predicts when VOC concentrations in these wells will attenuate to MCLs. This MNA study will be performed in accordance with U.S. EPA's April 1999 *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, OSWER Directive 9200.4-17P and the April 2004 *Performance Monitoring of MNA Remedies for VOCs in Ground Water*, EPA/600R-04/027. Univar will submit this MNA study for review by the U.S. EPA.

INSTITUTIONAL CONTROLS

Univar will record restrictive covenants with its property deed and chain of title, which will ensure:

- The property is restricted to industrial use;

- Ground water beneath the Univar property will not be extracted and used for any purpose other than corrective action for contamination; and

- The property will remain paved, and the integrity of the pavement will be maintained.

Attachment 1 to this SB is a copy of the environmental restrictive covenant (ERC) that Univar shall record with the St. Joseph County Recorder within 60 days of U.S. EPA's final decision. Simultaneously, Univar shall submit the final ERC to IDEM for approval[1].

[1] This restrictive covenant has been reviewed by IDEM and Univar. There remains some information in the Environmental Restrictive Covenant's exhibits to be provided by Univar prior to filing, including the legal descriptions of the facility and the pavement-covered area of the site that must be maintained.

PUBLIC PARTICIPATION

The U.S. EPA is soliciting comments from the public on the proposed corrective measures for Univar USA Inc. The U.S. EPA has scheduled a public comment period of 45 days from August 7, 2009, to October 9, 2009, in order to encourage public participation in the decision process. During the public comment period, the U.S. EPA will accept written comments on the proposed action. The public may submit written comments, questions and requests for a public meeting to the following address:

United States Environmental Protection Agency, Region 5
Remediation and Reuse Branch (LU-9J)
77 West Jackson Boulevard
Chicago, IL 60604
Attention: Don Heller
(312) 353-1248

The administrative record is available for review at the following two locations:

St. Joseph County Public Library
Western Branch
611 Lombardy Drive
South Bend, IN 46619

and

United States Environmental Protection Agency, Region 5
77 West Jackson Boulevard
Chicago, IL 60604
Attention: Don Heller

After U.S. EPA's consideration of the public comments that are received, U.S. EPA will summarize the comments and provide responses in a Response to Comments document. The Response to Comments document will be drafted after the conclusion of the public comment period and will be incorporated into the administrative record. Based on the comments received, the U.S. EPA may make changes to the proposed corrective measures which will be documented in the Final Decision.