General Information

Site Name and Location:	Shorty CleanersStillwater, Minnesota, United States
Description: Historical activity that resulted in contamination.	The site consists of a single story masonry building and adjacent parking lot. The site comprises approximately 13,000 square feet. The site is located in a residential/commercial area. Two dry cleaning machines are on property and PCE was the primary solvent used for the operation. The site is contaminated with both BTEX and chlorinated solvent.

Contaminants: Contaminants: Contaminants present and the highest amount detected in both soil and groundwater (please avoid giving ranges).

Contaminant	Conc in GW	Conc. in Soil
1,2,4-trimethylbenzene		95 ppm
1,3,5-trimethylbenzene		37 ppm
Benzene	3.3 ppb	4 ppm
cis-1,2-Dichloroethene	5,000 ppb	6.1 ppm
ethylbenzene	280 ppb	62 ppm
naphthalene	1,500 ppb	23 ppm
n-butylbenzene		230 ppm
n-propylbenzene		150 ppm
p-isopropyltoluene		18 ppm
sec-butylbenzene		3.7 ppm
Tetrachloroethene (PCE)	50,000 ppb	1,200 ppm
toluene	34 ppb	

Trichloroethene (TCE)	5,500 ppb	16 ppm
Vinyl Chloride	430 ppb	
xylenes	94 ppb	97 µ : g/kg

Other Contaminants Present: Indicates what other contaminants were found on-site

Deepest Significant Groundwater Contamination:

Plume Size: Based on available data, ground water contamination appears to be limited to the area around MW-3. Other shallow and deep monitoring wells, installed on- and off-site, have either been clean or had only trace concentrations of chlorinated solvents.

Site Hydrology:

Depth to Groundwater: 10 to 12 ft bgs

Lithology and Subsurface Geology: The site has complex glacial lithology: 0-11 ft silty sand fill 11-20 ft sand to silty sand, (water bearing unit) 20-40 ft sand to silty sand with clay layers, clay layers are 0.25 to 11 inch thick 40 ft -60 ft- gravelly sand to sand with gravel 60 ft-120 ft - bedrock

Conductivity: Shallow aquifer: 0.837 to 5.47 ft/day; Deep aquifer: 0.211 to 33.40 ft/day

Gradient: 0.318 ft/ft

Media:

Media: DNAPLGroundwaterSoil

Remediation Scenario:

Cleanup Goals: Groundwater: Eliminate hot spot at MW-3. Soil: Reach asymptotic removal rates of VOCs for 3 consecutive quarters.

Technologies:

Technologies Used: In Situ:

Chemical Oxidation

Monitored Natural Attenuation

Soil Vapor Extraction

Other technologies used:

Why the technology was selected: It is cost effective and it will also address BTEX impacts by delivering oxygen to the unsaturated zone to promote biodegradation.

Date implemented: SVE - June 1998 Chemical oxidation — pending as of August 2003

Final remediation design: Natural attenuation is being assessed through semi-annual groundwater monitoring. The SVE system had 6 extraction points connected to a blower located on site. The piping for the system is buried 4 ft below grade. The soil vents were inserted through old soil boring locations in situ. The radius of influence was assumed to be 25 ft. The air flow was operated continuously with exhaust air flow typically around 125 scfm. System turned off after 24 months.

Results and Next Steps:

Results to Date: Ground water monitoring has been conducted for several years. The data indicate that only one well is substantially impacted by PCE and its degradation products.

Although the concentration of the degradation products has increased steadily over time, the concentration of PCE remains quite high. The PCE concentration in ground water decreased by 50% (6200 ug/l to 3000 ug/l) during operation of the SVE, but spiked up again (10,000 ug/l) after the SVE system was shut off

Next Steps: Additional field work is underway to confirm/further define extent of ground water contamination.The consultant is preparing a work plan to implement in-situ chemical oxidation at the site using sodium or potassium permanganate injections. Additional soil and ground water monitoring will occur as part of this remedial action.

Costs:

Cost for Assessment:

Cost to Design and Implement:

Cost for Operation and Maintenance:

Total Costs for Cleanup:

Lessons Learned:

Lessons Learned:

Contacts:

Principal Point of Contact: Amy Hadiaris, P.G.Voluntary Investigation and Cleanup ProgramMinnesota Pollution Control Agency520 Lafayette RdSaint Paul, MN 55155-4194651-296-8947 amy.hadiaris@pca.state.mn.usConsultant:Delta Environmental Consulting, Inc2770 Cleveland AveRoseville, MN 55113651-639-9449

Site Specific References:

Site Specific References:

1. Shorty Cleaner Launderer Environmental Assessment — Phase 2. January 15, 1996. Prepared by Delta Environmental Consulting, Inc. 2. Addendum — Phase II Report, February 25, 1997, Delta 3. Environmental Assessment — Phase 3/Response Action Plan. December 5, 1997. Prepared by Delta Environmental Consulting, Inc. 4. SVE System Installation and Startup Report, August 13, 1998, Delta5. Ground Water Monitoring and Remediation System Closure Report, May 3, 2000, Delta.6. GW Monitoring Report for Shorty Cleaner Launderer Site. June 25, 2001. Prepared by Delta Env. Consulting, Inc.

Images:

Images of Site:

Profile last updated on Dec 15, 2003

General Information

Site Name and Location:	Long Prairie Long Prairie, Minnesota, United States
Description: Historical activity that resulted in contamination.	This site originated from a drycleaner located in the downtown area. Contamination spread over a 10 block area and impacted two municipal wells before it was detected. Remedies included pumpouts along the heart of the mile-long plume and GAC treatment of contaminated water, SVE at the source, and alternative water supply. Also, affected private wells were abandoned, and owners were put on city water. This site was remediated under the Superfund program.

Contaminants:

Contaminants: Contaminants present and the highest amount detected in both soil and groundwater (please avoid giving ranges).

Contaminant	Conc in GW	Conc. in Soil
cis-1,2-Dichloroethene	250 ppb	10 ppb
Tetrachloroethene (PCE)	150,000 ppb	7,300,000 ppb
Trichloroethene (TCE)	760 ppb	15 ppb
Vinyl Chloride	3 ppb	

Other Contaminants Present:Indicates what other contaminants were found on-site

Deepest Significant Groundwater Contamination: 75 ft

Plume Size:

Site Hydrology:

Depth to Groundwater: 5-55 ft bgs

Lithology and Subsurface Geology: The city of Long Prairie is located along a large glacial outwash valley that trends along the Long Prairie River. Sand and gravel deposits within this body of outwash sediment provide high yields of quality ground water used for drinking and irrigation. The depth to ground water beneath the Site varies from less than 5-feet to more than 60-feet deep. Soil directly beneath the Site consist of a series of interbedded glacial till and sand and gravel outwash deposits that extend to at least 200 feet below grade. Glacial drift deposits are reported to be up to 700 feet thick beneath the Long Prairie vicinity. The Western 2/3 of the site is underlain by sand and gravel outwash deposits that extend from the ground surface to a till layer that is about 60 to 80 feet below grade. The eastern 1/3 of the Site is underlain by upper and lower outwash layers that are separated by an approximately 20-foot thick till layer that acts as an aquitard separating the upper and lower outwash layers. The presence of the separate upper and lower aquifers beneath the eastern 1/3 of the Site has a significant influence on the plume distribution and migration patterns.

Conductivity: variable

Gradient: variable

Media:

Media: DNAPLGroundwaterSoil

Remediation Scenario:

Cleanup Goals: Groundwater: The targets for groundwater are MCLs (5 ppb for PCE and TCE and 70 ppb for DCE). (Discharge of treated water at MCLs also meets the chronic surface water quality standards.) Soil: PCE — 1,200 ppb

Technologies:

Technologies Used: In Situ:

Monitored Natural Attenuation

Soil Vapor Extraction

Ex Situ:

Carbon Adsorption

Pump and Treat

Other technologies used:

Why the technology was selected: These technologies were selected because the FS showed them to be an effective remedy that could meet the ROD criteria.

Date implemented: Granular Activated Carbon installed 8/97 SVE installed: 4/97 Alt water supply completed: 5/97

Final remediation design: Start: Sept 19, 1988 Completed: April 11, 1991

Results and Next Steps:

Results to date: Groundwater: New municipal wells were installed to replace old contaminated wells. Over 150 properties that formerly relied on private water supply systems in and near the plume were connected to the municipal water supplyThe mass of chlorinated solvent contamination in the plume has been reduced significantly, especially near the source area. The concentration of chlorinated solvent contamination in the ground water has decreased 3 orders of magnitude near the source area. Recovery wells at the site have continued to control the ground water flow gradient and plume migration to protect nearby municipal wells and the Long Prairie River. The recovery system removes and treats over 100 million gallons of water each year. The downgradient extent of the plume still has not changed significantly since remedial actions were initiated. The size and length of the plume is decreasing as ground water near the source area becomes clean.Soil: Met cleanup goals after operating an SVE system at the source area for approximately three years.

Next Steps: In accordance with the ROD for this site, active remediation would be continued until MCLs are met or until data shows monitored natural attenuation to be as effective to meet MCLs. At this point, we are planning to continue removing and treating contaminated ground water at least until it appears that the plume would no longer discharge to the Long Prairie and gradient control is no longer needed to protect nearby municipal water wells. Then, we will evaluate whether continued active remediation and gradient control is warranted.

Costs:

Cost for Assessment: $363,998

Cost to Design and Implement: RD $369,147 + RAandO&M $6,673,000

Cost for Operation and Maintenance: $300,000 annually

Total Costs for Cleanup:

Lessons Learned:

Lessons Learned: 1. Source removal/extraction is key to plume concentrations reduction and should be the first response action. Lateral spread is hard to control. Findings from this site clearly show the importance of finding the source (highly contaminated soil and ground water including DNAPL directly beneath the area of release) and removing it as soon as possible. The magnitude of dissolved contamination in the ground water began to decrease dramatically as soon as source removal was implemented. It appears that the plume is now beginning to shrink and natural attenuation is now taking affect.2. This is a good example of how far and fast a chlorinated solvent plume can spread under the right hydrogeologic conditions. Before the site was discovered in the mid 1980s the length of

the plume was captured and contained a by municipal wells located about one-third-mile downgradient. After these wells were shut down, the plume rapidly migrated another two thirds of mile downgradient to the Long Prairie River in less than ten years. 3. Conducting periodic and updated water supply well surveys and keeping area land owners and residents informed over the life of a long-term remediation project is very important. Due to the shallow ground water at this site, it is not unusual for the area residents to install their own shallow sand point wells for secondary use. There has been a number of instances at this site where new residence or land owner have installed wells in the plume, and were new residents used old secondary wells with out knowing about potential ground water contamination.

Contacts:

Principal Point of Contact: Maureen JohnsonMinnesota Pollution Control Agency520 Lafayette Road NorthSt. Paul, MN 55155-4194
651-296-7353Consultant (design and construction):Dale FinnesgaardBarr Engineering8300 Norman Center DriveMinneapolis, MN 55437-1026(952) 832-2667Dfinnesgaard@Barr.comConsultant (O&M):Terracon

Site Specific References:

Site Specific References: 1. Long Prairie Ground Water Contamination Five-Year Review, MPCA and EPA, 9/30/02

Images:

Images of Site:

Profile last updated on Dec 15, 2003

General Information

Site Name and Location:	Colonial Square Mall Wayzata, Minnesota, United States
Description: Historical activity that resulted in contamination.	The site is a 5.5 acre property containing the Colonial Square Mall complex which was built in 1958. Dry cleaning began at the site in 1972 with several different operations having been present. A release of PCE in the soil and GW beneath the property was identified on the property. The location of the contamination is directly beneath the dry cleaning facility (one dry cleaner reportedly used a concrete pit for chemical waste storage) and there is a secondary source at the sewer main.

Contaminants:

Contaminants: Contaminants present and the highest amount detected in both soil and groundwater (please avoid giving ranges).	**Contaminant**	**Conc in GW**	**Conc. in Soil**
	cis-1,2-Dichloroethene	62 ppb	110 µ : g/kg
	methylene chloride		3.6 µ : g/kg
	Tetrachloroethene (PCE)	3,500 ppb	150 mg/kg
	trans-1,2-Dichloroethene	unknown	
	Trichloroethene (TCE)	55 ppb	
	Vinyl Chloride	unknown	

Other Contaminants Present: Indicates what other contaminants were found on-site

Deepest Significant Groundwater Contamination:

Plume Size:

Site Hydrology:

Depth to Groundwater: 36 to 105 ft bgs

Lithology and Subsurface Geology: 0-10 ft yellow brown sand, dry, fine to coarse drain (fill) 10-15 ft layered silt and sand 11.5-12 ft Quaternary-aged loamy till, sandy till and lacustrine clay and silt deposits of the Des Moins lobe/Gransburg sublobe glaciation. Multiple sand stringers in the predominantly silty soil. Sediments overlying bedrock are estimated to be 150 to 200 ft in the area. There are two discrete saturated zones that may be present beneath the site.

Conductivity: 1.18 ft/day to 1.29 ft per day

Gradient: 0.04 to 0.05 ft/ft

Media:

Media: GroundwaterSoil

Remediation Scenario:

Cleanup Goals: Groundwater: Because of the presence of wetlands, the ecological criteria for surface water has been the preferred GW cleanup standard. No human health receptors down gradient of property exist. PCE concentrations for ecological criteria are 3.8 µ : g/L. Soil: No numerical standard has been set

Technologies:

Technologies Used: In Situ:

Monitored Natural Attenuation

Soil Vapor Extraction

Other technologies used:

Why the technology was selected: Monitored Natural Attenuation and Soil Vapor Extraction were selected because the underlying solids at the site were not conducive to effectively supporting a proactive groundwater source control system. Biodegradation indicators (PCE daughter products and geochemical indicators) confirm that natural attenuation is occurring.

Date implemented: June 4, 1999

Final remediation design: Monitored natural attenuation will require quarterly groundwater monitoring. The SVE system is comprised of 5 vents. The vents were installed by drilling through the floor of the dry cleaning business. A skid-mounted SVE system was placed outside the rear of the store. The system has a design flow of 300 cfm extracted at 24 inches of water vacuum.

Results and Next Steps:

Results to date: Quarterly monitoring from 1997 to 2002 indicates that the groundwater plume is stable. The SVE system operated continuously for 36 months. The residual contaminant concentrations in the source area soils are less than industrial and residential soil reference values. The consultant requested closure on the groundwater and soil. On September 9, 2003, after a year of GW monitoring was conducted post-active SVE, approval to remove the SVE system was granted.

Next Steps: Two additional GW samples over the next 12 months are to be conducted.

Costs:

Cost for Assessment:

Cost to Design and Implement:

Cost for Operation and Maintenance:

Total Costs for Cleanup: $300,000 + (est. by consultant)

Lessons Learned:

Lessons Learned:

Contacts:

Principal Point of Contact: Jennifer Haas, Staff TAMPCA520 Lafayette RdSaint Paul, MN 55155651-297-1802
John HuntBarr Engineering Company952-832-2777

Site Specific References:

Site Specific References:

Images:

Images of Site:

Profile last updated on Dec 15, 2003

General Information

Site Name and Location:	Midway PlazaSaint Paul, Minnesota, United States
Description: Historical activity that resulted in contamination.	This 37-acre site has been occupied by retail shopping mall since 1960. The site is zoned for commercial land use and is located in a commercial district. A PCE release appears to have occurred from the sumps at the Dry Cleaner located in the Midway Plaza shopping mall and also from the sewer line.

Contaminants:

Contaminants: Contaminants present and the highest amount detected in both soil and groundwater (please avoid giving ranges).

Contaminant	Conc in GW	Conc. in Soil
Benzene	22 ppb	
cis-1,2-Dichloroethene	100 ppb	
ethylbenzene	120 ppb	
methylene chloride	34 ppb	1,300 µ:g/kg
Tetrachloroethene (PCE)	41,000 ppb	11,000 mg/kg
Trichloroethene (TCE)	840 ppb	

Other Contaminants Present: Indicates what other contaminants were found on-site	Acetone in GW (140 ppb), in soil (320 µ:g/kg)
Deepest Significant Groundwater Contamination:	

Plume Size:

Site Hydrology:

Depth to Groundwater:	25.5 to 33 ft bgs
Lithology and Subsurface Geology:	0-11 ft: Fine to medium, red-brown sand 11-22 ft: Silty to clayey moderately stiff, red-brown till 22-26 ft: Silty, fine to medium, tan-brown sand (this unit water bearing in some locations) 26-28 ft: Dry, stiff to very dense, clayey, fine to medium, gray sand overlaying a well sorted fine to medium gray sand, which is laterally discontinuous and averages less than 3 ft in thickness. This unit, when present, overlies the Decorah shale bedrock and is typically saturated. Groundwater in the unconsolidated glacial sediments is not hydraulically connected across the entire site. Undulations in the bedrock surface appear to be the primary factor controlling the hydrogeology of the unconsolidated sediments at the site.
Conductivity:	4 to 9 ft/day
Gradient:	0.01 ft/ft

Media:

Media:	DNAPLGroundwaterSoil

Remediation Scenario:

Cleanup Goals:	Groundwater: Treatment required until a soil cleanup goal of 5 ppm PCE is achieved and a steady state level of PCE in GW is achieved. Soil: 19,900 µ : g/kg

Technologies:

Technologies Used:	In Situ: Air Sparging Multi Phase Extraction Soil Vapor Extraction
Other technologies	

used:

Why the technology was selected: Because these alternatives were found to meet the remedial objective for the project while being less costly, more readily implemented and achieve the remedial objectives sooner than the other alternatives.

Date implemented: February 3, 1999

Final remediation design: Multi phase extraction well was placed in one area of the site, while Air Sparging/SVE was implemented in another area. There were a total of 10 Multi phase extraction wells, 7 SVE wells and 2 AS wells. Even with the remediation system implemented, the soils remained above the cleanup goal of 5 ppm. A risk assessment was conducted to determine if human exposure could occur. A new clean up goal was estimated based upon the risk of human exposure being minimal, and the new cleanup goal is 19,900 µ : g/kg.

Results and Next Steps:

Results to date: Mass removal for both MPE and SVE from Feb 2, 1999 through June 8, 2001 is 2,313 lbs. Average daily contaminant recovery has declined from a high of 22 lb/day to 0.2 lb/day (in Jan 2001). Exponential decay analysis indicates that the average daily recovery has reached an asymptotic limit, which satisfies the first stage of the clean up goals. The MPE system was authorized to be shut down on December 11, 2001. The AS/SVE system was shut down after 1 year of operation, based upon an agreement between the MPCA and the owners of the Midway Plaza shopping center to facilitate continuing construction at the site.

Next Steps: Continue groundwater monitoring for another 2 years to document that the PCE concentrations remain stable or decrease, at which point the monitoring will be discontinued. The soils meet the new cleanup goal of 19,900 µ : g/kg and therefore closure has been requested for the soils.

Costs:

Cost for Assessment:

Cost to Design and Implement:

Cost for Operation and Maintenance:

Total Costs for Cleanup:

Lessons Learned:

Lessons Learned:

Contacts:

Principal Point of Contact: Mike Connolly, Staff TAMPCA520 Lafayette Rd.Saint Paul, MN 55155-4194651-297-8279 mike.connolly@pca.state.mn.us
Consultant: Kevin PowersLeggette, Brashears & Graham Northpark Corporate Center1210 West Cty Rd E, Suite 700Saint Paul, MN 55112(651) 490-1405

Site Specific References:

Site Specific References:

Images:

Images of Site:

Profile last updated on Dec 15, 2003