

Puritan Passive Treatment System
SRI O&M TAG Project #31 Request #1
OSM PTS ID: PA-245

Requesting Organization: Trout Run Watershed Association
Receiving Stream: Trout Run
Watershed: Little Conemaugh River
Municipality/County: Portage Township, Cambria County
Latitude/Longitude: 40°22'0.5088"N / 78°38'44.0016"W

Stream Restoration Incorporated was contacted by the Trout Run Watershed Association on 10/10/14 seeking assistance on how to improve treatment and reduce maintenance needs at the Puritan passive treatment system. The evaluation for this treatment system was part of a partnership effort with Saint Francis University's (SFU) Center for Watershed Research & Service (CWRS). The CWRS had been evaluating the system and providing assistance to the Trout Run Watershed Association as part of a class project. Tim Danehy and Cliff Denholm met with Dr. Bill Strosnider of SFU on 6/16/15 to visit the site and provide additional input in the evaluation of the system with the intention of partnering to submit a Growing Greener Grant.

The passive system consists of a single 3,500-ton limestone bed containing a series of nine (4 over & 5 under) wooden baffles. The bed discharges to a limestone channel outfall to Trout Run. Despite the current treatment system, the reach downstream of the system remains impacted. The treatment system was constructed with a flow splitter and bypass designed to allow a maximum of 100 gpm of the Puritan discharge to enter the limestone bed while the remaining flow, which can exceed 400 gpm during high-flow periods, bypasses directly to Trout Run. During these high-flow events, the untreated water significantly exceeds the treated water and can have a substantial negative impact regardless of the effectiveness of the treatment system.

In addition to the inability to fully treat the discharge, the following issues were identified:

- Within a few months of operation, the first two cells of the limestone bed became clogged with iron and aluminum solids requiring frequent cleaning and/or replacement of the limestone.
- Based upon flow measurements, it is believed that between 20% and 50% (average of 20%) of the influent flow to the system is leaking through the pond to Trout Run and therefore is likely not providing full treatment to the water that is leaking. The system was built within coal refuse and does not appear to be lined.

A review of the available water quality data for the treatment system was conducted. Water quality data of the discharge have been split into pre- (1997-2010) and post-construction. The quality of the discharge appears to be improving over time with less measurable acidity, iron, aluminum and manganese over the last few years compared to the previous 13 years. This is not an uncommon occurrence. The TR4 post construction flow data are for the flow that is going into the system and do not include the bypassed flow. Despite the changes in quality, the discharge can still be described as acidic with elevated concentrations of iron and aluminum and relatively low concentrations of

manganese. The final effluent can be described as net-alkaline and on average is removing 78% of the iron, 63% of the aluminum, and 33% of the manganese concentrations.

Puritan Water Quality Data (Average Values)

Sample Point	Flow	Lab pH	Alkalinity	Acidity	T. Fe	T. Mn	T. Al	SO ₄	TSS
TR4 (Raw) (1997-2010)	190	3.0	0	290	25.7	3.6	20.9	774	5
TR4 (Raw) (2012-2015)	91	3.5	0	122	8.4	1.5	9.7	643	7
TR4.1 (Effluent)	72	6.4	84	-46	1.8	1.0	3.6	698	14

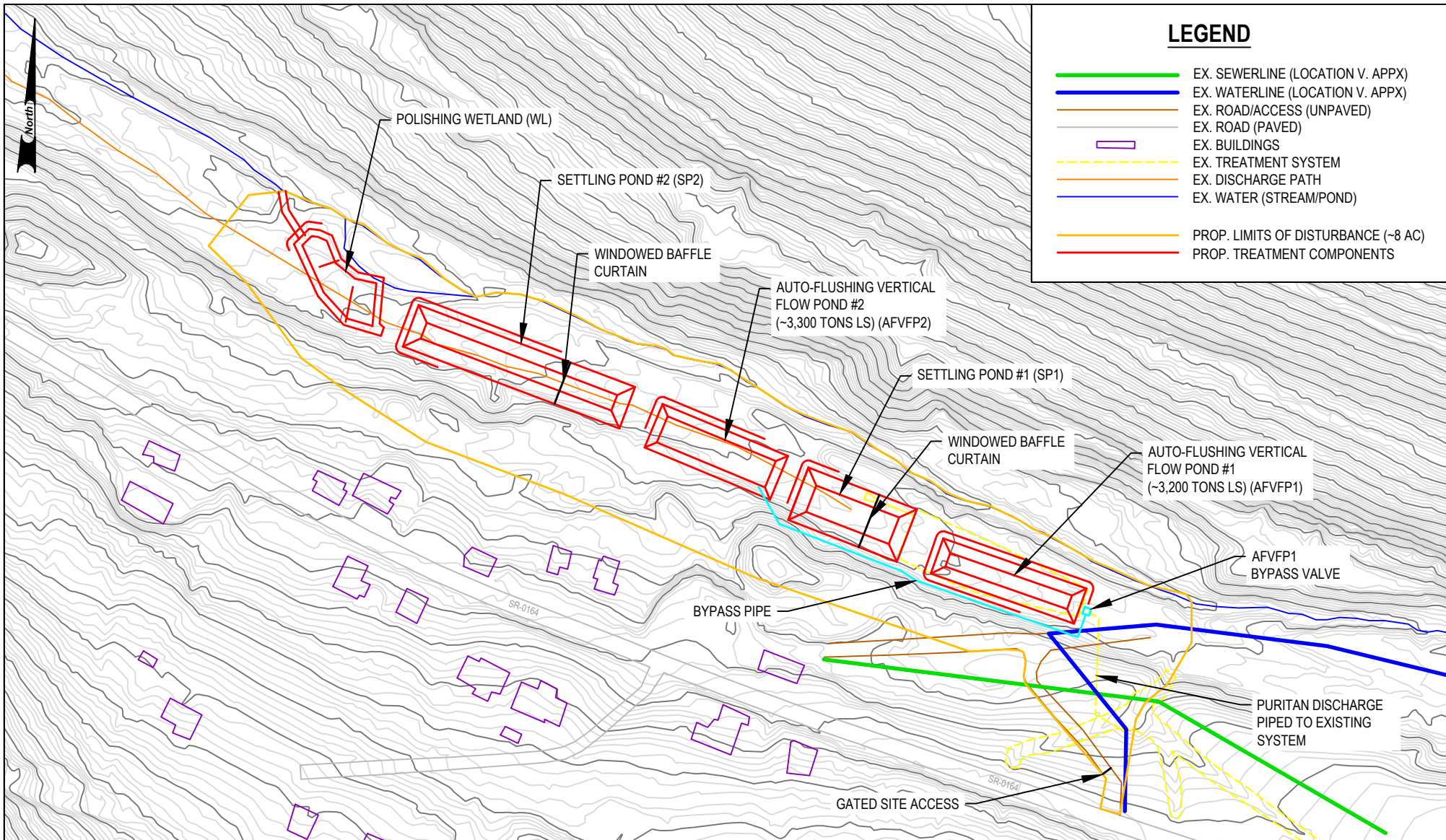
Flow in gpm, pH in standard units, Alkalinity and Hot Acidity in mg/L as CaCO₃, Iron (Fe), Manganese (Mn) and Aluminum (Al) as total metal concentrations in mg/L

While the Puritan system generally provides significant treatment in terms of raising pH, neutralizing acidity and removing much of the metals from the mine drainage, the system only treats a portion of the drainage as it is undersized. In addition, the leaking pond further reduces the amount of water treated. The importance of treating this discharge has dramatically increased because once the proposed large Portage Active Treatment Plan is constructed for the major discharges in the basin, the Puritan discharge will be one of the last major impacts in the headwaters of the Little Conemaugh River. The system needs to be modified/rebuilt in order to treat the entire discharge, fix leaks and simultaneously reduce future maintenance needs.

A \$538,944 Growing Greener Grant application was submitted in July 2015 by the Trout Run Watershed Association in cooperation with Stream Restoration Inc and SFU's CWRS. A new treatment system conceptual design (see attached) was completed by BioMost, Inc., which consisted of significantly altering the treatment design. The new system would consist of 3,200-ton Auto-Flushing Vertical Flow Pond → Settling Pond with windowed baffle curtain → 3,300-ton Auto-Flushing Vertical Flow Pond → Settling Pond with windowed baffle curtain → Wetland. Existing limestone would be reused as possible. The estimated total cost of the new system is \$785,168. The grant was awarded in April 2016. The partnership effort also obtained \$100,000 in matching funds from the US Office of Surface Mining. Construction is anticipated to begin in 2019.



At times, a large portion of the AMD is bypassing the Puritan passive system (Top Left). The first two cells of the limestone bed are regularly clogged with metals (Top Right). At least once per year, the limestone in these cells is removed for cleaning and placed in a pile (Top Right) and then the cleaned stone from the year before is put in its place. The limestone bed uses wooden baffles (Bottom Left) to try to fully utilize the treatment media. Water monitoring indicates the treatment system is likely leaking which would probably be due to fact that the system was built in coal refuse material and does not appear to be lined (Bottom Right).



LEGEND

- EX. SEWERLINE (LOCATION V. APPX)
- EX. WATERLINE (LOCATION V. APPX)
- EX. ROAD/ACCESS (UNPAVED)
- EX. ROAD (PAVED)
- EX. BUILDINGS
- - - EX. TREATMENT SYSTEM
- EX. DISCHARGE PATH
- EX. WATER (STREAM/POND)
- PROP. LIMITS OF DISTURBANCE (~8 AC)
- PROP. TREATMENT COMPONENTS

GENERAL NOTES:

Base map contours derived from 2006 bare-earth digital elevation model constructed from PAMAP LiDAR elevation points by PA DCNR, Bureau of Topographic and Geologic Survey [PA State Plane - South (US Survey Foot) NAD83 (Vertical datum - NAVD88)]. Select topographic and cultural features from 2006 PAMAP aerial photos obtained from www.pasda.psu.edu and USGS 7.5', Beaverdale PA (PR1981). Additional information from limited 2015 site investigation by BioMost. All existing conditions are to be field verified.

Stream presence/extent determined from "blue lines" of USGS map - locations revised based on LiDAR contours and information provided by 2011 Design Drawings by Penn Terra Engineering Inc.

CONCEPTUAL DESIGN
PURITAN AMD
FULL TREATMENT
TROUT RUN WATERSHED ASSOCIATION
CAMBRIA COUNTY
CONSERVATION DISTRICT
 Portage Twp., Cambria Co., PA
 Scale: 1" = 200' July 2015
 BioMost, Inc., Mars, PA

