



## FINAL REPORT

# WHITPAIN TOWNSHIP BASIN RETROFIT PROJECT

September 15, 2010



## EXECUTIVE SUMMARY

In 2008, the Township decided to pursue the design and construction of a basin retrofit project to promote stormwater awareness and improve water quality within the Township's watersheds. The Engineering department selected two Township owned basins from an inventory list that categorized basins by their feasibility for a retrofit, their ownership information and their maintenance history. To assist the Township in funding the project, Whitpain Township applied for and received a Growing Greener II Grant in the amount of \$60,000 from the Pennsylvania Department of Environmental Protection. The Township selected Land Concepts to prepare the design and, in May 2010, the Township put the project out for competitive bid. Ply-Mar Construction Company Inc. won the contract with a low bid price of \$140,900. The majority of the funding required to complete the project came from the Township's Fee-in-Lieu of Stormwater Fund. Construction began in June and the entire project was completed in late August. For more information on the location of the basins, location maps have been included at the end of this report.

The overall goal of the project was to upgrade the detention basins with features that improve the water quality of the surrounding watersheds while addressing any necessary maintenance issues. The first basin, basin #61, is located in the Blue Bell Run neighborhood near the intersection of Buggywhip Circle and Horseshoe Drive. The basin flows to Mermaid Run which is located within the Stony Creek/Saw Mill Run Watershed. The upgrade to a naturalized basin will increase base flows while reducing sediment loadings and runoff velocities to Mermaid Run. The second basin, basin #64, is located in the Valentine Estates neighborhood near the intersection of Lewis Lane and Miles Drive. The basin is located within the Prophecy Creek watershed which is a subwatershed of the Wissahickon Creek watershed. The upgrade to a naturalized basin will reduce sediment loadings and increase base flow levels within Prophecy Creek. The final result will be improvements in water quality that ultimately enhance the quality of life of the community's residents.

Another goal of the project was to assist the Township in promoting the public's awareness of new and innovative methods for storm water management. By constructing a "real world" example, residents, business owners and homeowners associations will be introduced to storm water management facilities that promote aesthetics, property values, and improve water quality. The project elevates the community's awareness of storm water issues, which ultimately assists the Township in meeting its MS4 requirements under the NPDES Phase II regulations.

Each basin was designed with several key features to promote water quality while continuing to provide peak rate volume control for stormwater runoff. The basin designs included flow channels of sufficient length to promote recharge, remove pollutants and discourage short circuiting of inflows. In addition, the outlet structures were modified to maximize detention and infiltration. Each of the basins also received suitable vegetation such as meadow grasses, trees and shrubs within the basin footprint to provide a naturalized appearance. In addition, the larger Blue Bell Run basin included a sediment fore-bay to pre-treat sediment laden stormwater runoff and minimize long term maintenance costs.

## PROBLEMS IDENTIFIED AND THEIR SOLUTIONS

For the basin in the Blue Bell Run community, the following eight problems were identified to be addressed by the basin retrofit. The project addressed each one of the problems and their solutions are indicated in bold:

1. The elevation of the top of the basin berm adjacent the residences on Buggywhip Circle and Horseshoe Drive was below the elevation of the emergency spillway. Serious life safety and property damage issues could arise in the event of a large rainfall. **The basin berm was raised to the correct elevation and it is now one foot above the elevation of the emergency spillway. In the event of a rainfall event in excess of the 100-year storm, the basin will discharge properly through the emergency spillway.**
2. Numerous areas within the basin bottom had standing, stagnant water. This was due to sediment buildup and erosion. These pockets of standing water created breeding areas for mosquitoes. **The project included the re-grading of the entire basin and the removal of the pockets of stagnant, standing water. The newly created permanent pool of water along the primary flowpath of the basin was added to provide a water quality benefit. The pool of water is always in motion thus inhibiting the creation of mosquito larvae.**
3. The basin had an excessive amount of sediment build-up. The sediment had obstructed approximately 40% of the surface area of the three inlet pipes into the basin. The obstructed pipes had a reduced capacity to carry stormwater runoff flows into the basin. The likelihood of upstream flooding increases with blockages such as these. **The project removed the sediment build-up in the basin and the inlet pipes were unblocked. In addition, a sediment fore-bay was installed to control sediment build-up in the future.**
4. The emergency spillway was too narrow and it had become obstructed with mature trees. In the event of a large rainfall event (exceeding the 100-year storm event), the spillway would not function as designed and property damage could occur. **The project removed the tree obstructions and widened the emergency spillway. The new emergency spillway allows for higher discharge rates at lower velocities resulting in less downstream erosion.**
5. The basin had no ability to pre-treat inflows to the basin. This is especially of interest given that the basin is immediately adjacent a large agricultural use that discharges sediment laden runoff into the basin. **The project included the installation of a sediment fore-bay to pre-treat sediment laden inflows from the adjacent land.**
6. The configuration of the basin inlet pipes and the location of the outlet pipe resulted in short circuiting of basin flows with minimal infiltration and impoundment. **The project**

**included the re-grading of the entire basin footprint to lengthen flow paths promoting recharge and discouraging short circuiting.**

7. The basin has a substantial amount of invasive plant growth that inhibited the growth of native plants. **The project removed all invasive plants within the basin footprint and the entire basin was replanted with meadow and basin grass mixes appropriate for a naturalized basin environment.**
  
8. The temporary riser pipes (vertical corrugated metal pipes) had never been removed and were in a state of disrepair. In addition, the outlet structure was in need of repair. **The project included the removal of the temporary riser pipes and the repair of the outlet structure.**

The following pictures illustrate the prior conditions of the Blue Bell Run Basin:



**Prior Condition - Blue Bell Run Basin – North View.**

The basin berm is on the left hand side and top of the picture. The basin bottom has been inundated with invasive plants.



**Prior Condition - Blue Bell Run Basin – West View.**

The basin berm is on the right hand side of the picture. The inlet pipe from the northern half of the drainage area is shown. Extensive erosion and sedimentation can be observed around the pipe. The agricultural use on the PECO easement can be seen on the right hand side of the picture.



**Prior Condition - Blue Bell Run Basin – Outlet Pipes.**

The CMP temporary riser pipes are in disrepair and they are only partially attached to the basin outlet pipes.

The following pictures illustrate the current conditions of the Blue Bell Run Basin after the retrofit project was completed:



**Project Completion - Blue Bell Run Basin – Southeast View.**

The basin berm is in the foreground. The new basin outlet structure weir wall is at the center left of the picture.



**Project Completion - Blue Bell Run Basin – East View.**

The lengthened flow paths can be seen in this picture. The new emergency spillway is at the right of the picture below the tree line.



**Project Completion - Blue Bell Run Basin – North View.**

The re-graded basin with the permanent pool of water is shown.



**Project Completion - Blue Bell Run Basin – Northwest View.**

The new outlet structure weir wall & secondary outlet structure are in the foreground.

## PROBLEMS IDENTIFIED AND THEIR SOLUTIONS

For the basin in the Valentine Estates community, the following seven problems were identified to be addressed by the basin retrofit. The project addressed each one of the problems and their solutions are indicated in bold:

1. Severe erosion at the outlet to the basin and along Lewis Lane due to the lack of outlet control. The lack of outlet control resulted in frequent washouts along Lewis Lane which is immediately downstream of the basin outlet. **The project included re-grading of the outlet channel, installation of a new outlet control structure and the installation of rip-rap to dissipate the energy of the discharge flows.**
2. The basin outflow pipe was the same size as the inflow pipe. This lack of outlet control results in inadequate stormwater management of peak runoff flows from the basin. **The project included the installation of a new outlet control structure to reduce peak discharge flows from the basin.**
3. The emergency spillway was too narrow and it had become obstructed with mature trees. In the event of a large rainfall event (exceeding the 100-year storm event), the spillway would not function as designed and property damage could occur. **The project removed the tree obstructions and widened the emergency spillway. The new emergency spillway allows for higher discharge rates at lower velocities resulting in less downstream erosion.**
4. The basin had minimal infiltration due to compacted soil, short flow paths and high flow velocities. **The project included the installation of three stone pits designed to infiltrate the maximum amount of runoff directly into the fractured sandstone below the surface. The result was an increase in basin volume through infiltration within the basin.**
5. The basin had an excessive amount of sediment build-up. **The project removed the sediment build-up in the basin.**
6. Substantial erosion at the basin inlet and outlet structures due to a lack of energy dissipation devices. **The project included the installation of rip-rap aprons at the inlet and outlet control structure to minimize erosion within the basin footprint.**
7. The basin required constant lawn mowing due to the type of turf vegetation in the basin. **The project included the installation of meadow and basin grass mixes within the basin footprint. Lawn mowing will be minimized and may only be required once or twice a year.**

The following pictures illustrate the prior conditions of the Valentine Estates Basin:



**Prior Condition - Valentine Estates Basin.**

The inlet pipe is at the top of the picture and the outlet pipe is at the bottom of the picture.



**Prior Condition - Valentine Estates Basin.**

The outlet pipe is at the top of the picture. The emergency spillway is located just to the right of the outlet pipe and is obstructed with trees.



**Prior Condition - Valentine Estates Basin – East View Towards Lewis Lane.**

The outlet pipe from the basin is at the lower right. The basin discharge flows have created substantial channel erosion. In addition, at times the basin discharge flows surcharge across Lewis Lane.

The following pictures illustrate the current conditions of the Valentine Estates Basin after the retrofit project was completed:



**Project Completion - Valentine Estates Basin.**

The new outlet structure is on the left side of the picture and the inlet pipe can be seen on the top right side of the picture. The three new infiltration pits are located where the rock is visible.



**Project Completion - Valentine Estates Basin.**

The new outlet structure is located in the center of the picture. The new emergency spillway is located where the green matting is visible to the right of the outlet structure.



**Project Completion - Valentine Estates Basin – East View Towards Lewis Lane.**

The channel leading from the basin outlet has been re-graded and lined with rip-rap to minimize erosion.