

## **Bethlehem Township, Northampton County Annex**

### **Hazard Mitigation Plan Points-of-Contact**

#### **Primary:**

Angela Kelly  
Emergency Management Coordinator  
4225 Easton Avenue, Bethlehem, PA 18020  
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#### **Alternate:**

Doug Bruce  
Manager  
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### **Municipal Profile**

Bethlehem Township is mainly a residential township with some agriculture, industrial, and commercial property and is located in the southeastern part of Northampton County. It encompasses an area of approximately 14.7 square miles, and has a population of 23,730 (2010 Census). The township is bordered by Bethlehem City and Freemansburg Borough to the southwest; Hanover Township to the west; Lower Nazareth Township to the north; Palmer Township to the east; Easton to the southeast; and Lower Saucon Township to the south.

The Lehigh River forms the township's southern border with Lower Saucon Township. The Monocacy Creek flows from Lower Nazareth Township south through the northwestern part of the township, and into Bethlehem City. Nancy Run creek also flows through the township, beginning in the central portion of the township and flowing south into the Lehigh River.

US Route 22 travels east-west through the northern part of the township. It has an interchange with PA Route 33, which runs north-south through the eastern portion of the township, in the township's northeast corner. PA Route 191 is another north-south roadway, found in the northwestern part of the township. Other major east-west roadways include Freemansburg Avenue in the south, and the William Penn Highway in the central portion of the township. A railroad operated by Norfolk Southern passes through the township's northwest boundaries with roadway crossings at Christian Springs Road and Brodhead Road. Numerous types of goods transported include but are not limited to industrial products, chemicals, agriculture, construction products, coal, metals, paper, and clays.

Lehigh Valley Industrial Parks four (IV) and six (VI) are located in the township. LVIP IV is located on the northwest boundaries bordered by Lower Nazareth and Hanover Township's and LVIP VI is located on the southeast portion of Bethlehem Township. Both industrial parks maintain properties of industrial manufacturing, factories, storage and distribution facilities as well as high hazard facilities with storage and manufacturing of reportable hazardous materials. Located on the southeast boundary is a hospital, cancer center, and medical office building owned and operated by St. Luke's Health Network and has been operational since 2011.

## Municipal Participation

1. Identify municipal stakeholders to be involved in the planning process such as, floodplain administrator, public works, emergency management, engineers, planners, etc., and include their specific role in the process.

Doug Bruce, Township Manager  
Role: Committee Liaison

Richard Kanaskie, Public Works Director  
Role:

Angela Kelly, Fire Marshall  
Role:

2. Identify community stakeholders such as; neighborhood groups, religious groups, major employers / businesses, etc., that will be informed and / or involved in the planning process and describe how they will be involved.
3. Describe how the public **will be engaged** in the current planning process examples, newsletters, social media, etc., **and how they were engaged** since the 2013 Hazard Mitigation Plan.

We will utilize our newsletter and social media to engage the public in the planning process. Unsure how the process was in 2013.

## Compliance with the National Flood Insurance Program (NFIP)

Topic	Identify source of information, if different from the one listed.	Additional Comments
<b>1. Staff Resources</b>		
Is the Community Floodplain Administrator (FPA) or NFIP Coordinator certified?	Community FPA	No
Is floodplain management an auxiliary function?	Community FPA	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GGIS, education or outreach, inspections, engineering capability)	Community FPA	Permit to review and GIS mapping.
What are the barriers to running an effective NFIP program in the community, if any?	Community FPA	None

**Compliance with the National Flood Insurance Program (NFIP) – *continued***

Topic	Identify source of information, if different from the one listed.	Additional Comments
<b>2. Compliance History</b>		
Is the community in good standing with the NFIP?	State NFIP Coordinator, FEMA NFIP Specialist, or community records	Yes
Are there any outstanding compliance issues (i.e., current violations)?		No
When was the most recent Community Assistance Visits (CAV) or Community Assistance Contact (CAC)?		Unknown
Is a CAV or CAC scheduled or needed?		No
<b>3. Regulation</b>		
When did the community enter the NFIP?	NFIP Community Status Book	No information of such on-hand.
Are the Flood Insurance Rate Maps (FIRMs) digital or paper? How are residents assisted with mapping?	Community FPA	Maps are available in paper and on Township GIS systems via Township Website.
Do floodplain regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Community FPA	Floodplain Regulation should at least MEET State minimum requirements. The Township is looking to increase and update these regulations moving forward.
Describe the permitting process	Community FPA, State, FEMA NFIP	Permitting is conducted through the building, construction and zoning department for both zoning and UCC compliance. If site plan or land development are triggered, the Township Planning Department also intercedes.
<b>4. Insurance Summary</b>		
How many NFIP policies are in the community? What is the total premium and coverage?	State NFIP Coordinator or FEMA NFIP Specialist	No information of such on-hand.
How many claims have been paid in the community? What is the total amount of paid claims? How many substantial damage claims have there been?	FEMA NFIP or Insurance Specialist	No information of such on-hand.
How many structures are exposed to flood risk within the community?	Community FPA or GIS Analyst	No information of such on-hand.
Describe any areas of flood risk with limited NFIP policy coverage	Community FPA or FEMA Insurance Specialist	No information of such on-hand.

## Compliance with the National Flood Insurance Program (NFIP) – *continued*

Topic	Identify source of information, if different from the one listed.	Additional Comments
<b>5. Community Rating System (CRS)</b>		
Does the community participate in CRS?	Community FPA, State, or FEMA NFIP	No information of such on-hand.
If so, what is the community's CRS Class Ranking?	Flood Insurance Manual ( <a href="http://www.fema.gov/floodinsurancemanual.gov">http://www.fema.gov/floodinsurancemanual.gov</a> )	No information of such on-hand.
What categories and activities provide CRS points and how can the Class be improved?		No information of such on-hand.
Does the plan include CRS planning requirements?	Community FPA, FEMA CRS Coordinator, or ISO representative	No information of such on-hand.

## Community Assets

Community assets are defined to include anything that is important to the character as well as the function of a community, and can be described in four categories, they are; people, economy, natural environment and built environment. Please identify the community assets and location under each category.

### 1. People

- Concentrations of vulnerable populations such as the elderly, physically or mentally disabled, non-English speaking, and the medically or chemically dependent.

Country Meadows Retirement Home  
Arden Courts – Old Orchard Health Care Center

- Types of visiting populations where large numbers of people are concentrated such as visitors for special events and students.

Freedom High School, Bethlehem, PA  
BASD Vo-Tech, Bethlehem, PA  
Moravian Academy, Bethlehem, PA  
Bethlehem Christian School, Bethlehem, PA  
Miller Heights Elementary School, Bethlehem, PA  
Farmersville Elementary School, Easton, PA  
Northampton Community College (school and residence halls), Bethlehem, PA  
Our Lady of Perpetual Help School, Easton, PA  
Notre Dame High School, Easton, PA  
Bethlehem Township Community Center, Bethlehem, PA  
St. Luke's Hospital – Anderson Campus, Easton, PA

**Community Assets – *continued***

**2. Economy**

Major employers, primary economic sectors such as agriculture and commercial centers where losses would have a severe impact on the community.

Our economy is driven by its location, proximity to the 78, 33, and 22 highways. The biggest impact to our businesses would be the inability to access those transportation corridors.

**3. Natural Environment**

Those areas / features that can provide protective functions that reduce the magnitude of hazard events such as, wetlands or riparian areas, and other environmental features important to protect.

Riparian areas of the Nancy Run Creek, Monocacy Creek, and the Lehigh River.

**4. Built Environment**

- Existing structures such as, concentrations of buildings that may be more vulnerable to hazards based on location, age, construction type and / or condition of use.

Any structures in the floodplain are of concern.

The oldest areas of construction in Bethlehem Township would be in the Heights and the Annex districts, adjacent to Bethlehem City and Freemansburg Borough. The Chetwin Terrace Neighborhood adjacent to Palmer Township is an older neighborhood that is also subject to flooding.

- Infrastructure systems such as water and wastewater facilities, power utilities, transportation systems, communication systems, energy pipelines and storage.

City of Bethlehem Water Tank

Easton Suburban Water Tank

Sanitary Sewer Pump Stations:

Pump Station #1

Pump Station #2

Pump Station #3

Pump Station #4

Pump Station #5

Pump Station #6

Pump Station #7

Pump Station #8

Pump Station #9

Pump Station #10

- High potential loss facilities such as, dams, locations that house hazardous materials, military and / or civilian defense installations.

Two dams

**Community Assets – continued**

- Critical facilities such as, hospitals, medical facilities, police and fires stations, emergency operations centers, shelters, schools and airports / heliports.

St. Luke's Hospital – Anderson Campus, Easton, PA  
 Bethlehem Township Police Department, Bethlehem  
 Bethlehem Township Volunteer Fire and EMS, Bethlehem  
 Nancy Run Fire Company, Bethlehem  
 Bethlehem Township Public Works Building, Bethlehem  
 Bethlehem Township PPIS/BTMA Building, Bethlehem

- Cultural / historical resources such as, museums, parks, stadiums, etc.

The Janet Johnston and William D. Housenick Park, Bethlehem  
 D&L Trail and Canal (along the Lehigh River) and the Lock-Tender's House

**Capability Assessment**

Capability	<ul style="list-style-type: none"> <li>✓ Regulatory</li> <li>✓ Tools</li> <li>✓ Programs</li> </ul>	Status			Department / Agency Responsible	Effect on Hazard Loss Reduction: -Supports -Neutral -Hinders	Change since 2013 Plan? + Positive - Negative	Has the 2013 Plan been integrated into the Regulatory Tool/Program? If so, how?	How can these capabilities be expanded and improved to reduce risk?	Additional Comments
		In Place	Date Adopted or Updated	Under Development						
<b>1. Planning &amp; Regulatory</b>	Comprehensive Plan	X	Updated 2017		Township Administration / Planning Dept.	S				
	Capital Improvement Plan									
	Economic Development Plan									
	Continuity of Operations Plan									
	Stormwater Management Plan / Ordinance	X	Amended 2020		Township Administration / Planning Dept.	S				Adopted 1988
	Open Space Management Plan (or Parks/Rec., Greenways Plan)	X	Amended 2014		Township Administration / Planning Dept.	S				Adopted 1995
	Natural Resource Protection Plan									

**Capability Assessment – continued**

Capability	✓ Regulatory ✓ Tools ✓ Programs	Status			Department / Agency Responsible	Effect on Hazard Loss Reduction: -Supports -Neutral -Hinders	Change since 2013 Plan? + Positive - Negative	Has the 2013 Plan been integrated into the Regulatory Tool/Program? If so, how?	How can these capabilities be expanded and improved to reduce risk?	Additional Comments
		In Place	Date Adopted or Updated	Under Development						
1. Planning & Regulatory	Transportation Plan									
	Historic Preservation Plan									
	Floodplain Management Plan	X	1993		Township Administration / Planning Dept.					
	Farmland Preservation									
	Evacuation Plan									
	Disaster Recovery Plan									
	Hazard Mitigation Plan	X	11/2018		Township Administration / Planning Dept.			N/A		
	Emergency Operations Plan	X	1/2019		Township Administration / Planning Dept.					
	Zoning Regulations	X	2004		Township Administration / Planning Dept.					
	Floodplain Regulations	X	1993		Township Administration / Planning Dept.					
	NFIP Participation	X	1993		Township Administration / Planning Dept.					
	Building Code	X	2004		Township Administration / Planning Dept.					
	Fire Code	X	2009		Township Administration / Planning Dept.					
Other										

**Capability Assessment – continued**

Capability	✓ Staff ✓ Personnel ✓ Resources			Department / Agency	Change since 2013 Plan? + Positive - Negative	How can these capabilities be expanded and improved to reduce risk?	Additional Comments
		Yes	No				
2. Administrative & Technology	Planners (with land use / land development knowledge)	X		Planning			
	Planners or engineers (with natural and / or human-caused hazards knowledge)	X		Planning / Public Works			
	Engineers or professionals trained in building and / or infrastructure construction practices (including building inspectors)	X		Planning / Engineering			
	Emergency Manager	X		Planning			
	Floodplain administrator / manager	X		Planning			
	Land surveyors	X		Engineering			
	Staff familiar with the hazards of the community	X		Planning / Public Works / Police			
	Personnel skilled in Geographical Information Systems (GIS) and / or FEMA's HAZUS program	X		Planning / PPIS			
	Grant writers or fiscal staff to handle large / complex grants	X		Administration / Planning / Public Works			
	Other						



**Capability Assessment – continued**

Capability		Yes	No	Department / Agency	Change since 2013 Plan? + Positive - Negative	How can these capabilities be expanded and improved to reduce risk?	Additional Comments
<b>3. Financial Resources</b>	Capital improvement programming	X		Administrative / Planning / Finance			
	Community Development Block Grants (CDBG)		X				
	Special purposes taxes	X		Finance			
	Gas / Electricity utility fees		X				
	Water / Sewer fees	X		PPIS (Sewer)			
	Stormwater utility fees	X		Being explored			
	Development impact fees	X		Planning			
	General obligation, revenue, and / or special tax bonds	X		Finance			
	Partnering arrangements or intergovernmental agreements	X		Administrative / Legislative			
Other							

Capability	<ul style="list-style-type: none"> <li>✓ Program</li> <li>✓ Organization</li> </ul>	Yes	No	Department / Agency	Change since 2013 Plan? + Positive - Negative	How can these capabilities be expanded and improved to reduce risk?	Additional Comments
<b>4. Education &amp; Outreach</b>	Firewise Communities Certification		X				
	StormReady Certification		X				
	Natural disaster or safety-related school programs		X				
	Ongoing public education or information programs such as, responsible water use, fire safety, household preparedness, and environmental education.	X		Administration / Planning / Public Works			
	Public-private partnership initiatives addressing disaster related issues.		X				
	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.		X				
	Other						

**Capability Assessment – continued**

Capability		Degree of Capability			Change since the 2013 Hazard Mitigation Plan? If so, how?	Additional Comments
		Limited	Moderate	High		
5. Self – Assessment	Planning and Regulatory			X		
	Administrative and Technical			X		
	Financial			X		
	Education and Outreach			X		

**Known or Anticipated Future Development / Redevelopment**

Development / Property Name	Type of Development	Number of Structures	Location	Known Hazard Zone	Description / Status
Traditions of America at Green Pond	55+ Residential Subdivision		Green Pond Road	Sinkholes, Stormwater	Tentative Plan Approval
Mill Creek Corporate Center	Office / business Campus		William Penn Highway (behind Park and Ride)	Sinkholes, Stormwater	Phase 1 Preliminary Plan submitted and tabled.
Hope Road / Chrin V7 Redevelopment	Mixed Service / Retail Village		Hope Road & William Penn Highway	Sinkholes, Stormwater	Sketch Plan Submitted with a Strong Developer Intent to Proceed.
Brodhead Road Distribution Center	Distribution Center / Logistics	1	Brodhead Road	Sinkholes, Stormwater	Prelim. / Final Plan Conditionally Approved by Township, awaiting 3 <sup>rd</sup> party agency approvals.
Annunciation Greek Orthodox Church	Church & Accessory Uses	1	Bethman Road & Church Road	Sinkholes, Stormwater	Township Prelim. / Final Conditional Approval
Freemansburg Square Major Subdivision	Mixed Service / Retail Village		Freemansburg Avenue & University Drive	Sinkholes, Stormwater	Prelim. / Final Conditional Approval with an anticipated modification of plan forthcoming.
Hecktown Road Business Park Lot 4	Distribution Center / Logistics	1	Commerce Park Drive (shared development – LNT and BT)	Sinkholes, Stormwater	Administrative Review with Planning Commission
Kings View Avenue MOB	Medical Office Building	1	Freemansburg Avenue and Kings View Avenue	Sinkholes, Stormwater	Sketch Plan before Township

**Known or Anticipated Future Development / Redevelopment – *continued***

<b>Development / Property Name</b>	<b>Type of Development</b>	<b>Number of Structures</b>	<b>Location</b>	<b>Known Hazard Zone</b>	<b>Description / Status</b>
Madison Farms	Mixed Service / Retail / Residential Village	Many	Freemansburg Avenue (with internal road network)	Sinkholes, Stormwater	Approved, under construction, future phases to start soon.
Nancy Run Estates Phases 7, 8, 9, 10	Residential Subdivision		New Road Network off Washington Street	Sinkholes, Stormwater & Nancy Run Flooding	Final Plans Approved by Township BOC
St. Luke's University Healthcare Network Anderson Campus	Medical Campus	Many	Freemansburg Avenue	Sinkholes, Stormwater	"Tower 2" Approved by Township BOC

**Natural & Non-Natural Event History Specific to Bethlehem Township**

<b>Type of Event and Date(s)</b>	<b>FEMA Disaster # (if applicable)</b>	<b>Local Damage(s) or Loss(es)</b>
Rain and flooding, June 2015		Storm damages repaired by the municipality
Severe winter storm / snowstorm, January 22 - 23, 2016	DR-4267-PA	FEMA money received for Public Works Overtime - \$51,538
Pennsylvania COVID-19 Pandemic – 1/2020	DR-4506-PA	Emergency Protective measures to combat COVID-19 Pandemic.
Remnants of Hurricane Ida	DR-4618-PA	Assistance to eligible individuals and families affected by this disaster.

## 2013 Municipal Action Plan Status

Existing Mitigation Action (from 2013 Hazard Mitigation Plan)		Status					Additional Comments
		No Progress / Unknown	In Progress	Continuous	Completed	Discontinued	
1	Stormwater management programs, mitigation efforts.		X	X			The Township has been engaged with a stormwater engineer to map the stormwater system, conduct a hydrological study, and make recommendations to the Commissioners on capital improvements.
2	Hazardous Materials Release, education, prevention, certification of responders to control and mitigate hazardous materials releases.			X			
3	Maintain compliance with and good-standing in the NFIP including adoption and enforcement of floodplain management requirements (e.g. regulating all new and substantially improved construction in Special Hazard Flood Areas), floodplain identification and mapping, and flood insurance outreach to the community.			X			
4	<p>Conduct and facilitate community and public education and outreach for residents and businesses to include, but not be limited to, the following to promote and effect natural hazard risk reduction: Willow Park Road, LVIP four and six</p> <ul style="list-style-type: none"> <li>• Provide and maintain links to the HMP website, and regularly post notices on the County/municipal homepage(s) referencing the HMP webpages.</li> <li>• Prepare and distribute informational letters to flood vulnerable property owners and neighborhood associations, explaining the availability of mitigation grant funding to mitigate their properties, and instructing them on how they can learn more and implement mitigation.</li> <li>• Use email notification systems and newsletters to better educate the public on flood insurance, the availability of mitigation grant funding, and personal natural hazard risk reduction measures.</li> <li>• Work with neighborhood associations, civic and business groups to disseminate information on flood insurance and the availability of mitigation grant funding.</li> </ul>	X					
5	Continue to support the implementation, monitoring, maintenance, and updating of this Plan, as defined in Section 7.0	X					
6	Complete the ongoing updates of the Comprehensive Emergency Management Plans			X			

**2013 Municipal Action Plan Status – continued**

Existing Mitigation Action (from 2013 Hazard Mitigation Plan)		Status					Additional Comments
		No Progress / Unknown	In Progress	Continuous	Completed	Discontinued	
7	Create/enhance/maintain mutual aid agreements with neighboring communities for continuity of operations.			X			
8	Identify and develop agreements with entities that can provide support with FEMA/PEMA paperwork after disasters; qualified damage assessment personnel – Improve post-disaster capabilities – damage assessment; FEMA/PEMA paperwork compilation, submissions, record-keeping			X			
9	Work with regional agencies (i.e. County and PEMA) to help develop damage assessment capabilities at the local level through such things as training programs, certification of qualified individuals (e.g. code)			X			

**Notes:**

1. Actions not carried through to the 2018 Action Plan are so noted.
2. To maintain National Flood Insurance Program (NFIP) compliance, actions related to the NFIP were carried through to the 2018 Action Plan even if identified by the municipality as completed.

**2018 Mitigation Action Plan**

Mitigation Action		Mitigation Technique Category	Hazard(s) Addressed	Priority (H / M / L)	Estimated Cost	Potential Funding	Lead Agency / Department	Implementation Schedule	Applies to New and / or Existing Structures
<b>1</b>	Stormwater management programs, mitigation efforts.	Structure and Infrastructure	Flood	Medium	High	Federal, State, County Grant funding	Township Engineer	Short-term (depending on funding)	New & Existing
<b>2</b>	Hazardous Materials Release, education, prevention, certification of emergency responders to control and mitigate hazardous materials releases	Education and Awareness	All Hazards	Medium	Low	Federal, State and Local Training Programs	Emergency Services	Ongoing	New & Existing
<b>3</b>	Maintain compliance with and goodstanding in the NFIP including adoption and enforcement of floodplain management requirements (e.g. regulating all new and substantially improved construction in Special Hazard Flood Areas), floodplain identification and mapping, and flood insurance outreach to the community.	Local Plans and Regulations	Flood	High	Low - Medium	Municipal Budget	Municipality (via Municipal Engineer/NFIP Floodplain Administrator) with support from PEMA, ISO FEMA	Ongoing	New & Existing

**2018 Mitigation Action Plan – continued**

	<b>Mitigation Action</b>	<b>Mitigation Technique Category</b>	<b>Hazard(s) Addressed</b>	<b>Priority (H / M / L)</b>	<b>Estimated Cost</b>	<b>Potential Funding</b>	<b>Lead Agency / Department</b>	<b>Implementation Schedule</b>	<b>Applies to New and / or Existing Structures</b>
4	<p>Conduct and facilitate community and public education and outreach for residents and businesses to include, but not be limited to, the following to promote and effect natural hazard risk reduction: Willow Park Road, LVIP four and six Provide and maintain links to the HMP website, and regularly post notices on the County/municipal homepage(s) referencing the HMP webpages. - Prepare and distribute informational letters to flood vulnerable property owners and neighborhood associations, explaining the availability of mitigation grant funding to mitigate their properties, and instructing them on how they can learn more and implement mitigation. - Use email notification systems and newsletters to better educate the public on flood insurance, the availability of mitigation grant funding, and personal natural hazard risk reduction measures. - Work with neighborhood associations, civic and business groups to disseminate information on flood insurance and the availability of mitigation grant funding.</p>	Education and Awareness	All Hazards	High	Low-Medium	Municipal Budget	Municipality with support from Planning Partners, PEMA, FEMA	Short-term	N/A

**2018 Mitigation Action Plan – continued**

Mitigation Action		Mitigation Technique Category	Hazard(s) Addressed	Priority (H / M / L)	Estimated Cost	Potential Funding	Lead Agency / Department	Implementation Schedule	Applies to New and / or Existing Structures
5	Continue to support the implementation, monitoring, maintenance, and updating of this Plan, as defined in Section 7.0	All Categories	All Hazards	High	Low – High (for 5-year update)	Municipal Budget, possibly FEMA Mitigation Grant Funding for 5-year update	Municipality (via mitigation planning point of contacts) with support from Planning Partners (through their Points of Contact), PEMA	Ongoing	New & Existing
6	Complete the ongoing updates of the Comprehensive Emergency Management Plans	Local Plans and Regulations	All Hazards	High	Low	Municipal Budget	Municipality with support from PEMA	Ongoing	New & Existing
7	Create/enhance/maintain mutual aid agreements with neighboring communities for continuity of operations.	All Categories	All Hazards	High	Low	Municipal Budget	Municipality with support from surrounding municipalities and County	Ongoing	New & Existing
8	Develop and maintain capabilities to process FEMA/PEMA paperwork after disasters; qualified damage assessment personnel – Improve post-disaster capabilities – damage assessment; FEMA/PEMA paperwork compilation, submissions, record keeping.	Education and Awareness	All Hazards	Medium	Medium	Municipal Budget	Municipality with support from County, PEMA, FEMA	Short-term	N/A



**2018 Mitigation Action Plan – continued**

Mitigation Action		Mitigation Technique Category	Hazard(s) Addressed	Priority (H / M / L)	Estimated Cost	Potential Funding	Lead Agency / Department	Implementation Schedule	Applies to New and / or Existing Structures
9	Work with regional agencies (i.e. County and PEMA) to help develop damage assessment capabilities at the local level through such things as training programs, certification of qualified individuals (e.g. code)	Education and Awareness	All Hazards	Medium	Medium	Municipal Budget, FEMA HMA grant programs	Municipality with support from County, PEMA	Short-, long-term (depending on funding)	N/A
10	Walnut Street and 10th Street Drainage Issues: Incorporation of roadside swales along Walnut Street and Turner Street along with extension of existing 36" storm pipe to Nancy Run. This system was approximated with the goal of capturing and conveying the 25-year (4%) storm event.	Structure and Infrastructure	Flooding	High	High	FEMA Mitigation Funding, Municipal Budget	Municipality with support	Depends on Funding	Existing
11	Santee Road/Sunset Drive/Easton Avenue Drainage Issues: Initially Preferred Alternative – Add Detention Storage in North Hills Area of City and Township through expansion of peak flow rate control facilities (detention basins) and green infrastructure techniques, it would be feasible to greatly reduce the frequency and extent of flooding for the 25-year (4%) design storm by targeting areas within the Township and City for retrofit opportunities. The structural improvements needed to reduce flooding along Santee Road, Sunset Drive, Easton Avenue and Willow Park Road would include: 24.4 ac-ft. of upstream volume storage and 0.5 acres of bio retention (green infrastructure).	Structure and Infrastructure	Flooding	High	High	FEMA Mitigation Funding, Municipal Budget	Municipality with support	Depends on Funding	Existing

**2018 Mitigation Action Plan – continued**

Mitigation Action	Mitigation Technique Category	Hazard(s) Addressed	Priority (H / M / L)	Estimated Cost	Potential Funding	Lead Agency / Department	Implementation Schedule	Applies to New and / or Existing Structures
<p><b>12</b> Blue Restaurant and ABE Salvage Drainage Issues                      Alternative 1: This alternative involves replacing a trunk-line main in front of Blue Restaurant and creating a new conveyance down Farmersville Road directly to the Nancy Run. This system was approximated with the goal of capturing and conveying the 25 year (4%) storm event.                      Alternative 2: This alternative involves decommissioning the existing pipe that runs through ABE salvage yard and implementing dual pipes along Farmersville Road. This system was approximated with the goal of capturing and conveying the 25 year (4%) storm event.</p>	<p>Structure and Infrastructure</p>	<p>Flooding</p>	<p>High</p>	<p>High</p>	<p>FEMA Mitigation Funding, Municipal Budget</p>	<p>Municipality with support</p>	<p>Depends on Funding</p>	<p>Existing</p>

**2018 Mitigation Action Plan – continued**

Mitigation Action	Mitigation Technique Category	Hazard(s) Addressed	Priority (H / M / L)	Estimated Cost	Potential Funding	Lead Agency / Department	Implementation Schedule	Applies to New and / or Existing Structures
<p><b>13</b> Willow Park Road Flooding Issues                      Alternative 1: This alternative involves the establishment of flood protection barriers (shields) to protect properties, which are repetitively impacted by high flood stage events. This system was approximated with the goal of capturing and conveying the 25-year (4%) storm event.                      Alternative 2: This alternative would involve the streambank restoration as a means of expanding the capacity of the watercourse within this area through floodplain improvements. This alternative would require purchase of private property; however, it would provide a high degree of sediment reduction credit, which could be thought of as an offsetting cost measure. This system was approximated with the goal of capturing and conveying the 25-year (4%) storm event.</p>	Structure and Infrastructure	Flooding	High	High	FEMA Mitigation Funding, Municipal Budget	Municipality with support	Depends on Funding	Existing

**2018 Mitigation Action Plan – continued**

	<b>Mitigation Action</b>	<b>Mitigation Technique Category</b>	<b>Hazard(s) Addressed</b>	<b>Priority (H / M / L)</b>	<b>Estimated Cost</b>	<b>Potential Funding</b>	<b>Lead Agency / Department</b>	<b>Implementation Schedule</b>	<b>Applies to New and / or Existing Structures</b>
14	<p>Sculac Drive and Wilson Avenue Flooding</p> <p>Alternative 1: (Initially Preferred Alternative) This alternative involves the extension of a culvert system to collect and convey runoff from a tributary of the Lehigh River. This conveyance system is proposed to include five structures and approximately 415 LF of 72" RCP. This system was sized to capture and convey the 100 Year (1%) storm event.</p> <p>Alternative 2: (Value Engineering Option) This alternative follows the same design approach as alternative 1 but instead considers the use of structural steel plate corrugated metal pipe (CMP). This is presented as a value engineering option; however, it was not selected as an initially preferred alternative since the service life of a CMP collection header would not compare well to the service life of RCP.</p>	Structure and Infrastructure	Flooding	High	High	FEMA Mitigation Funding, Municipal Budget	Municipality with support	Depends on Funding	Existing

**2018 Mitigation Action Plan – continued**

	<b>Mitigation Action</b>	<b>Mitigation Technique Category</b>	<b>Hazard(s) Addressed</b>	<b>Priority (H / M / L)</b>	<b>Estimated Cost</b>	<b>Potential Funding</b>	<b>Lead Agency / Department</b>	<b>Implementation Schedule</b>	<b>Applies to New and / or Existing Structures</b>
<b>15</b>	<p>Chetwin Terrace Drainage Issues Alternative: 1 (Initially Preferred Alternative) This alternative involves the establishment of a stormwater collection system to collect and convey runoff within the Chetwin Terrace neighborhood. This system was approximated with the goal of capturing and conveying the 25-year (4% probability of exceedance) storm event.</p> <p>Alternative 2: This alternative is similar to alternative 1. However in addition, would include opportunities for water quality reduction credits by utilization of a porous pipe system and implementation of rain gardens throughout Chetwin Terrace neighborhood.</p>	Structure and Infrastructure	Flooding	High	High	FEMA Mitigation Funding, Municipal Budget	Municipality with support	Depends on Funding	Existing

**2018 Mitigation Action Plan – continued**

Mitigation Action	Mitigation Technique Category	Hazard(s) Addressed	Priority (H / M / L)	Estimated Cost	Potential Funding	Lead Agency / Department	Implementation Schedule	Applies to New and / or Existing Structures
<p>16 William Penn Highway and Ohio Street Flooding Issues Alternative 1: (Initially Preferred Alternative) This alternative considers the extension of a storm main and was sized to capture and convey the 25-year storm event. This alternative would require coordination with Northampton Country Club as permission and potential easements would be required from Northampton Country Club (to be conveyed to the Township). It is expected that this alternative would also benefit the Country Club, as their driving range would likely be better drained during typical rainfall events than it is currently. Alternative 2: Same as the initially preferred alternative, however this alternative includes provisions for perforated piping and open bottom inlets to provide volume removal benefitting flood control and water quality (MS4/PRP) concerns. The geological makeup of this region of the Township includes many karst formations, which cause concern with sinkholes. Any area where infiltration is proposed should also include a detailed geological investigation. Consequently, the budget for this item has been increased to consider this investigation.</p>	Structure and Infrastructure	Flooding	High	High	FEMA Mitigation Funding, Municipal Budget	Municipality with support	Depends on Funding	Existing

**Notes:****Estimated Costs:**

- Where actual project costs have been reasonable estimated: Low = < \$10,000; Medium = \$10,000 to \$100,000; High = > \$100,000;
- Where actual project costs cannot reasonably be established at this time:
  - Low** = Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
  - Medium** = Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
  - High** = Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

**Potential Funding (FEMA HMA):**

- **BRIC** = Building Resilient Infrastructure and Communities
- **FMA** = Flood Mitigation Assistance Grant Program
- **HMGP** = Hazard Mitigation Grant Program
- **HSGP** = Homeland Security Grant Program
- **EMPG** = Emergency Management Performance Grant

**Implementation Schedule:**

- **Short Term** = 1 to 5 years
- **Long Term** = 5 years or greater
- **DOF** = Depending on Funding

**Applies to New and/or Existing Structures:**

- **N/A** = Not Applicable