Laurel Run #1 O&M Considerations

Laurel Run #1 Passive Treatment System

Brushvalley & Center Townships, Indiana County, PA

Background: Amerikohl Mining, Inc. (Amerikohl) will be expanding the existing Laurel Run #1 (aka Laurel Run North) passive treatment system (System) as part of activities authorized through the Wensell Mine (SMP #32120102) in Brushvalley and Center Townships, Indiana County, PA. The Blacklick Creek Watershed Association (BCWA) had provided comments on the proposed mining-related water treatment system improvements to the Pennsylvania Department of Environmental Protection, Cambria District Mining Office (DEP) prior to permit issuance.

BCWA recently contacted Stream Restoration Incorporated (SRI) for assistance in reviewing the improvements proposed by Amerikohl as well as other operation and maintenance (O&M) considerations of the System. SRI was the non-profit sponsor of the project that funded the original design and construction of the System and, through a PA DEP Growing Greener grant, is providing O&M technical assistance to watershed groups in cooperation with BioMost, Inc. (BMI) who designed the System.

On August 30, 2013, a meeting was conducted at the System to review the proposed improvements. Meeting attendees included: George Chakot, DEP; Tom Kovalchuk, Amerikohl; Tim Danehy & Ryan Mahony, BMI; Dennis Remy, BCWA; Adam Cotchen, Indiana County Conservation District. Amerikohl provided copies of Exhibit 13.2C: Impoundments (11/07/12) and Exhibit 26.4: Addendum Map (revised 11/07/12) to BMI. It was decided at the meeting that BMI would review the exhibit maps and provide comments for consideration to BCWA intended to help reduce long-term operation and maintenance efforts related to the proposed expansion of the System and suggest other potential improvements to the existing System that could be made in conjunction with the work proposed by Amerikohl.

BMI currently has copies of the two aforementioned exhibit maps, and the comments contained herein may be subject to change if additional information pertaining to the proposed System expansion is included in other documents.

Brief Summary of Proposed System Expansion per Exhibit 13.2C (13.2C) and Exhibit 26.4 (26.4)

It is noted on the Plan View on 13.2c that (sediment) Pond A is to be modified to a passive treatment pond (typically called a vertical flow pond or VFP). Per 08/30/13 discussions, the existing collection system (that currently is in need of repair) will be "mined through" and replaced with a collection system that will intercept the historic underground mine workings at the highwall. Per information on 26.4, a 15" PVC pipe will extend from the sealed deep mine to a new freeze proof box with air lock, cleanout, shut off valves, and bypass overflow. Three 8" pipes will be installed that will extend to Pond A and the two existing VFPs. Pond A will be modified by placing 4' of high quality limestone overlain by

3' of compost containing 10% limestone fines. In addition, an in-line flow control structure will be connected to the 8" perforated HDPE (underdrain) pipe which is to discharge to the final polishing pond (Wetland).

Suggested Modifications to the Proposed System Design

1. **Liner (Ref: 26.4 Detail 1)** Based the proposed elevation of Pond A in relation to the seat earth associated with the Upper Freeport coal seam (typically a clay-rich material), the proposed 30 Mil liner is most likely not needed. Omitting the proposed liner will reduce future O&M costs by allowing more ready access to the treatment media for evaluation, cleaning and eventual replacement and avoid costly repairs if the liner is compromised by future O&M activities conducted by BCWA. The existing VFPs only have a separation geotextile below the treatment media and the sludge pond and wetland are not lined and all four impoundments hold water. (See also: Laurel Run #1 As-Built online http://www2.datashed.org/laurel-run-1/downloads)

2. **VFP Outlet Piping (Ref: 26.4 Detail 2)** The in-line flow control structure could be replaced with an adjustable outlet riser with drain valve. There does not appear to be a separate drain valve included in the Pond A design (though it may be noted on other exhibits/documents) and BMI's experience with in-line flow control structures (usually manufactured by Agri-Drain, Adair, IA) has been that removing all the stop logs to fully drain the pond is difficult task. Future O&M activities to be conducted by BCWA would be eased if a drain pipe with valve be extended from Pond A to the existing sludge (flush) pond located at the northern terminus of the existing eastern vertical flow pond. An adjustable outlet riser similar to the risers installed on the existing VFPs is recommended. (See attached Vertical Flow Pond Outlet Typical)

3. **Underdrain (Ref: 13.2C Plan View)** There does not appear to be any laterals included with the underdrain proposed for Pond A. To help more fully utilize the treatment media in Pond A in order to extend the life of the expanded System and reduce future O&M costs, it would be recommended to install perforated laterals (typically 4" perforated pipe) on regular intervals along the single 8" center pipe (note, that if 4" perforated laterals are used, the 8" pipe would not need to be perforated). For this application HDPE pipe is a very robust and appropriate pipe material, however, for ease of installation and to reduce potential future replacement costs, SDR35 PVC pipe for both the main 8" underdrain and recommended 4" laterals should be adequate. (See attached Drainable Pond Outlet Typical.) As an Adjustable Outlet Riser is suggested for the outlet of the proposed vertical flow pond, a detail showing a proposed connection to the 8" pipe extending from the new vertical flow pond to the existing wetland has been developed. (See attached Adjustable Outlet to 8" Pipe Detail.) As shown on the attached Detail, cleanouts spaced at 100' intervals or less is recommended for the 8" pipe extending to the wetland.

4. **Box (Ref: 26.4 Detail #4)** The proposed freeze-proof box indicates that shut off valves will be installed. These valves will be the mechanism that the BCWA will used to control the amount of

flow being directed to the three VFPs. Balancing the amount of flow to the three VFPs using valves in this configuration may prove to be a difficult O&M task as the valves would need to be adjusted at the box and the flow verified at the outlet of the proposed 8" pipes at each of the three VFPs. It is suggested that adjustable risers (similar to the adjustable outlet riser for the new VFP described above) be used in place of the valves. This will allow BCWA personnel to set the three risers at the same elevation to allow equal flow to each pond or raise or lower the inlet risers to divert flow away from a pond during maintenance as desired. Essentially the inlet risers will function as adjustable weirs. It is also recommended that the bypass overflow be installed as a weir and be as wide as possible to allow excessive flow to exit the box without dramatically increasing the flow to the VFPs. It is noted that the approximate design flow for each of the existing VFPs is about 105 gpm per the Laurel Run Headwaters Restoration Effort Final Report by Stream Restoration Incorporated (June 2002).

5. **Treatment Media (Ref: 26.4 Detail #1)** The proposed VFP indicates that 3' of compost be placed over a 4'-thick mixture of high quality limestone (total material thickness 7'). Based on the performance of similar VFP systems over the last 15+ years, it is recommend that the organic material be a mixture of spent mushroom compost and wood chips (wood chips provide a long-term carbon source to help sustain beneficial biological activity within the organic material and provide physical structure to improve long-term permeability) and that a portion or the limestone be mixed with the organic material. A suggested typical cross section of the proposed VFP: Geotextile on pond bottom; 0.3' bedding stone (#57 aggregate); perforated PVC underdrain pipe; ~1.5' non calcareous #57 aggregate (to ~1' above the top of the pipe); ~5'-thick 1:1 by volume mixture of high-quality limestone (typical size range AASTHO #5 - #8) and organic material (wood chips mixed 1:1 by volume with spent mushroom compost). Research by others (Watzlaf, G., Schroeder K. T., and Karies C. Long-Term Performance of Alkalinity-Producing Passive Systems for the Treatment of Acid Mine Drainage. *In* proceedings of the seventeenth annual conference of the American Society of Mining and Reclamation, Tampa Florida, 2000) found that mixture-type VFPs typically generate higher alkalinity than layered-type systems.

Proposed Improvements to Existing System

1. **Valve Replacement.** The existing system has 16 ball valves that are used to drain the two existing VFPs. These valves are very difficult for BCWA personnel to operate. SRI will provide the materials and labor to install Valterra-type valves that will be easier for BCWA personnel to use. It would be greatly appreciated if Amerikohl assist SRI and BCWA by providing equipment to excavate and backfill the valve boxes during valve replacement. This could be completed concurrently with the installation of the new 8" pipe extending from the proposed VFP to the existing wetland.

2. **Media Stirring.** The existing VFPs were drained prior to the 08/30/13 meeting in order for BMI to evaluate the condition of the treatment media. It was found that only a very thin layer of

iron (~1/4" – 3/4") has been deposited on the compost layer since 2001. Several test pits were dug through the compost into the limestone where the condition of both the compost and limestone were observed. The condition of the compost and limestone were generally good considering the age (12 years) of a system that was designed to last 25 years. However, it was noted that there were numerous voids in the compost layer where the water was observed to flow directly into the limestone layer indicating that short circuiting is occurring. In order to help eliminate these voids and help improve flow distribution over the entire system, it is recommended that the ~0.5' layer of compost be mixed in with the first ~1 of limestone. Please note that there is a layer of piping located approximately 2' below the compost/limestone contact that should be avoided as feasible during the stirring operation, though this upper layer of piping is primarily used to flush the system and overall system performance would not be significantly affected if compromised during media stirring. It would be greatly appreciated if Amerikohl provide the equipment to perform this task where an excavator would begin stirring the media at one end of each of the VFPs and work to the opposite end to avoid running on the freshly stirred media.

Attachments:

- Vertical Flow Pond Outlet Typical & Adjustable Outlet to 8" Pipe Detail (1 sheet)
- Wensell Mine Exhibit 13.2C (2 sheets)
- Wensell Mine Exhibit 26.4 (2 sheets)