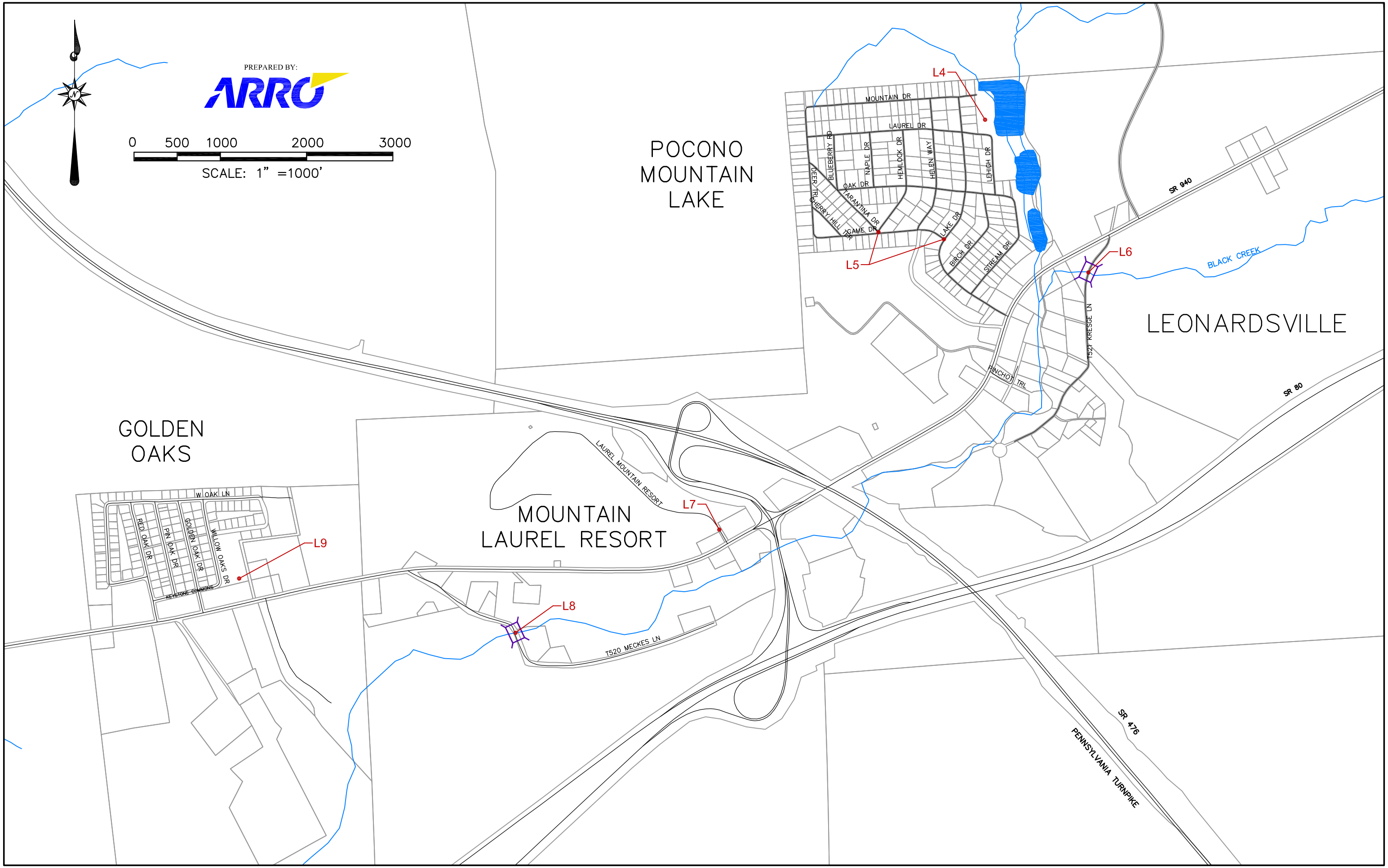
SECTION D

LEHIGH RIVER WATERSHED


PREPARED BY:
ARRO
0 500 1000 2000 3000
SCALE: 1" =1000'
POCONO MOUNTAIN LAKE
GOLDEN OAKS
MOUNTAIN LAUREL RESORT
LEONARDSVILLE
L4
L5
L6
L7
L8
L9
MOUNTAIN DR
LAUREL DR
BLUEBERRY RD
NAPLE DR
HEMLOCK DR
HELEN WAY
LEHIGH DR
DEER TRL
OAK DR
TARANTINA DR
CHERRY HILL TRL
GAME DR
LAKE DR
BIRCH DR
STREAM DR
SR 940
BLACK CREEK
T521 KRESGE LN
PINCHOT TRL
SR 80
LAUREL MOUNTAIN RESORT
W OAK LN
RED OAK DR
PIN OAK DR
GOLDEN OAK DR
WILLOW OAKS DR
KEYSTONE COMMONS
T520 MECKES LN
SR 476
PENNSYLVANIA TURNPIKE

Lehigh River Watershed

The Lehigh River drainage area accounts for more than half of the land area within in the Township but does not contain a larger portion of developed areas. The majority of the areas that are developed are located around the Black Creek. The watershed area within the Township consists of Jack Frost Ski resort at the northern most point and extends west through Hickory Run State Park.

The following is a description of the problem areas identified, the deficiencies noted, recommendations, color photographs, and an estimated cost to repair. A priority indicator of (L) =Low, (M) = Medium and (H) = High has been included next to the cost to indicate a priority level of each area. An indicator of (T) for Township and (P) for PennDOT has been included after recommendations and on the cost summary for items that include work in the indicated public right-of-ways.

Area L1

Location: Snow Ridge Development

Snow Ridge Development is a townhouse development with paved roads and parking areas. The development was constructed prior to current Zoning or SALDO ordinances and does not include stormwater management facilities to remove or detain run-off. Run-off from roads, houses and parking areas sheet flows through the development and then is conveyed by steep channels/swales off-site to Jack Frost Mountain Road.

Existing Deficiency: Throughout the development there are isolated areas of erosion and ponding. The main channels/swales from the development utilize a combination of erosion control matting, stone and concrete lining that is deteriorated, undersized or causing erosion. There are small ponds and lakes on the property that are not intended to control run-off and do at times create overflow issues due to leave-filled discharge swales.

Recommendation: Areas of isolated erosion and ponding can be alleviated with new paving, bituminous curbs, inlets or pipes by the property owner. Channel lining should be designed for the appropriate velocities of the run-off and damaged areas of the swales repaired. Concrete lined channels are a good

defense to address high velocity flows. However, they do not decrease velocities, remove sediment, treat water or remove any quantity of water. Alternative channel solutions should be explored. Continuous maintenance and leaf removal in the receiving swales should be implemented to prevent overflowing issues. An isolated stormwater management plan of the development should be considered to decrease run-off from the site by implementing post construction stormwater (BMP's) best management practices to hold and remove water on the development. Suggested examples include infiltration trenches, rain gardens, retentive berms or other infiltrating bmp's to reduce run-off.

Cost: $22,500.00 (L)

Area L2

Location: Jack Frost Mountain Road (Below Snowridge Development)

Existing Deficiency: Jack Frost Mountain Road receives a large amount of run-off downstream of the Snow Ridge development. The heavy velocities of run-off have created erosion issues to the receiving channels and roadway. Several of the existing pipes are damaged and may be undersized.

Recommendation: The roadside channels and bituminous paving downstream of Snow Ridge development have been recently repaired. No immediate repairs are required. However, monitoring of upstream runoff,capacity, and conditions of cross pipes should be performed for the undersized and deteriorated pipes.

Cost: $14,400.00 (L)

Area L3

Location: Jack Frost Mountain Road (At the intersection of SR 940) (P)

Existing Deficiency: Due to a large area of impervious coverage at the intersecting roadways, there are occurrences of large gutter spread and surface run-off through the intersection.

Recommendation: Both roads are owned by PennDOT and they will be responsible for the monitoring or rehabilitation of this intersection if needed.

Cost: N/A

Area L4

Location: Pocono Mountain Lake

Pocono Mountain Lake is a residential community with 3 existing lakes. Stormwater throughout the development is handled by a vegetated swale and cross pipe conveyance system. The existing system does not enter the lakes. The lakes are stream feed and outlet back to the stream. Currently Pocono Mountain Lake repairs and maintains the roadways and stormwater conveyance within the community.

Existing Deficiency: The existing stormwater conveyance system requires general maintenance and upkeep to protect the roadways and dwellings during heavy storms. See Area L5 for isolated defects. The existing timber retaining wall at the lake is rotating forward due to insufficient drainage behind the wall and the hydrostatic pressure resulting from this runoff.

Recommendation: Re-routing of runoff upstream from behinf the wall and replacement of the retaining wall should be performed.

Cost: $27,000.00 (L)

Area L5

Location: Game Drive @ Lake Drive Intersection and Tarantina Drive Intersection

Existing Deficiency: Within the Pocono Mountain Lake development the owner repairs and maintains the roadways and stormwater conveyance within the community. Two locations along Game Drive at the intersection of Lake Drive and Tarantina Drive have recently had new cross pipes installed, however improper backfill has created areas of minor settlement and depressions. In addition the upstream swales and headwalls are blocked and clogged with leaves and debris.

Recommendation: Clean and restore the swales at the ends of the pipes, restore backfill and paving in cross pipe trenches.

Cost: $14,550.00 (L)

Area L6

Location: Kresge Lane (T)

Kresge Lane is a Township Road that is 0.55 miles long and averages 16' wide Township Road. The roadway is located in Leonardsville and is accessed off SR 940.

Existing Deficiency: There is an existing 7' diameter cross culvert which is experiencing severe rusting and deterioration with associated rotated headwalls. The Black Creek runs through this culvert. Reports from the Township code official have indicated that recent flooding and overtopping of this roadway has stranded the residence from accessing SR 940.

Recommendation: The existing deficient pipe culvert should be replaced. A floodplain study of the Black Creek should be performed to verify the size of the culvert replacement. Riprap erosion protection should be palced at the downstream end of outlet pipes and outlet to a vegetated swale prior to entering the Black Creek.

Additional repairs from the Roadway Evaluation report prepared by ARRO Consulting Inc. dated February 2014 should also be considered and they are as follows.

Stationing as indicated below is starting at the south cul de sac end of Kresge Lane. The typical condition of the roadway is in fairly good condition with the following isolated recommended repairs.

- Minor shoulder cutting right edge from 3+50 to 4+95
- Alleviate ponding at interesting driveway with leveling patch at station 6+90 to 7+00.
- Right shoulder grading from 7+00 to 8+26.
- Full depth patch right edge from 8+26 to 9+90.

- Grade right shoulder from 8+26 to 11+81
- 48” diameter CMP stream crossing, insufficient cover and damaged guiderail.
- Remove shoulder debris and minor shoulder grading from 10+44 to 19+81.
- Full depth pavement repair 5’ x 8’ at station 17+13.
- Cut both shoulders back from 19+81 to 23+92.
- Stream crossing: 7’ diameter steel pipe cast in concrete, monitor condition in low flow condition. (* see recommendation above)
- Install 1 ½” overlay and cut back both shoulders from 23+92 to 28+20 (SR 940).
- At 940 intersection: fix shoulders and swale along westbound 940 onto Kresge lane.

Perform crack sealing as conditions require.

Cost: $116,970.00 (H)

Area L7

Location: Laurel Mountain Resort

Existing Deficiency: There is an existing collapsing culvert on the access road up to the Mountain Laurel Development. Currently there is a temporary steel plate across the roadway to protect motorist from falling into the opening.

Recommendation: Perform the required studies to determine the adequate size and replace the culvert. Repair the associated roadway and stream banks.

Cost: $108,000.00 (H)

Area L8

Location: Meckes Lane (T)

Existing Deficiency: There are several cross pipes along the roadway and a swale that directs run-off onto the roadway. There is an existing stone arch bridge over the Black Creek with previous scour protection repairs

Recommendation: Monitor run-off from the filled in swale and re-establish a new swale in the right-of –way if stormwater issues and roadway deterioration are occurring. Perform an inspection of the stone arch bridge to check the foundation for scour issues.

Cost: $1,800.00

Area L9

Location: Golden Oaks

Existing Deficiency: Golden Oaks is a residential development built under modern Zoning and SALDO requirements. Roadways are crowned, paved and drain to stable roadside swales that convey run-off to large detention basins.

The existing inlets located on the access road into Golden Oaks appear too high and allow run-off to leave the existing swale and sheet flow across the road.

Recommendation: Re-set the existing inlets at an elevation lower than the adjacent swales and roadway.

Cost: $2,400.00 (L)

Area L10

Location: State Route 534 (P)

Existing Deficiency: Minor erosion to existing swales, deterioration to cross pipes and large accumulation of antiskid material.

Recommendation: SR 534 is a PennDOT roadway and will be the responsibility of the State for the monitoring or rehabilitation of the roadway and storm systems.

Cost: N/A

L1-Snow Ridge Development
Leaf-filled swales

L1- Snow Ridge Development
Broken Concrete Downstream Channel

L1-Snow Ridge Development
Concrete Lined Channel

L1 – Snow Ridge Development
Surface run-off from parking lots

L1-Snow Ridge Development
Typical Run-off locations and eroded swales

L1- Snow Ridge Development
Townhouses below parking lots and roadways

L1-Snow Ridge Development
Swale draining pond

L1 – Snow Ridge Development
Downstream swale of Pond

L2- Jack Frost Road
Repaired channel and edge of paved road

L2- Jack Frost Road
Eroded Swale and new cross pipe location

L3-Intersection 903 and Jack Frost Road

L3 – 903 & Jack Frost Road
Eroded shoulders and heavy debris

L4-Pocono Mountain Lake
Rotating retaining wall

L5- Pocono Mountian Lake
Upstream end pipe at Tarantina Dr.

L5-Pocono Mountian Lake
Deteriorated paving above cross
pipe Tarantina Drive

L5 – Pocono Mountain Lake
Downstream end of cross pipe
Game Drive

L5-Pocono Mountain Lake
Cross pipe Lake Drive @ Game
Drive intersection

L6- Kresge Lane
7' diameter metal culvert

L6-Kresge Lane Culvert
Severely rusted with areas of 100%
section loss and holes in culvert

L6 – Kresge Lane
4' diameter culvert; insufficient cover
and capacity. Damaged guiderail

L6- Kresge Lane
Eroded island and shoulders at 940
draining to Black Creek

L6- Kresge Lane
Roadway runoff discharging directly
to Black Creek

L7 – Laurel Mountain Resort
Steel Plate supporting road over
deficient culvert

L7 – Laurel Mountain Resort
Deficient Culvert

L8- Meckes Lane
Clogged cross pipe

L8- Meckes Lane
No roadside swale

L8-Meckes Lane
Stone Arch

L8 – Meckes Lane
Previous Concrete Apron Repair;
verify scour at footings

L9- Golden Oaks
Crowned Roads to roadside swales

L9- Golden Oaks
Detention basins for Stormwater Mangement

L9 – Golden Oaks
Inlet higher then swale

L9 – Golden oaks
High Inlet and overflow back toward roadway

ARRO ENGINEERING & ENVIRONMENTAL CONSULTANTS
OUT IN FRONT
1239 Centre Turnpike Orwigsburg, PA 17961
(T) 570.366.9534 (F) 570.366.9537

Client: Kidder Township
Project: Stormwater Management Plan
Project No.: 10635.13
Date: 4/15/2015 **Rev.:** 5/27/2015

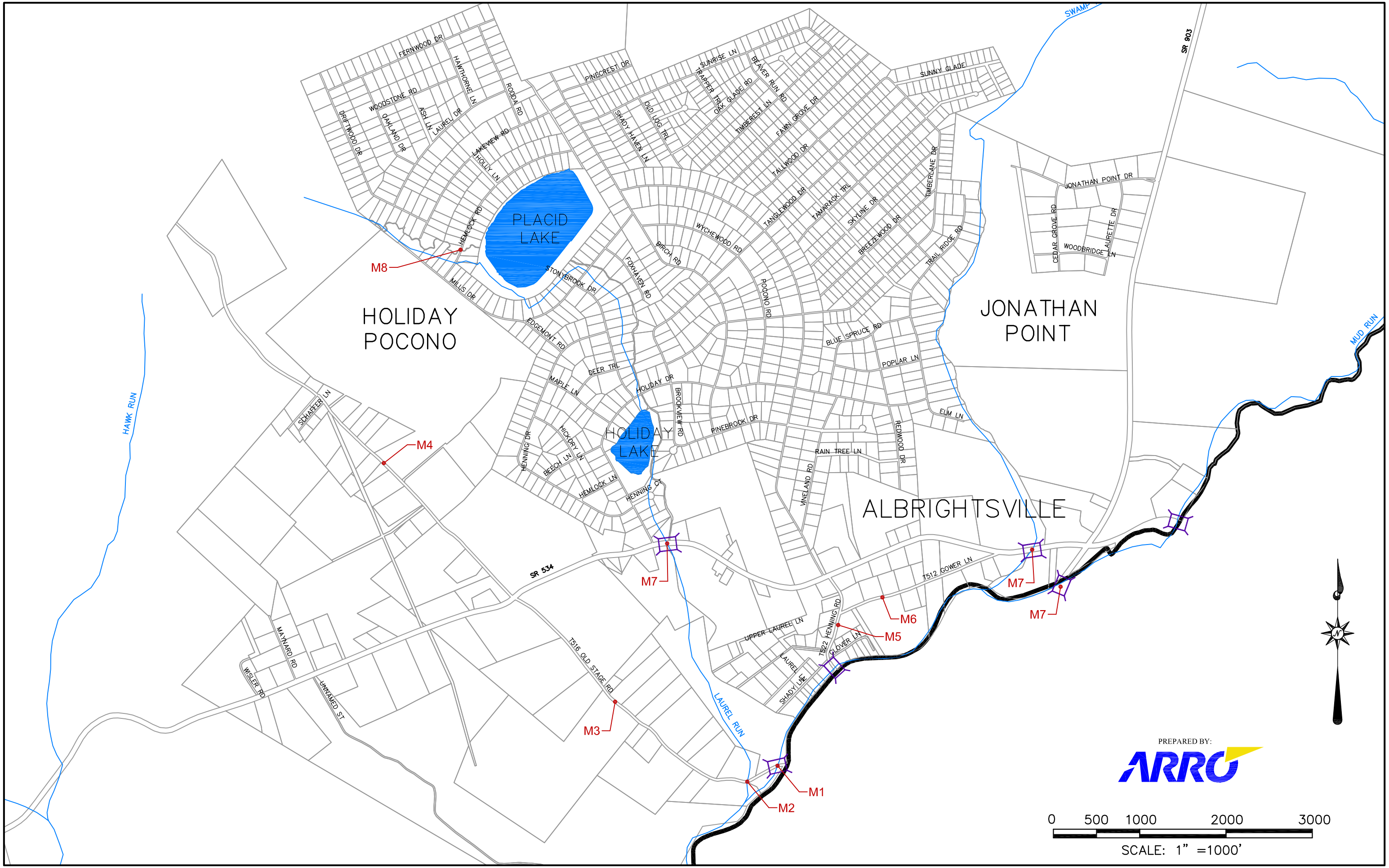
* Priority (L) Low, (M) Medium, (H) High

** T = Township & P = PennDOT

Problem Area	Location	ROW**	Item Description	Quantity	Unit	Unit Cost	Price
L1 (L)	**Snow Ridge Development**		Swale	750	LF	$ 25.00	$ 18,750.00
			Subtotal				$ 18,750.00
			Contingencies (20%)				$ 3,750.00
			Total				**$ 22,500.00**
L2 (L)	**Jack Frost Mountain Road**		Swale	50	LF	$ 15.00	$ 750.00
			18" HDPE Pipe	150	LF	$ 75.00	$ 11,250.00
			Subtotal				$ 12,000.00
			Contingencies (20%)				$ 2,400.00
			Total				**$ 14,400.00**
L4 (L)	**Pocono Mountain Lake**		Retaining Wall	750	SF	$ 30.00	$ 22,500.00
			Subtotal				$ 22,500.00
			Contingencies (20%)				$ 4,500.00
			Total				**$ 27,000.00**
L5 (L)	**Pocono Mountain Lake (Game Drive @ Lake Intersection and Tarantina Drive Intersection)**		18"HDPE Pipe	45	LF	$ 75.00	$ 3,375.00
			Headwall & Flared end section	2	EA	$ 1,250.00	$ 2,500.00
			18"HDPE Pipe	50	LF	$ 75.00	$ 3,750.00
			Headwall & Flared end section	2	EA	$ 1,250.00	$ 2,500.00
			Subtotal				$ 12,125.00
			Contingencies (20%)				$ 2,425.00
			Total				**$ 14,550.00**
L6 (H)	**Kresge Lane**	T	Culvert Replacement	1	LS	$ 60,000.00	$ 60,000.00
		T	Full Depth Pavement Repairs	115	SY	$ 125.00	$ 14,375.00
		T	Level Repair at Driveway	1	LS	$ 1,000.00	$ 1,000.00
		T	Shoulder & Swale Repairs at SR 940	1	LS	$ 4,000.00	$ 4,000.00
		T	Overlay	90	TON	$ 90.00	$ 8,100.00
		T	Shoulder Grading	2000	LF	$ 5.00	$ 10,000.00
			Subtotal				$ 97,475.00
			Contingencies (20%)				$ 19,495.00
			Total				**$ 116,970.00**
L7 (H)	**Laurel Mountain Resort**		Culvert Replacement	1	LS	$ 90,000.00	$ 90,000.00
			Subtotal				$ 90,000.00
			Contingencies (20%)				$ 18,000.00
			Total				**$ 108,000.00**
L8 (L)	**Meckes Lane**	T	Swale	125	LF	$ 12.00	$ 1,500.00
			Subtotal				$ 1,500.00
			Contingencies (20%)				$ 300.00
			Total				**$ 1,800.00**
L9 (L)	**Golden Oaks**		Inlet Adjustment	2	EA	$ 1,000.00	$ 2,000.00
			Subtotal				$ 2,000.00
			Contingencies (20%)				$ 400.00
			Total				**$ 2,400.00**

SECTION E

MUD RUN WATERSHED


PLACID LAKE
HOLIDAY POCONO
JONATHAN POINT
ALBRIGHTSVILLE
HOLIDAY LAKE
HAWK RUN
LAUREL RUN
MUD RUN
SWAMP
SR 903
SR 534
T512 GOWER LN
T516 OLD STAGE RD
T522 HENNING RD
M1
M2
M3
M4
M5
M6
M7
M7
M7
M8
FERNWOOD DR
HAWTHORNE LN
RODDA RD
WOODSTONE RD
ASH LN
LAUREL DR
OAKLAND DR
DRIFTWOOD DR
LAKEVIEW RD
HOLLY LN
HEMLOCK RD
MILLS DR
PINECREST DR
SUNRISE LN
BEAVER RUN RD
TRAPPER TRL
OAK GLADE RD
OLD LOG TRL
SHADY HAVEN LN
TIMBERST LN
FAWN GROVE DR
TALLWOOD DR
SUNNY GLADE
TIMBERLANE DR
TANGLEWOOD DR
TAMARACK TRL
SKYLINE DR
BREEZEWOOD DR
TRAIL RIDGE RD
JONATHAN POINT DR
CEDAR GROVE RD
WOODBRIDGE
LAURETTE DR
WYCHEWOOD RD
BIRCH RD
FOXHAVEN RD
STONYBROOK DR
POCONO RD
EDGEMONT RD
BLUE SPRUCE RD
POPLAR LN
DEER TRL
MAPLE LN
HOLIDAY DR
BROOKVIEW RD
PINEBROOK DR
ELM LN
REDWOOD DR
RAIN TREE LN
VINELAND RD
HENNING DR
HICKORY LN
BEECH LN
HEMLOCK LN
HENNING CT
SCHAFFER LN
UPPER LAUREL LN
LAUREL
SHADY LN
CLOVER LN
MAYNARD RD
WISLER RD
UNNAMED ST
PREPARED BY:
ARRO
0 500 1000 2000 3000
SCALE: 1" =1000'

Mud Run Watershed

The Mud Run watershed will focus on the areas surrounding Albrightsville, Holiday Pocono and contributing drainage areas from Hawk Run, Laurel Run, and Swamp Run.

The following is a description of the problem areas identified, the deficiencies noted, recommendations, color photographs, and an estimated cost to repair. A priority indicator of (L) =Low, (M) = Medium and (H) = High has been included next to the cost to indicate a priority level of each area. An indicator of (T) for Township and (P) for PennDOT has been included after recommendations and on the cost summary for items that include work in the indicated public right-of-ways.

Albrightsville

Area M1

Location: Old Stage Road (T-516) over Mud Run Bridge

Existing Deficiency: The Bridge over Mud Run is a steel stringer bridge with a timber deck and is currently posted for 5 tons. Therefore buses and the majority of plows, delivery, construction and emergency vehicles should not utilize this roadway due to the condition of the bridge. The bridge is perched above the north approach roadway and in the event of flooding the water overtopping the stream banks of the Mud Run will inundate the roadway and cross Old Stage in the direction of an existing dwelling.

Recommendation: The Bridge is owned and maintained by Carbon County and coordination with the County to obtain existing bridge inspection reports and to determine a plan to have the structural deficiency of the bridge removed should be performed. Existing hydraulic opening and waterway calculations should be reviewed to determine if the width of the structure is adequate to pass the applicable rain events of the Mud Run. Immediate corrective action to be performed would be to upgrade the existing stormwater management on the north approach to alleviate flooding on the existing roadway and prevent the loss of life and property of the downstream property. See M2 for more information.

Cost: N/A (H)

Area M2

Location: Old Stage Road (T-516) Between Mud Run and Laurel Run (T)

Existing Deficiency: There is an existing private pond at Laurel Run, adjacent to Old Stage Road, with a 24" RCP outlet pipe under Old Stage Road. The pipe discharges to an existing drainage swale which directs water to the Mud Run. During heavy rain events the section of roadway between the pond at Laurel Run and the Bridge over Mud Run becomes flooded.

Recommendation: Further studies on the capacity of the existing pond, height of berm and hydraulic capacity of the outlet pipe should be performed. In addition runoff down the hill is bypassing the cross pipe and contributing to the ponding issue on the road. The pond is on private property and upgrades by the township to this pond or outlet structure may not be possible. Therefore corrective actions the Township can do within their right-of way is increase the berm on the north side of the road to prevent overtopping of the pond into the roadway as well as directing water on the north side of the road towards the location of the pipe culvert above the downstream receiving channel. Install new inlets on both sides of the road to capture water. On the south side of the roadway a new swale and driveway pipe beneath the existing driveway should be installed to route roadway run-off and stream/pond overtopping away from the existing house and into the receiving downstream channel.

Cost: $19,320.00 (H)

Area M3

Location: Old Stage Road (T-516) From SR 534 to Mud Run (T)

Existing Deficiency: The following information was obtained from the Roadway Evaluation report prepared by ARRO Consulting Inc. dated February 2014. The section of roadway from SR 534 South to the Mud Run Bridge is bituminous pavement approximately 19' wide with areas of minor to moderate cracking. There were numerous cross pipes and roadside swales to collect and direct

stormwater run-off from the existing roadway. Minor drainage issues should be addressed to prevent the deterioration of the roadway.

Recommendations: They are included below (Stationing is from SR534 to Mud Run);

- Re-grade the right and left shoulders from station 0+36 to 7+20
- Provide swale or drainage path through driveway at station 9+41 to 13+00.
- Repair the right edge of the road 4' wide with a bituminous shoulder from station 13+75 to 15+50.
- Re-grade the left shoulder from 16+20 to 17+00.
- Re-grade the left shoulder and discharge at the existing driveway station 17+32 to 18+80.
- Re-grade left shoulder from station 18+80 to 20+95.
- Full depth roadway reconstruction for the right half of the roadway with a bituminous curb and 2' wide shoulder grading from station 21+43 to 22+54.
- Repair/install a bituminous curb and provide 2' wide shoulder re-grading stations 22+87 to 28+53.
- Re-grade left shoulder to downstream cross pipe from station 22+87 to 28+23.
- Re-grade the right shoulder and provide a bituminous swale to the outlet of the cross pipe from stations 30+74 to 31+97.
- Minor shoulder grading both shoulders to the existing pond and existing cross pipe at stations 31+97 to 36+78.
- Minor shoulder grading to the existing bridge over the Mudd Run stations 36+78 to 39+66.
- Perform Crack sealing as conditions require.

Cost: $33,000.00 (M)

Area M4

Location: Old Stage Road (T-516) From SR 534 to Hickory Run State Park (T)

Existing Deficiency: The following information was obtained from the Roadway Evaluation report prepared by ARRO Consulting Inc. dated February 2014. The

section of roadway from SR 534 North to Hickory Run State Park is bituminous pavement approximately 18' wide with areas of moderate to severe cracking with occasional areas of moderate settlement. There were numerous cross pipes and roadside swales to collect and direct stormwater run-off form the existing roadway. A 2" thick 12.5mm bituminous wearing surface for the full width of this section of roadway to station 23+30 and a 3/4" leveling course and oil and chip from station 23+30 to 34+72 is recommended.

Recommendations: Isolated areas of additional full depth paving and shoulder repairs are listed below. (Stationing is from SR534 to Hickory Run);

- Full depth roadway reconstruction of 6' wide of the left edge at stations 17+05 to 17+85.
- Full depth 10' x 6' patch at station 24+90.
- Severe ponding at T-intersection with dirt road (Schaffer Road). Install swales, cross pipes and other means to drain this section of roadway down to Stage Trail.
- Stage Trail into Hickory Sun State park consists of a well groomed dirt road with no significant defects.

Cost: $120,000.00 (M)

Area M5

Location: Henning Road (T-522) (T)

Existing Deficiency: The following information was obtained from the Roadway Evaluation report prepared by ARRO Consulting Inc. dated February 2014. Henning Road is 0.23 miles long and on average approximately 24' wide. The roadway is located in Albrightsville between SR 534 and the Township line at the Henning Road Bridge over Mud Run. Stationing as indicated in this report is starting at SR 534 and running south to the township line.

Recommendation: The typical condition of the roadway is in good condition with the following isolated recommended repairs.

- At station 2+20 there is an existing cross pipe that requires minor crack sealing to the pavement, the inlet end is partially blocked and the natural drainage way of the discharge at the outlet end has been blocked by grading on private property and in a possible utility easement. The blocking of the downstream swale will not impact the township road.
- Right shoulder grading 2+80 to 4+25.
- The existing driveway at station 3+81 should be re-configured with a cross pipe or swale to prevent run-off from entering the roadway.
- The right shoulder from 5+00 to 10+46 has been recently maintained with R3 stone, paved shoulders and open swales that are in adequate condition. Monitoring after heavy storms is recommended.
- Re-grade the left shoulder from 9+35 to 10+21 to allow roadway run-off to leave the road.
- End of Henning Road is at the bridge over Mud Run, ownership and condition of the bridge should be monitored or inspection report verified.

Cost: $4,980.00 (M)

Area M6

Location: Gower Lane (T-512) (T)

Existing Deficiency: The following information was obtained from the Roadway Evaluation report prepared by ARRO Consulting Inc. dated February 2014. Gower Lane is 0.37 miles long and approximately 18' wide. Stationing was measured from Route 534 to Henning Road. The bituminous pavement exhibits many wide cracks and areas of minor settlement.

Recommendation: A 60 lb/sy leveling course followed by a 1.5" wearing course is recommended for the whole length of the roadway. Additional areas of isolated repairs are listed below.

- 40' each way of the cross pipes should be cut back and re-grading of the swale performed as needed.
- From 15+40 to 16+35 minor shoulder grading.
- At approximately station 10+15 the property owner has installed an inlet and filled in the existing roadside swale which is contributing to accelerated

deterioration of the right edge of the roadway. And downstream erosion around the recently installed headwall

- Full depth pavement reconstruction for a 95' long section for the full width of the roadway where the roadway experiences sever cracking and settlement at station 5+40.
- Full depth pavement reconstruction at station 13+88 to 16+35 the right half of the roadway experiences an area of severe wheel rutting.

Cost: $77,880.00 (M)

Area M7

Location: SR 534 and SR 903 bridges over Laurel Run/Swamp Run/Mud Run and the SR 903 Bridges of Mud Run (P)

Existing Deficiency: The existing bridges over Laurel Run, Swamp Run and Mud Run are owned by the Pennsylvania Department and Transportation. No known occurrences of stormwater issues were brought to our attention during this study. The most notable defect during cursory visual inspections was the accumulation of large areas of sediment within the stream impacting stream flow.

Recommendation: The Township should request the most recent bridge inspections reports from PennDOT. However, PennDOT will be responsible for monitoring the condition, maintenance and rehabilitation of the bridges.

Holiday Pocono

Area M8

Location: Holiday Pocono

The development was constructed along the Laurel Run and there are currently (4) existing pipe culverts constructed to cross traffic over the existing stream: Holiday Drive, Mills Drive, Access Road, & Hemlock Road. Holiday Pocono has used their own funds to have independent engineering studies of these pipe culverts. The study found that one of the culverts needed replacement, and

Holiday Pocono is in the process of replacing one of these culverts with a new concrete arch on Holiday Drive.

Placid Lake, a man-made lake, has an intake valve at the upper end of the lake to bring water in to the lake, as needed, and an outlet structure on the other end of the lake. The outlet structure consists of pipe overflows and an outlet valve to allow high water from the lake to spill into Laurel Run. Placid Lake is constructed with a sand beach playground and pavilion around a portion of the lake. This lake is utilized for recreational swimming and paddle boats. No issues with water quantity or water quality were reported by the property owner.

High crowned roadways with roadside swales directing run-off to cross pipes at the intersections is the method used to convey run-off throughout the site. Generally the condition of this system is adequate except for an occurrence in the back portion of the development where there is a large amount of run-off from the adjoining upstream park.

Existing Deficiency:
The existing pipe culvert under Hemlock Road is severely deteriorated, collapsing, and undersized. During heavy rain event the upstream properties are inundated with water.

Recommendation: The culvert should be adequately sized and replaced. Routine vegetation trimming, leaf removal and pipe replacements should be continued by the property management.

Cost: $240,000.00 (H)

M1-Old Stage Road over Mud Run
North Elevation

M1-Old Stage Road over Mud Run
Deteriorated beams and timber deck

M2-Old Stage Road Laurel Run
Private Pond

M2-Old Stage Road
Paved gutter to swale across from Pond

M2-Old Stage Road
Pond and Road Discharge

M2-Old Stage Road
Downstream Channel

M2-Old Stage Road Laurel Run
Flooded Roadway

M2-Old Stage Road
Residential Driveway

M3-Old Stage Road
Eroded Shoulders

M3-Old Stage Road
No shoulders or bermed/leaves directing water on to road

M3-Old Stage Road Laurel Run
Unpaved Driveways at Roadways

M3-Old Stage Road
Flooded Roadway

M4-Old Stage Road
Insufficient and clogged pipe causing overtopping and erosion of roadway

M4-Old Stage Road
Flooded Intersection

M5- Henning Road
No shoulders

M5-Henning Road
Blocked Downstream Channel

M6 - Gower Lane
Insufficient and clogged pipe causing overtopping and erosion of roadway

M7- 534 over Swamp Run
Debris in waterway

M7- SR 534 over Laurel Run
Debris in Waterway

M8-Holiday Pocono
Beach

M8 – Holiday Pocono
By-Pass Channel upstream of Lake

M8 – Holiday Pocono
New Arch Holiday Drive

M8- Holiday Pocono
Culverts under Hemlock Road

M8-Holiday Pocono
Severely Damaged Pipe Culvers

ARRO
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Client: Kidder Township
Project: Stormwater Management Plan
Project No.: 10635.13
Date: 4/15/2015 **Rev.:** 5/27/2015

* Priority (L) Low, (M) Medium, (H) High

** T = Township & P = PennDOT

Problem Area	Location	ROW**	Item Description	Quantity	Unit	Unit Cost	Price
M1 (H)	**Old Stage Road (T-516) over Mud Run Bridge**	T	Superstructure Replacement (Carbon County)	1	LS	$ -	N/A
M2 (H)	**Old Stage Road (T-516) Between Mud Run and Laurel Run**	T	Inlets	2	Each	$ 1,500.00	$ 3,000.00
		T	Swale	1000	LF	$ 7.00	$ 7,000.00
		T	18" Pipe	60	LF	$ 55.00	$ 3,300.00
		T	Berm Construction	400	LF	$ 7.00	$ 2,800.00
			Subtotal				$ 16,100.00
			Contingencies (20%)				$ 3,220.00
			Total				**$ 19,320.00**
M3 (M)	**Old Stage Road (T-516) from SR 534 to Mud Run**	T	Shoulder Grading	3500	LF	$ 3.00	$ 10,500.00
		T	Roadway Reconstruction Various Locations	1	LS	$ 17,000.00	$ 17,000.00
			Subtotal				$ 27,500.00
			Contingencies (20%)				$ 5,500.00
			Total				**$ 33,000.00**
M4 (M)	**Old Stage Road (T-516) from SR 534 to Hickory Run State Park**	T	Schaeffer Road Intersection Storm Improvements	1	LS	$ 25,000.00	$ 25,000.00
		T	Shoulder reconstruction & paving	1	LS	$200,000.00	$ 75,000.00
			Subtotal				$ 100,000.00
			Contingencies (20%)				$ 20,000.00
			Total				**$ 120,000.00**
M5 (M)	**Henning Road**	T	Shoulder Grading	250	LF	$ 10.00	$ 2,500.00
		T	18" HDPE	30	LF	$ 55.00	$ 1,650.00
			Subtotal				$ 4,150.00
			Contingencies (20%)				$ 830.00
			Total				**$ 4,980.00**
M6 (M)	**Gower Lane**	T	Shoulder Grading	175	LF	$ 10.00	$ 1,750.00
		T	Pavement Reconstruction	410	SY	$ 45.00	$ 18,450.00
		T	Leveling Course 1/2" (60lb/sy)	120	TON	$ 110.00	$ 13,200.00
		T	9.5 MM Overlay (1 1/2")	350	TON	$ 90.00	$ 31,500.00
			Subtotal				$ 64,900.00
			Contingencies (20%)				$ 12,980.00
			Total				**$ 77,880.00**
M8 (H)	**Holiday Pocono**		Hemlock Road Culvert	1	LS	$200,000.00	$ 200,000.00
			Subtotal				$ 200,000.00
			Contingencies (20%)				$ 40,000.00
			Total				**$ 240,000.00**