UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

STATEMENT OF BASIS

Akzo Nobel Incorporated

Delaware City, Delaware

EPA ID: DED 980 551 667

Prepared by

Office of Remediation

Land and Chemicals Division

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Section 1: Introduction

The United States Environmental Protection Agency (EPA) has prepared this Statement of Basis (SB) to solicit public comment on its proposed remedy for the Akzo Nobel Incorporated Facility (Facility) located at 385 Schoolhouse Road, in Delaware City, New Castle County, Delaware 19706. EPA's proposed remedy consists of (1) establishing a Technical Impracticability Zone for on-Site contaminated groundwater; (2) implementing long term groundwater monitoring; (3) requiring engineering controls consisting of maintenance of existing engineered covers on two on-Site units, and (4) requiring institutional controls to implement land and groundwater restrictions. Akzo Nobel Incorporated (Akzo) currently owns the Facility.

This SB highlights key information relied upon by EPA in proposing its remedy for the Facility. Akzo has conducted interim remedial measures at several units on the Facility.

This Facility is subject to EPA's Corrective Action Program under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984, 42 U.S.C. §§ 6901 et seq. (Corrective Action Program). The Corrective Action Program is designed to ensure that certain facilities subject to RCRA have investigated and cleaned up releases of hazardous waste and/or hazardous constituents that have occurred at or from their property. Delaware is authorized to implement the Corrective Action Program under Section 3006 of RCRA, 42 U.S.C. § 6906, and as part of a workshare agreement with EPA, EPA is the lead Agency in overseeing the investigation and selecting a final remedy at the Facility.

Information on the RCRA Corrective Action Program and a fact sheet for the Facility can be found by navigating to https://www.epa.gov/hwcorrectiveaction/hazardous-waste-cleanup-akzo-nobel-chemicals-inc-delaware-city-de.

The Administrative Record (AR) for the Facility contains all documents, including data and quality assurance information on which EPA's proposed remedy is based. See Section 11, Public Participation, for information on how you may review the AR.

Section 2: Facility Background

The Facility is located adjacent the Delaware City Refinery and is surrounded by other industrial and agricultural properties as shown in Figure 1. The Facility is currently unused. The Facility property consists of 191 acres, which includes 68 acres formerly used for manufacturing (the Akzo Study Area) and 123 acres currently and historically used exclusively for agriculture (Agricultural Parcel) (see Figure 2). The remaining 68-acre former manufacturing area is divided into the 52-acre Carbon Disulfide (CS_2) Area and a 16-acre area called the Undeveloped Parcel. The CS_2 Area included the manufacturing

process units, waste water treatment plant, drum storage, above ground tanks and other manufacturing support units. The Undeveloped Parcel is overgrown with vegetation with two small marginal wetlands and two former waste areas capped with synthetic membranes overlain by grassed soil covers.

The Facility was originally part of a manufacturing complex located along Schoolhouse Road, built and operated by Stauffer Chemical Company (Stauffer). The complex consisted of two manufacturing units, the CS_2 and NaHS plant (CS_2 and NaHS Plant) and a polyvinyl chloride (PVC) resin plant (PVC Plant). In 1981, Stauffer sold the PVC Plant to Formosa Plastics Corporation (Formosa). The PVC Plant is now known as Delaware City PVC Plant Site (DE PVC). DE PVC is located adjacent to and south of the CS_2 and NaHS Plant. In 1987, Akzo acquired the CS_2 and NaHS Plant. In 1992, Akzo ceased production at the Facility and the manufacturing units were dismantled and removed. Currently, the former CS_2 Area is heavily vegetated with remnant concrete slabs, two small one story structures, an open sided shed and two capped areas. The two capped areas on the Undeveloped Parcel are mowed and maintained by Akzo.

CS_2 and NaHS were produced at the location for about 32 years. CS_2 is a solvent mostly used in rayon fiber and cellophane production and in insecticide production and is also used as a fumigant. NaHS is mostly used in cloth and paper manufacturing. PVC resin production continues at DE PVC located adjacent to and south of the Akzo property.

Section 3: Summary of Environmental Investigations

3.1 Corrective Action Regulatory History

In 1980, Stauffer sent EPA a Notification of Hazardous Waste (HW) Activity and a RCRA Hazardous Waste Permit Application (Part A) for its PVC and CS_2 operations. EPA determined that Stauffer met interim status requirements. In 1981, Stauffer sold its PVC Plant to Formosa and sent EPA a Part B HW Permit Application for the CS_2 operation, identifying hazardous chemicals on-site, which included: CS_2, hydrogen sulfide, lead acetate, mercury and waste exhibiting HW characteristics. EPA and the Delaware Department of Natural Resources and Environmental Control (DNREC) each issued Stauffer a HW Storage Permit for NaHS storage. Stauffer later notified EPA that it was a HW generator, generating waste sodium filter cake and waste oil. During Akzo's ownership, no other documented HWs were generated or stored in the Facility's drum storage area. Non-hazardous off-specification sulfur and ceramic brick debris were reportedly disposed of in two areas called the Barren Area and the Landfill Area, respectively. The Landfill Area had been covered with plastic sheeting that had deteriorated over time, exposing the underlying soil in these areas.

Chlorinated volatile organic compounds (cVOCs) in groundwater (GW) were first discovered under the Agricultural Parcel in 1982. EPA determined that the cVOCs were associated with the PVC

manufacturing Facility. PVC-related cVOCs were later found in GW beneath portions of Akzo's Undeveloped Parcel. The PVC related cVOCs were 1,2-dichloroethane (1,2-DCA), trichloroethylene (TCE) and vinyl chloride (VC). The GW contamination findings resulted in the PVC Facility's listing on the National Priorities List as the Delaware City PVC site (DE City PVC). In May 1984, EPA and DNREC entered into a CERCLA Administrative Order (CERCLA Order) with Stauffer and Formosa. DE PVC potentially responsible parties (PRPs) retained responsibility for GW clean-up beneath the Agricultural Parcel and other off-Site areas. The DE City PVC PRPs were also Ordered to excavate, consolidate and cap PVC resin and resin contaminated soils on their property.

In December 1994, EPA and Akzo entered into a Consent Order pursuant to RCRA § 7003 (RCRA Consent Order), requiring Akzo to investigate and evaluate clean-up remedies. EPA determined that investigation of soil on the Agricultural Parcel was unnecessary because that parcel was used exclusively for farming and was not impacted by run-off from the Undeveloped Parcel. Corrective Action efforts were focused on the remaining 68 acres of the Facility ("Akzo Study Area") because DE City PVC PRPs were responsible for removing chlorinated solvents from GW beneath the Agricultural Parcel and off-Site areas under the CERCLA Order.

3.2 Facility Corrective Action Investigation Summary:

Akzo submitted *Phase 1* and *2 RCRA Facility Investigation (RFIs) Reports* dated August 1999 and May 2002, respectively. Soil, sediment and GW samples were collected on the Akzo Study Area and a human health risk assessment was completed and approved by EPA.

3.3 Findings of Investigations:

1. Site Geology and Hydrogeology: The Akzo Study Area is approximately 55 to 65 feet above mean sea level and is underlain by Coastal Plain sediments of the Columbia Formation. The Columbia Formation aquifer is a low yield water table aquifer beneath the Akzo Study Area. The Columbia Formation consists of coarse to medium sands and gravels from the surface to approximately 33 to 44 feet below ground surface (bgs) on-Site. The Columbia Formation is underlain by the Merchantville Formation which consists of a distinct dark micaceous fine silt and clay. The Merchantville Formation and the underlying Upper Potomac Formation are considered aquitards or confining units in New Castle County and are approximately 50 feet thick beneath the Site. The Potomac Formation underlies the Merchantville Formation and is hundreds of feet thick consisting of sand, clay and silt layers with abundant water bearing zones used locally for industrial/commercial water supplies. Facility-related GW contamination beneath the Akzo Study Area was found only in the Columbia Formation. This observation is supported by GW investigations on the adjacent DE PVC site. Under the CERCLA Order, DE PVC PRPs initiated a GW pump and treatment remedy on the Agricultural Parcel and on DE PVC. Currently, GW contamination beneath the Agriculture Parcel meets CERCLA clean-up goals.

GW beneath the Facility forms a thin layer on top of the Merchantville Formation confining unit. The water column ranges from approximately 3 to 20 feet thick. A GW high point or mound on the adjacent DE PVC property creates a GW divide on Akzo under the Undeveloped Parcel. East of the GW divide, GW flows east from the Barren Area towards the CS_2 Area and towards Schoolhouse Road and the DE City Refinery. West of the divide, GW flows towards the Agricultural Parcel. Contaminated GW in the Akzo Study Area does not impact any surface water bodies located in the areas surrounding the Facility.

2. Soil and sediment: *Phase 1 RFI* soil samples were collected from 28 soil borings located on the Akzo Study Area. Samples were collected from three depths, 0-2 feet, 3 to 4.3 feet respectively, and from above the water table. Samples were collected from the CS_2 Area, Barren Area and Capped Area. One sediment sample was collected from a concrete stormwater collection pit where sediment settled out. The samples were analyzed for inorganics (metals), volatile and semi-volatile organic compounds (VOCs and SVOCs, respectively), with a subset of samples analyzed for polychlorinated biphenyls (PCBs) and total petroleum hydrocarbons (TPHs).

The only constituent detected in Facility soils above EPA's 2001 Regional Screening Levels (RSLs) for industrial sites was arsenic. Arsenic levels were not confined to a particular area or unit, indicating that it is not from a specific release from the Facility. Arsenic levels in the soil is considered within normal background ranges calculated for New Castle County soils. DNREC concluded that arsenic is not considered a Site-related contaminant. Aroclor-1260 (PCB) was found in the sediment sample from the stormwater collection pit. The PCB level was above the residential RSL but below the industrial RSL.

Phase 2 RFI sediment samples were collected from the Undeveloped Parcel in four areas of accumulated sediment that had apparently washed off from the Landfill and Barren Areas. Another sediment sample was collected from the concrete stormwater collection system. The four Undeveloped Parcel sediment samples were analyzed for metals only. Only hexavalent chromium and arsenic exceeded their industrial RSL in all four samples. The arsenic levels were within established background levels for New Castle County. The sediment sample from the stormwater collector was analyzed for sVOCs, metals and PCBs, with no RSL exceedances. A human health risk assessment was completed using soil, sediment and GW data from *Phase I* and *II RFIs*. The HHRA results are discussed in Section 5.

3. Groundwater: For initial GW monitoring in 2001, Akzo sampled 19 monitoring wells (MWs), which included Akzo and DE PVC MWs. Akzo MWs screens are set at the bottom of the Columbia Formation, on top of the underlying Merchantville Formation confining unit. All samples were analyzed for VOCs and metals and three MWs were selected for sVOCs analysis.

In 2016, Akzo sampled 16 MWs including four MWs located on DE City Refinery's property. Figure 3 shows MW locations and GW flow directions. Table 1 below lists constituents (in parts per billion or ppb) that exceeded applicable drinking water standards known as National Primary Drinking Water

Standard Maximum Contaminant Levels (MCLs) promulgated pursuant to Section 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act and codified at 40 CFR Part 141 or Regional Screening Levels (RSLs) if an MCL has not been established for a contaminant. Table 1 lists contaminant concentrations that were the highest exceedances from the 2001 and 2016 data sets, except Delaware City Refinery data, where GW data is from 2006 instead of 2001.

Table 1.
GW Contaminant Ranges (2001 and 2016 Data Sets) in ppb

Contaminant	MCL	RSL	2001	2016
Former CS_2 Area				
PCE	5		1,800	840
TCE	5		37	12
Chromium (VI)		0.035	--	24.6 J*
Manganese		430	6,120	1,030
Iron		14,000	26,800	NS
DE Refinery MWs (2006 and 2016 Data Sets) in ppb				
PCE	5		1,700	500
TCE	5		36	8.1
Undeveloped Parcel (2001 and 2016 Data Sets) in ppb				
TCE	5		4.6	0.84 J*
1,2-DCA	5		130	13
VC	2		39	2.3
Bis(2-eh) phthalate	6		430	ND
Arsenic	10		22.4	NS
Beryllium	4		11.6	NS
Manganese		430	17,100	10,800
Nickel		200	3,640	1,490
Chromium (total)	100		349	609
Chromium (VI)		0.035	647	737

*J – a lab 'flag' denoting that the analyte was detected at levels below lab detection limits.
NS – not sampled – considered within background (naturally occurring) levels.
ND – not detected.

Table 1 shows that two distinct plumes exist under the Akzo Study Area. A small PCE plume is located beneath the eastern part of the CS_2 Area, which has migrated off-site beneath the DE City Refinery, impacting MW-4S primarily. An inorganics plume is located beneath the Undeveloped Area and the western portion of the CS_2 Area and consists of dissolved manganese and hexavalent chromium. The dissolved manganese plume appears to have its source from DE PVC to the south of the Facility and a hexavalent chromium plume source appears to be the Landfill and Barren Areas. Although arsenic exceeded its MCL in groundwater beneath the Undeveloped Parcel, EPA has determined the

concentrations are within naturally occurring background levels for GW in New Castle County, Delaware.

Akzo sampled GW in 2001, 2003, 2004, 2006, 2007 and 2016. The 2003 GW investigation was centered around MW P-5 to locate a PCE source. A source was not found. In 2004, 6 Delaware City Refinery MWs were sampled. Refinery MW-4S, located nearest to MW P-5, had PCE at significant levels above the MCL, indicating that the Facility is a source. Sampling of the PCE plume on- and off-Site over time has shown a cycle of higher PCE levels in GW during wet seasons and lower levels during dry seasons. The 2016 PCE data shown in Table 1 was collected in the dry season and reflects the seasonal downward trend, however natural attenuation of PCE is evident from longer term data. Akzo prepared a *Corrective Measures Study* (*CMS*) to propose GW remedies for the PCE plume. The *CMS* is discussed in Section 6, below.

Section 4: Summary of Interim Remedial Activities

1. GW Remediation: In 1982, Stauffer began GW studies on the DE PVC Site and the Agricultural Parcel, where PVC related GW contaminants were first identified. This and later investigations found that: (1) the PVC related cVOCs were restricted to the Columbia Formation on-site; and (2) the major source of contamination was the unlined PVC Impoundments located on DE PVC, and (3) an aquitard (Merchantville and/or Upper Potomac Formations below the Columbia Formation) restricts the vertical migration of contaminants into the underlying Potomac Formation. Under the CERCLA Order, DE PVC was required to install a series of GW recovery wells in the Columbia Formation, along Route 13 (west of the Facility). Currently, the PVC contaminants beneath the Agricultural Parcel are below CERCLA clean-up goals.

2. Closure of Hazardous Waste storage pad: In 1983, Stauffer constructed a hazardous waste (HW) drum storage pad, constructed primarily for storage of sodium hydrosulfide filter cake which is a listed waste (D002, D003). The 20 x 20 feet storage pad was located in a larger 20 by 100 feet building with a curbed reinforced concrete floor. As part of the DNREC HW permit, Akzo submitted a closure plan to DNREC for this unit in 1991. Akzo demolished the concrete floor and excavated 12 cubic feet of soil for off-site disposal. DNREC approved the closure in 1992. Also in 1992, Akzo removed all CS_2 and NaHS Plant equipment, including above ground storage tanks and 3 gasoline containing underground storage tanks, power systems (including four transformers), pipes and buildings.

3. PVC Resin Removal: During excavation of Formosa's former PVC impoundment, a buried thin layer of white resin was discovered extending onto Facility property. Contractors excavated a portion of a wetland located on Facility property to remove the buried resin. Further investigation in the Barren Area uncovered a one to six-inch resin layer beneath fill which consisting of lumps of sulfur, brick and concrete. The resin was analyzed and PVC-related chemicals, TCE, 1,2-DCA and PCE, were found in

the resin. The resin was excavated from the wetland area adjacent to the Barren Area. Some resin was left in place.

4. Barren and Landfill Area Remedy: In April 2001, Akzo installed temporary erosion control (hay bales and silt fencing) to control soil erosion from the Barren Area and the Landfill Areas. In August 2003, Akzo submitted an *Interim Measures (IM) Synthetic Cap* design for the Barren and Landfill Areas. EPA approved the design in September 2006. The Synthetic Cap's purposes are to: (1) shed precipitation from the Barren and Landfill Areas, preventing further leaching of contaminants (metals) into GW, and; (2) remove potential ecological receptor exposure to metal contaminants in eroded soil/debris from the Landfill Area. Cap construction began with moving eroded sediment from around the Landfill and placing it back on the Landfill, prior to grading and capping. The Barren Area Cap covered the Barren Area and the surrounding area where resin was delineated and left in place. The material in the Barren and Landfill Areas was compacted and a High Density Polyethylene (HDPE) 40-mil thick geosynthetic membrane was installed over both the Barren and Landfill Areas. The membrane was covered with 18 inches of cover soil that was seeded with grass. A gas vent was installed through the Landfill Area Cap. Cap installation was completed in 2007. Akzo maintains both Caps and mows the grass covers.

Section 5: Human Health Risk Assessment

The *Phase II RFI* Report included a Human Health Risk Assessment (HHRA). The likely future use of the Facility is industrial or commercial use. On-site GW will not be used as a potable supply. For future Site and construction workers, the calculated risk is within EPA's acceptable cancer and non-cancer risk range. For future adult and child residential exposures, the calculated risk is also within EPA's acceptable cancer and non-cancer risk range, when on-Site GW use is excluded. When on-site GW use is considered in the residential risk calculations, the risk exceeds EPA's acceptable range. For vapor intrusion screening, EPA used the 2016 cVOC GW results from the eastern CS_2 plume as inputs to EPA's vapor intrusion screening level calculator (VISL) to calculate potential indoor air levels of cVOC levels. The results of the VISL indicate that if buildings were located directly above or near to the plume, further investigation of potential indoor impact is recommended. Currently there are no actively used buildings located directly above or near to the plume.

For the portion of the cVOC plume that extends onto the Delaware City Refinery property, two of the four MWs sampled had PCE and TCE levels above MCLs. EPA conducted an assessment of the available data using the VISL calculator to evaluate whether indoor air may potentially be impacted by vapor from GW. The results of the VISL indicate that if buildings were located directly above or near the plume, the potential risk from indoor air in an industrial/commercial setting would be within EPA's acceptable cancer risk range, and within EPA's risk ratio for non-cancer effects. Currently there are no buildings on or near the cVOC plume on the Refinery, and future buildings are unlikely to be constructed on or around the former industrial waste landfills where the plume is located.

5.5 Environmental Indicators

Under the Government Performance and Results Act (GPRA), EPA set national goals to address RCRA corrective action facilities. Under GPRA, EPA evaluates two key environmental clean-up indicators for each facility: (1) Current Human Exposures Under Control; and (2) Migration of Contaminated Groundwater Under Control. The Facility met both indicator goals in May 2001 and September 2007, respectively.

Section 6: Corrective Measures Study

Akzo submitted to EPA a Final *Corrective Measures Study* (*CMS*), dated May 2010. The *CMS* evaluated GW remedies for the two distinct contaminant plumes beneath the Facility. EPA and DNREC requested that Akzo include GW treatment for the PCE plume in the CS_2 Area. Akzo proposed an in-situ pilot scale oxidation study for the CS_2 Area as an interim measure. The oxidation study consisted of injecting hydrogen peroxide into 20 temporary injection wells situated in and around the plume. A total of 19,500 gallons of hydrogen peroxide (10% by weight) was injected into the plume starting in June 2013. The study ended in January 2014 and results were mixed regarding successful elimination of PCE. Also, the wells only accepted low volumes of peroxide, and in some wells, peroxide returned to the surface rather than flowing into the aquifer as planned. These results indicate the low permeability of the aquifer and show that the CS_2 Area is not suitable for further injection treatment.

Section 7: Corrective Action Objectives (CAOs)

EPA's Corrective Action Objectives (CAOs) for the environmental media at the following:

1. Soil - EPA's Corrective Action Objective (CAO) for Facility soils is to prevent exposures to soil with concentrations exceeding EPA's acceptable cancer risk range (10^{-4} to 10^{-6}) and non-cancer hazard quotient (HQ no greater than 1) for industrial Sites. Based on the Site HHRA, future adult and child residential soil exposures are within EPA's acceptable cancer and non-cancer HQ. Therefore, EPA's CAO for the Facility has been met.

2. Groundwater - EPA expects final remedies to return usable groundwater to its maximum beneficial use within a reasonable timeframe given the Facility's setting. Where aquifers either have the potential or are currently used for water supply, EPA uses MCLs. For the groundwater under the Akzo Facility and Facility-related groundwater under the Delaware City Refinery, GW clean up goals are Delaware's MCLs. DE's MCLs for PCE (1 ppm), TCE (1 ppm) and VC (2 ppm) are more stringent than the applicable federal MCLs (5 ppm for each constituent).

If clean-up to MCLs is not possible, EPA expects Facilities to prevent or minimize the further migration of a plume, prevent exposure to contaminated GW and evaluate further risk reduction. Technical Impracticability (TI) refers to a situation where achieving GW clean-up standards is not practicable using current engineered treatment solutions when feasibility, reliability, project scale/magnitude and safety is considered.

EPA has determined that restoration of GW to drinking water standards or MCLs (as promulgated in 40 C.F.R. Part 141, pursuant to Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300g-1 and as promulgated in 16 DE Administrative Code 4462, Delaware's *Regulations Governing Public Drinking Water Systems*, Section 6.0 at the Facility is technically impracticable for the following reasons:

(1) the aquifer beneath the exhibits low permeability and low GW yield, unsuitable for treatment by either injection or GW extraction for treatment;

(2) the metals plume beneath the Undeveloped Parcel and a portion of the CS_2 Area has remained stable and stationary since GW monitoring began in 2001, indicating an old plume staying on-site, moving very slowly or not at all.

(3) the CS_2 Area PCE plume has remained in a small area at the Facility. In the past, the PCE plume moved off-site onto the DE City Refinery property. PCE levels in the DE City Refinery MWs appear to be diminishing over time, however more monitoring during wet seasons will be collected to verify trends. A source of the PCE plume was not found on-site, indicating that PCE was a one-time release, not associated with a SWMU. Therefore, because continued PCE loading to GW is unlikely, PCE levels on-site will likely continue to diminish over a long period of time (possibly beyond EPA's reasonable timeframe) from dilution and dispersion.

(4) Excavation of potential contaminant source areas, the Landfill and Barren Areas, is not recommended because the waste is capped with geosynthetic Caps that prohibits precipitation from washing any residual contaminants into the aquifer.

(5) Akzo is located within the Delaware City Industrial Area Groundwater Management Zone (GMZ) established by DNREC in 2008. New public or domestic (potable) water supply wells are prohibited within the GMZ by DNREC (Attachment B).

EPA's CAO for Facility GW is to control exposure to hazardous constituents remaining in GW until GW meets the more stringent of EPA's and Delaware's clean-up goals of MCLs or RSLs (where MCLs are not established for a constituent) in the future.

3. Vapor Intrusion - EPA's CAOs for Sites with the potential for contaminated subsurface vapor to enter buildings/structures is to control human exposure and attain EPA's acceptable cancer risk range and non-cancer risk hazard quotient. Currently there are no indoor air exposures to vapor at the Facility or on Delaware City Refinery property from Facility related GW contaminants.

Section 8: EPA's Proposed Remedy

The proposed remedy for the Facility consists of: (1) Establishment of a Technical Impracticability (TI) Zone for groundwater and includes long term groundwater monitoring; and (2) land and groundwater use restrictions, as discussed below.

(1) Groundwater - Establishment of a TI Zone for GW including long term monitoring on- and off-Site.

Because of on-Site aquifer characteristics (as discussed in Section 7) that inhibit MCL attainment throughout the groundwater plume, EPA is proposing continued GW monitoring along with establishment of a TI Zone as the remedy that represents the best balance of the criteria EPA uses when selecting a remedy. This remedy will protect human health and the environment. Contaminant levels have shown declines in the PCE plume and stable trends in the metals and are expected to attenuate naturally over time.

The proposed TI zone is defined as GW within the area depicted in Figure 3. The Facility will be required to submit an annual report to EPA documenting GW plume trends.

(2) Land and Groundwater Use Restrictions.

Because contaminants remain in the Landfill and Barren Areas and in GW at levels above what EPA considers acceptable for residential use, EPA's proposed remedy requires land use restrictions to restrict activities that may result in human exposure to those contaminants. EPA proposes that such restrictions be implemented and maintained through institutional controls (ICs). ICs are administrative and/or legal controls that minimize the potential for human exposure to contamination and/or protect the integrity of the remedy by limiting land or resource uses. EPA is proposing the following land and GW use restrictions:

a. The Facility property shall not be used for any purposes other than industrial or commercial use unless demonstrated to EPA that such use will not pose a hazard to human health or the environment and EPA provides prior written approval for such use;

b. All Facility earth moving activities, including excavation, drilling and construction will be conducted in ways that will not adversely affect or interfere with the final remedy, including the Capped Landfill and Barren Area engineered covers and will not adversely affect human health and the environment. An EPA-approved Soil Management Plan complying with OSHA

worker health and safety requirements is required as part of the Final Remedy. Earth moving activities at the Facility will require prior written consent of EPA in consultation with DNREC;

c. Compliance with an approved Cap Management Plan (CMP) for the Landfill and Barren Area Caps. The CMP will be submitted for EPA review, approval and, at a minimum, must include the following: the procedures used to maintain the Caps over the contaminated soil; an inspection schedule to ensure Cap maintenance, at least annually; the maintenance requirements necessary to prevent degradation of the Cap and unacceptable exposure to the underlying soil

d. Compliance with an EPA approved groundwater monitoring plan;

e. Compliance with DNREC's Delaware City Industrial Area Groundwater Management Zone (GMZ) requirements as shown in Attachment B; and

f. Compliance with an EPA approved vapor intrusion (VI) Assessment Plan for any occupied structures planned to be constructed directly above or within 100 feet of the PCE plume on the Facility.

Implementation

EPA proposes that the final remedy for the Facility be implemented through an enforceable mechanism such as a Permit, Order, or an Environmental Covenant. If an Environmental Covenant is selected as the enforceable mechanism, it will be recorded in the chain of title for the Facility property pursuant to the Delaware Uniform Environmental Covenants Act (7 Del. C Chapter 79, Subchapter II).

EPA will also require a coordinate and metes and bounds survey of the Facility boundary to be included in the enforceable mechanism which implements the final remedy for the Facility as follows:

1. The boundary of each area with a use restriction will be defined as a polygon; and
2. The longitude and latitude of each polygon vertex will be established as follows:

    a. Decimal degrees format;
    b. At least seven decimal places;
    c. Negative sign for west longitude; and
    d. World Geodetic System (WGS) 1984 datum

EPA, DNREC and/or their authorized agents and representatives will have access to the Facility property to inspect and evaluate the continued effectiveness of the final remedy and if necessary, to conduct additional remediation to ensure the protection of the public health and safety and the environment upon the final remedy selection in the Final Decision and Response to Comments (FDRTC).

Section 9: Evaluation of EPA's Proposed Remedy

Table 2 lists EPA's criteria for evaluating proposed remedies. The evaluation is two phased. In phase one, the proposed remedy is evaluated against three 'threshold' decision criteria as general goals. In the second phase, remedies that pass the threshold criteria are then evaluated according to seven balancing criteria.

Table 2

Threshold Criteria	Evaluation
1) Protect human health and the environment	The primary risks posed to human health and the environment by Facility contaminants are related to potential: (1) ingestion of contaminated GW and; (2) inhalation of indoor air with volatile chemicals from contaminated GW beneath future structures. The proposed remedy consists of (1) achieving MCLs over time, documented by Long Term Monitoring (LTM) inside and outside the TI Zone; (2) restricting Facility property to non-residential use; (3) maintaining the Landfill and Barren Area Caps; (4) providing vapor control systems in new structures constructed on or within 100 feet of the PCE plume, as necessary; (5) restricting use of GW for potable use through an established TI Zone and the 2008 GMZ established by DNREC; (6) requiring an approved Soil Management Plan, GW Monitoring and Cap Maintenance Plan and VI Assessment Plan (as necessary).
2) Achieve media cleanup objectives	The RFIs documented that Facility related soil contaminants did not exceed industrial RSLs. Facility land use is expected to remain industrial or commercial. GW contaminants were found in the shallow water table aquifer, vertically confined to the Columbia Formation. The GW plumes are delineated and stable with declining contaminant levels. Declining levels can be attributed to the Landfill and Barren Area Caps, which prevent contaminant loading to GW and to contaminant dilution and dispersion. GW clean-up objectives may be met in 20 years in the areas outside of the TI Zone. As GW cVOCs decline, VI potential declines.
3) Remediating the Source of Releases	In EPA's proposed remedies, the goal is to eliminate or reduce further releases of remaining Facility-related hazardous wastes and/or constituents posing unacceptable risk to human health and the environment. To meet the goal, Akzo capped contaminated soil and debris in the Landfill and Barren Areas and will continue LTM of GW.
Balancing Criteria	**Evaluation**
4) Long-term effectiveness	EPA's proposed remedy will maintain protection of human health and the environment as GW contaminant levels diminish over time. The proposed remedy requires Akzo to maintain the Capped Areas and GW LTM and compliance with the GW use restriction through an established TI Zone and through the 2008 GMZ established by DNREC.

5) Reduction of toxicity, mobility or volume of hazardous constituents	Capping the Landfill and Barren Areas reduced mobility of contaminants into soil and GW. GW contaminant levels are expected to diminish over time through dilution and dispersion.
6) Short-term effectiveness	The Facility is unused and is fenced and monitored for trespassers. Waste areas are capped and the caps are maintained and GW is not used, therefore, human exposures to Facility contamination are currently controlled.
7) Implementability	Most of the elements in the proposed remedy are already being implemented. EPA proposes to implement the proposed remedy elements through enforceable institutional controls.
8) Cost	The implementation cost of EPA's proposed remedy will be estimated using 20 years as an estimated duration and will be determined prior to Final Remedy.
9) Community Acceptance	EPA will solicit public comment on the proposed remedy and evaluate community acceptance by reviewing comments submitted during the 30-day public comment period. A public meeting will be held, if requested. Responses to comments and any subsequent modifications to the proposed remedy will be included in EPA's Final Decision and Response to Comments.
10) State Acceptance	DNREC reviewed this SB and concurred with the proposed remedy.

Section 10: Financial Assurance

EPA will evaluate whether financial assurance for corrective action is necessary to implement EPA's final remedy at the Facility. The estimated costs will use 20 years as an estimated duration and will be determined prior to the Final Remedy decision.

Section 11: Public Participation

Before EPA makes a final decision on its proposed remedy for the Facility, the public may participate in the remedy selection process by reviewing this SB and documents contained in the Administrative Record (AR) for the Facility. The AR contains all information considered by EPA in reaching this proposed remedy. It is available for public review during normal business hours at:

U.S. EPA Region III
1650 Arch Street (3LC10)
Philadelphia, PA 19103
Contact: Barbara Smith
Phone: (215) 814-5786
Fax: (215) 814-3113
Email: Smith.Barbara@epa.gov

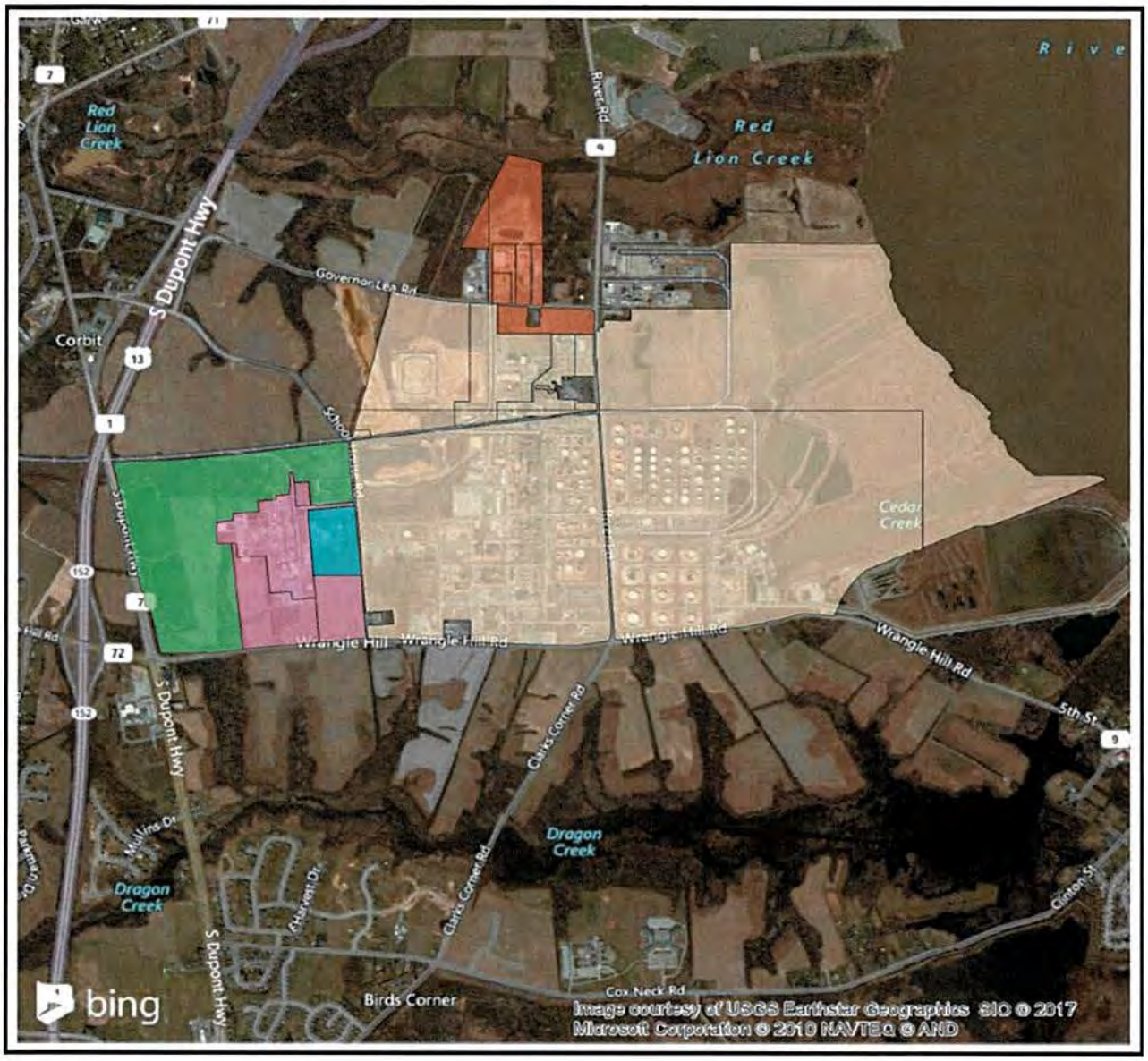
Interested parties are encouraged to review the AR and comment on EPA's proposed remedy. The public comment period will last thirty (30) calendar days from the date that notice is published in a local newspaper. You may submit comments by mail, fax, or e-mail to Ms. Barbara Smith. EPA will hold a public meeting to discuss this proposed remedy upon request. Requests for a public meeting should be made to Ms. Smith.

EPA will respond to all relevant comments received during the comment period. If EPA determines that new information warrant a modification to the proposed remedy, EPA will modify the proposed remedy or select other alternatives based on such new information and/or public comments. EPA will announce its final decision and explain the rationale for any changes in a document entitled the Final Decision and Response to Comments (FDRTC). All persons who comment on this proposed decision will receive a copy of the FDRTC. Others may obtain a copy by contacting Ms. Smith at the address listed above.

Section 12: Signature

Date: 06-07-2017

Catherine A. Libertz, Acting Director
Land and Chemicals Division
US EPA, Region III



0 0.25 0.5 0.75 1 Miles

N
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Figure 1
Akzo and Adjacent Properties

- Akzo Nobel
- PBF Delaware City Refinery
- Bilcare Research, Inc
- Formosa Plastics Corp
- Standard Chlorine of Delaware, Inc

Akzo Facility

Legend

0 125 250 500 750 1,000 Meters

- Capped Landfill
- Barren Area
- Akzo
- Agricultural Parcel
- Undeveloped Parcel
- Carbon Disulfide Plant Parcel
- Roads

*Boundaries defined by Delaware tax parcel data.
EPA Region 3, LCD GIS Team: J.Anstotz & J.Hennessy

N W E S

Figure 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

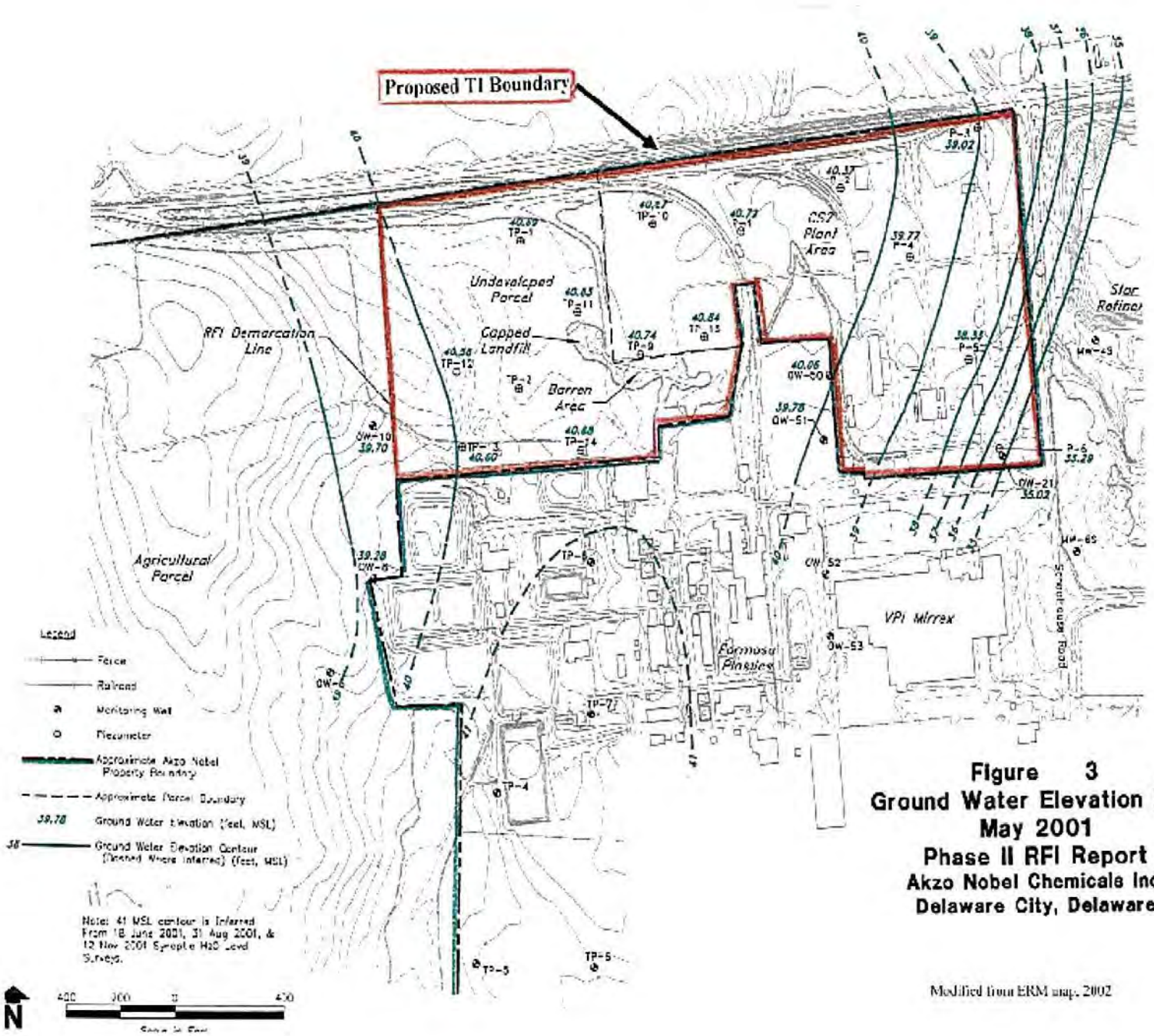

Figure 3
Ground Water Elevation Map
May 2001
Phase II RFI Report
Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Modified from ERM map, 2002

Attachment A

Administrative Record Index

1986, September; *Superfund Record of Decision: Delaware City PVC, DE*, EPA.

1992, October; *Certification of Closure Report, [Akzo] Hazardous Waste Storage Facility, Revision 1*, Tetra Tech Richardson.

1993, January; *Report to Hoechst Celanese Corporation for Hydrogeologic Characterization of the Former Hoechst Celanese PVC Film Manufacturing Facility (Now American Mirrex Corporation) Near Delaware City, Delaware*, SEC Donohue, Inc.

1994, December 30; *7003 Final Administrative Order on Consent, Akzo Nobel Chemicals, Inc. Respondent*.

1998, March; *Phase I RCRA Facility Investigation/Verification Sampling Workplan, Akzo Nobel Chemicals, Inc., Delaware City, Delaware Facility*, ARCADIS Geraghty & Miller, Inc., revised by Environmental Resources Management (ERM).

1998, November 10; *Phase 1 RCRA Facility Investigation/Verification Sampling Workplan* (Final), ERM.

1999, January 14; EPA Approval Letter of *Phase 1 RCRA Facility Investigation/Verification Sampling Workplan.*

1999, August; *Technical Memorandum-Results of Phase I, RCRA Facility Investigation (RFI)/Verification Sampling*, ERM.

2001, March 19; *Background Soil Data: Source: Delaware DNREC*, ERM.

2001, April 17; EPA Approval Letter of *Phase 2 RFI Workplan.*

2001, October; *Quality Assurance Analytical Results, Phase II RFI, Akzo Nobel Chemicals, Inc.*, ERM.

2002, May; *RCRA Facility Investigation Phase II Workplan*, ERM.

2003, July 20; *Results of Supplemental Tetrachloroethene Delineation*, ERM.

2004, April; *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action*, USEPA, EPA530-R-04-030.

2004, September; *Revised Sediment and Stormwater Management Plan for Interim Remedial Measures*, ERM.

2005, March; *Results of PCE Delineation on Premcor and Akzo Nobel Premises*, ERM.

2006, May; *Quality Assurance Project Plan for Ground Water Sampling*, ERM.

2006, July 10; *Supplemental Tetrachloroethene (PCE) Delineation Results*, ERM.

2006, July 27; EPA Approval Letter for *Phase II RFI Report* and *Revised Human Health Risk Assessment (2/14/2003) with EPA Revisions*.

2006, September 11; EPA Approval Letter of Interim Measures Cap Design.

2006, November 3; *Data Validation Report for Supplemental PCE Delineation Results*, ERM.

2010, May; *Final Corrective Measures Study*, ERM.

2010, July 15; *Results of Supplemental PCE Delineation on Akzo and Adjoining Premises*, ERM.

2012, February; *Technical Memorandum for Interim Remedial Measure Treatability Study*, ERM.

2012, September 26; EPA Approval Letter for *Technical Memorandum for Interim Remedial Measure Treatability Study*.

2013; *Subsurface Geology of the Area Between Wrangle Hill and Delaware City, Delaware*, by John W. Jengo, Peter P. McLaughlin, Jr., and Kelvin W. Ramsey, Delaware Geological Survey Report of Investigation No. 78, University of Delaware, Newark, DE.

2014, January; *Groundwater Interim Remedial Measure Report*, ERM.

2016, September 15, 2016; EPA Approval Letter of *Groundwater Interim Measure Report*.

2016, December 22; *August 2016 Groundwater Sampling Results*, ERM.

Attachment B

Memorandum of Agreement (MOA) signed by DNREC DAWM and DWR in April 2008:
NOW, THEREFORE, IT IS AGREED BY Division of Air and Waste Management (DAWM) AND Division of Water Resources (DWR) AS FOLLOWS:

1. A Groundwater Management Zone (GMZ) shall be established to include the listed sites and surrounding areas as defined both in the text and on the attached maps (Attachments 1,2,3, and 4).

2. No new public or domestic (potable) water supply wells will be allowed or permitted within the GMZ Area A (Attachment 4). [Akzo is located in Area A – see Attachment 4 below]

3. No new public or domestic (potable) water supply wells will be allowed in the unconfined Columbia aquifer and any underlying aquifer unit hydraulically connected to the Columbia aquifer within the GMZ Area B (Attachment 4). Potable wells in the GMZ Area B may be allowed or permitted provided: (i) they are drilled into a confined aquifer (ii) they are constructed to prevent the vertical movement of potential contaminants, (iii) that contaminated groundwater, if encountered, will be sufficiently treated to applicable potable use standards; and (iv) a joint review and approval is completed by both DWR and DAWM.

4. Non-potable wells, such as, but not limited to, industrial, monitoring, observation, and contaminant recovery wells, may be installed in GMZ areas A and B following joint review and approval by DWR and DAWM.

5. Permits for wells in GMZ Area B may only be issued by DWR following joint reviews and approvals by both DWR and DAWM.