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October 6, 2017

Greg Sahd, Borough Manager
Borough of Columbia
308 Locust Street
Columbia, PA 17512

Re: Cloverton Drive – Detention Basin “B”
Professional Engineering Assessment of Existing Conditions
Columbia Borough, Lancaster County, PA
Engineer’s Project No. 3981.5.08.00

Dear Mr. Sahd:

As requested by the Borough, we have completed an assessment of the stormwater basin known as Detention Basin “B”, located south of the cul-de-sac at the western terminus of Cloverton Drive. Basin “B” was approved for construction, as part of the Final Subdivision Plan for Hilmar Estates, with a Cover Sheet noting a last revision of February 18, 1986, and prepared by Stallman & Stallman, Inc. The design calculations for the basin were presented within a 15 page report, dated October 1985, and also prepared by Stallman & Stallman, Inc. This information was provided to us by Columbia Borough from a file in their archives on September 14, 2017.

The design documents call for a 4’ deep detention basin with the capacity to store 30,056 cubic feet of runoff. The basin was to be installed with a flat bottom at elevation 367.0 and an earthen berm at elevation 372.00. The report calls for an outlet structure consisting of a 36” diameter corrugated metal (CMP) riser pipe and a 36” diameter asphalt coated corrugated metal (ACCM) outfall pipe. The report calls for the riser to be 4’ high (top of structure elevation 371.00) and have 34 – 3” diameter orifice holes. A 6’ diameter baffle is to be installed on top of the riser pipe. The bottom of the riser pipe and invert out of the outflow pipe are to be at the same elevation as the bottom of the basin, elevation 367.0. The outflow pipe is to run for 25’ at a slope of 1% and discharge at an invert elevation of 366.75 to a rock lined channel. The channel is then to convey runoff to an existing 24” diameter reinforced concrete pipe (RCP) that runs under Route 30 with an invert in elevation of 366.50.

In the project file, an Erosion and Sedimentation Plan, with a revision date of May 1, 1989, was discovered that contains some discrepancies between the original approved plan and report noted above. The 1989 plan calls for an outlet structure consisting of a 30” diameter CMP riser discharging to a 24” diameter ACCM outfall pipe, instead of a 36” diameter riser pipe and a 36” diameter outfall pipe of the same materials. The plan also calls for the riser to have 37 – 3” diameter orifice holes, instead of 34 – 3” diameter orifice holes. It appears the information contained on the revised 1989 plan was utilized in the basin’s construction.

A survey crew from C.S. Davidson, Inc. visited the site on the dates of September 19, 2017 and September 26, 2017 to perform an as-built survey of the basin. Because the existing 24” reinforced concrete pipe under Route 30 is the ultimate controlling structure, the vertical datum for our survey was based on the invert of this pipe and set at elevation 366.50 to match both the original and revised construction plans. An exhibit demonstrating the results of our as-built survey, as compared to the May 1, 1989 Erosion and Sedimentation Control Plan, has been included with this report.

The survey measured the following as-built elevations (as compared to the design elevations):

- Route 30 culvert – 24” RCP, invert in: Elevation 366.50 (vertical datum);

- Outfall pipe – 24” ACCMP, invert out: Elevation 366.83 (+0.08’);
- Outfall pipe – 24” ACCMP, invert in (invert out of riser): Elevation 367.12 (+0.12’);
- Outlet structure – 30” CMP Riser, invert: Elevation 367.12 (+0.12’);
- Outlet structure – 30” CMP Riser, top of pipe: Elevation 370.93 (-0.07’);
- Outlet structure – number of 3” orifice holes: 30 holes (- 7 holes);
- Outlet structure – elevation of lowest orifice (control): 367.46 (+.46’);
- Basin bottom: Elevation 368.07 to Elevation 368.40 (+1.07’ to +1.40’);
- Top of berm: Elevation 372.20 (+0.20’);
- Basin capacity at top of berm (by AutoCAD surface calculation): 26,493 cubic feet (-3,563 cubic feet).

In analyzing the results of the as-built survey, we can conclude the following:

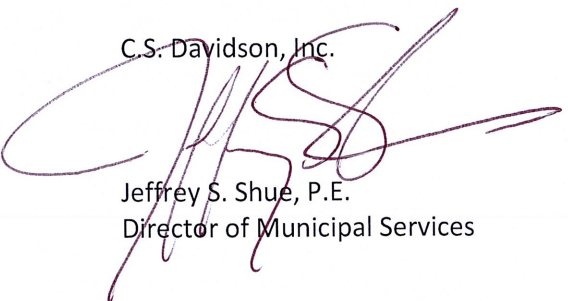
1. The outfall pipe and rock lined channel leading to the Route 30 culvert were constructed per plan, within less than 2 inches of tolerance.
2. The basin berm was constructed per plan to within 3 inches of tolerance.
3. The outlet structure riser pipe was constructed per plan, with the exception of the number and elevation of the orifice holes. The pipe was to be 4’ tall with an invert elevation of 367.12. The survey shows the pipe is 3.81’ high and the invert is within less than 2 inches of tolerance. The outlet structure is short 7 orifice holes, which will extend dewatering times in storm events that generate enough runoff to create water impoundment. The lowest orifice was constructed 5.5” (0.46’) higher than design.
4. The basin bottom is relatively flat with a slight slope toward the outlet structure (+/- 0.5%). The bottom is currently 1.07’ to 1.40’ higher than designed. This additional material in the basin negatively affects the basin’s capacity, contributing to the 3,563 cubic foot capacity shortage noted above. It is unclear if the basin was originally constructed at the current elevation or if the current elevation is a product of sediment accumulating in the basin through the years.
5. Positive slope exists throughout the cross section of the basin with the basin bottom at elevation 368.07, the lowest orifice at elevation 367.46, the invert out of the outlet structure at 367.12, the invert of the outfall pipe at elevation 366.83, and the invert in of the Route 30 culvert at 366.50.

The water retained in the basin may be due to a high ground water table, as we witnessed the presence of flowing water in and around the basin during dry conditions and saturated soils within the basin throughout the summer months. While the height of the lowest orifice is 0.46’ higher than designed, the basin bottom is over one foot higher than designed, which would indicate that the retention of water in the basin, once a normal period of time is permitted for the basin to dewater after a rain event cannot be attributed to the outlet structure’s elevations.

If you have any questions regarding this assessment, please do not hesitate to contact me directly at (717) 814-4560 or jss@csdavidson.com.

Sincerely,

C.S. Davidson, Inc.



Jeffrey S. Shue, P.E.
Director of Municipal Services

JSS/DJR/cmd

Copy: Barry N. Handwerger, Esquire, Zimmerman, Pfannebecker, Nuffort & Allen, LLP
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