2005 ANNUAL REPORT

PENTA WOOD PRODUCTS SITE

Town of Daniels, Wisconsin

Long-Term Response Action

WA No. 201-RALR-05WE/Contract No. 68-W6-0025

April 2006

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Abbreviations and Acronyms

µg/L	micrograms per liter
BTEX	benzene, toluene, ethylbenzene, and xylene
CAMU	Corrective Action Management Unit
ES	Enforcement Standard
EW	extraction well
ft^3	cubic feet
g/cm^3	grams per cubic centimeter
gal	gallon
gpm	gallons per minute
GW	groundwater
HVAC	heating, ventilating, and air conditioning
lb	pound
LNAPL	light nonaqueous phase liquid
mg/L	milligrams per liter
MW	monitoring well
ORP	oxidation-reduction potential
PAL	Preventive Action Limit
PCP	pentachlorophenol
PVC	polyvinyl chloride
QC	quality control
RA	remedial action
RDVF	rotary drum vacuum filter
SM	Site Manager
STL	Severn Trent Laboratories
USEPA	United States Environmental Protection Agency
WA	Work Assignment
WAM	Work Assignment Manager
WDC	Water Development Corporation
WDNR	Wisconsin Department of Natural Resources

Introduction

This Annual Report documents the groundwater sampling, hazardous waste generation and disposal, and site inspection and maintenance activities conducted at the Penta Wood Products Site as performed by CH2M HILL for the U.S. Environmental Protection Agency (USEPA) under Work Assignment (WA) No. 201-RALR-05WE.

2005 Groundwater Sampling Results

Introduction

Semiannual groundwater sampling was conducted at the Penta Wood Products Site in May 2005 at five monitoring wells, five residential wells, and one onsite potable well; along with static water level measurements collected at all monitoring wells, and product level measurements in wells with product. The fifth annual post-remedial action (RA) groundwater sampling event was conducted in September 2005 and consisted of sampling 19 monitoring wells, 5 residential wells, and 1 onsite potable well; and measuring static water levels in all monitoring wells and product levels in wells with product. As part of the annual September 2005 sampling, one monitoring well (MW), MW-20, was sampled on October 25, 2005. This monitoring well was sampled at a later date because of pump issues during the September event. This report presents the results of the two groundwater sampling events and includes tables and figures presenting historical groundwater data. It is an update of the previous year's report, retaining and updating evaluations based on the new data.

The treatment system operated for about 1 year prior to September 2001, when it was shut down to allow for pilot testing and plant modifications intended to help meet effluent criteria. Having been restarted on February 27, 2004, the treatment system has been running continuously since that time. The September 2005 monitoring well results reflect approximately 1.5 years of system operation since the system was restarted.

Purpose and Scope

The purpose of the groundwater sampling events is to monitor groundwater contaminant levels, remaining product thickness, and natural attenuation parameters to assess the effectiveness of the groundwater and product extraction, treatment, and natural attenuation. Parameters that are analyzed include pentachlorophenol (PCP); naphthalene; benzene, toluene, ethylbenzene, and xylene (BTEX); total and dissolved metals; and natural attenuation parameters (see the analytical results in Appendix A and B). Water level measurements were also collected during each sampling event to assess groundwater flow direction.

Water Level Measurements

Water levels in all monitoring wells were measured in May and September 2005. An oil/water interface probe was used to measure the distance from the top of the inner well casing to the water surface and, where applicable, to the product surface.

Unconfined Aquifer Groundwater

The water levels recorded in May and September 2005 continue to show a consistent capture zone in the unconfined aquifer resulting from the operation of the groundwater collection system. In the unconfined aquifer, groundwater displays a varied local flow pattern across the site (Figures 1 and 2). The September 2005 potentiometric surface indicates a groundwater divide existing beneath the site, running from the southwest to the northeast. Monitoring wells MW-09 and MW-16 exhibit the local groundwater highs within this divide, possibly indicating infiltration within the unconfined aquifer as a result of surface water runoff from the Corrective Action Management Unit (CAMU). The capture zone of the extraction wells in the CAMU extends to MW-09 on the north and MW-16 on the west, as indicated by the low water levels in the CAMU monitoring wells. The horizontal extents of the 2005 groundwater capture zone are greater than the extents of the 2004 groundwater capture zone, based on the potentiometric surface maps.

The effect of the discharge of the treated groundwater at the infiltration basin has continued to show minimal to no response on the unconfined aquifer. The variability of the water table surface observed in the unconfined aquifer in 2005 is likely a function of both the influence of the treatment system's pumping wells and varying surface infiltration rates across the site

Semiconfined Aquifer Groundwater

Groundwater in the semiconfined aquifer exhibited similar flow patterns between May and September 2005 (Figures 3 and 4). During May 2005, a groundwater divide ran north-south beneath the site. The water levels recorded in May and September 2005 continue to show a consistent capture zone in the semiconfined aquifer resulting from the groundwater collection system.

Compared to the 2004 results, the groundwater divide had moved further to the west, intersecting the infiltration basin. West of this divide, groundwater flow was to the west and northwest. Water levels recorded near the extraction wells indicate a localized groundwater depression that results from extraction well pumping with groundwater flow on the eastern half of the divide directed radially toward the area near MW-4. Continued pumping from extraction wells should have little effect on the potentiometric surface of the semiconfined aquifer for the next sampling year. The effect of the recharge from the infiltration basin continues to show an elevated potentiometric surface in this area. The effects of the infiltration basin do not impact the collection of contaminated groundwater by the groundwater collection system.

In May 2005, light nonaqueous phase liquid (LNAPL) was observed in MW-10S (0.29 foot), MW-18 (0.48 foot), MW-19 (0.38 foot), and MW-20 (0.57 foot). During September 2005, LNAPL was observed in MW-10S (0.87 foot), MW-18 (0.06 foot), MW-19 (0.58 foot), and MW-20 (1.15 foot). This is consistent with observations made in the past several years. Groundwater elevations, oil/water interface measurement data, and other observations are included in Appendix C.

Monitoring Well Sampling and Analysis

For the semiannual sampling round conducted in May 2005, five monitoring wells and five residential wells were sampled. The monitoring wells chosen for this event were MW-01, MW-12, MW-19, MW-21, and MW-26. MW-19 was chosen to represent the unconfined groundwater in the LNAPL area; MW-01, MW-12, and MW-21 were chosen to assess the impacts of the plant shutdown to the perimeter of the plume, particularly in the direction of residential wells; and MW-26 was chosen to monitor groundwater quality near the treated water infiltration basin. These wells were sampled on May 10, 2005. All monitoring wells were purged of at least three well volumes before sampling. MW-12 was purged and sampled with the dedicated Timco bladder pump that was installed in 1997, and the remaining monitoring wells were purged and sampled using disposable polyvinyl chloride (PVC) bailers.

Severn Trent Laboratories (STL) of Chicago, Illinois, analyzed the samples. Quality control (QC) samples consisting of field blanks, duplicate samples, and matrix spike/matrix spike duplicate samples were collected at the frequency specified in the Sampling and Analysis Plan (CH2M HILL 2000; revised April 2001).

For the annual sampling event conducted during September 2005, 19 monitoring wells, 5 residential wells, and 1 potable-water well were sampled. The monitoring wells selected for sampling were MW-01, MW-02, MW-03, MW-05, MW-07, MW-08, MW-09, MW-10S, MW-11, MW-12, MW-13, MW-15, MW-16, MW-17, MW-19, MW-20, MW-21, MW-22, and MW-26. CH2M HILL sampled the wells during the week of September 26, 2005. Well MW-06S and MW-10 were not sampled because they were found to be dry during the sampling event. Monitoring wells were purged and sampled with dedicated Grundfos Redi-Flo 2 pumps, which were installed in 2005. With the installation of new dedicated Grundfos Redi-Flo 2 MP1 pumps, more representative contamination sampling will occur because they eliminate the task of bailing from these wells.

The samples were analyzed by STL of Chicago, Illinois. QC samples consisting of field blanks, duplicate samples, and matrix spike/matrix spike duplicate samples were collected at the frequency specified in the Sampling and Analysis Plan (CH2M HILL 2000; revised April 2001).

All monitoring well and residential well sample result packages were submitted to the director of USEPA Region 5 Central Regional Laboratory for data validation.

Residential Well Analytical Results

The residential well sample information (names, addresses, and telephone numbers) and the analytical results were submitted under separate cover to Tom Williams, USEPA Work Assignment Manager (WAM), on August 11, 2005, and January 4, 2006 (Appendix D).

Semiannual sampling (May 2005) results received from STL showed that PCP was present at low concentrations at one residential well and at the onsite potable well. Since the presence of PCP in these wells has varied, it was suspected that there may have been instrument carryover from other site monitoring well samples with high PCP concentrations. The residential well was resampled on July 7, 2005, and the subsequent results showed that PCP was present at a low concentration (0.043 micrograms per liter (µg/L)). No other contaminant (BTEX or naphthalene) was detected in the semiannual residential well groundwater samples.

Annual sampling (September 2005) results received from STL showed that PCP was present at low concentrations at one residential well and at the onsite potable well. PCP concentrations were 0.040 µg/L in the onsite potable well and 0.049 µg/L in the residential well. No other contaminant was detected in the annual residential well groundwater samples.

Evaluation of Groundwater Contaminant Trends

Trend analysis of historical groundwater data is presented to evaluate the performance of the RA at the site. The analysis has the following objectives:

- Evaluate the influent data from the groundwater extraction system to determine the amount of PCP removed to date. The system was in operation from September 2000 to September 2001, and since February 2004.
- Evaluate the current monitoring data to determine whether the plume is declining in size since the February 2004 restart of the treatment system.
- Evaluate the infiltration basin area to determine the effect of reinfiltration on groundwater quality.
- Identify changes needed to groundwater monitoring strategy.

For completeness, the results of the previous analyses and new data from 2005 are presented below.

Groundwater Extraction System PCP Removal Estimates

The groundwater extraction system was operated between September 27, 2000, and September 27, 2001, for a total of 280 days, with flow rates ranging from 35 gallons per minute (gpm) to 120 gpm during operation. A total volume of 30 million gallons of groundwater, or roughly 2 pore volumes of the extraction zone, was removed. PCP influent concentrations were typically in the 5,000 to 14,000 µg/L range. Based on this information, the estimated PCP mass removed was about 2,500 pounds (see Table 1).

TABLE 1
PCP Mass Removed with the Groundwater Extraction System: September 27, 2000–September 27, 2001; and February 27, 2004–December 31, 2005
Penta Wood Products Site

Operation Period	Days Operated[a]	Average Flow Rate (gpm)	Average PCP Influent Concentration (µg/L)	PCP Mass Removed (lb])
9/27/00 to 12/18/00	83	98	12,535	1,224
2/2/01 to 2/8/01	8	60	12,535	72
3/16/01 to 6/10/01	86	75	10,356	802
6/15/01 to 9/27/01	103	46	7,535	429
		Total PCP Mass Removed 2000 to 2001		**2,527**
2/27/04 to 12/31/04	240[1]	80	9,227	2,128
1/1/05 to 12/31/05	190	74	7,300	1,233
		Total PCP Mass Removed 2000 to 2005		**5,888**

[a] Number of days operated is approximate because of start-up/shut-down times.

The groundwater extraction system was restarted on February 27, 2004. From February to July 2004, the extraction system operated intermittently, and from July to December 2004 it operated more consistently. A total volume of approximately 28 million gallons of groundwater, or roughly 2 pore volumes of the extraction zone, were removed during 2004.

The extraction system has operated consistently in 2005, with only a few shutdowns. Over 2005, groundwater extraction rates ranged from 63 to 85 gpm. A total volume of approximately 21 million gallons of groundwater, or roughly 2 pore volumes of the extraction zone, were removed during the year. PCP influent concentrations in 2005 ranged from 3,500 to 10,800 μg/L. Based on this information, the estimated PCP mass removed was approximately 1,200 pounds (see Table 1).

The total PCP mass removed since September 2000 is about 5,900 pounds. This represents about 73 percent of the dissolved phase PCP mass that was present prior to the operation of the extraction system. However, as shown in Table 2 on the following page, it is estimated that there is considerably more PCP mass adsorbed on the aquifer matrix (9,000 pounds) than in the groundwater (3,000 pounds). All the remaining PCP mass is present in the LNAPL residual zone (12,000 pounds). It should be noted that the contaminant mass estimates are based on many simplifying assumptions and expected to be accurate only to within a one order-of-magnitude range. As a result, they are intended as general comparisons of the relative significance of contaminant mass in different media.

With the installation of the new dedicated Grundfos Redi-Flo 2 MP1 pumps in September 2005, more representative contamination sampling will occur because they eliminate the task of bailing from these wells. Bailing of wells that contained free product required passing the bailer through the LNAPL to sample the groundwater. This caused the introduction of product to the sample and biased results higher than expected. The new pumps will allow for more reliable samples, which could result in lower or nondetect results, and it may be possible to redefine the areas in Table 2 in the future for better estimates of saturated zone contaminant mass.

Table 3 summarizes the PCP mass estimates for 1994, 1997, 2000, 2002, 2003, 2004, and 2005 at the Penta Wood Site.

The volume of liquid waste that was obtained from the separator can be used to make a rough estimate of the volume of LNAPL that was removed by groundwater extraction. While the plant was operating in 2005, approximately 5,026 gallons of liquid waste were captured in the separator; if the assumption is made that one-half of this waste was water, then roughly 2,513 gallons of LNAPL were removed. Assuming an LNAPL density of 0.84 grams per cubic centimeter (g/cm^3) and a PCP concentration of 5 percent, this volume equates to about 880 pounds of PCP.

TABLE 2
Estimate of Saturated Zone Contaminant Mass
Penta Wood Products Site

Contaminant	Parameter	Unconfined MW10S, 19, 20 (Area 1)	Unconfined MW6S, PW01 (Area 2)	Unconfined MW3 (Area 3)	Unconfined MW16 (Area 4)	Semiconfined MW5,10,18 (Area 1)	Semiconfined MW6, PW01 (Area 2)	Semiconfined MW3 (Area 3)	Semiconfined MW12 (Area 4)	Total Contaminant Mass (lb)
	Aquifer Media Volume (ft^3):	3,540,000	2,790,000	1,800,000	6,100,000	5,900,000	4,650,000	3,000,000	10,200,000	
	Aquifer Water Volume (ft^3):	1,416,000	1,116,000	720,000	2,440,000	2,360,000	1,860,000	1,200,000	4,080,000	
Mass in 1994 Based on Groundwater Sampling in September, 1994										
PCP	Conc. (µg/L)	77,300	51	2.6	0.3	17,400	2,350	2.6	10,000	
K_d^b = 0.60	Mass in soil (lb)	18,236	9	0	0	6,842	728	1	6,798	32,614
	Mass in GW (lb)	6,815	4	0.1	0.05	2,557	272	0.2	2,540	12,188
	Total Mass (lb)	25,051	13	0.4	0.2	9,398	1,000	0.7	9,338	44,802
Mass in 1997 Based on Groundwater Sampling in October, 1997										
PCP	Conc. (µg/L)	28,000	3	0.5	0.5	21,600	2,300	0.5	13,000	
K_d^b = 0.60	Mass in soil (lb)	6,606	1	0	0	8,493	713	0	8,837	24,649
	Mass in GW (lb)	2,468	0	0	0.08	3,174	266	0	3,302	9,211
	Total Mass (lb)	9,074	1	0.1	0.3	11,667	979	0.1	12,139	33,860
Mass in 2000 (Prior to Groundwater Extraction) Based on Groundwater Sampling in April, 2000[a]										
PCP	Conc. (µg/L)	37,000			0.2	15,065			10,300	
K_d^b = 0.60	Mass in soil (lb)	8,729	0	0	0	5,923	0	0	7,002	21,654
	Mass in GW (lb)	3,262	0	0	0.03	2,214	0	0	2,616	8,092
	Total Mass (lb)	11,991	0	0	0.1	8,137	0	0	9,618	29,746
Mass in 2002 (Following 1 Year of Groundwater Extraction) Based on Groundwater Sampling in August, 2002										
PCP	Conc. (µg/L)	13,797				11,255			4,300	
K_d^b = 0.60	Mass in soil (lb)	3,255	0	0	0	4,425	0	0	2,923	10,603
	Mass in GW (lb)	1,216	0	0	0	1,654	0	0	1,092	3,962
	Total Mass (lb)	4,471	0	0	0	6,079	0	0	4,015	14,566

TABLE 2
Estimate of Saturated Zone Contaminant Mass
Penta Wood Products Site

Contaminant	Parameter	Unconfined MW10S, 19, 20 (Area 1)	Unconfined MW6S, PW01 (Area 2)	Unconfined MW3 (Area 3)	Unconfined MW16 (Area 4)	Semiconfined MW5,10,18 (Area 1)	Semiconfined MW6, PW01 (Area 2)	Semiconfined MW3 (Area 3)	Semiconfined MW12 (Area 4)	Total Contaminant Mass (lb)
Mass in 2003 (2nd Year Following 1 Year of Groundwater Extraction) Based on Groundwater Sampling in September, 2003										
PCP	Conc. (µg/L)	10,067				5,050			10,000	
K_d[b] = 0.60	Mass in soil (lb)	2,375	0	0	0	1,986	0	0	6,798	11,158
	Mass in GW (lb)	888	0	0	0	742	0	0	2,540	4,170
	Total Mass (lb)	3,262	0	0	0	2,728	0	0	9,338	15,328
Mass in 2004 (Groundwater Extraction System restarted in February 2004) Based on Groundwater Sampling in September, 2004										
PCP	Conc. (µg/L)	10,067[c]				194			9,060	
K_d[b] = 0.60	Mass in soil (lb)	2,375	0	0	0	76	0	0	6,159	8,610
	Mass in GW (lb)	888	0	0	0	29	0	0	2,301	3,218
	Total Mass (lb)	3,262	0	0	0	105	0	0	8,460	11,827
Mass in 2005 (1st Year Following Groundwater Extraction System restarted in February 2004) Based on Groundwater Sampling in September, 2005										
PCP	Conc. (µg/L)	25,300							8,300	
K_d[b] = 0.60	Mass in soil (lb)	5,900	0	0	0	NA[d]	0	0	5,642	14,607
	Mass in GW (lb)	2,200	0	0	0	NA[d]	0	0	2,108	5,548
	Total Mass (lb)	8,100	0	0	0	NA[d]	0	0	7,750	20,065

[a] Where April 2000 groundwater data is not available for a MW, April 2001 data is used.
[b] K_d from Hydrogeologic Investigation, Dec. 1994.
[c] LNAPL product present in all three wells in this subarea. As a result, PCP concentrations are not reliable. Concentrations are assumed to be similar to 2003.
[d] MW10 could not be sampled during the September 2005 sampling event.

Notes:

Contaminant mass estimates are based on many simplifying assumptions and are expected to be accurate only to within a one order-of-magnitude range. As a result they are intended as general comparisons of the relative significance of contaminant mass in different media.

Soil Density = 1.78 g/cm^3; ft^3 = cubic feet; GW = groundwater

TABLE 3
Summary of PCP Mass Estimates
Penta Wood Products Site

Location	1994 PCP Mass (lb)	1997 PCP Mass (lb)	April 2000 PCP Mass (lb)	August 2002 PCP Mass (lb)	September 2003 PCP Mass (lb)	September 2004 PCP Mass (lb)	September 2005 PCP Mass (lb	Notes
Unsaturated Zone	115,000	115,000	115,000	115,000	115,000	115,000	115,000	No additional data to estimate actual degradation of PCP in unsaturated zone.
LNAPL Residual Zone	15,000	15,000	15,000	15,000	15,000	15,000	15,000	No additional data to estimate actual degradation of PCP in LNAPL zone.
Saturated Zone—Adsorbed	33,000	25,000	22,000	11,000	11,000	8,600	14,600	Based on groundwater concentration and a PCP K_d of 0.6.
Saturated Zone—Dissolved	12,000	9,200	8,100	4,000	4,200	3,200	5,500	Based on weighted average groundwater concentrations.
Total PCP Mass	175,000	164,000	160,000	145,000	146,000	141,800	150,000	
Removed by LNAPL Recovery System 2000–2001 / 2005	—	—	—	350	—	1,500		Assuming 50% of recovered liquid is LNAPL and LNAPL is 5% PCP.
Removed by GW Extraction System 2000–2001 / 2005	—	—	—	2,500	—	2,100	5,900	

Note: Contaminant mass estimates are based on many simplifying assumptions and are expected to be accurate only to within a one order-of-magnitude range. As a result, they are intended as general comparisons of the relative significance of contaminant mass in different media.

PCP Plume

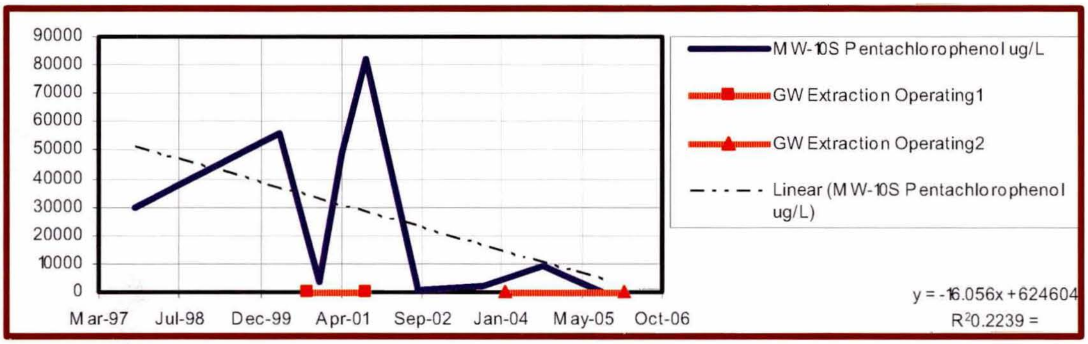
The monitoring well analytical results tables presented in Appendix A are formatted into two unique tables: the May 2005 semiannual sampling results; and the September 2005 annual sampling results.

To observe PCP trends over time, PCP concentration contours that exceed 1,000 µg/L are presented in Figure 1 of Appendix C. PCP concentration contours that exceed the Wisconsin NR 140 enforcement standard of 1 µg/L are presented in Figure 2 of Appendix C. A comparison of the 1,000 µg/L contour lines in Figure 1 for 1997, 2001 2002, 2003, 2004, and 2005 shows that the high concentration plume has shrunk from 1997 to 2005. The high concentration plume shrank a small amount from 2004 to 2005. A greater amount of shrinking is not anticipated until a more significant amount of LNAPL is removed, given the large mass of PCP that can solubilize from the LNAPL residual.

The 2005 extent of the plume exceeding the 1-µg/L contour, as shown in Figure 2 (Appendix C), remains similar to the 2004 contour with shrinkage on the northeast and southeast portions of the plume. There continues to be a sharp decline in PCP concentrations between the high concentration area where LNAPL is present and the surrounding perimeter of the plume, that is, the 1-µg/L contour is only slightly larger than the 1,000-µg/L contour. This is likely a combination of the groundwater collection system drawing water towards the center of the plume and biodegradation resulting from the availability of oxygen in groundwater around the plume perimeter. It should be noted that there was one well location, MW-11, where PCP was detected above 1 µg/L far from the actual PCP plume. However, from the analytical run logs, it is suspected that there may have been contaminant carryover on the laboratory instrumentation, biasing the well's PCP results. Therefore, that value has not been included in the delineation of the 1-µg/L PCP isoconcentration contour.

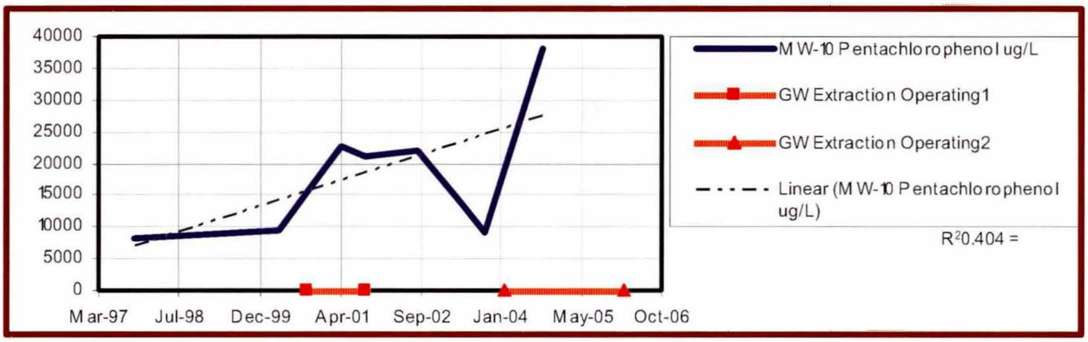
Monitoring well MW-10S has shown wide fluctuations in PCP during groundwater collection periods as can be seen in Figure 5. Overall, however, PCP has declined from 56,100 µg/L prior to groundwater extraction to 0.11 µg/L in the most recent 2005 sample. MW-10S is near the perimeter (within 100 feet) of the high concentration PCP plume in the unconfined aquifer, where relatively clean groundwater has been drawn past the well screen by nearby extraction well (EW) EW-03. Since 2003, free product was observed in the well, explaining why concentrations increased. The free product presence is likely to the result of extraction well EW-03 pulling product towards it while actively pumping. The 2005 PCP nondetect concentration is particularly remarkable because the well has 0.87 feet of LNAPL present. Typically when LNAPL is present the dissolution of PCP results in very high dissolved-phase PCP concentrations.

FIGURE 5
MW-10S PCP Concentration and Groundwater Extraction Operating Period



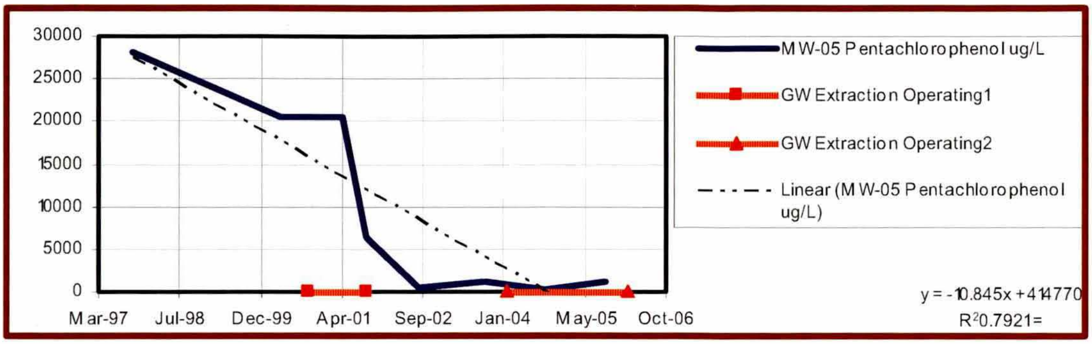
PCP in monitoring well MW-10 increased from 9,530 µg/L shortly before the startup of the treatment system to 22,000 µg/L in August 2002 (see Figure 6). Concentrations in the well did not drop immediately, but by September 2003, concentrations had fallen to 9,000 µg/L. In September 2004, PCP concentrations at MW-10 increased to 38,000 µg/L. This is likely a result of the extraction system restart in February 2004. MW-10 is very near to extraction well EW-03, which pulls product toward it while actively pumping. In September 2005, MW-10 was not sampled because it was dry.

FIGURE 6
MW-10 PCP Concentration and Groundwater Extraction Operating Period



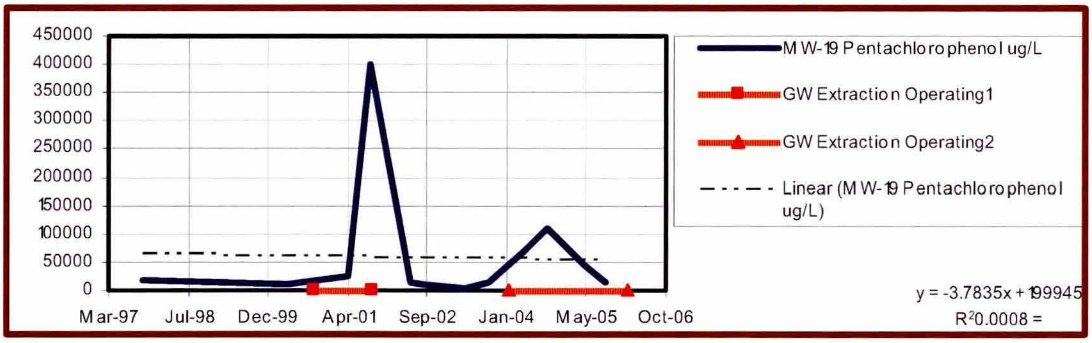
PCP in monitoring well MW-05 has dropped sharply from 20,600 µg/L prior to groundwater collection to 1,100 µg/L in the most recent sample in September 2005 (see Figure 7). PCP has been lower than the most recent result most likely because of the well's proximity to the perimeter of the high-concentration PCP plume. This area of the plume is being remediated relatively quickly because of the nearby uncontaminated groundwater being drawn radially toward EW-02 and EW-05 since their activation in February 2004, thereby purging the aquifer of PCP.

FIGURE 7
MW-05 PCP Concentration and Groundwater Extraction Operating Period



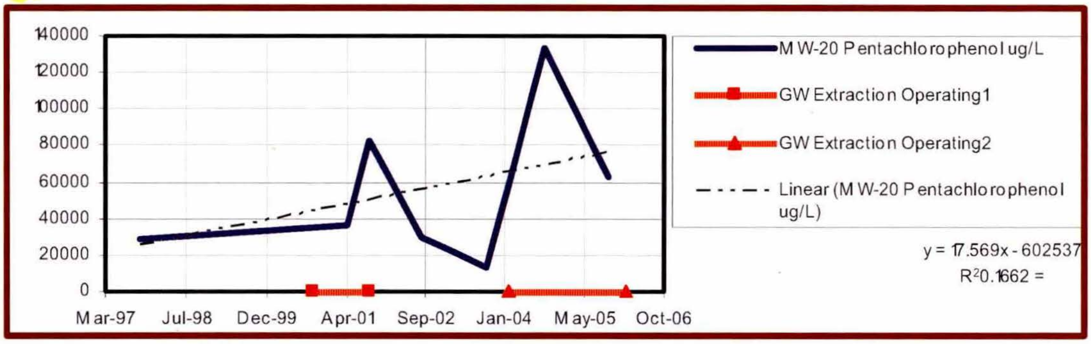
LNAPL has been present in MW 19 since monitoring began (see Figure 8), making the evaluation of PCP trends difficult because any entrainment of LNAPL droplets in the sample will have large effects on PCP concentrations. The LNAPL has resulted in large variations in PCP that are not believed to be indicative of dissolved phase groundwater concentrations. The addition of dedicated sampling equipment in the well is expected to reduce these wide variations in PCP in the future.

FIGURE 8
MW-19 PCP Concentration and Groundwater Extraction Operating Period



LNAPL has also been present in MW 20 since monitoring began (see Figure 9). The LNAPL has resulted in large variations in PCP that are not believed to be indicative of dissolved phase groundwater concentrations. After eliminating bailing with the use of new dedicated Grundfos Redi-Flo 2 MP1 pumps, the entrapment of LNAPL in groundwater samples from this well will be minimized.

FIGURE 9
MW-20 PCP Concentration and Groundwater Extraction Operating Period



The 2005 PCP concentrations in the high concentration perimeter areas (>1,000 µg/L) are largely similar to those of 2004.

Naphthalene

Naphthalene was detected in only four monitoring wells in 2005 (MW-05, MW-10S, MW-12, and MW-19) at levels above reporting limits. Concentrations ranged from 1.8 to 2,300 µg/L. All four wells where naphthalene was detected are within the area of concentrated PCP (> 1,000 µg/L).

BTEX

BTEX was detected above reporting limits at several monitoring wells in 2005. All wells where these compounds were detected were located within the area of concentrated PCP. Benzene was not detected in any of the monitoring wells. Ethylbenzene was detected in three monitoring wells (MW-12, MW-19, and MW-20) at concentrations ranging from 0.85 to 5.5 µg/L. Toluene was detected at two monitoring wells (MW-19 and MW-20). Toluene concentrations ranged from 1.1 to 5.4 µg/L. Xylene was detected in four monitoring wells (MW-10S, MW-12, MW-19, and MW-20) with concentrations ranging from 0.99 to 62 µg/L.

Total and Dissolved Metals

Both dissolved and total arsenic, copper, iron, manganese, and zinc were sampled in May and September 2005. Dissolved metals samples provide the best indicator of metals present in groundwater because total metal results are often biased high as a result of the presence of suspended solids in samples. When the groundwater sample is acidified for preservation, the metals that are present as suspended solids are dissolved into the water. The suspended solids are typically orders of magnitude higher in metal concentrations when compared to groundwater. As a result, even a very small amount of suspended solids can have a large effect on total metal concentrations. Turbidity was observed in some of the samples and, in those cases, metals may not have been representative of groundwater.

Arsenic. Dissolved arsenic in all May and September 2005 samples were below the Wisconsin Department of Natural Resources (WDNR) Preventive Action Limit (PAL) of 5 µg/L.

Total arsenic did not exceed the WDNR Enforcement Standard (ES) of 50 µg/L in any well in 2005. It exceeded the WDNR PAL of 5.0 µg/L in two wells (MW-02, and MW-21).

Copper. In 2005, total copper exceeded the WDNR PAL of 130 µg/L at MW-02 (140 µg/L) and MW-21 (230 µg/L). High turbidity could cause an increase in metal concentrations due to the increase in suspended solids. All other total copper samples were below the WDNR PAL. Copper exceeded the site's reporting limit of 10 µg/L in seven wells (MW-01, MW-02, MW-10S, MW-13, MW-19, MW-20, and MW-21), with concentrations ranging from 11 to 230 µg/L.

Dissolved copper was detected at 12 wells in 2005, but it did not exceed the WDNR PAL of 130 µg/L or the site's reporting limits of 10 µg/L.

Iron. Total iron was detected above the WDNR ES of 0.3 milligrams per liter (mg/L) and the WDNR PAL of 0.15 mg/L at 16 wells across the site in 2005, ranging from 0.42 mg/L (MW-15) to 56 mg/L (MW-21). As noted, the high turbidity of groundwater in some wells likely increases total metal concentrations due to the increase in suspended solids.

Dissolved iron was detected above the WDNR ES of 0.3 mg/L and the site's reporting limit of 0.15 µg/L at two wells (MW-05 and MW-07) in 2005, ranging from 0.88 mg/L (MW-07) to 19 mg/L (MW-05).

There is a clear downward trend in both total and dissolved iron concentrations in nearly all monitoring wells. This is expected as the more oxygen-rich groundwater surrounding the site is drawn into the reducing portion of the plume, increasing the oxidation-reduction potential (ORP) to more oxidative conditions.

Manganese. Total manganese was detected and exceeded the WDNR ES of 0.05 mg/L at 13 wells across the site in 2005, ranging from 0.056 mg/L (MW-08) to 7.6 mg/L (MW-05). Again, the high turbidity of groundwater in some of these wells likely causes an increase in metal concentrations due to the increase in suspended solids.

Dissolved manganese exceeded the WDNR ES of 0.05 mg/L at five wells across the site, ranging from 1.3 mg/L (MW-12) to 7.6 mg/L (MW-05).

For most wells, there is an overall downward trend in total and dissolved manganese concentrations, with the exception of a few wells, where the trend is less well-defined and displays some lower manganese concentrations prior to September 2004.

Zinc. Total zinc was detected at 11 wells across the site in 2005, ranging from 0.0075 mg/L (MW-26) to 0.11 mg/L (MW-21). There were no WDNR PAL (2.5 mg/L) or ES (5.0 mg/L) exceedances of total zinc in any wells.

Dissolved zinc was detected at one well in 2005 (0.0098 mg/L). There were no WDNR PAL or ES exceedances of dissolved zinc in any wells.

As with iron, there is a clear downward trend in both total and dissolved zinc concentrations in all wells across the site.

Evaluation of Natural Attenuation

Natural attenuation is a remediation approach that relies on natural processes that work to reduce mass and concentration of contaminants in soil and groundwater. Natural attenuation processes include dispersion, dilution, abiotic transformation, volatilization, sorption, and biodegradation. Biodegradation is often the most important process for compounds that can be transformed or reduced by indigenous microorganisms.

Appendix B contains a table presenting the natural attenuation parameters for each well as measured in 1997, 2000, 2001, 2002, 2003, 2004, and 2005.

Limitations in Field Measurements of Natural Attenuation Parameters. The natural attenuation parameters measured in the field may not be truly representative of groundwater because of the limitations that exist in measurement methods. Installation of the new dedicated Grundfos Redi-Flo 2 MP1 pumps in 2005 has greatly reduced the potential for measurement-induced errors in natural attenuation parameters. Use of these dedicated pumps minimizes suspended solids in samples and minimizing aeration during sample collection. Dissolved metals will again be representative of groundwater because of new pump installation. However, if sample locations are frequently turbid (such as MW-03) or if metal casings in wells have corroded, total metals data may not be representative of groundwater conditions. Dedicated downhole Grundfos Redi-Flo 2 pumps were installed into MW-03, MW-05, MW-07, MW-08, MW-09, MW-10S, MW-11, MW-12, MW-15, MW-17, MW-19, MW-20, and MW-26.

Oxidation/Reduction. Evaluation of the data generated during 2005 suggested that the LNAPL area was under reducing conditions and the surrounding areas were oxidizing. The 2005 data in general are similar to 2004 data, indicating a relatively stable reducing area of the plume.

Chloride. Chloride production is an indicator of PCP degradation. About 700 µg/L of chloride is produced for each 1,000 µg/L of PCP degraded. Except for MW-03 and MW-21, chloride is generally higher near the interior wells than the perimeter wells. MW-03 and MW-21 chloride concentrations have been traditionally higher than background. These wells are near the highway where influence from road salting may be causing elevated chloride concentrations.

Since the beginning of groundwater extraction, correlation between PCP degradation and chloride production has been difficult because, as chloride is produced, it is removed by the extraction system, creating a net effect that is difficult to discern.

Nitrate. During 2005, nitrate levels remained relatively low, ranging from 0.6 to 5.1 mg/L, and remaining comparable to concentrations observed in 2004.

Methane. Methane, a product of anaerobic degradation, was detected in two wells (MW-05 and MW-8) in September 2005 at low concentrations (23 and 2.6 µg/L, respectively). The absence of methane at or above the detection limit in most wells suggests that degradation is occurring primarily under nonmethanogenic, anaerobic iron, or sulfate-reducing conditions.

Sulfate. Once oxygen and nitrate are depleted, sulfate can also be used as an electron acceptor. Sulfate has fluctuated within the plume and has not shown any clear trends.

Effects of Reinfiltration on Groundwater Quality

Large quantities of treated groundwater were reinjected at the site's infiltration basin since the beginning of operation. A total of 79 million gallons of groundwater have been reinfiltrated. The water would be expected to displace groundwater over a considerable area. Assuming that a 20-foot thickness of the aquifer is affected, the area occupied by 79 million gallons equals roughly 40 acres.

MW-26 is used to determine the effects the infiltration basin has on groundwater in the area. The well, however, was not sampled prior to the discharge of groundwater. As a result, MW-08, located about 200 feet upgradient, is used to establish the local background concentrations.

PCP in MW-26 has remained similar to background levels. Based on surrounding background concentrations, chloride increased from an expected background of about 5 mg/L to a range of 10 to 30 mg/L during the operation of the groundwater collection and treatment system.

Sulfate has increased from a background value of less than 10 mg/l to an estimated 170 mg/L in the most recent September 2005 result.

Iron has dropped significantly at MW-26. This was also expected because the aeration of the groundwater results in precipitation and removal of iron from treated groundwater. Nitrate also dropped as expected because the source area groundwater has minimal nitrate.

Another benefit of reinfiltrating groundwater is that treatment results in aeration and reoxygenation of the groundwater. Assuming this water flows towards the extraction wells and into the PCP plume, it would result in a considerable supply of oxygen for aerobic biodegradation of the PCP. In previous years, water sourced from the infiltration basin has been shown to migrate towards the PCP plume in both the unconfined and confined aquifers. In 2005, the potentiometric surfaces of both aquifers did not generally follow this pattern observed in past years. Results from May and September 2005 show that the infiltration basin is situated on a groundwater divide. Groundwater flow is shown to migrate bilaterally from the infiltration flowing west-northwest and east. Fate of the groundwater flowing east will consequently migrate towards the PCP plume. Conversely, groundwater flow west of the infiltration basin will continue on a westward path traveling offsite.

Summary

Semiannual groundwater sampling was conducted at the Penta Wood Products Site in May 2005 for five monitoring wells, five residential wells, and one onsite potable well. The fifth post-RA annual groundwater sampling event was conducted in September 2005 and consisted of 19 monitoring wells, 5 residential wells, and 1 onsite potable well.

Results from the residential wells that were sampled in May and September 2005 indicate the presence of PCP at very low concentrations in one residential well and the onsite potable well. No other contaminant detections were reported in the residential wells sampled in August.

The groundwater extraction system was operated continuously from January 2005 through December 2005. More than 21 million gallons of groundwater, or about 2 pore volumes, were removed from the extraction zone. About 1,200 pounds of PCP were removed.

The PCP plume exceeding 1,000 µg/L has continued to shrink slightly between 1997 and 2005 as a result of groundwater extraction and natural attenuation. The extent of the plume, as defined by the 1 µg/L contour, extends out to MW-13 in the northeast and beyond MW-14 in the southeast. The most notable change in PCP concentration occurred at MW-10S, where PCP declined from 9,490 µg/L to nondetect, even though this well had about 0.87 feet of LNAPL.

More rapid plume remediation is limited by the continued dissolution of PCP from the LNAPL. The LNAPL extent or thickness has not declined appreciably even though an estimated 2,500 gallons of LNAPL were removed.

Naphthalene and BTEX were present in several wells in the area of concentrated PCP. They are not present in any of the monitoring wells along or outside the plume perimeter.

Evaluation of the natural attenuation parameters revealed similar conditions as those in 2004.

Recommendations

It is recommended that further evaluation of laboratory analytical contaminant carryover during PCP analysis should be undertaken. It is important that lower concentrations of PCP be accurately determined in groundwater beneath the site. In the future, samples will be submitted in three groups representing PCP concentrations from low to high and will be analyzed in that order. The proposed sample groupings are:

1. Wells with PCP < 100 µg/L
2. Wells with PCP > 100 µg/L and no LNAPL in the well
3. Wells with LNAPL

The continued dissolution of PCP from the LNAPL is limiting the ability to more rapidly remediate the groundwater. A more detailed analysis of LNAPL removal rates and the remaining mass of LNAPL should be undertaken. Analysis of the PCP concentration in the remaining LNAPL may also be warranted.

Waste Generation and Disposal Summary

The RA activities at the site result in the generation of hazardous waste. Hazardous waste management procedures for the Penta Wood Products Site (USEPA ID No. WID006176945) are outlined in the Waste Handling Plan (CH2M HILL 2005).

Table 4 summarizes the amount of waste generated and disposed of offsite.

TABLE 4
Hazardous Waste Generation Summary
Penta Wood Products Site

Manifest #	Date	Filter Cake (lbs)	Misc. Debris (lbs)	Carbon (lbs)	LNAPL (lbs)	Water (gal)	Yearly Total (lbs)
IL9408187	12/19/2000				5,009		
IL9408188	12/19/2000		200	6,000			
	Total (lb):	**0**	**200**	**6,000**	**5,009**		**11,209**
WIK168068	08/28/2001		400	3,600	4,239		
WIK169159	04/03/2001			44,000			
WIK169160	04/03/2001			8,500	1,927		
	Total (lb):	**0**	**400**	**56,100**	**6,166**		**62,665**
WIK179411	01/08/2002			40,000			
WIK179412	01/08/2002		200	8,000			
WIK179225	04/04/2002		200		3,083		
WIK298473	06/09/2002		1,000		7,707		
IL10328513	06/25/2002					3328	
	Total (lb):	**0**	**1,400**	**48,000**	**10,790**	**27,756**	**87,944**
WIK296620	10/30/2003		600		3,083		
IL10329166	10/30/2003					165	
	Total (lb):	**0**	**600**	**0**	**3,083**	**1,376**	**5,059**
WIK359186	02/11/2004		200	8,000			
WIK359185	02/12/2004			38,000			
WIK359334	05/04/2004			6,000			
2159985	05/19/2004		1200				
WIK359343	05/19/2004	10,700					
WIK278209	05/19/2004			10,000			
WIK376767	06/07/2004	24,000					

TABLE 4
Hazardous Waste Generation Summary
Penta Wood Products Site

Manifest #	Date	Filter Cake (lbs)	Misc. Debris (lbs)	Carbon (lbs)	LNAPL (lbs)	Water (gal)	Yearly Total (lbs)
WIK376681	07/12/2004	18,860					
WIK363235	08/05/2004	19,140					
CWM0027842	08/10/2004				25,500		
WIK363114	09/14/2004	18,700					
WIK363151	10/20/2004	15,660					
WIK361532	11/22/2004		1,800	40,000			
WIK448461	11/22/2004	24,900					
WIK361540	12/04/2004				28,022		
WIK446853	12/29/2004	24,000					
	Total (lb):	**155,960**	**3,200**	**102,000**	**53,522**		**314,682**
WIK361592	01/19/2005	13.26					
WIK361599	02/02/2005	0.40	140	19465			
WIK302737	03/09/2005	14.05					
WIK390017	03/20/2005			24498			
WIK390019	03/21/2005				3404		
WIK390053	05/04/2005		76	18492			
WIK417972	05/05/2005	14.27					
WIK390072	06/20/2005	16.48					
WIK390144	07/14/2005	2.66	787	19138			
WIK390188	10/04/2005	13.58					
WIK390189	10/04/2005		287	23394			
WIK511343	11/29/2005	14.70					
	Total (lb):	**178,775**	**1,290**	**104,987**	**24,415**		**309,467**

Misc. Debris assumes 200 lb/drum
Weight of Fuel Oil (LNAPL) = 8.34 lb/gal water x 0.84 density
Weight of Water = 8.34 lb/gal
Weight of Carbon based on 2,000 lb/filter bag

gal = gallon

Site Inspection and Maintenance

Community Relations

During 2005, there were no trespassing, neighbor, or Township/Community issues at the site.

The potable well (WI Well No. FG508) at the Ellis Property located at 8317 Daniels 70, which is directly south of the site, went dry and needed to be replaced. A new well was installed (WI Well No. SX303) in June. As discussed earlier in this report, the new well was sampled by CH2M HILL on July 7, 2005.

Site Condition

During 2005, the overall condition of the site was very good. The CAMU cap remains heavily vegetated with grasses and no erosion was observed on the CAMU cover.

Brust Excavating was onsite in May and July to conduct erosion repair activities along the north side of the property and east side of the CAMU (Figure 10). The work consisted of installing some rip rap-lined ditches, checking dams, and general grading. Both sedimentation basins were cleaned out in July 2005.

Treatment System

During January, a regulator within the propane system failed causing the vaporizer to overpressurize the system, causing a pressure relief valve to vent propane. The problem was discovered by the propane supplier, who immediately notified the operator. The operator went to the site and assisted the propane supplier in shutting down the propane vaporizer, and thus heat to the building. The overnight temperature was expected to be -20°F. The operator notified the Site Manager (SM) and they discussed temporary heating options to get through the night. The operator had also contacted the heating, ventilating, and air conditioning (HVAC) subcontractor and requested they call the propane supplier and discuss the situation. Despite the extremely cold weather and long travel time, the HVAC subcontractor drove to the site. After arriving at the site, the HVAC subcontractor was able to temporarily restore propane service and restart the heaters until a replacement part could be obtained. Later in the day, two replacement regulators were acquired (one replacement, one spare); one was installed and the propane system resumed normal operation.

The make-up air unit in the main treatment room failed in January. The HVAC subcontractor arrived to investigate 2 days later and found that the air filters were clogged with snow. The filters were cleaned and the unit resumed normal operation. The clogging of the air filters with snow was eliminated with the installation of a hood over each of the HVAC intake openings in April 2005.

Also during April 2005, the installation of the backwash system for the small carbon vessel and associated work was completed. The work consisted of the following:

- Supply and installation of a backwash pump and associated valves and piping
- New 2-inch service water line to the neutralization tank to provide a source of backwash water
- Supply and installation of a basket strainer on the influent line to the filtrate tank to prevent debris from entering the tank
- Installation of a permanent pipe support for the rotary drum vacuum filter (RDVF) feed pump pipe

The pumps in Well No. 7 and Well No. 4 were removed and inspected by drillers from Water Development Corporation (WDC). It was determined that the splines on the motor were worn out and the pumps needed to be replaced. New pumps were installed and tested, and operation resumed.

The product recovery pump in Well Nest No. 3 was not functioning properly. A product-recovery pump manufacturer contacted CH2M HILL about supplying a new and different product-recovery pump for a trial period at no cost to USEPA. The recovery pump is designed to pump only product (not water and product) just as the current recovery pumps do. CH2M HILL installed the new pump and it performed as expected. The pump was purchased for the site.

A new gearbox was installed on the polymer metering pump that will allow lower polymer dosages to be used.

In December, the operator noticed that the temperature in the free product storage tank was below the target temperature. An electrician inspected the tank heaters and determined that a fuse had blown. The fuse was replaced and the heat pads resumed operation.

Remediation System Evaluation

In October, a remediation system evaluation of the Penta Wood facility was conducted at the site by USEPA and GeoTrans, Inc., a USEPA contractor that specializes in conducting these evaluations. CH2M HILL and WDNR also participated in the evaluation.

A draft evaluation report was prepared and issued in December. Comments to the recommendations were prepared and a response letter was issued in January 2006. These documents are included as Appendix E.

Health and Safety

Waste filter cake handling has been simplified and made safer through the use of small, 4-cubic-yard dump boxes that are moved around with a fork lift. When most of the units are filled, the hazardous waste subcontractor mobilizes a large roll-off box to the site and the small dump boxes are emptied into the large roll-off box and the waste filter cake is transported to the approved disposal facility.

The cover for the oil/water separator was difficult for the operator to open alone and presented a health and safety concern. A set of hinges and pneumatic cylinders were installed to assist the operator in safely opening and closing the cover.

The RDVF vacuum pump exhaust discharged vapor near the operator's breathing zone when standing on the platform to observe the operation of the drum. A pipe was installed on the exhaust to extend the discharge above the Operator's breathing zone.

A cantilevered platform one-person lift was ordered for the site to safely access the HVAC units during maintenance activities.

Recommendations

Some erosion preventative maintenance (Figure 10) will be required during 2006 including:

- Recrowning of the site driveway because erosion is causing minor flooding in the building
- Erosion repairs on the north side of the building
- Erosion repairs near the east sedimentation basin
- Seeding of the area east of the CAMU to further minimize erosion in that area

Backwashing of the large carbon vessels should be evaluated in terms of the additional piping and tanks that would be needed and installation cost.

References

CH2M HILL. 2000. Sampling and Analysis Plan. Revised April 2001.

CH2M HILL. 2005. Waste Handling Plan.

Figures

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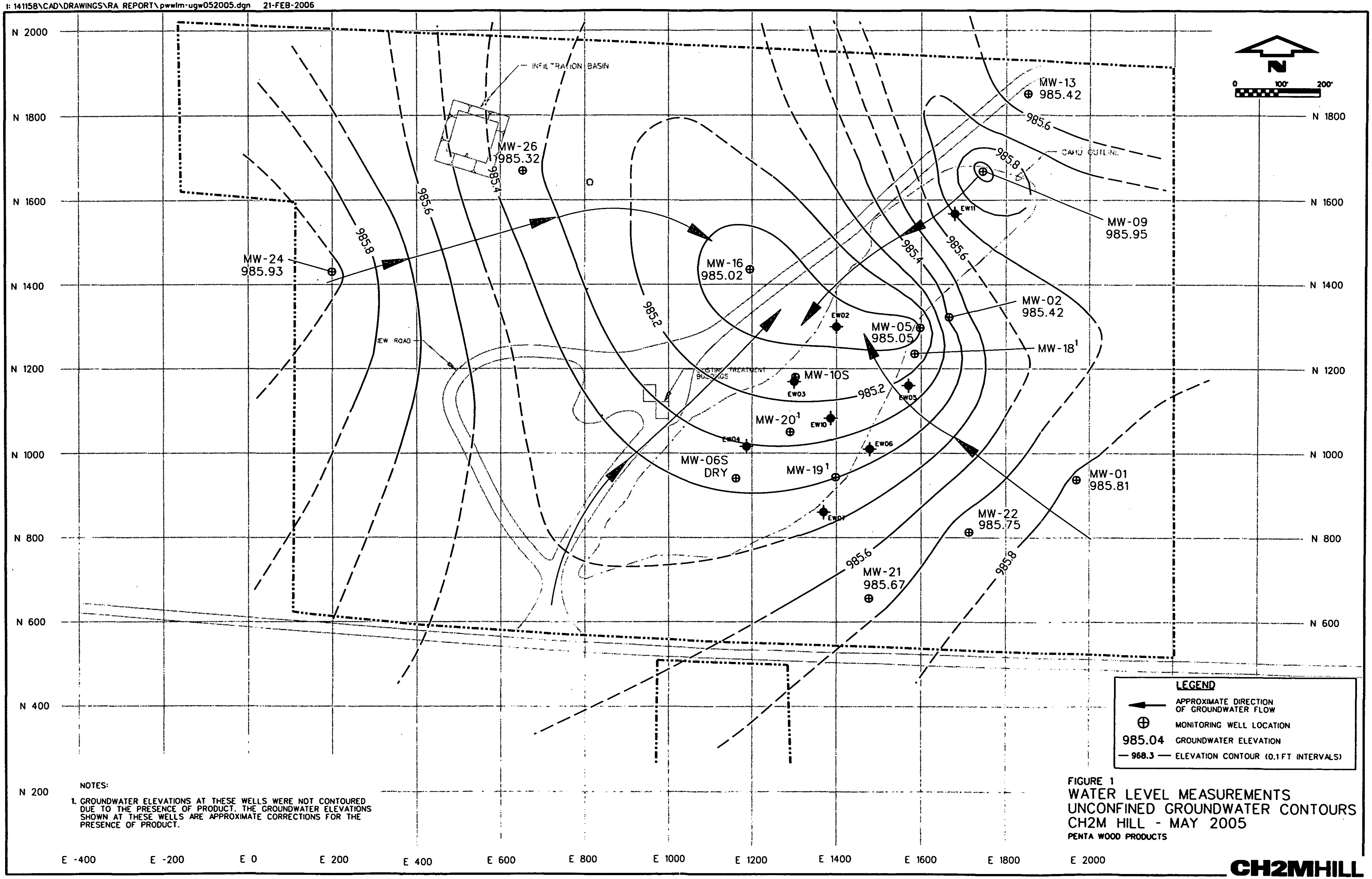

NOTES:

1. GROUNDWATER ELEVATIONS AT THESE WELLS WERE NOT CONTOURED DUE TO THE PRESENCE OF PRODUCT. THE GROUNDWATER ELEVATIONS SHOWN AT THESE WELLS ARE APPROXIMATE CORRECTIONS FOR THE PRESENCE OF PRODUCT.

FIGURE 1

WATER LEVEL MEASUREMENTS
UNCONFINED GROUNDWATER CONTOURS
CH2M HILL - MAY 2005

PENTA WOOD PRODUCTS

CH2MHILL

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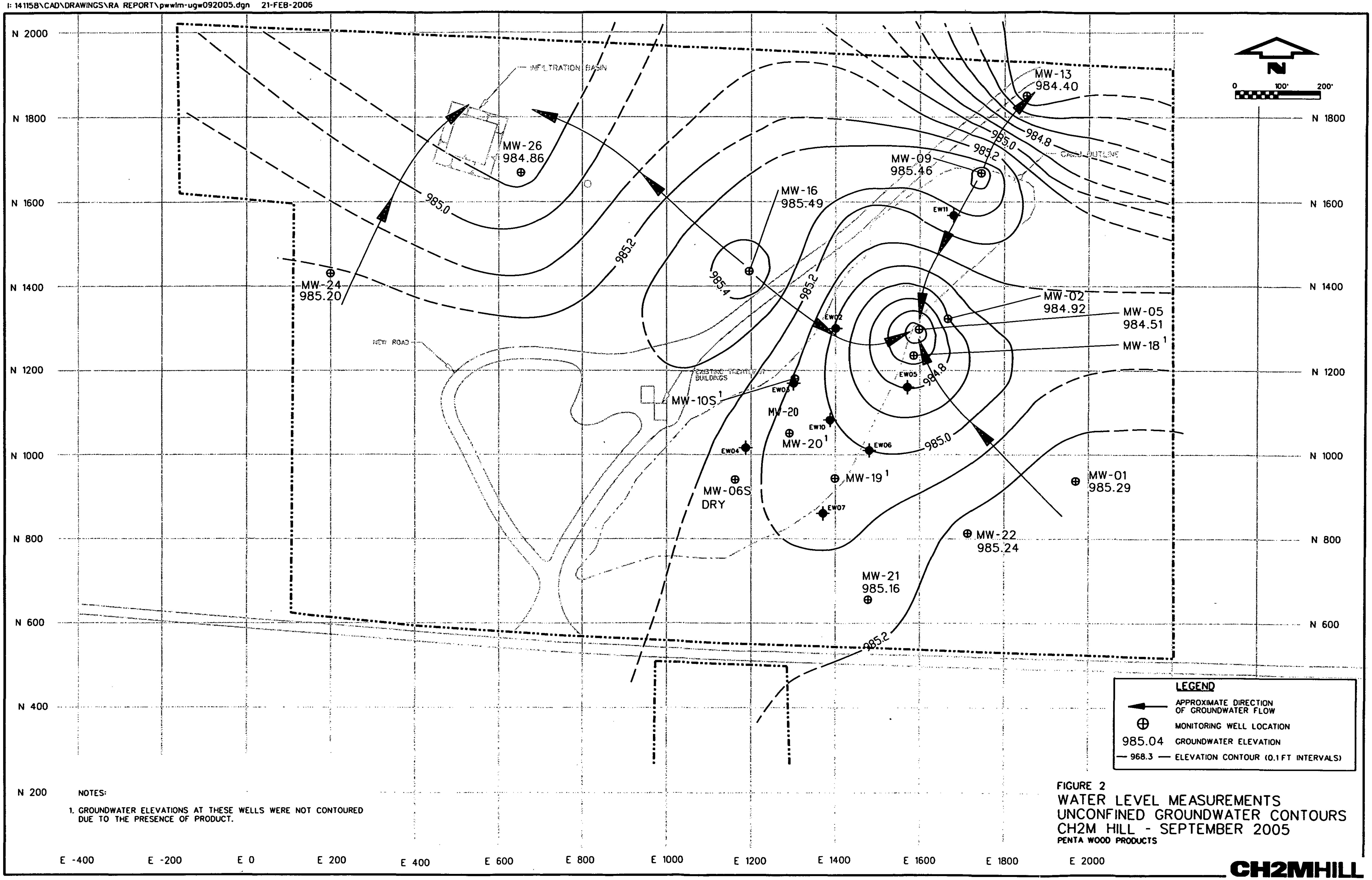

NOTES:

1. GROUNDWATER ELEVATIONS AT THESE WELLS WERE NOT CONTOURED DUE TO THE PRESENCE OF PRODUCT.

FIGURE 2
WATER LEVEL MEASUREMENTS
UNCONFINED GROUNDWATER CONTOURS
CH2M HILL - SEPTEMBER 2005
PENTA WOOD PRODUCTS

CH2MHILL

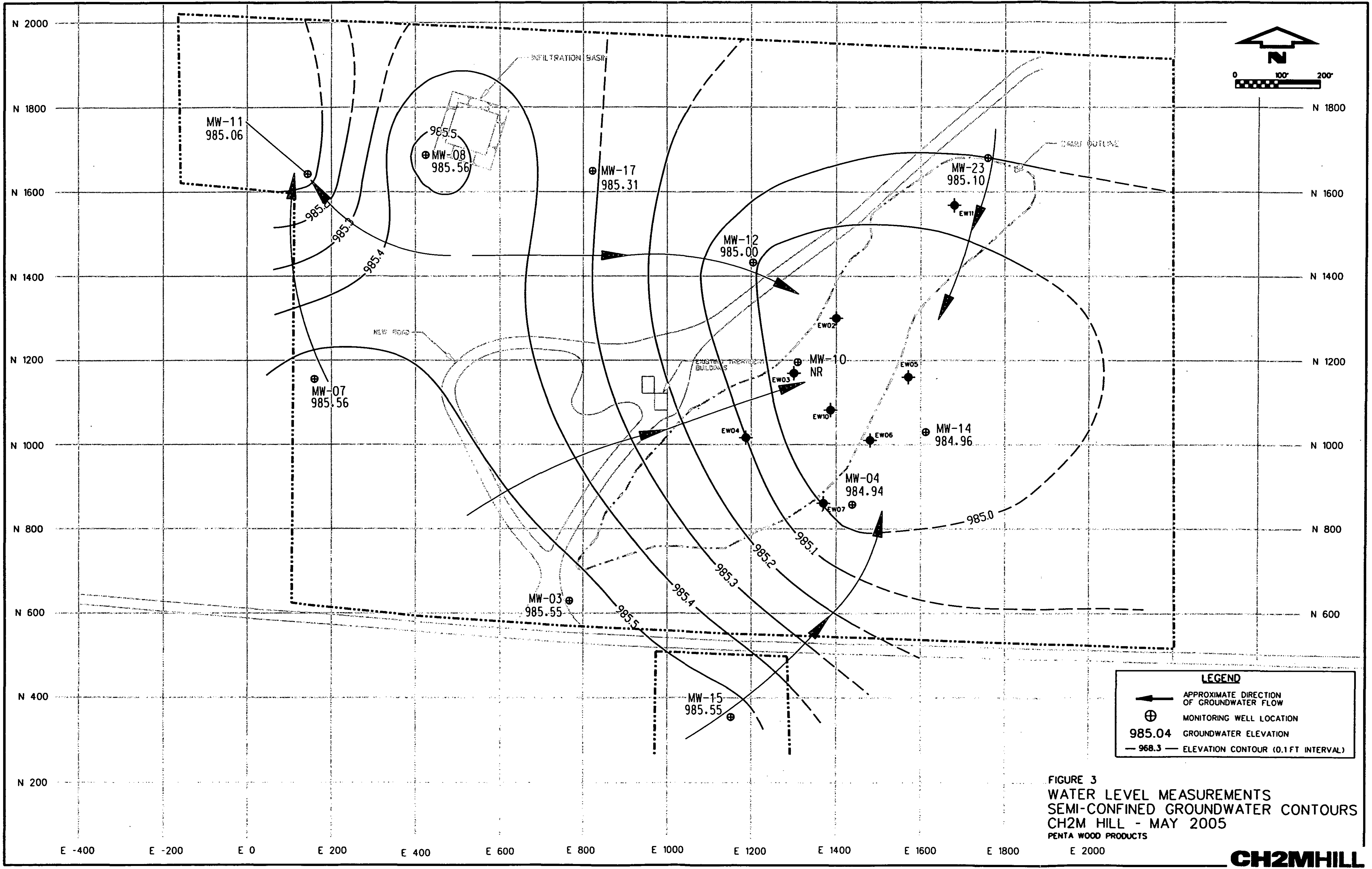

FIGURE 3
WATER LEVEL MEASUREMENTS
SEMI-CONFINED GROUNDWATER CONTOURS
CH2M HILL - MAY 2005
PENTA WOOD PRODUCTS

CH2MHILL

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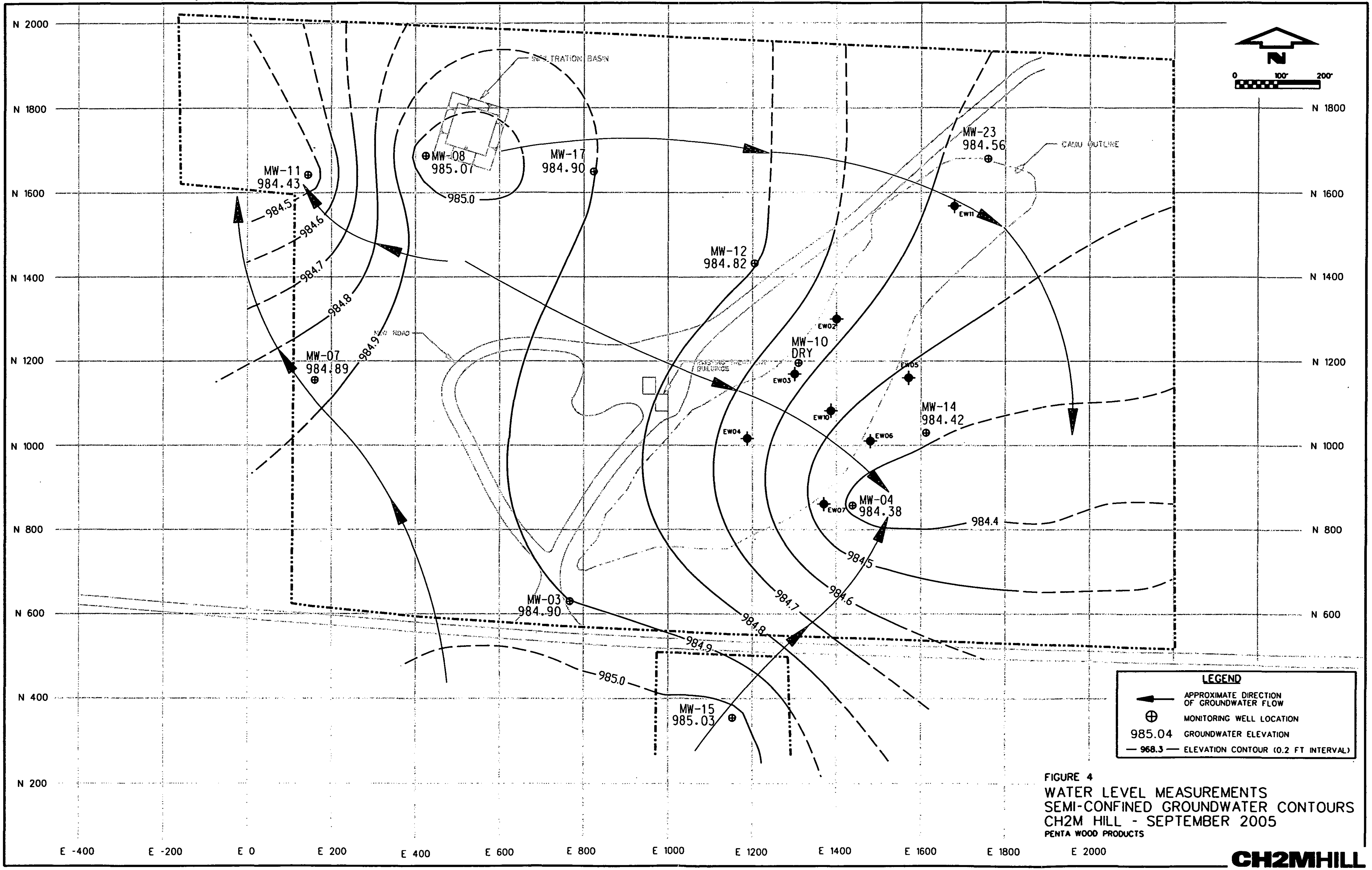

FIGURE 4

WATER LEVEL MEASUREMENTS
SEMI-CONFINED GROUNDWATER CONTOURS
CH2M HILL - SEPTEMBER 2005
PENTA WOOD PRODUCTS

CH2MHILL

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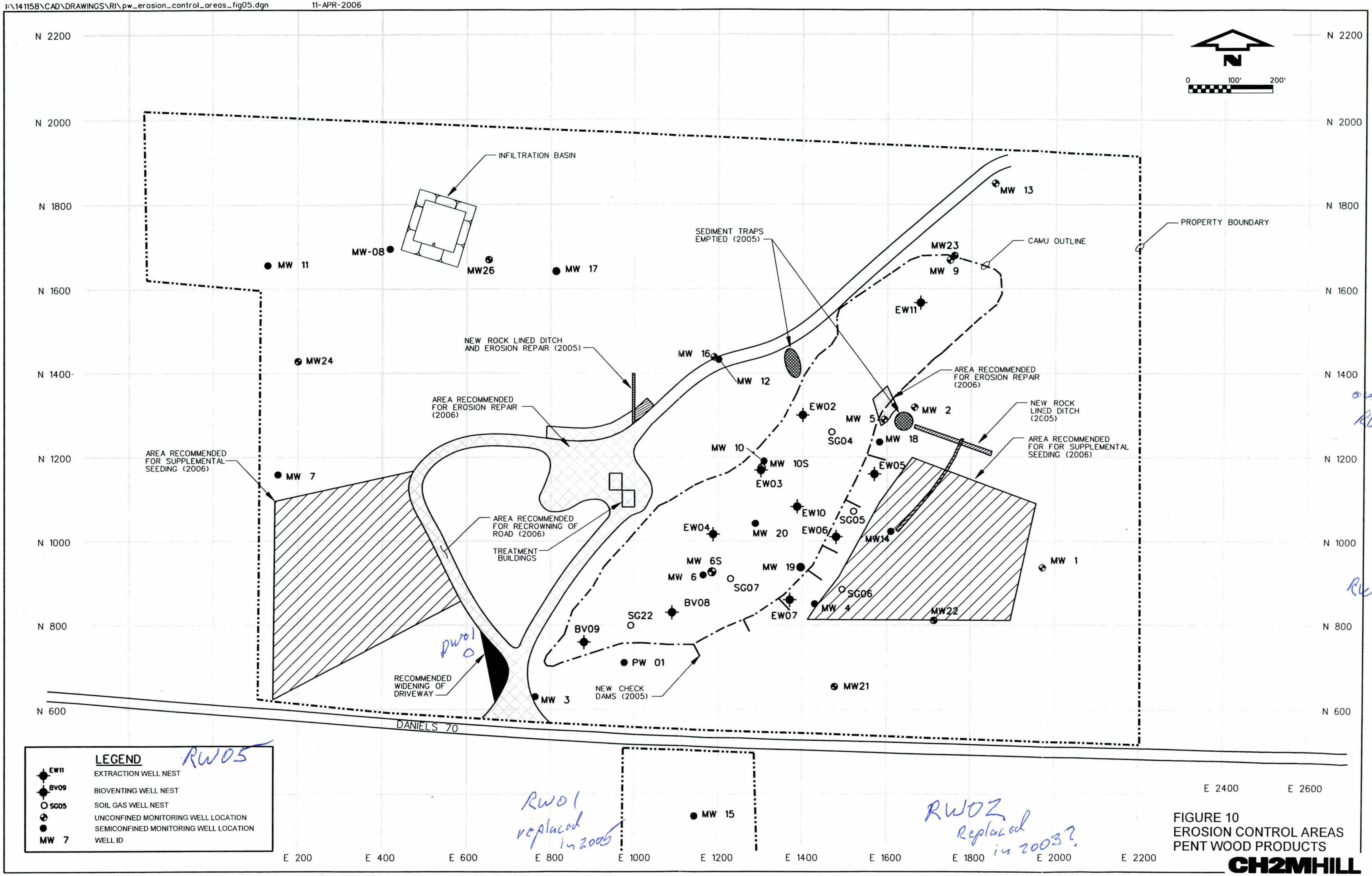

FIGURE 10
EROSION CONTROL AREAS
PENT WOOD PRODUCTS

CH2MHILL

Appendix A
Analytical Results

Penta Wood
Monitoring Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	MW-01	MW-01	MW-02	MW-03	MW-05	MW-07	MW-08
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water	Water	Water	Water	Water	Water	Water
	Sample Collection Date:	5/10/2005	9/29/2005	9/28/2005	9/28/2005	9/28/2005	9/27/2005	9/28/2005
	Field Sample Identification:	05CA31-04	05CA43-06	05CA43-08	05CA43-10	05CA43-12	05CA43-14	05CA43-16
Dissolved Gasses	**Units**							
METHANE	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.3	2.0 UJ	2.6

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	MW-08	MW-09	MW-10S	MW-11	MW-12	MW-12	MW-13
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water, Dup	Water	Water	Water	Water	Water	Water
	Sample Collection Date:	9/28/2005	9/27/2005	9/29/2005	9/29/2005	5/10/2005	9/27/2005	9/27/2005
	Field Sample Identification:	05CA43-20	05CA43-18	05CA43-24	05CA43-26	05CA31-05	05CA43-28	05CA43-30
Dissolved Gasses	**Units**							
METHANE	ug/l	2.0 U	2.0 UJ	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 UJ

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	MW-15	MW-16	MW-17	MW-19	MW-19	MW-20	MW-21
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water	Water	Water	Water	Water	Water	Water
	Sample Collection Date:	9/29/2005	9/29/2005	9/27/2005	5/10/2005	9/29/2005	10/25/2005	5/10/2005
	Field Sample Identification:	05CA43-32	05CA43-34	05CA43-36	05CA31-06	05CA43-38	05CA43-71	05CA31-07
Dissolved Gasses	**Units**							
METHANE	ug/l	2.0 U	2.0 U	2.0 UJ	2.0 U	2.0 U	2.0 UJ	2.0 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01
Field Sample Location:		MW-21	MW-22	MW-26	MW-26	MW-26	MW-26
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water, Dup	Water	Water, Dup
Sample Collection Date:		9/27/2005	9/28/2005	5/10/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA43-42	05CA43-44	05CA31-08	05CA31-09	05CA43-46	05CA43-48
Dissolved Gasses	**Units**						
METHANE	ug/l	2.0 UJ	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 UJ

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-01	MW-01	MW-02	MW-03	MW-05	MW-07	MW-08
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		5/10/2005	9/29/2005	9/28/2005	9/28/2005	9/28/2005	9/27/2005	9/28/2005
Field Sample Identification:		05CA31-04	05CA43-07	05CA43-09	05CA43-11	05CA43-13	05CA43-15	05CA43-17
Dissolved Metals (Filtered)	**Units**							
ARSENIC	ug/L	1.0 U	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 UJ
COPPER	ug/L	10 U	10 UJ	2.5 J	3.0 J	10 UJ	10 U	10 UJ
IRON	ug/L	50 U	50 UJ	65 J	120 J	19,000 J	880	130 J
MANGANESE	ug/L	10 U	3.8 J	9.3 J	6.7 J	7,600 J	16 J	16 J
ZINC	ug/L	20 U	20 UJ	20 UJ	20 UJ	20 UJ	20 U	20 UJ

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-08	MW-09	MW-10S	MW-11	MW-12	MW-12	MW-13
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water, Dup	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/28/2005	9/27/2005	9/29/2005	9/29/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA43-21	05CA43-19	05CA43-25	05CA43-27	05CA31-05	05CA43-29	05CA43-31
Dissolved Metals (Filtered)	**Units**							
ARSENIC	ug/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 UJ
COPPER	ug/L	10 UJ	10 U	10 UJ	10 UJ	4.8 J	3.9 J	2.5 J
IRON	ug/L	120 J	50 U	50 UJ	50 UJ	50 U	50 U	50 U
MANGANESE	ug/L	13 J	5.4 J	3,900 J	3.0 J	1,400	1,300	7.1 J
ZINC	ug/L	20 UJ	20 U	20 UJ	20 UJ	20 U	20 U	20 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-15	MW-16	MW-17	MW-19	MW-19	MW-20	MW-21
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/29/2005	9/29/2005	9/27/2005	5/10/2005	9/29/2005	10/25/2005	5/10/2005
Field Sample Identification:		05CA43-33	05CA43-35	05CA43-37	05CA31-06	05CA43-39	05CA43-72	05CA31-07
Dissolved Metals (Filtered)	**Units**							
ARSENIC	ug/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 UJ	1.0 U
COPPER	ug/L	10 UJ	2.9 J	10 U	6.3 J	5.0 J	2.7 UJ	10 U
IRON	ug/L	50 UJ	50 UJ	50 U	50 U	50 UJ	140 J	50 U
MANGANESE	ug/L	1.6 J	2.1 J	10 U	2,300	2,700 J	2,400 J	0.47 J
ZINC	ug/L	20 UJ	20 UJ	20 U	9.8 J	20 UJ	20 UJ	20 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01
Field Sample Location:		MW-21	MW-22	MW-26	MW-26	MW-26	MW-26
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water, Dup	Water	Water, Dup
Sample Collection Date:		9/27/2005	9/28/2005	5/10/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA43-43	05CA43-45	05CA31-08	05CA31-09	05CA43-47	05CA43-49
Dissolved Metals (Filtered)	**Units**						
ARSENIC	ug/L	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 UJ
COPPER	ug/L	2.6 J	10 UJ	10 U	10 U	2.2 J	2.6 J
IRON	ug/L	36 J	50 UJ	50 U	50 U	50 U	50 UJ
MANGANESE	ug/L	9.8 J	1.3 J	1.8 J	0.59 J	10 U	10 U
ZINC	ug/L	20 U	20 UJ	20 U	20 U	20 U	20 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-01	MW-01	MW-02	MW-03	MW-05	MW-07	MW-08
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		5/10/2005	9/29/2005	9/28/2005	9/28/2005	9/28/2005	9/27/2005	9/28/2005
Field Sample Identification:		05CA31-04	05CA43-06	05CA43-08	05CA43-10	05CA43-12	05CA43-14	05CA43-16
Metals	**Units**							
ARSENIC	ug/L	1.0 U	1.0 J	6.7	1.0 U	1.0 UJ	1.0 U	1.0 UJ
COPPER	ug/L	18	23 J	140 J	4.9 J	6.0 J	10 U	3.8 J
IRON	ug/L	3,800	4,800 J	40,000 J	23,000 J	18,000 J	1,300	4,700 J
MANGANESE	ug/L	360	400 J	1,300 J	93 J	7,600 J	18	63 J
ZINC	ug/L	11 J	14 J	82 J	20 UJ	20 UJ	20 U	20 UJ

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	MW-08	MW-09	MW-10S	MW-11	MW-12	MW-12	MW-13
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water, Dup	Water	Water	Water	Water	Water	Water
	Sample Collection Date:	9/28/2005	9/27/2005	9/29/2005	9/29/2005	5/10/2005	9/27/2005	9/27/2005
	Field Sample Identification:	05CA43-20	05CA43-18	05CA43-24	05CA43-26	05CA31-05	05CA43-28	05CA43-30
Metals	**Units**							
ARSENIC	ug/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 J
COPPER	ug/L	2.3 J	10 U	14 J	10 UJ	4.2 J	10 U	18
IRON	ug/L	4,500 J	50 U	3,600 J	50 UJ	50 U	50 U	6,200
MANGANESE	ug/L	56 J	6.3 J	4,000 J	1.6 J	1,500	1,200	200
ZINC	ug/L	20 UJ	20 U	8.0 J	20 UJ	8.9 J	7.8 J	18 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-15	MW-16	MW-17	MW-19	MW-19	MW-20	MW-21
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/29/2005	9/29/2005	9/27/2005	5/10/2005	9/29/2005	10/25/2005	5/10/2005
Field Sample Identification:		05CA43-32	05CA43-34	05CA43-36	05CA31-06	05CA43-38	05CA43-71	05CA31-07
Metals	**Units**							
ARSENIC	ug/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 U
COPPER	ug/L	2.4 J	7.6 J	10 U	15	11 J	16 J	25
IRON	ug/L	420 J	1,000 J	50 U	630	97 J	780 J	6,200
MANGANESE	ug/L	15 J	130 J	0.44 J	2,100	2,600 J	2,300 J	480
ZINC	ug/L	20 UJ	8.1 J	20 U	8.4 J	20 UJ	20 UJ	16 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01
Field Sample Location:		MW-21	MW-22	MW-26	MW-26	MW-26	MW-26
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water, Dup	Water	Water, Dup
Sample Collection Date:		9/27/2005	9/28/2005	5/10/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA43-42	05CA43-44	05CA31-08	05CA31-09	05CA43-46	05CA43-48
Metals	**Units**						
ARSENIC	ug/L	7.1	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 UJ
COPPER	ug/L	230	9.8 J	2.4 J	2.2 J	10 U	10 U
IRON	ug/L	56,000	2,100 J	680	510	50 U	50 U
MANGANESE	ug/L	3,400	130 J	18	14	2.3 J	1.7 J
ZINC	ug/L	110	8.0 J	7.5 J	17 J	20 U	20 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-01	MW-01	MW-02	MW-03	MW-05	MW-07	MW-08
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		5/10/2005	9/29/2005	9/28/2005	9/28/2005	9/28/2005	9/27/2005	9/28/2005
Field Sample Identification:		05CA31-04	05CA43-06	05CA43-08	05CA43-10	05CA43-12	05CA43-14	05CA43-16
Semivolatile Organic Compounds	**Units**							
NAPHTHALENE	ug/L	0.92 U	1.0 U	0.98 U	0.93 U	1.8	0.91 UJ	0.93 U
PENTACHLOROPHENOL	ug/L	0.12	0.12	2.2	0.20 J	1,100	0.12 U	0.031 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-08	MW-09	MW-09	MW-10S	MW-11	MW-12	MW-12
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water, Dup	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/28/2005	9/27/2005	10/18/2005	9/29/2005	9/29/2005	5/10/2005	9/27/2005
Field Sample Identification:		05CA43-20	05CA43-18	05CA43-70	05CA43-24	05CA43-26	05CA31-05	05CA43-28
Semivolatile Organic Compounds	**Units**							
NAPHTHALENE	ug/L	0.93 U	0.93 U	NR	5.6	0.95 U	6.1	3.3
PENTACHLOROPHENOL	ug/L	0.12 U	NR	0.57	0.11 U	740	8,300 J	8,500 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	MW-13	MW-15	MW-16	MW-17	MW-19	MW-19	MW-20
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water	Water	Water	Water	Water	Water	Water
	Sample Collection Date:	9/27/2005	9/29/2005	9/29/2005	9/27/2005	5/10/2005	9/29/2005	10/25/2005
	Field Sample Identification:	05CA43-30	05CA43-32	05CA43-34	05CA43-36	05CA31-06	05CA43-38	05CA43-71
Semivolatile Organic Compounds	**Units**							
NAPHTHALENE	ug/L	0.97 U	0.93 U	1.0 U	0.92 U	2,300	78	NR
PENTACHLOROPHENOL	ug/L	0.85	0.11 U	0.11 U	0.054 J	45,000 J	13,000	63,000

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-21	MW-21	MW-22	MW-26	MW-26	MW-26	MW-26
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water, Dup	Water	Water, Dup
Sample Collection Date:		5/10/2005	9/27/2005	9/28/2005	5/10/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA31-07	05CA43-42	05CA43-44	05CA31-08	05CA31-09	05CA43-46	05CA43-48
Semivolatile Organic Compounds	**Units**							
NAPHTHALENE	ug/L	0.98 U	0.91 U	1.0 U	0.94 U	0.93 U	0.93 U	0.92 U
PENTACHLOROPHENOL	ug/L	0.33	0.046 J	0.16 J	0.061 J	0.11 U	0.027 J	0.024 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	MW-01	MW-01	MW-02	MW-03	MW-03	MW-05	MW-07
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water	Water	Water	Water	Water, Dup	Water	Water
	Sample Collection Date:	5/10/2005	9/29/2005	9/28/2005	9/28/2005	9/28/2005	9/28/2005	9/27/2005
	Field Sample Identification:	05CA31-04	05CA43-06	05CA43-08	05CA43-10	05CA43-69	05CA43-12	05CA43-14
Volatile Organic Compounds	**Units**							
BENZENE	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
TOLUENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
XYLENES	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-08	MW-08	MW-09	MW-10S	MW-11	MW-12	MW-12
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water, Dup	Water	Water	Water	Water	Water
Sample Collection Date:		9/28/2005	9/28/2005	9/27/2005	9/29/2005	9/29/2005	5/10/2005	9/27/2005
Field Sample Identification:		05CA43-16	05CA43-20	05CA43-18	05CA43-24	05CA43-26	05CA31-05	05CA43-28
Volatile Organic Compounds	**Units**							
BENZENE	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.93 J	0.85 J
TOLUENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
XYLENES	ug/L	5.0 U	5.0 U	5.0 U	0.99 J	5.0 U	5.6	4.9 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-13	MW-15	MW-16	MW-17	MW-19	MW-19	MW-20
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/27/2005	9/29/2005	9/29/2005	9/27/2005	5/10/2005	9/29/2005	10/25/2005
Field Sample Identification:		05CA43-30	05CA43-32	05CA43-34	05CA43-36	05CA31-06	05CA43-38	05CA43-71
Volatile Organic Compounds	**Units**							
BENZENE	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	100 UJ	0.50 U	0.50 U
ETHYLBENZENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	1,000 UJ	1.2 J	5.5
TOLUENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	1,000 UJ	1.1 J	5.4
XYLENES	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	1,000 UJ	18	62

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:	01	01	01	01	01	01
Field Sample Location:	MW-21	MW-21	MW-22	MW-26	MW-26	MW-26
Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:	Water	Water	Water	Water	Water, Dup	Water
Sample Collection Date:	5/10/2005	9/27/2005	9/28/2005	5/10/2005	5/10/2005	9/27/2005
Field Sample Identification:	05CA31-07	05CA43-42	05CA43-44	05CA31-08	05CA31-09	05CA43-46

Volatile Organic Compounds	**Units**						
BENZENE	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
TOLUENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
XYLENES	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-01	MW-01	MW-02	MW-03	MW-05	MW-07	MW-08
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		5/10/2005	9/29/2005	9/28/2005	9/28/2005	9/28/2005	9/27/2005	9/28/2005
Field Sample Identification:		05CA31-04	05CA43-06	05CA43-08	05CA43-10	05CA43-12	05CA43-14	05CA43-16
Wet Chemistry	**Units**							
ALKALINITY, TOTAL (AS CACO3)	mg/L	110 J	110 J	150 J	370 J	260 J	260 J	160 J
CHLORIDE (AS CL)	mg/L	3.6 J	6.2 J	5.6 J	62 J	18 J	18 J	20 J
HARDNESS (AS CACO3)	mg/l	140 J	160 J	270 J	490 J	480 J	450	240 J
NITROGEN, NITRATE (AS N)	mg/L	1.7 J	1.9 J	0.10 UJ	3.3 J	0.10 UJ	1.8 J	2.0 J
SULFATE (AS SO4)	mg/L	14 R	16 R	27 R	24 R	35 R	130 J	19 R
SULFIDE	mg/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 R	1.0 UJ	1.0 UJ
TOTAL CARBON	mg/L	3.7 R	2.4 J	2.5 J	1.4 J	7.4 J	0.96 J	1.2 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-08	MW-09	MW-10S	MW-11	MW-12	MW-12	MW-13
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water, Dup	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/28/2005	9/27/2005	9/29/2005	9/29/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA43-20	05CA43-18	05CA43-24	05CA43-26	05CA31-05	05CA43-28	05CA43-30
Wet Chemistry	**Units**							
ALKALINITY, TOTAL (AS CACO3)	mg/L	160 J	55 J	130 J	200 J	390 J	370 J	67 J
CHLORIDE (AS CL)	mg/L	19 J	2.6 J	16 J	14 J	23 J	20 J	3.1 J
HARDNESS (AS CACO3)	mg/l	200 J	70	300 J	280 J	360 J	410	68
NITROGEN, NITRATE (AS N)	mg/L	2.0 J	1.9 J	2.0 J	2.4 J	1.3 J	1.1 J	0.60 J
SULFATE (AS SO4)	mg/L	19 R	20 J	120 R	9.7 R	16 R	26 J	19 J
SULFIDE	mg/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 R	1.0 UJ	1.0 UJ
TOTAL CARBON	mg/L	1.0 J	2.0	3.0 J	1.2 J	9.9 R	9.2	4.3

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		MW-15	MW-16	MW-17	MW-19	MW-19	MW-20	MW-21
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/29/2005	9/29/2005	9/27/2005	5/10/2005	9/29/2005	10/25/2005	5/10/2005
Field Sample Identification:		05CA43-32	05CA43-34	05CA43-36	05CA31-06	05CA43-38	05CA43-71	05CA31-07
Wet Chemistry	**Units**							
ALKALINITY, TOTAL (AS CACO3)	mg/L	220 J	82 J	160 J	97 J	140 J	170 J	130 J
CHLORIDE (AS CL)	mg/L	17 J	11 J	3.9 J	18 J	19 J	13 J	49 J
HARDNESS (AS CACO3)	mg/l	300 J	190 J	180	140 J	UJ	190 J	170 J
NITROGEN, NITRATE (AS N)	mg/L	4.2 J	1.5 J	5.1 J	0.76 J	0.75 J	2.1 J	2.8 J
SULFATE (AS SO4)	mg/L	5.8 R	71 R	7.8 J	29 R	40 R	39 R	12 R
SULFIDE	mg/L	1.0 UJ	1.0 UJ	1.0 UJ	1.1 J	1.0 UJ	1.0 R	1.0 UJ
TOTAL CARBON	mg/L	0.84 J	0.83 J	0.91 J	35 R	32 J	21 R	2.2 R

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Monitoring Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01
Field Sample Location:		MW-21	MW-22	MW-26	MW-26	MW-26	MW-26
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water, Dup	Water	Water, Dup
Sample Collection Date:		9/27/2005	9/28/2005	5/10/2005	5/10/2005	9/27/2005	9/27/2005
Field Sample Identification:		05CA43-42	05CA43-44	05CA31-08	05CA31-09	05CA43-46	05CA43-48
Wet Chemistry	**Units**						
ALKALINITY, TOTAL (AS CACO3)	mg/L	130 J	91 J	250 J	240 J	240 J	250 J
CHLORIDE (AS CL)	mg/L	47 J	9.6 J	26 J	26 J	25 J	25 J
HARDNESS (AS CACO3)	mg/l	370	130 J	340 J	370 J	350	380
NITROGEN, NITRATE (AS N)	mg/L	2.4 J	1.7 J	2.8 J	2.2 J	1.9 J	2.0 J
SULFATE (AS SO4)	mg/L	17 J	18 R	200 R	180 R	170	160 J
SULFIDE	mg/L	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ
TOTAL CARBON	mg/L	1.2	0.94 J	2.1 R	1.1 R	0.72 J	0.68 J

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Residential Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		RW-01	RW-01	RW-01	RW-01	RW-01	RW-01	RW-02
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water, Dup	Water	Water, Dup	Water	Water, Dup	Water
Sample Collection Date:		5/10/2005	5/10/2005	7/7/2005	7/7/2005	9/27/2005	9/27/2005	5/10/2005
Field Sample Identification:		05CA31-10	05CA31-11	05CA31-27	05CA31-28	05CA43-50	05CA43-51	05CA31-12
Semivolatile Organic Compounds	**Units**							
NAPHTHALENE	ug/L	0.93 U	0.93 U	0.95 U	0.96 U	0.92 UJ	0.93 UJ	0.93 U
PENTACHLOROPHENOL	ug/L	0.068 J	0.053 J	0.043 J	0.035 J	0.050 J	0.049 J	0.11 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Residential Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		RW-02	RW-03	RW-03	RW-04	RW-04	RW-05	RW-05
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/27/2005	5/10/2005	9/27/2005	5/10/2005	9/27/2005	5/10/2005	9/27/2005
Field Sample Identification:		05CA43-52	05CA31-13	05CA43-53	05CA31-14	05CA43-54	05CA31-15	05CA43-55
Semivolatile Organic Compounds	**Units**							
NAPHTHALENE	ug/L	0.92 UJ	0.93 U	0.93 UJ	0.94 U	0.91 UJ	0.93 U	0.92 UJ
PENTACHLOROPHENOL	ug/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Residential Well Sampling Results
2005

	Field Site Identifier:	01	01	01	01	01	01	01
	Field Sample Location:	RW-01	RW-01	RW-01	RW-01	RW-01	RW-01	RW-02
	Sample Interval:	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Matrix:	Water	Water, Dup	Water	Water, Dup	Water	Water, Dup	Water
	Sample Collection Date:	5/10/2005	5/10/2005	7/7/2005	7/7/2005	9/27/2005	9/27/2005	5/10/2005
	Field Sample Identification:	05CA31-10	05CA31-11	05CA31-27	05CA31-28	05CA43-50	05CA43-51	05CA31-12
Volatile Organic Compounds	**Units**							
BENZENE	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
TOLUENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
XYLENES	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Penta Wood
Residential Well Sampling Results
2005

Field Site Identifier:		01	01	01	01	01	01	01
Field Sample Location:		RW-02	RW-03	RW-03	RW-04	RW-04	RW-05	RW-05
Sample Interval:		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Matrix:		Water	Water	Water	Water	Water	Water	Water
Sample Collection Date:		9/27/2005	5/10/2005	9/27/2005	5/10/2005	9/27/2005	5/10/2005	9/27/2005
Field Sample Identification:		05CA43-52	05CA31-13	05CA43-53	05CA31-14	05CA43-54	05CA31-15	05CA43-55
Volatile Organic Compounds	**Units**							
BENZENE	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ETHYLBENZENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
TOLUENE	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
XYLENES	ug/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

QUALIFIER KEY: "U" - Analyte not found at the listed detection limit; "J" - Estimated Result; "B" - Analyte detected in Blank; No Qualifier - Analyte found; "R" - Rejected; "NR" - Not Reported

Appendix B
Natural Attenuation Data

Pentawood Products Site
Natural Attenuation Trend Data
Anuual Groundwater Sampling
Page 1 of 9

Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
DW-01	9/24/2003								1.48	<0.005	<0.05	<2	<0.5	<0.05	66.9
DW-01															
MW-01	10/9/1997	8.46	475	11.23	96.2	7.32	171.0		6.5	NT	<0.02	6.3	<0.01	2.0	18
MW-01	4/5/2000	8.56	416	10.34	86.5	7.14	290.6		1.6	<0.002	<0.05	2.5	0.0003	<0.5	8.7
MW-01	4/24/2001	8.69	431	9.83	84.6	7.08	168.7		6.5	<0.015	<0.025	13.0	<0.00011	<0.1	24
MW-01	9/11/2001	10.18	370	10.63	NR	7.00	235.8		2.6	0.001	<0.035	<8.2	<0.01	0.5	10
MW-01	5/14/2002	8.89	541	9.68	83.6	7.17	113.7		2.7	0.005	<0.011	7.8		0.1	9
MW-01	8/6/2002	8.82	439	NR	89.2	7.33	241.1		<0.15	0.00095 B	<0.011	7.9	<0.01	0.1	7
MW-01	4/29/2003	9.03	383	3.03	26.5	7.13	151.8		2.6	<0.005 UJ	<0.025	10.0	<0.0005	<0.1 UJ	4.3
MW-01	9/24/2003	9.22	349	10.23	89.2	7.16	322.6	53.2	2.61	0.036	0.1 J	<2	<0.0005	0.1	3.3
MW-01	5/4/2004	9.15	314	--	93.8	7.05	217.0		2.1 J	0.015 R	0.079 R	2.0 R	0.00086 J	1.06 J	4.3 R
MW-01	9/21/2004	10.05	279	10.89	97.1	7.07	91.1	160	1.8 J	0.0026 J	0.8	5.2 J		0.3	2.7
MW-01	5/10/2005	9.30	540	11.68	102.2	7.08	190.8	155	1.7 J	<0.01	<0.05	14 R	<0.002	0.1	3.6 J
MW-01	9/29/2005	8.96	282	12.12	105.1	7.15	154.6	217	1.9	0.0038 J	<0.05	16.0	<0.002	0.1	6.2
MW-02	10/9/1997	9.49	143	8.82	77.2	6.42	274.1		1.1	NT	<0.02	17.0	<0.01	<1.0	4
MW-02	4/5/2000	9.47	111	9.59	81.4	6.85	305.8		<0.1	0.003	<0.05	58.3	0.0003	<0.5	1
MW-02	9/12/2001	12.00	172	11.50	99.8	7.62	96.9		2.3	0.057	<0.035	10	<0.01	0.51	6.2
MW-02	8/6/2002	9.96	128	6.31	NR	5.41	380.5		<0.15	0.018	0.0	10.0	<0.01	0.1	3
MW-02	9/24/2003	9.85	172	7.07	62.8	6.19	326.2	Off Scale	2.02	0.443	3.03	3 J	<0.0005	0.28	1 J
MW-02	9/21/2004	10.29	319	1.17	10.7	6.01	182.6	Off Scale	1.4 J	0.0222 J	25.80	4.0 R		1.26	12 J
MW-02	9/28/2005	10.27	358	8.95	88.0	6.26	156.2	Off Scale	<0.1	0.0093 J	0.07	27.0	<0.002	2.2 J	6
MW-03	10/8/1997	10.34	696	3.52	31.5	6.91	38.4		4.4	0.011	0.3	16.0	<0.01	<1.0	42
MW-03	4/4/2000	Parameters not measured							2.8	0.010	0.5	12.5	0.0016	<0.6	64
MW-03	4/25/2001	10.27	1039	3.77	33.8	6.83	169.1		4.42	0.008	0.1	11.0	NT	<0.11	47
MW-03	9/13/2001	11.53	1118	16.44	NR	6.93	99.0		4	0.031	0.9	14.0	<0.01	0.093	58
MW-03	8/7/2002	10.36	1007	4.50	NR	6.74	165.1		<0.15	0.011	0.2	16.0	<0.01	0.1	69
MW-03	9/23/2003	10.32	873	5.68	50.9	7.06	147.3	0.65	4.43	0.008 J	<0.001	<2	0.0025	0.31	52.4

Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-03	9/21/2004	10.70	1071	0.38	3.4	6.80	87.2	10.6	3.5 J	0.00499 J	0.3	8.9 R		0.37	62 J
MW-03	9/28/2005	10.58	948	24.95	222.8	6.82	242.6	25.9	3.3	0.0067 J	0.1	24.0	<0.002	0.2 J	62.0
MW-04	10/9/1997	9.61	228	1.09	8.0	8.41	-137.9		<0.1	NT	0.04	6.3	0.139	<1.0	7.3
MW-04	4/4/2000	9.43	237	1.38	NR	8.49	NR		<0.1	0.047	<0.05	10.8	0.0008	<0.5	9.6
MW-05	10/10/1997	10.68	887	0.38	3.4	6.24	28.8		<0.1	NT	4.9	15.0	<0.01	28000.0	50
MW-05	4/7/2000	8.76	737	4.81	39.3	6.03	119.4		<0.1	3.350	3.4	34.3	0.0009	20600.0	49
MW-05	4/26/2001	12.29	1018	3.71	36.0	6.40	-39.7		<0.13	11.300	7.6	28.0	NT	20600.0	42
MW-05	9/13/2001	11.45	698	10.19	97.0	6.80	-68.6		0.17	8.500	4.1	22.0	<0.01	6300	29
MW-05	8/7/2002	11.80	589	5.02	NR	6.15	35.2		<0.15	7.840	7.9	21.0		510.0	26
MW-05	9/25/2003	10.60	559	2.99	27.0	6.54	-21.3		<0.05	8.320	13.4	20.0	0.00047 J	1100.0	22.1
MW-05	9/22/2004	11.80	749	8.43	82.8	6.53	-98.5	56.8	0.01 R	5.65 J	30.5	0.024 R		194.0	29 J
MW-05	9/28/2005	11.13	627	3.27	30.3	6.47	-60.4	0.98	<0.1	7.6	19.0	35.0	0.0230	1100 J	18.0
MW-06S	10/9/1997	11.26	792	5.25	48.0	6.21	232.1		4.5	NT	0.02	0.9	<0.01	<1.0	72
MW-06S	4/7/2000	Not measured. Sampled for VOCs only													
MW-06S	4/26/2001	12.03	453	2.78	26.7	5.92	142.2		0.87	0.347	<0.025	12	NT	3	14
MW-06S	9/12/2001	Not measured due to product in the well.							1.1	0.8	<0.035	16	<0.01	1.1	12
MW-06S	8/7/2002	12.75	583	NR	41.4	6.08	77.8		<0.15	1.790	3.33	18	0.2700	88 B	17
MW-06S	9/25/2003	Not measured due to product in the well.							1.01	0.961	1.10	17	0.1300	0.33	23.9

Pentawood Products Site
Natural Attenuation Trend Data
Anuual Groundwater Sampling

Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-07	10/14/1997	10.13	709	8.23	73.0	6.86	6.0		4.9	NT	0.62	6.0	<0.01	<1.0	7.6
MW-07	4/4/2000	9.87	693	5.82	51.5	7.01	156.1		2.7	0.026	0.36	6.1	0.004	<0.5	4.8
MW-07	4/25/2001	12.60	721	7.54	71.2	6.89	127.5		3.6	0.007	0.15	6.5	0.0047	<0.1	8.4
MW-07	9/11/2001	11.04	824	8.36	74.5	6.27	208.0		3	0.0044	0.23	10	0.012	0.083	23
MW-07	8/7/2002	12.68	812	NR	93.7	6.71	256.3		<0.15	0.004 B	0.305	10	<0.01	0.03	21
MW-07	9/24/2003	10.38	680	6.85	61.6	6.90	98.7	1.97	2.97	<0.005	0.09 J	<2	0.0049	0.044 J	12.2
MW-07	9/22/2004	13.90	736	7.89	77.5	6.71	35.2	14.5	3.4 J	0.00975 J	1.64 J	6.8 R		5.75	7.2 J
MW-07	9/27/2005	10.44	789	8.01	71.9	5.53	146.0	6.97	1.8	0.016	0.88	130 J	0.002 UJ	<0.12	18
MW-08	10/14/1997	9.73	363	4.28	37.2	7.93	12.2		1.4	NT	0.148	4.5	0.0365	<1.0	4.2
MW-08	4/5/2000	10.07	295	3.78	33.5	6.91	252.3		3.5	0.0053	<0.05	6.5	0.0072	<0.5	6.26
MW-08	4/26/2001	11.08	358	5.50	52.3	7.94	151.3		1.52	0.027	<0.025	7.47	0.0116	0.2	3.25
MW-08	9/11/2001	10.49	386	4.08	NR	7.77	29.3		1.5	0.018	0.07	<7.6	<0.01	0.062	3.8
MW-08	8/8/2002	11.80	375	NR	75.2	7.56	160.9		<0.15	0.0053 B	0.011 B	6	<0.01	<0.04	4.2
MW-08	9/25/2003	10.67	414	6.20	57.8	7.79	125.4	4.15	2.6	0.006 J	<0.05	<2	0.0092	<0.11	11
MW-08	9/23/2004	11.89	449	5.50	52.8	7.14	11.0	2.99	2.4 J	0.012 J	0.256	5.8 J	0.00375 J	1.94	15
MW-08	9/28/2005	11.10	407	8.25	71.0	7.56	195.2	52.2	2.0 J	0.016	0.13	19	0.0026	0.031 J	20
MW-09	10/8/1997	10.59	171	6.30	54.9	5.63	217.6		4.2	NT	<0.0001	3.4	<0.01	<1.0	45
MW-09	4/5/2000	9.65	153	6.36	44.7	5.78	321.7		1.97	0.0217	<0.05	8.46	0.000396	0.6	3.15
MW-09	4/23/2001	9.62	172	5.21	43.1	5.72	162.7		2.46	0.034	<0.025	27	<0.00012	0.12	3.22
MW-09	9/12/2001	11.23	206	5.75	NR	5.54	309.8		3.3	0.016	0.11	<6.8	<0.01	0.76	6.5
MW-09	8/6/2002	9.21	253	1.96	17.3	5.27	391.9		<0.15	0.0063 B	<0.011	22	<0.01	0.54	11
MW-09	9/25/2003	9.22	206	3.53	34.3	5.62	278.7	73.3	2.36	0.016	0.24	24	<0.0005	2.3	4.4
MW-09	9/22/2004	11.91	228	4.99	47.5	5.28	148.1	5.93	1.8 J	0.00851 J	0.231 J	26 R	0.01 UJ	2.92	3.2 J
MW-09	9/27/2005	10.45	168	165.54	--	4.33	333.6	0.76	1.9 J	0.0054 J	<0.05	20	0.002 UJ	0.57	2.6
MW-10	10/15/1997	10.88	803	0.38	3.4	6.83	-33.2		4.9	NT	0.00219	13	0.0135	3400	35
MW-10	4/6/2000	10.76	988	0.47	4.2	6.82	27.4		1.72	1.59	0.1159	13.8	0.003067	9530	55.9

Pentawood Products Site
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Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-10	4/26/2001	12.31	1029	4.52	42.8	6.89	-103.5		0.18	2.38	5.65	22	NT	22800	48
MW-10	9/12/2001	11.18	1188	6.55	63.1	6.89	-71.1		0.13	3.2	2.4	23	<0.01	21000	61
MW-10	8/7/2002	14.24	1010	NR	60.9	6.30	-147.8		<0.15	2.54	10.7	20	0.011	22000	56
MW-10	10/1/2003								<0.05	1.85	2.59	3	0.00062	9000	22
MW-10	9.23/2004	Not measured due to product in the well							0.0018 J	1.81	3.55	18	0.01 U	38000	38
MW-10	9/29/2005	Dry													
MW-10S	10/15/1997	13.18	339	10.49	100.0	7.55	135.6		<0.1	NT	0.0000454	23	<0.01	12000	38
MW-10S	4/7/2000	9.41	599	5.02	41.5	6.37	331.6		<100	10.1	<0.05	138	0.001567	56100	53
MW-10S	12/5/2000	7.94	362	0.67	75.6	5.99	248.3		1	6.9	0.61 J	11	0.00057	3810 B	15
MW-10S	4/25/2001	Not measured due to product in the well							1.5	6.03	11.30	8.6	0.0006	49000	11
MW-10S	9/12/2001	Not measured due to product in the well							4.7	7.60	0.048	13	<0.01	82000	10
MW-10S	8/7/2002	13.62	431	NR	66.1	6.31	303.8		0.11	7.07	0.0673	14	<0.01	390	10
MW-10S	9/25/2003	Not measured due to product in the well							3.41	5.9	<0.05	2	<0.0005	2200	6.7
MW-10S	9/22/2004	Not measured due to product in the well							3.6 J	3.74 J	14.5	15 R	0.01 UJ	9490	24 J
MW-10S	9/29/2005	Not measured due to product in the well							2.0 J	3.9	<0.05	120 J	<0.002	<0.11	16

Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-11	10/15/1997	13.98	398	4.86	47.2	7.94	144.3		3.4	NT	<0.0001	12	<0.01	<1.0	7.5
MW-11	4/4/2000	13.24	427	6.57	61.9	7.80	215.5		3.09	<0.002	<0.05	9.41	0.000138	<0.6	6.98
MW-11	4/4/2001	12.98	337	6.98	67.6	7.86	138.5		3.74	<0.015	<0.025	3.48	<0.00011	<0.11	6.25
MW-11	9/10/2001	13.13	414	9.09	NR	7.77	100.0		3.1	0.00045	<0.035	<7.4	<0.010	0.091	8
MW-11	8/6/2002	13.12	455	5.37	NR	7.58	240.6		<0.15	0.0012 B	<0.011	7.6	<0.01	<0.04	7.8
MW-11	9/23/2003	12.66	396	6.29	60.7	7.81	245.9	11.3	2.94	<0.005	<0.05	<2	<0.0005	<0.11	6.7
MW-11	9/21/2004	12.15	494	0.48	4.4	7.64	159.3	7.76	3.0 J	0.0014 J	0.0156	6.2 J	0.01 U	0.0656	9
MW-11	9/29/2005	11.55	502	8.12	96.9	7.26	177.2	0.32	2.4 J	0.003 J	<0.05	9.7	<0.002	740 J	14
MW-12	10/15/1997	10.16	1044	2.86	25.0	6.93	41.2		<0.1	NT	0.000267	15	<0.01	5000	48
MW-12	4/6/2000	10.10	1097	0.63	5.6	6.89	169.9		0.483	1.59	0.1128	11.9	0.001553	10300	54.5
MW-12	4/6/2001	Parameters not measured							0.43	1.57	0.131	16	0.048	1500	48
MW-12	9/13/2001	11.02	1142	3.95	36.7	6.84	22.2		<0.53	1.4	0.74	16	<0.01	18000	47
MW-12	5/14/2002	10.28	933	0.75	7.0	6.72	110.0		0.67	1.68	<0.011	17		4300	40
MW-12	8/7/2002	12.21	920	NR	45.9	6.69	150.0		0.46	1.6	0.105	15	<0.01	6400	37
MW-12	4/29/2003	10.95	982	5.24	47.2	6.80	126.1		0.8	1.56	<0.025	20	<0.05	3000	31
MW-12	9/23/2003	10.89	864	3.07	27.8	6.62	306.1	0.54	1.17	1.53	<0.05	<2	0.00049 J	10000	30.8
MW-12	5/4/2004	10.64	897	7.50	71.7	7.15	126.2		1.1 J	1.48 R	0.0527	14 R	0.00134 J	11200 J	29
MW-12	9/22/2004	13.49	939	3.87	37.6	6.77	95.6	0.83	1.1 J	1.23 J	0.0539	12 R	0.01 UJ	9060 J	26 J
MW-12	5/12/2005	11.24	1774	2.79	26.4	6.88	176.6	0.46	1.3 J	1.4	<0.05	16 R	<0.002	8300 J	23 J
MW-12	9/27/2005	11.67	760	0.70	6.4	6.56	169.3	4.28	1.1 J	1.3	<0.05	26 J	0.002 UJ	8500 J	20
MW-13	10/8/1997	12.79	185	6.00	54.1	6.19	206.7		1.3	0.000027	0.0000067	1.4	<0.01	0.7	2.7
MW-13	4/5/2000	9.67	189	8.29	51.5	5.49	296.7		<100	0.112	<0.05	431	0.0003	0.8	4.4
MW-13	12/5/2000	10.40	203.8	2.12	46.5	3.93	364.3		0.5	0.1	0.23	8.20 J	<0.00058	114.00 B	4.2
MW-13	4/23/2001	9.08	140	3.44	26.8	5.59	207.9		1.8	0.110	<0.025	35	<0.00012	0.2	3.5
MW-13	9/10/2001	10.69	203	NR	NR	5.54	196.0		2.5	0.027	0.052	<7.5	<0.01	0.69	5.4
MW-13	8/5/2002	11.49	223	5.36	48.3	5.38	333.1		<0.15	0.045	1.31	8.4	<0.01	0.64	6.8
MW-13	9/23/2003	11.16	195	3.50	32.3	5.80	317.0	432	1.86	0.182	0.96	7	<0.0005	2.9	5.1

Pentawood Products Site
Natural Attenuation Trend Data
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Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-13	9/21/2004	11.13	208	1.57	13.8	5.60	229.7	151	2.4 J	0.00367 J	0.125	6.4 R	0.01 UJ	4.67	6.5 J
MW-13	9/27/2005	12.48	168	418.16	--	5.19	335.1	221	0.6	0.0071 J	<0.05	19	0.002 UJ	0.85	3.1
MW-14	10/9/1997	9.32	252	6.43	56.2	8.09	108.9		1.6	NT	<0.0001	2.4	<0.01	<1.0	8.0
MW-14	4/6/2000	9.10	283	6.92	60.0	7.42	257.3		2.2	<0.002	<0.05	4.1	0.0002	<0.5	15.7
MW-15	10/16/1997	9.29	409	4.49	39.1	8.22	149.8		4.1	NT	0.00001	6.3	<0.01	<1	6.5
MW-15	4/4/2000	8.08	483	10.72	85.1	7.69	284.1		3.5	<0.002	<0.05	10	0.0003	<0.5	12.3
MW-15	4/25/2001	11.79	675	8.73	81.3	7.73	179.4		4.0	<0.015	<0.025	3	<0.0001	<0.11	15.0
MW-15	9/12/2001	9.74	548	9.80	NR	8.00	153.3		3.7	0.000	<0.035	<4.5	<0.01	0.077	17.0
MW-15	8/6/2002	10.24	508	NR	101.4	7.72	285.7		<0.15	<0.00042	<0.011	5	<0.01	<0.04	16.0
MW-15	9/23/2003	9.74	483	9.14	81.7	7.90	213.6	26.1	3.8	<0.005	<0.05	<2	<0.0005	<0.1	17.4
MW-15	9/21/2004	9.85	514	8.49	77.4	7.55	73.5	4.11	3.2 J	0.000976 J	0.04	3.9 J	<0.01	0.3	16.0
MW-15	9/29/2005	11.44	580	10.25	89.3	7.58	163.8	1.50	4.2 J	0.0016 J	<0.05	6	<0.002	<0.11	17.0
MW-16	10/14/1997	9.86	409	8.57	74.8	6.82	99.4		3.2	NT	0.00002	8.10	<0.01	<1	6.1
MW-16	4/6/2000	9.77	169	8.16	70.0	6.63	310.9		3.9	1.69	<0.05	24.1	<0.001068	<0.5	6.5
MW-16	4/26/2001	10.46	1102	4.72	43.2	6.81	75.6		8.7	0.009	0.03	29.0	<0.00012	<0.11	3.6
MW-16	9/10/2001	Parameters not measured							5.8	0.00082	<0.035	11.0	<0.01	0.17	1.8
MW-16	8/6/2002	11.70	247	10.86	NR	6.11	331.3		<0.15	0.0091 B	0.08	13.0	<0.01	0.0	2.0
MW-16	9/23/2003	10.97	216	10.27	93.2	6.34	349.1	29.0	3.5	<0.005	<0.05	3 J	<0.0005	0.089 J	6.2
MW-16	9/21/2004	10.68	222	0.07	0.6	6.49	173.9	37.4	2.1 J	0.000617 J	0.57	5.5 J	<0.01	0.1	3.7
MW-16	9/29/2005	10.48	373	11.12	97.6	6.79	233.4	12.8	1.5	0.0021 J	<0.05	71 J	<0.002	<0.11	11.0

Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-17	10/15/1997	9.26	399	4.53	39.0	7.89	147.2		4.1	NT	<0.0001	10	<0.01	<1	4.8
MW-17	4/6/2000	9.15	438	4.81	41.8	7.73	254.9		4.2	<0.002	<0.05	<3	0.0001	<0.5	4.9
MW-17	4/26/2001	10.38	412	9.64	85.7	7.77	58.6		5.0	<0.015	<0.025	6.8	NT	0.7	4.1
MW-17	9/11/2001	11.44	457	6.96	62.9	7.49	262.0		4.4	<0.00027	0.31	<9.3	<0.01	<0.059	4.8
MW-17	8/8/2002	12.88	425	NR	65.8	7.64	204.5		<0.15	<0.00042	<0.011	7.4	<0.01	0.032	4.6
MW-17	9/25/2003	9.80	405	6.45	57.3	7.80	206.0	358	5.1	<0.005	<0.05	<2	<0.0005	0.46	4.4
MW-17	9/22/2004	11.02	498	9.13	87.0	7.57	150.5	8.23	4.8 J	0.045 J	0.0115 UB	8.6 R	<0.01	2.82	4.1 J
MW-17	9/27/2005	11.94	368	377.82	--	6.31	325.4	0.23	5.1 J	<0.01	<0.05	7.8	0.002 UJ	0.054 J	3.9
MW-18	10/10/1997	11.51	777	1.03	9.2	6.13	-12.1		<0.1	NT	0.03	11.0	<0.01	8800	49
MW-19	10/16/1997	8.43	662	12.11	103.4	8.23	133.6		3.8	NT	<0.0001	19	<0.01	8900	47
MW-19	4/7/2000	7.80	650	5.02	40.3	6.75	323.2		7.0	<0.002	<0.05	90	0.0003	11000	37.4
MW-19	4/7/2001	Not measured due to product in the well.							3.37	1.79	<0.025	47	NT	25600	39
MW-19	9/12/2001	Not measured due to product in the well.							1.3	1.8	0.071	<9.7	0.0160	400000	19
MW-19	5/13/2002	Not measured due to product in the well.							2	2.07	<0.011	16		14000	33
MW-19	8/8/2002	Not measured due to product in the well.							0.16	3.11	0.218	16	<0.01	11000	22
MW-19	4/29/2003	Not measured due to product in the well.							3	3.59	<0.025	27	0.0024	4900	20
MW-19	9/25/2003	Not measured due to product in the well.							2	4.47	0.05 J	90	0.0057	15000	17.5
MW-19	5/4/2004	Not measured due to product in the well.							0.71 J	3.36 R	0.892 R	16 R	0.00113 J	70000 J	25.0
MW-19	9/22/2004	Not measured due to product in the well.							1.5 J	2650	402 J	23 R	10.0 UJ	111000	15 J
MW-19	5/10/2005	Not measured due to product in the well.							0.76 J	2.3	<0.05	29 R	<0.002	45000 J	18 J
MW-19	9/29/2005	Not measured due to product in the well.							0.75	2.7	<0.05	40 J	<0.002	13000 J	19.0
MW-20	10/15/1997	Dry. Could not collect parameter sample.							NT	NT	NT	NT	<0.01	11000	NT
MW-20	4/26/2001	Not measured due to product in the well.							<0.13	2.25	0.84	67	NT	36600	24
MW-20	9/12/2001	Not measured due to product in the well.							0.15	2.8	<0.035	24	<0.01	83000	16
MW-20	8/7/2002	Not measured due to product in the well.							<0.15	3.28	0.206	25	<0.01	30000 B	22
MW-20	9/25/2003	Not measured due to product in the well.							<1.25	3.25	0.35	80 J	0.0054	13000	19.4 J

Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-20	9/22/2004	Not measured due to product in the well.							0.29 J	2.32	1.32 J	23 R	0.01 UJ	133000	24 J
MW-20	10/25/2005	Not measured due to product in the well.							2.1 J	2.4	0.14	39 J	<0.002	63000 J	13
MW-21	2/9/1998	8.50	559	8.35	NT	7.05	177.5		NT	NT	<0.1	9.1	0.011	<1.0	71
MW-21	5/14/2002	9.29	457	10.66	93.5	5.86	152.0		2.0		0.130	7.3		0.1	69
MW-21	8/6/2002	10.72	444	NR	99.0	6.79	297.6		<0.15	0.00063 B	<0.011	9.6		0.0	49
MW-21	4/29/2003	9.91	473	3.72	NR	6.65	144.9		2.5	<0.005	<0.025	12.0	<0.0005	0.2	41
MW-21	9/24/2003	9.30	491	11.13	97.7	6.74	326.0	400	2.6	<0.005	<0.05	<2	<0.0005	0.063 J	48
MW-21	5/4/2004	10.10	557	--	89.2	6.50	196.3		2.3 J	0.000718 R	14 R	3.6 R	<0.01	0.135 UB	67
MW-21	9/21/2004	9.80	510	10.37	92.5	6.61	102.1	365	2.4 J	0.000484 J	10.3 J	4.8 R	0.01 UJ	0.5	63 J
MW-21	5/10/2005	10.47	544	10.89	94.1	6.63	159.6	103	2.8 J	0.00047 J	<0.05	12 R	<0.002	0.3	49 J
MW-21	9/27/2005	10.45	444	13.46	121.1	6.32	129.8	969	2.4 J	0.0098 J	0.036 J	17.0	0.002 UJ	0.046 J	47
MW-22	2/9/1998	8.70	558	7.50	NT	6.86	119.5		NT	NT	<0.1	18	0.013	<1.0	56
MW-22	5/14/2002	9.91	423	10.25	91.3	6.77	85.5		3.7 J	0.0035	0.023	14		0.1	18
MW-22	8/6/2002	11.37	343	NR	101.6	6.86	323.7		<0.15	<0.00042	0.025 B	12	<0.01	0.1	7
MW-22	9/24/2003	9.70	303	10.92	96.4	6.89	345.4	1038	2.2	0.542	2.77	3 J	<0.0005	0.3	5
MW-22	9/21/2004	9.78	316	10.59	94.5	6.64	99.3	777	2.2 J	0.015 UJ	13.6 J	6.7 R	0.01 UJ	0.2	11 J
MW-22	9/28/2005	9.70	Meter not working		87.4	6.66	260.8	59.5	1.7 J	0.0013 J	<0.05	18	<0.002	0.16 J	10
MW-23	2/27/1998	9.63	270	13.68	122.3	7.93	159.0		NT	NT	<0.1	7.6	0.0566	<1.0	8.7
MW-23	9/11/2001	11.57	322	3.21	28.8	7.46	112.6		<0.13	0.029	<0.035	<8.2	<0.01	0.49	10
MW-24	2/8/1998	13.80	524	5.35	NT	6.62	80.0		NT	NT	<0.1	5.2	<0.01	<1	19
MW-24	12/6/2000	9.28	527.3	0.04	67.2	5.57	259.0		2.30 J	<0.015	<0.025	7.10 J	<0.00053	123 B	21
MW-24	4/24/2001	15.30	634	3.67	34.9	6.28	209.2		3.6	0.0024	<0.025	12	<0.0001	0.1	36

Pentawood Products Site
Natural Attenuation Trend Data
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Well	Sample Date	Temp. (C)	Specific Cond. (umhos/cm^2)	DO (mg/L)	DO (%)	pH	ORP (mV)	Turbidity	Nitrate (mg/L)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Methane (mg/L)	PCP (ug/L)	Chloride (mg/L)
MW-25	2/9/1998	8.69	808	8.16	NT	6.95	55.0		NT	NT	<0.1	9.9	0.017	<1.0	16
MW-26	12/6/2000	9.13	631.3	0.00	91.1	6.47	279.3		2.8	0.1	<0.025	540 J	<0.00065	118 B	29.0
MW-26	4/24/2001	11.24	646	7.73	71.8	7.05	190.2		5.0	<0.015	0.04	10	<0.0001	<0.1	22
MW-26	9/10/2001	Parameters not measured							3.2	<0.004	0.1	12	<0.01	0.16	30
MW-26	5/14/2002	12.28	588.00	7.55	72.8	7.11	17.8		3 J	0.00073	<0.011	15		0.1	27
MW-26	8/5/2002	11.30	588.00	NR	66.3	6.52	280.1		<0.15	0.00056 B	<0.011	14	<0.01	0.03	18
MW-26	4/29/2003	10.58	621.00	8.68	79.2	6.53	157.3		3.5	<0.005	<0.025	14	<0.0005	<0.1	18
MW-26	9/23/2003	10.84	513	7.41	67.7	6.70	279.8	23.7	3.74	<0.005	<0.05	<2	<0.0005	<0.11	11
MW-26	5/4/2004	9.85	172	7.07	62.8	6.19	326.2		3.9 J	0.00123 R	0.458 R	42 R	<0.01	0.242 UB	17
MW-26	9/23/2004	13.16	931	8.85	87.2	6.44	63.4	44.6	1.5 J	0.0193	0.62	120	<0.01	0.393	28
MW-26	5/10/2005	11.49	1120	10.48	97.2	6.92	197.0		2.8 J	0.0018 J	<0.05	200 R	<0.002	0.061 J	26 J
MW-26	9/27/2005	12.13	845	6.77	63.2	6.78	129.2	5.24	1.9 J	<0.01	<0.05	170 J	0.002 UJ	0.027 J	25
PW-01	10/23/1997	11.10	550	5.00	NT	8.92	185.0		7.7	NT	0.0012	10	0.0195	5	48
PZ-03	2/9/1998	7.50	212	11.02	NT	6.91	164.0		NT	NT	NT	NT	NT	<1	NT

NR - Parameter not Recorded.

NT - Parameter not tested.

Appendix C

Groundwater Contour Maps, Groundwater Elevations and Observations, and Oil Measurements

I:\141158\CAD\DRAWINGS\RI\ pw_2005-pcp_1000 in gw fig01.dgn 05-APR-2006

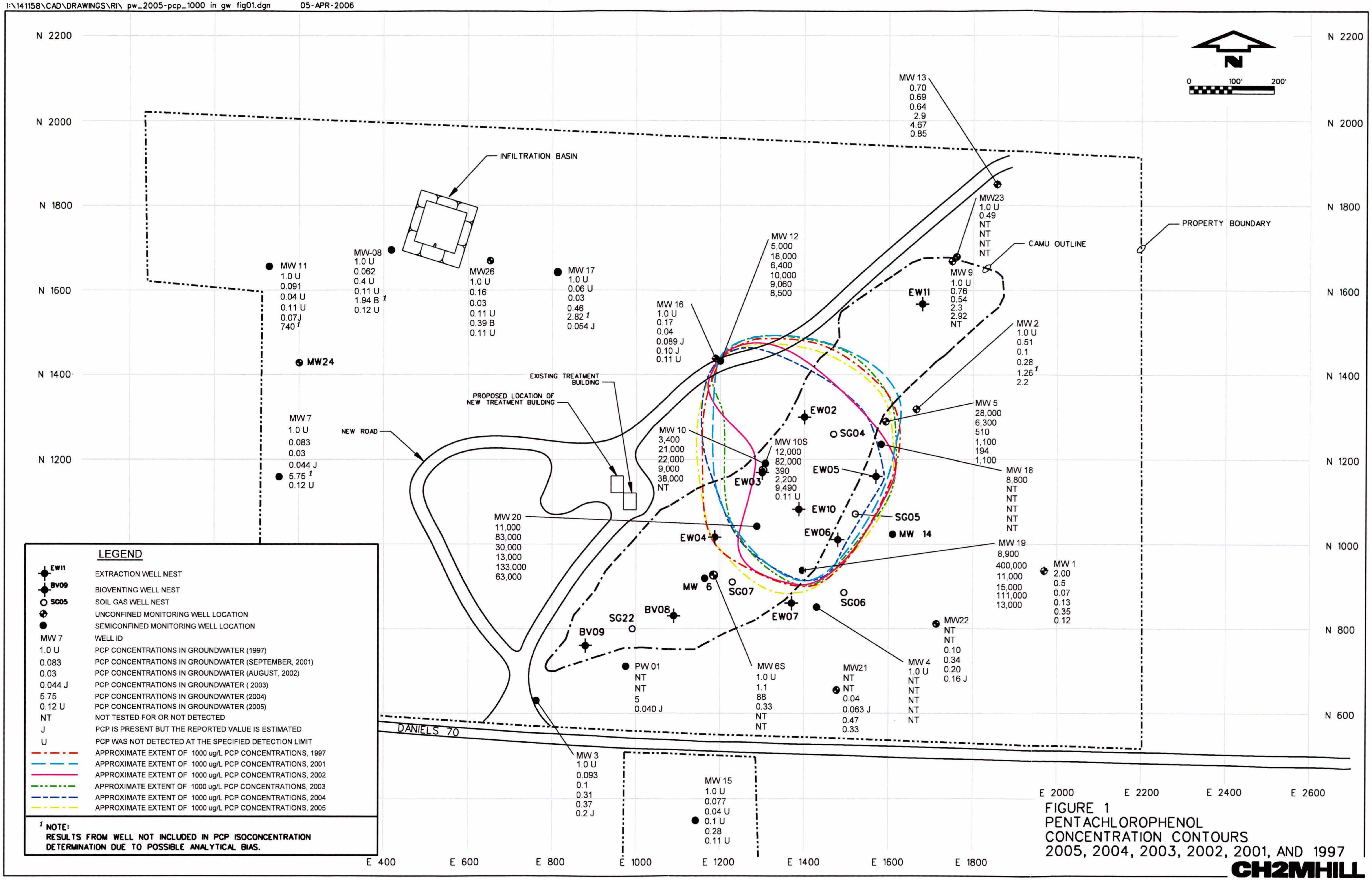

FIGURE 1
PENTACHLOROPHENOL
CONCENTRATION CONTOURS
2005, 2004, 2003, 2002, 2001, AND 1997

CH2MHILL

I:\141158\CAD\DRAWINGS\RI\ pw_2004-pcp_1 in gw fig01.dgn 05-APR-2006

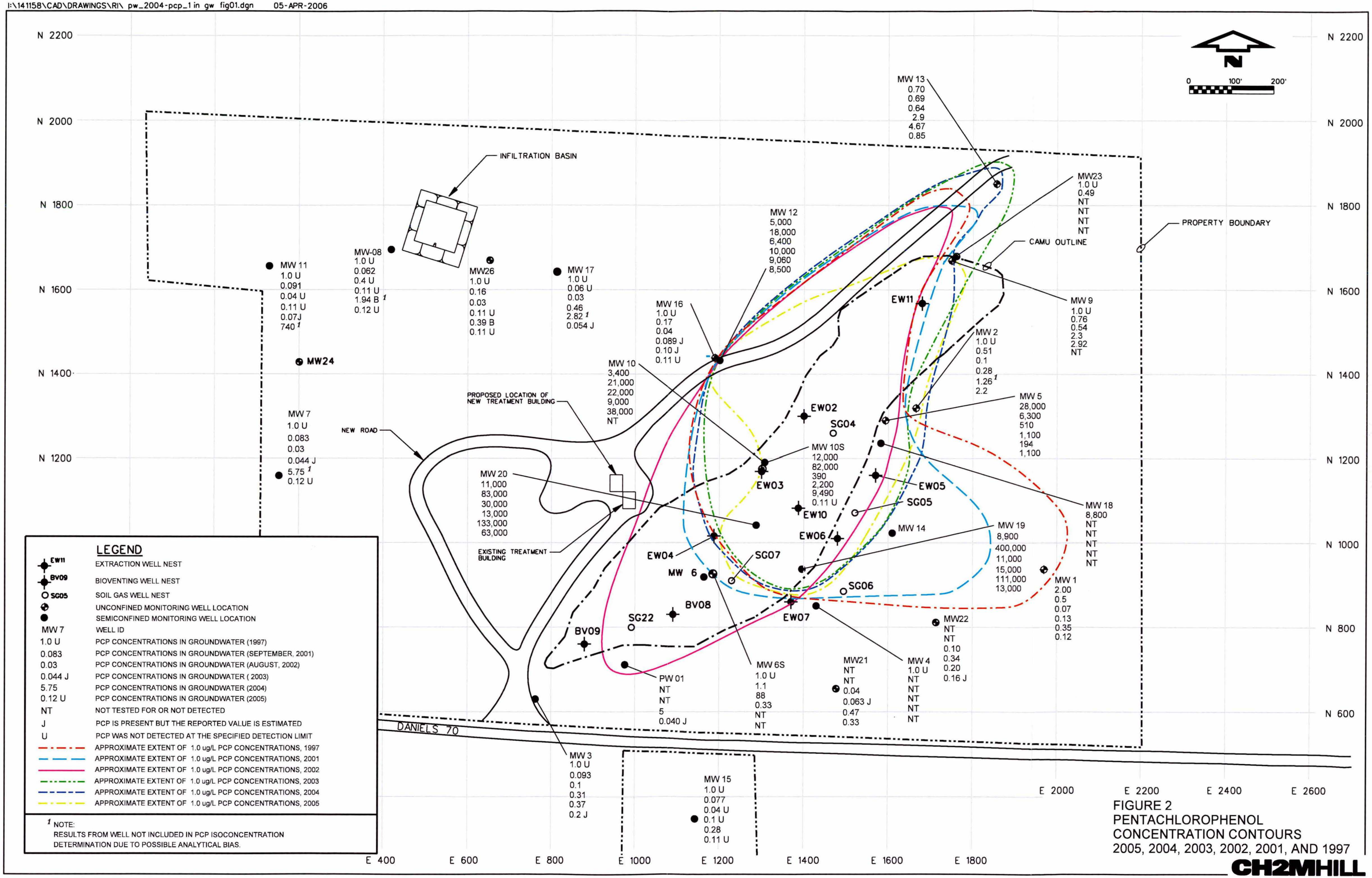

FIGURE 2
PENTACHLOROPHENOL
CONCENTRATION CONTOURS
2005, 2004, 2003, 2002, 2001, AND 1997

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Appendix D
Residential Well Memoranda

August 11, 2005

Mr. Tom Williams
Remedial Project Manager (SR-6J)
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604-3590

Subject: Subcontract No. 333, Penta Wood Products, WI
May 2005 Sampling Results
WA No. 201-RALR-05WE, Contract No. 68-W6-0025

Dear Tom:

Attached are the Pentachlorophenol (PCP) results of the residential and potable well sampling event that took place on May 10, 2005 and July 7, 2005. These sampling events included the analysis of benzene, ethylbenzene, toluene, xylene (BTEX), and napthalene for the residential and potable wells. All analyses were performed by Severn Trent Laboratories (STL) of University Park, Illinois. The well description information is shown in the following table:

LTRA Residential Well Information
Penta Wood Products – Siren, Wisconsin

Location ID	Resident Name	Resident Address	Resident Phone Number	WI Well #
RW01	Bill Ellis (formerly Skold)	8713 Daniels 70	(715) 349-5840	FG508 SX303
RW02	LaVonne Brethorst	8627 Daniels 70	(715) 349-5237	Unknown
RW03	Ken and Sheri Nelson	Daniels 70 (same driveway as V. Engstrom)	(715) 349-8070	JB 251
RW04	Vayne Engstrom	8526 Daniels 70	(715) 349-5212	AN547
RW05	Timothy Tjader	8783 Daniels 70	(715) 349-5192	Unknown

The results of the May 2005 sampling event showed no detections of BTEX and naphthalene. However, PCP concentrations were estimated to be above the detection limit of 0.011 µg/L but less than the reporting limit of 0.1 µg/L at RW-01 (Ellis residence) and DW-01 (potable well). These estimated concentrations were found at 0.068 µg/L and 0.033 µg/L, respectively.

After the May 2005 sampling event, RW-01 has since been abandoned and a new well (WI Well # SX303) was installed in June 2005. The sampling of the new well was conducted on July 7, 2005. The results of this sampling event showed no detections of BTEX and naphthalene. However, PCP was estimated at 0.043 µg/L, which is above the detection limit of 0.018 µg/L but less than the reporting limit of 0.1 µg/L.

If you have any questions or comments please give me a call at 414.272.1052 ext. 476, or Bill Andrae at ext. 341.

Sincerely,

CH2M HILL

Steven Paukner
Project Chemist

c: Stephen Nathan, PO/U.S. EPA, Region 5 (w/o enclosure)
Marshall McReynolds, CO/U.S. EPA, Region 5 (w/o enclosure) c/o Dave Alberts, CS
Bill Andrae, SM/CH2M HILL, Milwaukee
Ike Johnson, PM/CH2M HILL, Milwaukee
Dan Plomb, DPM/CH2M HILL, Milwaukee
Gina Bayer, RTL/CH2M HILL, Milwaukee
Dave Shekoski/CH2M HILL, Milwaukee
Cherie Wilson, AA/CH2M HILL, Milwaukee

January 4, 2005

Mr. Tom Williams
Remedial Project Manager (SR-6J)
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, IL 60604-3507

Subject: Subcontract No. 333, Penta Wood Products, WI
September 2005 Sampling Results
WA No. 201-RALR-05WE, Contract No. 68-W6-0025

Dear Tom:

Attached are the Pentachlorophenol (PCP) results of the residential and potable well sampling event that took place on September 27, 2005. This sampling event also included the analysis of benzene, ethylbenzene, toluene, xylene (BTEX), and napthalene. All analyses were performed by Severn Trent Laboratories (STL) of University Park, Illinois. The well description information is shown in the following table:

LTRA Residential Well Information
Penta Wood Products – Siren, Wisconsin

Location ID	Resident Name	Resident Address	Resident Phone Number	WI Well #
RW01	Bill Ellis (formerly Skold)	8713 Daniels 70	(715) 349-5840	SX303
RW02	LaVonne Brethorst	8627 Daniels 70	(715) 349-5237	Unknown
RW03	Ken and Sheri Nelson	Daniels 70 (same driveway as V. Engstrom)	(715) 349-8070	JB 251
RW04	Vayne Engstrom	8526 Daniels 70	(715) 349-5212	AN547
RW05	Timothy Tjader	8783 Daniels 70	(715) 349-5192	Unknown

The results of the September 2005 sampling event showed no detections of BTEX and naphthalene. However, PCP concentrations were estimated to be above the detection limit of 0.018 μg/L but less than the reporting limit of 0.1 μg/L at RW-01 (Ellis residence) and

DW-01 (potable well). These estimated concentrations were found at 0.050 µg/L and 0.040 µg/L, respectively.

If you have any questions or comments, please give me a call at 414.272.1052 ext. 476, or Bill Andrae at ext. 341.

Sincerely,

CH2M HILL

Steven Paukner
Project Chemist

c: Stephen Nathan, PO/U.S. EPA, Region 5 (w/o enclosure)
Dave Alberts, CO/U.S. EPA, Region 5 (w/o enclosure)
Bill Andrae, SM/CH2M HILL, Milwaukee
Ike Johnson, PM/CH2M HILL, Milwaukee
Dan Plomb, DPM/CH2M HILL, Milwaukee
Gina Bayer, RTL/CH2M HILL, Milwaukee
Dave Shekoski/CH2M HILL, Milwaukee
Cherie Wilson, AA/CH2M HILL, Milwaukee

Appendix E

Draft Remediation System Evaluation Report and Reponses to Recommendations

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGIONS 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JAN 2 4 2006

REPLY TO THE ATTENTION OF:
SR-6J

Mr. Charles S. Sands
U.S. Environmental Protection Agency, Headquarters
Ariel Rios Building
1200 Pennslyvania Avenue, N.W.
Mail Code: 5204G
Washington, D.C. 20460

Subject: Responses to Remediation System Evaluation Recommendations
Penta Wood Products Site, Siren, WI
WA No. 201-RALR-05WE, Contract No. 68-W6-0025

Dear Mr. Sands

CH2M HILL has prepared responses to the recommendations presented in Section 6 of the Draft Remediation System Evaluation Report dated December 2, 2005. CH2M HILL's responses are presented in italics.

Recommendations to Improve Effectiveness

Follow Water Quality Trends In Monitoring Wells To Determine If The Plume Is Migrating

The potential migration evidenced by increased PCP concentrations in MW-13 suggests the need to continue to closely evaluate the concentration trends in this well to determine if plume migration is occurring. It is recommended that the site team continue to closely follow the sampling data from this and other monitoring wells to evaluate the potential for plume migration. These monitoring wells represent the only source of information that will provide evidence of migration before residential wells or ecological receptors are impacted. If continued increases are observed in MW-13, the site team may want to consider installing a monitoring well approximately 300 feet west of MW-13 (if access is available) to monitor potential migration in this direction. If data suggests that migration is occurring in the direction of the residences, a more thorough capture zone analysis is likely merited to determine if pumping needs to increase to prevent migration and protect these wells.

CH2M HILL will continue to evaluate the PCP data for MW-13 and the site to determine if plume migration is expanding and if additional monitoring sites may be needed. If continued increases are observed in MW-13, installation of a monitoring well to the east, in the direction of two residences, may be considered.

Recommendations to Reduce Costs

Provide More Accurate Prediction Of Consumables And Disposal Costs

After another year of operation, the site team should more accurately predict materials and disposal costs and budget site costs accordingly. Many of the estimates provided to the RSE team, including those for GAC, LNAPL, and filter cake disposal are too conservative and over estimate the expenditures for the site. The RSE team found that the estimates for utilities, lab analysis, and labor are reasonable and there are no significant savings likely. Based on the actual and budgeted costs discussed in Section 4.4 of this report, the site team budgets approximately $374,000 per year in extra funding for consumables and disposal costs. Another year of operation will provide the site team with more data to provide better estimates for funding in future years. The site team should strive to estimate/budget costs accurately so that unnecessary funding is not allocated to this site instead of other sites where it might be more appropriate. If the budget does include this extra $374,000, then the annual costs are closer to $833,000 per year.

CH2M HILL prepared the initial project budget prior to the system being operated and costs were estimated based on theoretical operational data. Since the system began operation in early 2004, CH2M HILL has been tracking operational costs, including the consumables and disposal costs. Future operational cost estimates will be more accurate because of the availability of actual costs.

Consider Modifying Management Of GAC Units

Assuming an influent PCP concentration on the order of 10,000 µg/L, GAC isotherms suggest a GAC usage of approximately 1 pound of GAC per 1 pound of PCP. With this influent concentration and a flow rate of 90 gpm, the mass of PCP exiting the DAF is approximately 4,000 pounds per year. Based on chemical loading, this should translate to a GAC usage of approximately 4,000 pounds per year.

However, the site team reports changing out 12,500 pounds approximately 6 times per year for a total of 75,000 pounds per year. Thus, it seems that the GAC may be replaced, in large part, due to pressure build up or solids loading. The site team should evaluate the following three options and move forward with the most appropriate one:

Option 1

Consider replacing the 2,500-pound GAC unit (which is currently used more for its filtering capacity than for its chemical adsorption ability) with a sand filter, multimedia filter, or additional bag filters for improved filtering. This option might decrease the amount of solids loading to the downstream 10,000-pound GAC units thus extending the life of the GAC in those bigger units. In addition, because the 2,500-pound unit would no longer require GAC replacement, it might reduce GAC usage for the site by approximately 15,000 pounds per year (2,500 pounds per changeout times six changeouts per year). At a cost of approximately $0.76 for GAC and GAC disposal, this translates to a savings of approximately $11,000 per year in savings associated with GAC.

Option 2

Consider using GAC in the 2,500-pound unit but do not change it out as frequently. It would no longer provide adsorptive capacity, but it would continue to serve as a filter. This might reduce GAC usage by approximately 10,000 pounds per year (an estimated reduction of four replacements per year), but would not involve the capital costs of replacing the 2,500 pound unit with a new filter. This would be feasible because backwashing capability is available for this smaller GAC unit.

Option 3

Evaluate the cost-effectiveness of adding backwashing capability to the lead 10,000-pound GAC unit. This would require more substantial capital cost and would be more of an engineering challenge due to the space requirements for the larger tank. However, if the GAC usage can be reduced by half (e.g., by approximately 37,500 pounds per year), the savings might be on the order of $30,000 per year.

CH2M HILL internally evaluated Option 1 and determined is was infeasible due to the multiple filtration units that would be required and space constraints for the equipment. Option 2 was implemented in April 2005 and is currently operating as designed. At USEPA's request, CH2M HILL will evaluate the *installation of backwash piping for the 10,000 pound units. The backwash pump installed in April 2005 is capable of supplying the necessary flow rate to backwash the larger GAC units.*

Eliminate Redundant Or Unnecessary Laboratory Analysis

The monitoring and sampling program can be modified to eliminate redundant samples and reduce costs without sacrificing remedy effectiveness. There is a significant amount of total and dissolved metals data from ground water sampling that exists and it is not being used for additional decisions. At a minimum, if consistent with State requirements, the site team should consider eliminating total metals since dissolved analysis occurs and is more representative of potential ground water problems. Costs could be reduced by approximately $3,000 per year without a loss of protectiveness. The site team should also seek to minimize analysis for dioxins in process water sampling given the high cost for the analysis. Where possible, other contaminants (e.g., PCP) should be used as indicators for contaminant presence. The RSE team acknowledges that the site team is already pursuing reducing the number of samples that are analyzed for dioxins. The RSE team agrees with the site contractor's recommendation to eliminate the spring sampling event.

CH2M HILL will review historical metals data to verify elimination of total metals from the annual sampling of the monitoring wells will not affect data evaluation. As instructed by USEPA, CH2M HILL will not eliminate the spring sampling event until sufficient data exists to fully understand the contaminant plume.

Savings From The Use Of Dedicated Pumps In Monitoring Wells

The installation of dedicated pumps in monitoring wells, which was accomplished during 2005, should reduce the time associated with purging the wells and decontaminating equipment. Therefore, the time associated with sampling should be reduced. The RSE team estimates that the annual sampling event may be shortened by one or two days, potentially resulting in savings of approximately $4,000 to $8,000 per year from the current annual sampling cost of $29,000. This estimate assumes that the semi-annual event has already been eliminated. The RSE team agrees with the site contractor's recommendation to eliminate the spring sampling event. The site team should also evaluate the potential for the plant operator to assist with the ground water sampling effort since the operator is already paid to be at the site and also does not incur travel costs from Milwaukee.

CH2M HILL is agreement that the use of the dedicated pumps should reduce the sampling effort by a day or two. CH2M HILL will evaluate the potential for the plant operator to serve as a field team member to further reduce travel costs.

Investigate Possibility Of Declassifying Waste

The filter cake disposal cost is extremely high. There are examples of similar filter cake being sufficiently stabilized and delisted so that disposal options other than incineration are available. Since the disposal costs are so high, the site team is encouraged to consider these other disposal options. Cost savings of up to $100,000 per year are possible. As an example, the link below discusses the delisting of filter cake at the GROWS landfill.

http://www.epa.gov/fedrgstr/EPA-WASTE/2001/July/Day-26/f18533.htm

As requested by USEPA, CH2M HILL will investigate the possibility of declassifying the waste.

Decrease Project Management/ Reporting Costs

The project management costs are estimated at about $157,000 per year, having decreased and stabilized since the design efforts in FY03. The cost is primarily time for the site contractor's project manager as well as contracting and technical support. These costs are high in comparison with similar sites. The RSE team would assume that PM costs will decrease over time to about $100,000 per year as the system operation becomes more routine.

CH2M HILL agrees that project management and reporting costs should decrease as operation becomes more routine. Some of the increased costs seen in the past were associated with data management activities. These activities have been reviewed and revised to make them more efficient.

Develop Tracking Of Routine & Non-Routine Costs

Routine parts and maintenance and non-routine costs combine for a fairly significant portion of the annual cost. Routine parts and maintenance are expected to be $130,000 and non-routine costs expected to be $53,000. Pump replacements and erosion control are included in these costs but a detailed breakdown was not discussed. These costs seem relatively high, but likely result from the sampling pump installations and significant erosion control measures. A detailed tracking of routine and non-routine maintenance should be developed in order to easily see what activities are included in these costs and how they can be reduced.

CH2M HILL will review historic routine and non-routine maintenance activities and develop a tracking system to assist in analyzing the activities, the associated costs, and possible ways to reduce the costs.

Evaluate Potential To Reduce Ground Water Extraction Without Substantially Affecting LNAPL Recovery

Disposal costs represent the single largest cost category for the site, even when considering the actual disposal values rather than the conservative estimates provided by the site team. Moreover, the majority of the disposal costs are associated with the disposal of the filter cake. For example, if ground water recovery can be decreased by 10% then a savings of approximately $15,000 could be realized in avoided disposal costs (approximately $12,500 for avoided filter cake disposal and approximately $2,500 for avoided GAC disposal). In addition, approximately $12,500 might be realized in reduced GAC and chemical usage. Thus, for a 10% reduction in ground water extraction, a savings of approximately $27,500 per year might be realized. The site team should evaluate various pumping schemes to determine if pumping can be reduced without sacrificing the effectiveness of LNAPL recovery or the control of the dissolved contaminant plume. Given that this evaluation consists of decreasing pumping from some wells and tracking LNAPL recovery and concentrations at nearby monitoring wells, this evaluation should be feasible within the existing PM and reporting budget. *As part of the data evaluation activities associated with preparation of the 2005 Annual Report, CH2M HILL will evaluate LNAPL recovery and dissolved plume containment to determine the potential for reduced groundwater pumping.*

Adjust pH To 6.5 Instead Of 7.0

Prior to discharge of treated water, the site team currently adjusts pH from approximately 5.7 to 7.0. Alternatively, the site team could adjust pH to 6.5. A pH of 6.5 is still within discharge criteria of 6 and 9 and is likely closer to the natural pH of the ground water. Adjusting to a pH of 6.5 would decrease the use of sodium hydroxide and the associated costs without sacrificing remedy effectiveness. Implementing this recommendation may result in savings of approximately $10,000 per year.

CH2M HILL agrees with this recommendation although will further evaluate the data before implementation.

Recommendations For Technical Improvement

No recommendations are provided in this category.

CH2M HILL has no response to this comment.

Considerations For Gaining Site Close Out

Transition From Ground Water Extraction & LNAPL Recovery System To Bioventing System & Intrinsic Remediation

The site team estimates that the majority of LNAPL will be recovered within 10 years and that ground water extraction and LNAPL recovery system can be discontinued in favor of the bioventing system and intrinsic remediation. The RSE team agrees that the bioventing system should not be run concurrently with the ground water extraction system given the increased biological activity and the potential for fouling of the recovery wells and treatment system. This means that it is likely that ground water extraction, which is the most costly aspect of this remedy, will not need to occur after the site is transferred to the State. The RSE team supports this overall exit strategy assuming that sufficient data are available at the time of transfer to confirm that the dissolved plume is stable in the absence of pumping. If it is not stable, then the potential exists for PCP to migrate to residential wells and nearby wetlands and the RSE team would suggest that ground water extraction may need to continue.

CH2M HILL agrees with the RSE team's comment about not operating the bioventing system concurrently with the ground water extraction system given the increased biological activity and the potential for fouling of the recovery wells and treatment system.

Sincerely,

Thomas Williams
Remedial Project Manager

c: Sharon Jaffess, Chief/U.S. EPA, Region 5
Stephen Nathan, PO/U.S. EPA, Region 5
Bill Schultz/WDNR, Rhinelander
Bill Andrae, SM/CH2M HILL, Milwaukee

DRAFT

REMEDIATION SYSTEM EVALUATION

PENTA WOOD PRODUCTS SITE
DANIELS, WISCONSIN

Report of the Remediation System Evaluation
Site Visit Conducted at the Penta Wood Products Site
October 12, 2005

Draft Report
December 2, 2005

NOTICE

Work described herein was performed by GeoTrans, Inc. (GeoTrans) for the U.S. Environmental Protection Agency (U.S. E.P.A). Work conducted by GeoTrans, including preparation of this report, was performed under EPA contract 68-C-02-092 to Dynamac Corporation, Ada, Oklahoma. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

EXECUTIVE SUMMARY

A Remediation System Evaluation (RSE) involves a team of expert hydrogeologists and engineers, independent of the site, conducting a third-party evaluation of site operations. It is a broad evaluation that considers the goals of the remedy, site conceptual model, above-ground and subsurface performance, and site exit strategy. The evaluation includes reviewing site documents, visiting the site for up to 1.5 days, and compiling a report that includes recommendations to improve the system. Recommendations with cost and cost savings estimates are provided in the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs
- Technical improvements
- Gaining site closeout

The recommendations are intended to help the site team identify opportunities for improvements. In many cases, further analysis of a recommendation, beyond that provided in this report, may be needed prior to implementation of the recommendation. Note that the recommendations are based on an independent evaluation by the RSE team, and represent the opinions of the RSE team. These recommendations do not constitute requirements for future action, but rather are provided for the consideration of all stakeholders.

The Penta Wood Products (PWP) site is a former wood treating facility located on Daniels 70 (former State Route 70) in Burnett County, Wisconsin. The Village of Siren, Wisconsin, is approximately two miles east of the site and there are two residences within 200 feet of the site using private wells. The PWP property currently consists of approximately 82 acres which were actively used for wood treating. The PWP facility operations involved wood treatment from 1953 to 1992 which caused contamination in site soil and ground water. The site was listed on the National Priorities List on June 17, 1996. The 1998 Record of Decision (ROD) for the site specified remedies for both soil and ground water contamination. At the time of the RSE, surface soil contamination had been addressed and subsurface soil contamination, ground water contamination, and LNAPL remained. The primary constituents of concern include pentachlorophenol (PCP), benzene, toluene, ethylbenzene, and xylene (BTEX), naphthalene (from No. 2 fuel oil carrier), arsenic, chromium, and zinc. Metals contamination was primarily present in surface soils, which have already been addressed. The focus of the RSE is on the pump and treat (P&T) and LNAPL recovery system.

In general, the RSE team found a well-operated system. The observations and recommendations contained in this report are not intended to imply a deficiency in the work of either the system designers or operators but are offered as constructive suggestions in the best interest of the EPA, the public, and the facility. These recommendations have the obvious benefit of being formulated based upon operational data unavailable to the original designers.

Recommendations are provided in three of the four categories: effectiveness, cost reduction, and site closeout. The recommendation for improving system effectiveness involves continuing with annual ground water sampling and closely following water quality trends in MW-13 and other wells to evaluate the potential for plume migration.

Recommendations for cost reduction include the following:

- After another year of operation, more accurately forecast materials and disposal costs. Many of the estimates, including those for GAC, LNAPL, and filter cake disposal are overly conservative and result in allocation of additional funding (up to $374,000 extra per year) for the site.

- Consider modifying management of Granular Activated Carbon (GAC) units to reduce costs associated with GAC changeouts and disposal. Various options ranging from improved filtration to the consideration of backwashing are provided. Annual savings from implementing this recommendation might range from $11,000 per year to $30,000 per year depending on the option implemented.

- Modify the monitoring and sampling program to eliminate redundant samples and reduce costs without sacrificing remedy effectiveness. The site team is already moving forward with the elimination of the May sampling event, and the RSE team supports this decision. If consistent with State requirements, the site team should also consider eliminating total metals from the analysis since dissolved analysis is conducted and is more representative of potential ground water problems. Costs could be reduced by approximately $3,000 per year without a loss of protectiveness. The site team should also continue to minimize analysis for dioxins in process water sampling given the high cost for the analysis.

- Realize cost savings from the use of the dedicated pumps that have been installed in the monitoring wells. The RSE team estimates that the annual sampling event may be shortened by one or two days, potentially resulting in savings of approximately $4,000 to $8,000 per year from the current annual sampling cost of $29,000. Use of the plant operator during the sampling event could also reduce the time involved and/or the travel of a sampling team member from Milwaukee.

- Investigate the possibility of declassifying waste. The filter cake disposal cost is extremely high. There are examples of similar filter cake being sufficiently stabilized and delisted so that disposal options other than incineration are available. Cost savings of up to $100,000 per year are possible. The RSE team has provided a link to information regarding declassification at another Superfund site.

- Decrease project management/reporting costs as system operation becomes more routine. Project management costs are estimated at about $157,000 per year. These costs are relatively high, partially due to the costs of managing site subcontractors/vendors. The RSE team assumes that PM costs will decrease over time to about $100,000 per year as the system operation becomes more routine.

- Develop tracking of routine and non-routine costs. Routine parts and maintenance and non-routine costs combine for a fairly significant portion of the annual cost. Routine parts and maintenance are expected to be $130,000 and non-routine costs expected to be $53,000. Pump replacements and erosion control are included in these costs but a detailed breakdown was not discussed. Routine and non-routine maintenance should be tracked separately in order to easily see what activities are included in these costs and how they can be reduced.

- Evaluate potential to reduce ground water extraction without substantially affecting LNAPL recovery. If ground water recovery can be decreased by 10% then a savings of approximately $15,000 could be realized in avoided disposal costs and approximately $12,500 might be realized in reduced GAC and chemical usage. Thus, for a 10% reduction in ground water extraction, a savings of approximately $27,500 per year might be realized. The site team should evaluate various pumping schemes to determine if pumping can be reduced without sacrificing the effectiveness of LNAPL recovery or the control of the dissolved contaminant plume. Given that this evaluation consists of decreasing pumping from some wells and tracking LNAPL recovery and concentrations at nearby monitoring wells, this evaluation should be feasible within the existing PM and reporting budget.

The one recommendation with regard to site close out involves the transition from ground water extraction and LNAPL recovery system to the bioventing system and intrinsic remediation. The RSE team agrees that the bioventing system should not be run concurrently with the ground water extraction system given the increased biological activity and the potential for fouling of the recovery wells and treatment system. The site team estimates that the majority of LNAPL will be recovered within 10 years, which means that it is likely that ground water extraction, which is the most costly aspect of this remedy, will not need to occur after the site is transferred to the State. The RSE team supports this overall exit strategy assuming that sufficient data are available at the time of transfer to confirm that the dissolved plume is stable in the absence of pumping.

A table summarizing the recommendations, including estimated costs and/or savings associated with those recommendations, is presented in Section 7.0 of this report.

PREFACE

This report was prepared as part of a project conducted by the United States Environmental Protection Agency Office of Superfund Remediation and Technology Innovation (U.S. EPA OSRTI) in support of the "Action Plan for Ground Water Remedy Optimization" (OSWER 9283.1-25, August 25, 2004). The objective of this project is to conduct Remediation System Evaluations (RSEs) at selected pump and treat (P&T) systems that are jointly funded by EPA and the associated State agency. The project contacts are as follows:

Organization	Key Contact	Contact Information
U.S. EPA Office of Superfund Remediation and Technology Innovation (OSRTI)	Jennifer Hovis	1235 S. Clark Street, 12th floor Arlington, VA 22202 Mail Code 5201G phone: 703-603-8888 griesert.jennifer@epa.gov
Dynamac Corporation (Contractor to U.S. EPA)	Daniel F. Pope	Dynamac Corporation 3601 Oakridge Boulevard Ada, OK 74820 phone: 580-436-5740 fax: 580-436-6496 dpope@dynamac.com
GeoTrans, Inc. (Contractor to Dynamac)	Doug Sutton	GeoTrans, Inc. 2 Paragon Way Freehold, NJ 07728 phone: 732-409-0344 fax: 732-409-3020 dsutton@geotransinc.com

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Figures

1.0 INTRODUCTION

1.1 PURPOSE

During fiscal years 2000 and 2001 Remediation System Evaluations (RSEs) were conducted at 20 Fund-lead pump and treat (P&T) sites (i.e., those sites with pump and treat systems funded and managed by Superfund and the States). Due to the opportunities for system optimization that arose from those RSEs, EPA OSRTI has incorporated RSEs into a larger post-construction complete strategy for Fund-lead remedies as documented in *OSWER Directive No. 9283.1-25, Action Plan for Ground Water Remedy Optimization*. OSRTI has since commissioned RSEs at 10 additional Fund-lead sites with P&T systems. An independent EPA contractor is conducting these RSEs, and representatives from EPA OSRTI are participating as observers.

The Remediation System Evaluation (RSE) process was developed by the US Army Corps of Engineers (USACE) and is documented on the following website:

http://www.environmental.usace.army.mil/library/guide/rsechk/rsechk.html

An RSE involves a team of expert hydrogeologists and engineers, independent of the site, conducting a third-party evaluation of site operations. It is a broad evaluation that considers the goals of the remedy, site conceptual model, above-ground and subsurface performance, and site exit strategy. The evaluation includes reviewing site documents, visiting the site for up to 1.5 days, and compiling a report that includes recommendations to improve the system. Recommendations with cost and cost savings estimates are provided in the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs
- Technical improvements
- Gaining site closeout

The recommendations are intended to help the site team (the responsible party and the regulators) identify opportunities for improvements. In many cases, further analysis of a recommendation, beyond that provided in this report, may be needed prior to implementation of the recommendation. Note that the recommendations are based on an independent evaluation by the RSE team, and represent the opinions of the RSE team. These recommendations do not constitute requirements for future action, but rather are provided for the consideration of all site stakeholders.

The Penta Wood Products site was selected by EPA OSRTI based on a recommendation from the associated EPA Region, the effectiveness of the remedy to protect human health and the environment, and the annual costs of operating the remedy. This report provides a brief background on the site and current operations, a summary of observations made during a site visit, and recommendations regarding the remedial approach. The cost impacts of the recommendations are also discussed.

1.2 TEAM COMPOSITION

The team conducting the RSE consisted of the following individuals:

Jessica Leerkes, Civil and Environmental Engineer, GeoTrans, Inc.
Peter Rich, Civil and Environmental Engineer, GeoTrans, Inc.
Doug Sutton, Water Resources Engineer, GeoTrans, Inc.

The RSE team was also accompanied by the following observer:
Charles Sands from EPA OSRTI

1.3 DOCUMENTS REVIEWED

Author	Date	Title
US EPA	9/29/1998	Record of Decision, Penta Wood Products, Daniels, WI 09/29/1998
CH2M Hill	3/26/2003	Bioventing/Ground water Treatment Facility Modifications – Process and Instrumentation Diagram
Wisconsin Dept. of Natural Resources	3/2005	5 Year Review
CH2M Hill	8/2005	Monthly Technical Status Report
CH2M Hill	9/2005	2004 Annual Report
CH2M Hill	9/2005	Waste Handling Plan
CH2M Hill	10/2005	Penta Wood Products, Operations and Maintenance Manual
Wisconsin Dept. of Natural Resources		Substantive Requirements of A WPDES Permit WPDES Permit No. WI-0061531-01-0

1.4 PERSONS CONTACTED

The following individuals associated with the site were present for the visit:

Chuck Sands, RSE Project Liaison, EPA Region V
Tom Williams, Remedial Project Manager, EPA Region V
Bill Shultz, State Regulator, Wisconsin Department of Natural Resources
Bill Andrae, Site Manager, CH2M Hill
Mary Wicklund, Lead Plant Operator, OMI

1.5 SITE LOCATION, HISTORY, AND CHARACTERISTICS

1.5.1 LOCATION

The Penta Wood Products (PWP) site is a former wood treating facility located on Daniels 70 (former State Route 70) in Burnett County, Wisconsin. The Village of Siren, Wisconsin, is approximately two miles east of the site and there are two residences within 200 feet of the site using private wells. The PWP property originally consisted of approximately 120 acres. Approximately 40 undeveloped acres consisting of forest were sold after the facility closed, and the site currently consists of approximately 82 acres that were actively used. The property is located in a rural agricultural and residential setting and is bordered to the east, west, and north by forested areas; some of these areas are classified by the State of Wisconsin as wetlands. With the exception of an eight acre parcel, Daniels 70 forms the southern property boundary. The Amsterdam Slough Public Hunting area covers 7,233 acres and is located one mile north of the site. The site layout is shown on Figure 1-1. Onsite soils and ground water were contaminated with pentachlorophenol (PCP), arsenic, copper, and zinc from the wood treating activities which occurred on the site.

The wood-treating facility operated from 1953 to 1992, when the plant shut down. In 1988, the on-site production well was closed for potable use when it was found to contain 2,700 parts per billion (ppb) of PCP. The State of Wisconsin Department of Justice filed a preliminary injunction against Penta Wood Products in 1991, citing WPDES violations and violations of other State statutes regarding storage of raw materials, and waste handling practices. The facility voluntarily closed in May 1992 with the promulgation of the Resource Conservation and Recovery Act (RCRA) drip track regulations. The site was listed on the National Priorities List on June 17, 1996.

In September 1998, the Record of Decision (ROD) for the site was finalized specifying remedies for both soil and ground water contamination. The selected remedy included soil and sediment consolidation, bioventing, collection and disposal of light non-aqueous phase liquid (LNAPL), ground water collection and treatment, and monitored natural attenuation. Remedial construction activities in support of the RA began in 1999 and continued through September 2000. These activities included the demolition and off-site disposal of buildings and foundations, addressing the soil contamination, and constructing P&T system for ground water extraction and LNAPL recovery. Contaminated soils were excavated and consolidated into a 7-acre Corrective Action Management Unit (CAMU). PCP-contaminated soils were deposited on the CAMU's southern portion and arsenic-contaminated soils were placed on the northern portion. A wall of concrete rubble and stabilized arsenic-contaminated soil divides the two portions. A soil cover was placed over the CAMU consisting of 6 inches of sand followed by 6 inches of topsoil and was then seeded and mulched. This soil cap allows percolation of rain water and introduction of moisture that is necessary for biological activity. Erosion control structures including gabion basket downchutes, velocity control check dams and rip-rapped drainage ditches were constructed to protect the integrity of the CAMU. A gated 6-foot high fence was installed encircling the perimeter of the CAMU to restrict access. The primary ongoing effort associated with the CAMU portion of the remedy is to control soil erosion. The P&T and LNAPL recovery system began operation in 2000, underwent modifications, and resumed operation in 2004. This RSE focuses on the modified P&T and LNAPL collection system that has been in operation since March 2004.

1.5.2 POTENTIAL SOURCES

The PWP facility operated from 1953 to 1992. Raw timber was cut into posts and telephone poles and treated with either a 5 to 7 percent PCP solution in a No. 2 fuel oil carrier, or with a water borne salt treatment called Chemonite consisting of ammonia, copper II oxide, zinc and arsenate (ACZA). PWP also conducted toll blending of pentachlorophenol and fuel oil on a contract basis for other industrial users just prior to closing in 1992. During its 39 years of operation, PWP discharged wastewater from an oil/water separator down a gully into a lagoon on the northeast corner of the property. Process wastes were also discharged onto a wood chip pile in the northwestern portion of the property. Ash from a boiler was used to berm a cooling pond. Beginning in the 1970s, WDNR investigators noted several large spills, stained soils, fires and poor operating practices.

The site was put into the Superfund Accelerated Cleanup Model (SACM) pilot program in 1993. The site was listed on the National Priorities List on June 17, 1996. A removal action was conducted from 1994 to 1996. The ACZA treatment building and half of the oil/water separator building were demolished and remaining chemicals and sludges were disposed off-site. Grossly PCP-and metals-contaminated soils were excavated and disposed off-site, and metals-contaminated soils were excavated and mixed with cement on-site to form a 3-acre concrete biopad.

The PCP/oil mixture, which has traveled to the ground water and spread horizontally as a light non-aqueous phase liquid (LNAPL) layer is floating on the water table over an estimated four acre area. The LNAPL exists both as a free phase and as a residual phase. A dissolved phase PCP plume exists in the ground water. Ground water contamination appears to be stable, and there is no evidence of contaminated ground water discharging to the wetland or migrating below the wetland to surface water bodies. The contaminants of concern at the PWP site include PCP, benzene, toluene, ethylbenzene, and xylene (BTEX), naphthalene (from the No. 2 fuel oil carrier), arsenic, chromium, and zinc. Metals contamination at the site was primarily present in soils, which have been addressed as part of the OU1 activities. Metals concentrations in ground water are below standards. BTEX and naphthalene are also generally below relevant standards. The primary contaminant of concern is PCP, which is present in the vadose zone soils, LNAPL, and ground water. All known surface sources of contamination have been eliminated, but the LNAPL and subsurface soil contamination provides an ongoing source of ground water contamination.

1.5.3 HYDROGEOLOGIC SETTING

Most of the site is located on a plateau. On the north portion of the site there is a steep drop so that there is a 110-foot drop in elevation from the southern boundary to the northern boundary. The site geology consists of three stratigraphic layers: an upper sand, a glacial till that is not continuous throughout the site, and a lower sand. The upper sand is fairly continuous across the site extending from the natural surface to depths of 90 to 120 feet below ground surface (bgs). Below the upper sand unit is the glacial till. The glacial till has a variable lithology and consists mainly of silts and silty sands to sandy silts with gravel. This unit is present beneath most of the site and ranges from 3 to 45 feet in thickness. The till is underlain by a layer of sand and gravel which is similar to the upper sand unit. The top of this lower sand unit was found at depths ranging from 102.5 feet bgs to 215 feet bgs and it extends to at least 300 feet bgs. The lower sand may be interbedded with glacial till layers at depths between 120 and 180 feet bgs. The depth to ground water is approximately 100 feet on the plateau. Groundwater occurs both in a thin unconfined aquifer and within a multi-layered semiconfined aquifer system. The regional ground water flow direction is to the north. Onsite, the ground water flow has been radial, with a strong downward vertical gradient, since the closure of the production well. The site is situated in a ground water recharge zone, and because of the high permeability of the surficial soils, precipitation rapidly infiltrates the soil.

The unconfined aquifer consists of a thin zone of ground water, within the upper sand unit, perched upon the less permeable till. The observed saturated thickness ranges from less than 5 feet to greater than 25 feet. The ROD indicates that given an average hydraulic conductivity of 21 feet per day and an effective porosity of 0.30, the average horizontal ground water velocity is estimated at approximately 25 feet per year. This estimate is comparable to a previous estimate of ground water velocity based on distribution of chloride.

Ground water within the lower sand unit makes up the semiconfined aquifer system. Given an average hydraulic conductivity of 7.6 feet per day and an effective porosity of 0.30, the average horizontal ground water velocity is estimated at approximately 19 feet per year.

The water levels in the unconfined aquifer are generally a foot higher than those measured in the semiconfined aquifer. The data suggests that the till, where present, acts as a confining layer. Data indicate that strong downward vertical gradients, 0.008 to 0.045 feet per foot, exist between the shallow unconfined aquifer and semiconfined systems.

1.5.4 POTENTIAL RECEPTORS

There are four houses within 1,000 feet of the site, all of which have potable wells. Monitoring of residential wells has demonstrated that the plume has been contained on site. Annual sampling events monitor the residential wells. There was one sampling event where a low level of PCP below the MCL was found in one of the residential wells, but no PCP was found during subsequent sampling events. A number of surface water bodies are present north and east of the site. Doctor Lake and an unnamed lake are located 2,000 feet east and northeast of the site, respectively. A wetland is located within 130 feet of the northern property boundary. The Amsterdam Slough Public Hunting area covers 7,233 acres and is located 1 mile north of the site.

1.5.5 DESCRIPTION OF GROUND WATER PLUME

The contaminants of concern at the PWP site include PCP, BTEX and naphthalene (from No. 2 fuel oil carrier), arsenic, chromium, and zinc. The extent of dissolved ground water contamination as determined by the annual sampling event in September 2004 is illustrated in Figure 1-2. The PCP/oil mixture, which is present in ground water and spread horizontally as a light non-aqueous phase liquid (LNAPL) layer is floating on the water table over an estimated 4-acre area within the 1,000 ug/L contour indicated on Figure 1-2. The LNAPL exists both as a free phase and as a residual phase. A dissolved phase PCP plume exists in both the unconfined and semi-confined units. The contours on Figure 1-2 represent the plumes in both of these units together. Ground water contamination appears to be stable, and there is no evidence of contaminated ground water discharging to the wetland or migrating below the wetland to surface water bodies.

2.0 SYSTEM DESCRIPTION

2.1 SYSTEM OVERVIEW

A P&T system was constructed and began operation at the site in 2000. The system extracted ground water with the purpose of creating a cone of depression to funnel LNAPL towards the recovery wells where it could be extracted for offsite disposal. The wells were constructed to extract water from 20 feet below the water table to minimize the extraction of emulsified product; however, this approach was not effective. The ground water extraction included emulsified product, and the treatment system, which consisted of an oil-water separator, bag filters, organoclay, and GAC, was not capable of meeting discharge standards. Because ground water extraction needed to continue for an effective remedy, the site team designed and constructed a pretreatment plant to remove the emulsified product. Construction of the pretreatment system was completed in February 2004.

2.2 EXTRACTION SYSTEM

A total of ten borings have been installed for remediation at the site. Eight of these borings have both bioventing and ground water recovery wells in a single borehole. Two have bioventing wells only. The bioventing wells have screened intervals that extend from 40 feet above the water table to 10 feet below the water table. The ground water recovery wells have 20-foot screen intervals that begin at 20 feet below the water table. The bioventing aspect of the remedy will begin when the LNAPL recovery effort ends. Therefore, for the combined bioventing/water extraction locations, the bioventing wells are used for LNAPL recovery. Ground water is extracted from each of the eight water extraction wells at approximately 10 to 12 gpm with 2 horsepower centrifugal pumps. LNAPL is extracted with pneumatic pumps from the co-located bioventing. The 2004 Annual Report showed an estimated PCP mass removal from the aqueous phase of 2,100 pounds from February through December 2004, and a total removal since September 2000 of approximately 4,600 pounds. As of the time of the RSE site visit, the site team reported an average flow rate of 90 gpm and an average influent concentration of 12,600 ug/L. Given this influent concentration and an average influent flow rate of 90 gpm, mass removal via ground water extraction and treatment is approximately 13.6 lbs per day (or 4,500 pounds per year assuming the system operates 90% of the time.

$$\frac{90\text{ gal}}{\text{min}} \times \frac{3.785\text{ L}}{\text{gal}} \times \frac{12{,}600\text{ ug}}{\text{L}} \times \frac{1\text{ kg}}{10^9\text{ ug}} \times \frac{2.2\text{ lbs}}{\text{kg}} \times \frac{1440\text{ min}}{\text{day}} = \frac{13.6\text{ lbs}}{\text{day}}$$

2.3 TREATMENT SYSTEM

The pretreatment plant includes an oil-water separator, chemical addition for coagulation and flocculation, dissolved air flotation, dewatering with a rotary drum vacuum filter, and associated tanks for storage. The current treatment system (which includes the pretreatment system and components of the original treatment system) has the following primary components:

- Oil-water separator
- Chemical conditioning with ferric sulfate and polymer addition
- Dissolved air flotation (DAF)

- Rotary drum vacuum filter (RDVF)
- Bag filters
- 2,500-pound granular activated carbon (GAC) unit (which replaces the original organo-clay unit)
- Two 10,000-pound GAC units arranged in series
- Sodium hydroxide addition for pH adjustment
- Discharge to an on-site infiltration gallery

The system is designed for a capacity of 120 gpm. The current extraction rate is 90 gpm. The system is contained in two joined metal frame buildings. The components from the original system are contained in a 30-foot by 42-foot building, and the components for the pretreatment system are contained in a 52-foot by 67-foot building, which includes office space and a separate room for the RDVF.

Bioventing will be used as a follow-up to the LNAPL recovery effort, and the system includes a 75 horsepower centrifugal blower to inject air into the aquifer. This aspect of the remedy will begin operating when operation of the LNAPL recovery system is discontinued.

2.4 MONITORING PROGRAM

The monitoring program consists of both ground water monitoring and process monitoring for the P&T system.

The ground water monitoring program consists of an annual sampling event in September of each year and another smaller event in May of each year. The September event consists of sampling 20 monitoring wells, five residential wells, and one potable well. The May event consists of sampling five monitoring wells and four residential wells. Samples are analyzed for PCP, naphthalene, BTEX, and total and dissolved copper, arsenic, zinc, and manganese. Ground water samples are not analyzed for dioxin. Static water level measurements are also collected during each sampling event to assess ground water flow direction. The site team is considering eliminating the May event.

PCP data are presented on concentration contour site maps for each sampling event and potentiometric surface maps are prepared for each round of water level measurements that includes data from monitoring wells.

Process monitoring includes monthly sampling of the influent (after the DAF) and effluent analyzed for PCP. The effluent is also analyzed for naphthalene, BTEX, phenol, dioxin/furans, Copper (Cu), Zinc (Zn), Arsenic (As), and Manganese (Mn). The process water between the two GAC units is sampled and analyzed for PCP as needed. Usually this occurs right before change out, which is approximately every 2.5 months.

There are two sets of reports generated: monthly technical status / O&M reports and annual reports. The detailed tech status reports include process sampling results as well as other operational information. The annual report summarizes the progress onsite, hazardous waste generation and disposal, site inspection and maintenance activities and includes interpretation of data associated with the ground water sampling and analysis.

3.0 SYSTEM OBJECTIVES, PERFORMANCE, AND CLOSURE CRITERIA

3.1 CURRENT SYSTEM OBJECTIVES AND CLOSURE CRITERIA

The remedial action objectives are specified in the September 1998 ROD as follows:

- Reduce the PCP content in soils and ground water to achieve compliance with ch. NR 720, Wisconsin Administrative Code, and in ground water to achieve compliance with preventative action limits (PALs), as established in ch. NR 140, Wisconsin Administrative Code, by removing the free phase LNAPL, and associated highly contaminated ground water, remediating the PCP in the soils, and monitoring the intrinsic remediation of PCP in the ground water.

- Highly contaminated arsenic soils will be immobilized and consolidated with other arsenic contaminated soils, and secured, in order to achieve compliance. Soil contaminated with arsenic and other metals will be managed to essentially eliminate the direct contact exposure route and to protect ground water

- An erosion control plan will be implemented and maintained to prevent physical transport of contamination off-site and to protect the cap and consolidated areas from damage.

The ROD provided an initial estimate of 10 years for active LNAPL and ground water recovery.

The cleanup standards for the site contaminants are provided in the following table.

Contaminant of Concern	Cleanup Criteria (μg/L)
Arsenic	5
Benzene	0.5
Chloride	125,000
Copper	130
Ethylbenzene	140
Iron	150
Manganese	25
Naphthalene	8
Pentachlorophenol	0.1
Toluene	68.6
Xylene, mixture	124
Zinc	2,500

3.2 TREATMENT PLANT OPERATION STANDARDS

Treated ground water is discharged to the onsite infiltration gallery. Discharge is governed by a WPDES Permit Equivalent. The criteria specified in the permit equivalent are listed in the following table.

Parameter	**Discharge Limits (μg/L)**
Dioxin (2,3,7,8 TCDD)	0.000003
Pentachlorophenol	0.1
Naphthalene	8.0
Benzene	0.5
Arsenic, Total Recoverable	5.0

4.0 FINDINGS AND OBSERVATIONS FROM THE RSE SITE VISIT

4.1 FINDINGS

The observations provided below are not intended to imply a deficiency in the work of the system designers, system operators, or site managers but are offered as constructive suggestions in the best interest of the EPA and the public. These observations obviously have the benefit of being formulated based upon operational data unavailable to the original designers. Furthermore, it is likely that site conditions and general knowledge of ground water remediation have changed over time.

4.2 SUBSURFACE PERFORMANCE AND RESPONSE

4.2.1 WATER LEVELS

Water level data from the site are recorded semi-annually, in the spring and in the fall. These data are used to generate potentiometric surface maps for each sampling event, and the potentiometric surface maps for both events are included in the annual report. The background hydraulic gradient on site is reportedly relatively flat with radial flow. Potentiometric surface maps do not show a consistent pattern as a result of pumping, other than that there appears to be a ground water divide that runs north-south through the site to the west of the extraction system. This may be due to a relative lack of piezometers in some areas of the site. For example, there are no piezometers to the east to show if there is a divide in that direction. Data from only two rounds of monitoring were available since the treatment system was restarted in 2004: one in May 2004 and one in September 2004. Further monitoring events will provide additional data that can be used to determine flow patterns and trends.

4.2.2 CAPTURE ZONES

The ground water remedy system at the PWP site is not specifically designed to provide capture. Rather, the site team was looking to establish a cone of depression that encompassed the LNAPL plume so that the LNAPL plume could be funneled toward the LNAPL recovery wells. There is likely an unstated goal that the contamination should not expand to effect residential wells or begin to migrate uncontrollably. Monitoring of the concentration trends and potentiometric surfaces over time will help determine if the contamination is adequately contained by a combination of ground water extraction and intrinsic remediation.

4.2.3 CONTAMINANT LEVELS

The site team reports state that the plume is shrinking, but this appears to be due to interpolation only, and not due to substantial reductions at outer monitoring wells. Since there are only two rounds of well sampling that have occurred since the pretreatment system began operation, it is difficult to accurately predict contaminant concentration trends. Given the presence of LNAPL, substantial decreases of PCP concentrations in ground water are not expected.

Concentration trends in the outer monitoring wells are important in determining whether or not plume migration is being controlled. Concentrations of PCP in these wells have generally remained stable at or below 1 ug/L. However, there are a few exceptions. Most notable is the detection of PCP at 2.9 ug/L and 4.67 ug/L in MW-13 in 2003 and 2004, respectively. This increase, if statistically significant and not the result of cross contamination from other samples, could indicate that the plume is migrating to the northeast.

4.2.4 LNAPL RECOVERY

LNAPL recovery on site is on the order of 700 gallons per month. Over 12,000 gallons of LNAPL have been recovered since March 2004. There is no accurate measure of which wells produce the most LNAPL. The site team suggests that the greatest recovery is likely from EW-10.

4.3 COMPONENT PERFORMANCE

4.3.1 EXTRACTION SYSTEM WELLS, PUMPS, AND HEADER

The extraction system is operating at approximately 90 gpm rather than the design rate of 120 gpm. The site team however, believes that the 90 gpm is reasonable for the site based on operational data. The ground water extraction wells have 2-hp electric submersible pumps that were oversized for the yields. The site team has installed variable frequency drives (VFDs) for each of these pumps to use the pumps more efficiently. Pumping appears to be based on maximum well yields. It is unclear if less ground water pumping could accomplish the LNAPL collection goals.

4.3.2 OIL/WATER SEPARATOR & EQUALIZATION TANK

The coalescing oil/water separator (COW) was designed to remove free phase product from the liquid stream sent to it from the free product pumps. It is not designed to remove emulsified oils that are present in the liquid stream. The COW receives flow from the free product pumps located in the biovent/LNAPL recovery wells. The oil/water separator requires some routine maintenance including: cleaning the site glass, inspection and adjustment of skimmer, cleaning the water pump, and lubricating the electric motor.

The equalization system was designed to balance the flow into the treatment system. Ground water is pumped directly into the equalization tank from the well heads and the COW effluent water is also pumped to the equalization tank. The equalization tank is a continuously mixed tank, sized to provide equalization of approximately 1 day of COW effluent. Both the COW and equalization tank function as designed.

4.3.3 CHEMICAL CONDITIONING

Chemical conditioning, which consists of the addition of ferric sulfate and flocculent polymer, is used to enhance the removal of TSS and free and emulsified oil and grease in the Dissolved Air Flotation (DAF) unit. Chemical conditioning and the DAF were added to the treatment system after initial operation revealed large quantities of emulsified oil present in the ground water that resulted in repeated fouling of the granular activated carbon (GAC). The coagulant (ferric sulfate) is fed on a pH control basis in order to maintain pH at approximately 5.5 to 5.9 as determined by pilot testing. Flocculent polymer is added in very small amounts (approximately 6 gallons over several months) based on operational experience during 2004. Process water flows by gravity from the COW through the coagulation and flocculation tanks and through the DAF. All pumps, piping, probes, and other system components are inspected weekly.

4.3.4 DISSOLVED AIR FLOTATION

The DAF system is designed to significantly improve the performance of the GAC system. The DAF system is intended to provide removal of total suspended solids (TSS) and free and emulsified oil and grease from the combined ground water and COW effluent water stream. The system is operated in a continuous mode with a float handling system to remove the floated solids. DAF effluent flows over a weir and into the DAF pump tank to be pumped through bag filters and the GAC. Float from the DAF unit is pumped to the float storage tank, which holds up to 3 days of DAF float volume so that the RDVF does not need to operate on weekends. According to the site team, the DAF is functioning well and up to expectations with respect to removal of solids and emulsified oil and grease. The DAF is cleaned each week day using a garden hose to clear sludge buildup from paddles and rails. The operation of the skimmer, sludge pump, recirculation pumps, and probes is periodically checked throughout each week day. The DAF is drained completely and pressure washed on a bi-monthly basis.

4.3.5 ROTARY DRUM VACUUM FILTER DEWATERING SYSTEM

The RDVF is used to dewater float from the DAF system. The RDVF dewaters float on a diatomaceous earth precoat built up at the beginning of each batch run. Under vacuum, the float adheres to the surface of the precoat, and water is pulled through the float to the interior of the drum and exits as filtrate. Solids remaining on the precoat material are scraped off by a blade and fall into a collection dumpster where it is stored until transported offsite for disposal. The filtrate from the RDVF is collected in a filtrate collection tank equipped with a filtrate transfer pump included in the RDVF system. The filtrate is pumped to the filtrate storage tank and then into the DAF system influent. The operator runs the RDVF once every one to two weeks. Each run takes approximately 4 to 6 hours and produces 4 cubic yards of filter cake. Approximately 150 to 175 pounds of diatomaceous earth are used per run.

4.3.6 BAG FILTERS

Bag filters (25 microns) are used inline prior to the GAC pre-filter unit and the GAC vessels to collect particulate matter. The bag filters are considered spent and require replacement when there are elevated pressure readings, indicating a reduction of flow (approximately once or twice per week). The spent bag filters are considered to be a listed hazardous waste because they have been in contact with the constituents in the ground water.

4.3.7 GRANULAR ACTIVATED CARBON UNITS

The treatment system has three GAC vessels operated in series, a 2,500-pound pre-filter vessel and two 10,000-pound GAC vessels. The 2,500-pound GAC pre-filter vessel (which was previously an organoclay unit) removes the remaining particulate from the water so that the two 10,000-pound vessels can function more efficiently. The two 10,000-pound vessels are operated in a lead-lag scenario such that the bulk of the contaminant adsorption occurs in the first (lead) vessel and the second (lag) vessel further polishes the water. The vessels were originally sized to reduce the PCP concentration in the ground water from approximately 15 milligram per liter (mg/L) to less than 0.1 microgram per liter (ug/L). Initially, the lead vessel effluent was supposed to be routinely monitored for PCP breakthrough to determine when the GAC requires replacement, but the site team reports that GAC changeout is normally based on pressure buildup and occurs every two months. Typically 12,500 pounds of GAC are changed out each time because the 2,500-pound and one 10,000-pound unit are changed out together. During a GAC changeout, the carbon in the lead vessel is replaced, and the flow path will be reversed so that the former lead vessel becomes the lag vessel and the former lag vessel is now the lead vessel.

4.3.8 NEUTRALIZATION TANK

Prior to discharge to the on-site infiltration basin, GAC effluent pH is adjusted from approximately 5.7 to a pH of 7 with 20% sodium hydroxide (caustic soda).

4.3.9 BIOVENTING WELLS, PIPING AND BLOWER SYSTEM

Once LNAPL is no longer consistently removed, the bioventing subsystem will commence operation. The bioventing wells have screened intervals that extend from 40 feet above the water table to 10 feet below the water table to achieve air distribution over the full target depth. There are ten bioventing wells, eight of which are co-located with ground water extraction wells. The airflow rate to each biovent well will be manually adjusted based on oxygen levels within the target depth area and soil gas pressure readings will be collected at various monitoring points. Based on the results of the bioventing treatability test, the design airflow rate for six of the biovent well nests was 500 standard cubic feet per minute (scfm) and 200 scfm for two shallow biovent well nests, at a pressure of approximately 50 inches water to the subsurface target area. Most of the biovent wells are constructed with Schedule 80, 4-inch-inner diameter (ID) polyvinyl chloride (PVC) pipe.

The blower is a 75 horsepower (hp) centrifugal blower capable of providing up to a total of 5,000 scfm at 55 inches water in order to provide the required airflow rate to each biovent well. The piping system consists of a 12-inch high-density polyethylene (HDPE) intake pipe attached to an intake filter/silencer, a 16-inch HDPE manifold that feeds 8-inch or 6-inch headers. Each pipe is equipped with a flow meter, flow control valve, and a pressure indicator and excess air is vented to the outside of the building via a vent pipe. At the well vault, the 8-inch or 6-inch HDPE pipe is reduced to a 4-inch flexible pipe connected to the biovent well. Airflow to the biovent well can be further controlled using the additional flow control valve located in the well vault. Maintenance on the biovent system would typically consist of inspecting and replacing air intake filters and greasing the bearing on the electric motor.

4.3.10 SYSTEM CONTROLS

The controls from the original treatment system remain in place in the old building and monitor that same equipment, except for the COW that was moved to the new building. An additional system was installed in the control room of the new building that monitors all new equipment, the COW, and information from the old PLC system, which is linked to the new PLC. This allows all operating systems to be monitored from one PLC. The system utilizes several level controllers, flow meters, and pH controllers. Level controllers are on the COW, equalization tank, DAF pump tank, float storage tank, filtrate storage tank, and neutralization tank. The coagulant tank and the neutralization tanks are equipped with pH meters.

4.3.11 DISCHARGE

Treated ground water is discharged to a combination infiltration basin/gallery located northwest of the former biopad site. It is located to minimize the potential for treated water to discharge over the target ground water collection area and induce gradients away from the ground water collection system. The infiltration basin/gallery is designed to infiltrate the pumping capacity of the ground water wells (120 to 160 gpm).

During freezing temperatures, treated water is discharged through the infiltration gallery (i.e., underground leach field) to avoid complications due to freezing. During above-freezing conditions, water is discharged above ground through a more conventional infiltration basin. Discharge to the gallery or basin can be easily controlled with manual values. In addition, there is a manhole inlet that connects the basin and the gallery, so if either clogs, the treated water flows to the other structure.

4.4 COMPONENTS OR PROCESSES THAT ACCOUNT FOR MAJORITY OF ANNUAL COSTS

The construction of the pretreatment system was completed in March 2004, and the full system resumed operation in March 2004. The following table provides the budgeted annual O&M costs for calendar year 2005, which are similar to the projections for calendar year 2006.

Item Description	Estimated Cost*
Labor: Project management, reporting, etc.	$156,736
Labor: System operation	$120,120
Labor: Ground water sampling	$37,800
Utilities: Electricity	$37,931
Utilities: Other	$41,037
Non-utility Consumables (GAC, chemicals, etc.)	$156,301
Discharge or disposal costs	$538,400
Analytical costs	$34,700
Other (parts, routine maintenance, etc.)	$83,975
Total Estimated Cost	**$1,207,000**

* *Projected for calendar year 2005*

4.4.1 UTILITIES

The primary utility expenditure is for the propane used for building heat, approximately $40,000 per year. Electrical costs for the plant tend to average approximately $3,000 per month due to the large number of motors associated with the system.

4.4.2 NON-UTILITY CONSUMABLES AND DISPOSAL COSTS

Non-utility consumables include GAC, bag filters, and chemical addition. The GAC is the primary cost in this category. There are approximately six replacements of 12,500 lbs of GAC each year. At an estimated unit cost of $0.76 per pound (provided by the site team), the cost for this is estimated to be $57,000. Approximately $71,000 is budgeted for the ferric sulfate, sodium hydroxide, bag filters, and polymer. Therefore, the actual costs are approximately $128,000 ($28,000 less than the budgeted costs).

The largest portion of the budgeted site costs are for disposal at about $538,400 for 2005 with the following breakdown: LNAPL (25%), GAC (12.5%), filter cake (60%), and debris disposal (2.5%). Based on information provided by the site team during the RSE site visit, the actual costs are closer to $200,000 per year as follows:

Disposal Item	Units per Year	Unit Cost	Total Cost per Year
LNAPL	8,400 gallons	$6 per gallon	$50,400
GAC	75,000 pounds	$0.25 per pound	$18,750
Debris (bag filters, etc.)	3,200 pounds	$1.50 per pound	$4,800
Filter cake	155,960 pounds	$0.79 per pound	$123,200
		Total	**$197,150**

The site team conservatively estimates usage so that the site has enough funding to keep operating. At this rate, however, the conservative estimates result in approximately $346,000 in extra funding for the site.

4.4.3 LABOR

There are three principal labor cost categories: project management, operator labor, and ground water sampling. Project management (PM) and reporting is approximately $156,000 per year. This cost is mainly time for the project manager but also includes general PM, budget tracking, preparation of annual reports, preparation of monthly tech status reports, management of subcontractors, and data evaluation. Operator labor is approximately $125,000 and involves one full-time local operator plus time for someone to help with two-person tasks, a total of 1.25 full time equivalents (FTEs) with travel costs from Milwaukee for the second person. The labor for the ground water sampling was approximately $38,000 for 2005, but is estimated to drop to approximately $29,000 due to the elimination of the May sampling event. Two two-person teams can complete the September event in 5 days, including travel from Milwaukee. This cost is relatively high for sampling 20 monitoring wells and 9 residential well samples, but the relatively high costs are in part due to travel time from Milwaukee and the depth of wells.

4.4.4 CHEMICAL ANALYSIS

The annual analytical costs for 2005 were approximately $34,700, but the estimated costs for 2006 are approximately $26,800 due to the elimination of the May sampling event. Monitoring wells are sampled annually for PCP; benzene, toluene, ethylene, and xylene (BTEX); naphthalene; Target Analyte List (TAL) metals; and natural attenuation indicator parameters. The ground water treatment system influent is sampled for PCP on a monthly basis. The table below illustrates the monitoring requirements for the system effluent to the infiltration basin.

Parameter	Sample Frequency
pH field	Quarterly
Total Suspended Solids (TSS)	Quarterly
Chloride	Quarterly
Diesel Range Organics (DRO)	Monthly
Total Organic Carbon (TOC)	Monthly
1,3,5-Trimethylbenzene	Quarterly
1,2,4-Trimethylbenzene	Quarterly
Total Trimethylbenzene	Quarterly
Dioxin (2,3,7,8 TCDD)	Quarterly
Pentachlorophenol	Weekly
Phenol	Monthly
Naphthalene	Monthly
Benzene	Quarterly
Ethylbenzene	Quarterly
Toluene	Quarterly
Xylene	Quarterly
Arsenic, Total Recoverable	Quarterly
Copper, Total Recoverable	Quarterly
Zinc, Total Recoverable	Quarterly
Iron, Total Recoverable	Quarterly
Manganese, Total Recoverable	Quarterly
Acid Extractable	Annual
Dioxins & Furans (all congeners)	Annual

4.5 RECURRING PROBLEMS OR ISSUES

The previous problem of not meeting discharge standards has been addressed through the construction and operation of the pretreatment unit. Upon completion of the pretreatment system, there were concerns about indoor air quality in treatment plant; however, this concern was addressed by improving tank lids and increasing the air exchange rate in the building. Other issues, beyond the control of the site team, include a severe tornado in 2004, which came close to the site, and frequent lightning strikes in the area.

4.6 REGULATORY COMPLIANCE

Since operation of the pretreatment system, discharge standards are routinely met and no issues regarding compliance were reported by the site team.

4.7 TREATMENT PROCESS EXCURSIONS AND UPSETS, ACCIDENTAL CONTAMINANT/REAGENT RELEASES

The site team reports that there have not been any uncontrolled releases of contaminants or reagents.

4.8 SAFETY RECORD

The site team reports no health and safety incidents.

5.0 EFFECTIVENESS OF THE SYSTEM TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT

5.1 GROUND WATER

The 2003 and 2004 increases in PCP concentrations for MW-13 suggest that the PCP plume might be expanding toward the northeast. Additional years of monitoring data will help confirm if the plume is expanding. The current system is not designed to provide hydraulic containment, so it is possible for the system to operate as intended and for the plume to potentially expand. The migration toward MW-13 is away from residences with potable wells but is toward wetlands and lakes to the northeast of the property. The remedy currently appears to be protective of human health and the environment but future monitoring will need to be evaluated to determine if the remedy will be protective over the long-term:

5.2 SURFACE WATER

The potential migration toward MW-13 is in the direction of Doctor Lake and an unnamed lake. Therefore, if migration is occurring and continues to occur in this direction, it could eventually present a threat to surface water. However, the lakes are 2,000 feet from the site, and contaminant migration would likely need to be much more substantial than currently observed to eventually impact the lakes.

5.3 AIR

Air is not expected to be impacted by the current ground water remedy. The primary contaminant of concern is PCP which will not affect air quality. The water table at the site is approximately 100 feet deep. Although LNAPL is present, concentrations of BTEX compounds and naphthalene are relatively low. The maximum concentrations found during the September 2004 sampling event were as follows: benzene non-detect (ND) at 5 µg/L and naphthalene at 282 µg/L). These results are well below any air quality limits and would not pose a risk to human health.

5.4 SOIL

Surface soils at the site have been addressed by consolidating and stabilizing soil in the on-site CAMU. The RSE team did not review this aspect of the remedy. Subsurface soils impacted with fuel oil and PCP will be addressed by bioventing after LNAPL collection is completed.

5.5 WETLANDS AND SEDIMENTS

A wetland located along the northern property boundary and the Amsterdam Slough Public Hunting area north of the site are the closest natural receptors for the contaminants of concern. Continued sampling to the northeast will help determine if contamination is migrating toward wetlands.

6.0 RECOMMENDATIONS

Cost estimates provided herein have levels of certainty comparable to those done for CERCLA Feasibility Studies (-30%/+50%), and these cost estimates have been prepared in a manner consistent with EPA 540-R-00-002, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, July, 2000.

6.1 RECOMMENDATIONS TO IMPROVE EFFECTIVENESS

6.1.1 FOLLOW WATER QUALITY TRENDS IN MONITORING WELLS TO DETERMINE IF THE PLUME IS MIGRATING

The potential migration evidenced by increased PCP concentrations in MW-13 suggests the need to continue to closely evaluate the concentration trends in this well to determine if plume migration is occurring. It is recommended that the site team continue to closely follow the sampling data from this and other monitoring wells to evaluate the potential for plume migration. These monitoring wells represent the only source of information that will provide evidence of migration before residential wells or ecological receptors are impacted. If continued increases are observed in MW-13, the site team may want to consider installing a monitoring well approximately 300 feet west of MW-13 (if access is available) to monitor potential migration in this direction. If data suggests that migration is occurring in the direction of the residences, a more thorough capture zone analysis is likely merited to determine if pumping needs to increase to prevent migration and protect these wells.

6.2 RECOMMENDATIONS TO REDUCE COSTS

6.2.1 PROVIDE MORE ACCURATE PREDICTION OF CONSUMABLES AND DISPOSAL COSTS

After another year of operation, the site team should more accurately predict materials and disposal costs and budget site costs accordingly. Many of the estimates provided to the RSE team, including those for GAC, LNAPL, and filter cake disposal are too conservative and over estimate the expenditures for the site. The RSE team found that the estimates for utilities, lab analysis, and labor are reasonable and there are no significant savings likely. Based on the actual and budgeted costs discussed in Section 4.4 of this report, the site team budgets approximately $374,000 per year in extra funding for consumables and disposal costs. Another year of operation will provide the site team with more data to provide better estimates for funding in future years. The site team should strive to estimate/budget costs accurately so that unnecessary funding is not allocated to this site instead of other sites where it might be more appropriate. If the budget does include this extra $374,000, then the annual costs are closer to $833,000 per year.

6.2.2 CONSIDER MODIFYING MANAGEMENT OF GAC UNITS

Assuming an influent PCP concentration on the order of 10,000 µg/L, GAC isotherms suggest a GAC usage of approximately 1 pound of GAC per 1 pound of PCP. With this influent concentration and a flow rate of 90 gpm, the mass of PCP exiting the DAF is approximately 4,000 pounds per year. Based on chemical loading, this should translate to a GAC usage of approximately 4,000 pounds per year. However, the site team reports changing out 12,500 pounds approximately 6 times per year for a total of 75,000 pounds per year. Thus, it seems that the GAC may be replaced, in large part, due to pressure build up or solids loading. The site team should evaluate the following three options and move forward with the most appropriate one:

Option 1

> Consider replacing the 2,500-pound GAC unit (which is currently used more for its filtering capacity than for its chemical adsorption ability) with a sand filter, multimedia filter, or additional bag filters for improved filtering. This option might decrease the amount of solids loading to the downstream 10,000-pound GAC units thus extending the life of the GAC in those bigger units. In addition, because the 2,500-pound unit would no longer require GAC replacement, it might reduce GAC usage for the site by approximately 15,000 pounds per year (2,500 pounds per changeout times six changeouts per year). At a cost of approximately $0.76 for GAC and GAC disposal, this translates to a savings of approximately $11,000 per year in savings associated with GAC.

Option 2

> Consider using GAC in the 2,500-pound unit but do not change it out as frequently. It would no longer provide adsorptive capacity, but it would continue to serve as a filter. This might reduce GAC usage by approximately 10,000 pounds per year (an estimated reduction of four replacements per year), but would not involve the capital costs of replacing the 2,500 pound unit with a new filter. This would be feasible because backwashing capability is available for this smaller GAC unit.

Option 3

> Evaluate the cost-effectiveness of adding backwashing capability to the lead 10,000-pound GAC unit. This would require more substantial capital cost and would be more of an engineering challenge due to the space requirements for the larger tank. However, if the GAC usage can be reduced by half (e.g., by approximately 37,500 pounds per year), the savings might be on the order of $30,000 per year.

6.2.3 ELIMINATE REDUNDANT OR UNNECESSARY LABORATORY ANALYSIS

The monitoring and sampling program can be modified to eliminate redundant samples and reduce costs without sacrificing remedy effectiveness. There is a significant amount of total and dissolved metals data from ground water sampling that exists and it is not being used for additional decisions. At a minimum, if consistent with State requirements, the site team should consider eliminating total metals since dissolved analysis occurs and is more representative of potential ground water problems. Costs could be reduced by approximately $3,000 per year without a loss of protectiveness. The site team should also seek to minimize analysis for dioxins in process water sampling given the high cost for the analysis. Where possible, other contaminants (e.g., PCP) should be used as indicators for contaminant presence. The RSE team acknowledges that the site team is already pursuing reducing the number of samples that are analyzed for dioxins. The RSE team agrees with the site contractor's recommendation to eliminate the spring sampling event.

6.2.4 SAVINGS FROM THE USE OF DEDICATED PUMPS IN MONITORING WELLS

The installation of dedicated pumps in monitoring wells, which was accomplished during 2005, should reduce the time associated with purging the wells and decontaminating equipment. Therefore, the time associated with sampling should be reduced. The RSE team estimates that the annual sampling event may be shortened by one or two days, potentially resulting in savings of approximately $4,000 to $8,000 per year from the current annual sampling cost of $29,000. This estimate assumes that the semi-annual event has already been eliminated. The RSE team agrees with the site contractor's recommendation to eliminate the spring sampling event. The site team should also evaluate the potential for the plant operator to assist with the ground water sampling effort since the operator is already paid to be at the site and also does not incur travel costs from Milwaukee.

6.2.5 INVESTIGATE POSSIBILITY OF DECLASSIFYING WASTE

The filter cake disposal cost is extremely high. There are examples of similar filter cake being sufficiently stabilized and delisted so that disposal options other than incineration are available. Since the disposal costs are so high, the site team is encouraged to consider these other disposal options. Cost savings of up to $100,000 per year are possible. As an example, the link below discusses the delisting of filter cake at the GROWS landfill.

http://www.epa.gov/fedrgstr/EPA-WASTE/2001/July/Day-26/f18533.htm

6.2.6 DECREASE PROJECT MANAGEMENT/ REPORTING COSTS

The project management costs are estimated at about $157,000 per year, having decreased and stabilized since the design efforts in FY03. The cost is primarily time for the site contractor's project manager as well as contracting and technical support. These costs are high in comparison with similar sites. The RSE team would assume that PM costs will decrease over time to about $100,000 per year as the system operation becomes more routine.

6.2.7 DEVELOP TRACKING OF ROUTINE & NON-ROUTINE COSTS

Routine parts and maintenance and non-routine costs combine for a fairly significant portion of the annual cost. Routine parts and maintenance are expected to be $130,000 and non-routine costs expected to be $53,000. Pump replacements and erosion control are included in these costs but a detailed breakdown was not discussed. These costs seem relatively high, but likely result from the sampling pump installations and significant erosion control measures. A detailed tracking of routine and non-routine maintenance should be developed in order to easily see what activities are included in these costs and how they can be reduced.

6.2.8 EVALUATE POTENTIAL TO REDUCE GROUND WATER EXTRACTION WITHOUT SUBSTANTIALLY AFFECTING LNAPL RECOVERY

Disposal costs represent the single largest cost category for the site, even when considering the actual disposal values rather than the conservative estimates provided by the site team. Moreover, the majority of the disposal costs are associated with the disposal of the filter cake. For example, if ground water recovery can be decreased by 10% then a savings of approximately $15,000 could be realized in avoided disposal costs (approximately $12,500 for avoided filter cake disposal and approximately $2,500 for avoided GAC disposal). In addition, approximately $12,500 might be realized in reduced GAC and chemical usage. Thus, for a 10% reduction in ground water extraction, a savings of approximately

$27,500 per year might be realized. The site team should evaluate various pumping schemes to determine if pumping can be reduced without sacrificing the effectiveness of LNAPL recovery or the control of the dissolved contaminant plume. Given that this evaluation consists of decreasing pumping from some wells and tracking LNAPL recovery and concentrations at nearby monitoring wells, this evaluation should be feasible within the existing PM and reporting budget.

6.2.9 ADJUST PH TO 6.5 INSTEAD OF 7.0

Prior to discharge of treated water, the site team currently adjusts pH from approximately 5.7 to 7.0. Alternatively, the site team could adjust pH to 6.5. A pH of 6.5 is still within discharge criteria of 6 and 9 and is likely closer to the natural pH of the ground water. Adjusting to a pH of 6.5 would decrease the use of sodium hydroxide and the associated costs without sacrificing remedy effectiveness. Implementing this recommendation may result in savings of approximately $10,000 per year.

6.3 RECOMMENDATIONS FOR TECHNICAL IMPROVEMENT

No recommendations are provided in this category.

6.4 CONSIDERATIONS FOR GAINING SITE CLOSE OUT

6.4.1 TRANSITION FROM GROUND WATER EXTRACTION & LNAPL RECOVERY SYSTEM TO BIOVENTING SYSTEM & INTRINSIC REMEDIATION

The site team estimates that the majority of LNAPL will be recovered within 10 years and that ground water extraction and LNAPL recovery system can be discontinued in favor of the bioventing system and intrinsic remediation. The RSE team agrees that the bioventing system should not be run concurrently with the ground water extraction system given the increased biological activity and the potential for fouling of the recovery wells and treatment system. This means that it is likely that ground water extraction, which is the most costly aspect of this remedy, will not need to occur after the site is transferred to the State. The RSE team supports this overall exit strategy assuming that sufficient data are available at the time of transfer to confirm that the dissolved plume is stable in the absence of pumping. If it is not stable, then the potential exists for PCP to migrate to residential wells and nearby wetlands and the RSE team would suggest that ground water extraction may need to continue.

7.0 SUMMARY

The observations and recommendations contained in this report are not intended to imply a deficiency in the work of either the system designers or operators, but are offered as constructive suggestions in the best interest of the EPA and the public. These recommendations have the obvious benefit of being formulated based upon operational data unavailable to the original designers.

Recommendations are provided in three of the four categories: effectiveness, cost reduction, and site closeout. The recommendation for effectiveness focuses on plume delineation and migration. Recommendations for cost reduction include more accurate materials and disposal cost projections, considering modifications to the management of GAC units, eliminating redundant/unnecessary lab analysis, the use of dedicated pumps in monitoring wells, investigating declassifying waste, reduction in project management/reporting costs, tracking routine and non-routine costs, evaluating the potential to reduce ground water extraction without significantly affecting LNAPL recovery, and decreasing the pH adjustment from 7.0 to 6.5. The section on site closeout agrees in concept with the site team's exit strategy but emphasizes that the site team should document plume stability in the absence of pumping before discontinuing operation of the P&T system.

Table 7-1 summarizes the costs and cost savings associated with each recommendation in Sections 6.1 through 6.4. Both capital and annual costs are presented. Also presented is the expected change in life-cycle costs over a 10-year period for each recommendation both with discounting (i.e., net present value) and without it.

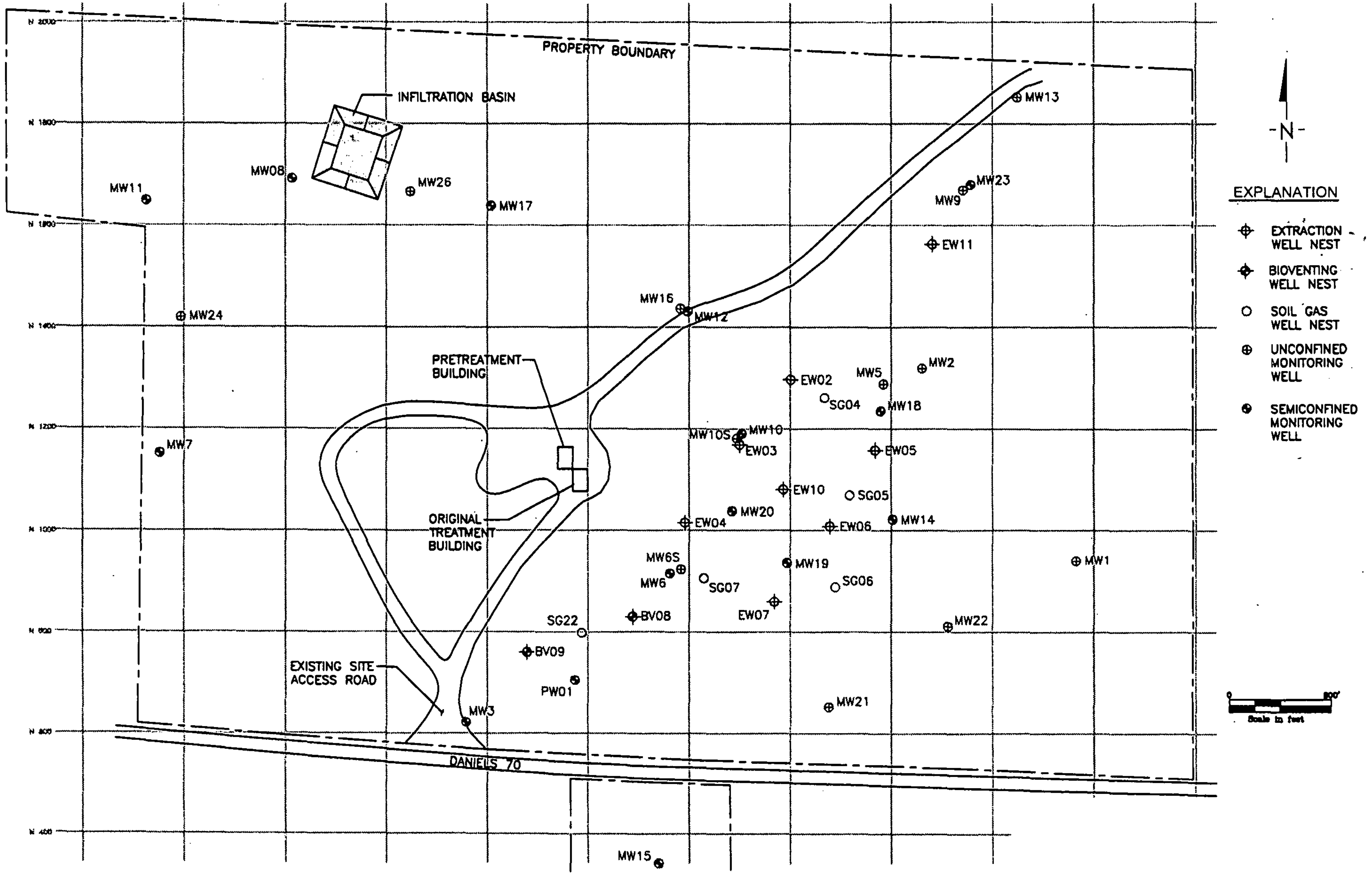
Table 7-1. Cost Summary Table

Recommendation	Reason	Additional Capital Costs ($)	Estimated Change in Annual Costs ($/yr)	Estimated Change in Life-cycle Costs ($)*	Estimated Change in Life-cycle Costs ($)**
6.1.1 Follow trends in monitoring wells to determine if plume is migrating	Effectiveness	$0	$0	$0	$0
6.2.1 Provide more accurate prediction of consumables and disposal costs	Cost Reduction	$0	($374,00)	($3,740,000)	($3,029,000)
6.2.2 Consider modifying management of GAC units	Cost Reduction	Not quantified	($10,000) to ($30,000)	($100,000) to ($300,000)	($81,000) to ($243,000)
6.2.3 Eliminate redundant or unnecessary lab analysis	Cost Reduction	Negligible	($3,000)	($30,000)	($24,000)
6.2.4 Use of dedicated pumps installed in monitoring wells	Cost Reduction	Negligible	($8,000)***	($80,000)***	($65,000)***
6.2.5 Investigate possibility for declassifying waste	Cost Reduction	negligible	($100,000)	($1,000,000)	($811,000)
6.2.6 Decrease project management/reporting costs	Cost Reduction	negligible	($57,000)	($570,000)	($462,000)
6.2.7 Develop tracking of routine & non-routing costs	Cost Reduction	$0	Not Quantified	Not Quantified	Not Quantified
6.2.8 Evaluate potential to reduce ground water extraction without significantly affecting LNAPL recovery	Cost Reduction	negligible	($27,500)	($275,000)	($222,000)
6.2.9 Adjust pH to 6.5 instead of 7.0	Cost Reduction	Negligible	($10,000)	($100,000)	($81,000)
6.4.1 Transition from ground water extraction & LNAPL recovery system to bioventing system & intrinsic remediation	Site Closeout	Not quantified	Not quantified	Not quantified	Not quantified

Costs in parentheses imply cost reductions
* assumes 10 years of operation with a discount rate of 0% (i.e., no discounting)
** assumes 10 years of operation with a discount rate of 5% and no discounting in the first year
*** indicates savings that should be realized from actions that the site team took prior to the RSE

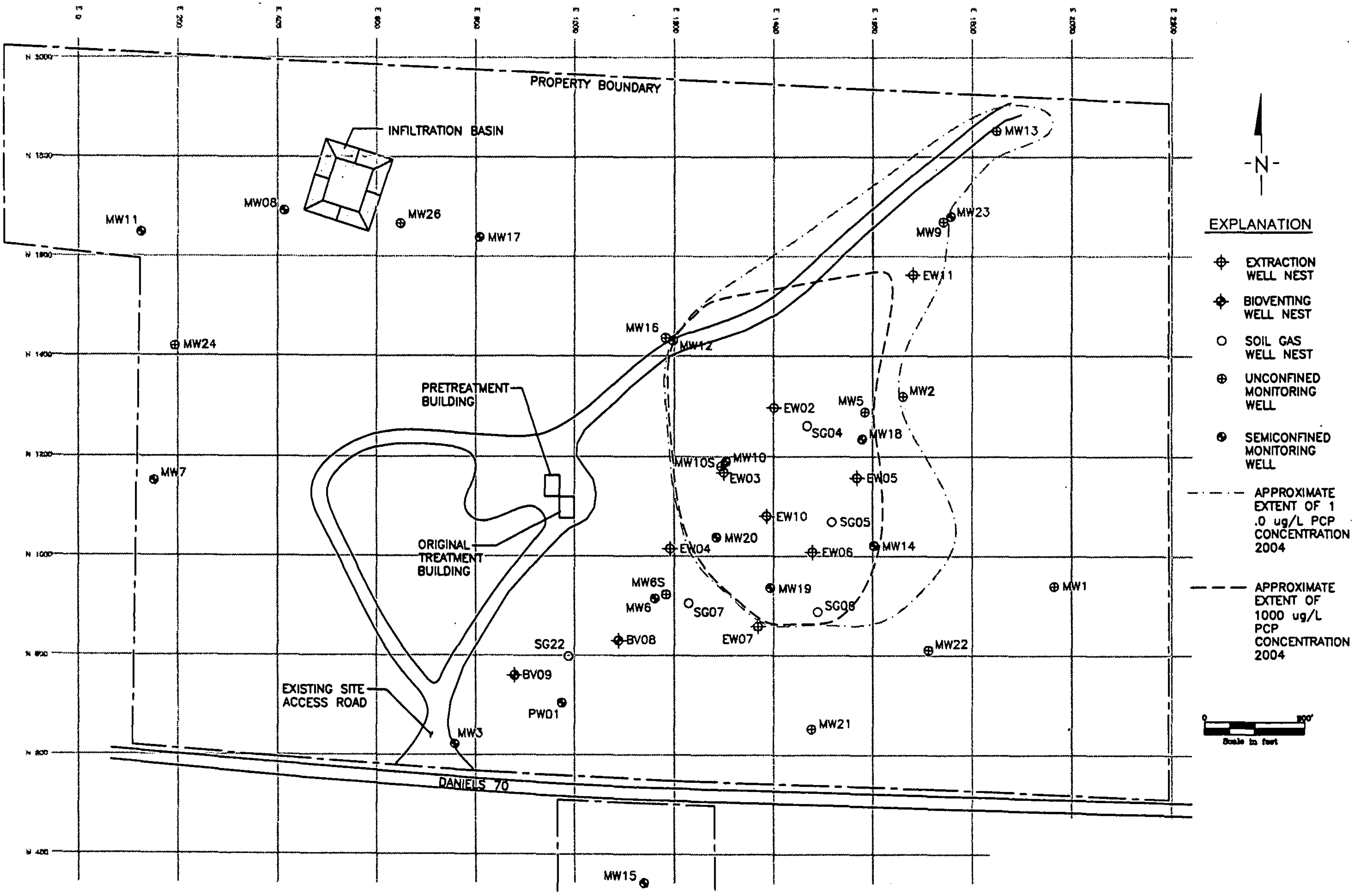
FIGURES

Figure 1-1 SITE MAP



(Note: Figure generated based on 2004 Annual Report, CH2M Hill, 2005)

Figure 1-2 EXTENT OF PCP GROUNDWATER CONTAMINATION 2004



(Note: Figure generated based on independent plume maps for the 1,00ug/L and 1.0 ug/L plumes as depicted in the 2004 Annual Report, CH2M Hill, 2005. The 1,000 ug/L plume has been modified slightly to ensure it fits completely within the 1.0 ug/L plume)