

**Case Study:** Bridal Veil Open Space, Minneapolis, Minnesota, USA

<p><b>Site Overview</b></p>	<p>Bridal Veil Open Space is a 6.6 acre parcel within the Valentine-Clark Superfund site where soil, sediments, groundwater and surface water were contaminated with wood-preserving chemicals (primarily creosote and pentachlorophenol [PCP]). Valentine Clark utilized the facility for wood treating operations from 1908 to 1962. Located in a heavily industrial area between Minneapolis and St. Paul, the parcel consisted of a storm water pond, a flowing stream and woodlands. Local residents used the site for recreation including fishing, swimming and nature walks.</p>
<p><b>GSR and/or Triple Bottom Line Project Outcome</b></p>	<ul style="list-style-type: none"> <li>• Met the complex requirements of the multiple stakeholders by providing environmental protection and enhancement with no operational costs.</li> <li>• Used sustainable, environmentally-friendly remediation techniques to address significant contamination problems.</li> <li>• Satisfied community’s requirements to restore natural woodlands and recreational areas within industrial site.</li> </ul>
<p><b>Background &amp; Drivers</b></p>	<ul style="list-style-type: none"> <li>• Unacceptable risk to human health from exposure to contaminants in soil and surface water</li> <li>• Local community group wanted this area restored and maintained in a natural setting.</li> </ul>
<p><b>Regulatory Program</b></p>	<p>Minnesota Pollution Control Agency (MPCA) State Superfund Program</p>
<p><b>Site End Use</b></p>	<p>Public access for recreation.</p>
<p><b>Contaminants of Concern and Impacted Media</b></p>	<ul style="list-style-type: none"> <li>• Soil: Polynuclear aromatic hydrocarbons (PAHs); PCP; several metals; and polychlorinated dibenzo-dioxins/polychlorinated dibenzofurans (PCDD/PCDF)</li> <li>• Surface Water: PCP</li> <li>• Sediment: PAHs and lead</li> </ul>
<p><b>Key Stakeholders in Project</b></p>	<ul style="list-style-type: none"> <li>• Minnesota Pollution Control Agency</li> <li>• City of Minneapolis (land owner)</li> <li>• Community group</li> </ul>

<p><b>Cleanup Objectives</b></p>	<ul style="list-style-type: none"> <li>• Provide the response action necessary to eliminate unacceptable human risk exposure to soil contamination.</li> <li>• Provide a response action to reduce unacceptable human risk exposure to PCP contaminated surface water.</li> <li>• Provide a response action to reduce PCP concentration in the surface water through bioremediation activities.</li> <li>• Allow for appropriate use of the open space by the community.</li> </ul>
<p><b>Remediation Strategy</b></p>	<ul style="list-style-type: none"> <li>• <b>Use of Vegetation to mitigate human risk exposures.</b> Open water creates an attraction to humans and the potential for direct contact with PCP-contaminated surface water. However, the community sponsor insisted that water features be maintained on the site. The design uses wetland vegetation and wetland soils to minimize the potential exposure, as humans are less likely to contact water in a wetland than in an open water body.</li> <li>• <b>Wetland Storm Water Detention.</b> The storm water pond was the only detention structure on Bridal Veil Creek, and its retainage capacity had to be maintained. AECOM evaluated the Bridal Veil drainage basin, and designed a wetland basin with detention capacity equal to the existing pond.</li> <li>• <b>Photolysis/Bioremediation Treatment Stream.</b> Groundwater contaminated with PCP provides the base stream flow for Bridal Veil Creek, and will continue to discharge to the creek since no groundwater remediation is planned for the site. In order to reduce PCP concentrations in the creek in a green, sustainable process, AECOM designed a rock-filled treatment stream that reduces the PCP concentrations with sunlight (photolysis) and bioremediation. The design was based on research sponsored by the USEPA and is the only known system operating in the USA (as of 2009).</li> <li>• <b>Base Flow Diversion.</b> Storm water discharge required a 72-inch concrete arched pipe to meet design peak flow conditions. However, sediment removal and PCP treatment occurs during the first flush and base flow conditions. AECOM designed a diversion structure within the 72-inch pipe to direct the first flush and base flow through a sediment trap and to the treatment stream.</li> </ul>

<p><b>GSR Strategy/Best Management Practices (BMPs)</b></p>	<ul style="list-style-type: none"> <li>• Restoration of native habitat (qualitative)</li> <li>• Reduction of storm water flow/discharge through use of wetlands and diversion structure (qualitative)</li> <li>• Utilization of passive treatment with no fuel/electricity requirements (qualitative)</li> <li>• Mimicry of natural processes for treatment (qualitative)</li> <li>• Incorporation of community requests into project design (qualitative)</li> <li>• Enhancement of community recreation resources (qualitative)</li> <li>• Elimination of operating costs (qualitative)</li> </ul>
<p><b>GSR Metrics and/or Footprinting Tool(s)</b></p>	<p>None used.</p>
<p><b>GSR Project Contact</b></p>	<p>Amanda McNally, P.E., Environmental Engineer AECOM Pittsburgh, PA (412) 316-3506 <a href="mailto:Amanda.mcnally@aecom.com">Amanda.mcnally@aecom.com</a></p> <p>Daryl Beck, P. E., Project Manager AECOM Minneapolis, MN (612) 376-2424 <a href="mailto:Daryl.beck@aecom.com">Daryl.beck@aecom.com</a></p>
<p><b>Relevant Links</b></p>	<p><a href="http://www.pca.state.mn.us/index.php/view-document.html?gid=3207">http://www.pca.state.mn.us/index.php/view-document.html?gid=3207</a> <a href="http://www.pca.state.mn.us/index.php/view-document.html?gid=3208">http://www.pca.state.mn.us/index.php/view-document.html?gid=3208</a></p>
<p><b>References</b></p>	<p>AECOM (2009). “Green and Sustainable Remediation Captures Regional ACEC Award” (Fact Sheet)</p> <p>Minnesota Pollution Control Agency. (2007). “Final Minnesota Decision Document, Valentine-Clark State Superfund Site, Bridal Veil Open Space Operable Unit, City of Minneapolis, Hennepin County, Minnesota” Retrieved from <a href="http://www.pca.state.mn.us/index.php/view-document.html?gid=3208">http://www.pca.state.mn.us/index.php/view-document.html?gid=3208</a></p> <p>Minnesota Pollution Control Agency. (2007). “Valentine Clark State Superfund Site – Bridal Veil Open Space Recommended Contamination Response” (Fact Sheet) Retrieved from <a href="http://www.pca.state.mn.us/index.php/view-document.html?gid=3207">http://www.pca.state.mn.us/index.php/view-document.html?gid=3207</a></p>