STATEMENT OF BASIS

FOR

PHARMACIA & UPJOHN COMPANY LLC SITE
NORTH HAVEN, CONNECTICUT

EPA ID NO. CTD001168533
EPA ID NO. CTD000635896

JUNE 15, 2010

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STATEMENT OF BASIS

1.0 INTRODUCTION

This Statement of Basis describes the proposed corrective measures (proposed remedy) for the Pharmacia & Upjohn Company LLC (Pharmacia & Upjohn) facility, located at 41 Stiles Lane in North Haven, Connecticut (Site). This document also explains why the proposed remedy was selected over other alternatives. The United States Environmental Protection Agency (USEPA[1]) Region I, in coordination with the Connecticut Department of Environmental Protection (CTDEP), is issuing this Statement of Basis as part of USEPA's public participation policies under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA) as well as CTDEP's public participation requirements.

The Pharmacia & Upjohn facility was used for industrial manufacturing from the mid-1800s through 1993. The Site became contaminated through the historical releases of manufacturing process wastes and wastewater treatment residuals to manufacturing areas, former lagoons and waste piles. The Upjohn Company (Upjohn), now Pharmacia & Upjohn, conducted extensive investigation, risk assessment, interim remedial measures (IRMs), and Corrective Measure Study (CMS) evaluations at the Site in accordance with two RCRA Orders issued to Upjohn by USEPA and under the State of Connecticut Transfer Act. Pharmacia & Upjohn have completed numerous IRMs to protect human health and the environment while the site investigation and risk assessment work was completed. These IRMs include limiting access to and securing the Site, construction of covers over impacted soils, consolidation and isolation of wastewater treatment residuals, removal and off-site disposal of impacted soil and sediment, and installation and continued operation of a state-of-the-art groundwater extraction and treatment system.

The RCRA Orders covered both the Site (USEPA ID# CTD001168533) and the adjacent Lake A Property (USEPA ID# CTD000635896) located at 410 Sackett Point Road in North Haven, which was once a part of the Upjohn property. The RCRA 3013 Order required Pharmacia & Upjohn to complete Site characterization and risk assessments. Both requirements have been completed to the satisfaction of USEPA; thus, the USEPA terminated that order on June 9, 2009. The RCRA 3008(h) Order required Pharmacia & Upjohn to complete and monitor interim measures, develop media protection standards, and prepare a CMS to evaluate several remedy alternatives for the Site. The proposed remedy is based on the results of the CMS. The CMS was reviewed and approved by USEPA and CTDEP.

The CTDEP has primary oversight responsibilities for the investigation and remediation of the Lake A Property under the Connecticut Transfer Act. A Remedial Action Plan (RAP) for the Lake A Property was

[1] A glossary has been added to the end of this document to assist the reader with acronyms and certain terms.

submitted to CTDEP and public-noticed in May 2008, thereby fulfilling the remedy selection requirements under the RCRA 3008(h) Order and CTDEP public participation requirements for the Lake A Property. Implementation of the remedy for the Lake A Property was completed in September 2009. The remedy for the Lake A Property involved the limited excavation and off-site disposal of contaminated soils and surfactant enhanced in-situ chemical oxidation of groundwater to treat a dilute plume of chlorinated volatile organic compounds (VOCs). CTDEP and USEPA have indicated that the Lake A Property has met the corrective action requirements for milestones CA400 – Remedy Decision and CA550 – Remedy Construction Complete, as indicated in a letter from CTDEP dated March 5, 2010. Groundwater and soil-vapor monitoring to confirm the continued effectiveness of the remedial actions are ongoing. Environmental Land Use Restrictions (ELURs) will soon be implemented for this property.

This document summarizes information related to the approximately 80-acre Pharmacia & Upjohn facility, at 41 Stiles Lane (Site). Detailed reports and information are presented in full in the Site Administrative Record, which includes the CMS as well as the USEPA and CTDEP-approved Site characterization and risk assessment reports and related documents and correspondence. As a summary, the Statement of Basis is not a substitute for the more detailed records available in the Site Administrative Record. In particular, interested parties are encouraged to read the CMS. Public comment on the proposed remedy and on other remedy alternatives is important to the final remedy selection process. USEPA, in coordination with CTDEP, may modify the proposed remedy or select another remedy based upon new information or comments received from the public during the public comment period. The Administrative Record locations and public participation opportunities are noted at the end of this Statement of Basis.

2.0 PROPOSED REMEDY

The proposed remedy will provide long-term protection to human health and the environment and will return the Site to productive use. A summary of the major components of the proposed remedy, which is referred to as Corrective Measure Alternative 4 in the CMS, is listed below:

- Construction of a hydraulic control system for shallow groundwater (hydrogeologic Unit 1) consisting of a perimeter sub-grade low-permeability vertical barrier and a groundwater extraction and treatment system that will intercept and treat contaminated groundwater, preventing impacts to the Quinnipiac River and abutting properties;
- Monitoring of deep groundwater (in hydrogeologic Units 3 and 4) to assess continued compliance with CTDEP remediation criteria;
- Treatment and elimination of the most highly contaminated area on the Site using in-situ thermal remediation and on-site treatment of dense non-aqueous phase liquids (DNAPL);
- Construction of protective barrier covers over the west side of the Site to allow safe commercial/light industrial redevelopment of this portion of the Site;
- Stabilization and installation of low-permeability cover systems for both the North and South Piles in the east side of the Site to safely contain contaminated materials, prevent future contact with the materials, and minimize groundwater impacts from the Piles;

- Construction of protective barrier and low-permeability (nearly impermeable) cover systems over the east side of the Site to allow it to be safely used by maintenance workers and visitors;
- Enhancement of the east side ecological habitat, including creation of higher value uplands and wetlands habitat. Walking trails for interpretative environmental education will be constructed for guided viewing of the enhanced habitats, which will be maintained as an ecological preserve;
- Focused remediation of Quinnipiac River sediment in two areas of the tidal mud flats and in a small stretch of South Creek, which would remove the highest concentrations of key contaminants in a manner that would minimize damage to ecological habitat;
- Placement of institutional controls, including ELURs, to prohibit residential use, restrict groundwater use, and prevent disturbance to or demolition of engineered controls constructed on Site;
- Long-term operation, monitoring, and maintenance (OM&M) of the Site to verify continued protection of human health and the environment.

More detailed information about the remedy is provided in Section 6 below.

3.0 FACILITY BACKGROUND

3.1 Site Description and Use

The Site consists of an approximately 80-acre parcel of land located within a commercial/industrial area of North Haven, Connecticut (see Figures 1 and 2). The Site was used for industrial manufacturing beginning in the mid-1800s, when I.L. Stiles & Sons operated a clay mine and brick yard into the 1930s. The Site was used by Carwin Chemical Company for chemical manufacturing from the mid-1940s to 1962 and by the Burndy Corporation for electrical component manufacturing from circa 1963 to 1975. Beginning in 1962, Upjohn produced specialty and industrial chemicals including pharmaceutical, dye, pigment, and photographic intermediates, agricultural treatment chemicals, ultraviolet curing initiators, coating and adhesive additives, and flavor and fragrance components. Chemical manufacturing continued until 1993, when the manufacturing facilities (buildings, tanks, and pipelines) were dismantled and demolished to grade. Wastes generated at the Site during historical operations primarily included chemical manufacturing process wastes and wastewater treatment residuals consisting of several different types of organic chemicals and metals, including, among others, polychlorinated biphenyls (“PCBs”), VOCs, semivolatile organic compounds (SVOCs), and lead.

Pfizer Inc acquired the Site on April 16, 2003 as a result of its acquisition of the Pharmacia Corporation. As a result, the Pharmacia Corporation is a wholly owned subsidiary of Pfizer Inc and remains the parent company of Pharmacia & Upjohn Company LLC, which owns and operates the Site. Current Site use is limited to the operation and maintenance of the existing remedial systems, including a groundwater extraction system and groundwater treatment facility (GWTF).

When chemical manufacturing was conducted, process wastes were placed in the western portion of a former clay mine pit prior to and during the time the pit was being backfilled to reclaim land for the

expansion of manufacturing facilities. These activities resulted in contamination of soils in the west side of the Site and produced a heterogeneous mixture of soil/fill, wastewater treatment residuals (WWTR), and DNAPL in the area now referred to as the Former Production Area. The DNAPL located in this area is the primary source of groundwater contamination at the Site.

The east side of the Site was used for the treatment of chemical process wastes generated during manufacturing through the use of several interconnected flow-through lagoons constructed largely within the eastern portion of the former clay mine pit. Several hundred thousand cubic yards of WWTR (largely spent activated carbon and biological solids) accumulated within the former lagoons, including the area known as the North Pile. The South Pile was created by placement of WWTR (largely acid wastewater neutralization sludge). The WWTR in the former lagoons and piles are currently contained by soil berms, below soil or geosynthetic membrane covers.

3.2 Site Environmental Investigations

Numerous environmental investigations were conducted at the Site between 1990 and 2009. The initial RCRA Facility Investigation (RFI) report was completed in 1993 (RUST E & I, 1993). Further evaluation of historic Site operations led to several additional investigations through 2003 (Post-RFI investigations). Beginning in 2004, Pfizer completed a comprehensive Site-wide investigation that focused on completing the investigation of the entire Site. The Final Investigation Report or FIR (Golder, 2007a) integrated the results of this investigation with previous work and presented a comprehensive evaluation of the geology, hydrogeology, chemical source areas, and contamination in soil/WWTR, DNAPL, groundwater, surface water, and sediment. Additional investigations were completed following the FIR (Post-FIR Investigations) to complete the ecological risk assessment and evaluate remedy alternatives in the CMS.

Twenty-eight Areas of Environmental Concern (AEC) were identified at the Site under the RCRA Orders and have been fully investigated. To facilitate the evaluation of alternative remedies, the twenty-eight AECs were combined and the Site was divided into nine CMS Areas: four on the west side (CMS Areas W-1 through W-4) and five on the east side (CMS Areas E-1 through E-5) as shown on Figure 3. The tables on pages 7 and 8 provide representative contaminants found in each CMS Area.

West Side CMS Areas

- CMS Area W-1 – includes the portions of the Site (largely within the west side Former Production Area) where DNAPL is present.
- CMS Area W-2 – is the remainder of the Former Production Area excluding the portions contained in CMS Area W-1. This CMS Area includes several former storage tanks (three of which were RCRA units), the Former D-Street Drum Disposal Area, the Former Zinc Pits, and the Former Salt Pits.
- CMS Area W-3 – is the former Relic Firewater Pond which has recently been addressed by interim remedial measures.

- CMS Area W-4 – includes the northern portion of the west side and the western and southern perimeters of the west side where less manufacturing activities took place. This CMS area includes the Former Drum Storage Area, which is a former RCRA unit that has undergone closure, and part of the ortho-nitrochlorobenzene (ONCB) Spill Area, which was previously remediated as part of the IRMs completed at the Site.

East Side CMS Areas

- CMS Area E-1 – includes the former Burndy Lagoons, the former Northern Lagoon, and their surrounding areas. This CMS area also contains the remainder of the ONCB Spill Area, which was previously remediated.

- CMS Area E-2 – includes the Former Laboratory Bottle Area, the surrounding area to the north, and the open areas north and west of the South Pile.

- CMS Area E-3 – includes several former wastewater treatment lagoons including the Former Polishing Lagoon and the Former Enclosed Aeration Lagoon, which were RCRA units, as well as the Former Equalization Basin and the Former Aeration Lagoon. CMS Area E-3 also contains the surrounding areas that are located generally within the confines of the former clay mine pit and the Relic Wastewater Treatment Facility.

- CMS Area E-4 – includes the North Pile, which is a RCRA unit, and the former belt press storage bin; and,

- CMS Area E-5 – includes the South Pile.

In addition to evaluating soil remediation technologies and alternatives for the above CMS Areas, the CMS also evaluated remediation technologies and alternatives for impacted groundwater and sediments.

3.3 Summary of Completed Interim Remedial Measures and RCRA Unit Closures

As a result of the environmental investigations, Pharmacia & Upjohn has completed numerous interim remedial measures at the Site to control sources of contamination, control the spread of contaminated groundwater, and control potential human and ecological exposures to impacted soil/WWTR.

After decontaminating, decommissioning and removing former manufacturing buildings and storage tanks, Pharmacia & Upjohn paved the majority of the western portion of the Site, installed chain-link fence around the north, west, and south property boundaries, installed warning signs along the portion of the property facing the Quinnipiac River, and provides 24-hour per day Site security to minimize human direct contact exposures to impacted areas. Pharmacia and Upjohn installed, operates, and maintains a state-of-the-art GWTF that controls potential threats to human health and the environment from releases of groundwater to surface waters (i.e., Quinnipiac River, North Creek and South Creek) by providing effective capture and treatment of impacted groundwater. The GWTF employs several technologies that work together to provide a high degree of treatment, including biological treatment, chemical coagulation and suspended solids removal, ultra-violet light oxidation with hydrogen peroxide, and carbon adsorption. Pharmacia & Upjohn recently completed construction of interim measures for the Relic Firewater Pond, which compressed loose sediment at the bottom of the former pond and isolated these sediments below

a geosynthetic membrane and soil cover to prevent human and wildlife exposures and to minimize impacts to groundwater.

Various stages of closure also were completed at each of the RCRA units. For instance, final closure of the Former Polishing Lagoon was achieved by excavating WWTR, backfilling the excavation and, installing a compacted soil and vegetated cover. Interim closure activities at the North Pile included construction of a geosynthetic membrane cover over the crown of the pile and collection and treatment of surface water runoff. Interim closure of the Former Enclosed Aeration Lagoon included compressing the WWTR to render them less permeable and isolating the low permeability WWTR below geosynthetic membrane and soil covers.

Additional IRMs completed at the Site included:

- Regular and ongoing removal and off-Site disposal of liquid DNAPL;
- Removal of soil from the site perimeter and other areas containing elevated concentrations of PCBs and disposing these soils off-site;
- Removal of wastes from the Former Burndy Lagoons, Former Northern Lagoon and Former Laboratory Bottle Area and disposing these materials off-site; and
- Management of surface water accumulation and infiltration at the South Pile.

Interim Measures Evaluation and RCRA Groundwater Monitoring Reports are submitted semi-annually to USEPA and CTDEP to demonstrate that the Site continues to be controlled.

4.0 SUMMARY OF ENVIRONMENTAL CONDITIONS AND FACILITY RISKS

4.1 Summary of Environmental Conditions

As described above, numerous studies, investigations and assessments have been conducted on the property. Through these evaluations, a site-wide three-dimensional model has been developed to understand environmental conditions on the Site. This section includes a summary of the Site geologic features and existing environmental conditions associated with soil and wastewater treatment residuals, DNAPL, groundwater and sediments.

Geologic and Hydrogeologic Features

Essentially all of the land area at the Site has been created through the placement of fill material during construction of historical industrial operations. The geologic features or “Units” underlying the Site include, from top to bottom, the Unit 1 historic fill and shallow sand layer; Unit 2 silt/clay layer; Unit 3 lower sand layer; and Unit 4 bedrock (See Figure 4). Extractable groundwater is present in Units 1, 3 and 4, while Unit 2 is a low permeability layer that is highly resistant to groundwater flow. The majority of groundwater contamination occurs within Unit 1, which is hydraulically separated from Units 3 and 4 by the Unit 2 silt/clay layer. Unit 1 groundwater flows eastward towards the Quinnipiac River and is tidally influenced.

The Site's existing groundwater extraction system captures Unit 1 groundwater prior to its discharge to the Quinnipiac River and its tributaries, North Creek and South Creek. The captured Unit 1 groundwater is treated in the GWTF prior to being discharged to the Quinnipiac River in accordance with a CTDEP National Pollutant Discharge Elimination System (NPDES) permit. The deeper Units 3 and 4 groundwater flows nearly horizontally toward the east beneath Unit 2 and then slowly seeps upward through Unit 2 near the river channel.

Dense Non-Aqueous Phase Liquid

DNAPL is a mixture of chemicals that are heavier than water and do not readily dissolve in water. A heterogeneous distribution of DNAPL was identified within Unit 1 materials above the Unit 2 surface in CMS Area W-1 (see Figure 3). Approximately 138,000 kg of DNAPL chemicals are present about 15-30 feet below the surface in this area. The primary DNAPL constituents include volatile organic compounds (VOCs; predominantly benzene, toluene, and tetrachloroethylene); semivolatile organic compounds (SVOCs; predominantly dichlorobenzenes, azobenzene, 2-chloroaniline, and 3,3'-dichlorobenzidine); and PCBs. The DNAPL found within CMS Area W-1 contains approximately 15% VOCs, 80% SVOCs and between 1% to 5% PCBs, with the largest single chemical component being 1,2-dichlorobenzene. DNAPL is the primary source of groundwater contamination, releasing more than twice the amount of contamination to groundwater than is released from the North Pile, South Pile, and former lagoons combined. Therefore, remediation of the DNAPL area is the most effective means to reduce further groundwater contamination.

Soil and Wastewater Treatment Residuals

It is estimated that more than 1.3 million cubic yards of contaminated soil/WWTR are present at the Site. Chemicals detected in soil/WWTR include a broad range of VOCs, SVOCs, PCBs, and metals. The highest concentrations of chemicals occur in soil/WWTR that are impacted by DNAPL in CMS Area W-1. Table 1 below shows average soil concentrations by CMS area for ten representative chemicals that are widely distributed at the Site and that are responsible for the majority of potential Site risks (discussed later in this Statement of Basis). The table also shows the Preliminary Media Protection Standards (PMPS), which were used during the CMS to identify areas of the site potentially needing remedial action. These PMPS were based on the CTDEP Remediation Standard Regulations (RSR) criteria for potential human health risks from direct contact to contaminated soils (i.e., I/C DEC) and on the Site ecological risk assessment for terrestrial receptors. As described in the CMS, the Unit 1 hydraulic control system addresses the RSR soil criteria based on protection of GB groundwater, which is known as the GB Pollutant Mobility Criteria (GB PMC).

Table 1 – Average Concentrations for Representative Chemicals in Soil/WWTR and DNAPL

CHEMICAL	CMS AREA							PMPS	
Concentrations in mg/kg (parts per million or ppm)	W-1		W-2, W-3, & W-4	E-1 & E-2	E-3	E-4	E-5	I/C DEC	ecological
	DNAPL	Soil							
Volatile Organic Compounds (VOCs)									
Benzene	11,700	120	3.9	3.1	10	38	19	57	None
Chlorobenzene	14,300	210	39	3.7	44	47	18	1,000	None
1,4-Dioxane	15,700	29	85	2.0	2.4	ND	ND	2,500	None
Toluene	13,900	190	59	12	41	380	180	1,000	None
Semivolatile Organic Compounds (SVOCs)									
Benzidine	3,040	560	25	0.55	47	35	6.5	0.02	0.15
2-Chloroaniline	11,000	160	41	3.8	250	1,500	8.4	818	70
1,2-Dichlorobenzene	338,000	2,000	210	0.47	68	73	3.4	1,000	None
3,3'-Dichlorobenzidine	14,600	470	27	18	440	890	410	13	1.7
Polychlorinated Biphenyls (PCBs)									
PCBs, total	20,700	210	54	1.1	41	150	9.2	3.0	3.0
Metals									
Lead	2	1,900	67	390	940	9,900	1,800	1,000	82

Groundwater

Chemicals detected in groundwater include VOCs, SVOCs, PCBs, and metals. Concentrations of representative chemicals found in groundwater at the Site are summarized in Table 2 below. Table 2 also includes the PMPS used during the CMS process; which were based on the CTDEP RSRs. The RSR criteria for groundwater are based on the protection of adjacent surface water and associated human and ecological receptors (i.e., SWPC), and the potential risks to human health in future occupied buildings from volatilization of groundwater chemicals (i.e., I/C VC). The highest chemical concentrations in groundwater occur within Unit 1 immediately downgradient of the DNAPL area. Groundwater contamination also exists along the downgradient perimeter of the Site, although at much lower concentrations. Except for well SEC-7D, which will be addressed as part of the proposed remedy, contamination was usually not detected in Units 3 and 4 groundwater or, if detected, was insignificant as compared to concentrations in Unit 1 groundwater. Substantial naturally occurring biological degradation of contamination in Unit 1 groundwater is ongoing as evidenced by degradation products and other biochemical indicators.

Table 2 – Average Concentrations for Representative Chemicals in Groundwater (2004 – 2008)

Chemical Concentrations shown in mg/L (parts per million or ppm)	Groundwater Unit			PMPS	
	Unit 1	Units 3 & 4	SEC-7D	SWPC	I/C VC
Volatile Organic Compounds (VOCs)					
Benzene	2.0	0.0015	0.035	0.23	0.31
Chlorobenzene	1.2	0.0051	0.51	0.64	27
1,4-Dioxane	2.6	0.13	0.19	8.0	N/A
Toluene	1.2	0.00079	0.00022	0.098	42
Semivolatile Organic Compounds (SVOCs)					
Benzidine	0.13	0.0017	0.0032	0.0010	N/A
2-Chloroaniline	11	0.0022	1.5	0.13	N/A
1,2-Dichlorobenzene	0.84	0.0028	0.23	0.14	50
3,3'-Dichlorobenzidine	0.036	0.00034	0.0011	0.00085	NA
Polychlorinated Biphenyls (PCBs)					
PCBs	0.0061	0.00025	0.00017	0.00025	0.0050
Metals					
Lead	0.0010	0.0012	0.00014	0.012	NA

Sediment

Quinnipiac River tidal flat sediments in the vicinity of the Site, including those in North Creek and South Creek, have been contaminated by historic Site operations as well as by numerous other off-site regional background sources, such as industrial operations, spills, landfills, municipal wastewater discharges, and stormwater runoff from extensive urbanization within the Quinnipiac River watershed. The primary contaminants of concern in sediment are SVOCs, PCBs, and metals. PCBs, some SVOCs, and metals are a regional concern from several of the off-site sources noted and were found in sediment samples collected in the vicinity of the Site as well as in upstream areas.

The maximum concentrations of key chemicals with bioaccumulation potential detected in sediment were 430 mg/kg of 3,3'-dichlorobenzidine, 24 mg/kg of benzidine, and 41 mg/kg of PCBs, which were co-located at a single sampling point in Tidal Flat 1. Tidal Flat 2 had the next highest concentration of these key chemicals (25 mg/kg of 3,3'-dichlorobenzidine, 1.9 mg/kg of benzidine, and 22 mg/kg of PCBs). A short stretch of South Creek had concentrations of PCBs up to 14 mg/kg. Lower concentrations of these key chemicals were detected in Tidal Flat 3, the remainder of South Creek and in North Creek. PCBs were also found in off-site, upstream regional background samples.

4.2 Site Risks

The proposed remedy combines aggressive treatment along with containment to eliminate potential exposures. This proposed remedy was developed through a comprehensive understanding of the environmental conditions that exist today, the risks associated with those conditions, and the regulatory standards that must be met.

Existing Conditions

Section 4.1 above described the environmental conditions on the property and Section 3.3 above described the numerous Interim Remedial Measures that Pharmacia & Upjohn has implemented to ensure the Site does not currently pose a risk to human health and the environment.

USEPA uses Environmental Indicators (EI) to measure whether, in the short term, (a) the Site poses a current threat of harm to humans; and (b) contaminated groundwater discharges are under control. USEPA has determined that there are no unacceptable human exposures to soil/WWTR at the Site (based on current use of the Site), and that contaminated groundwater discharges to the Quinnipiac River are under control (based on continued operation of the groundwater extraction system and GWTF). Currently, potential risk of human exposures to soil/WWTR and groundwater are considered acceptable because:

- There is no residential use of the Site;
- Site workers are protected from exposure to contaminants via the existing covers, as well as through the implementation of safe management practices and health and safety protocols;
- Twenty-four-hour security, coupled with fencing and natural barriers, restrict unwanted visitors and trespassers that could potentially come into contact with uncovered portions of the Site; and
- Groundwater at the Site is not used and is classified by CTDEP as GB and therefore is presumed not suitable for residential or potable use without treatment.

While there are no unacceptable human exposures today based on current use of the site, the likely future land use was considered in the CMS process, and long-term remedial measures are required.

Human Health Risk Evaluation

USEPA has approved two baseline human health risk assessments completed for the Site; the 1996 Human Health Risk Assessment (HHRA) by RUST and the 2001 Human Health Streamlined Risk Evaluation (SLRE) by Earth Tech, Inc. These assessments were conducted with a focus on identifying potentially complete exposure pathways (e.g., ingestion, dermal contact, and inhalation) to impacted environmental media (e.g., soil, groundwater and sediments). The 1996 HHRA was superseded by the 2001 SLRE which evaluated exposure scenarios and potential risks that are relevant to the planned future use of the Site (industrial/commercial area for the west side and maintained green space for the east side).

When conducting a human health risk assessment, risk is estimated based on an evaluation of exposure scenarios that describe the pathway in which a person (commonly referred to as a receptor in risk assessment) may be exposed to chemicals of concern (e.g., contact with skin, inhalation of dust, and incidental ingestion) in environmental media (e.g., soil, groundwater), the frequency, duration, and intensity of the exposure, and the toxicity of the chemicals of concern. Toxicity is generally expressed as either cancer effects or non-cancer effects. Risk for chemicals of concern that are known or suspected to

cause cancer is expressed as the probability of an incremental chance of cancer. For example, a risk value for human health of 1-in-100,000 ($1x10^{-5}$) would mean that for every 100,000 people exposed to a particular chemical one additional person over and above the normal number of cancer occurrences may develop cancer over a lifetime of 70 years. For non-cancer effects, the risks are based on an acceptable or safe dose below which adverse effects are not likely to occur. This is expressed as a hazard quotient or hazard index where a value of less than one is not likely to be associated with an adverse effect. USEPA's target risk goal is $1x10^{-6}$ or less. The CTDEP RSRs for individual chemicals are based on a risk goal of $1x10^{-6}$ and a cumulative risk goal for all chemicals of $1x10^{-5}$. These risk goals are protective of future industrial/commercial use of the Site and groundwater discharges to surface water.

Ecological Risk Evaluation

The CTDEP and the United States Fish and Wildlife Service have verified that no threatened or endangered species are located within and adjacent to the Site boundaries. In the absence of threatened or endangered species and in accordance with USEPA technical guidance, the assessment of ecological risk to wildlife receptors focuses on potential effects at the population level, rather than assessing risks to individual animals from discrete chemical impacts.

Potential ecological risks to wildlife were evaluated in the Screening Ecological Risk Assessment Amendment (Golder, 2007b), which considered both terrestrial receptors (such as the rabbit and hawk) and estuarine receptors (such as the mink and sandpiper). As shown in Table 3, terrestrial and estuarine receptors were selected to include a wide array of species with varied feeding habits and requiring both large and small habitats. Potential impacts to terrestrial plants, terrestrial soil invertebrates, and estuarine or benthic invertebrates were also evaluated. Fish were evaluated as components of the aquatic food chain modeling for omnivorous and carnivorous estuarine receptors.

The ecological evaluation also included laboratory toxicity testing of two benthic macro-invertebrate species (an insect larva and an amphipod) that live in sediment, analyses of tissue data for benthic macro-invertebrates exposed to sediments collected from tidal mud flats at the Site, and analyses of fish tissue collected directly from tidal mud flats at the Site. The results of the toxicity testing indicated that chemicals present in the sediments are unlikely to cause adverse effects to benthic macro-invertebrates (Golder, 2008).

The fish and macro-invertebrate tissue data were also used to evaluate risks across the food chain. A food chain model was developed and used to evaluate the higher trophic level species (e.g., mink, sandpiper, and heron) which feed on estuarine fish and invertebrates. Food chain modeling was conducted following USEPA technical guidelines and equations.

Table 3 – Selected Terrestrial and Estuarine Receptors

Receptor	Type	Diet	Home Range	Exposure Pathways
Terrestrial Receptors				
Eastern Cottontail	Mammal	Herbivore	Small	Ingestion of plants and soil
Short-tailed Shrew	Mammal	Insectivore	Small	Ingestion of plants, soil invertebrates, and soil
Terrestrial Raccoon	Mammal	Omnivore	Large	Ingestion of plants, soil invertebrates, small mammals, and soil
Red Fox	Mammal	Carnivore	Large	Ingestion of plants, soil invertebrates, small mammals and soil
Canada Goose	Bird	Herbivore	Large	Ingestion of plants and soil
American Robin	Bird	Omnivore	Small	Ingestion of plants, soil, and soil invertebrates
Red-tailed Hawk	Bird	Carnivore	Large	Ingestion of small mammals and soil
Terrestrial Plants	Plant	Not Applicable	Small	Uptake from soil
Soil Invertebrates	Invertebrate	Not Applicable	Small	Uptake from soil
Estuarine Receptors				
Estuarine Raccoon	Mammal	Omnivore	Large	Ingestion of plants, sediment invertebrates, and sediment
Mink	Mammal	Carnivore	Large	Ingestion of sediment invertebrates, fish and sediment
Mallard	Bird	Herbivore	Large	Ingestion of plants and sediments
Spotted Sandpiper	Bird	Insectivore	Small	Ingestion of sediment invertebrates and sediment
Black-crowned Night Heron	Bird	Omnivore	Large	Ingestion of sediment invertebrates, fish, plants, and sediment
Belted Kingfisher	Bird	Carnivore	Large	Ingestion of fish and sediments
Benthic Invertebrates	Invertebrate	Not Applicable	Small	Uptake from Sediment

Regulatory Standards

During the CMS process, the concentrations of chemicals in each CMS Area were compared to the PMPS, which were based on the CTDEP RSR criteria (for human receptors) and the Site ecological risk assessment (for ecological receptors). The RSR criteria for soil are based on potential human health risks from direct contact to contaminated soils (i.e., I/C DEC) and on potential impacts to groundwater from contaminated soils (i.e., GB PMC). The ecological PMPS for soil are based on potential risks to terrestrial plants and wildlife populations that may contact the contaminated soil. The RSR criteria for groundwater are based on the potential degradation of adjacent surface water and protection of human and ecological receptors (i.e., the SWPC), and the potential risks to human health in future occupied buildings from volatilization of groundwater chemicals (i.e., the I/C VC). The ecological PMPS for sediment are based on potential ecological risks to estuarine wildlife. These PMPS were used to identify areas of the Site potentially needing remedial action.

Summary of Soil and Groundwater Concerns

Exceedances of the RSR criteria were observed in both soil and groundwater, indicating that potential risks exceed target goals for industrial/commercial use of the Site and for Unit 1 groundwater discharging to the Quinnipiac River should operation of the current groundwater extraction and treatment system be discontinued.

The following table identifies the receptors, pathways and estimates of human health risks based upon the 2001 SLRE. As the table shows, the proposed remedy controls all the identified exposure pathways of concern.

Table 4 – SLRE Estimates of Human Health Risk

Receptor	Pathways	Cancer Risk (ELCR)[1]	Non-Cancer Risk (HI)[2]	Proposed Remedy Addresses Exposure Pathway
Adolescent Trespasser	Incidental Ingestion of Soil	$2.7x10^{-4}$	No	Yes
Construction Worker	Ingestion of Soil	No	220	Yes
	Dermal Contact with Soil	No	67	Yes
	Inhalation from Soil	$1.5x10^{-4}$	3,010	Yes
	Incidental Ingestion of Groundwater	$3.5x10^{-4}$	7.5	Yes
	Dermal Contact with Groundwater	No	61	Yes
	Groundwater Vapor Inhalation	No	15	Yes
Future Indoor Worker	Inhalation from Soil	No	34	Yes
Maintenance/Patrol Worker	Ingestion of Soil	$5.1x10^{-4}$	No	Yes
	Ingestion of Groundwater	$1.6x10^{-4}$	No	Yes
	Dermal Contact with Groundwater	No	5.3	Yes
Landscaper	Ingestion of Soil	$2.1x10^{-4}$	6	Yes
	Dermal Contact with Soil	No	1.4	Yes

ELCR = Excess Lifetime Cancer Risk HI = Hazard Index

1 – A 'no' for Cancer Risk indicates that the calculated lifetime cancer risks are below the USEPA target risk goal of $1x10^{-6}$.

2 – A 'no' for Non-Cancer Risk indicates that the calculated non-cancer risks are below the USEPA target hazard index of 1.

Ecological protection levels (ePMPS) were also calculated for the chemicals of potential concern identified in soil (ePMPS Proposal; Golder, 2008). It was determined that contamination in surface soil in some areas of the Site may pose an unacceptable level of risk to terrestrial ecological receptors (the American Robin, Shrew and Eastern Cottontail). The proposed remedy for soils includes protective barrier covers for all of these areas and would thus eliminate the concern for unacceptable risks to terrestrial receptors.

Summary of Sediment Concerns

Sediments were also evaluated relative to human health risks. This evaluation concluded that the chemicals detected in portions of Tidal Flats 1 and 2 posed the greatest potential human health risk, but this risk was unlikely to exceed USEPA's target risk goal. Furthermore, it was concluded that once the proposed remedy is implemented and sediments from Tidal Flats 1 and 2 are removed, the potential risks would be safely below the USEPA and CTDEP target risk goals.

Although the laboratory toxicity testing and ecological risk assessments indicated adverse effects to ecological receptor populations are unlikely (Golder, 2008; Golder, 2010), sediment removal has been included in the proposed remedy to ensure an additional level of protection. The proposed remedy includes removal of contaminated sediments from Tidal Flats 1 and 2, and from a section of South Creek as a means to provide a high level of assurance that ecological receptors in the sediment will remain protected in the future. This ecological benefit would be achieved by removing sediment with the highest PCB concentrations and the highest concentrations of other bioaccumulative substances in a manner that would minimize physical damage to tidal wetland habitats.

5.0 PRIMARY REMEDIAL ACTION OBJECTIVES

The final remedy selected for the Site must address the following primary remedial action objectives as established by the RCRA 3008(h) Order and the results of the human health and ecological risk assessments:

- Protect human health and the environment by reducing or eliminating the potential for unacceptable human health and ecological risks based on anticipated future uses of the Site;
- Comply with CTDEP RSRs through exposure pathway elimination and DNAPL remediation;
- Provide source controls to mitigate further groundwater contamination from the DNAPL area and wastewater residuals on the east side of the Site;
- Address TSCA requirements for PCBs present at the Site;
- Complete RCRA unit closure for those units that have not yet received clean closure; and
- Facilitate reuse and redevelopment of portions of the property.

6.0 SUMMARY AND EVALUATION OF PROPOSED REMEDY AND ALTERNATIVES

6.1 Corrective Measure Alternative Development and Evaluation Process Overview

Developing a Site-wide remedy involved three key steps. First, a wide range of treatment, removal/disposal, and containment technologies were evaluated for DNAPL, soil/WWTR, groundwater, and sediment. In addition to conventional technologies, such as excavation and off-site disposal, the CMS considered innovative technologies such as in-situ thermal remediation, in-situ chemical oxidation, and in-situ soil flushing to address Site contaminants. In total, the CMS considered:

- 25 soil/WWTR and DNAPL remediation technologies including 59 process options;
- 18 groundwater remediation technologies including 37 process options; and,
- 7 sediment remediation technologies including 19 process options.

Next, sixty-two (62) CMS Area-specific alternatives for soil/WWTR and DNAPL were compiled and evaluated based on criteria identified in the RCRA Order. Finally, thirty-three (33) of these CMS Area-specific alternatives were retained and combined with the retained groundwater and sediment

technologies for use in the development of the five Site-wide Corrective Measure Alternatives (Alternatives or CMA) described below.

6.2 Description of Site-wide Alternatives

The CMS contains a detailed description of each of the five Site-wide Alternatives. In addition to the remedy proposed in this Statement of Basis (Site-wide Corrective Measure Alternative 4, or Alternative 4), the other Site-wide Alternatives evaluated in the CMS include:

Alternative 1: This alternative is a baseline "no action" alternative, which includes only inspection and maintenance of current RCRA covers and groundwater monitoring. This alternative provides a baseline for comparison with the other proposed remedies.

Alternative 2: This alternative is a No Further Action alternative and includes continuing the current Site stabilization efforts, including the following:

- OM&M of the existing perimeter groundwater extraction and treatment system;
- Inspection and maintenance of existing covers;
- Continuation of 24-hour Site security; and
- Continuation of Site-wide management procedures and health and safety protocols.

Alternative 3: This alternative focuses on containment and includes the following components:

- Unit 1 groundwater hydraulic control system consisting of a subgrade low-permeability vertical barrier, groundwater extraction and treatment systems, and long-term monitoring;
- Monitoring of Units 3 and 4 groundwater;
- Containment of the DNAPL source area via a subgrade low-permeability vertical barrier, DNAPL extraction through wells and off-site disposal, and interior groundwater extraction and treatment;
- Stabilization of both the North and South Piles;
- Protective barrier cover systems across the Site, including asphalt pavement for the west side and vegetated soil cover or low permeability cover systems for the east side;
- Site-wide source controls to facilitate natural recovery of sediment concentrations and monitoring of sediments in Tidal Flats 1 and 2 and in a small section of the South Creek;
- Surface water detention basins in east side areas to manage surface water runoff from the west side and east side cover systems; and,
- Institutional controls to prohibit residential use of the Site and potable use of groundwater, require vapor controls and monitoring for any new west side buildings, and prevent the disturbance or demolition of any engineered controls;
- Long-term OM&M to ensure future effectiveness of remedial components.

Alternative 4: Alternative 4 is the proposed remedy as more fully described in Section 2.0 of this Statement of Basis and shown on Figure 5. This alternative includes the same remedial components as

Alternative 3 (except DNAPL and sediment components) and includes the following additional remedial components:

- Treatment of DNAPL source area using liquid DNAPL extraction and off-Site incineration and in-situ thermal remediation of DNAPL impacted soils;
- Facilitation of reuse and redevelopment of the west side;
- More extensive removal of impacted soil from CMS Areas E-1 and E-2 to create enhanced wetland habitats and use of these soils to stabilize side slopes of the North Pile and to compress South Pile WWTR and promote better surface water drainage off the South Pile;
- Regrading the top of North Pile to maintain or reduce its height;
- Enhancement of the east side ecological habitat, including creation of higher value uplands in all east side CMS Areas and higher value wetlands habitat in east side CMS Areas E-1, E-2 and E-3. Enhancements will also include aesthetic visual screening of the piles;
- Construction of interpretative walking trails for environmental education and group tours of the enhanced habitats, and maintenance of the eastern portions of the site as an ecological preserve;
- Removal of sediment from Tidal Flats 1 and 2, and a small stretch of South Creek and consolidation of the sediments below a low-permeability cover system near the North Pile.

Alternative 5: This alternative includes the same remedial components as Alternative 4 (except for the DNAPL and sediment components) and includes the following additional remedial components:

- Excavation of DNAPL impacted soil/WWTR and DNAPL, off-site transportation and disposal of DNAPL and highly contaminated soils/WWTR (via incineration) and on-site reuse of less contaminated soil/WWTR as backfill in the base of the excavation;
- Extensive excavation of soils from Areas E-1 and E-2 and consolidation of excavated material in other areas of the Site, including the North and South Piles; and
- Extensive removal and on-site consolidation of sediment from Tidal Flat 1, along with monitoring of sediments in Tidal Flat 2 and in a small section of the South Creek.

6.3 Evaluation of Proposed Remedy and Alternatives

A detailed evaluation of the five Site-wide Alternatives was completed with respect to the following nine criteria listed in the RCRA 3008(h) Order:

- Overall protectiveness of human health and the environment;
- Attainment of media protection standards;
- Control of source releases;
- Compliance with waste management standards;
- Long-term reliability and effectiveness;
- Reduction of toxicity, mobility, and/or volume through treatment;
- Implementability;
- Short-term effectiveness (including carbon footprint); and,
- Cost effectiveness.

The first three criteria (overall protectiveness of human health and the environment, attainment of media protection standards, and control of source releases) are Performance Standards or threshold criteria that must be satisfied before an alternative can be considered for selection. The remaining six criteria represent Balancing Criteria upon which the comparative analysis of Alternatives is primarily based. Table 5 summarizes the evaluations of Alternatives 1 through 5 based on the RCRA Order criteria, which are described below.

Alternatives 1 and 2 do not satisfy the three Performance Standards and, therefore, are not considered to be viable Alternatives. Alternatives Nos. 3, 4 and 5 all satisfy the Performance Standards and address all potential Site risks and exposure pathways of concern through the use of different remedial components. As required by the USEPA RCRA 3008(h) Order, the alternatives were further evaluated with respect to the six Balancing Criteria to determine which alternative is best suited for the Site. Because Alternatives 1 and 2 do not meet the Performance Standards, the Balancing Criteria evaluation focused on Alternatives 3, 4 and 5. The results of the Balancing Criteria evaluation are summarized below. Alternative No.4 is recommended because it would provide the highest level of overall performance with respect to the six Balancing Criteria.

Compliance with Waste Management Standards

Alternatives 3, 4 and 5 would all comply with waste management standards as they all would manage impacted soil/WWTR remaining on-site in accordance with the applicable requirements of 40 CFR Part 265, the equivalent requirements of RCSA Section 22a-449(c)-105, and in accordance with a CTDEP approved Engineered Control Variance under RCSA Section 22a-133k-2(f). Alternatives 3, 4, and 5 would all include on-Site consolidation of excavated soil beneath the low permeability covers at the Site. Alternatives 4 and 5 include on-site consolidation of dredged sediment beneath the low permeability cover of the North Pile. On-site consolidation of soil and sediment would be done as part of a Site-wide area of contamination designation consistent with the preamble to the National Contingency Plan (55 FR 8758-8760, March 8, 1990) and all relevant guidance.

Table 5. Summary of Alternative Evaluation

USEPA Alternative Evaluation Criteria	Alternative No. 1	Alternative No. 2	Alternative No. 3	Alternative No. 4	Alternative No. 5
Performance Standards (Threshold Criteria)					
Overall Protectiveness of Human Health and the Environment	○	◐	●	●	●
Attainment of Media Protection Standards	○	○	●	●	●
Control of Source Releases	○	◐	●	●	●
Balancing Criteria					
Compliance with Waste Management Standards	○	○	●	●	●
Long-Term Reliability and Effectiveness	○	◐	●	●	●
Reduction of Toxicity, Mobility, and/or Volume through Treatment	○	◐	◐	●	●
Implementability	○	○	●	●	◐
Short-Term Effectiveness	●	●	●	●	◐
Cost (in $ Millions)	$2.9	$75	$105	$144	$190

Legend:
The CMS evaluation of alternatives determined that:

○ **Alternative does not satisfy USEPA criteria**

◐ **Alternative partially satisfies USEPA criteria**

● **Alternative satisfies USEPA criteria**

Long-Term Reliability and Effectiveness

The long-term effectiveness of Alternatives 3, 4, and 5 was evaluated for separate components of the proposed remedy. The following section includes separate discussions regarding DNAPL, soil and groundwater, and sediments.

Alternatives 3, 4 and 5 would all provide a high degree of reliability and long-term effectiveness for addressing DNAPL. Both Alternatives 4 and 5 would permanently remove and/or destroy the majority of the DNAPL chemical mass via ISTD treatment (Alternative 4) or excavation and off-site disposal (Alternative 5). Alternative 3 provides some chemical mass removal via liquid DNAPL extraction and containment for the remaining chemical mass.

Alternatives 3, 4, and 5 would each provide a high degree of reliability and long-term effectiveness for protecting human health and the environment from impacted soils and groundwater. The cover systems,

groundwater perimeter hydraulic controls, groundwater treatment, pile sideslope stabilization and flood water scour protection measures proposed in all three alternatives have been used reliably and effectively as part of the remediation of many sites throughout the U.S.

Alternative 4 would provide a greater degree and assurance of long-term protection of ecological receptors than Alternatives 3 and 5. Alternative 4 would accomplish this by removing sediment from Tidal Flat 1, Tidal Flat 2 and a short stretch of South Creek that contains more of the highest concentrations of PCBs and other bioaccumulative chemicals. As a result, Alternative 4 would remove more sediment contaminants while disturbing less than one-half the tidal wetland habitat than would be disturbed by Alternative 5.

In summary, Alternatives 4 and 5 both provide an equivalent degree of long-term reliability and effectiveness for protecting human health and the environment with respect to soil, DNAPL, and groundwater. However, Alternative 4 provides a greater degree of reliability and long-term effectiveness with respect to the protection of sediment ecological receptors than Alternative 5. The long-term reliability and effectiveness of Alternative 3 is slightly lower than that for Alternatives 4 and 5 since it relies on the long-term operation of a DNAPL containment and collection system, and long-term monitoring of sediments.

6.4 Reduction of Toxicity, Mobility, and/or Volume Through Treatment

Alternatives 3, 4, and 5 would all provide reduction of toxicity, mobility, and/or volume through DNAPL removal (Alternative 5), treatment (Alternative 4) and/or containment (Alternative 3). Alternatives 4 and 5 provide greater reduction of chemical mass as compared to Alternative 3. Table 6 below summarizes the estimated chemical mass removal that would occur from the initial construction/implementation of each the five remedial alternatives through the first year of OM&M.

Table 6. Approximate Chemical Mass Removal

Alternative	Chemical mass removal (initial plus 1st year) (kg)
No. 1	3,000
No. 2	6,345
No. 3	9,910
No. 4	111,660 to 135,660
No. 5	138,660

Implementability

Alternative 5, which includes excavation and off-site disposal of DNAPL and DNAPL-impacted soil/WWTR, would be extremely difficult to implement. Excavation of the very contaminated material in the DNAPL area would require excavation supports; an enclosure over the excavation areas or other means to control air emissions; protection of on-Site remediation workers with protective suits and supplied air respirators; an enclosed area for handling and/or treating excavated soils; and collection and

treatment of exhaust air from the enclosure using high capacity air emissions control equipment. Limited capacity at off-site disposal facilities would lengthen the period of time required to implement this alternative. This work would likely require use of much of the west side of the Site, which would limit access to the remaining portions of the Site and delay implementation of other corrective measure components. In addition, Alternative 5 would include on-site consolidation of a very large volume of soil excavated from CMS Areas E-1 and E-2 (over 100,000 cubic yards). This soil would have to be consolidated on the west side of the Site or adjacent to the North and South Piles, which would increase the footprint and/or raise the height of the North and South Piles.

Alternatives 3 and 4 would be significantly easier to implement than Alternative 5. The most challenging implementability issue associated with Alternative 4 involves the use of a patented in-situ thermal remediation technology (i.e., in-situ thermal desorption or ISTD) that would require pilot testing, may require a TSCA demonstration for the vapor treatment train, and would require a CTDEP air permit.

Short-Term Effectiveness

The short-term effectiveness of Alternatives 3, 4, and 5 were evaluated for separate components of the proposed remedy. The following section includes separate discussions regarding cover and containment systems, DNAPL remediation, and sediment remedy.

With respect to the construction of cover and containment systems, Alternatives 3, 4, and 5 would result in an equivalent degree of short-term impacts to the community, on-site workers and Site terrestrial habitats. Noise levels from trucks and heavy equipment during on-site construction are not expected to be disruptive to the community since the Site is isolated from residential communities by the railroad tracks, the Quinnipiac River, and other industrial commercial properties. The community would experience short periods of increased truck traffic during time periods when transportation of construction materials to the Site are concentrated.

The excavation and off-site transportation and disposal of DNAPL and DNAPL-impacted soil/WWTR associated with Alternative 5 would have a much greater potential for adverse impacts to the community (release of odors and vapors, increased truck or rail traffic, potential releases during transportation, and increased duration) and to Site workers (health and safety concerns for working in temporary enclosures and numerous DNAPL handling operations) as compared with Alternatives 3 and 4.

The sediment remedial activities associated with Alternative 3 (monitoring) would result in the least adverse short-term ecological impacts. Sediment remedial activities associated with Alternative 5 would result in the greatest adverse short-term ecological impacts due to extensive excavation of sediments from much of the Tidal Flat 1.

In summary, Alternative 5 would have the greatest potential to result in significant adverse short-term community, Site workers, and ecological impacts due to the excavation and off-site disposal of the

DNAPL area and the extensive disturbance of estuarine sediment habitat. Alternative 3 would have the least potential to cause adverse short-term impacts to the community, Site workers, and the environment, followed by Alternative 4.

The estimated relative carbon footprint associated for each Alternative (expressed in terms of tons of CO_2 produced) is summarized below in Table 7:

Table 7. Estimated Carbon Footprint

Alternative	Estimated Relative Carbon Footprint (tons CO_2)
No. 1	0
No. 2	26,790
No. 3	24,430
No. 4	28,930 to 35,200
No. 5	38,920

As shown in Table 7, Alternative 5 would result in the greatest amount of greenhouse gas emissions, expressed as tons of CO_2, compared with the other alternatives.

6.5 Cost Effectiveness

The total estimated cost (construction plus 30 years of annual OM&M) in 2008 dollars and first year mass reductions are summarized below for each Site-wide CMA in Table 8 below:

Table 8. Estimated Cost and Chemical Mass Removal

Alternative	Total Estimated Cost	Chemical Mass Removed (initial plus 1st year) (kg)
No. 1	$2,933,000	3,000
No. 2	$74,467,000	6,345
No. 3	$104,590,000	9,910
No. 4	$143,937,000	111,660 to 135,660
No. 5	$190,256,000	138,660

6.6 Summary of Proposed Alternative Evaluation

In summary, Alternative 4 does the best job of fully achieving the performance standards (i.e. overall protectiveness of human health and the environment, attainment of media protection standards, and control of source releases), while providing the best balance of long-term reliability and effectiveness; reduction of toxicity/mobility/volume through treatment; implementability; short-term effectiveness (including carbon footprint); and cost effectiveness. Finally, Alternative 4 allows the Site to be safely developed for beneficial use. The proposed remedy fulfills the required scope of the Corrective Action, achieves all of the identified remedial action objectives, and mitigates all potential exposure pathways and risks of concern at the Site as summarized below.

- The DNAPL area will be eliminated as a significant source of groundwater contamination by removing approximately 104,000 to 128,000 kg of chemical mass using ISTR. In addition, ISTR will render the minor amount of remaining chemical mass to a low solubility/low mobility state. Any minor residual impacts to groundwater will continue to decline through natural attenuation (biodegraded or adsorbed) and groundwater will continue to be collected and treated in the GWTF. The proposed remedy also meets the CTDEP requirement for containing and/or removing DNAPL to the "maximum extent prudent." Operation of the ISTR will be addressed in accordance with the TSCA PCB regulations under 40 CFR Part 761. Operational and monitoring conditions will be refined during field testing.
- Protective barrier and low-permeability cover systems will be constructed over all CMS Areas and, together with environmental land use restrictions (ELURs), will eliminate potential human and ecological direct contact exposures to soil/WWTR. Low permeability cover systems will also substantially reduce sources of groundwater contamination from the North and South Piles. Media protection standards will be achieved through exposure pathway elimination.
- RCRA Unit Closure requirements will be satisfied.
- Concentrations of PCBs in soil/WWTR greater than 1 ppm will be contained below protective soil barriers or low-permeability covers, and PCB impacts to groundwater downgradient of the DNAPL area will be significantly reduced. Any remaining contamination will be contained and treated by the perimeter hydraulic control system. Cleanup of the residual PCB impacts in soil/WWTR also will comply with the TSCA PCB regulations under 40 CFR Part 761.
- Impacts to groundwater will either naturally biodegrade, be adsorbed prior to reaching the Site perimeter, or be collected by the perimeter hydraulic control system and treated in the GWTF. The perimeter hydraulic control system will eliminate potential discharges of Unit 1 groundwater contamination to the Quinnipiac River and to North and South Creeks.
- Side-slope stabilization measures will be designed to contain the North and South Piles and provide a level of protection consistent with modern civil engineering projects, such as highway embankments and waste containment facilities. Erosion protection measures will be constructed at the base of the North and South Piles to protect against a 500-year flood event.
- Sediment will be removed from three areas that contain the highest concentrations of key Site-related chemicals in order to provide a net environmental benefit and a high level of long-term assurance that human health and ecological receptors will remain protected in the future.
- Following remedy construction, a long-term OM&M plan will be implemented to ensure that the remedy continues to protect human health and the environment in the future. Long-term inspection and maintenance will be performed to ensure the effectiveness of the covers and containment systems. Long-term groundwater monitoring will be performed to verify the effectiveness of the perimeter hydraulic control and treatment system. Units 3 and 4 groundwater will be monitored to assess continued compliance with the CTDEP RSR criteria.
- The proposed remedial alternative is consistent with commercial/light industrial reuse of the west side. Indoor air vapor barriers and monitoring will be implemented for any new buildings constructed on the west side.
- Ecological enhancements on the east side will include upland coastal grass and shrub land; new, higher value inland wetlands; upland/wetland transition zone; and enhancement to tidal wetland vegetation. The inland wetlands will serve two functions: ecological habitat and management of clean stormwater from the newly constructed cover systems. The east side will be designated as an ecological preserve with Pfizer as the primary caretaker and other community-based groups as key stakeholders. Public access will be provided for group tours, and educational and recreational purposes Following implementation of the remedy, Pharmacia & Upjohn would record deed restrictions that describe the ELURs to prohibit residential use and that will prevent disturbance of the final covers and other remedial components.

- Pharmacia & Upjohn will also provide financial assurance for implementation of the remedy and for the long-term OM&M activities to assure that the remedy is constructed, operated, monitored and maintained in a manner that will provide future protection of human health and the environment.

6.7 Final Remedy Selection and Implementation

Once the public participation process concludes, USEPA and CTDEP will select the final Site-wide remedy, taking into consideration any public comments received, and will communicate the final remedy for the Site. Following final remedy selection, USEPA and Pharmacia & Upjohn will enter into an updated RCRA Section 3008(h) agreement to complete the design and construction of the final remedy, and to implement OM&M procedures to ensure that the final remedy performs as intended. The agreement will include requirements for long-term financial assurance from Pharmacia & Upjohn to insure not only that funds will be available for construction of the remedy, but also for long-term operation and maintenance.

After construction of the final remedy, Pharmacia & Upjohn will perform long-term OM&M to maintain the effectiveness of remedy and maintain consistency with planned future beneficial use. Long-term groundwater monitoring will be conducted to assess and ensure the continued performance of the groundwater perimeter hydraulic control system. Operation of the GWTF will be conducted under a NPDES permit to protect adjacent surface waters. Inspection, maintenance, and repairs to the protective barrier and low-permeability cover systems and other remedial components will be performed. Institutional controls, including ELURs, will be implemented and monitored to ensure that residential and potable water uses are prohibited and future re-use activities do not disturb or interfere with the integrity and protectiveness of the final remedy.

7.0 PUBLIC PARTICIPATION

USEPA and CTDEP are soliciting input and comment from the community on the proposed remedy for the Pharmacia & Upjohn Company LLC Site. Comments are most helpful if they point out specific legal or technical issues associated with the proposed remedy. The USEPA and CTDEP have set a public comment period from June 20 through August 4, 2010 to encourage public participation in the process. The comment period includes a public informational meeting, at which USEPA and CTDEP will present this Statement of Basis, and accept both oral and written comments.

The USEPA and CTDEP invite the public to attend an informational meeting to be held on Wednesday, August 4, 2010 regarding the CMS Report and the proposed remedy to address the Pharmacia & Upjohn Site. Interested parties may attend a presentation concerning the CMS Report and proposed remedy, ask questions, and put their comments on the public record if they desire. The public meeting will consist of a presentation and a question and answer session, which will be held from 7:00 to 9:00 p.m.

The public meeting will be held at:

North Haven High School
221 Elm Street
North Haven, CT 06473

The public is also invited to comment on the CMS Report and the proposed remedy in writing. Written comments may be submitted to the USEPA and CTDEP contacts named below. All comments should be made within the 45-day public comment period, concluding on August 4, 2010.

Any person may submit a request in writing to CTDEP for a public hearing. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held whenever the CTDEP finds that the response to this notice indicates significant public interest. Requests for a public hearing must be submitted by interested parties no later than July 20, 2010 to the CTDEP contact given below.

All comments received within the public notice period will be considered in the final decision regarding approval or disapproval of the proposed remedy.

The public can find additional information regarding the Site at: http://www.upjohnnorthhaven.com/.

The CMS Report and other related documents may be found at the North Haven Memorial Library, which is located at 17 Elm Street, North Haven, CT 06473. For directions and library hours, see http://www.leaplibraries.org/nhaven/.

At the end of the public comment period, USEPA and CTDEP will review all written comments received and the oral comments given at the public meeting and hearing. USEPA and CTDEP will write a summary and response to all comments. The Response to Comments will be incorporated into the Administrative Record for the Pharmacia & Upjohn Company LLC Site. USEPA and CTDEP can modify the proposed final remedy, or select another remedy based on technical or legal issues brought up by the community's comments.

To send written comments, or obtain further information, contact:

USEPA Contact

Mr. Robert O'Meara (OSRR07-3)
U.S. Environmental Protection Agency
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Email: omeara.bob@epa.gov

CTDEP Contact

Mr. Gennady Shteynberg
Remediation Division
Connecticut Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Email: gennady.shteynberg@ct.gov

8.0 GLOSSARY

Administrative Record – Collection of documents (reports, correspondence, etc.) that form the basis for the remedy selection

Areas of Environmental Concern (AEC) – Area of a property that may be contaminated as a result of previous activities.

Carbon Footprint – Measure of the greenhouse gas emissions caused by an activity such as the remedy alternatives. For simplicity, it is expressed in terms of the amount of carbon dioxide for comparable remedial activities.

Corrective Measures Study (CMS) – Report that evaluates alternatives for cleanup of RCRA contaminated sites.

Dense Non-Aqueous Phase Liquid (DNAPL) – Liquid that is heavier than water and remains in a separate phase and does not entirely dissolve in water.

Environmental Land Use Restrictions (ELURs) – Easement granted to the Commissioner of the CTDEP by the property owner and is recorded on the municipal land records. The purpose of an ELUR is to minimize the risk of human exposure to pollutants and hazards to the environment by preventing specific uses or activities at a property. An ELUR is a tool which permits the remedial goals for a property to be dependent on the exposure risk associated with its use

GB Groundwater - Groundwater defined by CTDEP as being within a historically highly urbanized area or an area of intense industrial activity and where public water supply service is available. Such ground water is presumed not be suitable for human consumption without treatment due to waste discharges, spills or leaks of chemicals or land use impacts.

Groundwater Treatment Facility (GWTF) – Existing treatment facility at the Site that removes contaminants from extracted groundwater prior to discharge to the Quinnipiac River in accordance with a CTDEP NPDES permit.

Interim Remedial Measures (IRM) – Actions taken prior to a final remedy decision to protect human health and the environment by controlling the spread or release of contaminants to the environment.

In-situ Thermal Desorption (ISTD) – In-situ remediation technology that simultaneously applies heat and vacuum to remove contaminants from subsurface soil/WWTR located above and/or below the water table, without the need for excavation. Contaminants removed from soil/WWTR are treated in an above ground vapor treatment system.

National Pollutant Discharge Elimination System (NPDES) Permit – Permit issued from CTDEP that allows and requires monitoring of the discharge of treated groundwater extracted from the Site to the Quinnipiac River.

Operation, Monitoring and Maintenance (OM&M) – Continuing activities to operate installed corrective measures, monitor the continued effectiveness of the corrective measures, including groundwater monitoring, and the maintenance and repair, as needed, of the remedy components.

Polychlorinated Biphenyls (PCBs) – Class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl, which is a molecule composed of two benzene rings. PCBs were widely used for many applications, especially as dielectric fluids in transformers, capacitors, and coolants. Due to PCB's toxicity and classification as a persistent organic pollutant the current use of PCBs, the disposal of PCB containing materials, and remediation of sites contaminated with PCBs is regulated by TSCA.

Preliminary Media Protection Standards (PMPS) – Screening values used during the CMS to evaluate the potential effectiveness of a technology or alternative to address Site conditions.

Remediation Standard Regulations (RSRs) – CTDEP regulations governing the requirements for remediation of contaminated sites.

Resource Conservation and Recovery Act (RCRA) – This law regulates the management and disposal of hazardous wastes. RCRA, in Section 3008(h), also authorizes the federal government to respond directly to releases of hazardous waste which may be a threat, or potential threat, to public health or the environment.

RCRA Facility Investigation (RFI) – Investigation to determine the nature and extent of contamination at a facility. The scope of an RFI can vary widely from a small specific activity to a complex study. If evaluation of the results indicate that remediation may be necessary, a Corrective Measures Study would be the next step.

Risk Assessment – Formal process to evaluate the hazards presented by environmental conditions at the Site.

Statement of Basis – Document presenting the proposed remedy for a facility to the public. The Statement of Basis provides a brief summary of the facility conditions, potential risks, and alternatives studies in the detailed analysis phase of the CMS.

Toxic Substances Control Act (TSCA) – This law provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. The TSCA includes specific requirements concerning the production, importation, use, and disposal of several chemicals including polychlorinated biphenyls (PCBs). The TSCA PCB regulations are found at 40 CFR Part 761.

Waste Water Treatment Residuals (WWTR) – Sludge-like material generated from the treatment of chemical manufacturing process wastewaters. In general, WWTR consists of spent powdered activated carbon and biological solids from the previous aerated biological treatment processes and acid neutralization sludges from the addition of lime and other chemicals to acidic wastewaters.

9.0 REFERENCES

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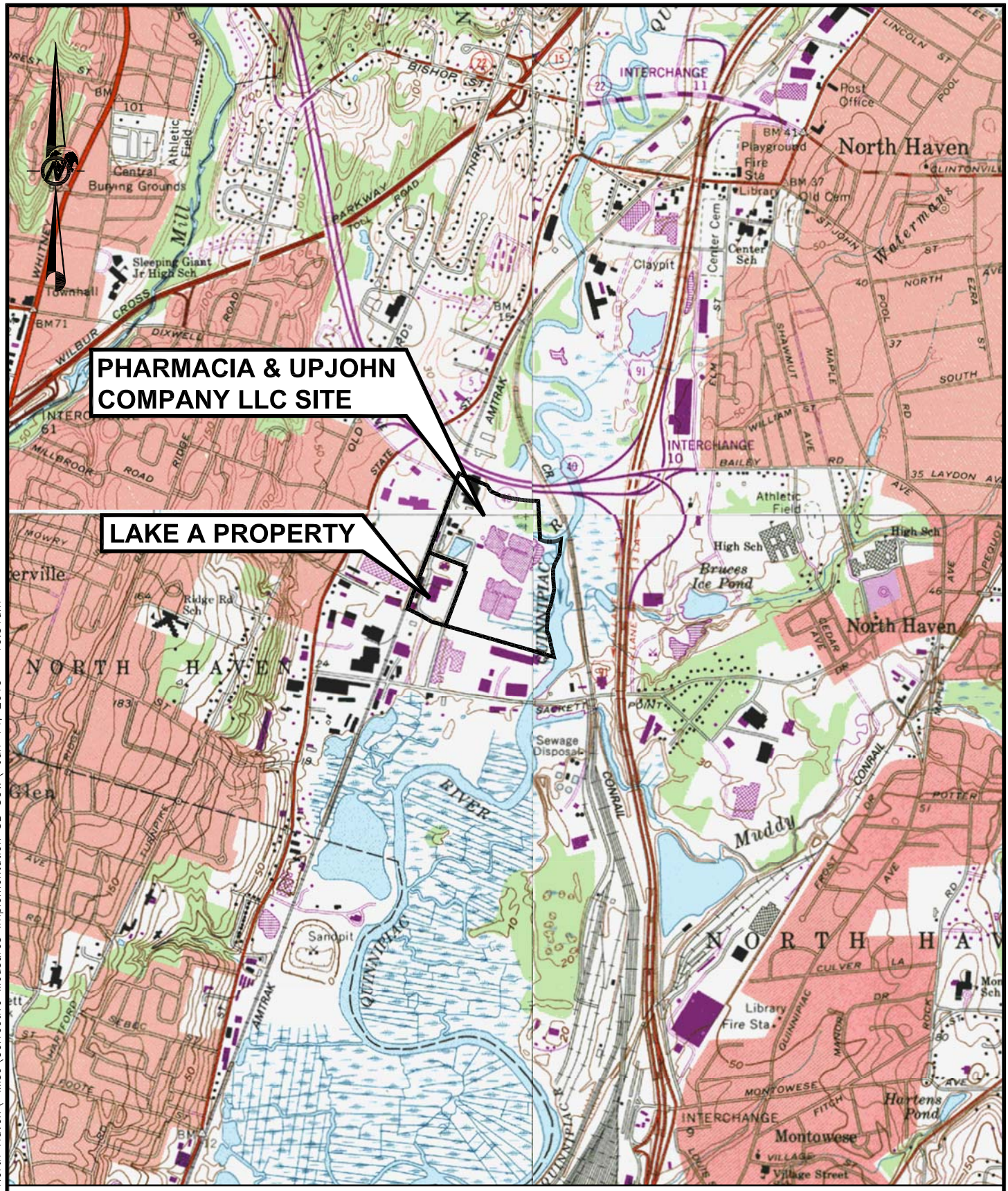

SITE LOCATION MAP

PHARMACIA & UPJOHN COMPANY LLC SITE

FIGURE 1

Golder Associates
Mt. Laurel, New Jersey

PROJECT No. 033-6231 FILE No. FIGURE 1 CADD AM DATE 06/11/10

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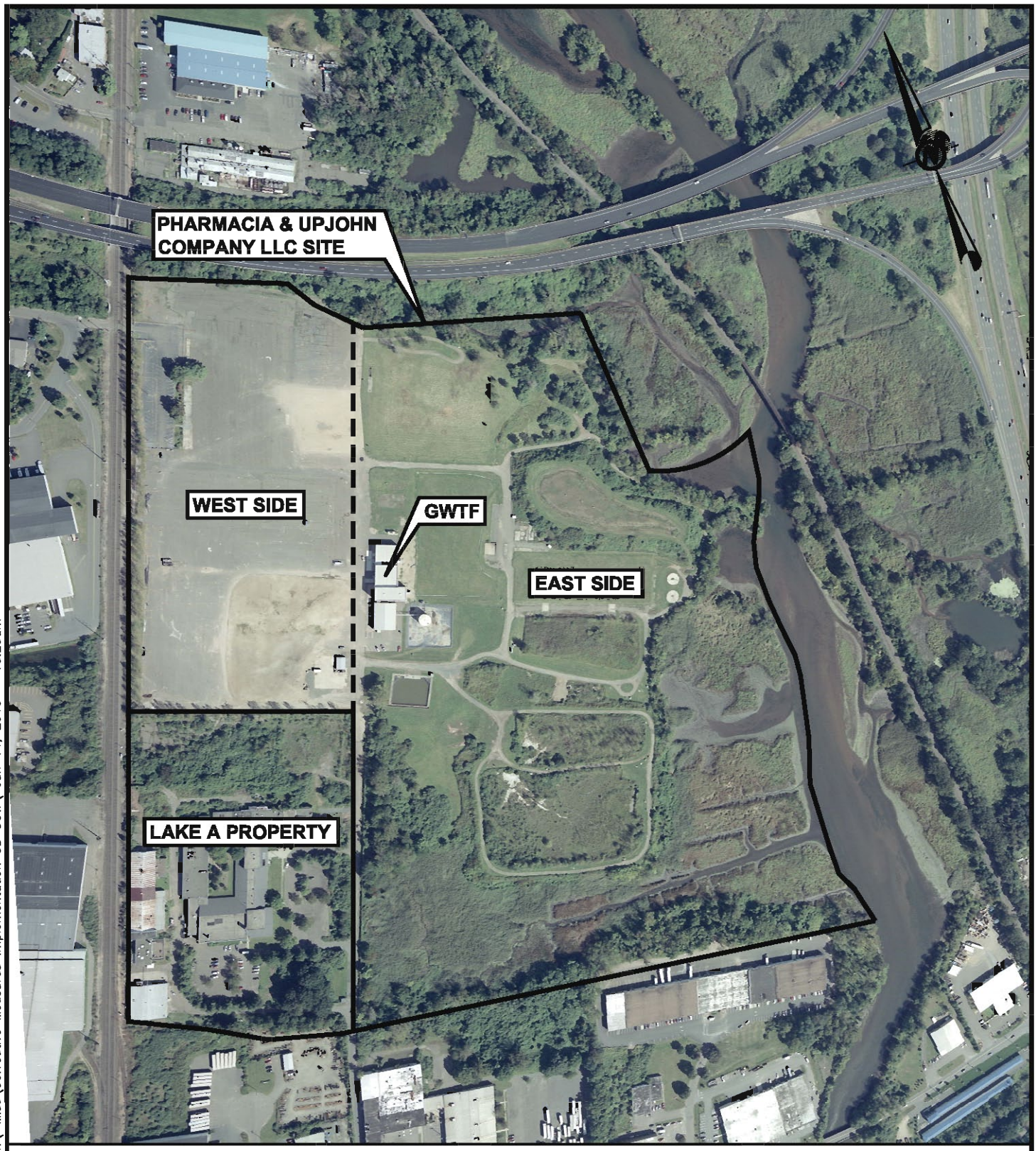

LEGEND

———	APPROXIMATE SITE BOUNDARIES
GWTF	GROUNDWATER TREATMENT FACILITY

Golder Associates
Mt. Laurel, New Jersey

2009 AERIAL PHOTOGRAPH

PHARMACIA & UPJOHN COMPANY LLC SITE

FIGURE 2

PROJECT No. 033-6231 FILE No. FIGURE 2 CADD AM DATE 06/11/10

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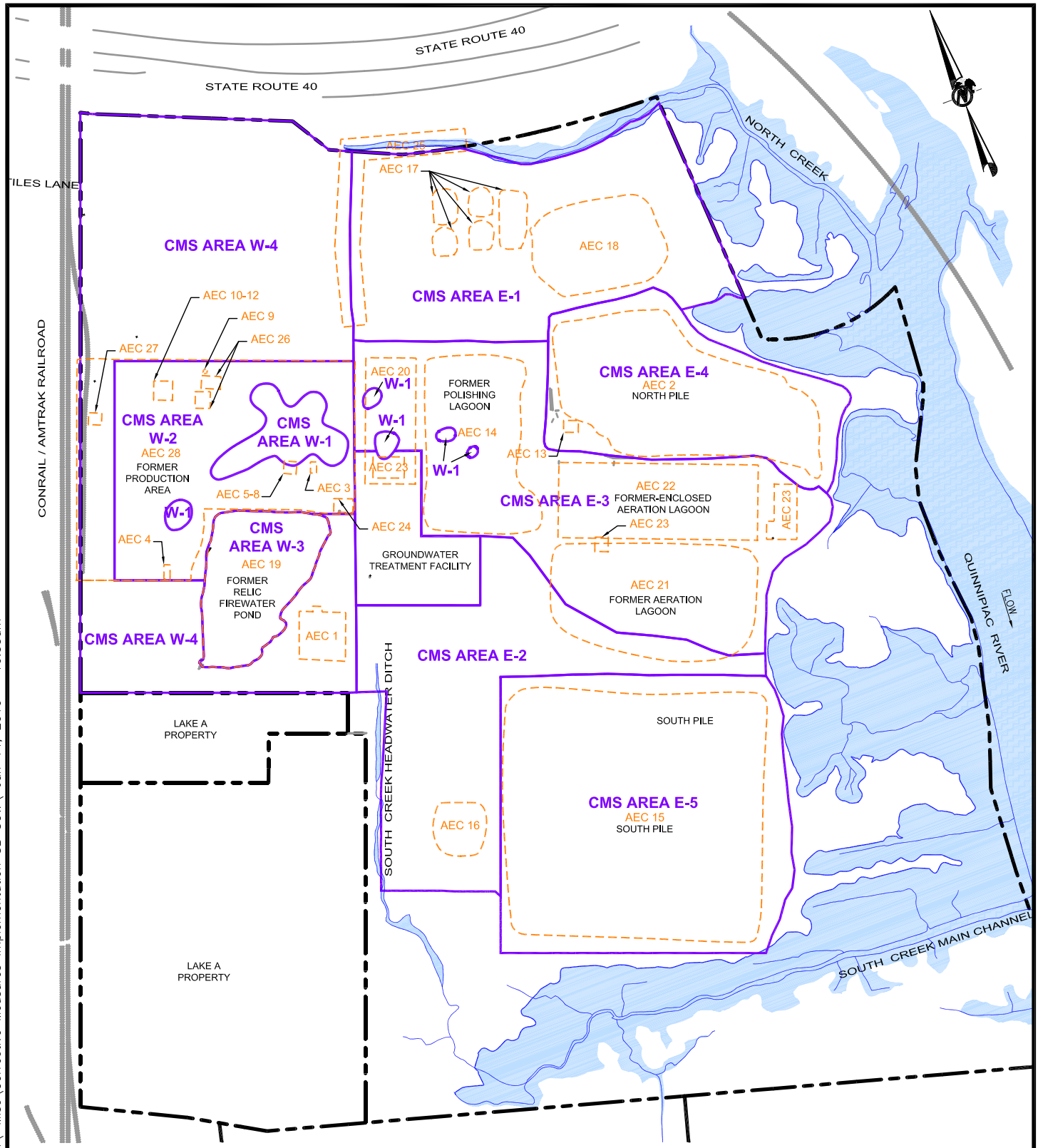

LEGEND

- SITE BOUNDARY
- AEC BOUNDARIES AS DEFINED DURING RFI
- CMS AREA GROUPINGS
- SURFACE WATER

300 0 300

SCALE FEET

LOCATION OF AECs AND CMS AREAS

PHARMACIA & UPJOHN COMPANY LLC SITE

FIGURE 3

Golder Associates
Mt. Laurel, New Jersey

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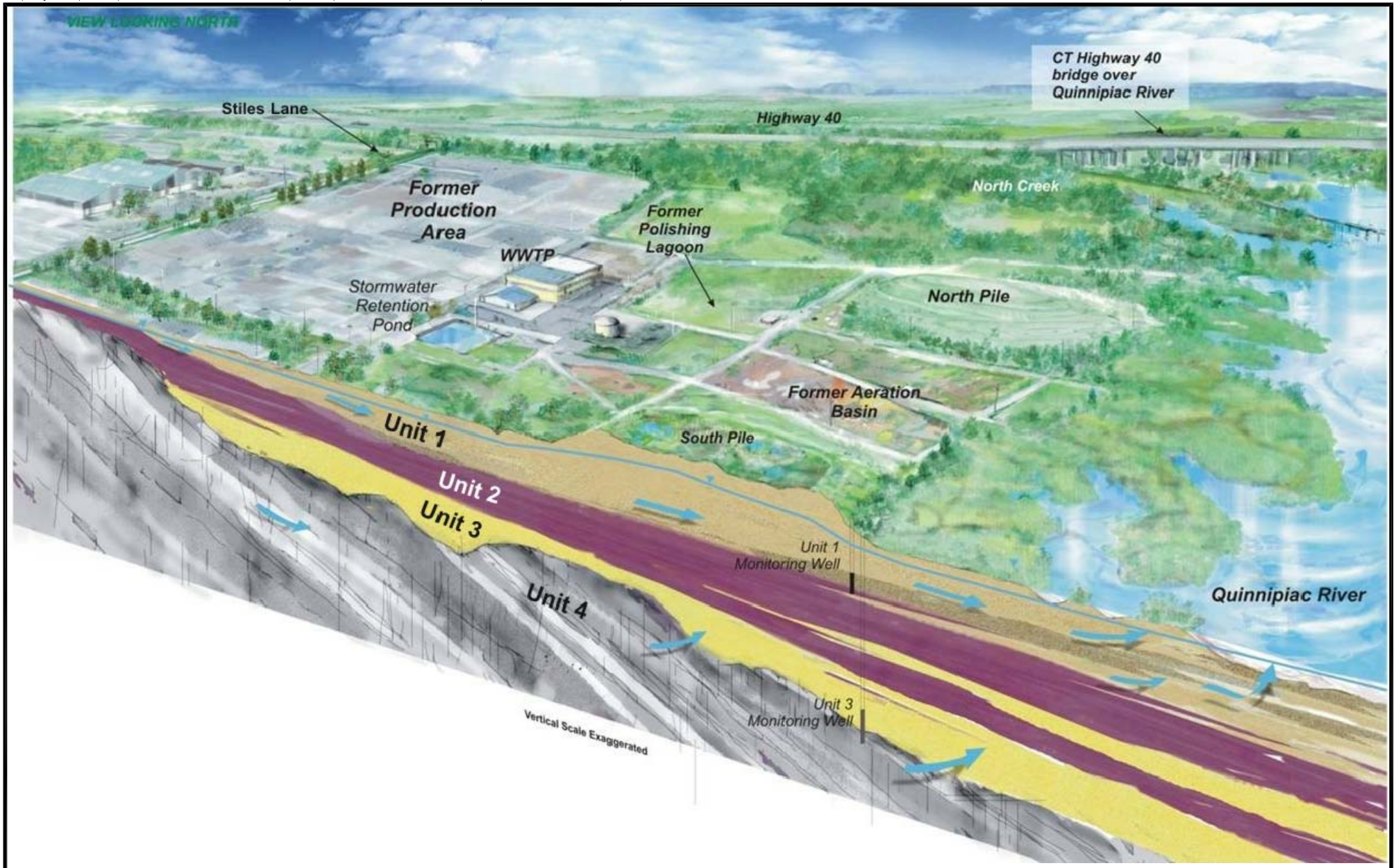


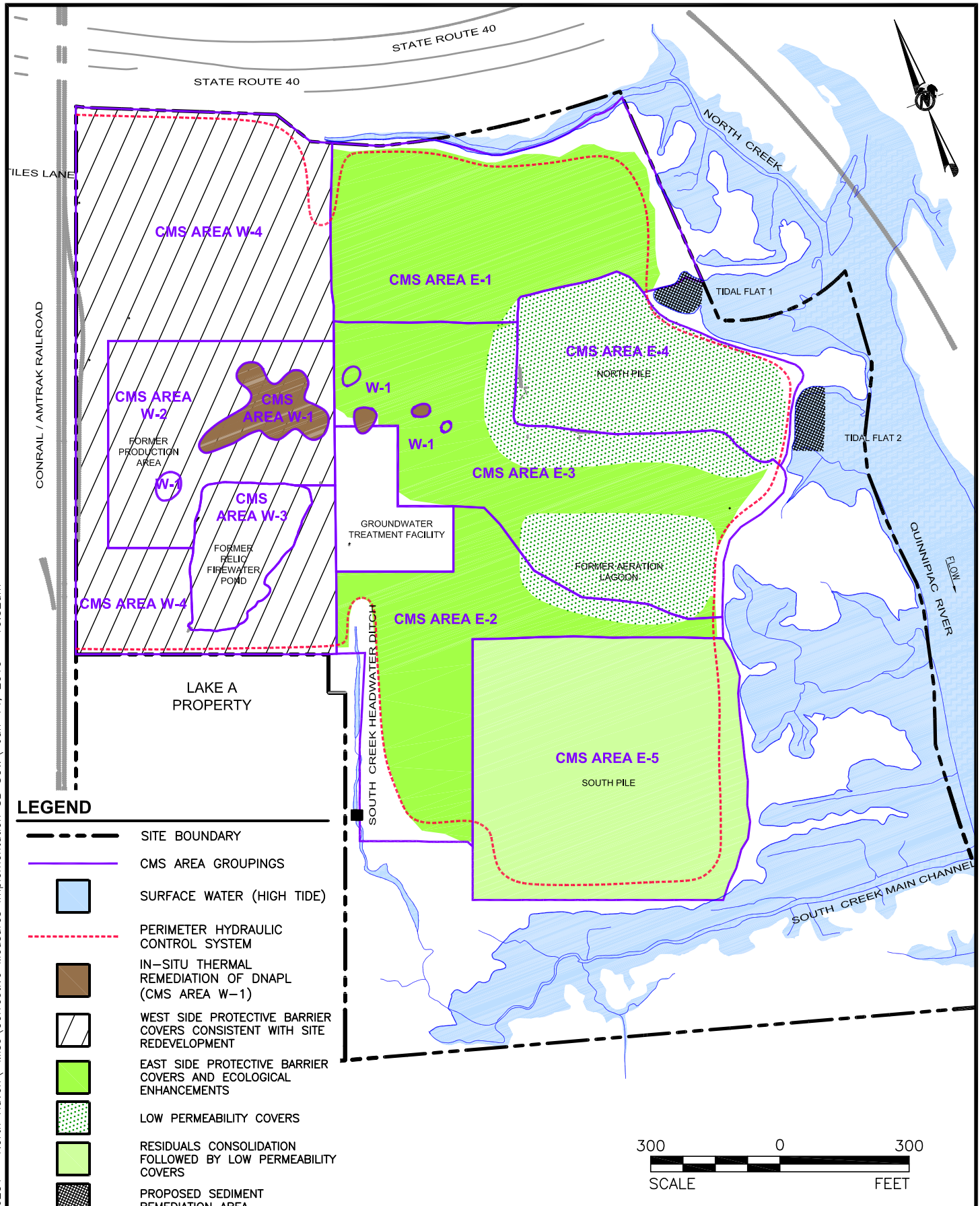
Golder Associates
Mt. Laurel, New Jersey

HYDROGEOLOGIC UNITS

PHARMACIA & UPJOHN COMPANY LLC SITE

FIGURE 4

PROJECT No. 033-6231 FILE No. FIGURE 4 CADD AM DATE 06/11/10



CONCEPTUAL DIAGRAM OF SELECTED CORRECTIVE MEASURES

PHARMACIA & UPJOHN COMPANY LLC SITE

FIGURE 5

Golder Associates
Mt. Laurel, New Jersey

PROJECT No. 033-6231 FILE No. FIGURE 5 CADD AM DATE 06/11/10

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