FIVE-YEAR REVIEW REPORT
AMERICAN CYANAMID SUPERFUND SITE
SOMERSET COUNTY, NEW JERSEY

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

Approved by:

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Date: June 26, 2014

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Executive Summary

This is the fourth five-year review (FYR) for the American Cyanamid Superfund site (site) located in the Township of Bridgewater, Somerset County, New Jersey. The purpose of this FYR is to review information to determine if the remedy is and will continue to be protective of human health and the environment. Waste remains on site above levels that allow of unrestricted use and unlimited exposure, therefore, it is required that the remedy for the site be reviewed no less often that once every five years in accordance with 40 CFR 300.430(f)(4)(ii).
The triggering action for this statutory FYR was the completion of the previous FYR on September 23, 2009.

No issues, recommendations or follow-up actions were identified during the completion of this FYR. The remedies at OUs 1, 2 and 3 are or will be protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: American Cyanamid		
EPA ID: NJD002173276		
Region: 2	**State:** NJ	**City/County:** Bridgewater Twp./Somerset County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Joseph Battipaglia
Author affiliation: EPA
Review period: 9/23/2009 - 6/25/2014
Date of site inspection: 3/26/2014
Type of review: Statutory
Review number: 4
Triggering action date: 9/23/2009
Due date *(five years after triggering action date)*: 9/23/2014

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OUs 1, 2, 3

Issues and Recommendations Identified in the Five-Year Review: None

Protectiveness Statement(s)

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment.		

Protectiveness Statement(s)		
Operable Unit: OU2	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at OU2 will be protective of human health and the environment.		

Protectiveness Statement(s)		
Operable Unit: OU3	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at OU3 is protective of human health and the environment.		

Introduction

The purpose of a FYR is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment and is functioning as intended by the decision documents. The methods, findings and conclusions of reviews are documented in the FYR. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

This is the fourth FYR for the American Cyanamid Superfund site, located in the Township of Bridgewater, Somerset County, New Jersey. This FYR was conducted by the United States Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Joseph Battipaglia. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii), and in accordance with the *Comprehensive Five-Year Review Guidance*, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the site file.

The triggering action for this statutory review is the completion of the previous FYR on September 23, 2009. A FYR is required at this site due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The site originally consisted of seven Operable Units (OUs), and a remedy was selected and has been implemented, or partially implemented, for OU1, OU2, OU3 and OU6. The following OUs are addressed in this FYR:

- OU 1 (impoundments 11 and 19);
- OU 2 (impoundments 15, 16 and 18); and,
- OU 3 (impoundments 14, 20 and 26).

The remedy for OU6, the Hill Property soils, was determined to be no action for soils (due to no unacceptable risks to human health and the environment) with groundwater monitoring and an institutional control (IC) in the form of a classification exception area (CEA). Groundwater ARARs were subsequently achieved, thereby resulting in all RAOs for this OU being met, the CEA was removed. Consequently, this OU was deleted from the National Priorities List (NPL) in 1998 and is not subject to this FYR.

The remaining operable units (OU4, OU5 and OU7), as well as the portions of the remedies for OU1, OU2 and OU3 that were not implemented, have been combined and are being addressed under the existing OU4, with the exception of impoundments 1 and 2 which are being addressed under a recently created OU8. A removal action currently is being conducted to address groundwater discharges into the Raritan River and will be incorporated into the OU4 remedy. As a result, OU4, OU6 and OU8 will not be reviewed as part of this FYR.

Site Chronology

See Table 1 for the site chronology.

Background

The site is located in the central portion of New Jersey within the southeastern section of Bridgewater Township, Somerset County. It is bounded by Main Street to the north, the Raritan River to the west and south and Interstate 287 to the east, as shown on Attachment 1. The site encompasses approximately 435 acres and is divided into the following five areas as shown on Attachment 2: North Area, South Area, West Area, East Area and the Impoundment 8 Facility.

Physical Characteristics

The area surrounding the site is an urban mixture of industrial, commercial and residential uses. Waste disposal areas, referred to as impoundments, comprise about 100 acres of the site, and the remainder of the site consists of wetland areas and soil areas containing patches of vegetation and asphalt.

Site Geology/Hydrogeology

Two groundwater aquifer systems are present beneath the site. The shallow overburden aquifer system, which consists of man-made fill and unconsolidated alluvial deposits, is present continuously across the site at depths ranging from 5 to 30 feet. As shown in Attachment 3, overburden groundwater generally flows horizontally towards local surface water discharge zones, such as the Raritan River and Cuckel's Brook; however, in some areas overburden groundwater flows downward as a result of the hydraulic gradients induced by the operation of a bedrock groundwater extraction system, which has been pumping a minimum of 650,000 gallons per day since the late 1980s, pursuant to an order with the New Jersey Department of Environmental Protection (NJDEP), which is discussed in the *Initial Response* section. The bedrock groundwater aquifer is composed of siltstones and claystones and is located within the Passaic Formation. The bedrock aquifer beneath the site contains three main transmissive zones separated by zones of less permeable, more competent rock. A bedrock groundwater divide generally exists between the North and South Areas. Bedrock groundwater in the North Area is generally captured by the bedrock extraction system; however, bedrock groundwater located south of the Lehigh Valley and Port Reading Railroad is not captured and flows towards the Raritan River, as shown in Attachment 4. The surrounding communities are serviced by a public water supply, with the exception of residents located south of the Raritan River who utilize private wells that are not hydraulically connected to the contaminated groundwater at the site.

Land and Resource Use

The site is currently zoned for industrial use and the surrounding areas consist of a mixture of industrial, commercial and residential uses. The title to the site property is held by Wyeth Holdings LLC (Wyeth), a wholly-owned subsidiary of Pfizer, Inc. Wyeth has discussed a number of potential future uses for portions of the site, ranging from light industrial use to recreational use. The reuse of any portion of the site will require approval from the EPA. The implementation of institutional controls is required per the September 2012 OU4 Record of Decision (ROD) to ensure the protectiveness of the remedy and its compatibility with future reuse. A site-wide classification exception area/well restriction area (CEA/WRA) is currently being developed by Wyeth with the NJDEP to restrict potable use of groundwater until it has been restored. The Raritan River is used as a drinking water source by a local public water utility; however, the intake is located upstream of the site and the river water is treated to ensure

that it complies with state and federal drinking water regulations. In December 2012, the local sewerage authority re-routed their discharge from Cuckel's Brook to the Raritan River, resulting in decreased flow in the brook.

History of Contamination

The site was used for numerous chemical and pharmaceutical manufacturing operations for more than 90 years. The facility was originally built in 1915 as Calco Chemical Company to manufacture intermediate chemicals and dyes. The plant expanded over the next 60 years to become one of the nation's largest dye and chemical plants. The majority of the expansion at the plant occurred after American Cyanamid purchased the facility in 1929 and was driven by the large increase in demand for chemicals in the United States, particularly during and immediately after World War II. The manufacture of pharmaceutical intermediates was initiated at the facility in the 1930s and continued until 1999, when all manufacturing operations ceased.

As a result of past activities at the facility, a number of waste storage and disposal areas, referred to as impoundments, were constructed throughout the North, South and West Areas. Historical records, aerial photographs and sampling efforts indicate that manufacturing and waste disposal activities were not conducted in the East Area. Of the 27 impoundments constructed for disposal purposes, 16 are being addressed under CERCLA and were used for storing by-products of rubber chemical production, dye production and coal tar distillation, as well as for disposal of general plant waste and demolition debris. As shown in Attachment 5, these 16 impoundments have been identified as impoundments 1, 2, 3, 4, 5, 11, 13, 14, 15, 16, 17, 18, 19, 20, 24 and 26. These 16 impoundments originally were estimated to contain 877,000 tons of waste material. The remaining 11 impoundments were either never used for waste disposal, have been addressed under the Resource Conservation and Recovery Act (RCRA) or are currently being addressed under RCRA. As a result of the waste disposal activities, the impoundments, surrounding soils and groundwater contain elevated levels of volatile organic compounds (VOCs), semi-VOCs (SVOCs) and inorganics. Tables 2A-2F provide a summary of all 27 impoundments, including their size, volume, contaminants of concern (COCs) and current status.

The Hill Property, which was formerly part of the site, consists of 140 acres located northeast of the site. The Hill Property included a research laboratory and administrative buildings. No remedial action was required for the Hill Property because it did not pose an unacceptable risk to human health or the environment, and the groundwater ICs that were required by the ROD have been removed since groundwater now meets the requirements of the ROD. The Hill Property was deleted from the NPL in 1998 and has been redeveloped for commercial use.

Initial Response

In June 1981, American Cyanamid filed a general notification of release of hazardous substances with the EPA. The site was placed on the NPL in September 1983.

In May 1988, American Cyanamid entered into an administrative consent order (ACO) with NJDEP to address the 16 impoundments, as well as contaminated site soils and groundwater. In addition to the regulatory requirements established under the 1988 NJDEP ACO, a New Jersey Pollutant Discharge Elimination System/Discharge to Groundwater (NJPDES/DGW) permit was issued in 1987. This permit required American Cyanamid to conduct extensive groundwater

monitoring and to continue pumping bedrock extraction wells, at a minimum rate of 650,000 gallons per day. In May 1994, American Cyanamid and NJDEP amended the administrative consent order to incorporate the existing bedrock groundwater extraction and monitoring requirements of the NJPDES/DGW permit and include additional monitoring requirements for the groundwater beneath impoundment 8 facility.

NJDEP was the lead agency for the Site until March 2009, when EPA assumed the lead role. In July 2011, Wyeth entered into an administrative order on consent with the EPA to address groundwater discharges into the Raritan River as a removal action. The removal action order required the design and construction of a groundwater removal system to intercept and capture the releases of groundwater into the Raritan River in the vicinity of impoundments 1 and 2. The groundwater removal system includes a collection trench, a containment wall and an interim groundwater treatment plant. This system was completed in May 2012, is currently operating and will be incorporated into the site-wide remedy under OU4.

In March 2013, Wyeth entered into an administrative order on consent with for the remedial design of the OU4 site-wide remedy, as well as for a focused feasibility study (FFS) for impoundments 1 and 2. The remedial design of the OU4 site-wide remedy and the FFS for impoundments 1 and 2 are currently ongoing.

Basis for Taking Action

Site conditions have been characterized through a series of remedial investigations in order to determine the nature and extent of the contamination. An impoundment characterization program was completed in 1990 and a soils investigation was completed in May 1992 to characterize and delineate contaminated soils. A remedial investigation of groundwater was completed in February 2006 and a supplemental groundwater investigation was completed in February 2008.

A number of human health and ecological risk assessments have been conducted since the site was listed on the NPL. A baseline endangerment assessment was conducted in 1992 to evaluate cancer risks and noncancer health hazards associated with potential exposures to the impoundments, surface soils and groundwater in the North Area. A human health risk assessment was conducted in 2006 for the South and West Areas for the same exposures as in the 1992 baseline endangerment assessment. A streamlined human health risk assessment was completed in February 2010 to evaluate the cancer risks and noncancer hazards associated with an industrial worker’s potential exposure to the impoundments and surface soils, a trespasser’s exposure to surface soils, and a resident’s exposure to overburden and bedrock groundwater. These assessments generally concluded that impoundments, soils and groundwater presented an unacceptable human health risk to current and potential future receptors.

Ecological risks at the site were addressed through the 1992 baseline endangerment assessment, as well as through a baseline ecological risk assessment conducted in 2005. The baseline endangerment assessment evaluated the potential risks to ecological receptors from exposure to sediment and surface water in the Raritan River and concluded that the impact of the discharge of overburden groundwater discharge to the Raritan River is unlikely to adversely affect the health and diversity of aquatic biota in the Raritan River. A groundwater discharge containing elevated benzene concentrations was discovered in December 2010 and was subsequently addressed through a removal action. The 2005 baseline ecological risk assessment evaluated

potential ecological exposures to soils in the South and West Areas, as well as surface water and sediment in Cuckel's Brook and the Raritan River. The baseline ecological risk assessment concluded that the level of potential impact of site-related contaminants to ecological receptors is likely to be below levels of concern. An ecological risk assessment will be performed for impoundments 13, 17 and 24 as part of the OU4 site-wide remedy implementation to determine whether their contents require relocations to the North Area per the September 2012 OU4 ROD.

As identified in the 2012, OU4 ROD, the following are the main COCs for the affected media at the site:

- Impoundments: benzene, nitrobenzene, naphthalene, N-nitrosodiphenylamine and 1,2-dichlorobenzene;
- Site soils: antimony, arsenic, benzo(a)pyrene, chromium IV, cobalt and total polychlorinated biphenyls; and,
- Groundwater: benzene, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, nitrobenzene, n-Nitrosodiphenylamine, toluene and xylene.

Remedial Actions

Remedy Selection

Due to the size and nature of contamination, the site was originally divided into the following seven OUs:

- OU1: Impoundments 11, 13, 19 and 24
- OU2: Impoundments 15, 16, 17 and 18
- OU3: Impoundments 1, 2, 3, 4, 5, 14, 20 and 26
- OU4: Site soils
- OU5: Site groundwater
- OU6: Hill Property soils
- OU7: Site-related wetlands

Remedies were selected for OU1, OU2 and OU3 in Records of Decision issued in 1993, 1996 and 1998, respectively. An Explanation of Significant Differences (ESD) was issued for OU2 in 1998 and for OU3 in 2007. The completed portions of OU1, OU2 and OU3, as well as the ongoing remediation of impoundments 15 and 16 under OU2, are the subject of this FYR.

OU6 was deleted from the NPL in 1998. A groundwater CEA/WRA was established as part of the OU6 ROD; however, the CEA/WRA was closed in June 2008 after residual groundwater contaminant concentrations were reported below NJDEP groundwater quality standards. Therefore, this OU will not be covered in the FYR.

The portions of OU1, OU2 and OU3 that were not completed or undergoing active remediation, as well as the remaining OUs (OU4, OU5 and OU7) that had not been addressed at the time of the issuance of the OU4 ROD were combined and added to the existing OU4, with the exception of impoundments 1 and 2 which are being addressed under a newly created OU8. A remedy was selected for OU4 in September 2012 and the remedial design is currently underway. The OU4 remedy addresses contaminated groundwater, soils and impoundments 3, 4, 5, 13, 17 and 24. A FFS is being developed for impoundments 1 and 2 under OU8.

Below is a summary of the selected remedies for the OUs that have been completed or partially completed and are evaluated in this FYR:

- Operable Unit 1: Impoundments 11 and 19
  - A ROD was signed for impoundments 11, 13, 19 and 24 in September 1993. The remedies for impoundments 11 and 19 were completed in November 1997 and November 1995, respectively.
  - The remedial activities for impoundments 13 and 24 are now being addressed under OU4.
  - The 1993 OU1 ROD called for the excavation of impoundments 11 and 19, the on-site solidification of excavated material, and the consolidation of solidified material into the impoundment 8 facility.
  - The remedial action objectives per the 1993 OU1 ROD were to:
    - Eliminate source of contamination; and
    - Contribute to compliance with applicable or relevant and appropriate requirements (ARARs) for groundwater.

- Operable Unit 2: Impoundments 15, 16, and 18
  - A ROD was signed for impoundments 15, 16, 17 and 18 in July 1996. The remedy for impoundment 18 was completed in April 1998. The remedy for impoundments 15 and 16 was modified through an ESD in November 1998, and their remediation is ongoing.
  - The 1998 OU2 ESD for impoundments 15 and 16 called for the excavation of iron oxide material, transport and reuse of the material at an off-site recycling facility, the backfilling and revegetation of the former impoundment areas and the monitoring of groundwater. The remedial action objectives for the 1998 OU2 ESD remained the same as the remedial action objectives in the 1996 OU2 ROD.
  - The remedial activities for impoundment 17 are now being addressed under OU4.
  - The 1996 OU2 ROD called for the construction of a fence, maintenance of natural vegetation and groundwater monitoring for impoundment 18.
  - The remedial action objectives per the 1996 OU2 ROD were to:
    - Eliminate and/or control source(s) of contamination;
    - Eliminate the potential for incidental ingestion, dermal contact and inhalation of impoundments' solids; and,
    - Contribute to compliance with groundwater ARARs.

- Operable Unit 3: Impoundments 14, 20 and 26
  - A ROD was signed for impoundments 1, 2, 3, 4, 5, 14, 20 and 26 in September 1998. The remedy for impoundment 26 was completed in March 2002 per the OU3 ROD. The remedies for impoundments 14 and 20 were completed in December 2009 per a 2007 ESD.
  - The remedial activities for impoundments 1 and 2 are now being addressed under OU8, and the remedial activities for impoundments 3, 4 and 5 are now being addressed under OU4.
  - The OU3 ROD for impoundment 26 called for the excavation, solidification and placement of silts, tars and underlying soils within into the impoundment 8 facility.

- The 2007 ESD for impoundments 14 and 20 called for the excavation, solidification and placement of materials into the impoundment 8 facility.
- The remedial action objectives per the OU3 ROD were to:
  - Eliminate the migration of constituents from the impoundments to air, soil, groundwater and surface water at levels representing an unacceptable human health or environmental risk or resulting in exceedance of ARARs; and,
  - Reduce the risk associated with potential exposure from contaminated material in the impoundments.

Remedy Implementation

The following is a summary of the implemented remedies that are the subject of this FYR:

- Operable Unit 1: Impoundments 11 and 19
  - The remediation of impoundment 11 was initiated in August 1996 and concluded in June 1997 following restoration and demobilization work. The closure consisted of the excavation, solidification and placement of approximately 30,000 cubic yards of sludge and underlying soils into the impoundment 8 facility. A certification closure report was approved by NJDEP in November 1997.
  - The remediation of impoundment 19 was initiated in October 1994 and concluded in June 1995. The closure consisted of the excavation, solidification and placement of approximately 12,000 cubic yards of sludge into the impoundment 8 facility. A certification closure report was completed in August 1995 and revised in November 1995 with NJDEP approval.

- Operable Unit 2: Impoundment 18
  - The remediation of impoundments 15 and 16 was initiated in 2000 and is ongoing. To date, approximately 66,000 cubic yards of iron oxide material has been transported to an off-site recycling facility for reuse, while approximately 15,000 cubic yards of material remains. It is anticipated that the recycling of impoundment 15 and 16 material will be completed in 2015. The backfilling, grading and revegetation of these areas will be completed along with the implementation of the OU4 remedy.
  - The remediation of impoundment 18 was initiated in September 1997 and concluded in January 1998. The closure of impoundment 18 consisted of fencing around the perimeter of the impoundment, harvesting of large diameter trees, and the construction of a spillway to control potential erosion during large flood events.

- Operable Unit 3: Impoundments 14, 20 and 26
  - The remediation of impoundment 26 was initiated in November 2000 and concluded in June 2001. The closure consisted of the excavation, solidification and placement of approximately 20,600 cubic yards of silt, tar and underlying soils into the impoundment 8 facility. A certification closure report for impoundment 26 was completed in November May 2002, with NJDEP approval.
  - The remediation of impoundments 14 and 20 was initiated in September 2007 and concluded in September 2009. The closure consisted of the excavation,

solidification and placement of approximately 33,101 cubic yards of material into the impoundment 8 facility. A certification closure report was completed with NJDEP approval in December 2009.

System Operations/Operation and Maintenance

Groundwater, surface water, sediment and air monitoring are conducted regularly at the site. In accordance with the 1988 NJDEP ACO, a groundwater monitoring program was established and included site-wide bedrock groundwater pumping and monitoring of both overburden and bedrock groundwater. To control groundwater contamination related to the site, bedrock groundwater is extracted at a minimum of 650,000 gallons per day. The bedrock groundwater pumping system generally provides hydraulic capture of bedrock groundwater within the North Area of the site, while complete hydraulic containment of bedrock groundwater is not achieved in the West and South Areas. The bedrock groundwater pumping system induces vertical hydraulic gradients between the overburden and bedrock aquifers, which provides limited hydraulic containment of overburden groundwater within the North Area. The Raritan River, Cuckel's Brook and Middle Brook are local discharge zones for overburden groundwater. The site-wide groundwater monitoring program consisted of quarterly monitoring from 1988 to 2008 and semi-annual monitoring from 2009 to present. The site-wide groundwater monitoring program is consistent with the requirements of the OU1, OU2 and OU3 RODs. A site-wide CEA/WRA is currently being developed Wyeth with NJDEP to restrict potable use of groundwater until groundwater has been restored and chemical-specific ARARs have been met. Since July 1988, more than 5.9 billion gallons of bedrock groundwater have been extracted and treated.

During the preparation of the 2005 baseline ecological risk assessment, NJDEP requested that a monitoring program be developed to evaluate the impacts of affected media to Cuckel's Brook and the Raritan River. The monitoring program consisted of semi-annual surface water and sediment monitoring and included a number of site-specific contaminants. This program was discontinued in 2008 after it was concluded that contaminants of concern were not migrating from the site into Cuckel's Brook and the Raritan River, based upon the consistency between current concentrations and historical concentrations. Following the discovery of an overburden groundwater discharge from the site into the Raritan River in December 2010 and the initiation of a removal action to address the discharge of contamination in the impoundments 1 and 2 area, an updated quarterly surface water and sediment monitoring program was developed. This monitoring program began in 2012 and includes more than 20 monitoring stations located throughout the Raritan River, Cuckel's Brook, Millstone River and Middle Brook, as shown in Attachment 7. The monitoring program includes additional sampling locations for both surface water and sediment and a more expansive analyte list than previously used. In August 2013, two groundwater discharges were observed in Cuckel's Brook during standard site reconnaissance activities. In order to address these discharges, which were found to contain elevated levels of VOCs, carbon bags were installed as an interim measure. The OU4 groundwater remedy, which is currently being designed, will address these discharges as part of the long-term remedy.

An ambient air monitoring program was initiated in mid-2012 to collect quarterly ambient air sampling data to use as a baseline during the implementation of the OU4 site-wide remedy. The monitoring program includes eight locations along the perimeter of the site and another four locations in the vicinity of impoundments 1 and 2.

Progress Since Last Five-Year Review

The following is the protectiveness statement for OUs 1, 2 and 3 from the previous FYR completed in September 2009:

> *The remedies for these OUs are protective in the short-term because exposure pathways that could result in unacceptable risks are being controlled. These actions include access and engineering controls, and ongoing or completed remedial actions. Exposure to impoundments has been effectively eliminated or controlled by the installation of security fencing, berm improvements, and maintenance of a natural vegetative cover. In order to be protective in the long-term, the Comprehensive Site-wide Feasibility Study needs to be completed and the associated remedies selected by EPA implemented. In addition, institutional controls should be implemented and documented in a decision document.*

The following is the protectiveness statement for OU6 from the 2009 FYR:

> *The remedy implemented at the Hill Property and underlying groundwater contamination is protective in the long-term because there is no current exposure and all unacceptable risks are being controlled. Institutional controls, in the form of a groundwater Classification Exception Area, were put in place by the NJDEP as a result of the 1996 Record of Decision.*

The following recommendations and follow-up actions were made in the previous FYR for OUs 1, 2 and 3:

- *Impoundments 1 and 2: Reevaluate and develop alternatives that will be feasible to implement for these impoundments;*
- *Soils and Impoundments 3, 4, 5, 13, 17 and 24: Evaluate alternatives for the site soils and the remaining impoundments at the site;*
- *Institutional Controls: Include appropriate institutional control evaluation in the development of the site-wide alternatives; and,*
- *Groundwater Monitoring: Once a site-wide feasibility study (FS) is approved, current groundwater requirements will be reevaluated.*

Since the completion of the previous FYR, the following summarizes the progress that has been made with regards to the above recommendations:

- Impoundments 1 and 2: A FFS is being conducted for impoundments 1 and 2 to develop remedial alternatives. As part of the FFS, a field-scale pilot study is being conducted to evaluate technologies that could potentially be implemented on a full-scale basis for these two impoundments.
- Soils and Impoundments 3, 4, 5, 13, 17 and 24: The site-wide FS report was completed in February 2012 to develop and evaluate remedial alternatives for impoundments 3, 4, 5, 13, 17 and 24, as well as site soils and groundwater. The OU4 ROD was issued in September 2012 and called for the treatment via in-situ solidification/stabilization and/or the installation of engineered capping systems to address three highly contaminated impoundments and all site soils, as well as the collection and treatment of site-related contaminated groundwater. The remedy also called for the completion of an ecological

risk assessment to determine whether three additional impoundments would require excavation and relocation. The remedial design of the site-wide remedy is currently underway.

- Institutional Controls: The OU4 ROD issued in September 2012 requires that the following be implemented as part of the remedy: deed restrictions, restrictive covenants and the establishment of a groundwater CEA/WRA. A site-wide CEA/WRA is currently being developed by Wyeth with NJDEP to restrict potable use of groundwater until groundwater has been restored and chemical-specific ARARs have been met.
- Groundwater Monitoring: The site-wide groundwater monitoring program was reevaluated as part of the OU4 FS and is included in the OU4 ROD.

Five-Year Review Process

Administrative Components

The FYR team included Joseph Battipaglia (EPA-RPM), Sharissa Singh (EPA-Hydrologist), Julie McPherson (EPA-Human Health Risk Assessor), Michael Clemetson (EPA-Ecological Risk Assessor) and Melissa Dimas (EPA-Community Involvement Coordinator). This is a potentially responsible party (PRP)-lead site.

Community Involvement

A general notice was distributed electronically through the EPA's email listserv on January 27, 2014 to inform the community of the initiation of the site's fourth FYR. The notice indicated that the EPA was conducting a FYR to ensure that the remedies implemented at the site continue to remain protective of public health and are functioning as intended by their RODs. The general notice was also posted on the EPA's American Cyanamid website at http://www.epa.gov/region2/superfund/npl/american_cyanamid/. CRISIS, the primary community-based group and the recipient of an EPA technical assistance grant, provided notification of the initiation of the FYR in their technical report distributed electronically on April 4, 2014. On January 27, 2014, the Township of Bridgewater posted a general notice of the initiation of the FYR on their website at www.bridgewaternj.gov.

Once the FYR is completed, the results will be made available at the local site repository, which is at the Bridgewater Township Library located at 1 Vogt Drive, Bridgewater, New Jersey. In addition, efforts will be made to reach out to local public officials to inform them of the results.

Document Review

The documents, data and information which were reviewed in completing this FYR are summarized in Table 3.

Data Review

Groundwater, surface water, sediment and air monitoring are conducted regularly at the site.

<u>Groundwater</u>
A site-wide groundwater monitoring program has been implemented since 1988 with quarterly monitoring from 1988 to 2008 and semi-annual monitoring from 2009 to present. The locations

of the wells in the groundwater monitoring program are shown in Attachment 6. Groundwater concentrations in monitoring wells downgradient or near the remediated impoundments have generally shown decreasing trends since the remedies for these impoundments have been implemented. However, some of these wells have exhibited stable concentrations, or for a few contaminants, increasing concentrations more recently, reflecting the need to implement the OU4 remedy that will address additional impacts to groundwater, as well as initiate the comprehensive groundwater remedy. The most recent groundwater sampling results from monitoring wells within each OU addressed in this FYR indicate the following:

- OU1:
    - Impoundment 11: VOC concentrations in monitoring well 42-R exhibit decreasing and/or stable trends; however, concentrations remain above regulatory standards. As an example, benzene was present in this well at concentrations in excess of 150 micrograms per liter (ug/L) in the late 1990s and concentrations have stabilized to 25-30 ug/L in the past five years. Arsenic concentrations, which have ranged from 15 to 25 ug/L over the past five years, appear to be stable with seasonal fluctuations. SVOC concentrations in well 42-R exhibit increasing and/or stable trends and are above regulatory standards. For example, concentrations of aniline exhibit long-term increasing trends, but appear to have stabilized between 5-10 ug/L over the past five years. Attachments 8-10 include groundwater trend plots for VOCs, SVOCs and metals in well 42-R.
    - Impoundment 19: VOC and SVOC concentrations in monitoring well 38-R exhibit decreasing trends; however, concentrations remain above regulatory standards. Benzene concentrations in this well were present in excess of 1,000 ug/L in the late 1990's and have decreased below 500 ug/L over the past five years. No metals were detected above laboratory method detection limits and/or regulatory standards in well 38-R in the most recent groundwater monitoring event. Attachments 11-12 include groundwater trend plots for VOCs and SVOCs in well 38-R. VOC and SVOC concentrations in monitoring well TFP-94-1R appear to be increasing and/or stable and are above regulatory standards. For example, chlorobenzene concentrations appear to be increasing and were present in excess of 5,000 ug/L in the most recent monitoring event; however, benzene concentrations appear to have stabilized with a concentration of 105 ug/L during the most recent monitoring event. Arsenic concentrations have decreased in the past five years but remain above regulatory standards. Attachments 13-15 include groundwater trend plots for VOCs, SVOCs and metals in well TFP-94-1R.
- OU2:
    - Impoundments 15 and 16: VOC and SVOC concentrations within the vicinity of impoundments 15 and 16 (16-MW-2) were either not detected above the laboratory method detection limits and/or are below regulatory standards in the past five years. Metals concentrations in well 16-MW-2 exhibit decreasing and/or stable trends; however, concentrations of arsenic, iron, lead and manganese were present above regulatory standards in the most recent monitoring event. Attachment 24 includes a groundwater trend plot for metals in 16-MW-2 that exceeded regulatory standards in the past five years.
    - Impoundment 18: Metal concentrations for wells within the vicinity of impoundment 18 (MWs KKK, CCC-R, EEE-R and III) appear to be decreasing and/or stable but remained above regulatory standards in the past five years. For

example, manganese concentrations in well EEE-R exhibit decreasing trends, while arsenic concentrations appear to have stabilized in the well. VOC and SVOC concentrations in these monitoring wells are either not detected above laboratory method detection limits and/or are below regulatory standards, with the exception of well KKK where bis(2-ethylhexyl) phthalate, which was detected slightly above the regulatory standards twice in the last five years with a maximum detection at 4.2 ug/L. Attachments 16-20 include groundwater trend plots for wells KKK, CCC-R, EEE-R and III where parameters exceeded regulatory standards.

- OU3:
  - Impoundment 14: VOC, SVOC and metal concentrations within the vicinity of impoundment 14 (MW 21-R) are either not detected above the laboratory method detection limits and/or are below regulatory standards in the past five years.
  - Impoundment 20: The only VOC detected above regulatory standards in MW-17 in the past five years was benzene, which exhibits a stable trend with some seasonal fluctuations. No SVOCs were detected above laboratory method detection limits and/or regulatory standards in the past five years. The only metals detected above regulatory standards in MW-17 in the past five years were iron and manganese, which both appear to exhibit stable trends.
  - Impoundment 26: VOC, SVOC and metal concentrations within the vicinity of impoundment 26 (MW-2) appear to be decreasing and/or stable but are above regulatory standards. For example, benzene concentrations in MW-2 over the past five years appear to exhibit a decreasing trend with a concentration of 400 ug/L during the most recent monitoring event. Naphthalene concentrations in MW-2 appear to exhibit a stable trend over the past five years with a concentration of 550 ug/L during the most recent monitoring event. Attachments 21-23 include groundwater trend plots for VOCs, SVOCs and metals in MW-2.

The overburden wells that show the highest impacts and/or broadest range of impacts of major contaminants coincide with known or potential source areas that have not undergone, or currently are undergoing, remediation (i.e., MW-2, MW-9, MW-10, 21-R/19-R/O-R, TFP-94-1R, and the "PZ-12"- and "FLOD-W"-series). For example, benzene concentrations in the "PZ-12" and "FLOD-W"-series wells in the vicinity of impoundments 1 and 2 were among the highest reported since the inception of the groundwater monitoring program, with benzene concentrations up to 259,000 ug/L in the most recent monitoring event. As noted previously, the discharge of overburden groundwater to surface water in this area is prevented by the removal action collection and treatment system. For bedrock groundwater, the highest impacts of major contaminants generally is observed in the bedrock extraction wells (PW-2 and PW-3), as well as in FLOD-W2BS (near impoundments 1 and 2) and LA07-MP1 (in the vicinity of former impoundment 24). In the most recent monitoring event, benzene, chlorobenzene and 1,2,4-trichlorobenzene were detected in PW-2 and PW-3 at concentrations up to 1,640 ug/L, 1,160 ug/L and 276 ug/L, respectively, indicating continued mass removal by the bedrock pumping system.

Surface Water and Sediment

Surface water and sediment have been monitored on a quarterly basis since August 2012 with monitoring stations located throughout the Raritan River, Cuckel's Brook, Millstone River and Middle Brook (as shown in Attachment 5). Surface water contaminant concentrations in

Cuckel's Brook generally have increased in recent monitoring events, which is believed to have occurred primarily due to the re-routing of the local sewerage authority's discharge from Cuckel's Brook to the Raritan River in December 2012, resulting in less flow in the brook. For example, benzene concentrations in Cuckel's Brook were reported at concentrations above the NJDEP surface water quality criteria of 0.15 ug/L at CB-02 through CB-08 in 2013 with the maximum concentration at CB-05 in both January 2013 (18 ug/L) and May 2013 (27 ug/L), whereas benzene was only reported at one location in Cuckel's Brook (CB-06) during the previous monitoring event. Benzene concentrations in the Raritan River have significantly decreased since the completion of the removal action groundwater collection and treatment system in May 2012. While benzene concentrations in the Raritan River continue to exhibit decreasing trends, benzene was detected above the regulatory standard in the Raritan River downstream of its confluence with Cuckel's Brook in the most recent monitoring event, suggesting that the water quality in Cuckel's Brook may have a minor local influence on the Raritan River.

In the May 2013 monitoring event, elevated concentrations of lead were detected in Cuckel's Brook (CB-03) and the Raritan River (RR-05). Arsenic concentrations up to 1.4 ug/L were reported in the Millstone River, Middle Brook and the farthest upstream sample in the Raritan River in excess of the NJDEP surface water quality standard of 0.017 ug/L for arsenic, suggesting that upstream sources may be impacting the Raritan River in the vicinity of the site. Sporadic exceedances of the NJDEP ecological screening criteria have occurred for several contaminants (naphthalene, methyl mercury, lead, arsenic, etc.) in sediment from Cuckel's Brook in recent monitoring events; however, there are no clear patterns associated with these exceedences.

While concentrations of major contaminants (e.g., benzene, naphthalene) in the Raritan River and Cuckel's Brook have been reported above surface water quality standards in recent monitoring events, interim measures (e.g., carbon bag installation) have been implemented to reduce surface water impacts in advance of the implementation of the OU4 site-wide remedy. In August 2013, following the discovery of two groundwater discharges in Cuckel's Brook containing elevated levels of VOCs, carbon bags were installed at the discharge points as an interim measure. This interim measure is expected to remain in place until the OU4 site-wide remedy is implemented. Implementation of the OU4 remedy is currently underway and will include the capture and treatment of contaminated groundwater that currently is impacting surface water and sediment.

Ambient Air

The ambient air monitoring program initiated in mid-2012 collects quarterly ambient air sampling data throughout the site to use as a baseline during the implementation of the OU4 site-wide remedy. The results of the quarterly monitoring events generally have exhibited low level concentrations of constituents consistent with urban background monitoring stations measured by the NJDEP.

Site Inspection

The inspection of the site was conducted on March 26, 2014. In attendance were Joseph Battipaglia, EPA; Julie McPherson, EPA; Michael Clemetson, EPA; Russell Downey, Pfizer, Inc.; William Winkley, Pfizer, Inc.; Roman Pazdro, QMG, Inc.; and Renae Adee, QMG, Inc. The

purpose of the inspection was to assess the protectiveness of the previously implemented remedies.

The site visit began with a review of the major events and activities that have occurred over the past five years pertaining to the FYR, most notably the history of the previously remediated impoundments, the OU4 site-wide remedial decision, the Hurricane Irene-related flooding and its associated response efforts, and security and access improvements. The status of the previously remediated impoundments and the existing monitoring programs for groundwater, surface water, sediment and air were also reviewed. A visual inspection of impoundments 11, 14, 18, 19, 20 and 26 was completed to assess the protectiveness of their respective remedies. A visual inspection of impoundments 15 and 16 was completed to evaluate the status of the remedy under the OU2 ESD. The impoundment 8 facility was visually inspected and the maintenance and monitoring activities for the facility were discussed with the Pfizer representatives. A visual inspection of the bedrock groundwater extraction wells was completed and the current status of the bedrock and overburden groundwater capture was discussed. The site inspection included an examination of the Blue Lot, which is occasionally used for parking by various entities that have access agreements with the site owner. The site inspection did not identify any issues that affected the protectiveness of the previously implemented remedies, or the progress of the ongoing remediation efforts.

Interviews

During the FYR process, interviews were conducted with the site owner and with the NJDEP. The purpose of the interviews was to document any perceived problems or successes with the ongoing remediation efforts and remedies that have been implemented to date. Interviews were conducted throughout the FYR process, as documented below. Interviews are summarized below.

An informal interview was conducted with the site owner and their representatives throughout the site inspection completed on March 26, 2014. The majority of the interview with Wyeth representatives was completed with Russell Downey, Director of Environmental Engineering, Remediation & Transactions for Pfizer Global Engineering; however, portions of the interviews were also completed with the other Wyeth representatives present during the site inspection. The EPA and the site owner discussed the status of the site monitoring and maintenance programs, particularly for groundwater, surface water, sediment and ambient air. The EPA and Wyeth representatives discussed historical security and access issues and the security and fencing improvements that have been completed since the previous FYR. The impact of the Hurricane Irene-related flooding and the associated response efforts were also discussed and evaluated. The EPA and Wyeth representatives discussed the monitoring and maintenance requirements for the impoundment 8 facility, where solidified material from many of the previously remediated impoundments was placed.

An informal interview was conducted via telephone with Haiyesh Shah, the NJDEP Case Manager for the American Cyanamid site, on April 15, 2014. The purpose of the interview was to identify any concerns that NJDEP may have had with respect to the implemented remedies or the maintenance/monitoring of the solidified material in the impoundment 8 facility. Minor concern was expressed with an exceedance of the action leachate rate in cell #3 of the impoundment 8 facility identified in March 2014. An investigation of the exceedance under the

RCRA program concluded that freezing conditions caused damage to mechanical equipment and electrical lines. Temporary corrective measures have been implemented until a long-term solution is developed and implemented under RCRA. No other issues or concerns were identified during the telephone interview.

Institutional Controls Verification

The September 2012 OU4 ROD requires that the following institutional controls be implemented as part of the remedy: deed restrictions, restrictive covenants and the establishment of a groundwater CEA/WRA. A site-wide CEA/WRA is currently being developed with the NJDEP to restrict the potable use of groundwater until groundwater has been restored and chemical-specific ARARs have been met. Deed restrictions and restrictive covenants will be implemented following the design and construction of the selected remedy.

Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedies selected and implemented in the OU1, OU2 and OU3 RODs, as well as the OU2 and OU3 ESDs, are functioning as intended. The objectives of the remedies selected for impoundments 11, 14, 15, 16, 19, 20 and 26 were to eliminate/control the sources of contamination and migration of contaminants, reduce the risk of potential exposures and contribute to compliance with ARARs for groundwater. The remedies for impoundments 11, 14, 19, 20 and 26 included excavation, solidification and placement in the impoundment 8 facility, while the remedy for impoundments 15 and 16 required the excavation and off-site recycling of iron oxide material. The remediation of impoundments 15 and 16 is ongoing and is expected achieve the remedial action objectives for these impoundments. The OU2 ROD for impoundment 18 consisted of fencing, berm improvements and groundwater monitoring to eliminate/control the sources of contamination, eliminate potential exposures and contribute to compliance with ARARs for groundwater. The implemented OU1, OU2 and OU3 remedies have achieved their respective RAOs and the completed activities are providing source control which is contributing to the compliance with groundwater ARARs under the OU4 ROD. The implemented remedies have eliminated the exposure of humans to contaminated impoundment material and have eliminated these sources of contamination. While compliance with groundwater ARARs has not yet been achieved, overall groundwater trends for most site-related contaminants in areas downgradient of the remediated impoundments indicate decreasing concentrations. Attainment of ARARs is expected to occur following the completion of the OU4 remedy, which will address groundwater impacts from other on-site sources.

Monitoring of the groundwater over the past 25 years has generally demonstrated either a decrease or stability in groundwater concentrations and indicates that the groundwater conditions at the site are in a state of semi-equilibrium. Contaminant concentrations exceed regulatory standards in both the overburden and bedrock aquifers; however, based on the completed status of the remedies selected for OU1, OU2 and OU3, it appears that the remedial actions selected for each OU continue to operate and function as designed. Once the OU4 remedy is implemented, the collection and treatment of site-related contaminated groundwater is expected to prevent the discharge of contaminated groundwater to nearby surface water bodies and restore groundwater quality in the overburden and bedrock aquifers. In the interim, the groundwater removal system

has prevented the discharge of overburden groundwater to surface water in the impoundments 1 and 2 area. Interim measures have also been implemented to address contaminated groundwater discharges into Cuckel's Brook. In addition, the site-wide CEA/WRA, will serve to restrict potable use of groundwater until it has been restored. The surrounding communities are serviced by a public water supply, with the exception of residents located south of the Raritan River who utilize private wells that are not hydraulically connected to the contaminated groundwater at the site.

An updated surface water and sediment monitoring program was developed in July 2012 to evaluate the potential migration of contaminated groundwater into adjacent surface water bodies. While concentrations of benzene in the Raritan River have decreased significantly since the installation of the removal action groundwater collection and treatment system, contaminant concentrations in both Cuckel's Brook and the Raritan River sediment remain above ecological screening values and contaminant concentrations in surface water remain above surface water quality standards. Design of the OU4 remedy is currently underway and will include the capture and treatment of contaminated groundwater that currently is impacting surface water and sediment. In the interim, the removal action groundwater collection and treatment system has prevented benzene discharges to the Raritan River and Cuckel's Brook, while the installation of carbon bags at two locations in Cuckel's Brook have mitigated discharges of VOCs to the brook.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions, toxicity data, cleanup levels and remedial action objectives that were identified in the ROD for OUs 1, 2 and 3 may have changed as science or policies change. However, the remedies for the impoundments included in these OUs consist of excavation and solidification for impoundments 11, 14, 19, 20 and 26, and a cover of natural vegetation and a fence to restrict access for impoundment 18. RAOs and cleanup levels remain protective, as there are currently no complete exposure pathways. The exposure assumptions, toxicity data, cleanup levels and remedial action objectives identified for OU4 and memorialized in the 2012 ROD remain valid and are expected to be protective upon completion of the remedy. While a remedy was selected for impoundments 1 and 2 under OU3 in September 1998, these impoundments are currently being reevaluated under a recently created OU8 as part of a FFS. A vapor intrusion assessment was completed in 2008 and concluded that there is no risk of vapor intrusion via the groundwater pathway for residential and commercial areas surrounding the site.

Although the ecological risk assessment screening and toxicity values used to support the various RODs may not necessarily reflect the current values, the excavation and solidification eliminates any potential risk from surface soil contaminants to terrestrial receptors. A baseline ecological risk assessment conducted in 2005 concluded that the potential risks to ecological receptors from exposure to Raritan River sediment and/or surface water were low. Groundwater discharge mass loading calculations completed as part of this assessment suggested that exposure to overburden groundwater discharge of site contaminants is unlikely to affect the health and diversity of aquatic biota in the Raritan River. An ecological risk assessment will also be conducted for impoundments 13, 17 and 24 as part of the OU4 remedy. While recent surface water and sediment monitoring data do not suggest significant impacts to the environment, the continued monitoring of surface water and sediment will be performed to assess impacts to the river and the

brook. The migration of any contaminated groundwater to surface water will be addressed by the implementation of the groundwater remedy for OU4.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

Technical Assessment Summary

Based upon the results of this FYR, it has been determined that the remedies implemented as part of the OU1 ROD, OU2 ROD, OU3 ROD and OU3 ESD are functioning as intended and continue to progress towards the achievement of their respective RAOs. The exposure assumptions, toxicity data, cleanup levels and RAOs identified in the feasibility studies for OUs 1, 2 and 3 remain valid, as there have been no changes in the ARARs and no new standards issued since the completion of a historical data review in 2012.

While contaminated impoundments and soils remain present at the site, the site is fenced and patrolled by security to restrict access and prevent potential exposures to contaminated materials. The surrounding communities receive potable water from sources that are not hydraulically connected to contaminated site groundwater. While compliance with groundwater ARARs in the vicinity of the remediated impoundments and surface water quality standards in the Raritan River and Cuckel's Brook have not yet been achieved, overall conditions are improving, and the implementation of the OU4 remedy is expected to prevent the discharge of contaminated groundwater to nearby surface water bodies and restore groundwater quality in the overburden and bedrock aquifers.

Issues, Recommendations and Follow-Up Actions

No issues, recommendations or follow-up actions were identified during the completion of this FYR.

Protectiveness Statement

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment.		

Protectiveness Statement(s)		
Operable Unit: OU2	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at OU2 will be protective of human health and the environment.		

Protectiveness Statement(s)		
Operable Unit: OU3	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at OU3 is protective of human health and the environment.		

Next Review

The next FYR report for the American Cyanamid Superfund site is required five years from the completion date of this review.

Tables

Table 1: Chronology of Site Events

Event	Date(s)
Calco Chemical Company began manufacturing intermediate chemicals and dyes	1915
Calco facility purchased by American Cyanamid	1929
American Cyanamid notified EPA of release of hazardous substances	1981
Final NPL listing	Sep 1983
American Cyanamid enters ACO with NJDEP to address 16 impoundments, contaminated soils and groundwater	May 1988
Soils Remedial Investigation completed	May 1992
OU1 ROD executed for impoundments 11, 13, 19 & 24	Sep 1993
NJDEP executes ACO Amendment to include additional groundwater monitoring requirements	May 1994
American Cyanamid purchased by American Home Products Corporation	Dec 1994
Remediation of impoundment 19 completed per OU1 ROD	Nov 1995
OU2 ROD executed for impoundments 15, 16, 17 & 18	Jul 1996
OU6 ROD executed for Hill Property	Jul 1996
Remediation of impoundment 11 completed per OU1 ROD	Nov 1997
OU3 ROD executed for impoundments 1, 2, 3, 4, 5, 14, 20 & 26	Sep 1998
NJDEP issued ESD for part of OU2 (impoundments 15 & 16)	Nov 1998
Remediation of impoundment 18 completed per OU2 ROD	April 1998
OU6 Hill Property deleted from NPL	Dec 1998
All manufacturing at the site ceased	June 1999
First FYR	Sep 1999
American Home Products Corporation changes its name to Wyeth Holdings Corporation	Mar 2002
Most remedial activities at the site are suspended pending the reevaluation of previously selected remedies. Initiation of a Comprehensive Site-Wide FS	Spring 2004
Second FYR	Sep 2004
Baseline Ecological Risk Assessment	Jan 2005
Human Health Risk Assessment	Dec 2006

Remedial Investigation for Groundwater	Apr 2007
NJDEP issued ESD for part of OU3 (impoundments 14 & 20)	May 2007
EPA and NJDEP agree to separate impoundments 1 & 2 from the OU4 Site-wide remedy and address the two impoundments through a FFS under a newly created OU8	2009
Third FYR	Sep 2009
Pfizer, Inc. purchases Wyeth Holdings Corporation	Oct 2009
Remediation of impoundments 14 & 20 completed per 2007 OU3 ESD	Aug 2010
EPA Removal Action initiated following discovery of groundwater discharges into the Raritan River containing elevated levels of benzene	Dec 2010
Removal Action AOC executed between EPA and PRP to address groundwater discharges	July 2011
Comprehensive Site-wide FS completed	Feb 2012
EPA issues proposed plan for the OU4 Site-wide remedy	Feb 2012
Removal Action groundwater capture system completed and begins operating	May 2012
OU4 ROD executed for impoundments 3, 4, 5, 13, 17, 24, and site groundwater and soils	Sep 2012
AOC executed between EPA and PRP for the OU4 RD and OU8 FFS	Mar 2013
OU4 Remedial Design Start	Mar 2013
Execution of Amendments to OU4 RD/OU8 FFS AOC and Removal Action AOC	Aug 2013
Initiation of impoundments 1 & 2 pilot study	Jan 2014
Quarterly & Semi-Annual Groundwater Monitoring	2006-2014
Quarterly & Semi-Annual Surface Water & Sediment Monitoring	2005-2014
Quarterly Ambient Air Monitoring	2012-2014

Table 2A: Summary of CERCLA Impoundments subject to this Five-Year Review					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** ***Please note that this list may not be exhaustive**
Impoundment 11	2.6	30,000 cubic yards (CY)	Disposal of sludges, furnace ash, and klinkers	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 1993 OU1 ROD.	acetone, ethylbenzene, chlorobenzene, methylene chloride, toluene, xylenes, acenaphthalene, benzo(a)anthracene, fluorene, naphthalene, 2-methylnaphthalene, chromium, copper, lead, mercury, nickel, zinc
Impoundment 14	0.9	33,101 CY	Storage of organic tars	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 2007 ESD.	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methylnaphthalene, 1,2-dichlorobenzene, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc
Impoundment 20	1.0		Settling basin for on-site treatment of dye and pigment operation wastewater	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 2007 ESD.	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, cyanide, mercury, nickel, selenium, silver, vanadium, zinc
Impoundment 18	15.4	217,000 CY	Storage of primary sludge from settlement of lime-neutralized effluent from on-site wastewater treatment	Remediation completed; Closed with No Further Action per remedy selected in 1996 OU2 ROD	acetone, chlorobenzene, 2-methylnaphthalene, naphthalene, 4-chloroaniline, acenaphthalene, benzo(a)anthracene, phenanthrene, bis(2-ethyl hexyl)phthalate, fluorene, arsenic, chromium, copper, lead, zinc
Impoundment 19	2.3	12,000 CY	Storage of lime for use in wastewater treatment	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 1993 OU1 ROD.	benzene, ethylbenzene, chlorobenzene, methylene chloride, toluene, xylenes, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, 1,2,4- trichlorobenzene, arsenic, chromium, copper, iron, lead, magnesium, nickel
Impoundment 26	2.3	20,600 CY	Storage of organic tars and, later, construction material, general plant debris and fill material	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 1998 OU3 ROD.	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc

Table 2B: Summary of CERCLA Impoundments to be addressed under OU4 Remedy

Impoundment	Area (acres)	Volume Remediated	Description/Use	Current Status	COCs *Please note that this list may not be exhaustive
Impoundment 3	1.3	Not Yet Remediated (Approx. 30,200 CY Remaining)	Storage of organic tars from the distillation of coal oil and consolidation of construction material, general plant debris and fill material	Being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, naphthalene, n-nitrosodiphenylamine, 2-methylnaphthalene, 1,2-dichlorobenzene, nitrobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver, vanadium, pH of 4-8
Impoundment 4	1	18,700 CY Remediated (Approx. 4,300 CY remaining in Impoundment 4 and 110,330 CY remaining in Impoundment 5)	Storage of sludges and organic tars from various production processes	Approximately 3.8 MG of pumpable sludge removed and recycled; remaining material not yet remediated, being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, 1,2- dichlorobenzene, naphthalene, pH of 1-3
Impoundment 5 (wet)	5.2		Storage of sludges and organic tars from various production processes	Approximately 3.8 MG of pumpable sludge removed and recycled; remaining material not yet remediated, being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver, vanadium, zinc, pH of 3.7-9.0
Impoundment 5 (dry)	2.5	17,500 CY Remediated	Storage of sludges and, later, mixed fill materials (layered over the sludge)	Approximately 33% excavated, solidified and placed in Impound 8; remaining material not yet remediated, being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver, vanadium, zinc, pH of 3.7-9.0
Impoundment 13	3.9	Not Applicable (N/A) (Approx. 55,000 CY Remaining)	Storage of lime and disposal of wastewater treatment sludges	Being addressed as part of OU4 Site-wide remedy	benzene, toluene, ethylbenzene, xylene, chlorobenzene, acenaphthalene, fluorine, 2-methylnapthalene, naphthalene, 1,2,4-trichlorobenzene, arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, pH of 6.5-9.0
Impoundment 17	6.2	N/A (Approx. 69,300 CY Remaining)	Storage of primary sludge from settlement of lime-neutralized effluent from on-site wastewater treatment	Being addressed as part of OU4 Site-wide remedy	acetone, toluene, ethylbenzene, and xylene, chlorobenzene, 1,2,4- trichlorobenzene, benzo(a)anthracene, bis(2-ethyl hexyl)phthalate, naphthalene, n-nitrosodiphenylamine, chromium, copper, lead, nickel, zinc. pH of 7-8
Impoundment 24	3.2	N/A (Approx. 65,000 CY Remaining)	Storage of lime for primary treatment and, later, storage for sludges and general plant wastes	Being addressed as part of OU4 Site-wide remedy	acetone, chlorobenzene, methylene chloride, toluene, xylene, dibenzofuran, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, arsenic, chromium, copper, iron, lead, nickel, pH of 7-12.7

Table 2C: Summary of CERCLA Impoundments to be addressed under OU8 FFS					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** ***Please note that this list may not be exhaustive**
Impoundment 1	2.1	3.0 MG (Approx. 26,900 CY Remaining)	Storage of sludges from the coal oil ("light oil") refining process	Approx. 3.0 million gallons (MG) of light oil sludge (LOS) layer removed and recycled; solids not yet remediated, to be addressed as part of the OU8 FFS	benzene, toluene, xylene, 1,2-dichlorobenzene, naphthalene, nitrobenzene, arsenic, barium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc. pH less than 2
Impoundment 2	2.3	3.1 MG (Approx. 26,700 CY Remaining)	Storage of sludges from the coal oil ("light oil") refining process	Approx. 3.1 MG of light oil sludge (LOS) layer removed and recycled; solids not yet remediated, to be addressed as part of the OU8 FFS	benzene, toluene, 1,2 –dichlorobenzene, naphthalene, chromium, copper, lead, mercury, nickel, selenium, zinc. pH less than 2

Table 2D: Summary of CERCLA Impoundments Currently Undergoing Remediation					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** ***Please note that this list may not be exhaustive**
Impoundment 15	2.8	66,000 CY remediated to date (Approx. 15,000 CY Remaining)	Storage of iron oxide material resulting from iron use in aniline production	Remediation in progress - iron oxide materials being excavated and sent off-site for recycling	iron oxide, acetone, benzene, methylene chloride, xylenes, 4-chloroaniline, n-nitrosodiphenylamine, anthracene, naphthalene, phenanthrene, arsenic, copper, lead, zinc, PCBs
Impoundment 16	3		Storage of iron oxide material resulting from iron use in aniline production	Remediation in progress - iron oxide materials being excavated and sent off-site for recycling	iron oxide, acetone, benzene, methylene chloride, xylenes, 4-chloroaniline, n-nitrosodiphenylamine, anthracene, naphthalene, phenanthrene, pyrene, arsenic, copper, lead, zinc, PCBs

Table 2E: Summary of CERCLA Impoundments with No Remediation Required					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Impoundment 9	-	No Remediation Required	Never Used	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 10	-	No Remediation Required	Never Used	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 12	-	No Remediation Required	Never Used	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 21	-	No Remediation Required	Contains emergency fire water	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 22	-	No Remediation Required	Previously contained emergency fire water	No remediation required based on 1990 Impoundment Characterization Program; Impoundment was backfilled with clean fill	-
Impoundment 23	-	No Remediation Required	Previously used to collect river sediment from the facility's former river water treatment plant	No remediation required based on 1990 Impoundment Characterization Program	-

Table 2F: Summary of Impoundments Addressed under RCRA

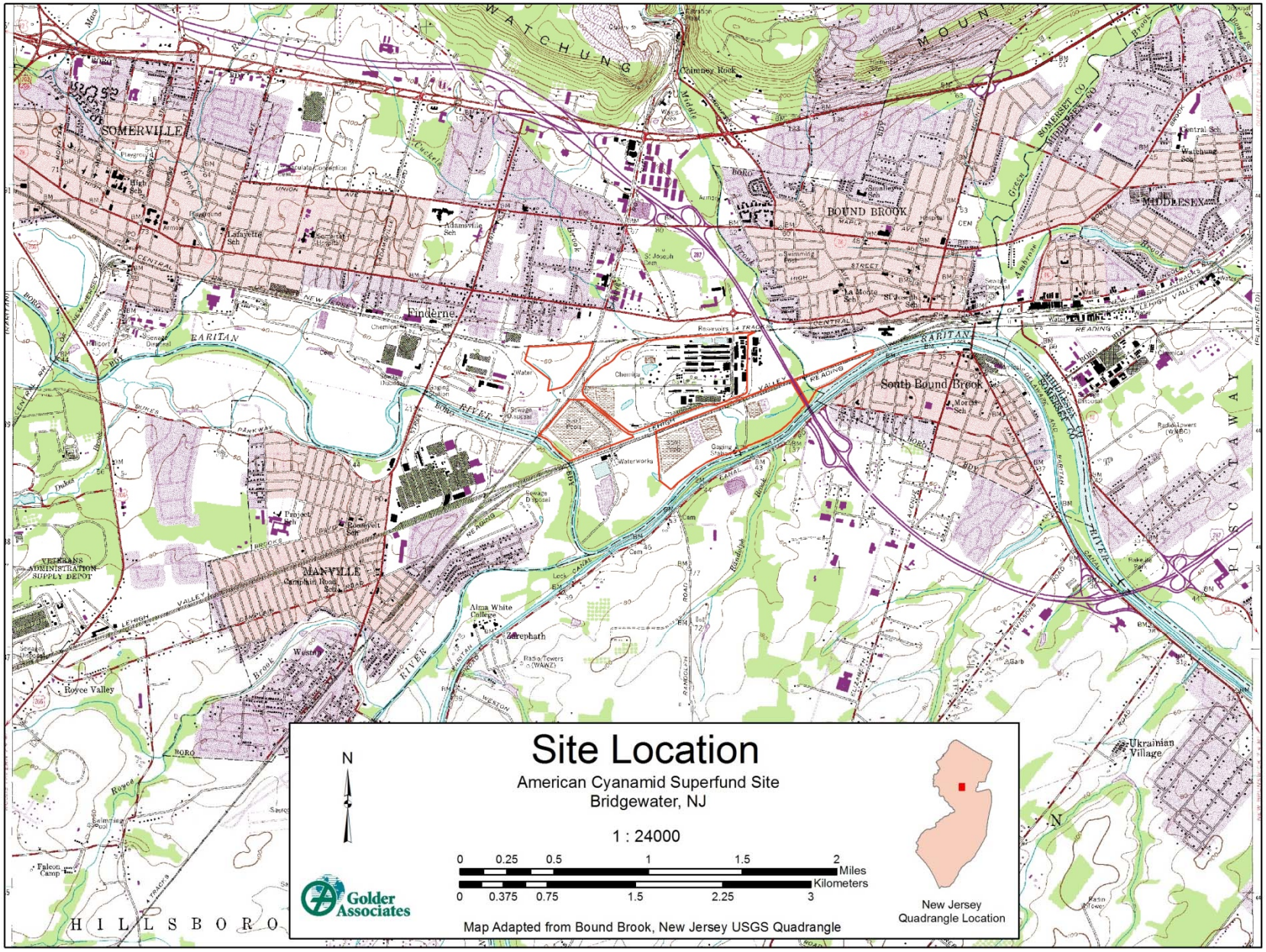
Impoundment	Area (acres)	Volume Remediated	Description/Use	Current Status	COCs *Please note that this list may not be exhaustive
Lagoon 6	5.5	113,500 CY	RCRA impoundment; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA. Waste in Lagoon 6 has been removed, solidified and placed in the Impoundment 8 Facility.	NA
Lagoon 7	20.9	241,400 CY	RCRA impoundment; in the process of being closed in accordance with approved RCRA closure plan	Remediation partially completed; Approx. 95% of waste in Lagoon 7 has been removed, solidified and placed in the Impoundment 8 Facility.	NA
Lagoon 8	11.5	60.8 MG	RCRA impoundment; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA. Waste in Impoundment 8 [Old] has been removed, solidified and placed in the Impoundment 8 Facility.	NA for Lagoon 8 (Old); Impoundment 8 Facility COCs: chloroform, tetrachloroethene, trichloroethene
Lagoon 9A	4.1	52,900 CY	RCRA impoundments; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA; Impoundment 9A (plant effluent sludge) was closed in-place by installing a double synthetic liner capping system	chloroform, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, iron, manganese
Impoundment 25	0.2	1,600 CY	RCRA impoundments; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA Effluent Collection Basin for Plant Effluent (sludge removed and closed in 1988 with NJDEP approval)	NA

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Submittal Date**
OU1 ROD, EPA Region 2	Sep 1993
OU2 ROD, EPA Region 2	Jul 1996
OU2 ESD, NJDEP	Nov 1998
OU3 ROD, EPA Region 2	Sep 1998
OU3 ESD, NJDEP	May 2007
OU6 ROD, EPA Region 2	Jul 1996
NJDEP ACO, NJDEP	May 1988
NJDEP ACO (Amended), NJDEP	May 1994
Removal Action AOC, EPA Region 2	Jul 2011
OU4 RD/OU8 FFS AOC, EPA Region 2	Mar 2013
Certification Report for Impoundment 19 Closure, O'Brien & Gere (OBG)	Nov 1995
Certification Report for Impoundment 11 Closure, OBG	Nov 1997
Certification Report for Impoundment 18 Closure, OBG	Apr 1998
Certification Report for Impoundment 26 Closure, OBG	May 2002
Certification Report for Impoundments 14 and 20 Closure, OBG	Dec 2009
First FYR Report, EPA Region 2	Sep 1999
Second FYR Report, EPA Region 2	Sep 2004
Third FYR Report, EPA Region 2	Sep 2009
Impoundment Characterization Program Report, Blasland, Bouck & Lee (BBL)	Aug 1990
Natural Resource Assessment, BBL	Apr 1994
Soils Remedial Investigation Report, BBL	May 1992
Remedial Investigation Report for Groundwater, OBG	Feb 2006
Supplemental Remedial Investigation Report for Groundwater, OBG	Apr 2007

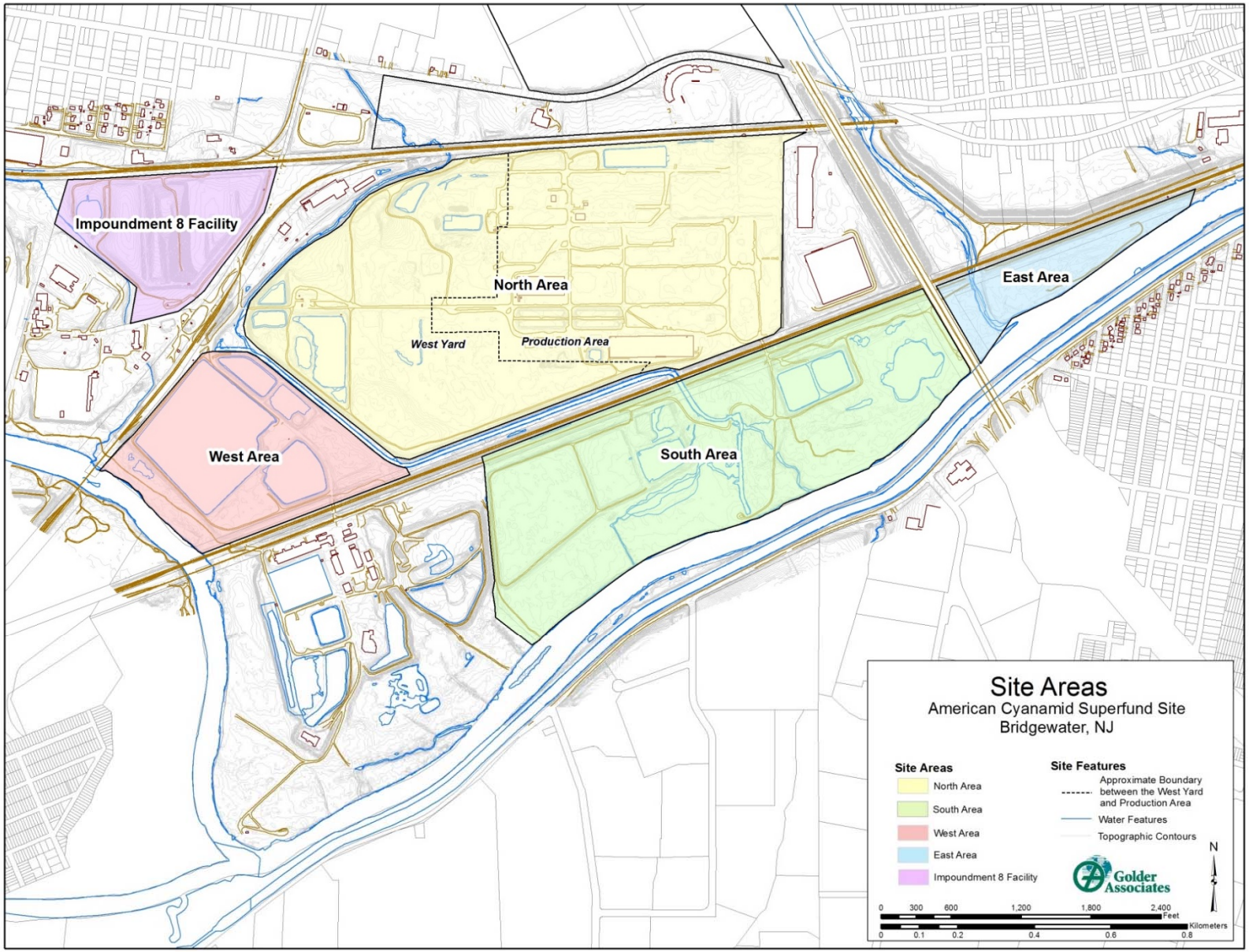
Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Baseline Endangerment Assessment, BBL	Mar 1992
Baseline Ecological Risk Assessment, OBG	Jan 2005
Human Health Risk Assessment, OBG	Dec 2006
Streamlined Human Health Risk Assessment, EPA Region 2	Feb 2010
Comprehensive Site-wide Feasibility Study, OBG	Feb 2012
OU4 ROD, EPA Region 2	Sep 2012
Quarterly & Semi-Annual Groundwater Monitoring Reports, OBG & Golder Associates	2006-2014
Quarterly & Semi-Annual Surface Water & Sediment Monitoring Reports, OBG & Golder Associates	2005-2014
Quarterly Ambient Air Monitoring Reports, CH2M Hill	2012-2014

Attachments

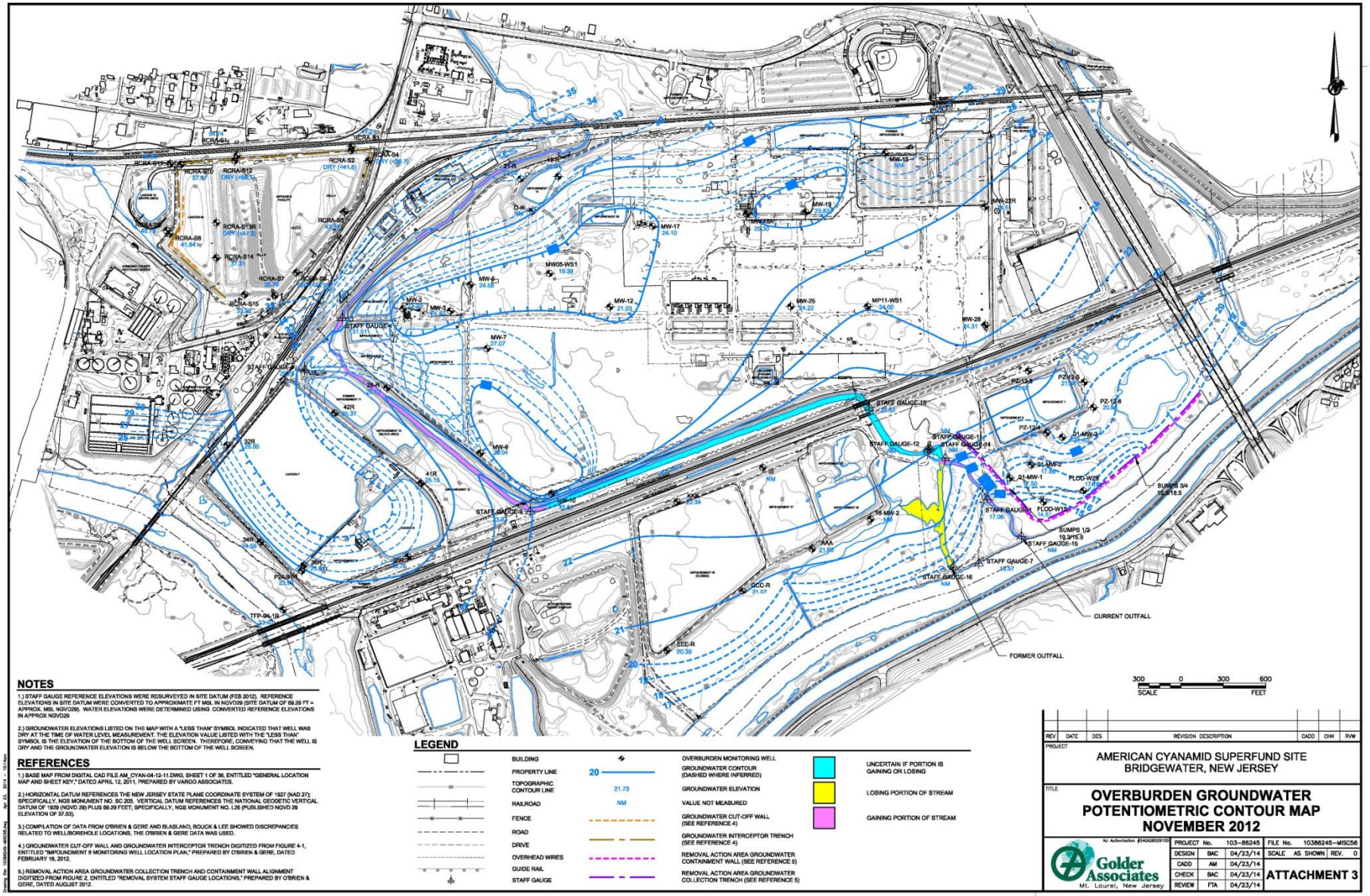
Attachment 1: Site Location



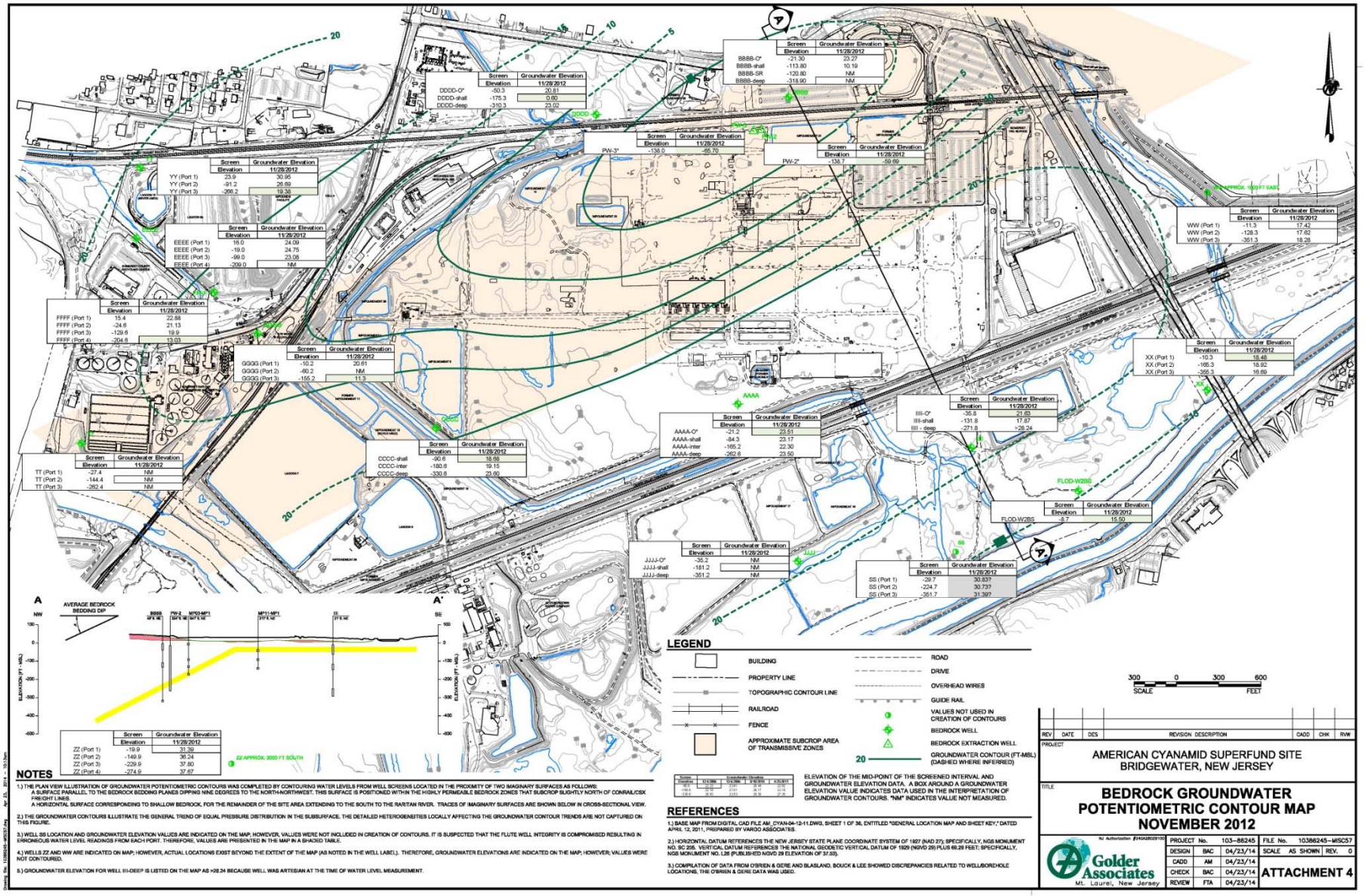
Attachment 2: Site Areas



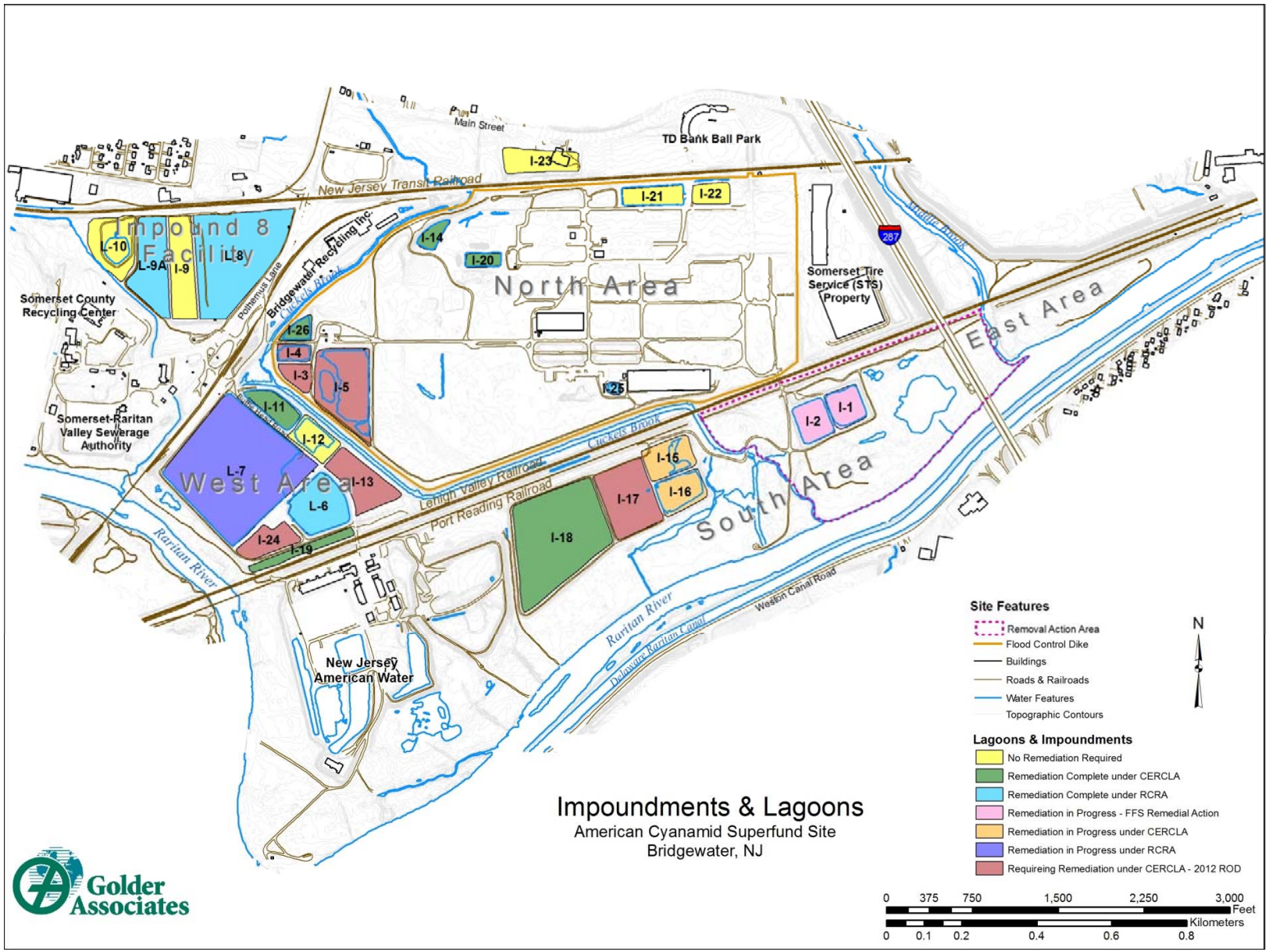
Attachment 3: Overburden Groundwater Contour Map



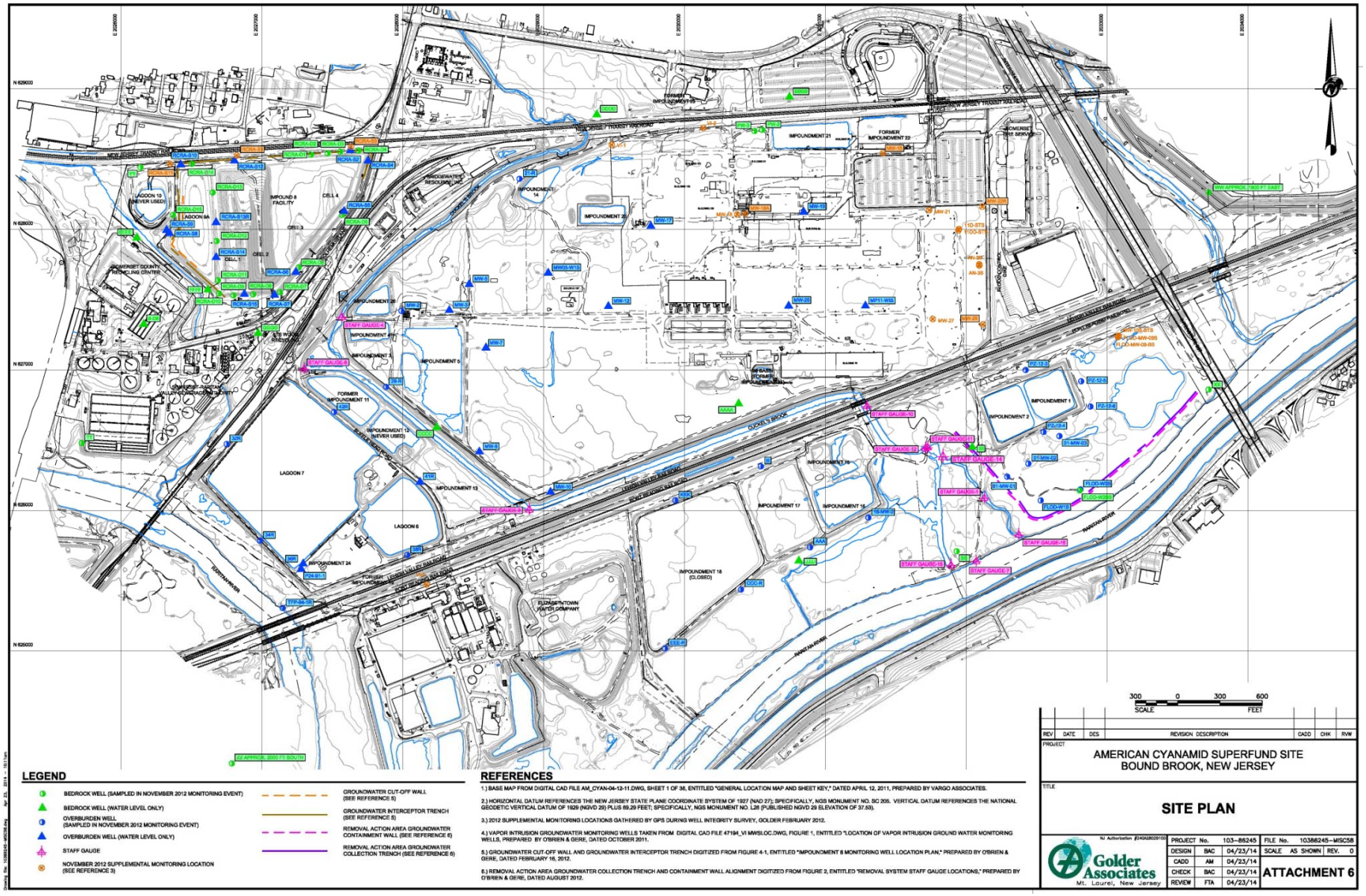
Attachment 4: Bedrock Groundwater Contour Map



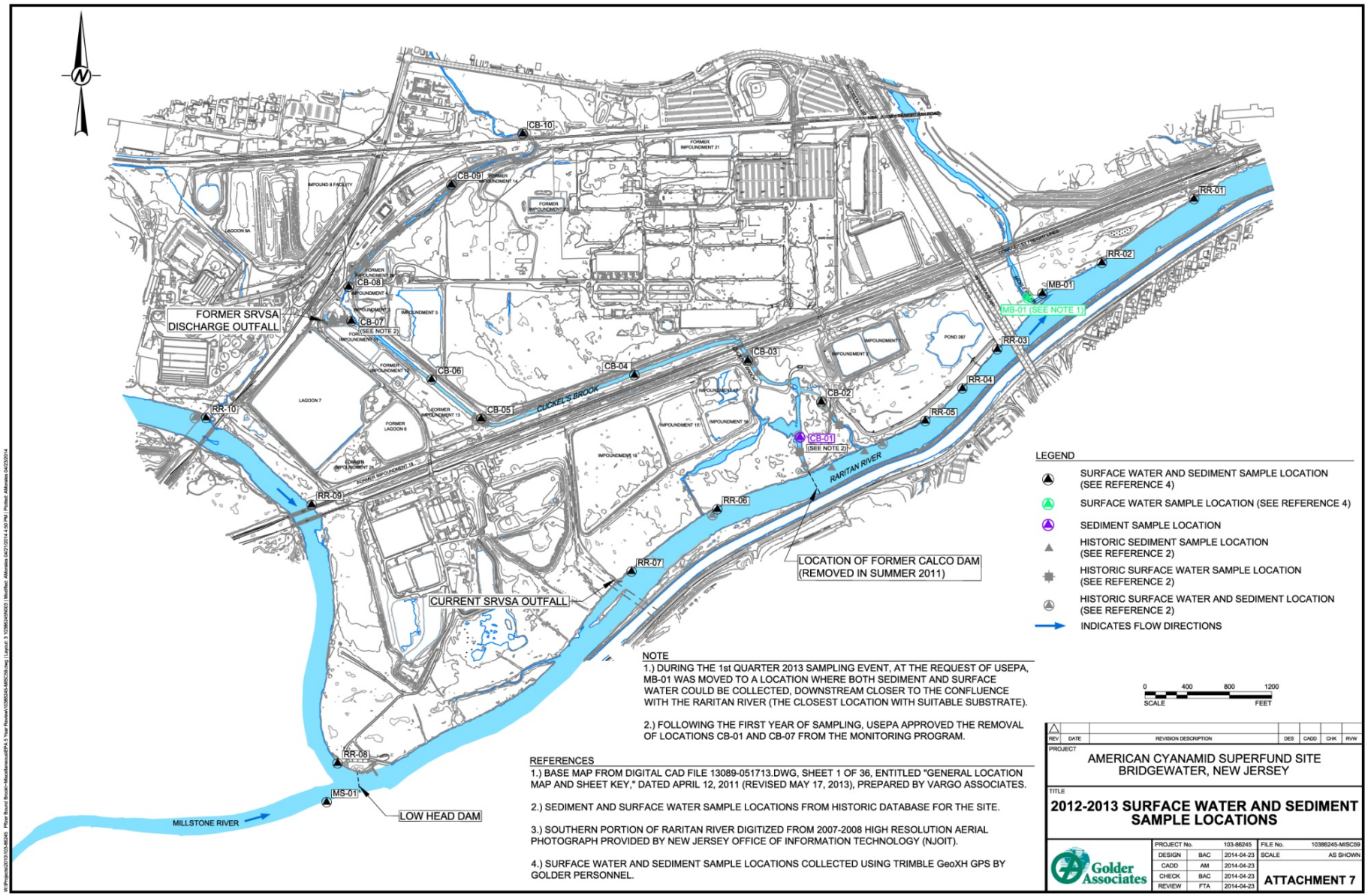
Attachment 5: Impoundment and Lagoon Locations



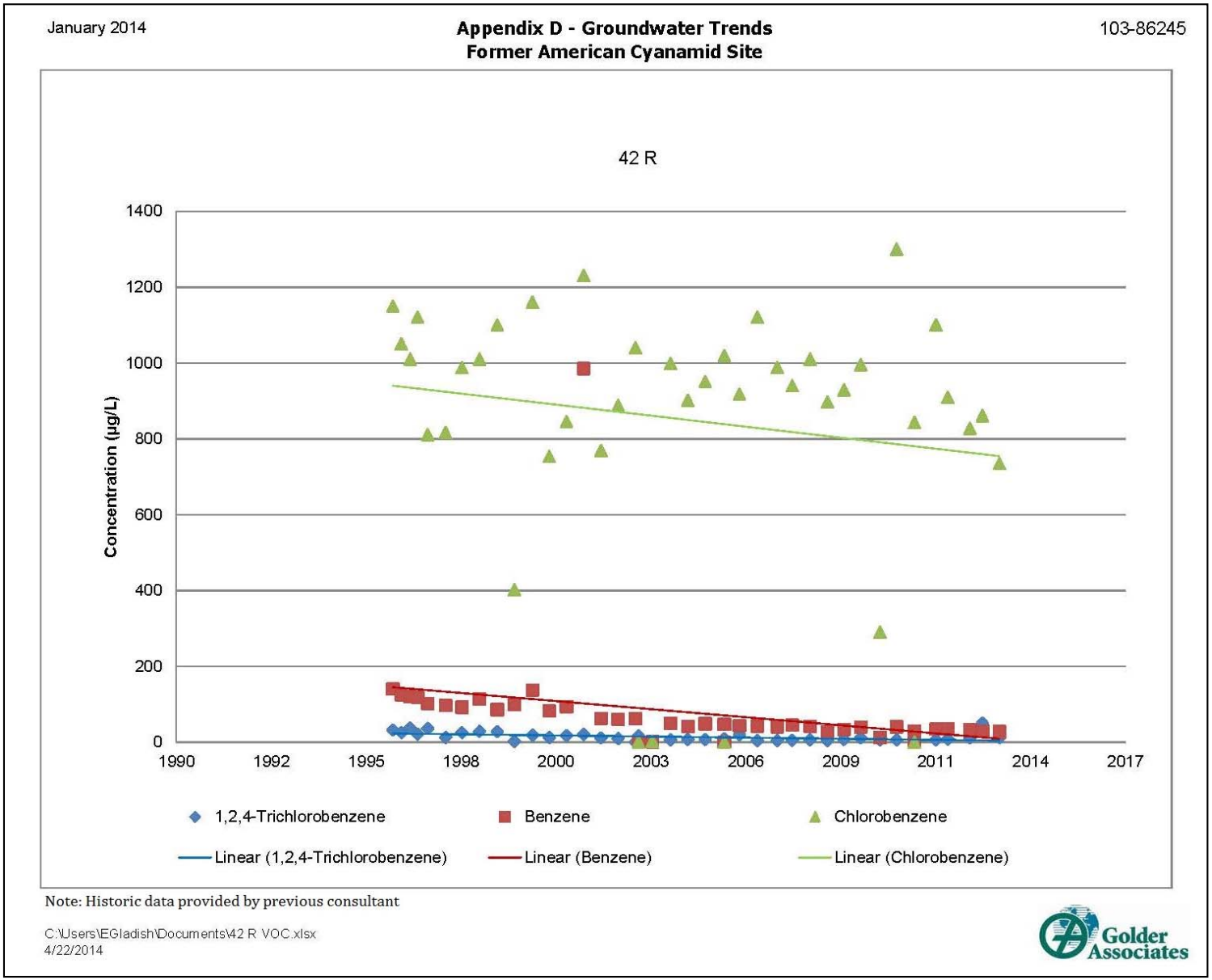
Attachment 6: Groundwater Monitoring Well Locations



Attachment 7: Surface Water and Sediment Monitoring Locations



Attachment 8: Trend Plot for VOCs in 42-R



Attachment 9: Trend Plot for SVOCs in 42-R

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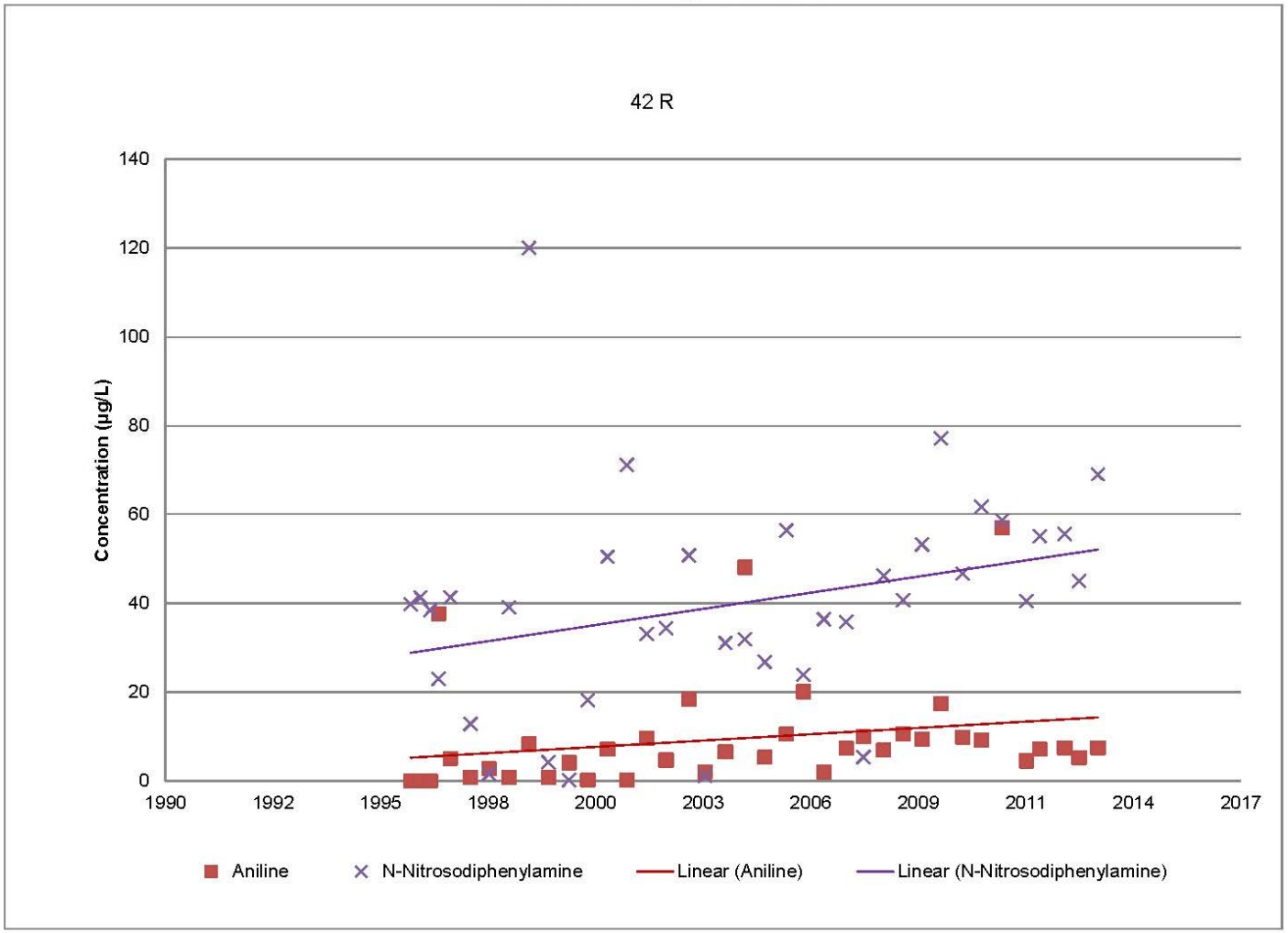
Appendix D - Groundwater Trends
Former American Cyanamid Site

103-86245



Note: Historic data provided by previous consultant

C:\Users\EGladish\Documents\42 R SVOC.xlsx
4/22/2014

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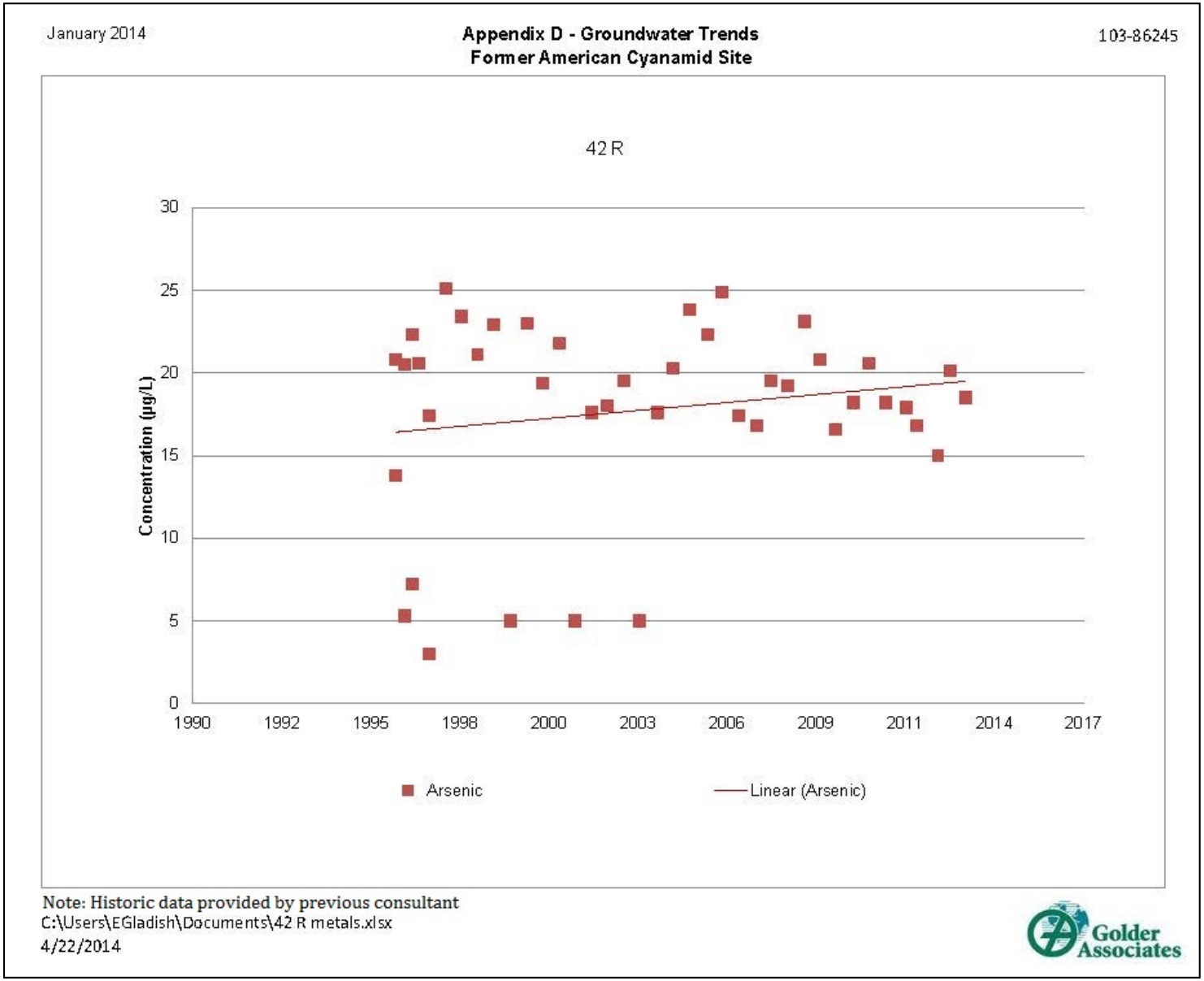
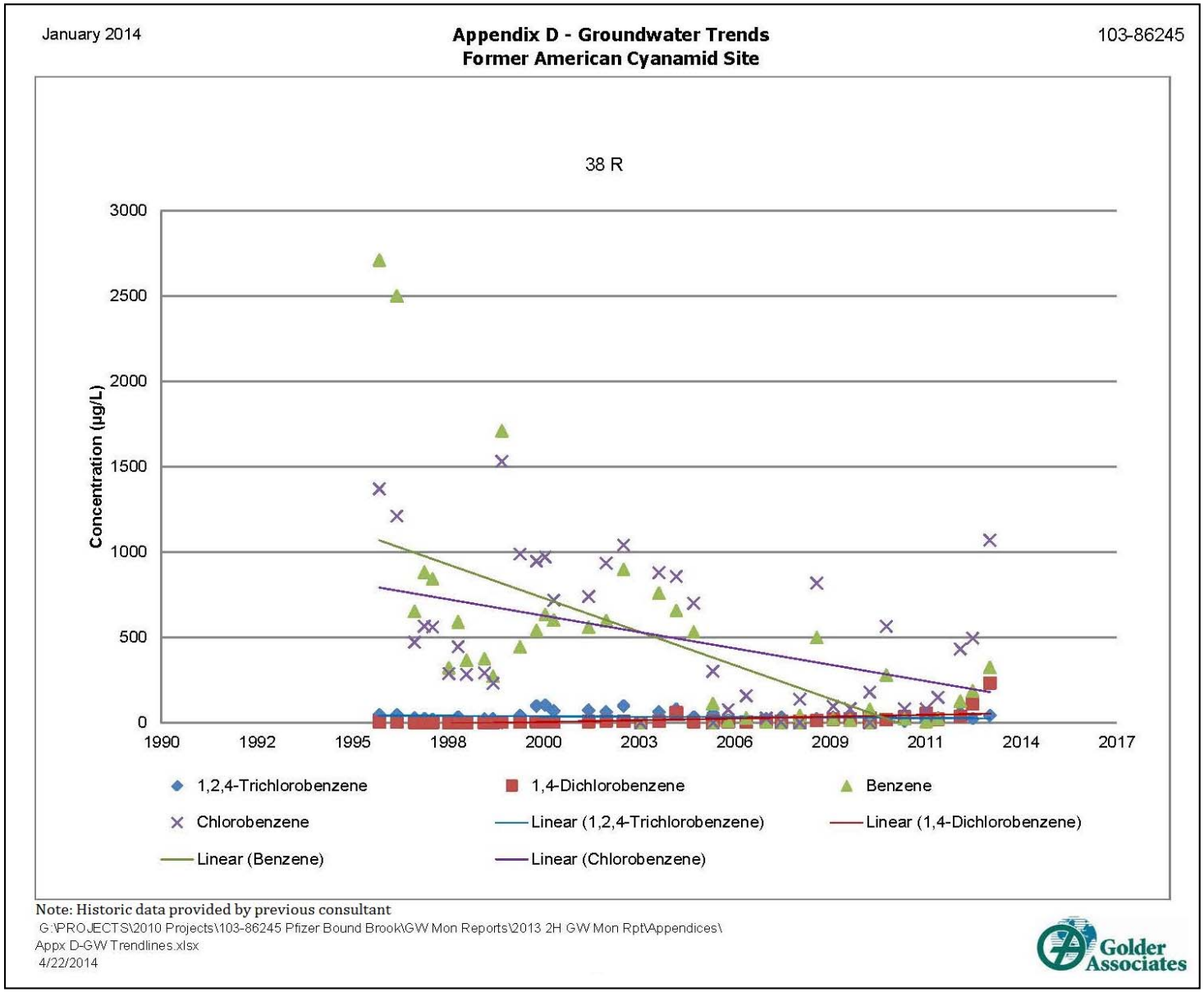
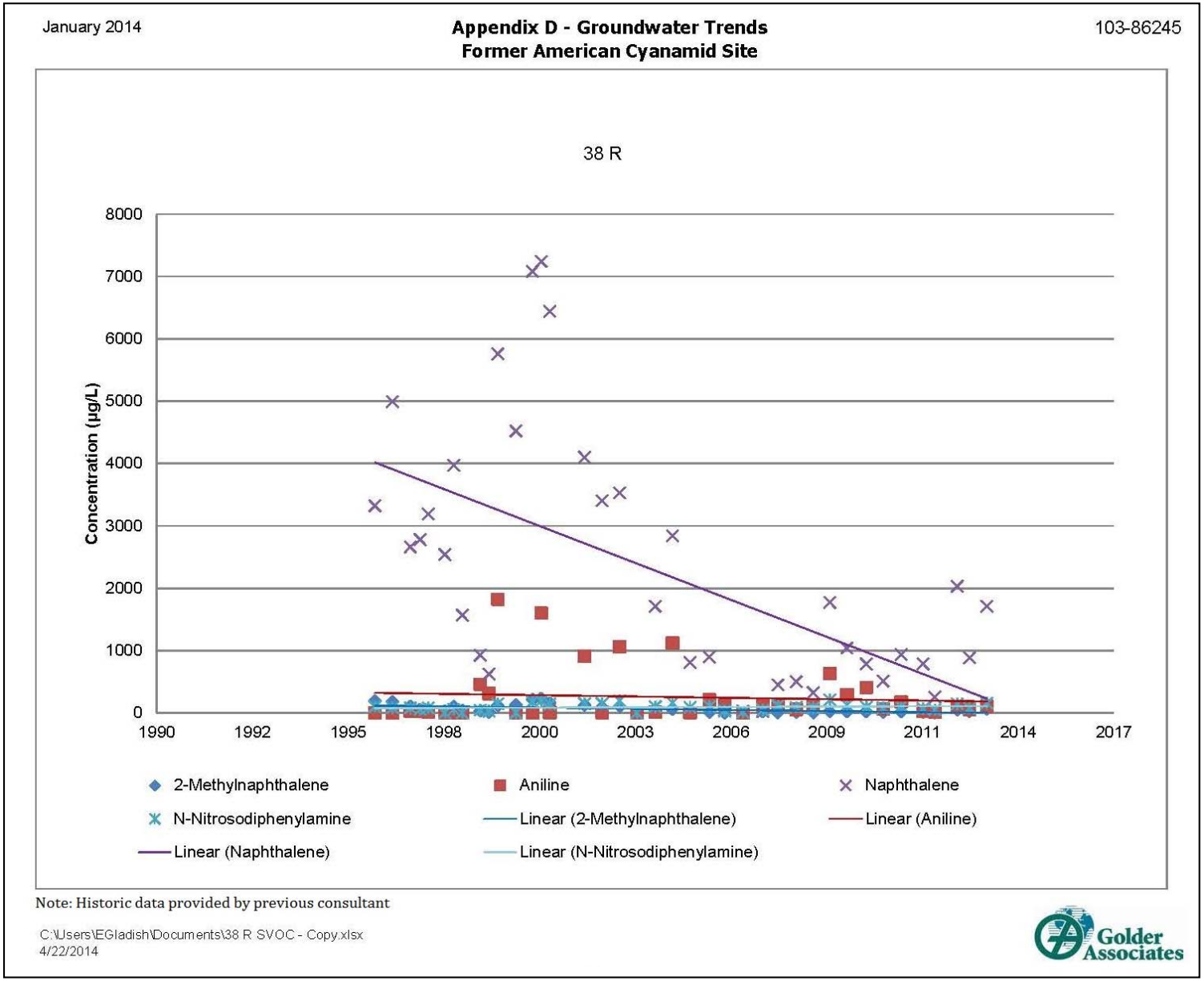
Attachment 10: Trend Plot for Metals in 42-R



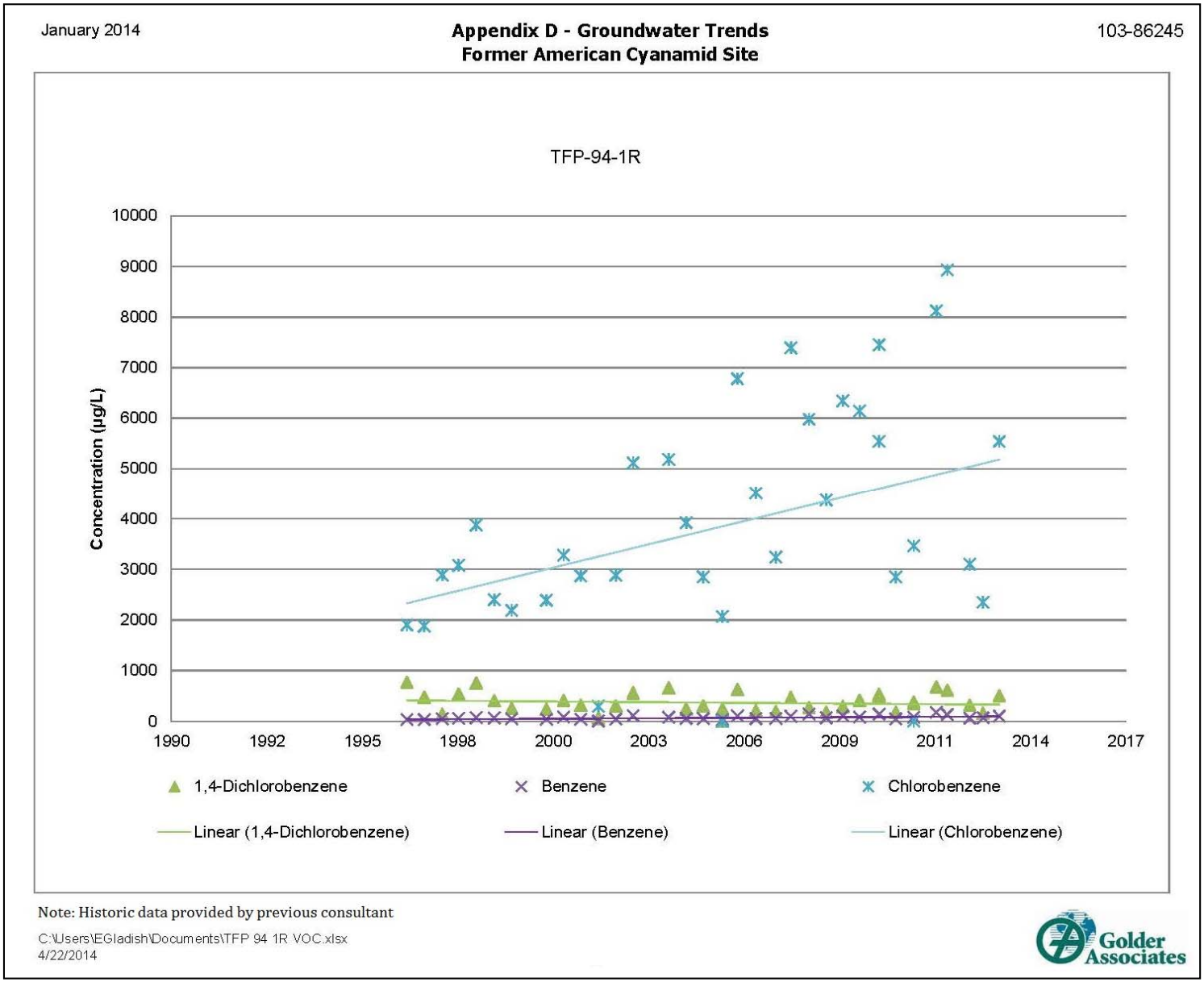
Attachment 11: Trend Plot for VOCs in 38-R



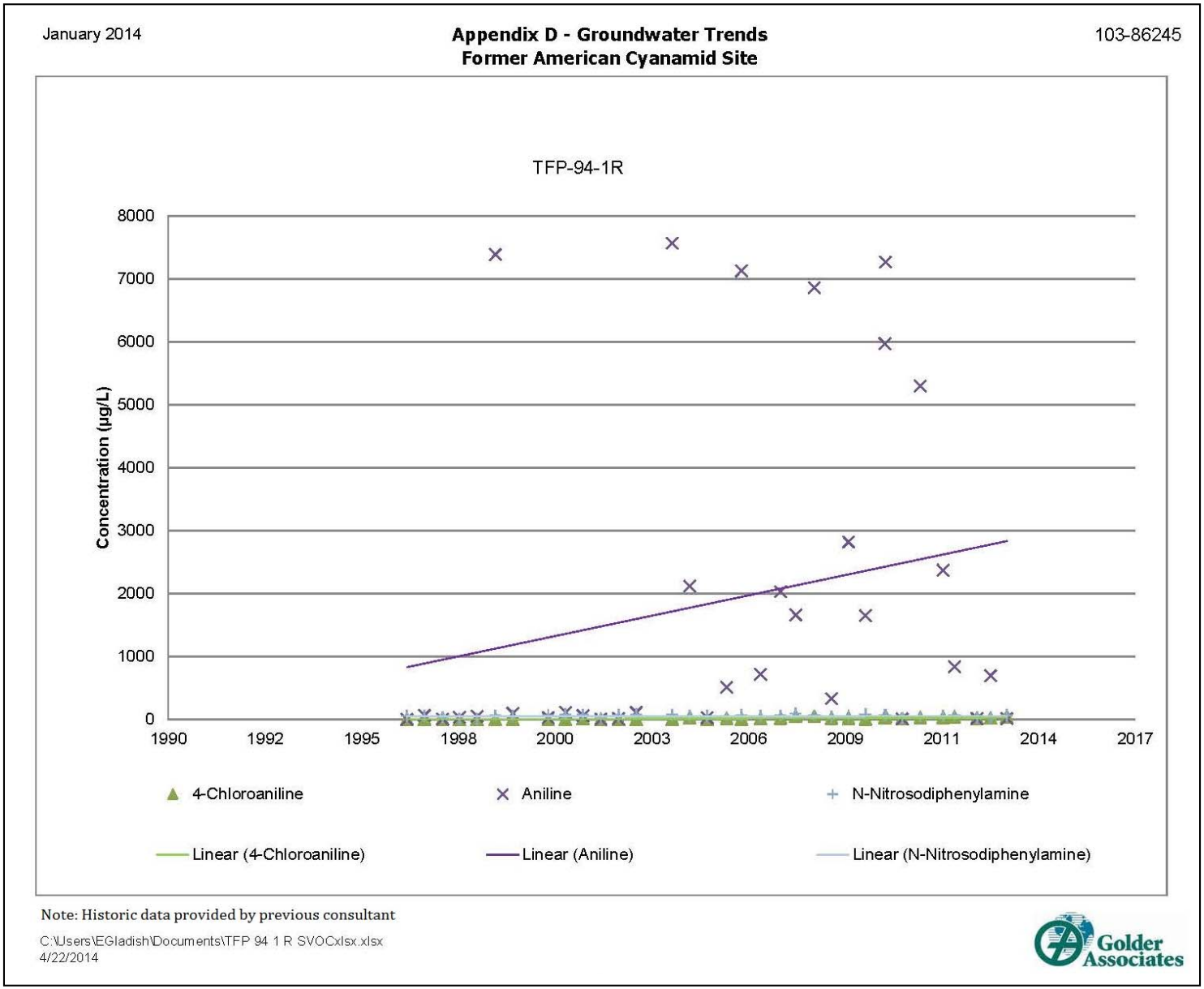
Attachment 12: Trend Plot for SVOCs in 38-R



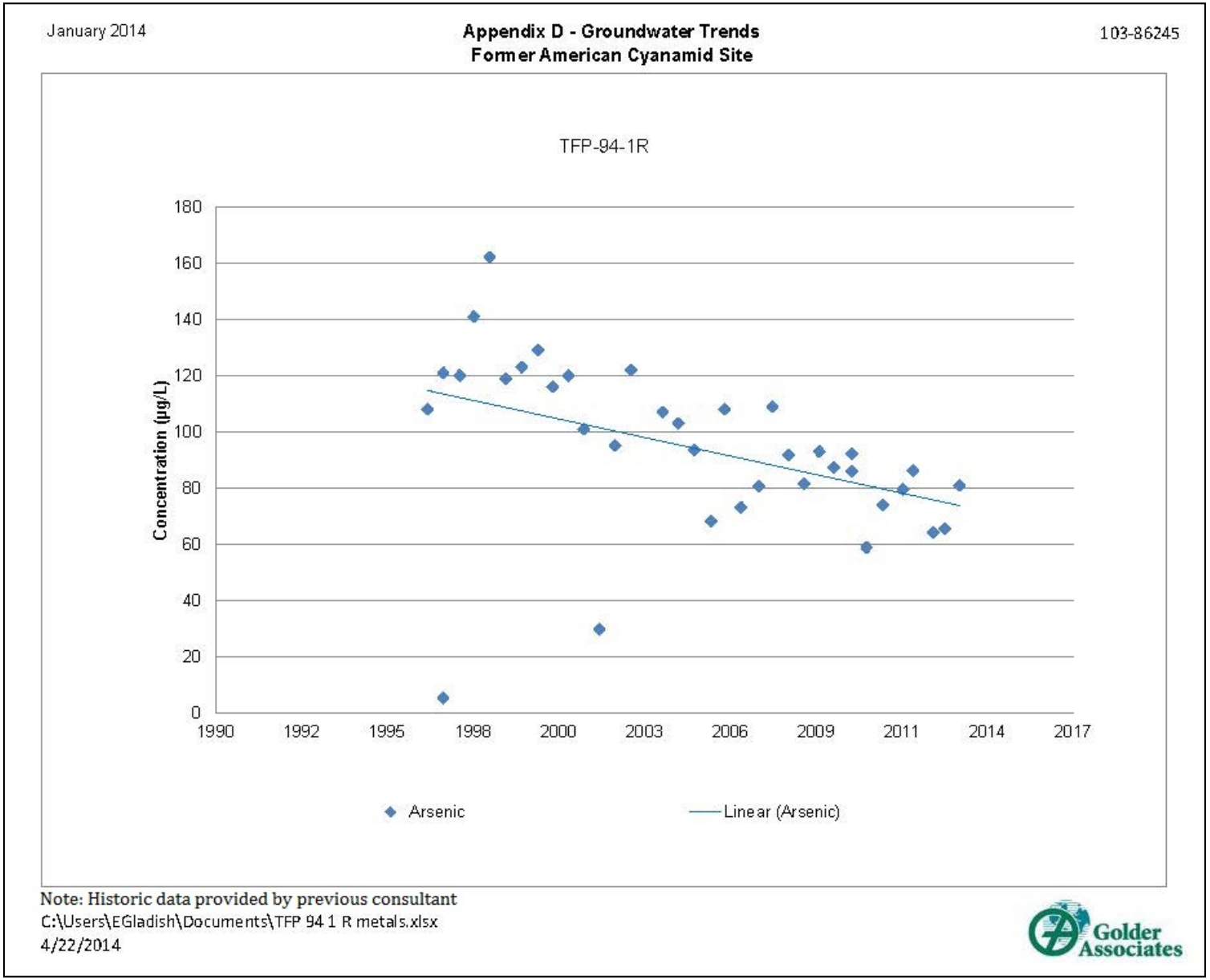
Attachment 13: Trend Plot for VOCs in TFP-94-1R



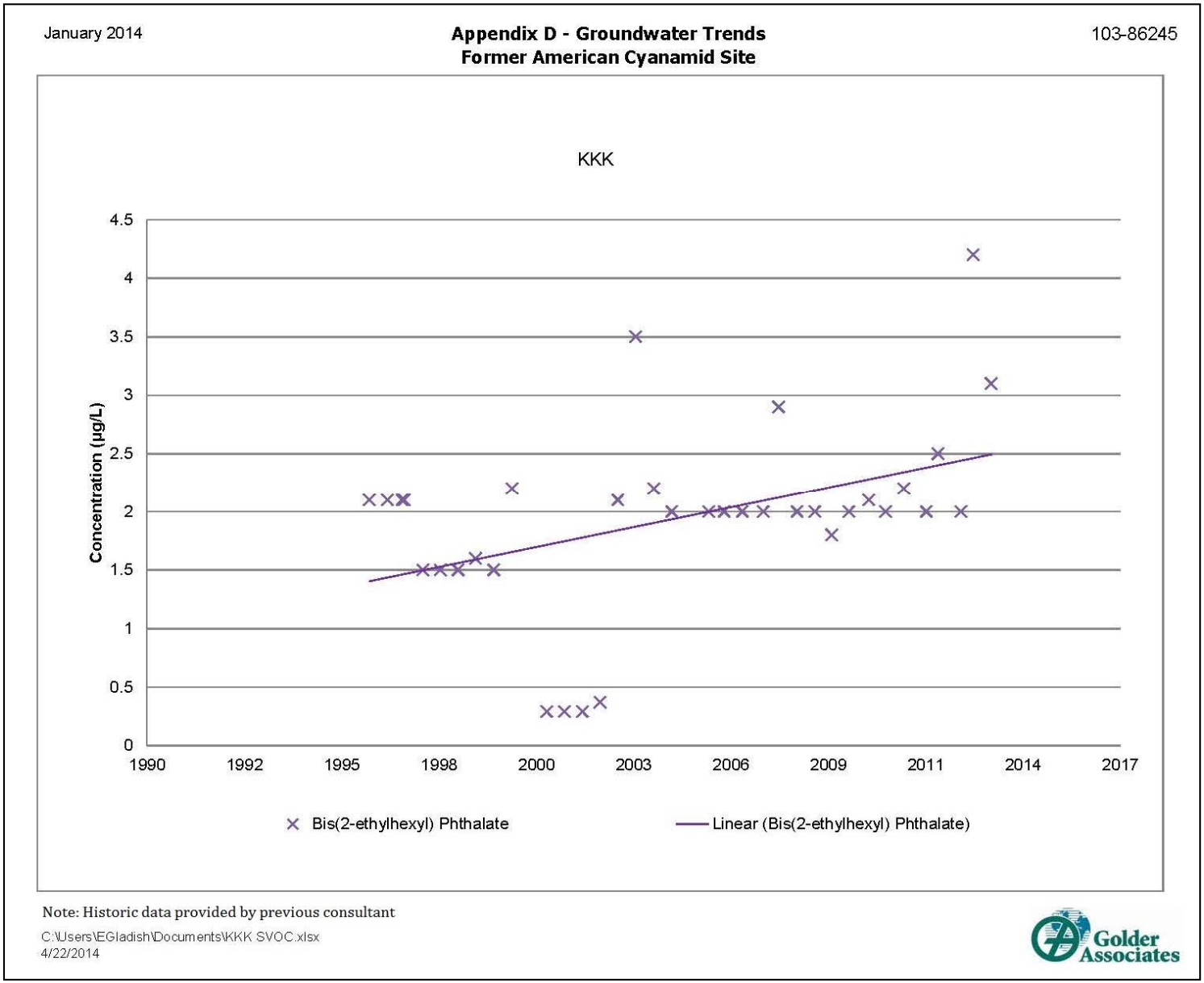
Attachment 14: Trend Plot for SVOCs in TFP-94-1R



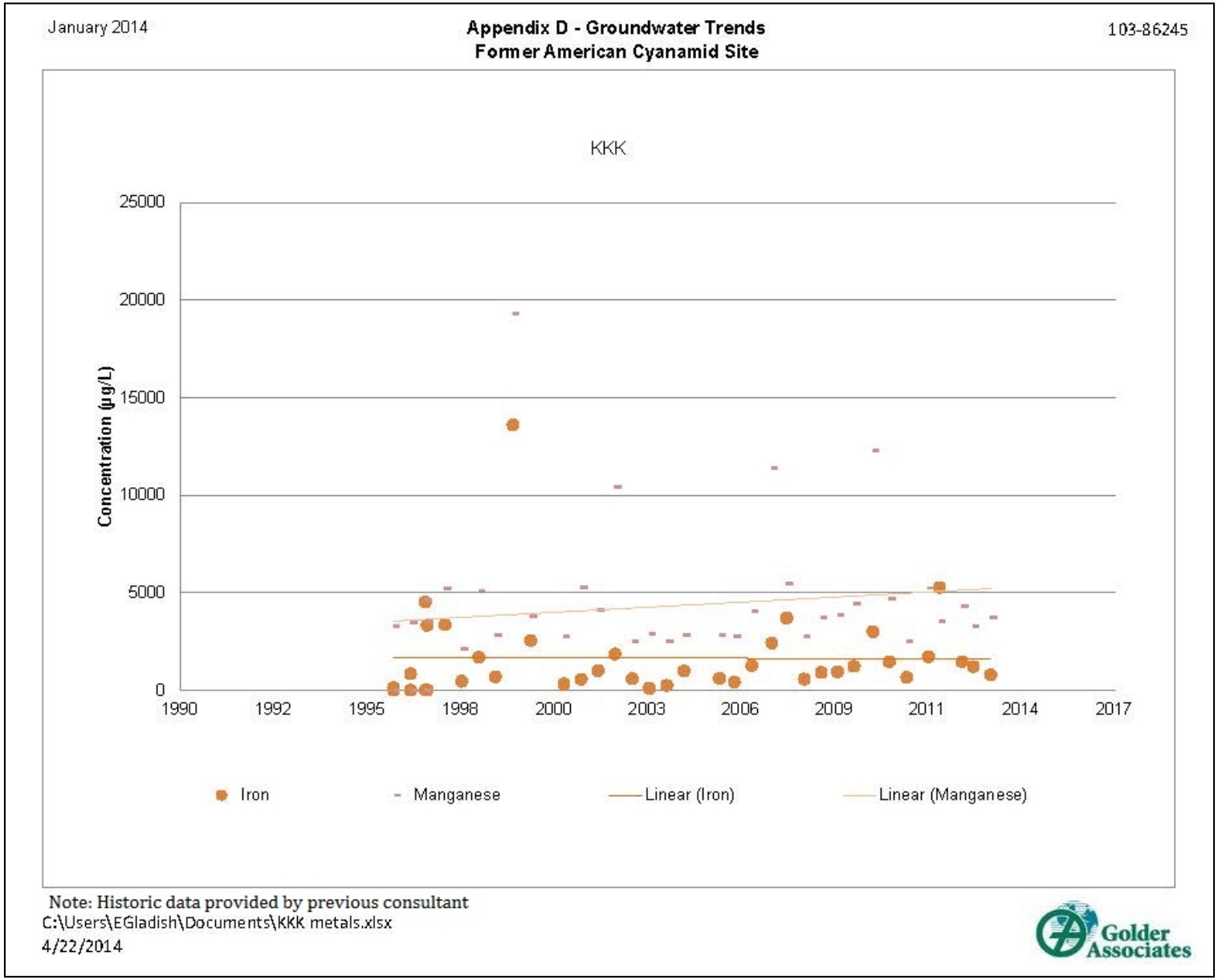
Attachment 15: Trend Plot for Metals in TFP-94-1R



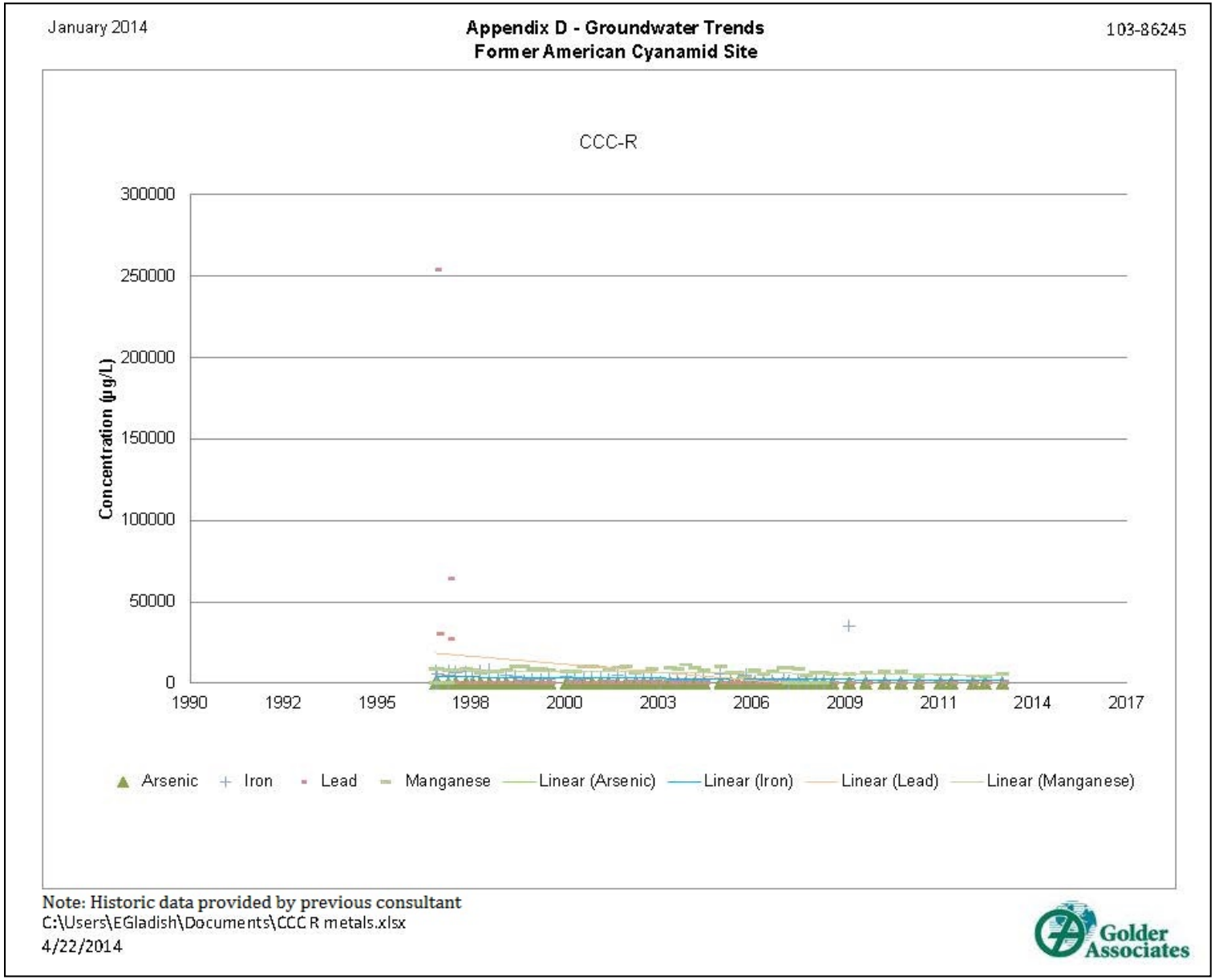
Attachment 16: Trend Plot for SVOCs in KKK



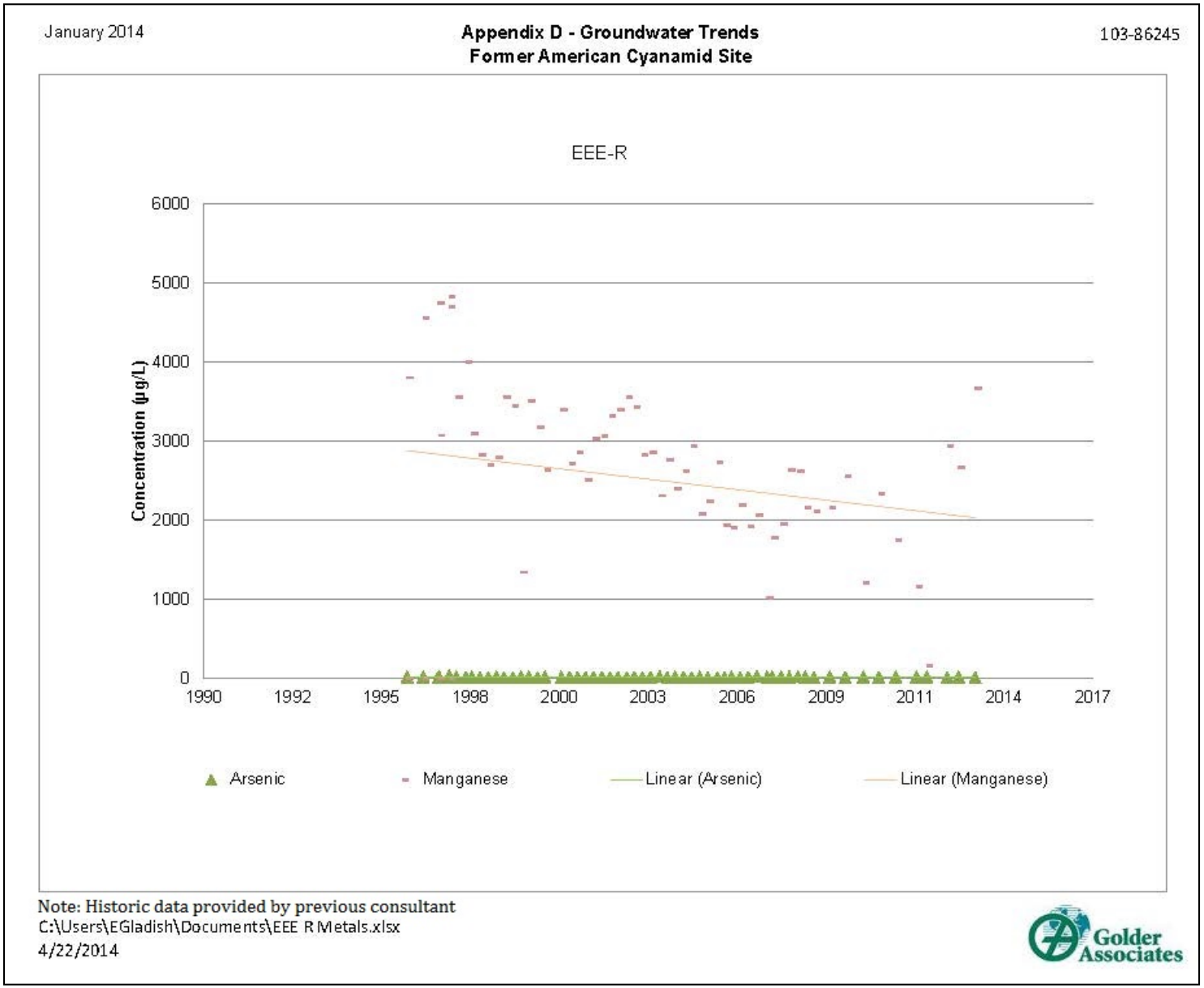
Attachment 17: Trend Plot for Metals in KKK



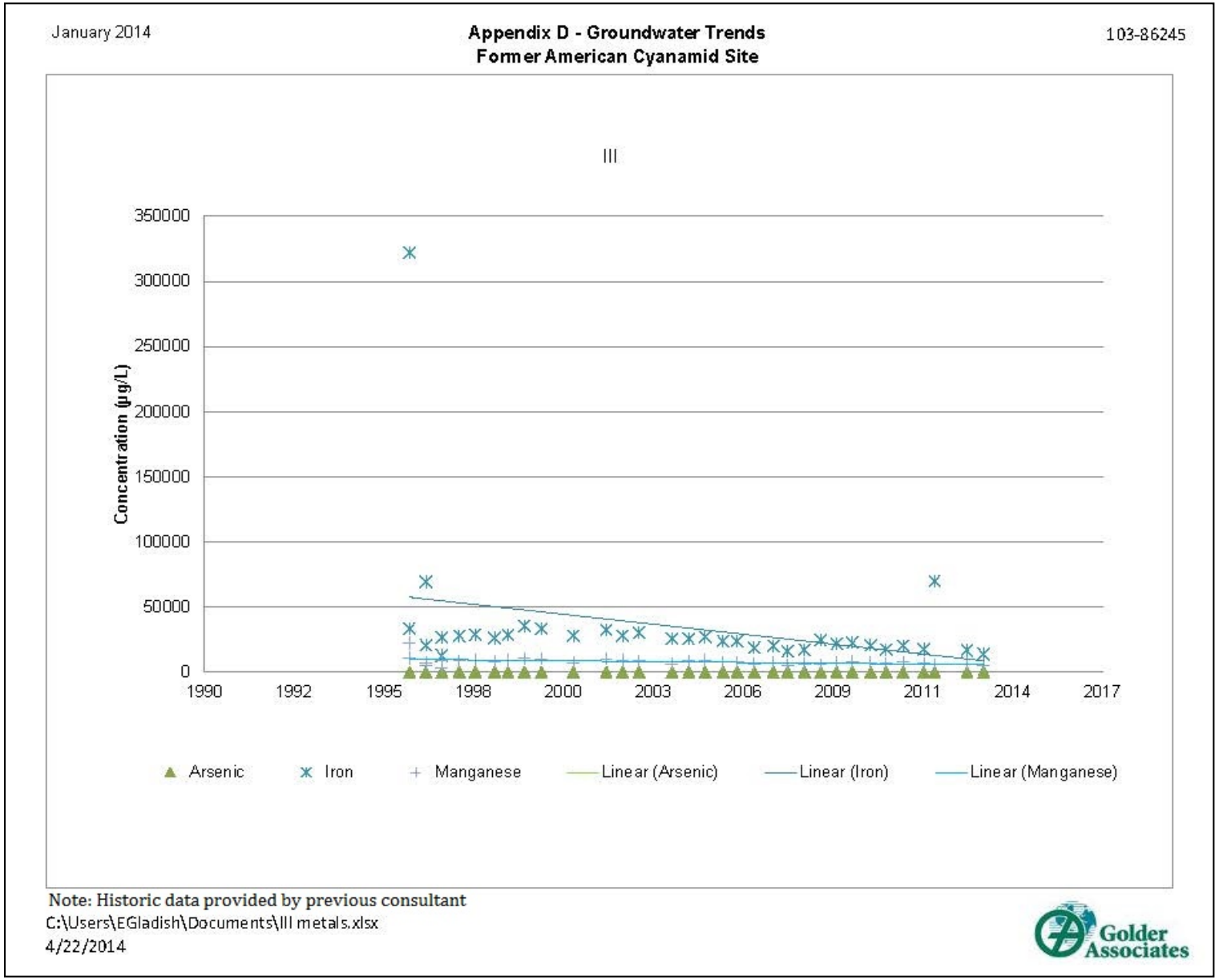
Attachment 18: Trend Plot for Metals in CCC-R



Attachment 19: Trend Plot for Metals in EEE-R



Attachment 20: Trend Plot for Metals in III



Attachment 21: Trend Plot for VOCs in MW 2

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Appendix D - Groundwater Trends
Former American Cyanamid Site

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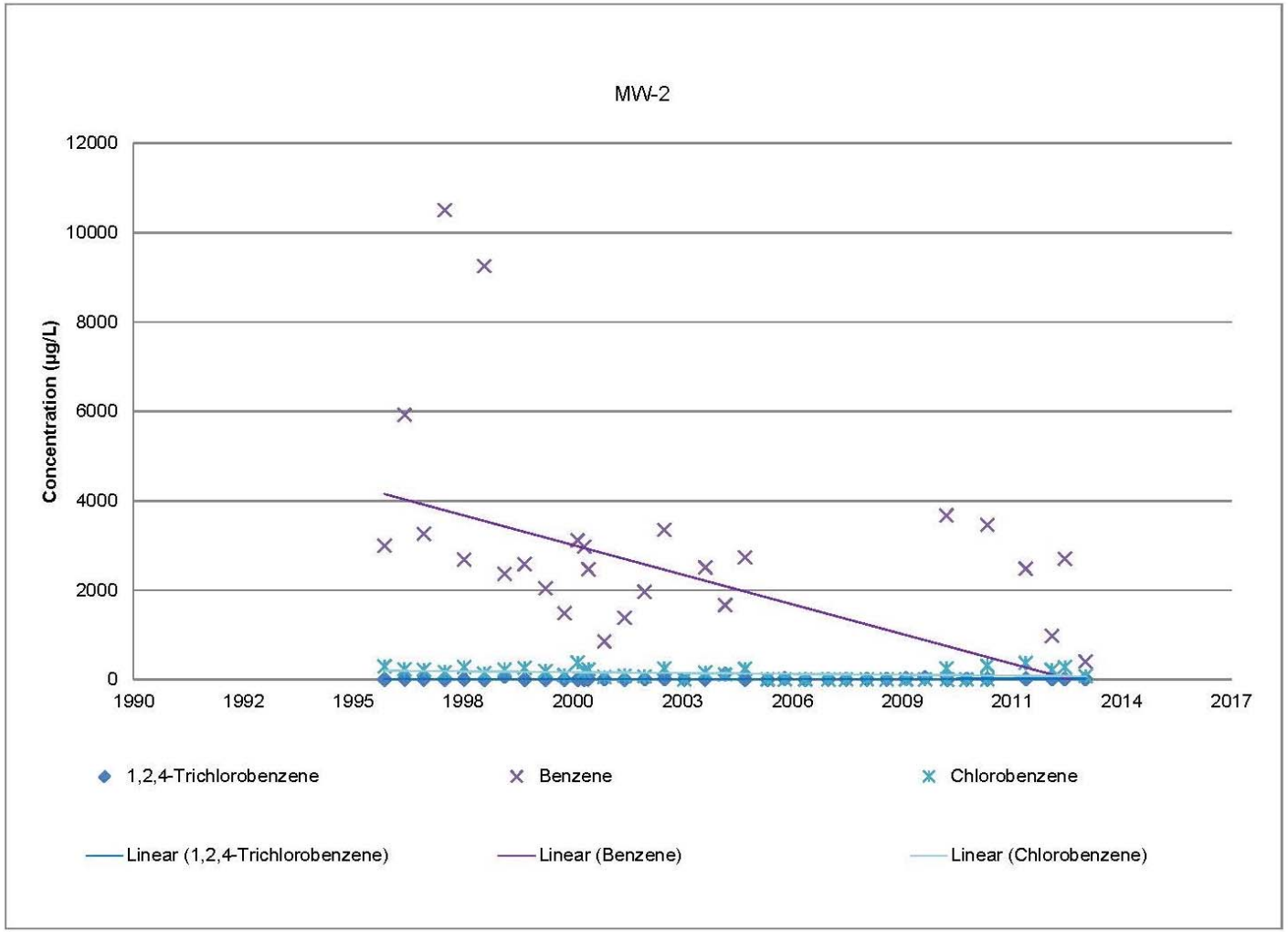

Note: Historic data provided by previous consultant

C:\Users\EGladish\Documents\MW 2 VOC.xlsx
4/22/2014

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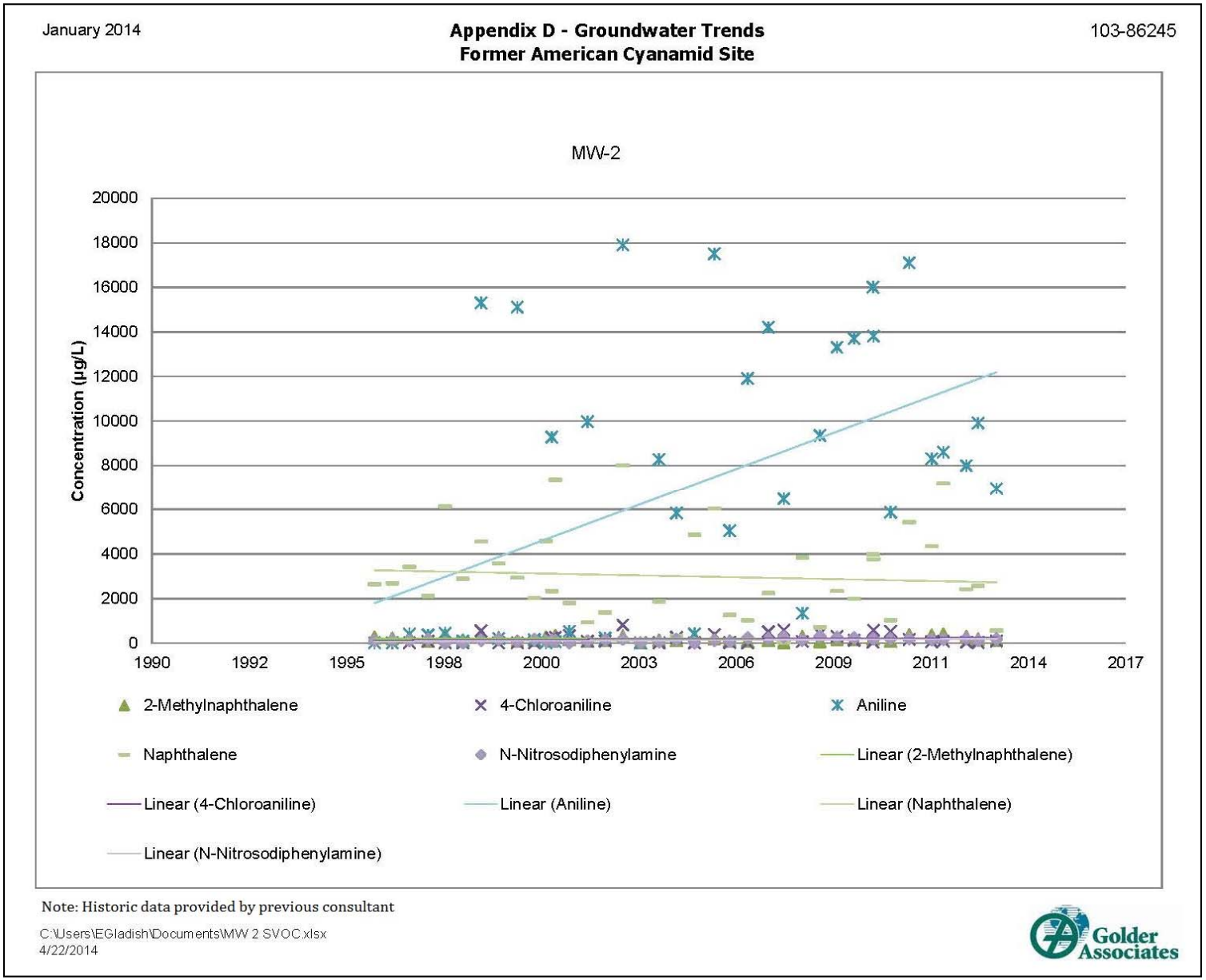
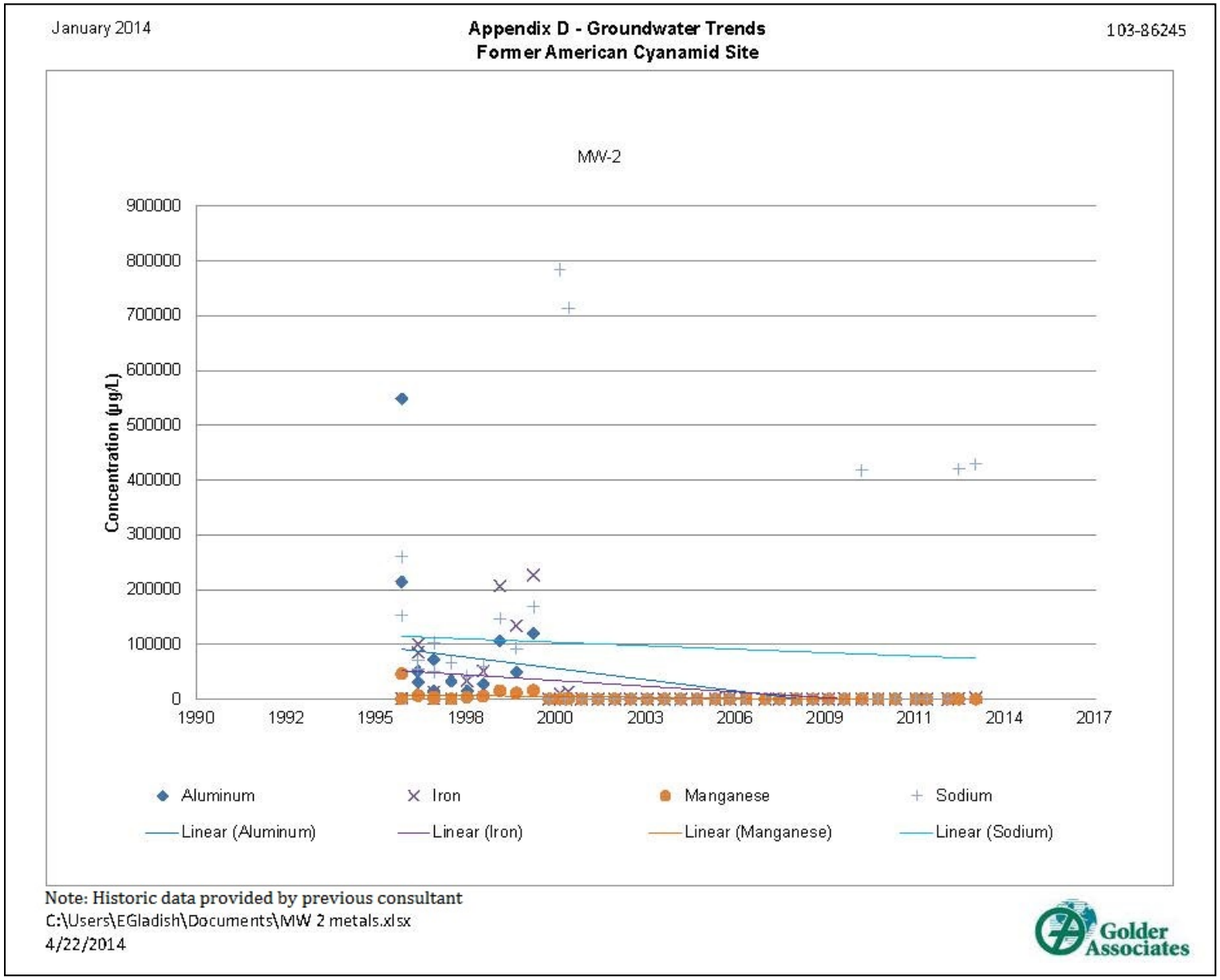
Attachment 22: Trend Plot for SVOCs in MW 2



Attachment 23: Trend Plot for Metals in MW 2



Attachment 24: Trend Plot for Metals in 16-MW-2

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Appendix D - Groundwater Trends
Former American Cyanamid Site

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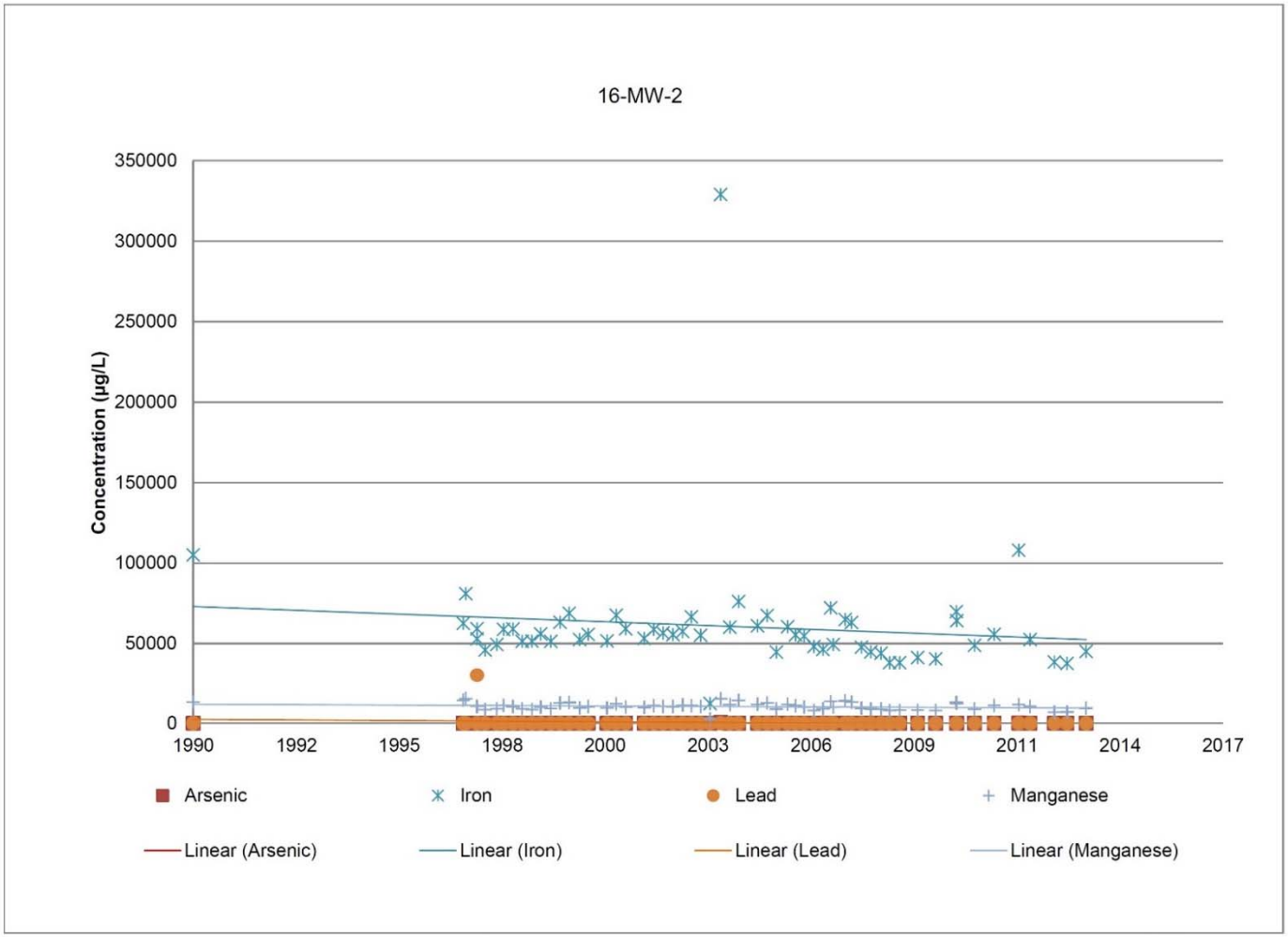

Note: Historic data provided by previous consultant

5/23/2014

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