

Derry Township

Stormwater Management Study — 2nd Phase

December 9, 2008



[BUILDING RELATIONSHIPS.
DESIGNING SOLUTIONS.]

HRG CONTACT INFORMATION

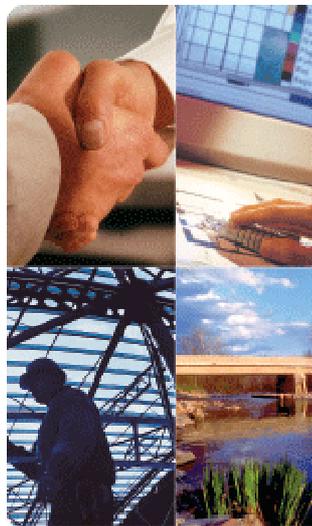
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**BUILDING RELATIONSHIPS.
DESIGNING SOLUTIONS.**

PRIORITY AREA NO. 4 – FOREST AVENUE, CLARK AND SAND HILL ROADS

The intersection of Forest Avenue, Clark Road and Sand Hill Road, shown on Drawing No. 4, has been subjected to flooding during heavy rainfall events. The problem is that there is a considerable area of steep-sloped land (0.29 sq. mi.) that drains to this intersection and there are only a few inlets to capture the contributing runoff. The stormwater runoff flows with such force and velocity that it often overtops the curb and gutter line and floods adjoining residential property owners. The estimated peak discharges for the selected design storm events are presented in Table 10.

**TABLE 10
PRIORITY AREA NO. 4 – ESTIMATED PEAK DISCHARGES**

DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE (CFS) FOR INDICATED RETURN FREQUENCY EVENT			
	2.33 YEAR	10 YEAR	50 YEAR	100 YEAR
0.29	31	148	331	428

It is recommended that a replacement storm sewer system be installed with additional inlets on Sand Hill Road and Forest Avenue. The storm sewer should be 36 inches in diameter. The recommended system is illustrated on Drawing No. 4.

It should be noted that implementing the recommended solution for this priority area will place increased pressure on the downstream system. The recommendations for this priority area should not be implemented until the Mill Street / Cherry Drive (Priority Area No. 1) system are constructed.

The estimated cost for this system is \$139,060.

PRIORITY AREA NO. 5 – HERSHEY PARK DRIVE – SHOPPING CENTER

The system of culverts and open channels between the Route 422/322 interchange and Swatara Creek is significantly undersized for the contributing watershed area. This system has been subject to extreme flooding conditions on several occasions. As illustrated on Drawing No. 5, the stream parallels Hershey Park Drive to the Mae Street/Walton Avenue intersection. At that point, the stream flows in a westerly direction for a short distance, then turns northwest and flows under the Norfolk Southern railroad embankment, through the Hershey Highmeadow Campgrounds and ultimately discharges to Swatara Creek. Table 11 summarizes the estimated peak discharges for the design storms at selected locations.

**TABLE 11
PRIORITY AREA NO. 5 – ESTIMATED PEAK DISCHARGES**

LOCATION	DRAINAGE AREA (SQ.MI.)	PEAK DISCHARGE (CFS) FOR INDICATED RETURN FREQUENCY EVENT			
		2.33 YEAR	10 YEAR	50 YEAR	100 YEAR
At confluence with Swatara Creek	2.95	176	459	998	1,318
At Route 322 interchange	1.53	121	341	741	973
At Wood Road	1.37	115	325	703	922
At Hershey Medical Center Pond	0.75	77	244	527	687

The primary cause of flooding for this priority area is the small culvert that goes under the railroad embankment. This culvert is comprised of three segments. The first segment is a corrugated metal pipe approximately 5 feet in diameter. The second segment is a reinforced concrete pipe approximately 4 feet in diameter. The third segment is a concrete box culvert approximately 5 feet wide and 6 feet high. Obviously, the concrete pipe is the controlling element and it constricts the flow significantly.

The recommended solution for this priority area is to enlarge the capacity of the culvert under the railroad tracks and to widen the open channel to handle larger peak discharges. The recommendations are illustrated on Drawing No. 5. Table 12 summarizes the recommended improvements for this priority area.

**TABLE 12
PRIORITY AREA NO. 5 – EXISTING AND RECOMMENDED CULVERT SIZES AND
IMPROVEMENTS**

CULVERT LOCATION	EXISTING CULVERT	RECOMMENDED IMPROVEMENTS	NOTES
Under Hershey Park Drive	6' x 12'	No change	
Between Hershey Park Drive and Bob Evans Driveway	-	Enlarge Channel	Size channel for the 50-year peak discharge.
Under Bob Evans Driveway	6' x 16'	No change	
Between Bob Evans Driveway and RR Embankment	--	Enlarge Channel	Size channel for the 50-year peak discharge.
Under RR Embankment	48" *	2- 60" & 1- 48"	Keep existing pipe. Add 2 - 60" pipes.
Between RR Embankment and Swatara Creek	--	Enlarge Channel	Size channel for the 50-year peak discharge.
Under Matlack Road	Bridge	3 - 60"	
Under Camp Driveway	Bridge	3 - 60"	
*Note – There are three segments of culvert that extend through the railroad embankment. The first segment is a 60" corrugated metal pipe about 15 feet long. The second segment is a 48" reinforced concrete pipe about 40 feet long. The final (downstream) segment is a 5' wide by 6' high concrete box culvert. The capacity of the three segments is limited by the 48" pipe.			

Drawing No. 5 shows the plan of the proposed improvements. The replacement culvert under the railroad embankment will have to be bored since Norfolk Southern would most likely not allow open cut construction on this important rail line. There will also be significant coordination issues between the various affected property owners, utility companies, and Norfolk Southern Railroad.

It is recommended to design the system for the 50 year return frequency event. If it was desired to achieve control of the 100 year event, it might be more cost effective to construct flood control ponds at three tributary locations upstream of Wood Road.

The estimated cost for the recommended improvements is \$1,045,500.

PRIORITY AREA NO. 6 – WOOD ROAD AT BULLFROG VALLEY ROAD

Drawing No. 6 shows the area that is subject to flooding and channel erosion for this priority area. The drainage system is comprised of a stream running south to north that roughly parallels Bullfrog Valley Road from Alpine Drive to the Route 322/422 interchange. The stream passes under a wooden footbridge and through a small pond just south of the intersection of Bullfrog Valley and Wood Roads and then flows through a culvert under Wood Road and then under another wooden footbridge and through a short segment of storm sewer before being discharged into an open channel. Table 13 presents the estimated peak discharges that occur at selected points along the stream.

**TABLE 13
PRIORITY AREA NO. 6 – ESTIMATED PEAK DISCHARGES**

LOCATION	DRAINAGE AREA (SQ.MI.)	PEAK DISCHARGE (CFS) FOR INDICATED RETURN FREQUENCY EVENT			
		2.33 YEAR	10 YEAR	50 YEAR	100 YEAR
At Route 322 Interchange	1.53	121	341	741	973
At Wood Road	1.37	115	325	703	922

To minimize the flooding conditions that have been experienced periodically, it is recommended that the culvert under Wood Road be replaced and the short segment of storm sewer just north of Wood Road be removed. This will require relocating a major water pipeline that parallels the north side of Wood Road. The existing gabion weirs upstream of the pond on the south side of Wood Road should be evaluated for their impacts on flooding and stream sinuosity and the eroded channel should be repaired.

The Township is considering replacing the footbridge upstream of the pond with a new bridge with greater capacity. In addition, it is recommended that a bypass channel be constructed on the west side of the pond so that high flows would bypass the pond and that the outlet structure of the pond (primary and emergency) be replaced with a system that can handle higher flows without suffering from erosion.

Table 14 summarizes the recommendations for culvert replacement and other work and Drawing No. 6 illustrates the location of the proposed work.

**TABLE 14
PRIORITY AREA NO. 6 – EXISTING AND RECOMMENDED CULVERT SIZES AND
IMPROVEMENTS**

LOCATION	EXISTING CULVERT	RECOMMENDED IMPROVEMENTS	NOTES
Upstream of Pond	-	Channelization	Widen and armor existing channel.
Under Wood Road	60"	2 – 60"	Add 1 60" pipe. Keep existing pipe.
Under Water Line	24"	Channelization	Remove existing pipe. Relocate water line and create an open channel.

The estimated cost for a system that would prevent flooding under a 50 year return frequency storm event is \$345,160.

