UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION III

STATEMENT OF BASIS

ROHM AND HAAS COMPANY
BRISTOL PLANT
AMMONIUM SULFATE AREA

200 Route 413
Bristol, Pennsylvania

EPA ID NO. PAD 002 292 068

Prepared by
Office of Pennsylvania Remediation
Land and Chemicals Division
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List of Acronyms

ARS	**Alternate Remedial Strategy**
AS Area	**Ammonium Sulfate Area**
AS Waste	**Ammonium Sulfate Waste**
EC	**Environmental Covenant**
EPA	**United States Environmental Protection Agency**
FDRTC	**Final Decision and Response to Comments**
ICs	**Institutional Controls**
MCL	**Maximum Contaminant Level**
Mg/l	**milligram per liter**
PADEP	**Pennsylvania Department of Environmental Protection**
POC	**Point-of-Compliance**
RCRA	**Resource Conservation and Recovery Act**
RFI	**RCRA Facility Investigation**
SWQS	**Surface Water Quality Standard**
TI	**Technical Impracticability**

Section 1: Introduction

The United States Environmental Protection Agency (EPA) has prepared this Statement of Basis to solicit public comment on its proposed remedy for the Rohm and Haas Company Bristol Plant (hereafter referred to as Facility) Ammonium Sulfate Area (AS Area) located at 200 Route 413, Bristol, Pennsylvania 19047.

EPA's proposed remedy for the Facility's AS Area consists of the following components:

1) establishing a Technical Impracticability (TI) Zone around contaminated groundwater;

2) monitoring and controlling contaminated groundwater within the TI Zone to ensure that groundwater migration does not contaminate the adjacent Delaware River above surface water quality standards; and

3) implementing soil and groundwater use restrictions through institutional controls (ICs).

This Statement of Basis highlights key information relied upon by EPA in proposing its remedy for the Facility's AS Area.

The Facility is subject to EPA's Corrective Action program under the Solid Waste Disposal Act, as amended, commonly referred to as the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Sections 6901 et seq. The Corrective Action program requires that owners and/or operators of facilities subject to certain provisions of RCRA investigate and address releases of hazardous waste and hazardous constituents, usually in the form of soil or groundwater contamination, that have occurred at or from their property. The Commonwealth of Pennsylvania is not authorized for the Corrective Action program under Section 3006 of RCRA. Therefore, EPA retains primary authority in the Commonwealth of Pennsylvania for the Corrective Action Program.

EPA is providing a thirty (30) day public comment period for this Statement of Basis. EPA may modify its proposed remedy based on comments received during this period. EPA will announce its selection of a final remedy for the Facility's AS Area in a Final Decision and Response to Comments (FDRTC) after the comment period has ended.

Information on the Corrective Action program, a fact sheet, and the Government Performance and Results Act Environmental Indicator Determination for the Facility can be found by navigating to https://www3.epa.gov/reg3wcmd/ca/pa.htm.

The Administrative Record for the Facility contains all documents, including data and quality assurance information, on which EPA's proposed remedy is based. See Section 9, Public Participation, for information on how you may review the Administrative Record.

Section 2: Facility Background

The Facility has been an active chemical manufacturing plant since 1917. It covers approximately 800 acres along the west bank of the Delaware River, in Bristol Township, Bucks County. The Facility is adjacent to the communities of Croydon and Bristol Borough, PA. Land use surrounding the Facility includes residential and industrial property to the north, west and east. The Delaware River bounds the Facility to the south. (Figure 1 - Rohm and Haas Bristol Plant Location Map)

Due to the Facility's large size and the diversity of its operations, the Facility has been divided into five study areas for the purpose of environmental investigations. This Statement of Basis addresses the AS Area of the Facility.

Ammonium Sulfate Area (Figure 2 - Ammonium Sulfate Area Layout)

The AS Area was used for the disposal of liquid Ammonium Sulfate Waste (AS Waste) from the chemical manufacturing process. From 1951 until 1970, an estimated 70,000 tons of AS Waste were discharged into shallow, unlined trenches over an estimated 10-acre area. AS Waste consisted of:

- 35-45% ammonium sulfate,
- 50-60% water, and
- 6% process residues.

The geology beneath the AS Area consists of several layers. They are, from top to bottom:

- overburden soils, composed primarily of silt, silty sand, and sandy silt;
- Trenton Gravel, composed primarily of sand, gravel, and clay; and
- schist bedrock/saprolite.

The upper several feet of the schist bedrock has weathered to a low-permeability clay layer, or saprolite, that follows the surface contours of the bedrock.

Due to the high density of the AS Waste, it migrated down through the overburden soils and the Trenton Gravel aquifer to the low-permeable clay layer (saprolite) above the bedrock. The dense AS Waste has accumulated in depressions in the irregular saprolite/bedrock surface.

The AS Area investigations revealed three areas of impact from AS Waste disposal:

- AS Area – 10-acre area where waste material was placed in trenches for disposal;
- Dense contaminant plume (dense plume) areas – Areas of high contaminant concentration (up to 110,000 milligrams per liter (mg/l) of ammonium sulfate) that have settled into depressions above the saprolite/bedrock surface. The dense plume, which was once a single contamination area, has broken into two smaller areas, as shown on Figure 2; and
- Dilute contaminant plume (dilute plume) area – An area of low contaminant concentration (less than 2,000 mg/l of ammonium sulfate) created when groundwater passes over and mixes with the dense plume. The dilute plume, although one continuous area of contamination, is divided into two areas on Figure 2, the south area dilute plume and the east area dilute plume. These designations represent the predominate direction of contaminant migration from the AS Area.

As noted on Figure 2, the dense plume and dilute plume have migrated from the AS Area. The dense plume has moved slowly down the contours of the saprolite/bedrock surface to settle in the bedrock depressions. The dilute plume has moved to the south and east by advection and dispersion. (Figure 3 - Conceptual Migration of the AS Waste).

Because the dilute plume is fed by interaction with the dense plume at the bedrock surface, the dilute plume is concentrated in the deeper groundwater. The shallow groundwater is minimally affected.

Section 3: Summary of Environmental Investigations

The AS Area contamination has been evaluated through a series of investigations from 1989 through 2014. These investigations have included groundwater analysis, soil analysis, surface-water analysis, hydrogeologic studies, specific conductance profiling, geophysical studies, and soil vapor analysis.

Groundwater quality has been evaluated temporally (over time), both vertically and horizontally.

- Initial baseline analysis included a broad list of compounds, including: volatile organic compounds, semi-volatile organic compounds, metals, ammonia, sulfate, and Facility-specific organic compounds.
- In 2000, groundwater analysis was reduced to a targeted list of analytes based on the nature of the AS Waste and chemical constituents detected in the baseline sampling. Required analytes included: semi-volatile organic compounds, acetone, arsenic, chromium, manganese, ammonia, and sulfate.
- In 2013, the list of required analytes was further reduced based on constituents detected in previous groundwater samples. Required analytes included: acetone, manganese, ammonia, and sulfate.
- In 2014, acetone and manganese were deleted from the analyte list.
    - In 2013, acetone was detected at a maximum concentration of 0.25 mg/l, well below the EPA Region III Residential Tapwater Screening Level of 14 mg/l.
    - Manganese was determined to be naturally occurring.

3.1 Environmental Investigations/Studies

RCRA Facility Investigation (RFI) Report, 1989

- Hydrogeologic studies characterized groundwater flow through aquifer investigations and groundwater contours.
- Groundwater and soil sampling identified contaminant chemistry and distribution.
- The horizontal and vertical extent of the dense and dilute plumes were defined.
- AS Waste was found to have migrated down through the unsaturated soil and the groundwater aquifer to accumulate above the low-permeability clay of the saprolite layer above the bedrock.
- Some AS Waste mixed with and diffused into the groundwater.
- Ammonia, sulfate, and acetone were identified as the primary constituents of concern.

RFI Interim Report, 1993

- Further investigations were performed to define the contamination, including:
  - additional well and piezometer installation,
  - specific conductance profiling,
  - three rounds of groundwater sampling, and
  - surface water sampling and soil sampling.

Phase II RFI Report, 1996

- Additional investigations were performed to further define the groundwater contamination and surface contours of the saprolite/bedrock, including:
  - seismic reflection survey to define the bedrock topography;
  - conductivity survey to identify areas of potential groundwater impacts;
  - specific conductance profiling;
  - groundwater sampling;
  - surface water sampling; and
  - borehole groundwater flow velocity measurements.
- The studies showed that the dense plume had migrated little since settling into the bedrock depressions.

Phase III RFI Report, 2001

- Further investigations included:
  - 15 new borings to further define the bedrock topography;
  - groundwater sampling, including nine new wells;
  - specific conductance profiling at monitoring wells; and
  - soil-vapor sampling to evaluate potential vapor intrusion issues.
- The investigations confirmed that:
  - the dense plume was stable;
  - no contaminants were detected in the soil vapor samples; and
  - acetone was detected in only one sample, at 16 mg/l, slightly above the EPA Region III Residential Tapwater Screening Level of 14 mg/l.

Environmental Groundwater Monitoring Report, 2010

- Additional specific conductance profiling and groundwater monitoring was conducted.
- The findings showed that the plumes remained stable.

Current Conditions Monitoring, Work Plan and Sampling Report, May 2014

- Comprehensive groundwater sampling was conducted to establish the current conditions for the corrective measures assessment of the AS Area. Groundwater samples collected from 39 wells were analyzed for ammonia, sulfate, acetone, manganese and indicator parameters.
- The plume boundaries are shown on Figure 2. The findings were compared to the 2009 sampling data. The comparison showed:
  - The dense plume and the east area of the dilute plume are relatively stable.
  - The boundary of the south area of the dilute plume moved closer to the Delaware River.

Corrective Measure Study Investigations, 2014
Additional investigations were performed, including:

- tidal study to determine the influence of tidal flow in the Delaware River on the groundwater beneath the AS Area;
- additional borings to further define the contours of the saprolite/bedrock surface;
- an additional pump test to refine the hydraulic conductivity of the groundwater; and
- additional groundwater monitoring.

Assessment of On-Site and Off-Site Manganese in Groundwater and Potential Influence Due to the Ammonium Sulfate Plume, February 2016

- The variability of manganese concentrations in AS Area groundwater is similar to regional groundwater along the Delaware River.
- Ammonium sulfate concentrations do not correlate with manganese concentrations.
- Variability of manganese concentrations relate to interactions of naturally occurring manganese with organic matter contained in geologic deposits.

3.1 Current Conditions

Groundwater

Contaminant/groundwater movement:

- Movement of the dense plume is controlled by the surface contours of the saprolite/bedrock.
- Movement of the dilute plume follows the groundwater flow, south/southeast to the Delaware River.
- Shallow and deep groundwater discharge to the Delaware River.

Dense Plume

- The extent of the dense plume is well-defined and contained in two distinct areas within bedrock depressions, well within the Facility property.
- The dense plume areas are confined and do not pose a potential exposure concern.
- Total mass of the contaminant plume has decreased through attenuation, from 2,900 tons in 1980 to 2,000 tons in 2014.
- The dense plume is shrinking and has broken into two smaller areas, as shown on Figure 2. The former center of the dense plume (Well CR-16 area) now contains only dilute concentrations of ammonium sulfate.
- Total ammonium sulfate concentrations over time for the dense plume areas are:

	Western dense plume Wells CR-28 and CR-29	Former center of dense plume Well CR-16	Eastern dense plume Well CR-32
1980's	100,000 mg/l		
1995	40,000 mg/l	10,000 mg/l	
2000			3,300 mg/l
2014	14,000 mg/l	< 1,000 mg/l	4,900 mg/l

Dilute Plume

- The dilute plume is confined to the lower stratum of the groundwater table.
- The boundary of the east area of the dilute plume is well contained within the Facility property.
- The boundary of the south area of the dilute plume extends to the edge of the Delaware River.

Surface Water

The only potentially complete migration pathway for the AS Area contamination to surface water is through the dilute plume migration via groundwater flow. The dilute plume is present only in the lower stratum of groundwater. The lower groundwater stratum ultimately discharges to the deep, channelized portion of the Delaware River that is dredged through the saprolite layer to support navigation. The other surface water bodies in the AS Area do not receive groundwater discharge from the contaminated stratum of groundwater, as documented by hydrogeologic studies and surface water sampling.

Current groundwater migration does not contaminate the adjacent Delaware River above surface water quality standards. The maximum contaminant levels detected in groundwater adjacent to the river are:

- 291 mg/l ammonia (Well CR-122, November 2013), and
- 87 mg/l sulfate (Well CR-217, August 2014).

Although the ammonia concentration in groundwater at one point adjacent to the river is above the PA Surface Water Quality Standard (SWQS) of 1.34 mg/l, an evaluation of the total groundwater flow shows that current discharges are not adversely impacting surface water quality.

The sulfate concentration is below the PA Surface Water Quality Standard (SWQS) of 250 mg/l.

Soil

Soil boring investigations show that the AS Waste has migrated to the bottom of the Trenton Gravel, immediately above the saprolite layer. Therefore, the only exposure hazard is by contact with deep soils through excavation activities.

Section 4: Corrective Measures Evaluation

4.1 Contaminant Constituents of Concern

The only constituents of concern remaining in the dense and dilute plumes are ammonia and sulfate. Based on the AS Area investigations and assessments, the only potentially complete exposure pathway is continued migration of the dilute plume to the Delaware River.

Drinking Water Screening Criteria

EPA has not established Maximum Contaminant Levels (MCLs) for ammonia or sulfate pursuant to the Safe Drinking Water Act, 42 U.S.C. Sections 300f et seq. Additionally, there are no drinking water

screening levels established for ammonia or sulfate in accordance with the Region III Residential Tapwater Screening Levels. EPA has established a "secondary maximum contaminant level" (SMCL) of 250 mg/l for sulfate. EPA has not established a SMCL for ammonia. SMCLs are non-mandatory water quality standards established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color, and odor. The National Institute of Health data documents that ammonia is extremely irritating to skin, eyes and respiratory passages. Therefore, EPA has determined that it is appropriate to limit exposure to the ammonia in the Facility groundwater in order to protect human health.

The groundwater in the AS Area is not currently being used as a water supply source. EPA proposes to restrict future groundwater use and exposure through an environmental covenant. Therefore, the potentially complete exposure pathway is continued migration of the dilute plume to the Delaware River.

Surface Water Quality Standards (SWQSs)

- PA Water Quality Standards (25 Pa. Code Section 93.7) were used to calculate the surface water quality standards.
    - Ammonia – The ammonia SWQS is pH and temperature dependent. Based on site-specific pH and temperature calculations, the PA SWQS for ammonia is 1.34 mg/l.
    - Sulfate – The PA SWQS for Sulfate is 250 mg/l.

4.2 Remediation Alternatives

Several technologies were evaluated to achieve the three corrective action threshold criteria:

- protect human health and the environment,
- remediate the source of the release, and
- achieve media cleanup objectives.

In-situ (treating in place) and ex-situ (removal for treatment) were considered.

- In-situ treatment – Given the nature of the groundwater chemistry, in situ treatment would be ineffective due to precipitation of metals by the treatment process reactions, and subsequent clogging of the aquifer by the precipitated metals.
- Ex-situ treatment
    - Ammonia - Nitrification/denitrification in an engineered bioreactor is a proven technology capable of reducing ammonia and nitrate concentrations below 10 mg/l.
    - Sulfate – Biological reduction in an engineered bioreactor is a proven technology that is capable of reducing sulfate below 250 mg/l.
    - Treatment systems would require resources to construct and operate, while generating waste material for disposal.

Due to the extensive size of the contaminant plume, in-situ pump and treat remediation would be a high cost/long-term remediation option. Remediation time and costs (capital and 30 years of operation and maintenance) as presented in the corrective measures evaluation are provided below:

- South area of the dilute plume: up to 100 years at $10.6 million; and
- East area of the dilute plume: up to 190 years at $14.3 million.

4.3 Technical Impracticability Assessment and Alternate Remedial Strategy

Rohm and Haas Company provided a Technical Impracticability (TI) Assessment in conjunction with a proposed Alternate Remedial Strategy (ARS) to control future exposure to ammonia and sulfate in the groundwater. The proposed ARS includes groundwater monitoring to determine whether surface water standards for ammonia or sulfate is exceeded in the future, and remediation of the contaminated groundwater to control discharges to the Delaware River if the surface water standards are exceeded.

The TI Assessment and ARS proposal are based on the following conclusions of the environmental investigations and the evaluation of remedial alternatives:

- Residual ammonia and sulfate concentrations in groundwater have attenuated 90% since disposal activities ceased in 1970. Potential human and environmental receptors are not currently impacted by the ammonium sulfate contamination.
- Accelerated remediation of the remaining contamination is technically impracticable primarily due to feasibility, scale and magnitude of the project.
- A robust monitoring network combined with mass flux (contaminant loading to the Delaware River) calculations can demonstrate whether surface water concentrations will continue to meet surface water quality standards.

Alternate Remedial Strategy

An Alternate Remedial Strategy (ARS) was developed to assess and control migration of contaminants to the Delaware River. It incorporates:

- establishing a TI zone (Figure 4 - Technical Impracticability Zone and Point of Compliance Wells), the area over which the TI determination applies;
- monitoring groundwater at the Delaware River edge to determine the concentrations of ammonia and sulfate discharging to the Delaware River;
- conducting a mass-flux assessment, using site-specific data, that can estimate the river water concentration of ammonia and sulfate based on the concentration of those contaminants in the groundwater at the river edge;
- sampling surface water in response to estimated exceedances in the mass-flux assessment; and
- remediating groundwater to control releases to the Delaware River if SWQSs are exceeded.

Groundwater to Surface Water Impact (Mass-Flux) Assessment, 2015

The mass-flux assessment evaluates the potential impact of the dilute plume discharge to the Delaware River. The evaluation is based on the PADEP Land Recycling Program Technical Guidance Manual, fate and transport analysis to assess impacts to surface water from diffuse flow of contaminated groundwater. The assessment methodology is designed to ensure compliance with SWQSs from a diffuse groundwater discharge.

For the assessment, the potential area of discharge to the Delaware River is divided into segments. Facility-specific parameters are used to create site-specific estimates of contaminant discharge for each aquifer segment. The sum of estimated discharges represents the total mass discharge to the Delaware River.

Facility-specific information is required, including: groundwater discharge rate to the Delaware River, spatial distribution of contaminant concentrations, critical low-flow conditions in the Delaware River (including tidal factors), and background contaminant concentrations in the River.

A Point-of-Compliance (POC) network of groundwater monitoring wells was established (Figure 4) to provide contaminant concentration data along the Delaware River edge. Data for the other elements of the evaluation were collected from site investigations, Delaware River Basin Commission information, and Delaware River gaging station (USGS 0143500).

PADEP and EPA have determined that the proposed POC groundwater monitoring well network and the mass-flux assessment are suitable for estimating ongoing Delaware River impacts due to the groundwater discharge of the dilute plume.

4.4 EPA Evaluation of Technical Impracticability Assessment and Alternate Remedial Strategy

Technical impracticability (TI) for contaminated groundwater refers to a situation where achieving groundwater cleanup standards associated with final cleanup standards is not practicable from an engineering perspective. The term "engineering perspective" refers to factors such as feasibility, reliability, scale or magnitude of a project, and safety.

EPA's evaluation of the TI Assessment along with the proposed ARS indicates that the ARS is the most effective remedy for the AS Area.

The proposed ARS can provide full protection to the surface water quality of the Delaware River. The remedial option of ex-situ groundwater treatment to provide accelerated groundwater remediation will not provide any additional environmental protection. The ex-situ remedial option will require resources to construct and operate, while generating waste material for disposal.

Section 5: Corrective Action Objectives

EPA has identified the following Corrective Action Objectives for the Facility:

Groundwater / Groundwater to Surface Water

EPA has determined that restoration of AS Area groundwater is technically impracticable. Therefore, EPA's Corrective Action Objectives for Facility groundwater are to:

- control human exposure to the hazardous constituents remaining in the groundwater; and
- ensure that groundwater migration does not contaminate the adjacent Delaware River above applicable SWQSs.

Soil

EPA has determined that only subsurface soil beneath the former AS Area poses an exposure hazard. The Corrective Action Objective for the AS Area soils is to control exposure to the hazardous constituents remaining in the Trenton Gravel beneath the AS Area.

Section 6: Proposed Remedy

The components of EPA's proposed remedy for the AS Area are listed below:

- A TI Zone shall be established that encompasses the area of groundwater contamination and extends down to the top of the saprolite. The proposed TI Zone is identified on Figure 4.

- A Protectiveness Assessment Plan shall be developed and implemented for the Alternate Remedial Strategy.
    - A Protectiveness Assessment Work Plan shall be developed and submitted for EPA review and approval. The Protectiveness Assessment Work Plan shall incorporate the elements included in Ammonium Sulfate Area RCRA Corrective Measures Study and Technical Impracticability Assessment (URS Corp for Rohm and Haas Company, June 2016).
        - Groundwater monitoring and mass-flux assessment shall be in accordance with Section 5.3.2 - Periodic Groundwater Sampling and Mass-Flus Analysis.
        - Surface water monitoring shall be in accordance with Section 5.3.2 – Surface Water Sampling.
        - A protectiveness assessment shall be conducted following each sampling event using the mass-flux approach in Section 3.0 – Groundwater to Surface Water Impact Assessment.
    - A groundwater remediation program shall be developed in the event that contaminated groundwater discharges to the Delaware River cause exceedances in the SWQSs. The remediation program shall be in accordance with Section 5.3.3 – Conceptual Remediation Framework of the Ammonium Sulfate Area RCRA Corrective Measures Study and Technical Impracticability Assessment (URS Corp for Rohm and Haas Company, June 2016).

- The following land and groundwater use restrictions shall be implemented through an Environmental Covenant at the Facility.
    - Groundwater at the TI Zone (Figure 4) shall not be used for any purpose; including, but not limited to, use as a potable water source, other than to conduct the maintenance and monitoring activities required by PADEP and/or EPA.
    - All earth moving activities at the AS Area (Figure 2), including excavation, drilling and construction activities, shall be conducted in accordance with a site-specific soil management plan that includes appropriate personal protective equipment requirements sufficient to meet EPA's acceptable risk standard and comply with all applicable OSHA requirements.
    - The AS Area shall not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedy selected by EPA in a Final Decision and Response to Comments for the AS Area.

- Any Owner of the Facility property or any portion thereof shall provide EPA and PADEP with a "Certified, True and Correct Copy" of any instrument that conveys any interest in the Facility property or any portion thereof.
- Any Owner of the Facility property or any portion thereof shall allow the EPA, state, and/or their authorized agents and representatives, access to the Facility 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.

Section 7: Evaluation of Proposed Remedy

This section provides an evaluation of the criteria EPA used to evaluate the proposed remedy consistent with EPA guidance. The criteria are applied in two phases. In the first phase, EPA evaluates three decision threshold criteria as general goals. In the second phase, for those remedies which meet the threshold criteria, EPA then evaluates seven balancing criteria.

Threshold Criteria	Evaluation
1) Protect human health and the environment	This criterion is met without additional remedial actions with respect to current risk. The groundwater at the AS Area is not currently being used as a water supply source. To minimize the potential for human exposure to contamination in the future, EPA is proposing to restrict the use of groundwater through an environmental covenant. The potentially complete exposure pathway is continued migration of the dilute plume to the Delaware River. EPA will require continued groundwater and surface water monitoring and a protectiveness assessment to ensure surface water quality standards are not exceeded. Land use restrictions will also be implemented to prohibit future uses that would pose an unacceptable risk.
2) Achieve media cleanup objectives	EPA's proposed remedy meets the media cleanup objectives appropriate for the expected current and reasonably anticipated land and water resource uses. The remedy proposed in this Statement of Basis is based on the current and future anticipated land use at the AS area, which is industrial. The proposed remedy does not meet groundwater cleanup standards that would allow for residential use of groundwater at the AS Area, however, achieving complete remediation of the groundwater plume and subsurface soil is technically impracticable. The activity use restriction will eliminate future unacceptable exposures to both soil and groundwater.
3) Remediating the Source of Releases	In all proposed remedies, EPA seeks to eliminate or reduce further releases of hazardous wastes and hazardous constituents that may pose a threat to human health and the environment. Remediation of the source material has been shown to be technically impracticable.

Balancing Criteria	Evaluation
4) Long-term effectiveness	The proposed remedy will maintain protection of human health and the environment over time by controlling exposure to the hazardous constituents remaining in groundwater. The long term effectiveness of the remedy will be maintained by the implementation of land and groundwater use controls. These institutional controls are readily implementable and easily maintained
5) Reduction of toxicity, mobility, or volume of the Hazardous Constituents	Significant reduction in the contamination has occurred by natural attenuation. Addition reduction is technically impracticable except by continued natural attenuation.
6) Short-term effectiveness	EPA's proposed remedy does not involve any activities, such as construction or excavation that would pose short-term risks to workers, residents, and the environment.
7) Implementability	EPA's proposed remedy is readily implementable. A groundwater monitoring system is already in place. EPA proposes that the institutional controls be implemented through an enforceable mechanism such as an order and/or an Environmental Covenant pursuant to the Pennsylvania Uniform Environmental Covenants Act. Therefore, EPA does not anticipate any regulatory constraints in implementing its proposed remedy.
8) Cost	The costs associated with this proposed remedy, estimated to be $500,000, is the most cost-effective option.
9) Community Acceptance	EPA will evaluate community acceptance of the proposed remedy during the public comment period and will describe it in the Final Decision and Response to Comments.
10) State/Support Agency Acceptance	PADEP and EPA jointly have reviewed the elements of the TI Assessment and ARS. EPA will evaluate state acceptance during the public comment period and provide an analysis in the Final Decision and Response to Comments.

Section 8: Financial Assurance

EPA is proposing that financial assurance be provided to satisfy the financial assurance requirement of RCRA. The cost of the proposed remedy is estimated to be $500,000.

Section 9: Public Participation

You are invited to 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. Comments may be submitted by mail, fax, email, or phone to Maureen Essenthier at the address listed below.

EPA intends to hold a public meeting to describe the proposed decision. EPA will provide details on the time and place of the meeting, when they are finalized, on EPA's website at **https://www.epa.gov/pa/epa-meetings-and-events-pennsylvania**.

The Administrative Record contains all information considered by EPA for the proposed remedy. It is available at the following location:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103
Contact: Maureen Essenthier (3LC30)
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Section 10: Signature

Date: 11/23/2016 original signed by JAA

John A. Armstead, Director
Land and Chemicals Division
US EPA, Region III

Section 11: Index to Administrative Record

1. National Institute of Health, Toxicology data Network, TOXNET Hazardous Substances Data Bank, Ammonia Fact Sheet; https://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+162

2. National Institute of Health, Toxicology data Network, TOXNET Hazardous Substances Data Bank, Ammonium Sulfate Fact Sheet; https://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+471

3. Ammonium Sulfate Area RCRA Corrective Measures Study and Technical Impracticability Assessment, EPA Docket No. RCRA-III-013-CA, Rohm and Haas Company Bristol Plant; URS Corp for Rohm and Haas Company, June 2016 (revised), including:
    - Groundwater to Surface water Impact (mass-flux) Assessment, Section 3;
    - Approaches for Remediation, Sections 4.3 and 4.4;
    - Alternate Remedial Strategy, Section 5.3; and
    - Technical Impracticability Assessment, Section 5.

4. EPA Review Comments: Rohm & Haas Co Bristol Plant - Manganese in Groundwater, EPA email dated 4/7/2016, Maureen Essenthier to Robert Casselberry (Rohm and Haas)

5. Assessment of On-Site and Off-Site Manganese in Groundwater and Potential Influence Due to the Ammonium Sulfate Plume; URS for Rohm and Haas Company, February 2016

6. EPA and PADEP Review Comments: Rohm and Haas Bristol ASA CMS/TI and Manganese Technical Review Memo, EPA email dated 9/17/2015, Maureen Essenthier to Robert Casselberry (Rohm and Haas)

7. Response to Comments, RCRA Corrective Measures Study and Technical Impracticability Assessment, Ammonium Sulfate Area, Rohm and Haas Bristol Plant; Rohm and Haas letter report to EPA, June 30, 2015

8. PADEP Review Comments on Surface Water Mass Loading: EPA email dated 6/15/2015, Maureen Essenthier to Robert Casselberry (Rohm and Haas)

9. EPA Review Comments: Bristol Plant Ammonium Sulfate Area CMS and TI Report, EPA email dated 5/26/2015, Maureen Essenthier to Robert Casselberry (Rohm and Haas)

10. Ammonium Sulfate Area RCRA Corrective Measures Study and Technical Impracticability Assessment, Rohm and Haas Company Bristol Plant; URS Corp for Rohm and Haas Company, December 2014

11. Work Plan – AS Area RCRA CMS and TI Assessment Rohm and Haas Bristol; Rohm and Haas Company to EPA, May 98, 2014, including:

July 2013 groundwater sampling results.

12. Groundwater Monitoring Report – Ammonium Sulfate Area, RCRA Facility Investigation; Sigma Environmental for Dow Chemical Company, Croydon, PA, May 2010

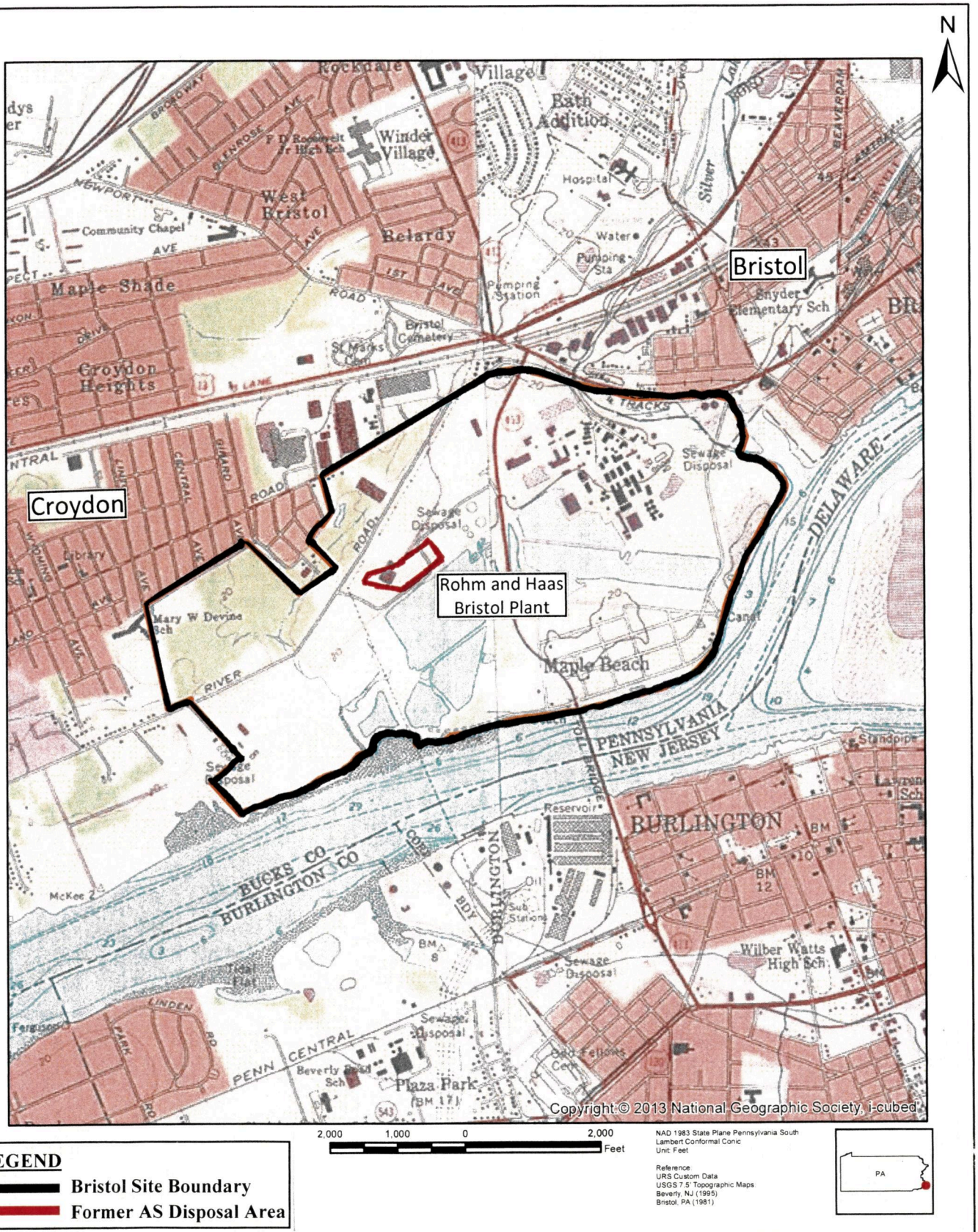
13. Phase III Report for Ammonium Sulfate Area RCRA Facility; Investigation; ST Environmental for Rohm and Haas Company, Bristol, PA, February 2001

14. Ammonium Sulfate Area RCRA Facility Investigation, Phase II RFI Report; Smith environmental Technologies Corporation for Rohm and Haas Company, July 1996

15. Ammonium Sulfate Area RFI Interim Report; BCM for Rohm and Haas Delaware Valley, August 1993

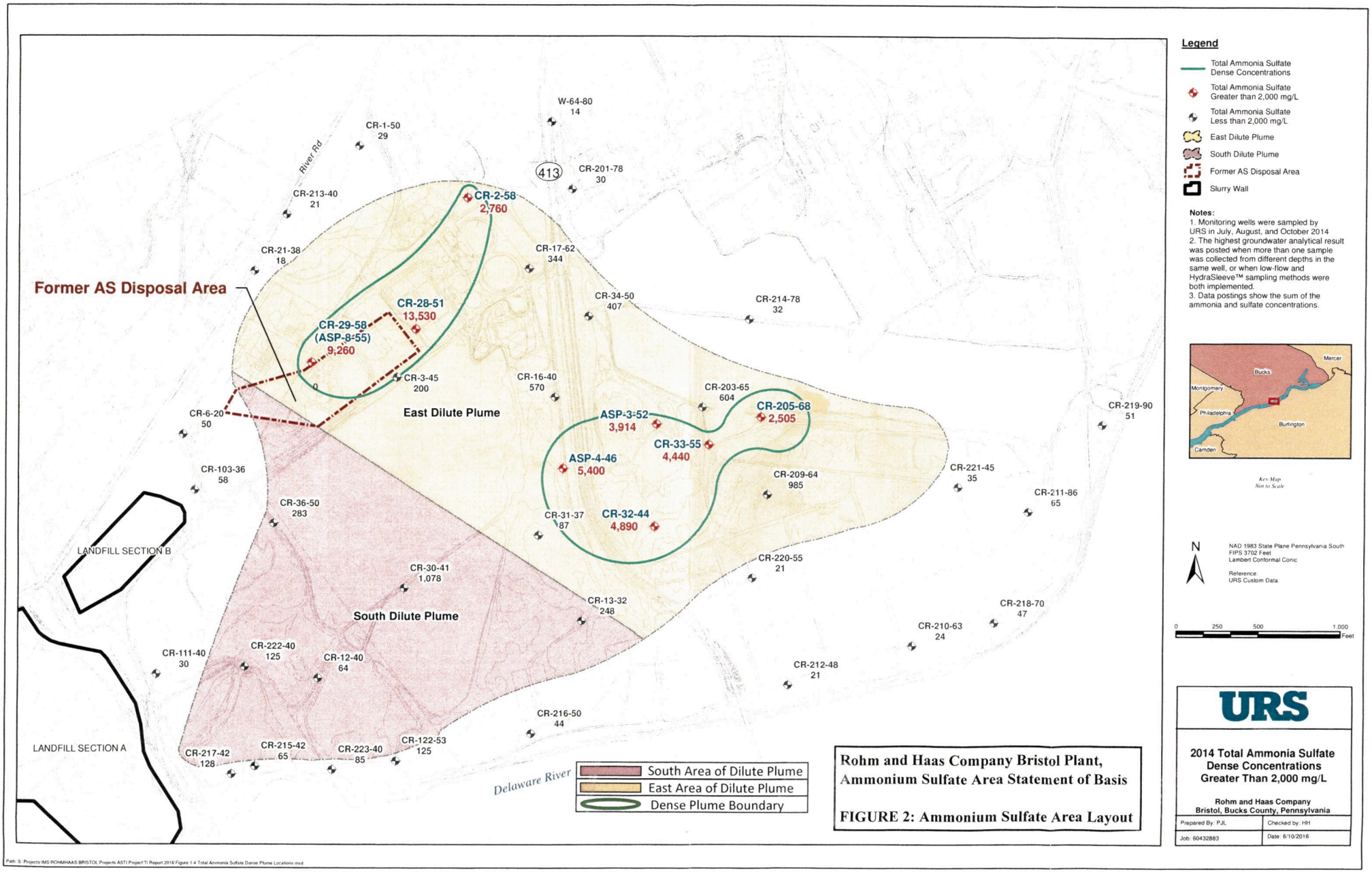
16. Ammonium Sulfate Area RCRA Facility Investigation Report; BCM for Rohm and Haas Delaware Valley, 1989

17. PADEP Land Recycling Program Technical Guidance Manual, June 6, 2002 Section IV.A.3 - General Guidance, Fate and Transport Analysis, Impacts to Surface Water from Diffuse Flow of Contaminated Groundwater (http://files.dep.state.pa.us/EnvironmentalCleanupBrownfields/LandRecyclingProgram/LandRecyclingProgramPortalFiles/GuidanceTechTools/section_iv_january_2008_revision.pdf)



Rohm and Haas Company Bristol Plant, Ammonium Sulfate Area Statement of Basis

FIGURE 1: Location Map



Legend

- Total Ammonia Sulfate Dense Concentrations
- Total Ammonia Sulfate Greater than 2,000 mg/L
- Total Ammonia Sulfate Less than 2,000 mg/L
- East Dilute Plume
- South Dilute Plume
- Former AS Disposal Area
- Slurry Wall

Notes:

1. Monitoring wells were sampled by URS in July, August, and October 2014
2. The highest groundwater analytical result was posted when more than one sample was collected from different depths in the same well, or when low-flow and HydraSleeve™ sampling methods were both implemented.
3. Data postings show the sum of the ammonia and sulfate concentrations.

Key Map Not to Scale

N

NAD 1983 State Plane Pennsylvania South FIPS 3702 Feet Lambert Conformal Conic

Reference URS Custom Data

0 250 500 1,000 Feet

Rohm and Haas Company Bristol Plant, Ammonium Sulfate Area Statement of Basis

FIGURE 2: Ammonium Sulfate Area Layout

URS

2014 Total Ammonia Sulfate Dense Concentrations Greater Than 2,000 mg/L

Rohm and Haas Company Bristol, Bucks County, Pennsylvania

Prepared By: PJL	Checked by: HH
Job: 60432883	Date: 6/10/2016

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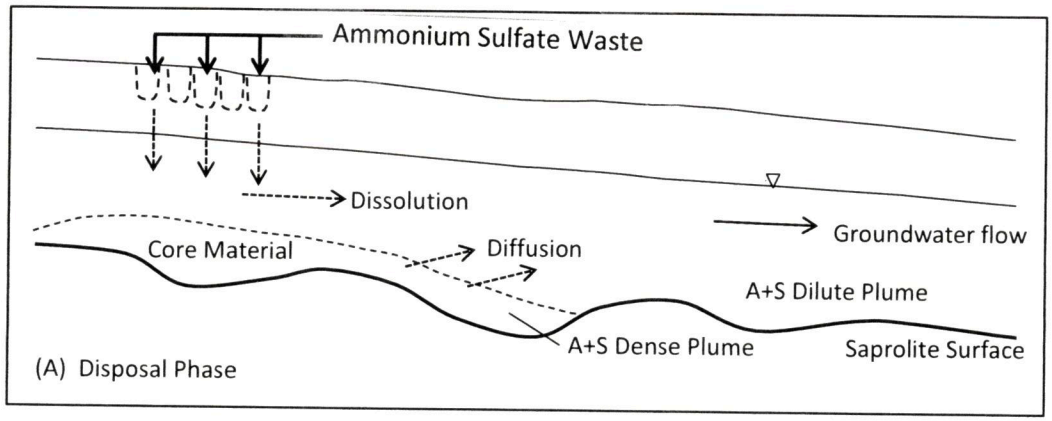

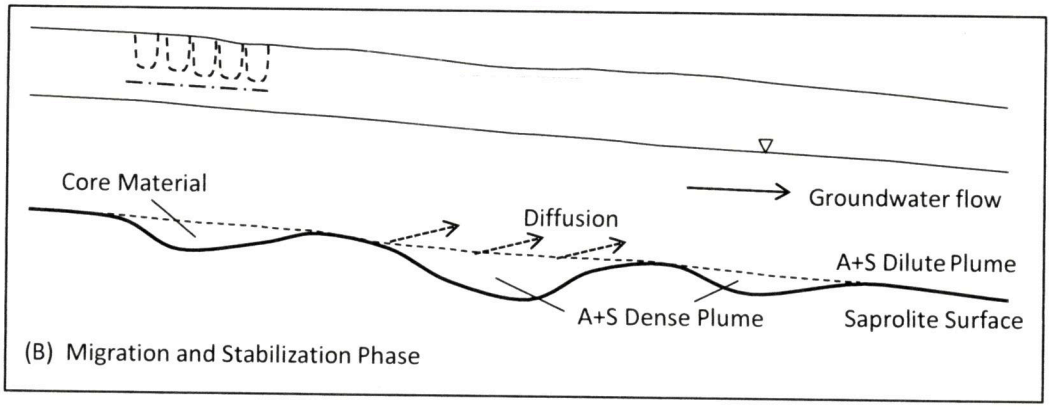

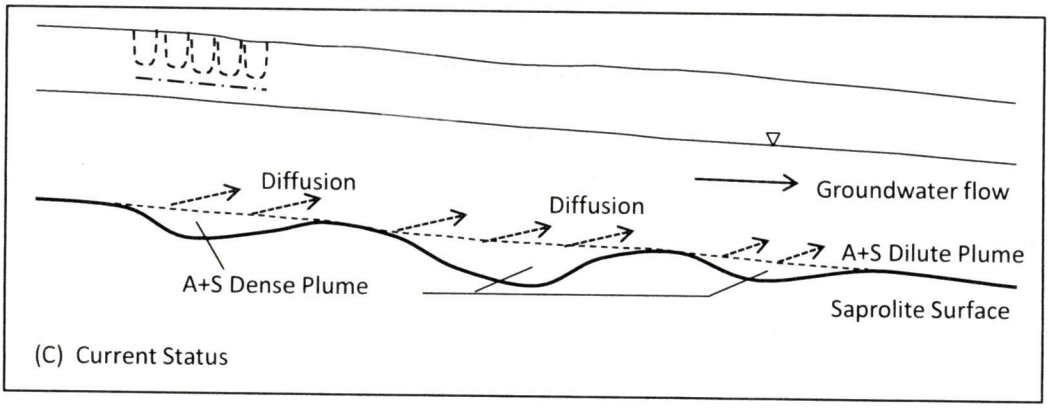

URS
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Date:	4/8/2016

Rohm and Haas Company Bristol Plant,
Ammonium Sulfate Area Statement of Basis

FIGURE 3: Conceptual Migration of the AS Waste

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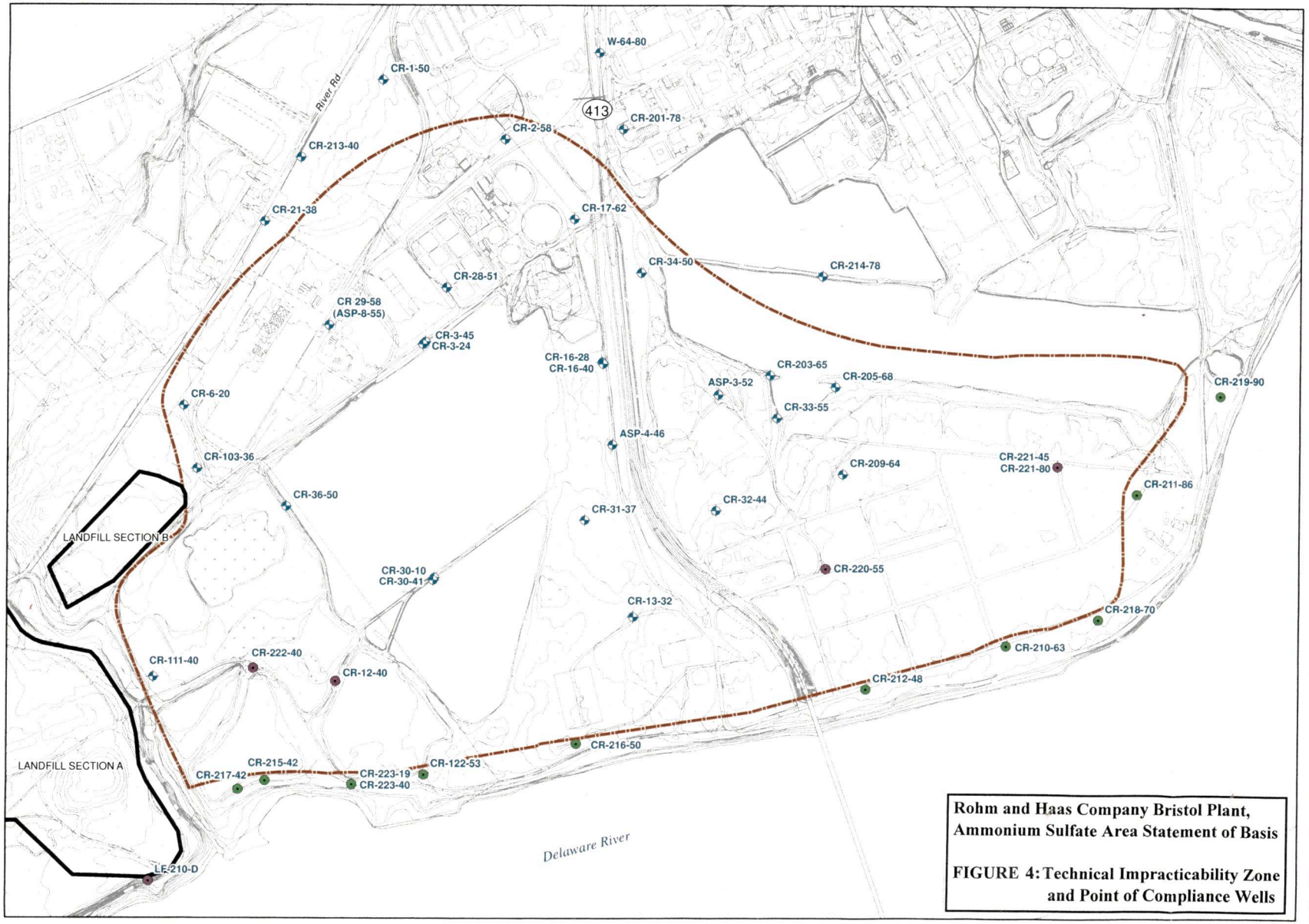
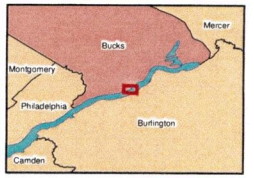


Legend

- Monitoring Well
- Point of Compliance Monitoring Well
- Sentinel Well
- Proposed Technical Impracticability Zone
- Slurry Wall



Key Map
Not to Scale

N

NAD 1983 State Plane Pennsylvania South
FIPS 3702 Feet
Lambert Conformal Conic

0 250 500 1,000 Feet

Rohm and Haas Company Bristol Plant,
Ammonium Sulfate Area Statement of Basis

FIGURE 4: Technical Impracticability Zone and Point of Compliance Wells

URS

Proposed
Technical Impracticability Zone
and Point of Compliance Wells

Rohm and Haas Company
Bristol, Bucks County, Pennsylvania

Prepared By: PJL	Checked By: HH
Job: 60432883	Date: 6/10/2016

Path: S:\Projects\IMS\ROHMHAAS\BRISTOL\Projects\AST\ Project\TI Report 2016\Figure 3-1 Proposed TI Zone and Point of Compliance Wells.mxd