SUBMITTED TO:
WDNR
3911 Fish Hatchery Road
Fitchburg, WI 53711

BY:
Shannon & Wilson, Inc.
6506 Schroeder Road,
Suite 201
Madison, WI 53711

(608) 442-5223
www.shannonwilson.com

SOURCE CONTROL TECHNOLOGY REVIEW

Hacco, Inc.

RANDOLPH, WISCONSIN

SHANNON & WILSON

October 15, 2019

Shannon & Wilson No: 103913-001

Submitted To: WDNR
3911 Fish Hatchery Road
Fitchburg, WI 53711
Attn: Ms. Janet DiMaggio

Subject: SOURCE CONTROL TECHNOLOGY REVIEW, HACCO, INC., RANDOLPH, WISCONSIN

Attached is our Source Control Technology Review Report for the Hacco, Inc. facility in Randolph, Wisconsin.

Please call (608-442-5223) or email (dpt@shanwil.com) with any questions.

Sincerely,

SHANNON & WILSON, INC.

David P. Trainor

David P Trainor, PE, PG
Vice President

DPT:DAN/dpt

c: Shane Fitzwater, Neogen

Digitally signed by David P. Trainor
DN: cn=David P. Trainor, o=Shannon & Wilson, ou=Shannon & Wilson, email=dpt@shanwil.com, c=US
Date: 2019.10.15 11:06:01 -05'00'

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Important Information

ACRONYMS

µg/kg	micrograms per milligram
AUS	Additional and Uncharacterized Sites
BAM	bioavailable absorbent media
bgs	below ground surface
BRRTS	Bureau of Remediation and Redevelopment Tracking System
CMS	Corrective Measures Study
COC	Contaminant of Concern
cy	cubic yard
DBCP	dibromo chloropropane
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
EE/CA	engineering evaluation/cost estimate
ERP	Environmental Repair Program
ES	enforcement standard
ESD	Explanation of Significant Differences
HAL	Health Advisory Level (Wisconsin/USEPA)
HWFI	Hazardous Waste Facility Investigation
IC	institutional control
ISCO	in situ chemical oxidation
ISS	in situ stabilization
ISTT	in situ thermal treatment
LCS	leachate collection system
LTTD	low-temperature thermal desorption
LUST	leaking underground storage tank
mg/g	milligrams per gram
MMSD	Milwaukee Metropolitan Sewerage District
NA	natural attenuation
NPL	National Priorities List
OM&M	operation, maintenance, and monitoring
OU	operational unit
P&T	pump and treat
PCBs	polychlorinated biphenyls
PCP	pentachlorophenol
PRP	potential responsible party
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROW	right-of-way
SET	solvated electron technology

ACRONYMS

SVE	soil vapor extraction
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
TCE	trichloroethene
TCH	thermal conductive heating
USEPA	U. S. Environmental Protection Agency
UV	ultraviolet
VOC	volatile organic compound
WDNR	Wisconsin Department of Natural Resources
WiDATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
ZVI	zero valent iron

1 INTRODUCTION

1.1 Site Description

The Hacco facility address is 110 Hopkins Drive, Randolph, Wisconsin (the Site). It is within an industrial park at the southeast side of the Village of Randolph, at the eastern terminus of Hopkins Drive. As shown in Figure 1, the Site is within the southwest quarter of the northeast quarter, Section 6, Township 12 North, Range 13 East, Dodge County, Wisconsin.

Operations include offices, production, packaging, and warehouses congregated near the center of a narrow 16-acre parcel south of Hopkins Drive. Producing agricultural fields are to the northeast, east, and south. Pleasant Road and other agricultural fields are farther to the east, and a grain elevator is to the west. The Wisconsin Southern Railroad and associated right-of-way (ROW) bounds the southern property line. A residential Randolph neighborhood is farther to the southwest. Hacco also owns 8.5 acres north of Hopkins Drive that includes an additional warehouse and several smaller buildings. The Busse Steel Fabricators facility is north of Hopkins Drive and west of Hacco's northern extension. The facility layout and adjacent parcels are shown in Figure 2.

1.2 Site Physiography

The surface of the Hacco property is at a regional topographic high elevation of approximately 960 feet North American Vertical Datum. The surface is underlain by unconsolidated aeolian (wind-blown) and glacial deposits overlying sedimentary bedrock. The upper native unit consists of silty clay loess underlain by silty gravel and silty sand glacial till, which in turn is underlain by dolomite bedrock. The depth to bedrock varies non-uniformly from 9 to 30 feet below ground surface (bgs). The upper portions of the dolomite are weathered and fractured, varying from 7 to 22 feet thick. The upper dolomite is in turn underlain by successive sequences of Ordovician dolomite and sandstone and deeper Cambrian sandstone for several hundred feet.

The hydrogeology of the Site includes a water table unit within the drift-dolomite horizon and a deeper underlying sandstone. The water table unit is considered as one unconfined water-bearing zone, because the lower portion of the drift (lower drift) and upper portion of the dolomite bedrock units are in hydraulic connection. The upper drift and loess units are within the unsaturated zone above the seasonal high-water table. The upper portion of the dolomite unit is weathered, and groundwater flow is predominantly through fractures that decrease with depth.

The depth to groundwater within the drift-dolomite varies both spatially and seasonally. Groundwater elevations at the east side of the facility fluctuate from 12 to 36 feet bgs. During the seasonal high, the water table surface is within the drift, but during the seasonal low, the water table is within the underlying dolomite. Flow in the drift-dolomite horizon is dominated by a groundwater divide near the center of the Site at the plant area, which mimics surface topography. West of the divide, flow is toward the west and southwest. East of the divide, flow is toward the east and southeast.

Flow in the deep sandstone is predominantly toward the east, though a local potentiometric "mound" has been measured southeast of the main plant area. This mounding causes radial flow away from its center. Groundwater elevations within the sandstone fluctuate seasonally by several feet.

1.3 Site History and Background

Several subsurface investigations beginning in 1986 have characterized the nature and extent of contamination in soil and groundwater as described in previous annual reports. Contaminants include chlorinated and petroleum-based volatile and semi-volatile organic compounds (VOCs and SVOCs) along with organochlorine, organophosphate, and urea/carbamate agricultural chemicals. These findings led to a Resource Conservation and Recovery Act (RCRA) corrective action order with the U. S. Environmental Protection Agency (USEPA) in 1992, which was then transferred to the Wisconsin Department of Natural Resources (WDNR) in 1994.

Groundwater monitoring was initiated in 1992 in compliance with the May 22, 1992, Conditional Plan Approval under the RCRA Corrective Action Special Order. Additional wells were then installed in 1994 in accordance with the Hazardous Waste Facility Investigation (HWFI) Work Plan, required as part of the WDNR Corrective Action Consent Order.[1] Quarterly monitoring was conducted through 1996. Following WDNR approval, the program was modified to a semi-annual frequency. This program with modifications has continued to the present time.

Hacco also initiated a groundwater recovery and treatment system in 1996. It initially consisted of two recovery wells screened with the upper drift-dolomite horizon. A third well was added in 2005 to enhance capture from this water-bearing unit. Groundwater was

[1] An August 25, 1994, meeting between WDNR and Hacco led to an agreement that the HWFI Work Plan would focus on groundwater investigations. Further discussions regarding the requirements of chapter NR 700, Wisconsin Administrative Code preceded submittal of a soil investigation work plan. Hacco subsequently submitted the HWFI Work Plan to the WDNR in October 1994, fulfilling the groundwater investigation work plan requirements.

originally conveyed through an oil-water separator, air stripper, bag filters, and activated carbon before discharge to the Village of Randolph sanitary sewer. Use of the separator and air stripper was discontinued following several months of contaminant declines. Only the bag filters and activated carbon systems are currently maintained, but at reduced frequencies. This three-well groundwater extraction system continues to treat and discharge to the sanitary sewer, having removed 395 pounds of contaminant mass from the saturated zone during its operational history through 2018.

A soil vapor extraction (SVE) system began operation in 1997 removing soil vapors from one of the groundwater recovery wells along with horizontal wells installed beneath one of the buildings at the primary soil source area at the RCRA solid waste management units (SWMUs) 2, 3, and 12. This system removed approximately 1,555 pounds of contaminant mass between the spring of 1997 and summer of 2003. It was discontinued per WDNR approval in September 2003 because of diminished contaminant recovery.

Hacco performed additional soil investigations between 1997 and 2000 to further characterize the lateral and vertical extent of soil contamination at the primary source areas. Following these investigations, contaminated soil was excavated from source areas.[2] Other areas with residual soil contamination were paved with asphalt.[3] Results confirmed elevated contaminant levels in unsaturated zone soils at the north and south sides of the facility, but concentrations declined significantly with depth. Elevated contaminants were also detected in unsaturated zone soils at the east side of the facility. Though soil concentrations at the east side of the facility also declined with depth, contaminants were present within the smear zone, the seasonal groundwater fluctuation zone. Based on data collected to date, the historical groundwater high was observed in April 2008. At SWMUs 2, 3, and 12 at the east side of the facility, the highest water table defines the upper boundary of the smear zone at approximately 12 feet bgs.

In addition to the SVE and groundwater extraction systems, asphalt pavement was installed in 2000 as part of the interim remedy. The asphalt pavement has mitigated infiltration and contaminant leaching to the water table. Together these actions limit off-site contaminant migration via groundwater. As a result, no receptors are at risk from contaminant exposure.

Additional remedial alternatives were evaluated in a September 2006 Corrective Measures Study (CMS). Groundwater extraction was recommended as the remedial response for the three designated CMS areas (SWMUs 2, 3, and 12). For the remaining areas, the

[2] A total of 103 cubic yards (cy) was excavated from four separate areas in 1999 to 2001 and hauled offsite for disposal.

[3] A detailed description of the site history, including soil sample collection and source area soil excavation activities, was presented in the April 1, 2005, Existing Conditions Report.

recommended remedy included asphalt pavement with deed restrictions. SWMUs and Areas of Concern are shown in Figure 3.

A CMS Addendum was submitted to WDNR in September 2008 in response to Agency comments on the CMS Report. In accordance with recommendations, groundwater sampling was conducted during October 2008 with analyses for all historically detected constituents so that water quality could be evaluated at all wells. Results for October 2008 were presented in the 2008 Annual Groundwater Monitoring Report. Results for subsequent events between 2009 and 2018 were presented in corresponding annual reports.

In 2017, the WDNR requested that Hacco prepare an updated CMS to target the primary source zones at SWMUs 2, 3, and 12. This report was prepared and submitted to the Agency in 2018. It evaluated the feasibility of the following five general response actions for the target source zones:

- Soil excavation and off-site disposal;
- Soil excavation, ex situ thermal treatment, and replacement;
- Soil excavation, ex situ chemical treatment/stabilization, and replacement;
- In situ thermal treatment, and
- In situ chemical treatment.

The report included the results of a treatability study that evaluated the effectiveness of selected chemical reagents on collected soil samples from the SWMU source zones. These reagents included a combination of bioavailable absorbent media (BAM) Ultra, Fenton's Reagent, zero valent iron (ZVI), and PermeOx®. The report determined that BAM Ultra in combination with any of the other tested reagents was the most effective mitigator for the contaminant leaching potential within the permanent unsaturated zone (<12 feet bgs) as well as destroying contaminants within the saturated zone. The report also described, for all of the five general response actions described above, the costs for treating the 17,550-cubic-yard (cy) treatment zone at SWMUs 2, 3, and 12 range from more than $2,000,000 to more than $81,000,000 (these costs excluded Site restoration and lost productivity costs that will be necessarily added if any of the ex situ methods are considered). The report concluded that in situ chemical treatment warranted further study. However, Hacco also advised the WDNR at that time that "the existing pump and treat system continues to contain contaminant mass and contain contamination," and that Hacco "believes that the current remedial measures continue to safeguard public health and the environment…and no additional remedial measures should be undertaken at this time."

The WDNR responded to the CMS Update in March 2019 by directing Hacco to develop a plan for an in situ chemical treatment pilot study, or alternatively, considering focused hot-

spot removal at the primary source zone. Hacco and the Agency then met during May to discuss the results of the CMS Update. The parties agreed at the meeting's conclusion that Hacco would prepare a report (this submittal) evaluating remedial technologies at other sites with similar conditions.

1.4 Purpose and Scope

The purpose of this report is to assist in remedy decision making at the Site by compiling a record of comparable sites with implemented remedial measures. As described above, the Site has been extensively studied for over 30 years. The combination of surface barriers and groundwater extraction/treatment have effectively mitigated off-site contaminant migration. However, recent advances in remedial technologies have resulted in accelerated contaminant destruction for many recalcitrant source areas. These have been proven for both inorganic contaminants (i.e., metals and other anions) as well as organic contaminants.

The contaminants at the Site source area consist of an organic combination of VOCs, SVOCs, and pesticide groups. The bulk of the contaminant mass is within the unsaturated zone above 12 feet bgs, though these compounds are also present within the next several feet below this depth. Though many remedial technologies have proven effective for volatile compounds (including the newer micro- and nano-particle reagents), there have been few applications at pesticide sites, as discussed in the following sections. Because of fundamental chemical property differences between volatiles and most pesticides, these technologies can have varying effectiveness on pesticides.

The focus for this study was based on a search of sites with pesticides identified as a contaminant of concern (COC). To prepare this summary, a review of available information within the Wisconsin State databases was performed. Additionally, available information within federal databases was also examined. Following compilation of representative case studies, a secondary review of current pesticide contaminant literature was also performed. The report concludes with a summary of these findings and whether they are potentially applicable.

2 CASE RECORDS

2.1 Wisconsin Records

The WDNR maintains an on-line database of all contaminated properties in the state. This system includes information on contaminant release incident reports, ongoing cleanups, properties issued closure, as well as documents submitted for Agency review (though the latter are not always available online). The WDNR is responsible for all cleanups, though the WDNR refers agricultural-related spills and associated cleanups to the Department of Agriculture, Trade and Consumer Protection (WiDATCP). Information regarding all sites, however, is accessed via the WDNR's publicly available Bureau of Remediation and Redevelopment Tracking System (BRRTS).

The BRRTS advanced search feature provides a menu-driven option for COCs. For this review, "pesticides/herbicides/insecticides" was chosen. The resultant output identified 1,057 activities (i.e., sites) along with the associated site name, address, type (Environmental Repair Program (ERP), leaking underground storage tank (LUST), spill/closed abandoned container or no action), status (open, closed, or historic, the latter indicating further action as possibly unnecessary), jurisdiction (WDNR or WiDATCP), county, and dates of entries. These sites were further categorized as follows:

- Open ERP sites[4] – 42
- Closed ERP sites – 177
- Open Spill sites – 6
- Closed Spill/Abandoned Container sites – 711
- Open LUST sites – 2
- Closed LUST sites – 5
- Historic Spills – 110
- No Further Action – 4

Though spill and LUST sites at many facilities require remedies, the applicability of complex remedial actions are generally limited to ERP facilities. Accordingly, each of the open and closed ERP sites were further reviewed for information regarding contaminants and remedy status. Though not all of the 219 ERP sites contained information online, brief summaries of those that primarily required active remedies were available are described as follow:

[4] The Hacco facility is identified as an open ERP site.

Agriliance Property – Green Bay, WI (Closed ERP); activity dates September 2005 to November 2016. Facility produced urea ammonium nitrate beginning in the 1980s. Elevated nitrogen and disulfoton identified in soil surrounding and beneath several buildings. Excavations of more than 2,200 tons of soil source material disposed offsite from 2007 to 2014. Residual material beneath buildings along with residual groundwater exceeding standards remain but considered stable. Site formally closed November 2016.

Agriliance Property – Little Chute, WI (Closed ERP); activity dates September 2002 to January 2009. Former bulk dry fertilizer warehouse facility. Elevated nitrogen (nitrate and ammonia) and cyanazine identified in soil and groundwater encroaching railroad ROW. On-site source soils excavated (quantity unknown) at several accessible areas in 2004. Site formally closed with restrictions (engineered barrier maintenance) January 2009.

Algoma Lumber – Algoma, WI (Closed ERP); activity dates October 2005 to September 2017. Active lumber treatment operations began during 1950s. Soil and groundwater contaminated with elevated pentachlorophenol (PCP) used as a fungicide. Approximately 1,700 tons of unsaturated zone soil removed and disposed at local sanitary landfill in 2012. PCP at inaccessible areas (below buildings) remain, but groundwater levels showed declines. Site formally closed with access restrictions in September 2017.

Allied Cooperative – Tomah, WI (Closed ERP); activity dates April 2003 to October 2014. Co-op with fertilizer blending and storage operations. Elevated nitrogen identified in soil, and more than 2,000 tons of excavated material was land-spread on nearby fields. No associated groundwater contamination was measured. The site was formally closed in October 2014.

Augusta Farmer's Union Cooperative – Fall Creek, WI (Closed ERP); activity dates February 1997 to October 2010. Active Co-op. Elevated nitrogen and metolachlor identified in soil and groundwater. Excavation and off-site disposal of affected soils performed 1999. Groundwater monitored and levels confirmed offsite but decreasing. Site formally closed October 2014.

Baehmann Farms – Mequon, WI (Closed ERP); activity dates February 2007 to April 2017. Former 61.5-acre orchard currently used for row crops. Elevated arsenic, lead, dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyltrichloroethane (DDT), dieldrin, heptachlor epoxide, and PCP identified in soil to shallow depths (< 2 feet) in 2014. No groundwater was investigated. Approximately 241 tons of soil removed and landfilled. Site formally closed with land use restrictions (farmland) April 2017.

Blue Ribbon Feed Company – New Richmond, WI (Closed ERP); activity dates March 1993 to September 2009. Bulk fertilizer mix and storage facility. Elevated nitrogen and herbicides/pesticides identified in soil and groundwater on and offsite. Soil excavation

(volume unknown) performed 2005 to 2006. Final closure with access restrictions issued September 2009.

(Former) Cornell Farmer's Union/River Country Cooperative – Cornell, WI (Closed ERP); activity dates September 1989 to September 2005. Existing bulk mixing and fertilizer co-op. On- and off-site nitrogen- and triazine-contaminated soil and groundwater characterized 1989 to 2003. Approximately 305 cy of soil excavated and stockpiled on site (later land-spread) in 2003. Groundwater subsequently monitored and the plume considered stable. Site formally closed with soil and groundwater use restrictions September 2005.

Country Pride Cooperative to Cumberland, WI (Closed ERP); activity dates November 1992 to September 2008. Existing bulk fertilizer and petroleum dispensing facility. Elevated nitrogen and atrazine identified characterized in soil and groundwater. Soil excavated (volume unknown) in 2004, groundwater monitored through 2008. Formal site closure with soil and groundwater use restrictions September 2008.

Former Country Visions Cooperative – Cleveland, WI (Closed ERP); activity dates January 1991 to June 2017. Bulk fertilizer mix and storage facility. Contaminated nitrogen and pesticide soils first identified in 1989; additional characterization including groundwater through 2016. Approximately 7,200 tons of ag-chem-contaminated soils excavated and disposed offsite (either landfilled or land-spread) from 2006 to 2014. Formal site closure with use restrictions for residual contaminated soils issued June 2017.

Cropmate/Con-Agra – Reedsburg, WI (Closed ERP); activity dates May 1995 to May 2015. Former feed lot and stockyard operated from 1965 to 2008. Soil contaminated with pesticides and nitrogen initially identified in 1996; additional characterization of soil and groundwater through 2014. An approximate total of 3,300 cy of contaminated soil was removed in 1996 and 2013. Elevated groundwater contaminants (nitrogen and alachlor) confirmed, but no active intervention required. Formal site closure issued May 2015.

Farm Feed and Seed – Holland Town - Kaukauna, WI (Closed ERP); activity dates October 1992 to August 2008. Fertilizer storage and mixing facility. Nitrogen and pesticide contaminated soil and groundwater were encountered and characterized beginning in 1993. Over 1,300 cy of contaminated soil was excavated and land-spread during two events in 1993 and 2006 from on-site source areas. On-site wells showed nitrate and cyanazine exceeded Wisconsin groundwater enforcement standards (ES) at closure, but formal closure was issued with engineered restrictions (barrier) in August 2014.

Former Farmer's Flying Service – Bancroft, WI (Closed ERP); activity dates July 1988 to October 2007. Dinoseb and chlorothalonil contaminated soil extending across two separate areas (the Sprayer Test Area and Mix/Load Pad) occupying respective 37,400 square feet and

11,000 square feet were identified at a former crop application flying service facility. On-site and off-site groundwater ES exceedances for these compounds were confirmed. Formal site closure with groundwater use restrictions and maintenance of an engineered barrier (asphalt cap) at the Mix/Load Pad and a poplar plantation (i.e., phytoremediation) at the Sprayer Test Area was issued in October 2007.

Fort McCoy Pesticide Disposal Site – Sparta, WI (Closed ERP); activity dates October 1987 to July 2019. Elevated levels of DDT, Dichlorodiphenyldichloroethane (DDD), DDE, and lindane were identified in soil and groundwater at this historical disposal area at a federal military base. The site was one of 11 SWMUs (the others including closed landfills and munitions disposal sites) requiring corrective action under a 1990 permit. The pesticide disposal area was remediated via an approximate 6,000-square-foot geomembrane and soil cap and subsequently issued formal closure with groundwater monitoring via natural attenuation (NA) in December 2008. USEPA issued a final completeness determination for the 11 SWMUs requiring corrective action and that ongoing monitoring could be terminated in July 2019.

Former Frederic Farmer's Cooperative – Frederic, WI (Closed ERP); activity dates June 2005 to May 2017. The site operated as a co-op for more than 40 years prior to a 2005 shutdown. Elevated nitrogen (nitrate) and triazines were identified in soil and groundwater both on and offsite beginning in 2006. Soil excavations in 2006 and 2009 removed 4,250 and 1,096 tons of contaminated material for off-site disposal. Residual materials remained above action/ES levels in soil and groundwater following removal. Subsequent groundwater monitoring confirmed declining trends, but levels remained elevated at formal closure with use restrictions for soil and groundwater in May 2017.

Former Freedom Agri-Center – Freedom, WI (Closed ERP); activity dates December 1993 to November 2014. The site is an operating fertilizer and chemical storage facility. Elevated nitrate, ammonia, and triazine pesticides were measured in soil and groundwater beginning in the mid-1990s. A total of 2,265 tons of contaminated soil was removed for off-site disposal at several separate source areas in 2000. Groundwater monitoring was subsequently performed through 2012 confirming declining trends. Formal site closure with a cover maintenance plan for a portion of the site (an existing building and asphalt pavement) was issued in 2014.

Former Greenhouse – Milwaukee Metropolitan Sewerage District (MMSD) - Oak Creek, WI (Open ERP); activity dated October 2018 to present. The formal release notification to WDNR included information on soil piles containing elevated organochlorine pesticides. An investigation work plan was submitted at that time. Work is ongoing.

Greenhouse Option Area – Wisconsin Department of Transportation – Wauwatosa, WI (Closed ERP); activity dates September 2003 to February 2014. Elevated toxaphene levels were confirmed in soil samples at a former greenhouse during a roadway construction project in 2003. Approximately 468 tons of contaminated soil were excavated from two areas and disposed offsite during the roadway construction in 2013. Formal closure was issued in 2014.

H&S Manufacturing – Marshfield, WI (Closed ERP); activity dates May 2015 to July 2019. Operating agricultural manufacturing company. Elevated PCP in soil and groundwater was identified originating from a former wood treatment operation that was discontinued in 1997. Approximately 1,360 tons of contaminated soil was excavated for off-site disposal. An oxidant (reagent) distribution system was installed at the excavation base but never implemented because the groundwater plume showed stable/declining trends. Formal closure with access and use restrictions for soil and groundwater was issued in July 2019.

(Former) Kaiser Fertilizer Manufacturing Plant – Whitewater, WI (Closed ERP); activity dates January 1980 to August 2017. Elevated nitrogen (nitrate and ammonia) and pesticides (silvex) were measured in soil and groundwater at this site. Groundwater monitoring identified declining levels, and NA was selected as a final remedy. Formal closure with use restrictions for both soil and groundwater was issued in 2013 (a subsequent continuing obligations report identifying no serious deficiencies was prepared in 2017).

Kronenwetter Municipal Garage – Mosinee, WI (Closed ERP); activity dates July 1989 to August 1994. A tipped barrel was discovered at this garage in 1989. Elevated levels of 2,4-D and 2,4,5-T were identified in soils and low levels in groundwater. Approximately 45 cy of contaminated soil was removed for off-site incineration in 1993. The site was formally closed in 1994.

Landmark Services Cooperative – Union Grove, WI (Closed ERP); activity dates June 2012 to May 2018. Grain and seed service facility that began operation in 1963, but the land is currently vacant. Elevated nitrogen and pesticides (triazines) were identified in soils and groundwater beginning in 2012. Approximately 340 tons of contaminated soils were excavated and hauled offsite for landfill disposal in 2015. Residual soil/groundwater action/ES levels remain. The site was formally closed with soil use restrictions in 2018.

Navarino Agri-Center – Navarino, WI (Closed ERP); activity dates June 1996 to May 2018. The site was a former agricultural cooperative that is currently vacant. Elevated nitrogen (ammonia and nitrate) and metolachlor were identified in soils and nitrate in groundwater beginning in 1998. Approximately 3,000 tons of contaminated soil was excavated and soil was land-spread in 2001. Groundwater monitoring continued through 2017. Formal closure was issued in 2018 with no continuing obligations.

Olsen's Mill – Auroraville, WI (Closed ERP); activity dates November 1998 to June 2014. The property is an agricultural chemical storage facility in operation since 1981. A fire destroyed the chemical storage facility in 1985. Elevated levels of nitrogen (ammonia, nitrate) and triazines were identified in soil and groundwater in 2000. Approximately 15,400 tons of contaminated soil were removed and landfilled in two separate actions in 2000 and 2002. An asphalt/concrete cover was placed over residual soils with elevated levels remaining. Subsequent groundwater monitoring through 2012 confirmed decreasing levels in groundwater, though ES exceedance measurements were measured onsite. The site was formally closed in 2014 with use restrictions.

Progressive Farmer's Cooperative – Greenleaf, WI (Closed ERP); activity dates April 1994 to June 2018. The site operated as an agricultural distribution facility from 1968 through 2017. Investigations in 2001 to 2002 identified elevated nitrogen and pesticides in soil and groundwater. Approximately 1,770 tons of soil was removed and disposed offsite in 2003. Groundwater monitoring continued through 2009 and the site was formally closed that year. In 2017, during a property transaction, an investigation confirmed elevated levels in soil requiring remediation (no groundwater was sampled during this later investigation). An additional 4,675 tons of soil was then removed and disposed offsite. Groundwater impacts measured during the earlier investigations were expected to undergo expedited NA. The site was closed a second time in 2018.

Reedsville Cooperative – Reedsville, WI (Open ERP); activity dates December 1997 to present. Information in the BRRTS database was limited, but documentation confirmed investigation activity has been ongoing at this site since 1997. The COCs are alachlor and nitrate in groundwater. Two record documents include a November 2018 injection work plan for BAM and a subsequent WDNR approval letter within two weeks of work plan submittal. The work plan described that the program would be a full-scale remedial action effort based on the results of a previous pilot test. The plan indicated the reagent would be injected into both the unsaturated and saturated zones to the depth of bedrock at approximately 12 feet. The injection program was to be performed in tandem with a simultaneous groundwater extraction system (no other documentation was available at the time of this review).

Shawano Equity Cooperative – Shawano, WI (Closed ERP) activity dates September 1995 to August 2009. Elevated nitrate and triazine pesticides were first encountered at this site in 1996. No active remedial action was initiated, but subsequent groundwater monitoring confirmed off-site migration of elevated nitrate. Monitoring continued through 2007, when data showed that the plume was stable/receding. NA was selected as a final remedy, and the site was formally closed with soil and groundwater use restrictions.

Tomorrow Valley Cooperative – Clintonville, WI (Closed ERP) activity dates January 1994 to November 2004. Elevated nitrate and metolachlor were identified both on and offsite in groundwater in 1999. The database file entry indicates a hot-spot removal for the agricultural COCs was performed, but there was no date or other information on soil contamination. Groundwater was monitored through 2003 and the plume shown to be stable/receding. The site was issued formal closure in 2004.

Vogel Seed and Fertilizer – Jackson, WI (Closed ERP) activity dates March 2011 to September 2014. The facility is an agricultural products distribution operation operating since the mid-1950s. Elevated levels of nitrate and low levels of pesticides (triazines) and herbicides were measured in soil and groundwater beginning in 2006 (though earlier groundwater data was collected at surrounding wells in 1999). Source soil excavations were performed in 2008, but information on volume and disposition was unavailable in the on-line closure documents. Groundwater monitoring was performed through 2012. Formal closure with soil and groundwater use restrictions was issued in 2014.

Waugamie FS Cooperative – Bear Creek, WI (Open ERP) activity dates January 1991 to present. Elevated nitrate and pesticides (triazines) were initially measured at off-site wells in 1987. A subsequent administrative order resulted in several investigations that identified on-site sources of COCs through 2001. Remedial excavations were performed in 2002 (no other on-line information was available). The site was then formally closed later that year with on-site exemptions for groundwater ES exceedances because of inaccessibility to the source area. The site was then reopened in 2016, indicating the on-site structures were to be removed and a subsequent remedial action was to be performed. No other information following this entry was available online.

Wauleco – Wasusau, WI (Open ERP) activity dates October 1984 to present. Window frame manufacturing began at this facility in 1944. Following several transitions, the Wauleco plant ceased operations in 1991. Soil and groundwater sampling were first initiated in 1984, and regular monitoring began in 1987. A light non-aqueous floating product pool of PCP/ mineral spirits was identified, and remedial activities beginning with a seepage bed/ infiltration gallery and product recovery system initiated at that time via a pilot then expanded system. The infiltration gallery was discontinued in 1992, but the product recovery and groundwater treatment system were expanded in 1993, 1998, and 2007. The product recovery system portion was shut down and the groundwater recovery rate reduced in 2011. Based on the July 2019 quarterly report, treated groundwater continues to be discharged to the Wausau sanitary sewer.

Westby Cooperative – Viroqua, WI (Closed ERP); activity dates July 1998 to January 2015. This co-op operated as a bulk fertilizer/pesticide storage facility from the late 1980s until the

early 2000s when the bulk storage tanks were shut down. Sampling initiated in 1998 identified elevated nitrogen and pesticides (triazines) in soil and off-site groundwater. A total of 11,641 tons of contaminated soil were excavated in 2001, though 200 tons were land-spread, the remainder was landfilled because the soils were excessively fine grained for land-spreading. Groundwater monitoring continued through 2014. COCs were found to be stable/decreasing at that time, and formal closure was issued in 2015 with soil and groundwater use restrictions.

Whitehall (Mondovi Equity) Cooperative – Whitehall, WI (Closed ERP); activity dates September 1989 to November 2006. This cooperative operates a fertilizer mixing/storage facility. Sampling identified elevated nitrogen and pesticides (triazines) in soil and groundwater both on and offsite. Source area excavations were performed (quantity unknown) and land-spread on nearby fields in 1997. Groundwater monitoring continued through 2004 and confirmed contaminants were stable/receding. The site was formally closed in 2016.

2.2 Federal Records

USEPA maintains a robust search window for active and archived sites through its Superfund Enterprise Management System database. The search feature allows retrieval of specific site information within each of the ten USEPA regions according to categories that are included on, deleted, or otherwise unlisted on the National Priorities List (NPL) or non-NPL sites, type (e.g., manufacturing/processing, mining, recycling, waste management, other or all), contaminant media, and contaminant species (i.e., pesticides). To focus this search to comparable conditions to the source area at the Hacco facility, each USEPA region was reviewed for all sites under the manufacturing/processing type, soil media, and pesticides contamination. A discussion of these sites and the applied remedies are described below.[5]

2.2.1 Region 1 (CT, MA, ME, NH, RI, VT)

Baird & McGuire – Holbrook, MA. This facility was a mixing and batch manufacturer of various products, including soaps, solvents, and pesticides, from 1912 to 1983. Waste materials were discharged directly to soil and a gravel pit and/or stored in an open lagoon. A Record of Decision (ROD) was issued in 1986 for excavation and off-site disposal of 1,020 cy of hazardous waste, placement of a clay cap, and a groundwater pump and treat (P&T) system. An Explanation of Significant Differences (ESD) was issued in 1992 for mobilization of an on-site incinerator for 1,500 cy of contaminated sediments from a nearby wetland area. The remedy was considered complete in 2003. The latest five-year review (2019) indicates the site is ready for reuse.

[5] Groundwater remedies that were included as part of any site review are also described.

2.2.2 Region 2 (NJ, NY, PR, VI)

Chemical Insecticide Corporation – Edison Township, NJ. The property included a six-acre rodenticide, fungicide, insecticide, and herbicide manufacturer operating from 1954 to 1970. Four operable units (OUs) were addressed: OU1 (1989 ROD) was for an interim runoff control system that included an engineered cap; OU2 (1990 ROD) included removal and off-site disposal of 140,000 cy of arsenic and pesticide contaminated soil; OU3 (1995) included removal of 13,800 cy of arsenic contaminated sediment; and OU4 (2003) implemented institutional controls (ICs) and groundwater monitoring. The 2019 five-year review indicated OU4 is ongoing.

Myers Property – Franklin Township, NJ. The property had a variety of manufacturers including an historical pesticide operation in the 1940s to 1950s. The primary COCs included DDT and DDD. The 1990 ROD recommended on-site excavation and in situ dechlorination of the affected soils. However, the ROD was amended in 2005, because treatability studies confirmed the original remedy was ineffective. The final response action included excavation and off-site disposal of 22,190 cy of non-hazardous waste soil and installation of a groundwater P&T system. As of 2017, this system had removed and treated nearly 300 million gallons.

Pesticide Warehouse III – Manati, PR. This property was a pineapple processing and canning facility from the 1930s to the 1950s. Concentrated pesticides were reportedly spilled and discharged directly onto site soils in the area of former warehouses. Investigations identified aldrin, dieldrin, toxaphene, and dioxins/furans as COCs. The 2015 OU1 addressed site soils and specified excavation of 8,800 cy of contaminated soil to 10 feet bgs. Approximately 3,500 cy will be thermally treated ex situ prior to off-site disposal as non-hazardous waste. The remaining 5,300 cy would be considered for direct off-site disposal as non-hazardous waste. The July 2019 proposed plan for OU2 addresses site groundwater. It will include monitoring and maintenance of the existing downgradient industrial supply wells and treatment systems, as well as ICs to restrict groundwater use. The OU2 proposed action is considered an interim remedy until the effect of the OU1 soil cleanup can be evaluated.

2.2.3 Region 3 (DC, DE, MD, PA, VA, WV)

Lindane Dump – Harrison Township, PA. The total site occupies 62 acres and consists of a historically filled ravine (Upper Portion) and lower filled area (Lower Portion) on the banks of the Allegheny River. Filling began during mining operations in the 1800s but was used more recently for industrial waste disposal of solvents and pesticides in the 1940s and 1950s from a nearby pesticide manufacturing plant (the Pennwalt facility). COCs include VOCs and organochlorine pesticides. The 1992 ROD specified installation of an 18-acre multi-layer cap covering the filled ravine and a surface water runoff control, passive leachate, and

groundwater collection system (leachate collection system [LCS]) at the lower portion of the site. The remedy was constructed in 1999. The latest 2018 five-year review indicated that operation, maintenance, and monitoring (OM&M) on the LCS is ongoing.

Aberdeen Proving Grounds – Edgewood Area – Aberdeen Proving Grounds, MD. The Aberdeen Proving Grounds is a 72,000-acre Army facility in southeastern Baltimore and southern Hartford Counties. The Edgewood Area has been the site of laboratory research, field testing of materials and munitions, pilot and production-scale manufacturing, and related test, storage, and disposal operations. It was added to the NPL in 1986 and has had 22 RODs that address 25 OUs, segregated primarily by geographic location. Pesticides were identified as COCs (along with other contaminants) at five of the 25 OUs. The 2008 five-year review for the Edgewood Area (the only on-line document available) provides a comprehensive summary of the technologies evaluated and their present status following implementation. For pesticides, the technology evaluation summary confirmed that in situ biological treatment, in situ chemical oxidation (ISCO), ex situ solvated electron technology (SET - materials are placed in a treatment cell and mixed with inorganic neutralizing agents) and ex situ ultraviolet (UV)/oxidation treatment all show potential effectiveness. However, for the five OUs with pesticides that each had implemented treatment, the applied technologies included excavation and off-site disposal, capping, phytoremediation (for an arsenic contaminated zone), and ICs. SET was one of several in situ remedies along with ex situ stabilization; the report indicated that an evaluation of SET should be deferred because of minimal results.

Drake Chemical Lock Haven, PA – The property is an 8-acre facility that manufactured pesticides from the 1960s through 1981. Waste drums were buried onsite along with wastes discharged to open lagoons. COCs include beta-naphthylamine along with VOCs. The environmental response action included four RODs: OU1 (1984) addressed a leachate stream from a lagoon that was removed in 1987, OU2 (1986) required building demolition completed in 1990, OU3 (1988) included mobilizing an on-site incinerator to neutralize soil excavated to the water table (approximately 12 feet bgs) that generated more than 295,000 tons of ash that was graded onsite and covered with a soil cap, and OU4 was modified with a 1995 ESD that requires on-site P&T with discharge to an on-site infiltration gallery. The P&T system was installed in 2000 and is currently ongoing as described in the 2018 five-year review.

Central Chemical – Hagerstown, MD. The property occupies 19 acres that was the site of pesticides and fertilizer blending operations from the 1930s to the 1980s. Waste materials were disposed in a treatment lagoon. COCs in soil, groundwater, and surface water are primarily organochlorine pesticides. A 2009 ROD prepared for OU1 specified installation of a groundwater control system for the lagoon, in situ stabilization (ISS) of the wastes in the lagoon with concrete, and then placement of a cap above the stabilized wastes. OU2 for

bedrock groundwater was considered in 2010. Work performed through 2017 included preparation of the site for implementation of the lagoon area based on a 2018 fact sheet. The proposed plan for OU2 for a groundwater P&T system is pending.

2.2.4 Region 4 (AL, FL, GA, KY, MS, NC, SC, TN)

FCX Plant – Washington, NC. The FCX plant was a farm distribution and repackaging facility that sold and repackaged pesticides, herbicides, and tobacco-treating chemicals from 1945 to 1985. During the 1970s, trenches were dug onsite for disposal of pesticide wastes and other compounds. USEPA performed a time-critical removal action 1990 to 1996 when over 16,000 cy of excavated materials from the disposal area were thermally desorbed and disposed offsite. A 1993 ROD addressed groundwater contamination (OU1) at the site specifying groundwater P&T and discharge to surface water. A 1996 ROD for soil (OU2) specified no further action because the removal action effectively eliminated the need for further remediation. A 2005 ROD amendment for OU2 stated that monitoring data had shown that groundwater COC levels had sufficiently declined that monitored NA would be the final remedy in lieu of groundwater P&T. The 2015 five-year review indicates the final remedies continue to be protective.

Aberdeen Pesticide Dump Site – Aberdeen, NC. The Aberdeen Dump site consists of five separate areas where industrial wastes from historical pesticide formulation were disposed. For purposes of Comprehensive Environmental Response, Compensation, and Liability Act, these five areas were designated as OU1/OU4 for contaminated soil at all five areas, OU2 (later renamed OU4) for contaminated soil stockpiled at one of the five areas, OU3 for groundwater at three of the areas, and OU5 for groundwater at the other two. The remedy for OU1 and OU4 included excavation and thermal desorption at an on-site facility. The excavated areas were re-graded and considered complete in 1998. The original remedy for OU3 included groundwater P&T; however, a 2003 ROD amendment specified a revision to phytoremediation along with monitored NA. The final remedy for OU5 included installation of a groundwater P&T system with discharge to an infiltration gallery at one of the areas and a phyto remedy at the other. The 2018 five-year review for the site indicates that monitoring for both OU3 and OU5 is ongoing along with OM&M of the P&T system at OU5.

Geigy Chemical – Aberdeen, NC. This facility was one of the industries that contributed to the Aberdeen Pesticide Dump Site (above). It occupies 1 acre and operated from 1947 until 1989. COCs included organochlorine pesticides in soil and groundwater. A 1992 ROD specified excavation and either incineration or off-site disposal of contaminated soils in a Subtitle C (hazardous waste) landfill and groundwater P&T. Approximately 4,500 tons of affected soils were excavated and disposed as hazardous waste in 1996. The groundwater

treatment system began operation in 1997. Based on the 2018 five-year review, the system continues to operate and the implemented remedies continue to be protective.

Helena Chemical Company Landfill – Fairfax, SC. This site occupies 13.5 acres and includes a 4-acre landfill that was a pesticide formulation facility from the 1960s until 1979. COCs at the property include both organochlorine and organophosphate pesticide compounds. A 1993 ROC and subsequent amendments finalized a remedy for soil that included segregation of excavated waste for off-site incineration (700 cy) and off-site hazardous waste disposal (5,800 cy). These actions were completed from 1995 to 1998. A subsequent groundwater recovery system was installed in 1999. It consists of one recovery well (with no pretreatment) that discharges effluent directly to the publicly owned treatment works. Based on the most recent (2014) five-year review, the system continues to operate.

Kerr-McGee Chemical Corporation – Jacksonville, FL. The site occupies 31 acres on the banks of the St. John's River and was the site of a fertilizer and pesticide manufacturer from 1893 to 1978. Elevated levels of organochlorine pesticides, VOCs, polychlorinated biphenyls (PCBs), and radionuclides are present in soil and groundwater (the 2016 ROD specified that radionuclides are a principal threat waste occupying 2,650 cubic yards (cy) in separate sludge depositories that must be excavated for off-site disposal). The selected remedy for the most elevated saturated and unsaturated soil source areas is ISS, with the selected reagent to be determined during design. Groundwater will be addressed via P&T to prevent further plume discharge to the St. John's River. Based on the most recent documentation on the website, an August 2019 listening session was held to discuss progress on the cleanup (i.e., remedial design and schedule).

Marzone Inc./Chevron Chemical Corporation – Tift, GA. This property is a 24-acre site that included pesticide formulation at the northern 6-acre portion and a separate formulation area that included a disposal burn area at the southern 18 acres. It operated from 1950 until 1992. COCs in soil, sediment, surface water, and groundwater are primarily organochlorine and organophosphate pesticides, though elevated metals are also present. USEPA issued a 1994 ROD that was followed by a unilateral administrative order in 1995 for OU1. The remedy included demolition, excavation, and off-site landfill disposal of soil from 1996 to 1999. Groundwater was addressed by installation of a funnel and gate groundwater diversion and treatment system in 1998. It has continued to operate since that time. USEPA issued the OU2 ROD in 1998. Soil excavation and off-site disposal of affected wastes was conducted in 2006. Subsequent groundwater monitoring confirmed no declines in COCs. A pilot study to perform in situ chemical reduction for the plume was conducted in 2014. Based on the most recent (2017) five-year review, the Agency is evaluating the pilot study results to assess the technology's effectiveness for residual groundwater contamination.

TH Agriculture and Nutrition – Albany, GA. This property is a 12-acre former pesticide formulation and packaging facility that operated at two separate facilities from the 1950s until the 1980s and includes two separate OUs. OU1 includes soil contaminated with elevated organochlorines and organophosphates at the western portion of the site along with sitewide contaminated groundwater, and OU2 includes soil contaminated at the eastern part of the property, all with the same COCs. A 1993 OU1 ROD specified installation of a groundwater P&T system that began operation in 1995-1996 but allowed contingencies for alternate methods in the event of poor results. Because of unchanging levels, the system was shut down in 2003, and bioremediation treatment studies were conducted but again had poor results. Subsequent groundwater monitoring confirmed no lateral plume migration, but the Agency approved a 2017 bench-scale thermal conductive heating (TCH) study for potential application. The 1996 ROD for OU2 specified excavation and low-temperature thermal desorption (LTTD) of contaminated soil, replacement of the treated material, and ongoing monitoring. This action was completed in 2000. Though some inaccessible soil was not treated, it was covered with clean soil. The most recent five-year review (2018) indicated that the short-term effectiveness for remedies to date for both OUs are protective, but future remedial actions are pending.

Woolfolk Chemical Works – Fort Valley, GA. No documents were available on the website other than the homepage narrative. However, that information indicates the site was a facility for several pesticide manufacturers since 1910. RODs for three OUs were issued in 1994, 1995, and 1998. The ROD for OU4 that specified excavation and ongoing groundwater monitoring for off-site issues was issued in 2004. A ROD amendment issued in 2004 for OU3 was followed by an ESD in 2009. A ROD for OU5 for ecological impacts is projected for OU5 in 2020. Cleanup to date included a removal action in 1986-1987 that disposed 3,700 cy of contaminated soil offsite but only one potential responsible party (PRP) participated in that action. USEPA assumed responsibility for the site in 1998, though one other PRP installed a groundwater P&T system that year and continued to operate it through 2003 when USEPA assumed control. The Agency has excavated over 500,000 cy of contaminated material and continues to operate the P&T system.

Tower Chemical Company – Clermont, FL. This site is a 16-acre property that was home to a pesticide manufacturer from 1947 to 1980. COCs in soil and groundwater include organochlorine pesticides, VOCs, and metals. The site includes three OUs: OU1 is for soil and groundwater and potable well replacement, OU2 is an interim action for carbon filter systems, and OU3 includes site-wide contamination. The 1987 ROD for OU1 addressed soil and groundwater remedies but was cancelled because soil levels were lower than anticipated. The 2000 interim ROD for OU2 addressed off-site potable well replacement that provided filter systems for six off-site private wells completed in 2003. The 2006 ROD for OU3 replaced OU1. It included replacing the private wells' filter systems with connections to the public water

system (completed in 2010). Additionally, approximately 52,000 cy of on-site contaminated soil and off-site contaminated sediment was excavated and disposed offsite as non-hazardous waste in 2010 to 2011. The 2006 ROD also specified that the remaining residual on-site contaminated soils were to be treated via ISCO with potassium permanganate as shown by a 2013 treatability test. However, the results proved the technology ineffective for the primary COC, 4,4'-dichlorobenzophenone. Based on the 2018 five-year review, the Agency is considering ISS (using deep auger mixing with concreter) for these remaining soils. The Agency's 2019 proposed plan indicates the target area occupies about 62,000 cy in a zone from 12 to 70 feet bgs.

Stauffer Chemical Cold Creek Plant – Bucks County, AL. This 220-acre property included pesticide manufacturing from 1966 through 2008. Sludges and wastes were disposed in on-site landfills. COCs in soil and groundwater are primarily thiocarbamate pesticides. RODs were issued in 1991 for groundwater (OU1), in 1993 for nearby Cold Creek Swamp (OU3), and in 1995 for soil (OU2). An ESD was issued in 1996 for OU3, and three ESDs were issued in 1999, 2012, and 2018 for OU2. A groundwater P&T system began operating in 1995 for OU1 but was shut down in 2012 and has not been restarted. The remedy for OU2 included excavation and off-site disposal of 528 cy of contaminated soil and removal and placement of an additional 2,653 cy in an on-site biopile removed from a former old neutralization pond. Engineered caps were also installed at the on-site landfills. These activities were performed in 1999. Monitoring at the biopile has continued through the present time, but the 2018 ESD outlined a proposed removal and off-site disposal of the biopile along with OM&M on the landfill remedies. The remedy for OU3 consisted of an in situ cap at a portion of the swamp installed in 2016.

2.2.5 Region 5 (IN, IL, MI, MN, OH, WI)

Velsicol Chemical Corporation – St. Louis, MI. The former Velsicol plant site (OU1) occupies 52 acres and was the home of a chemical manufacturing facility that made a variety of products from 1936 to 1977, including pesticides (DDT and dibromo chloropropane [DBCP]). OU2 consists of contaminated sediments upstream of a dam in the nearby Pine River. OU3 is for sediments downstream of the dam in the Pine River floodplain that also includes athletic fields for the St. Louis public schools. A 1982 consent judgment resulted in a slurry wall and cap placed at the former plant site along with a hydraulic control system to prevent further off-site contaminant migration completed in 1986. A ROD for OU2 was issued in 1999. The cleanup included a pre-ROD removal of 30,000 cy of DDT-contaminated sediments in 1998 and post-ROD removal of 640,000 cy of DDT-contaminated sediments in 2006. All materials were disposed at permitted off-site facilities. The OU1 ROD was issued in 2012 and specified replacement of the slurry wall with an upgraded vertical barrier, installation of a RCRA cap, excavation and removal and/or ISCO treatment at two soil source areas, installation of a free

product and groundwater recovery system, and implementation of in situ thermal treatment (ISTT) for other intractable free-product areas. The latest document available (spring 2019) confirmed approximately 56,000 pounds of contaminant mass was removed with ISTT from one of two treatment areas in 2018. The design for the second area along with other provisions of the 2012 ROD for excavation and off-site disposal or ex situ ISCO is pending. Additionally, though contaminated materials were confirmed at depth at the St. Louis school athletic fields, no further action is planned for OU3.

Velsicol Chemical Corporation – Marshall, IL. This 420-acre plant site historically produced petroleum products along with the pesticide chlordane from the mid-1930s through 1988. COCs in soil and groundwater include VOCs and organochlorine pesticides. The 1988 ROD specified soil and sediment removal, consolidation of the excavated materials onsite in a former lagoon to be covered by an engineered cap, and installation of a groundwater P&T system. All final construction activities were completed in 1995. Based on the 2018 five-year review, nearly 7.5 million gallons of groundwater was treated through 2017 and conveyed to the POTW.

Crab Orchard National Wildlife Refuge (CONWR) Pesticide Area – Marion, IL. The 42,000-acre CONWR was historically a WWII munitions plant ceded to the Department of the Interior in 1946. Since that time, many of the original manufacturing facilities at the Refuge have been leased to a variety of tenants that continued munitions manufacturing as well as other manufacturing and storage operations. CONWR was initially added to the NPL in 1987 because of elevated PCBs in Crab Orchard Lake. Several OUs were subsequently investigated, and remedial activities performed at all but the Additional and Uncharacterized Sites (AUS) OU, currently undergoing feasibility study preparation. During the AUS OU remedial investigation, one historical storage area was investigated where organochlorine pesticides were stored from 1951 to 1971. Results confirmed elevated aldrin, dieldrin, and heptachlor in soil. This area was jurisdictionally removed from the AUS OU, and a separate engineering evaluation/cost estimate (EE/CA) prepared. The final 2018 EE/CA specified that approximately 6,000 cy of contaminated soil will be excavated and disposed offsite as hazardous waste. The final remedy implementation is pending.

2.2.6 Region 6 (AR, LA, NM, OK, TX)

Vertac, Inc. – Jacksonville, AR. This property occupies 193 acres and was originally a federal munitions manufacturing facility in the 1930s and 1940s. The property was purchased and converted to pesticide manufacturing in 1948, then converted in the 1950s to primarily herbicide manufacturing. It was purchased by Vertac in 1978 but never used for manufacturing. COCs include 2,3,7,8-TCDD (dioxin), 2,4-D, and 2,4,5-T (the latter two herbicides). RODs were issued in 1990 for off-site areas (OU), in 1993 for on-site above-

ground structures and appurtenances (OU1), in 1996 for soil (OU2), and in 1996 for groundwater (OU3). The remedy for the off-site areas included primarily excavation of residential soils and sediments in an on-site constructed RCRA landfill or by on-site or off-site incineration. Similarly, for OU1, buildings and debris were consolidated in the on-site landfill and drum contents incinerated onsite. OU2 also was remedied by consolidating soils in the landfill along with off-site incineration for soils with elevated COC levels. All activities were completed by 1997. OU3 was remedied with the installation of a groundwater pump and containment system, because the presence of free product prohibited effective treatment based on geologic conditions (a technical impracticability waiver zone was established for the central manufacturing process area because of fractured bedrock). Based on the 2019 five-year review, the extraction system OM&M is ongoing.

2.2.7 Region 7 (IA, LA, NM, OK, TX)

Aidex Corporation – Mineola, IA. The site occupies approximately 7 acres in southwest Iowa within the Missouri River floodplain. Aidex formulated organochlorine, organophosphate, and triazine pesticide compounds from 1974 until 1981. Historical spills including a fire in 1976 released significant volumes of waste materials to on-site soil and groundwater. A 1983 ROD specified an interim remedial measure including offsite disposal of liquid wastes by deep well injection and collection and staging of bulk solid wastes and solidified liquids by off-site landfilling and incineration. These activities were completed in 1984. A Find ROD issued in 1984 included building decontamination, soil excavation and off-site landfill disposal, and groundwater monitoring. Groundwater monitoring was subsequently performed, and the site was delisted from the NPL in 1993. The final five-year review recommending no further action status was issued in 2005.

Kem-Pest Laboratories – Cape Girardeau, MO. Kem-Pest Labs historically formulated organochlorine pesticides at a 6-acre facility from 1965 until 1977. Liquid wastes were discharged to an on-site lagoon. A 1989 ROD for soils and lagoon sediments (OU1) specified excavation and off-site disposal. Approximately 6,100 cy of soil and sediment were excavated and disposed with activities completed in 1993. A 1990 ROD specified demolition of the formulation building, soil excavation below the building footprint, off-site disposal, and groundwater monitoring. Remedial activities were completed in 1996, and the site formally delisted in 2001. USEPA declared the site was ready for reuse in 2006.

2.2.8 Region 8 (CO, MT, ND, SD, UT, WY)

Rocky Mountain Arsenal – Adams County, CO. Similar to CONWR, the Arsenal was initially established in 1942 to manufacture chemical warfare agents and munitions during WWII. Beginning in 1946, some of the facilities were leased to private companies for agricultural chemical production. The largest of these, Shell Chemical, operated at the site

from 1952 to 1982 producing primarily organochlorine pesticides. Waste disposal practices during that period resulted in soil and groundwater contamination containing pesticides, solvents, metals, and anti-degradation agents. Remedial investigations identified 3,000 acres of contaminated soil, 15 groundwater plumes, and 798 structures with significant COC levels. Respective on-post and off-post RODs were issued in 1995 and 1996. Thirty-one on-post remedial projects addressed soil, building, and groundwater contamination. More than 450 of the structures were either dismantled and interred in on-site landfills or disposed offsite. Contaminated soil was primarily interred in two on-site RCRA landfills (2.6 million cy) or transported offsite as hazardous waste (262,000 cy). For some highly contaminated areas, soil washing and replacement was performed, deep-well injection for liquid waste, and in situ thermal desorption (the latter included a project abandoned because heating of the organochlorine contaminants caused hydrochloric acid to form and corrode the piping). Groundwater was addressed via five on-site treatment plants. The latest (2016) five-year review confirms that the treatment plants will operate continuously until all effluent leaving the site meets state and federal standards. Approximately 16,000 acres at the facility was declared a National Wildlife Refuge in 2006.

2.2.9 Region 9 (AS, AZ, CA, FM, GU, HI, MH, MP, NV, PU, UM)

Williams Air Force Base – Chandler, AZ. This facility operated as an air base from 1941 until 1993 and occupies more than 4,000 acres. The site was evaluated as part of the Installation Restoration Program, the Department of Defense' equivalent to Superfund, from 1983 to 1987. Findings from this evaluation led to its listing on the NPL in 1989. Six OUs were subsequently identified for several operations, storage, and disposal facilities. Pesticides were identified during remedial investigations at OU1, OU4, and OU6. The remedies implemented for the OU1 facility (a former 34-acre landfill) was installation of a permeable landfill cap to prevent human exposure. Work was completed in 1995, though an active landfill gas extraction system was installed in 2013. The 2016 five-year review confirmed OM&M on the cap and gas system along with groundwater monitoring is continuing. The subject OU4 facility was a pesticide (entomology) shop. Elevated organochlorine pesticides were identified in nearby surface soil, but the implemented remedy was limited to ICs. OU6 included a pesticide/paint shop facility with elevated PCBs and dieldrin in soil. A removal action was performed in 2001, and the soils consolidated onsite in a treatment cell. Because this remedy failed to achieve treatment goals, the stockpiled material was disposed offsite as non-hazardous waste in 2007.

Brown and Bryant, Inc. – Arvin, CA. This facility operated a pesticide mixing and application service on approximately 2 acres from 1960 until 1989. Soil and groundwater contamination primarily from historical spills and leaks during this period resulted in elevated DBCP, ethylene dibromide, and dinoseb. A 1993 ROD specified consolidation of contaminated soil

beneath a RCRA cap, placement of a non-RCRA cap constructed over the remaining surface area at the facility. A groundwater P&T system for the shallow water table unit was also installed. Remedial activities were completed in 1998. A second ROD for deep groundwater was issued in 2007 and began operation in 2014. Based on the information on project background on the USEPA website, the groundwater systems continue to be operated.

George Air Force Base – Victorville, CA. This air base occupies 5,350 acres and operated from 1942 until 1992. Three OUs were established to address a trichloroethene (TCE) plume (OU1), landfills, and other disposal areas (OU3) and a source column for the TCE plume (OU5). RODs for OU1 and OU3 were respectively issued in 1994 and 1998. Two pesticide disposal pits were identified as part of the investigations for OU3. One was addressed via a 2-foot soil cover. The second was considered structurally sound and that the contents would degrade overtime; therefore, no further action was declared. A P&T system for OU1 was installed in 1991, expanded in 1996, and shut down in 2003 for optimization. A ROD Amendment was pending as of the 2016 five-year review. The ROD for OU5 was issued in 2015 declaring that all conditions for unconditional use had been met and no further action was needed.

2.2.10 Region 10 (AK, ID, OR, WA)

No sites with pesticide source areas comparable to Hacco were identified.

3 TECHNOLOGY REVIEW

3.1 Pesticides – Environmental Fate and Transport

Pesticides are conventionally grouped as herbicides, insecticides, fungicides, and rodenticides. Herbicides are comprised of triazines (atrazine, simazine), ureias (diuron), and chlorophenoxys (bentazon).[6] Insecticides are further classed as organochlorines (DDTs, aldrin, dieldrin, endosulfan), organophosphates (malathion, acephate/orphene), carbamates (thiodocarb, carbaryl/sevin, carbofuran/furadan), and arsenical compounds (chromated copper arsenate, lead arsenate). Fungicides include organochlorines (pentachlorophenol),[7] tetranortriterpenoids (azadirachtin), and organomercurials (copper sulfate). Rodenticides are generally limited to organobromines (brodifacoum, bromethalin).[8] The oganochlorine compounds are considered the most toxic because of their persistence, bioaccumulation properties, and carcinogenicity. However, all of the above compounds have some toxic effects on humans and the environment.

Specific compounds from the above pesticide groups have been identified at the Hacco site and are considered COCs with the exception of the metal-bearing compounds (arsenicals and organomercurials). Though arsenic has been historically monitored, it has been identified at levels and locations indicating it is not a contaminant source compound. The organic pesticides that are the subject of this review are long-chain molecules that show colloidal behavior in the environment. They are easily sorbed to soil surfaces and have low mobility. Consequently, they are not easily remediated. Neutralization, reduction, and electrochemical technologies are ineffective for eliminating these compounds. Organic pesticides are also not easily removed from aqueous solutions at normal temperatures, rendering air stripping for contaminated groundwater equally ineffective. Because of these properties, manufacturers have utilized solvents to solubilize pesticide compounds as part of the formulation process. Note that at many of the previous case record summaries described, several of the referenced contaminated sites include both pesticides along with VOCs as COCs. These same conditions are present at Hacco.

3.1.1 Pesticides – Applicable Technologies

Following the emerging concerns for environmental protection and the subsequently developed criteria for protection of human health and the environment, the primary method to eliminate pesticide source areas from the codification of environmental regulations through

[6] The active ingredient in the widely used herbicide Roundup® is glyphosate-isopropyl ammonium, an organophosphate (phosphonate) crop desiccant.
[7] Pentachlorophenol is also a SVOC.
[8] See Castelo-Grande, Teresa et al. 2010.

the first decade of this century was excavation and disposal or barrier isolation to restrict exposure and prevent migration. Review of the Wisconsin and federal case records described in Section 2 of this report shows the following technologies were either implemented or are proposed at the subject sites.[9,10]

Exhibit 3-1: Remedial Technology Summary, Wisconsin and Federal Sites (Section 2)

	Excav & Disp[1]	Eng Cap/ Vert Barrier	Excav & Incinerate	ISS[2]	NA[3]	P&T[4]	Excav & LTTD	In Situ Thermal[5]	Deep Well Inject	Soil Wash	Excav & ISCO[6]
WI[7]	25	2	1	1	2	1					
Fed	16	6	4	3		14	3	3	2	1	1

Notes

1 Excavate & Dispose - includes both on- and off-site disposal

2 ISS – one WI and two federal sites pending

3 NA - the bulk of the federal sites implemented monitored NA technology as part of the remedy

4 P&T - Several WI P&T systems have been approved as either interim or final remedies, primarily for VOC plumes; however, the Wauleco facility was the only identified pesticide (PCP) site. As described in Section 2.2, P&T at the federal sites was either implemented for a separate OU or part of a larger ROD.

5 In situ thermal - one federal site pending

6 Excavate & ISCO - one federal site pending

7 For the majority of the closed WI sites described in Section 2.1, closure required restrictions including prohibitions on groundwater use, maintaining engineered barriers, and/or requiring Agency notification and testing if excavations were proposed; these restrictions normally included a formal environmental covenant included with the property deed.

In addition to the case record review summary above, a 2009 publication of 383 case studies prepared by the U.S. Department of Defense, U.S. Department of Energy, and USEPA summarized sites by contaminant, remedial technology, and media. Details of the technology performance were limited to selected sites, and only one of these selected sites (the Rocky Mountain Arsenal) included details on performance (this information was summarized in Section 2). The tabulated list of the 383 sites included the following information regarding those with pesticide COCs (along with other contaminant groups).[11]

[9] Thirty-three Wisconsin records are summarized; however, no remedy has yet been selected for the Former Greenhouse – MMSD.

[10] Twenty-eight federal records are summarized; because the selected references represent complex sites with multiple remedies, the total number of individual technologies are listed.

[11] See Member Agencies of the Federal Remediation Technologies Roundtable, 2009.

Exhibit 3-2: Remedial Technology Summary – Soil, 2009 Federal Remediation Technologies Roundtable

Excavate & LTTD	Vitrification (ISS)	Excavate & Incinerate	Excavate & Ex Situ bio	In Situ Thermal
7	2	2	2	1

Exhibit 3-3: Remedial Technology Summary – Groundwater, 2009 Federal Remediation Technologies Roundtable

P&T	PRB [1]
4	1

1 PRB – Passive Reactive Barrier

Note that several of the sites in the Roundtable Summary were included in Section 2.

The last several years have experienced an expansion of alternative remedial technologies. In situ and ex situ methods designed to either eliminate or sequester pesticide contaminants are typically approved and implemented in lieu of long-term OM&M associated with containment and/or isolation. Nevertheless, containment has been retained as a final remedy where source removal is considered impracticable (see the previous Federal summaries for TH Agriculture and Nutrition[12] and Vertac, Inc).

Technology effectiveness is highly dependent on both contaminant strength and soil type. Higher strength indicates more contaminant mass is present and therefore a higher volume of material must be either destroyed or removed. A higher percentage of fine-grained soil provides more contaminant sorption potential and lower permeability, therefore reduced contaminant mobility. Many of the new in situ technologies have demonstrated improved contaminant destruction efficiencies, especially for VOCs, because of reduced reagent particle size. This has allowed increased contact with interstitial soil and associated contaminants.

The published literature review for this report identified few innovative technologies for pesticide sites. Biological amendments including Xenorem® and Daramend® have shown successful results eliminating organochlorines at several sites.[13,14] Xenorem is used as a composing (ex situ) agent, and Daramend is either tilled or otherwise surface-mixed into the soil in the unsaturated zone (in situ). Daramend has also shown positive results via well injection in the saturated zone. Aqueous treatment (i.e., saturated zone) of pesticide plumes using the Daramend technology via controlled release carbon and ZVI has also shown positive contaminant results. This process essentially stimulates bacterial growth within the

[12] The summary for TH Nutrition indicates that additional remedial activity is pending.
[13] See Frazer, 2000; Seech et al. 2008
[14] Daramend was a reagent surrogate for cost estimates using the RACER software platform as part of the 2018 CMS Update Report.

aquifer accelerating degradation. However, no case studies for these reagents' effectiveness in the unsaturated zone using delivery methods other than surface mixing were identified.[15]

One recent study indicated that physical and/or physicochemical processes have been effective in water treatment causing mineralization of contaminants and resulting degradation. However, few studies have demonstrated the effectiveness of these techniques in soils. This same study reported on positive results using a combination of electrolysis with other methods, such as the Fenton's reagent, ultrasound irradiation, and UV light to remove pesticides from soils ex situ. However, Fenton's technology used alone showed the most promising of the assessed techniques because it can be used for pesticide destruction and not cause harmful byproducts.[16,17]

Other published studies have identified pesticide elimination in water systems using nanotechnology. Graphene (a carbon nanomaterial) has a high adsorption capacity and has been successfully used for filtration of many contaminants. One study showed that the graphene adsorptive capacities for a range of pesticide groups are high, from 600 to 2,000 milligrams per gram (mg/g). Similarly, nanocrystalline metal oxides (i.e., iron oxide, aluminum oxide, and magnesium oxide) have also shown high adsorptive capacity along with chemical destruction for a variety of contaminants. Though the respective adsorptive capacities for organochlorines (10 to 25 mg/g) are lower than those for organophosphates (20 to 700 mg/g), production of fine oxides is costly.[18] Further, much of this current research is limited to laboratory studies.

3.1.2 Remedial Status at Hacco

At Hacco, significant excavation and removal has already occurred. However, a large volume of contaminated material remains. The bulk of the contaminant mass is within the upper drift unit, above the seasonal high water table. Soils consist primarily of silty clay and silty sand. These soils are the primary source for ongoing groundwater contamination. Based on Site characterization and historical monitoring, the bulk of the VOC mass within the upper drift has either been removed by the former SVE system and/or leached to groundwater where these compounds are captured by the extraction system. However, these same data confirm that the bulk of the pesticide mass remains in both the upper and lower drift units. The 2018

[15] Regenesis, a national remediation contractor that has developed innovative injection technologies using ZVI, controlled release carbon, and other agents for organic contamination, reports that surface mixing methods are approximately three to five times more costly per cy compared to injection methods (personal communication).
[16] See Baldissarelli, D.P., 2018.
[17] Fenton's reagent was evaluated in the 2018 Treatability Study and the results reported in the 2018 CMS Update Report.
[18] See Firozjaee, T. Taghizade et al, 2018.

CMS Update Report shows that VOC levels in the upper drift are limited to an isolated area above 100,000 micrograms per kilogram (µg/kg), while those in the lower drift are similarly limited to less than 10,000 µg/kg. Comparatively, the organochlorine pesticides above 100,000 µg/kg in both the upper and lower drift extend across both units occupying much larger volumes (see Figures 11 to 16 in the CMS Update Report, Shannon & Wilson, Inc., 2018).

These data confirm the persistence of the Site's pesticide COCs. However, the on-site plume is effectively contained by the three-well P&T system. The majority of indicator compounds have continued to decline at the monitoring well network wells since the full system began operating in 2005 (see the Hacco, Inc. 2018 Annual Report, Appendix D). Consequently, the system is operating as designed and protective of the environment.

4 SUMMARY AND CONCLUSIONS

This document is a summary of reviewed information regarding the historical remedies at sites comparable to the contaminant conditions at the Site. It also provides an overview of potentially available remedial technologies for those conditions. Though these references extend across a variety of physiographic and geologic settings, they confirm that technologies specific to those at the Site are limited based on implementability and effectiveness.

The fundamental challenge at the Site is that the bulk of the remaining contaminant mass is within the unsaturated zone, either below operational structures or pavements. These barriers inhibit infiltration and contaminant leaching as well as exposure. However, leaching of the recalcitrant pesticides ultimately continues, albeit at a low rate. Nevertheless, the existing P&T system continues to hydraulically control the plume onsite and remove mass, though the removal rate has declined over time. Remedial actions at the Site have removed over 1,950 pounds of COCs through 2018 (Shannon & Wilson, Inc., 2019).

Historically, the predominant technology selected to eliminate the COCs at source area soils at sites across the country (and as shown, especially in Wisconsin) has been excavation and removal. This option is technically infeasible based on the current Site infrastructure along with the associated direct and indirect costs being prohibitive. Because of these constraints, in situ technologies showed the most potential to address the source area. However, while there have been advancements with in situ technologies in recent years as described for some of the most recent examples described in Section 2, many are technically impractical and/or otherwise cost prohibitive at the Site.

The 2018 CMS Update Report showed that the unsaturated zone is potentially treated by injection of proprietary BAM Ultra and either Fenton's Reagent, ZVI, or PermeOx®. The treatability tests showed these combinations effectively destroyed many site COCs within the saturated zone while rendering the remainder in the unsaturated zone non-leachable. Based on these results, the WDNR requested that a comparable reagent be considered for a field pilot program.[19]

The in situ technologies described in the previous sections that have been implemented or selected at comparable sites across the country have been limited to thermal systems or contaminant sequestration. In situ thermal desorption was performed at the Rocky Mountain Arsenal (Colorado) with problematic results. TCH was successful at the Velsicol (Michigan) facility and is being considered at the TH Agriculture (Georgia) site. Sequestration using

[19] The WDNR also recently approved BAM for remedy injection at the Reedsville, WI Cooperative facility (see Section 2.1).

concrete was applied at the Central Chemical (Maryland) and is being considered at the Tower (Florida) site. Sequestration is also being considered at the Kerr-McGee (Florida) site, though the selected reagent is unknown at this time.

The review of pesticide sites conducted for this study confirms P&T has been the primary groundwater remediation technology. This technology, along with SVE, has removed and treated substantial contaminant mass at the Site. Groundwater concentrations are substantially lower than those before the initiation of remedial activities. Comparing post-2010 data with older historical results show declining concentrations for nearly all detected constituents at each monitoring well. The percent reduction for most constituents is over 90%. Historical results for piezometers screened within the underlying sandstone indicate limited vertical contaminant migration and declining concentrations. Additionally, results indicate that the P&T system is restricting contamination to the Site. The most recent annual results (from 2018) show off-site wells yielded no exceedances for ESs and only one health advisory limit (HAL) exceedance for dieldrin at MW-8A and MW-10A adjacent to the southern facility boundary by the rail line (Shannon & Wilson, Inc., 2019). As a result, human health and the environment are protected from exposure to groundwater, as well as exposure to all other affected media.

Hacco recommends that it further evaluate results for the ISS treatment technologies proposed for the associated sites described in Section 2. These include the Reedsville Cooperative facility in Wisconsin, the Tower Chemical and Kerr-McGee facilities in Florida, and other sites that may be identified with similar treatment programs. The information on these facilities indicate these efforts are recent. The BAM injection permit for the Reedsville site was issued this past November. Consequently, Hacco requests the Agency consider providing additional time to monitor these sites to obtain valuable performance data. This will include data on the geologic conditions and results of the remedial programs at these subject sites as they compare to the Hacco facility. This information will assist Hacco to better determine the viability of chemical in situ treatment. During this period, Hacco will also evaluate potential criteria to enhance and optimize the existing P&T system. In addition to determining the applicability of additional extraction wells, this criteria evaluation may also include data collection for attenuation conditions (i.e., collection of samples for geochemical indicators, bacteriological/ degrader populations, and/or isotope analysis). Such data will provide valuable inputs that can establish a framework for a possible timeline to reach remedial action objectives.

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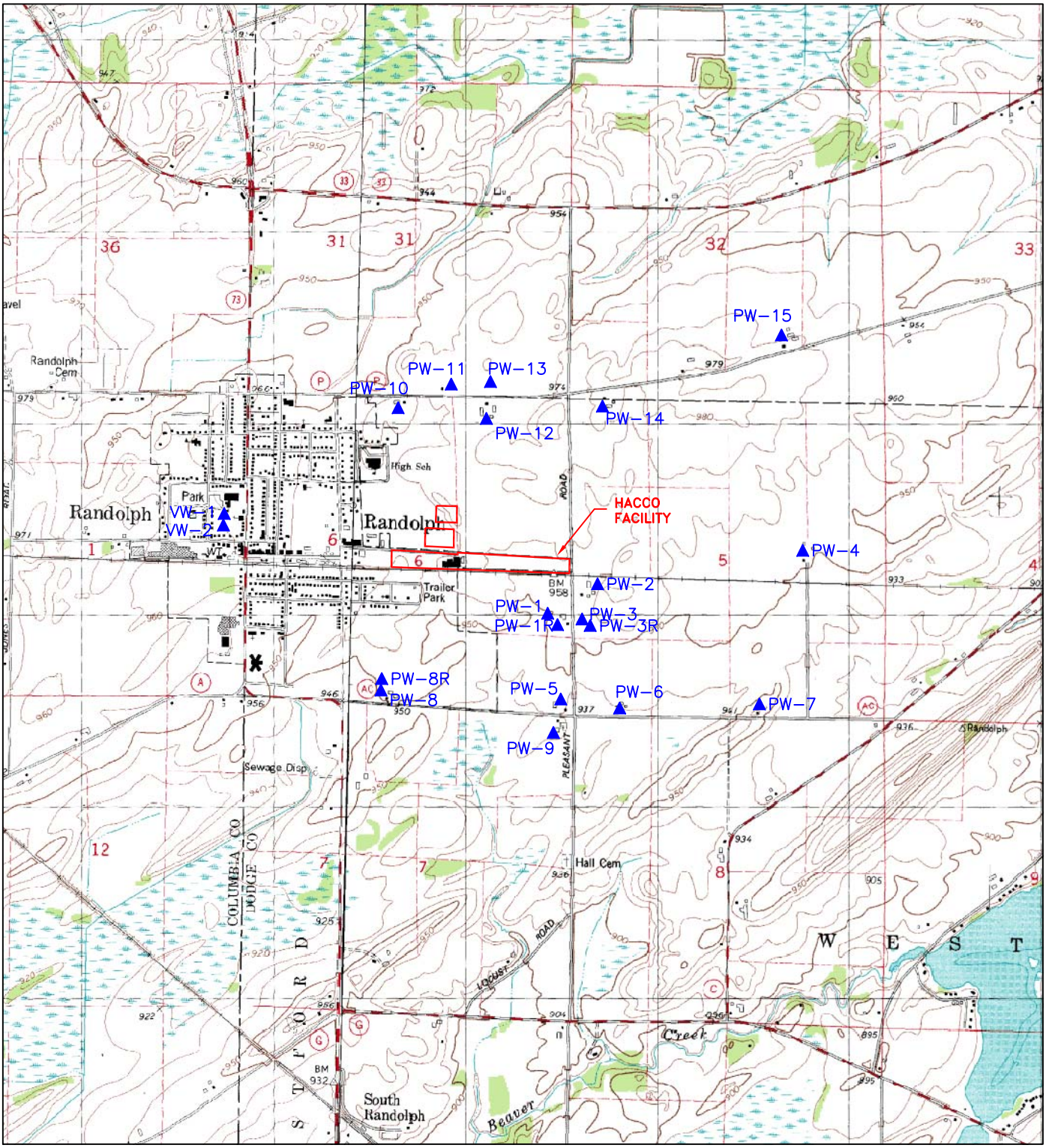
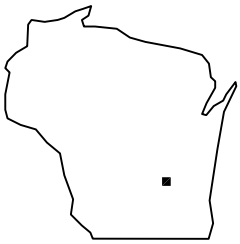


LEGEND

▲PW-4 **PRIVATE WELL LOCATIONS**

NORTH
SCALE: 1''=2400'



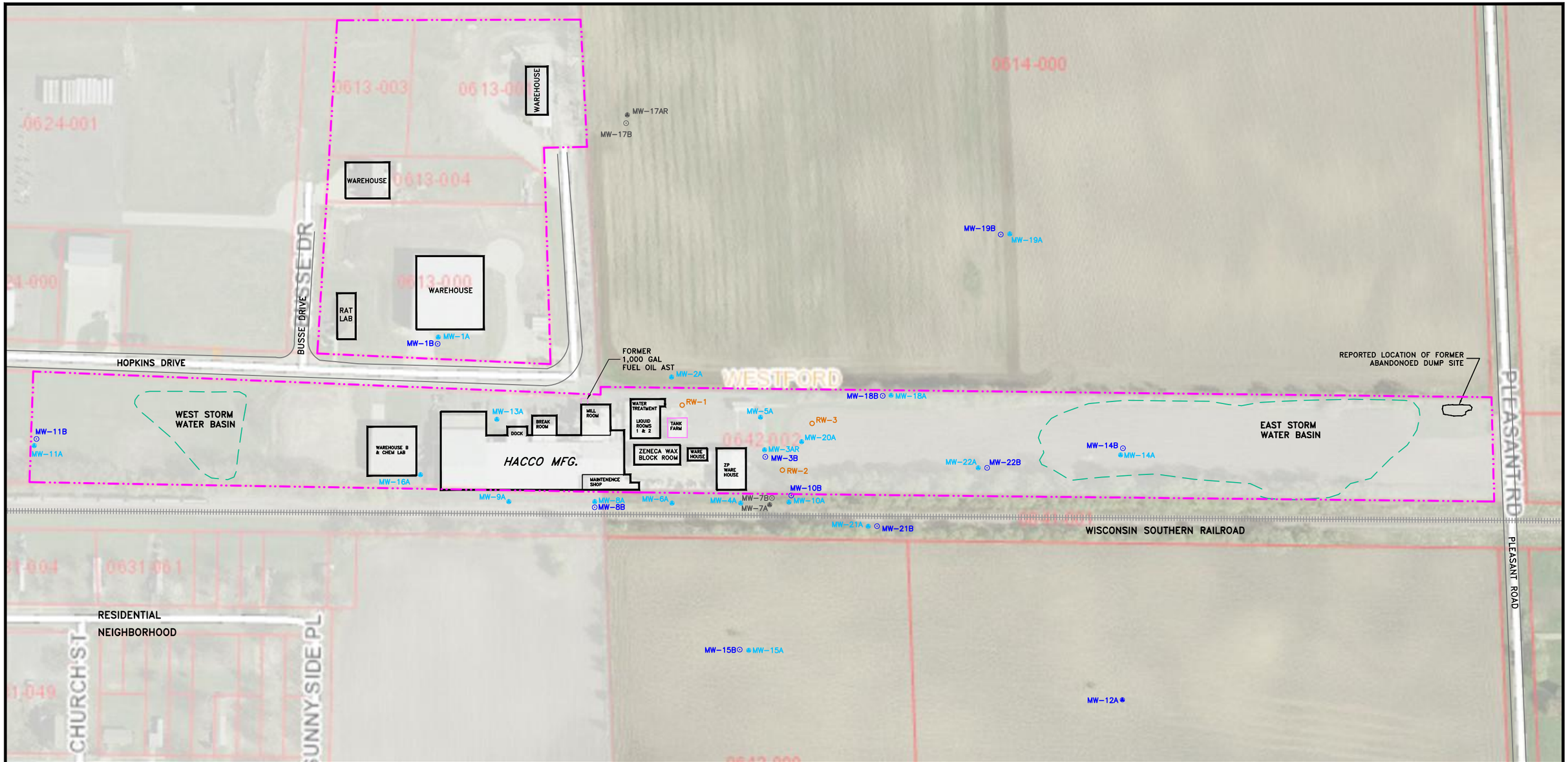
QUADRANGLE LOCATION

HACCO MANUFACTURING, INC.
RANDOLPH, WISCONSIN

FIGURE 1
SITE LOCATION

DRAWN BY: DDZ	PROJECT: 103913-001	DATE: 10-8-2019
CHECKED BY: JDH	SOURCE: USGS 7.5' Topo Quad-Randolph & Fox Lake	
APPROVED BY: DPT	FILE: C:\PROJECTS\HACCO\CAD\FIGURE_1.DWG	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
6506 Schroeder Road, Ste 201
Madison, WI 53711
(608) 442-5223



LEGEND

MW-8A	MONITORING WELL
MW-7A	ABANDONED MONITORING WELL
MW-8B	PIEZOMETER
MW-7B	ABANDONED PIEZOMETER
RW-1	EXTRACTION WELL
	PROPERTY BOUNDARY
	RAILROAD TRACKS

NOTE: MONITORING WELLS MW-7A, MW-7B, MW-17AR AND MW-17B ABANDONED IN MAY 2011.

NORTH

0 200 400

SCALE IN FEET

HACCO MANUFACTURING, INC.
RANDOLPH, WISCONSIN

FIGURE 2
SITE PLAN

DRAWN BY: DDZ, DAN	PROJECT: 103913-001	DATE: Oct 8, 2019
CHECKED BY: JDH	SOURCE: RMT Monitoring Well Location Map (April 2002) Dodge County GIS (March 2013)	
APPROVED BY: DPT	FILE: projects\37313 hacco\cad\site-2018.dwg[siteplan]	

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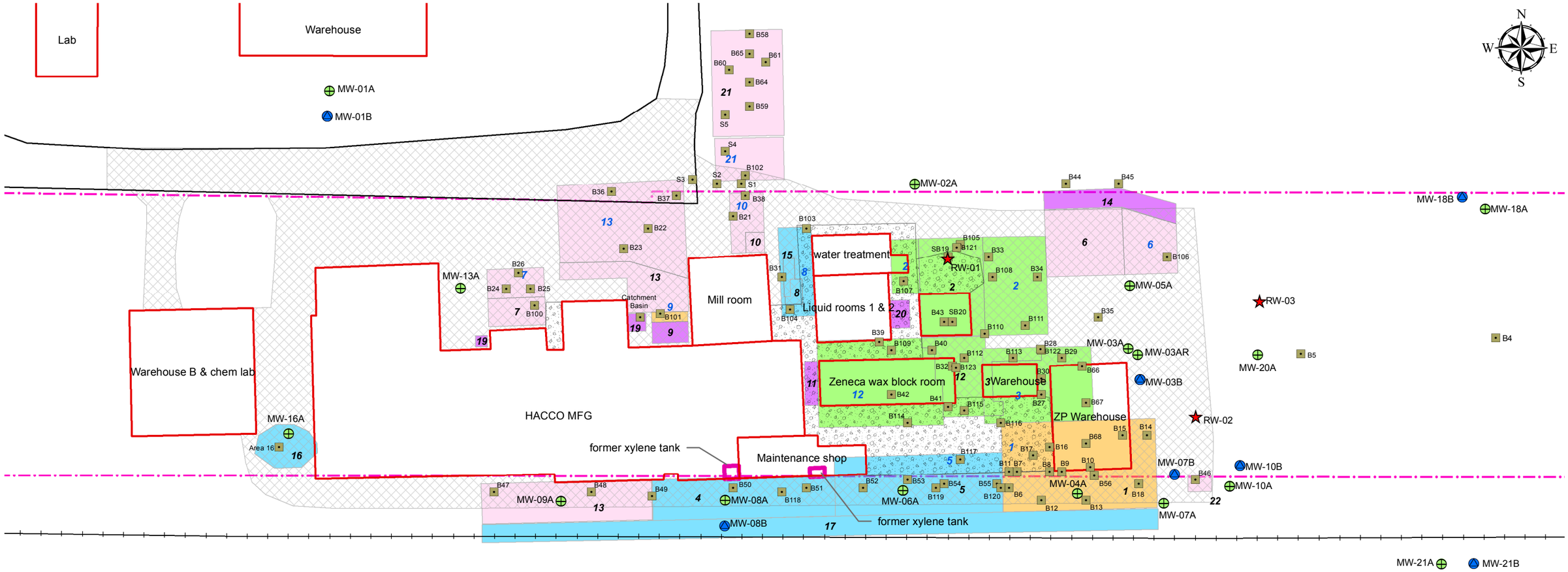
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
6506 Schroeder Rd #201
Madison, WI 53711
(608) 442-5223



LEGEND

- Property line
- Buildings
- Roads
- RR tracks
- Former Xylene tanks
- Soil Sample

Well Type

- Extraction
- Monitoring
- Piezometer
- Potable/Private

Paved areas

- asphalt
- concrete

SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN*

1 - HAZARDOUS WASTE STORAGE AREA
2 - WASTE EVAPORATION BASIN & TANKS
3 - EAST TANK AREA
4 - RAILROAD SPUR & XYLENE TANK
5 - PRODUCT STORAGE AREA
6 - EMPTY DRUM STORAGE AREA
7 - WEST LOADING DOCK
8 - EAST LOADING DOCK
9 - WEST DUST COLLECTOR
10 - NORTH DUST COLLECTOR
11 - EAST DUST COLLECTOR
12 - 1969 FIRE RUNOFF AND PIPING
13 - 1973 FIRE RUNOFF
14 - DRAINAGE ALONG NORTHEAST SIDE OF PLANT
15 - FORMER LOADING DOCK DRUM STORAGE AREA
16 - AREA AT SOUTHWEST CORNER OF PLANT
17 - DRAINAGE DITCH SOUTH OF PLANT
18 - OLD DUMP SITE
19 - UNDERGROUND WASTE STORAGE TANKS
20 - UNDERGROUND HAZARDOUS WASTE STORAGE TANK
21 - TREATMENT BUILDING SPILL
22 - STRESSED VEGETATION AREA SOUTHEAST OF PLANT

* Black numbers on map refer to original designations; blue numbers refer to expanded areas.

SWMU/AOC Status **(Based on WDNR letters dated 5-17-1991, 8-21-2000, 4-14-2008, and 5-4-2010)**

- Closed
- Open - No Further Action presumed
- Open - No Further Action likely
- Open - Additional information may be needed
- Open - Remedial evaluation ongoing

0 20 40 80 120 160 Feet

APPROXIMATE SCALE

HACCO MANUFACTURING, INC.
RANDOLPH, WISCONSIN

FIGURE 3
LOCATIONS OF SOLID WASTE MANAGEMENT UNITS (SWMUs) & AREAS OF CONCERN (AOCs)

DRAWN BY: DDZ, DAN	PROJECT: 103913-001	DATE: Oct 8, 2019
CHECKED BY: JDH	SOURCE: RMT Monitoring Well Location Map (April 2002)	
APPROVED BY: DPT	FILE: PROJECTS\37313 HACCO\GIS\Annual-Figure 3.mxd	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
6506 Schroeder Rd #201
Madison, WI 53711
(608) 442-5223

IMPORTANT INFORMATION

Important Information

About Your Geotechnical/Environmental Report

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CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you

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and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number

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of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland