

**De Sale Phase II Passive Treatment System**  
**SRI O&M TAG Project # 22 Request #1**  
**OSM PTS ID: PA-114**

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°08'39.9984"N / 79°49'54.9984"W  
Construction Year: 2000

The De Sale Phase II Passive Treatment System was constructed in 2000 to treat an entire unnamed tributary, which is heavily impacted by acidic, metal-bearing, drainage from an abandoned surface coal mine in the headwaters of Seaton Creek in Venango Township, Butler County, PA. The current system was designed by BioMost, Inc., (BMI) and consists of a small in-stream dam and intake pipe to direct the flow to a forebay, two Vertical Flow Ponds (VFPs) (operating in parallel), a settling pond, a treatment wetland and a Horizontal Flow Limestone Bed (HFLB). Routine maintenance and sampling have been conducted by the Slippery Rock Watershed Coalition (SRWC) since construction. Previous system rehabilitation activities have included recovery of manganese solids from the HFLB.

The SRWC requested maintenance assistance on 10/30/12, as site inspections and field water monitoring conducted in 2012 by the SRWC revealed that the VFP effluent water quality, at times, was not meeting the treatment performance goals, especially during high flow events. The poorer water quality from the VFPs resulted in the HFLB providing secondary treatment, causing aluminum solids to be removed and retained in the HFLB. Some flushing events were conducted to improve VFP performance. The suspected cause was either short-circuiting through preferential flow paths and/or fouling of the treatment media with aluminum and other solids. The decision was made to conduct stepwise rehabilitation in order to evaluate the effectiveness of each step. Pre-maintenance monitoring of all the VFP pipes was conducted by BMI on 11/27/12. In December 2012, the top 1 to 2 feet of VFP East (VFPE) was stirred by BMI. A permanent ramp was constructed into VFPE not only to enable the current maintenance but also to assist in future maintenance activities. Post-maintenance monitoring of all the VFP pipes was conducted by BMI on 12/11/12 and again on 12/8/14. Additional monitoring of the system was conducted by a volunteer for the SRWC throughout 2013 and part of 2014.

Pre- and post-maintenance monitoring of all VFP outlet pipes is provided in the following table. Pre-maintenance monitoring conducted under low flow conditions indicated VFP West (VFPW) was, in general, outperforming VFPE. A few weeks post-maintenance, even though flow rates had significantly increased due to substantial rainfall, VFPE was not only performing better, but also significantly outperforming VFPW. Monitoring conducted 12/8/14 further confirms the positive impact of stirring the VFPE treatment media, as the pH and alkalinity values in the lower tier are excellent where as VFPW was performing below expectations. The only exceptions are the upper tier pipes of VFPE, which are suspected to have been accidentally broken during the stirring event. These pipes could be capped so that the top tier underdrain is used only for flushing purposes. Water monitoring of the overall system available at *Datashed.org* does indicate the need for additional site maintenance. On 9/25/14 during somewhat low-flow

conditions, the treatment wetland had a pH of 4.9 with 2 mg/L of alkalinity and the HFLB final effluent had a pH of 5.9 with 11 mg/L of alkalinity and signs of aluminum solids in the effluent pipe and spillway. Additional maintenance activities will be completed under O&M TAG 2 grant.

**VFPE and VFPW Effluent Pipe Monitoring Pre- and Post-Maintenance**

Date	Parameter	VFPW Pipe #								VFPE Pipe #							
		Upper Tier				Lower Tier				Lower Tier				Upper Tier			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
11/27/12 (pre-2012 maintenance)	pH	NA	NA	NA	NA	7.2	6.4	6.2	6.2	5.2	5.5	6.4	6.3	NA	NA	NA	NA
	Alkalinity (mg/l)	NA	NA	NA	NA	103	39	28	24	6	8	49	34	NA	NA	NA	NA
	Flow (gpm)	0	0	0	0	2	3	6	8	2	3	5	7	0	0	0	0
12/11/12 (post-2012 maintenance)	pH	NA	NA	NA	3.9	6.4	6.2	6.2	6.2	6.3	6.3	6.2	6.2	6.2	6.1	5.8	5.3
	Alkalinity (mg/l)	NA	NA	NA	0	41	16	15	18	42	32	36	38	37	27	14	3
	Flow (gpm)	0	0	0	3	36	55	48	50	60	60	60	36	5	12	23	8
12/08/14 (post-2012 maintenance)	pH	NA	NA	NA	NA	6.2	5.8	6.0	6.5	7.2	7.2	7.2	7.1	4.4	5.1	5.8	4.4
	Alkalinity (mg/l)	NA	NA	NA	NA	6	3	5	9	102	94	86	86	0	NM	NM	0
	Flow (gpm)	0	0	0	0	7	7	8	9	7	6	6	5	4	1	1	5

NA – not applicable as pipe was not discharging

In addition, during the winter of 2012/2013, an SRWC monitoring volunteer reported that the outlet of the wetland became frozen and began to overtop the berm and bypass the HFLB due to an increase of plants, sludge, and organic matter in the outlet channel and that the channel needed to be cleaned. He also noted that the VFP outlet channel had become clogged with dense organic growth to the point that made water monitoring difficult and asked if the channel could be cleaned as well. In June 2013, BMI returned to the site to perform additional maintenance including cleaning the inlet and outlet of the forebay, clearing the VFP spillway of vegetation, clearing the wetland outlet of vegetation, and re-leveling the HFLB. Clearing the VFP outlet facilitated the measurement of flow rate and water quality sampling.

Over the winter of 2013/2014, leaves, sticks and other debris had clogged the bar guard of the forebay pipe, which splits the water between the two VFPs. Ice built up quickly and water began to flow over the emergency spillway bypassing the VFP treatment media. Modifications to the piping system to help prevent a recurrence and relocating the emergency spillway to direct the water into VFPE if it does occur will be conducted under a new request through the O&M TAG 2 grant.

The project team thanks the SRWC 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:**

Additional maintenance is to be conducted under the O&M TAG 2 grant that will most likely include backflushing and stirring (upper 1 to 2 feet) of the treatment media of both VFPs. Converting one or both VFPs to be auto-flushing through the installation of a siphon is also under consideration, but will not be decided until after evaluating the effectiveness of the current proposed maintenance activities due to the additional labor and expense. The forebay pipe will be shortened for easier maintenance with a “T” installed to help prevent plugging by leaves and sticks. The forebay emergency spillway will be relocated to direct any overflow to VFPE.



The top 1 to 2 feet of the VFPE treatment media was stirred with a skid loader (*top left*) to reduce short-circuiting and to improve permeability (*top right*). Vegetation, metal-bearing sludge, and other debris had accumulated in the VFP spillway (*middle left*) making water monitoring, especially flow measurement, difficult. The spillway was cleaned (*middle right*). Vegetation, sediment, etc. that had grown and accumulated in the wetland spillway (*bottom left*) would at times cause the water to bypass the HFLB, especially in the winter when ice would also accumulate. The vegetation and debris was, therefore, removed from the wetland spillway (*bottom right*).