De Sale Phase 1 Passive Treatment System
SRI O&M TAG Project # 21 Request #1
OSM PTS ID: PA-113

Requesting Organization:	Slippery Rock Watershed Coalition (in-kind partner)
Receiving Stream:	Unnamed Tributary (Slippery Rock Creek Watershed)
Hydrologic Order:	Unnamed Tributary→Seaton Creek→Slippery Rock Creek→ Beaver River→Ohio River
Municipality/County:	Venango Township, Butler County
Latitude/ Longitude:	41°08'33"N / 79°49'48"W
Construction Year:	2000

The De Sale Phase 1 Passive Treatment System was constructed in 2000 to treat an acidic, metal-bearing, discharge from an abandoned surface coal mine in Venango Township, Butler County, PA. The system was designed by BioMost, Inc., (BMI) and originally consisted of an anoxic collection system; flow splitter box; two, layered (limestone aggregate overlain by spent mushroom compost), Vertical Flow Ponds (VFPs) each with a 2-tiered underdrain system; a settling pond/wetland complex; and a Horizontal Flow Limestone Bed (HFLB). Various upgrades and maintenance activities have taken place over the years including the recovery of iron oxide. In 2005, a small grant from Butler County was used to install a forebay to remove iron at low pH in order to reduce pipe plugging problems and for future maintenance issues. The forebay now typically removes 50-75% of the iron prior to entering the VFPs. At that time, the funding also enabled the original VFP North (VFPN) effluent pipes to be converted to a peri-pipe configuration; however, sufficient funding was not available to convert the VFP South (VFPS) pipes. The system is monitored and maintained by the Slippery Rock Watershed Coalition (SRWC).

In November 2012, the SRWC requested assistance to address maintenance issues observed at the site. VFPN was believed to be developing permeability issues possibly caused by the accumulation of low pH iron solids on top of the compost layer. As the pond had already been drained for iron removal as part of another project, the decision was made to stir the upper 1 to 2 feet of the treatment media. A permanent ramp was installed at the northeast corner of VFPN to provide skid loader access in order not only to stir the media, but also for future maintenance efforts. VFPS was not stirred at this time as the component remained online to provide treatment of the raw water while the VFPN was offline for maintenance.

In May 2013, during a site inspection, newly-developed maintenance issues were identified. A portion of the flow entering VFPS was bypassing treatment by flowing through the emergency spillway into the settling pond. Partly in response to the pipe which directs flow from the forebay into VFPN becoming plugged with low pH iron solids, thereby directing all of the water to VFPS. The clogged pipe was cleaned. As peri-pipes had not been installed in VFPS, the outlet could not be lowered to increase head pressure in order to convey more water through the treatment media. In addition, several outlet pipes were also clogged with iron solids and vegetation as was the outlet spillway. Despite the issues, the 13-year old system was still treating the water fairly well with a final pH of 6.3. A decision was made to remove and replace the old outlet structures with peri-pipes.

In June 2013, BMI performed additional maintenance and upgrades to the De Sale Phase 1 PTS. The old outlet structures of VFPS were excavated and removed. A new peri-pipe system was installed to allow the VFPS water level to be adjusted as needed, which also allows for easier flow measurements and sampling. The channels below the VFP outlets were also restructured and cleared of organic matter.

Water monitoring conducted on 9/25/14 indicated that the system was working well. The treatment wetland effluent had a pH of 6.5 with 54 mg/L of alkalinity while the HFLB final effluent had a 6.4 pH with 70 mg/L of alkalinity.

The project team thanks the Slippery Rock Watershed Coalition and the landowner for all of their efforts including support and assistance. Funding for technical assistance and maintenance was provided by the PA DEP's Growing Greener and the Foundation for Pennsylvania Watersheds grant programs and in-kind services by project partners.

Additional Recommendations & Considerations:

- The forebay outlet pipes that periodically plug with low pH iron could be removed and replaced with either a channel or possibly larger diameter and shorter-length pipe to reduce the frequency and increase the ease of cleaning.
- The HFLB is plugged by manganese solids and other sediment and should be stirred and cleaned once the Smithsonian Institution has completed the research at the site.
- Continue monitoring and site inspections on at least a quarterly basis.

A permanent access ramp *(top left)* into VFPN was installed prior to stirring *(top right)* the treatment media to increase permeability and reduce short-circuiting. Overflowing of VFPS *(middle left)* along with clogging of the outlet pipes and overgrowth of vegetation and debris in the spillway *(middle right)*, led to VFPS being stirred, to the replacement of the outlet pipes with adjustable peri-pipes *(bottom left),* and to clearing of the spillways. Plugging of the forebay outlet pipes *(bottom right)* has been an ongoing problem.