Flood Risk Report

Lower Delaware River Watershed, Pennsylvania Study (HUC# 02040202)

County: Bucks, Chester, Delaware, Montgomery, Philadelphia

Community Names: (continued on next page)

State: Pennsylvania

Report Number 001

08/01/2016

FINAL

FEMA

RiskMAP

Increasing Resilience Together

Project Area Community List

Community Name	Community Name
Township of Bensalem, Bucks County	
Township of Lower Southampton, Bucks County	
Township of Aston, Delaware County	
City of Chester, Delaware County	
Township of Chester, Delaware County	
Borough of Collingdale, Delaware County	
Borough of Colwyn, Delaware County	
Borough of Darby, Delaware County	
Township of Darby, Delaware County	
Borough of Eddystone, Delaware County	
Borough of Folcroft, Delaware County	
Borough of Glenolden, Delaware County	
Borough of Lansdowne, Delaware County	
Borough of Marcus Hook, Delaware County	
Township of Nether Providence, Delaware County	
Borough of Norwood, Delaware County	
Borough of Parkside, Delaware County	
Borough of Prospect Park, Delaware County	
Township of Ridley, Delaware County	
Borough of Ridley Park, Delaware County	
Borough of Sharon Hill, Delaware County	
Township of Tinicum, Delaware County	
Borough of Trainer, Delaware County	
Borough of Upland, Delaware County	
Township of Upper Darby, Delaware County	
Borough of Yeadon, Delaware County	
City of Philadelphia	

Preface

The Department of Homeland Security (DHS), Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states, tribes, and local communities with flood risk information and tools that they can use to increase their resilience to flooding and better protect their citizens. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP has transformed traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

This Flood Risk Report (FRR) provides non-regulatory information to help local or tribal officials, floodplain managers, planners, emergency managers, and others better understand their flood risk, take steps to mitigate those risks, and communicate those risks to their citizens and local businesses.

Because flood risk often extends beyond community limits, the FRR provides flood risk data for the entire Flood Risk Project as well as for each individual community. This also emphasizes that flood risk reduction activities may impact areas beyond jurisdictional boundaries.

Flood risk is always changing, and there may be other studies, reports, or sources of information available that provide more comprehensive information. The FRR is not intended to be regulatory or the final authoritative source of all flood risk data in the project area. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.

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FLOOD RISK REPORT

1 Introduction

1.1 About Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry areas. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the generation of unwanted debris. Severe flooding can destroy buildings, ruin crops, and cause critical injuries or death.

Flooding is a natural part of our world and our communities. Flooding becomes a significant hazard, however, when it intersects with the built environment.

1.1.1 Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Just because one knows where a flood occurs does not mean they know the **risk** of flooding. The most common method for determining flood risk, also referred to as vulnerability, is to identify the probability of flooding and the consequences of flooding. In other words:

Flood Risk = Probability x Consequences; where

- **Probability** = the likelihood of occurrence
- **Consequences** = the estimated impacts associated with the occurrence

The probability of a flood is the likelihood that a flood will occur. The probability of flooding can change based on physical, environmental, and/or contributing engineering factors. Factors affecting the probability that a flood will impact an area range from changing weather patterns to the existence of mitigation projects. The ability to assess the probability of a flood and the level of accuracy for that assessment are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

The consequences of a flood are the estimated impacts associated with the flood occurrence. Consequences relate to humans' activities within an area and how a flood impacts the natural and built environments.

Which picture below shows more flood risk?

Even if you assume that the flood in both pictures was the same probability—let's say a 10-percent-annual-chance flood—the consequences in terms of property damage and potential injury as a result of the flood in the bottom picture are much more severe. Therefore, the flood risk in the area shown in the bottom picture is higher.

1.1.2 Flood Risk Products

Through Risk MAP, FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year. FEMA understands that flood risk is dynamic—that flooding does not stop at a line on a map—and as such, provides the following flood risk products:

Whether or not an area might flood is one consideration. The extent to which it might flood adds a necessary dimension to that understanding.

- **Flood Risk Report (FRR)**: The FRR presents key risk analysis data for the Flood Risk Project.
- **Flood Risk Map (FRM)**: Like the example found in Section 3.1 of this document, the FRM shows a variety of flood risk information in the project area. More information about the data shown on the FRM may be found in Section 2 of this report.
- **Flood Risk Database (FRD)**: The FRD is in Geographic Information System (GIS) format and houses the flood risk data developed during the course of the flood risk analysis that can be used and updated by the community. After the Flood Risk Project is complete, this data can be used in many ways to visualize and communicate flood risk within the Flood Risk Project.

These Flood Risk Products provide flood risk information at both the Flood Risk Project level and community level (for those portions of each community within the Flood Risk Project). They demonstrate how decisions made within a Flood Risk Project can impact properties downstream, upstream, or both. Community-level information is particularly useful for mitigation planning and emergency management activities, which often occur at a local jurisdiction level.

1.2 Uses of this Report

The goal of this report is to help inform and enable communities and tribes to take action to reduce flood risk. Possible users of this report include:

Vulnerability of infrastructure is another important consideration.

- Local elected officials
- Floodplain managers
- Community planners
- Emergency managers
- Public works officials
- Other special interests (e.g., watershed conservation groups, environmental awareness organizations, etc.)

State, local, and tribal officials can use the summary information provided in this report, in conjunction with the data in the FRD, to:

- **Update local hazard mitigation plans.** As required by the 2000 Federal Stafford Act, local hazard mitigation plans must be updated at least every five (5) years. Summary information presented in Section 3 of this report and the FRM can be used to identify areas that may need additional focus when updating the risk assessment section of a local hazard mitigation plan. Information found in Section 4 pertains to the different mitigation techniques and programs and can be used to inform decisions related to the mitigation strategy of local plans.
- **Update community comprehensive plans.** Planners can use flood risk information in the development and/or update of comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes may be changed to better provide for appropriate land uses in high-hazard areas.
- **Update emergency operations and response plans.** Emergency managers can identify low-risk areas for potential evacuation and sheltering and can help first responders avoid areas of high-depth flood water. Risk assessment results may reveal vulnerable areas, facilities, and infrastructure for which planning for continuity of operations plans (COOP), continuity of government (COG) plans, and emergency operations plans (EOP) would be essential.

Flooding along the Wabash River in Clark County, Illinois, contributed to a federal disaster declaration on June 24, 2008.

- **Develop hazard mitigation projects.** Local officials (e.g., planners and public works officials) can use flood risk information to re-evaluate and prioritize mitigation actions in local hazard mitigation plans.
- **Communicate flood risk.** Local officials can use the information in this report to communicate with property owners, business owners, and other citizens about flood risks, changes since the last FIRM, and areas of mitigation interest. The report layout allows community information to be extracted in a fact sheet format.
- **Inform the modification of development standards.** Floodplain managers, planners, and public works officials can use information in this report to support the adjustment of development standards for certain locations. For example, heavily developed areas tend to increase floodwater runoff because paved surfaces cannot absorb water, indicating a need to adopt or revise standards that provide for appropriate stormwater retention.

The Flood Risk Database, Flood Risk Map, and Flood Risk Report are “non-regulatory” products. They are available and intended for community use but are neither mandatory nor tied to the regulatory development and insurance requirements of the National Flood Insurance Program (NFIP). They may be used as regulatory products by communities if authorized by state and local enabling authorities.

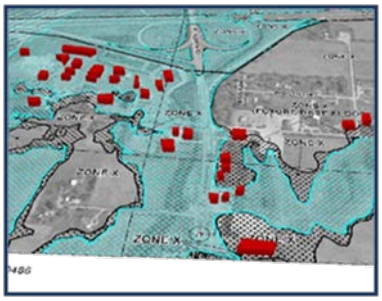
1.3 Sources of Flood Risk Assessment Data Used

To assess potential community losses, or the consequences portion of the "risk" equation, the following data is typically collected for analysis and inclusion in a Flood Risk Project:

- Information about local assets or resources at risk of flooding
- Information about the physical features and human activities that contribute to that risk
- Information about where the risk is most severe

For most Flood Risk Projects, FEMA uses the following sources of flood risk information to develop this report:

- Hazus-estimated flood loss information
- Total Exposure in Floodplain (TEIF)
- New engineering analyses (e.g., coastal, hydrologic, and/or hydraulic modeling) to develop new flood boundaries
- Locally supplied data (see Section 7 for a description)
- Sources identified during the Discovery process



FEMA data can be leveraged to identify and measure vulnerability by including local building information (i.e. building type). The examples above show various ways to display flooding intersecting with buildings.

1.4 Related Resources

For a more comprehensive picture of flood risk, FEMA recommends that state and local officials use the information provided in this report in conjunction with other sources of flood risk data, such as those listed below.

- **FIRMs and FIS Reports.** This information indicates areas with specific flood hazards by identifying the limit and extent of the 1-percent-annual-chance floodplain and the 0.2-percent-annual-chance floodplain. FIRMs and FIS Reports do not identify all floodplains in a Flood Risk Project. The FIS Report includes summary information regarding other frequencies of flooding, as well as flood profiles for riverine sources of flooding. In rural areas and areas for which flood hazard data are not available, the 1-percent-annual-chance floodplain may not be identified. In addition, the 1-percent-annual-chance floodplain may not be identified for flooding sources with very small drainage areas (less than 1 square mile).
- **Total Exposure in Floodplain (TEIF) Loss Estimation Database.** This tool ranks each community in the project area by its total potential economic losses in the special flood hazard area, and geospatially associates those losses, aggregated to each Census

block. The economic losses are estimates, derived from national level datasets – 2010 Census and American Community Survey (ACS) data applying 2012 RS Means valuations – and should be used for relative comparison of potential losses and risk. The National Flood Hazard Layer that was used to develop TEIF was extracted in May 2013. This tool can help to identify areas and populations of highest risk, prioritize hazard mitigation projects and inform resource allocation for pre-disaster planning (FEMA, 2013b).

- **Hazus Flood Loss Estimation Reports.** Hazus can be used to generate reports, maps and tables on potential flood damage that can occur based on new/proposed mitigation projects or future development patterns and practices. Hazus can also run specialized risk assessments, such as what happens when a dam or levee fails. Flood risk assessment tools are available through other agencies as well, including the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Army Corps of Engineers (USACE). Other existing watershed reports may have a different focus, such as water quality, but may also contain flood risk and risk assessment information. See Section 6 for additional resources.
- **Flood or multi-hazard mitigation plans.** Local hazard mitigation plans include risk assessments that contain flood risk information and mitigation strategies that identify community priorities and actions to reduce flood risk. This report was informed by any existing mitigation plans in the Flood Risk Project.
- **FEMA Map Service Center (MSC).** The MSC has useful information, including fly sheets, phone numbers, data, etc. Letters of Map Change are also available through the MSC. The user can view FIRM databases and the National Flood Hazard Layer (NFHL) Database.

2 Flood Risk Analysis

2.1 Overview

Flood hazard identification uses FIRMs, and FIS Reports identify where flooding can occur along with the probability and depth of that flooding. Flood risk assessment is the systematic approach to identifying how flooding impacts the environment. In hazard mitigation planning, flood risk assessments serve as the basis for mitigation strategies and actions by defining the hazard and enabling informed decision making. Fully assessing flood risk requires the following:

- Identifying the flooding source and determining the flood hazard occurrence probability
- Developing a complete profile of the flood hazard including historical occurrence and previous impacts
- Inventorying assets located in the identified flood hazard area
- Estimating potential future flood losses caused by exposure to the flood hazard area

Flooding impacts non-populated areas too, such as agricultural lands and wildlife habitats.

Flood risk analyses are different methods used in flood risk assessment to help quantify and communicate flood risk. Flood risk analysis can be performed on a large scale (state, community) level and on a very small scale (parcel, census block). Advantages of large-scale flood risk analysis, especially at the watershed level, include identifying how actions and development in one community can affect areas up- and downstream. On the parcel or census block level, flood risk analysis can provide actionable data to individual property owners so they can take appropriate mitigation steps.

2.2 Analysis of Risk

The FRR, FRM, and FRD contain a variety of flood risk analysis information and data to help describe and visualize flood risk within the project area. Depending on the scope of the Flood Risk Project for this project area, this information may include some or all of the following elements:

- Changes Since Last FIRM
- Flood Depth and Analysis Grids
- Flood Risk Assessments
- Areas of Mitigation Interest

State and Local Hazard Mitigation Plans are required to have a comprehensive all-hazard risk assessment. The flood risk analyses in the FRR, FRM, and FRD can inform the flood hazard portion of a community's or state's risk assessment. Further, data in the FRD can be used to develop information that meets the requirements for risk assessments as it relates to the hazard of flood in hazard mitigation plans.

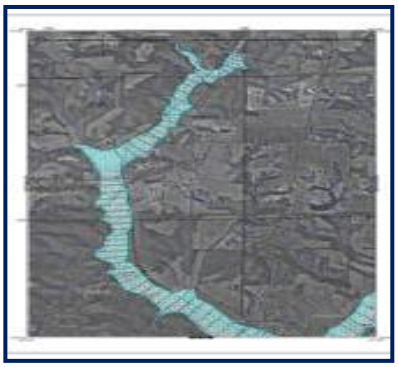
2.2.1 Changes Since Last FIRM

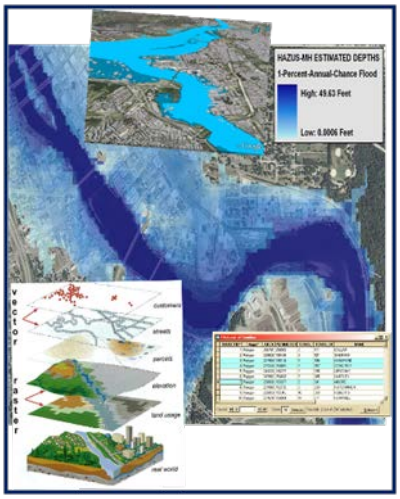
The Changes Since Last FIRM (CSLF) dataset, stored in the FRD and shown in Section 3 of this report, illustrates where changes to flood risk may have occurred since the last FIRM was published for the subject area. Communities can use this information to update their mitigation plans, specifically quantifying "what is at risk" and identifying possible mitigation activities.

The CSLF dataset identifies changes in the Special Flood Hazard Area (SFHA) and floodway boundary changes since the previous FIRM was developed. These datasets quantify land area increases and decreases to the SFHA and floodway, as well as areas where the flood zone designation has changed (e.g., Zone A to AE, AE to VE, shaded Zone X protected by levee to Zone AE for de-accredited levees).

The CSLF dataset is created in areas that were previously mapped using digital FIRMs. The CSLF dataset for this project area includes:

- **Floodplain and/or Floodway Boundary Changes**: Any changes to the existing floodplain or floodway boundaries are depicted in this dataset.
- **Floodplain Designation Changes**: This includes changed floodplain designations (e.g., Zone A to Zone AE).
- **Coastal High Hazard Changes**: This includes any floodplains that were formerly Zone A, AE or X that are now coastal high hazard zones (e.g., Zone V or VE).





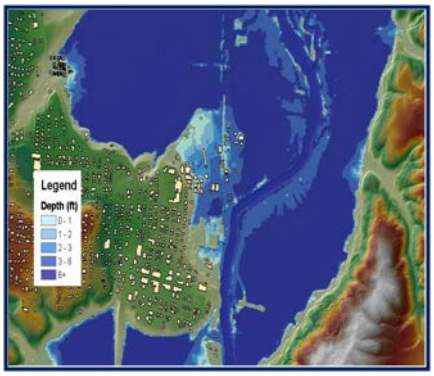
Floodplain maps have evolved considerably from the older paper-based FIRMs to the latest digital products and datasets.

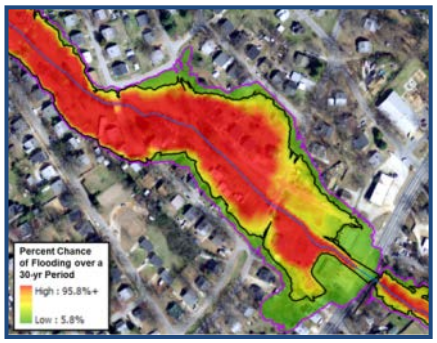
CSLF data can be used to communicate changes in the physical flood hazard area (size, location) as part of the release of new FIRMs. It can also be used in the development or update of hazard mitigation plans to describe changes in hazard as part of the hazard profile.

CSLF data is shown in the FRR, and underlying data is stored in the FRD.

2.2.2 Flood Depth and Analysis Grids

Grids are FEMA datasets provided in the FRD to better describe the risk of the flood hazard. Much like the pixels in a photo or graphic, a grid is made up of square cells, where each grid cell stores a value representing a particular flood characteristic (elevation, depth, velocity, etc.) While the FIRM and FIS Report describe "what" is at risk by identifying the hazard areas, water surface, flood depth, and other analysis grids can help define "how bad" the risk is within those identified areas. These grids are intended to be used by communities for additional analysis, enhanced visualization, and communication of flood risks for hazard mitigation planning and emergency management. The Flood Depth and Analysis Grids provide an alternative way to visualize how a particular flood characteristic (depth, velocity, etc.) vary within the floodplain. Since they are derived from the engineering modeling results, they are typically associated with a particular frequency-based flooding event (e.g., 1-percent-annual-chance event). Grids provided in the FRD for this project area include the following:





Grid data can make flood mapping more informative. The top image is a flood depth grid showing relative depths of water in a scenario flood event. The bottom image is a percent annual chance of flooding grid, which shows inundation areas of various frequency floods.

- **Water Surface Elevation Grids (for the calculated flood frequencies included in the FIS Report):** This dataset represents the flood elevations calculated for each modeled flood frequency.
- **Flood Depth Grids (for the calculated flood frequencies included in the FIS Report):** Flood Depth Grids are created for each flood frequency calculated during the course of a Flood Risk Project. These grids communicate flood depth as a function of the difference between the calculated water surface elevation and the ground. Five grids will normally be delivered for riverine areas for the standard flood frequencies (10-, 4-, 2-, 1-, and 0.2-percent-annual-chance).

  Coastal flood depth grids are created for areas where the dominant wave hazard is overland wave propagation. The grid depicts the difference in elevation between the wave crest elevation, or BFE, and the ground. Coastal areas will typically only receive a depth grid for the 1-percent-annual-chance (base) flood for which overland wave propagation results are produced as a part of the FIS; however, approximate methods may be used to estimate wave crest elevations for other flood frequencies, if desired.

Grid data can be used to communicate the variability of floodplains, such as where floodplains are particularly deep or hazardous, where residual risks lie behind levees, and where losses may be great after a flood event. For mitigation planning, grid data can inform the hazard profile and vulnerability analysis (what is at risk for different frequencies) and can be used for preliminary benefit-cost analysis screening. For floodplain management, higher regulatory standards can be developed in higher hazard flood prone areas (i.e., 10-percent-annual-chance floodplains or deep floodplains).

2.2.3 Flood Risk Assessments

Flood risk assessment results reported in the FRR were developed using Total Exposure in Floodplain (TEIF), a loss estimation tool that was developed at FEMA Region III using ArcGIS and Microsoft Excel. TEIF provides an approximate value of total exposure -- total potential economic losses -- in the Special Flood Hazard Areas (SFHAs). The economic losses are estimates, derived from national level datasets -- 2010 Census and ACS data applying 2012 RS Means valuations -- and should be used for relative comparison of potential losses and risk. The National Flood Hazard Layer that was used to develop TEIF was extracted in May 2013. TEIF allows the user to develop a relative comparison of potential flood loss among all levels of the census geographies.

Hazus (www.fema.gov/hazus) is a nationally-applicable and standardized risk assessment tool that estimates potential losses from earthquakes, floods, and hurricanes. It uses GIS technology to estimate physical, economic, and social impacts of disasters, Files from the FRD can be imported into Hazus to develop other risk assessment information including:

Hazus is a loss estimation methodology developed by FEMA for flood, wind, and earthquake hazards. The methodology and data established by Hazus can also be used to study other hazards.

- Debris generated after a flood event
- Dollar loss of the agricultural products in a study region
- Utility system damages in the region
- Vehicle loss in the study region
- Damages and functionality of lifelines such as highway and rail bridges, potable water, and wastewater facilities

Some benefits of using TEIF or Hazus include the following:

- Help individuals and communities graphically visualize the areas where flood risk is highest.
- Outputs that can enhance state and local mitigation plans and help screen for cost-effectiveness in FEMA mitigation grant programs
- Analysis refinement through updating inventory data and integrating data produced using other flood models
- Widely available support documents and networks (Hazus Users Groups)

HAZUS Flood Loss Estimates:

HAZUS loss estimates should be used to understand relative risk from flood and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, demographics, or economic parameters). Flood loss estimates can include the following:

- **Residential Asset Loss**: These include direct building losses (estimated costs to repair or replace the damage caused to the building) for all classes of residential structures including single family, multi-family, manufactured housing, group housing, and nursing homes. This value also includes content losses.
- **Commercial Asset Loss**: These include direct building losses for all classes of commercial buildings including retail, wholesale, repair, professional services, banks, hospitals, entertainment, and parking facilities. This value also includes content and inventory losses.
- **Other Asset Loss**: This includes losses for facilities categorized as industrial, agricultural, religious, government, and educational. This value also includes content and inventory losses.
- **Business Disruption**: This includes the losses associated with the inability to operate a business due to the damage sustained during the flood. Losses include inventory, income, rental income, wage, and direct output losses, as well as relocation costs.
- **Annualized Losses**: Annualized losses are calculated using Hazus by taking losses from multiple events over different frequencies and expressing the long-term average by year. This factors in historic patterns of frequent smaller floods with infrequent but larger events to provide a balanced presentation of flood damage.
- **Loss Ratio:** The loss ratio expresses the scenario losses divided by the total building value for a local jurisdiction and can be a gage to determine overall community resilience as a result of a scenario event. For example, a loss ratio of 5 percent for a given scenario would indicate that a local jurisdiction would be more resilient and recover more easily from a given event, versus a loss ratio of 75 percent which would indicate widespread losses. An annualized loss ratio uses the annualized loss data as a basis for computing the ratio. Loss ratios are not computed for business disruption.

2.2.4 Areas of Mitigation Interest

Many factors contribute to flooding and flood losses. Some are natural, and some are not. In response to these risks, there has been a focus by the Federal government, State agencies, and local jurisdictions to mitigate properties against the impacts of flood hazards so that future losses and impacts can be reduced. An area identified as an Area of Mitigation Interest (AoMI) is an important element of defining a more comprehensive picture of flood risk and mitigation activity in a watershed, identifying target areas and potential projects for flood hazard mitigation, encouraging local collaboration, and communicating how various mitigation activities can successfully reduce flood risk.

This report and the FRM may include information that focuses on identifying Areas of Mitigation Interest that may be contributing (positively or negatively) to flooding and flood losses in the Flood Risk Project. AoMIs are identified through coordination with local stakeholders; through revised hydrologic and hydraulic and/or coastal analyses; by leveraging other studies or previous flood studies; from community mitigation plans, floodplain management plans, and local surveys; and from the mining of federal government databases (e.g., flood claims, disaster grants, and data from other agencies). Below is a list of the types of Areas of Mitigation Interest; however, Areas of Mitigation Interest are not provided in this project.

- **Dams**

  A dam is a barrier built across a waterway for impounding water. Dams vary from impoundments that are hundreds of feet tall and contain thousands of acre-feet of water (e.g., Hoover Dam) to small dams that are a few feet high and contain only a few acre-feet of water (e.g., small residential pond). “Dry dams,” which are designed to contain water only during floods and do not impound water except for the purposes of flood control, include otherwise dry land behind the dam.

  Dams vary in size and shape, the amount of water they impound, and their assigned hazard classification.

  While most modern, large dams are highly engineered structures with components such as impervious cores and emergency spillways, most smaller and older dams are not. State dam safety programs emerged in the 1960s, and the first Federal Guidelines for Dam Safety were not prepared until 1979. By this time, the vast majority of dams in the United States had already been constructed.

  - **Reasons dams are considered AoMIs:**

    - Many older dams were not built to any particular standard and thus may not withstand extreme rainfall events. Older dams in some parts of the country are made out of an assortment of materials. These structures may not have any capacity to release water and could be overtopped, which could result in catastrophic failure.

- Dams may not always be regulated, given that the downstream risk may have changed since the dam was constructed or since the hazard classification was determined. Years after a dam is built, a house, subdivision, or other development may be constructed in the dam failure inundation zone downstream of the dam. Thus, a subsequent dam failure could result in downstream consequences, including property damage and the potential loss of life. Since these dams are not regulated, it is impossible to predict how safe they are.

This dam failure caused flooding that damaged several homes and vehicles.

- A significant dam failure risk is structural deficiencies associated with older dams that are not being adequately addressed today through needed inspection/maintenance practices.

- For larger dams a flood easement may have been obtained on a property upstream or downstream of the dam. However, there may have been buildings constructed in violation of the flood easement.

- When a new dam is constructed, the placement of such a large volume of material in a floodplain area (if that is the dam location) will displace flood waters and can alter how the watercourse flows. This can result in flooding upstream, downstream, or both.

- For many dams, the dam failure inundation zone is not known. Not having knowledge of these risk areas could lead to unprotected development in these zones.

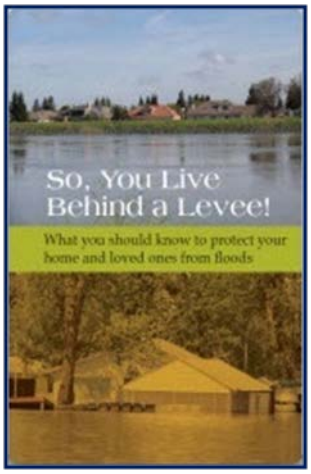
- **Levees**

  FEMA defines a levee as “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.” Levees are sometimes referred to as dikes. Soil used to construct a levee is compacted to make the levee as strong and stable as possible. To protect against erosion and scouring, levees can be covered with everything from grass and gravel to harder surfaces like stone (riprap), asphalt, or concrete.

  Similar to dams, levees have not been regulated in terms of safety and design standards until relatively recently. Many older levees were constructed in a variety of ways, from a farmer piling dirt along a stream to prevent nuisance flooding to levees made out of old mining spoil material. As engineered structures, levees are designed to a certain height and can fail if a flood event is greater than anticipated.

A floodwall is a vertical wall that is built to reduce the flood hazard in a similar manner as a levee. Typically made of concrete or steel, floodwalls often are erected in urban locations where there is not enough room for a levee. Floodwalls are sometimes constructed on a levee crown to increase the levee's height.

Most new dams and levees are engineered to a certain design standard. If that design is exceeded, they could be overtopped and fail catastrophically, causing more damage than if the levee was not there in the first place. Few levees anywhere in the nation are built to more than a 1-percent-annual-chance flood, and the areas behind them are still at some risk for flooding. In some states, the flooding threat can extend up to 15 miles from a riverbank. Although the probability of flooding may be lower because a levee exists, risk is nonetheless still present. The American Society of Civil Engineers' publication "So, You Live Behind a Levee!" provides an in-depth explanation of levee and residual risk.



For more information about the risks associated with living behind levees, consult the publication "So, You Live Behind a Levee!" published by the American Society of Civil Engineers at http://content.asce.org/ASCELeveeGuide.html

- **Reasons levees are considered AoMIs:**

  - Like dams, many levees in the United States were constructed using unknown techniques and materials. These levees have a higher failure rate than those that have been designed to today's standards.

  - A levee might not provide the flood risk reduction it once did as a result of flood risk changes over time. Flood risk can change due to a number of factors, including increased flood levels due to climate change or better estimates of flooding, development in the watershed increasing flood levels and settlement of the levee or floodwall, and sedimentation in the levee channel. Increased flood levels mean decreased reduction of the flood hazard. The lack of adequate maintenance over time will also reduce the capability of a levee to contain the flood levels for which it was originally designed.

  - Given enough time, any levee will eventually be overtopped or damaged by a flood that exceeds the levee's capacity. Still, a widespread public

Canal levee breaches as a result of Hurricane Katrina in New Orleans in 2005. Note damages can be more extensive due to high velocity flood flows than if the levee was not there.

perception of levees is that they will always provide protection. This perception may lead to not taking mitigation actions such as purchasing flood insurance.

- A levee is a system that can fail due to its weakest point, and therefore maintenance is critical. Many levees in the United States are poorly maintained or not maintained at all. Maintenance also includes maintaining the drainage systems behind the levees so they can keep the protected area dry.

- **Coastal Structures**

  Coastal structures, such as seawalls and revetments, are typically used to stabilize the shoreline to mitigate or prevent flood and/or erosion losses. Structures, such as jetties, groins and breakwaters, are constructed along naturally dynamic shorelines to alter the physical processes (e.g. sediment transport) for purposes that include reduction of long-term erosion rates, improvements to safe navigation (e.g., into ports), and reduction of erosive wave forces impacting a coast.

  - **Reasons coastal structures are considered AoMIs:**

    - Coastal structures may provide flood or erosion protection for one site. However, they may also interrupt the sediment transport process, resulting in accelerated coastal erosion downdrift of the structure.

    - Coastal structures are typically designed to withstand the forces associated with extreme design conditions of waves and water levels. Adequate protection may not be provided if these conditions are exceeded.

    - As with other infrastucture such as roads, bridges, and utilities, regular maintenance of shoreline protection structures is essential to ensure that they continue to provide the intended protection from flooding and erosion.

- **Stream Flow Constrictions**

  A stream flow constriction occurs when a human-made structure, such as a culvert or bridge, constricts the flow of a river or stream. The results of this constriction can be increased damage potential to the structure, an increase in velocity of flow through the structure, and the creation of significant ponding or backwater upstream of the structure. Regulatory standards regarding the proper opening size for a structure spanning a river or stream are not consistent and may be non-existent. Some local regulations require structures to pass a volume of water that corresponds to a certain size rain event; however, under sizing, these openings can result in flood damage to the structure itself. After a large flood event, it is not uncommon to have numerous bridges and culverts “washed out.”

- **Reasons stream flow constrictions are considered AoMIs:**

  - Stream flow constrictions can back water up on property upstream of the structure if not designed properly.

  - These structures can accelerate the flow through the structure causing downstream erosion if not properly mitigated. This erosion can affect the structure itself, causing undermining and failure.

  - If the constriction is a bridge or culvert, it can get washed out causing an area to become isolated and potentially more difficult to evacuate.

  - Washed-out culverts and associated debris can wash downstream and cause additional constrictions.

- **At-Risk Essential Facilities**

  Essential facilities, sometimes called "critical facilities," are those whose impairment during a flood could cause significant problems to individuals or communities. For example, when a community's wastewater treatment is flooded and shut down, not only do contaminants escape and flow into the floodwaters, but backflows of sewage can contaminate basements or other areas of the community. Similarly, when a facility such as a hospital is flooded, it can result in a significant hardship on the community not only during the event but long afterwards as well.

  - **Reasons at-risk essential facilities are considered AoMIs:**

    - Costly and specialized equipment may be damaged and need to be replaced.

    - Impairments to facilities such as fire stations may result in lengthy delays in responding and a focus on evacuating the facility itself.

    - Critical records and information stored at these facilities may be lost.

- **Past Flood Insurance Claims and Individual Assistance/Public Assistance Hotspots**

  Assistance provided after flood events (flood insurance in any event and Individual Assistance [IA] or Public Assistance [PA] after declared disasters) occurs in flood affected areas. Understanding geographically where this assistance is being provided may indicate unique flood problems.

Clusters of past flood insurance claims can show where there is a repetitive flood problem.

Flood insurance claims are not always equally distributed in a community. Although estimates indicate that 20 to 50 percent of structures in identified flood hazard areas have flood insurance, clusters of past claims may indicate where there is a flood problem. However, clusters of past claims and/or areas where there are high payments under FEMA's IA or PA Programs may indicate areas of significant flood hazard.

- **Reasons past claim hotspots are considered AoMIs:**

  - A past claim hotspot may reflect an area of recent construction (large numbers of flood insurance policies as a result of a large number of mortgages) and an area where the as-built construction is not in accordance with local floodplain management regulations.

  - Sometimes clusters of past claims occur in subdivisions that were constructed before flood protection standards were in place, places with inadequate stormwater management systems, or in areas that may not have been identified as SFHAs.

  - Clusters of IA or PA claims may indicate areas where high flood insurance coverage or other mitigation actions are needed.

- **Areas of Significant Land Use Change**

Development, whether it is a 100-lot subdivision or a single lot big box commercial outlet, can result in large amounts of fill and other material being deposited in flood storage areas, thereby increasing flood hazards downstream.

Additionally, when development occurs, hard surfaces such as parking lots, buildings and driveways do not allow water to absorb into the ground, and more of the rainwater becomes runoff flowing directly into streams. As a result, the "peak flow" in a stream after a storm event will be higher and will occur faster. Without careful planning, major land use changes can affect the impervious area of a site and result in a significant increase in flood risk caused by streams that cannot handle the extra storm water runoff.

Rooftops, pavements, patios, and driveways contribute to the impervious area in a watershed. This occurs in both urban areas and rural areas being developed.

Changes in land use in areas vulnerable to coastal flooding may affect the severity of wave hazards. Wave energy dissipates as waves propagate through forested areas or areas with dense development while wave energy can increase in open areas such as agricultural fields or parking lots. Changes in land use can affect

wave hazards beyond the immediate area of land use change.

- **Reasons Areas of Significant Land Use Change are considered AoMIs:**
  - Development in areas mapped SFHA reduces flood storage areas, which can make flooding worse at the development site and downstream of it.
  - Impervious surfaces speed up the water flowing in the streams, which can increase erosion and the danger that fast-flowing floodwaters pose to people and buildings.
  - Open areas can allow wave energy to increase while densely developed areas and dense vegetation cover often obstruct waves. These obstructions diminish the wave's potentially destructive forces in areas inland of the obstructions.
  - Rezoning flood-prone areas to high densities and/or higher intensity uses can result in more people and property at risk of flooding and flood damage.

- **Key Emergency Routes Overtopped During Frequent Flooding Events**

  Roads are not always elevated above estimated flood levels, and present a significant flood risk to motorists during flooding events. When alternate routes are available, risks may be reduced, including risks to life and economic loss.

  When large highways close due to flooding, traffic is detoured causing inconvenience and economic loss.

  - **Reasons overtopped roads are considered AoMIs:**
    - Such areas, when identified, can be accounted for and incorporated into Emergency Action Plans.
    - Roads may be elevated or reinforced to reduce the risk of overtopping during flood events.

- **Drainage or Stormwater-Based Flood Hazard Areas, or Areas Not Identified as Floodprone on the FIRM But Known to Be Inundated**

  Flood hazard areas exist everywhere. While FEMA maps many of these, others are not identified. Many of these areas may be located in communities with existing, older, and often inadequate stormwater management systems or in very rural areas. Other similar areas could be a result of complex or unique drainage characteristics. Even though they are not mapped, awareness of these areas is important so adequate planning and mitigation actions can be performed.

- **Reasons drainage or stormwater-based flood hazard areas or unidentified floodprone locations are considered AoMIs:**

  - So further investigation of such areas can occur and, based on scientific data, appropriate mitigation actions can result (i.e., land use and building standards).

  - To create viable mitigation project applications in order to reduce flood losses.

- **Areas of Mitigation Success**

  Flood mitigation projects are powerful tools to communicate the concepts of mitigation and result in more resilient communities. Multiple agencies have undertaken flood hazard mitigation actions for decades. Both structural measures—those that result in flood control structures—and non-structural measures have been implemented in thousands of communities. An extensive list of mitigation actions can be found in Section 4.

  - **Reasons areas of mitigation success are considered AoMIs:**

    - Mitigation successes identify those areas within the community that have experienced a reduction or elimination of flood risk.

    - Such areas are essential in demonstrating successful loss reduction measures and in educating citizens and officials on available flood hazard mitigation techniques.

    - Avoided losses can be calculated and shown.

- **Areas of Significant Riverine or Coastal Erosion**

  Stream channels are shaped by a number of factors, including: degradation, aggradation, general scour, local scour, deposition, and lateral migration. Streams are constantly progressing towards a state of dynamic equilibrium involving water and sediment.

  Coastal shorelines erode in response to wave and water level conditions and other factors. As sea levels rise, erosion is typically exasperated.

  - **Reasons why areas of significant riverine or coastal erosion are considered AoMIs:**

    - Riverine flood damage assessments generally consider inundation alone

    - Bank erosion caused by within channel flows is not recognized as a significant hazard in Federal floodplain management regulations

    - Riverine and coastal erosion can undercut structures and roads, causing instability and possible collapse.

- Landslides and mudslides are a result of erosion
- Approximately one-third of the nation's streams experience severe erosion problems
- Erosion of coastal barrier islands can result in breaches, washing out roads and cutting off access routes
- Erosion often occurs along beaches during storms, especially severe storms that stay offshore for long durations and result in ongoing "battering" of the shoreline from high winds and waves. As the beach erodes, vulnerable properties are placed at even greater risk to coastal flooding from later storm surge, high tides, and wave action.

- **Other**

  Other types of flood risk areas include drainage or stormwater-based flood hazard areas, or areas known to be inundated during storm events.

Areas of Mitigation Interest are not provided for this project.

3 Flood Risk Analysis Results

The following pages provide summary flood risk results for the Flood Risk Project as follows:

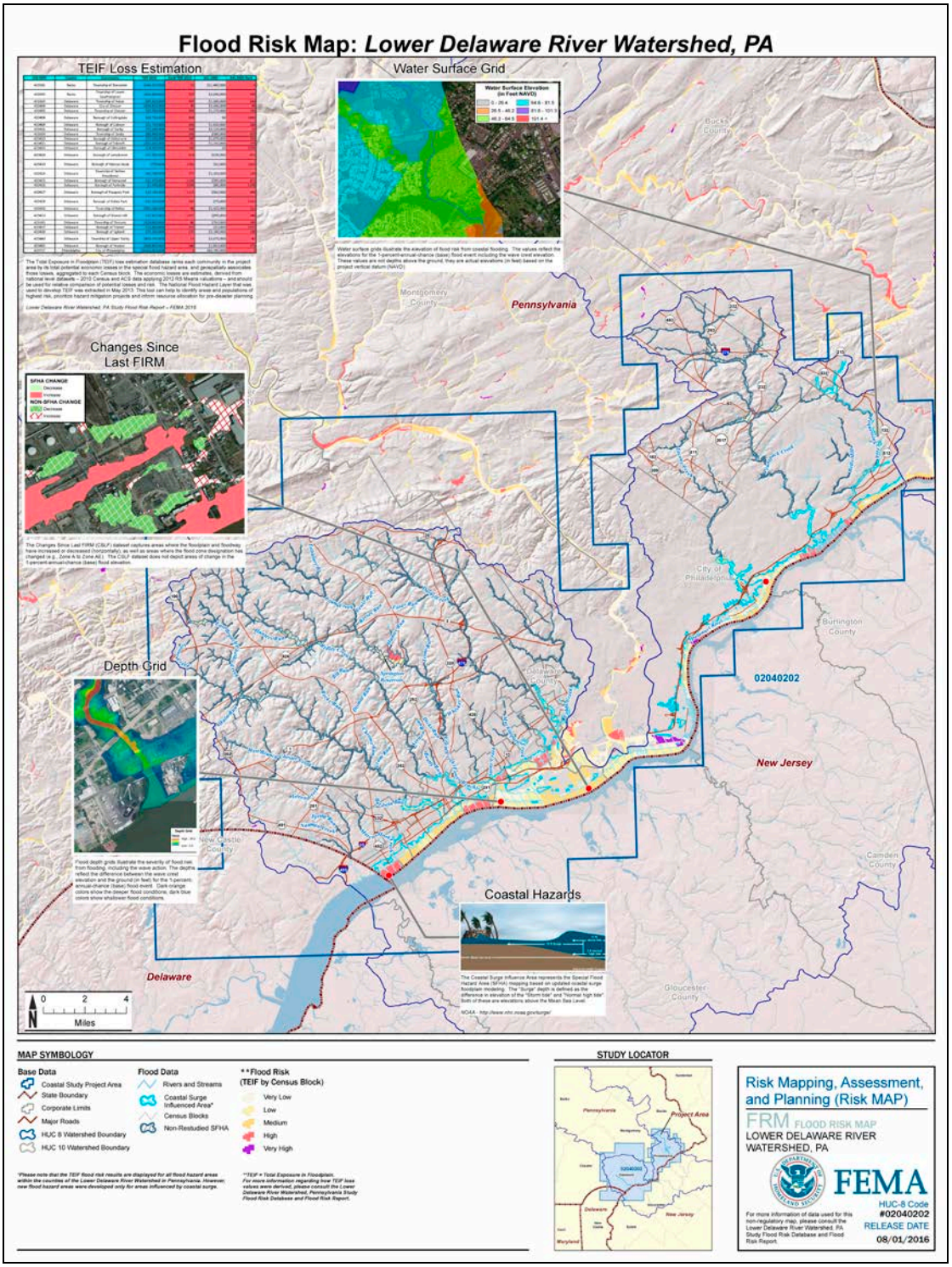
- **Flood Risk Map (FRM).** Within the Flood Risk Project the FRM displays base data reflecting community boundaries, major roads, and stream lines; potential losses that include the Total Exposure in Floodplain (TEIF) flood risk identification.This map promotes access and usage of additional data available through the FRD, FIRM, the National Flood Hazard Layer and viewers (desktop or FEMA website, etc.). This information can be used to assist in Flood Risk Project-level planning as well as for developing mitigation actions within each jurisdiction located within the Flood Risk Project.

  The FRM provides a graphical overview of the Flood Risk Project which highlights areas of risk that should be noted, based on potential losses, exposed facilities, etc., based on data found in the FRD. Refer to the data in the FRD to conduct additional analyses.

- **Flood Risk Project Summary.** Within the Flood Risk Project area, summary data for some or all of the following datasets are provided for the entire project area and also on a jurisdiction by jurisdiction basis:
  - **Changes Since Last FIRM (CSLF).** This is a summary of where the floodplain and flood zones have increased or decreased (only analyzed for areas that were previously mapped using digital FIRMs).
  - **Flood Depth and Analysis Grids.** A general discussion of the data provided in the FRD, including coastal analysis grids if furnished as part of the project.
  - **Flood Risk Assessment.** A loss estimation of potential flood damages using different flood scenarios.
    - TEIF 1.0: An analysis of the total potential economic losses in the special flood hazard area.
    - FEMA Average Annual Loss (AAL) Study: A national level flood analysis to compare losses from the regulatory 1% annual chance flood event at the State and Local level, published in 2010. The AAL grossly underestimates flood losses due to the low resolution of the inputs; therefore, this analysis is not sufficient for the comparison of losses below the municipal level.

3.1 Flood Risk Map

The Flood Risk Map for this Flood Risk Project is shown below. In addition to this reduced version of the map, a full size version is available within the FRD.



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3.2 Lower Delaware River Watershed, Pennsylvania Summary

The Delaware is the longest un-dammed river in the United States east of the Mississippi, extending 330 miles from the confluence of its East and West branches at Hancock, N.Y. to the mouth of the Delaware Bay where it meets the Atlantic Ocean. The river is fed by 216 tributaries, the largest being the Schuylkill and Lehigh Rivers in Pennsylvania. In all, the basin contains 13,539 square miles, draining parts of Pennsylvania (6,422 square miles or 50.3 percent of the basin's total land area); New Jersey (2,969 square miles, or 23.3%); New York (2,362 square miles, 18.5%); and Delaware (1,004 square miles, 7.9%). Included in the total area number is the 782 square-mile Delaware Bay, which lies roughly half in New Jersey and half in Delaware (DRBC, 2015).

Over 15 million people (approximately five percent of the nation's population) rely on the waters of the Delaware River Basin for drinking, agricultural, and industrial use, but the watershed drains only four-tenths of one percent of the total continental U.S. land area. The 15 million figure includes about seven million people in New York City and northern New Jersey who live outside the basin. New York City gets roughly half its water from three large reservoirs located on tributaries to the Delaware. The Delaware Bay is only a gas tank away for about 23 percent of the people living in the U.S. (DRBC, 2015).

3.2.1 Overview

Lower Delaware River Watershed, located in Pennsylvania, includes the following communities in the coastal area:

Community Name	CID	Total Community Population	*Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	*Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Bucks County								
Township of Bensalem	420181	60,427	9	19.8	6	Y	10	Y
Township of Lower Southampton	420192	18,909	16	6.7	3	Y	10	Y
Delaware County								
Township of Aston	421602	16,592	0	5.8	0	Y	10	Y
City of Chester	420404	33,972	15	4.8	48	Y	10	Y
Township of Chester	420405	3,940	41	1.4	7	Y	10	Y
Borough of Collingdale	420408	8,786	8	0.9	0	Y	10	Y
Borough of Colwyn	420409	2,546	26	0.3	33	Y	10	Y
Borough of Darby	420411	10,687	22	0.8	13	Y	10	Y
Township of Darby	421603	9,264	14	1.4	14	Y	10	Y
Borough of Eddystone	420413	2,410	39	1.0	100	Y	10	Y
Borough of Folcroft	420415	6,606	20	1.3	46	Y	10	Y
Borough of Glenolden	420416	7,153	16	1.0	0	Y	10	Y
Borough of Lansdowne	420418	10,620	3	1.2	0	Y	10	Y
Borough of Marcus Hook	420419	2,397	2	1.1	82	Y	10	Y
Township of Nether Providence	420424	13,706	3	4.7	2	Y	10	Y

Community Name (cont'd.)	CID	Total Community Population	*Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	*Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Norwood	420425	5,890	9	0.8	13	Y	10	Y
Borough of Parkside	420426	2,328	10	0.2	0	Y	10	Y
Borough of Prospect Park	420427	6,454	4	0.7	0	Y	10	Y
Township of Ridley	420429	30,768	9	5.1	73	Y	10	Y
Borough of Ridley Park	420430	7,002	13	1.1	0	Y	10	Y
Borough of Sharon Hill	420433	5,697	17	0.8	13	Y	10	Y
Township of Tinicum	421605	4,091	49	8.8	91	Y	10	Y
Borough of Trainer	420437	1,828	32	1.1	55	Y	10	Y
Borough of Upland	420438	3,239	38	0.7	14	Y	10	Y
Township of Upper Darby	420440	82,795	1	7.8	0	Y	10	Y
Borough of Yeadon	420442	11,443	14	1.6	0	Y	10	Y
Philadelphia County								
City of Philadelphia	420757	1,526,006	1	134.1	11	Y	10	Y

*Percent Population and Percent Land Area calculations are based on extent of Changes Since Last FIRM layer within the coastal areas of the Lower Delaware River Watershed.

Community-specific results are provided on subsequent pages. Data provided below and on subsequent pages only includes areas located within the coastal areas of the Lower Delaware River Watershed, Pennsylvania Flood Risk Project and do not necessarily represent community-wide totals.

Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.2.2 Flood Risk Datasets

As a part of this Flood Risk Project, flood risk datasets were created for inclusion in the Flood Risk Database. The flood risk datasets were developed for both the tidal and non-tidal areas of the Lower Delaware Watershed, with the exception of Changes Since Last Firm (CSLF). The only changes to the effective Special Flood Hazard Area (SFHA) within the Lower Delaware Watershed are the result of the revised coastal analysis that affects only the tidal area, so the CSLF dataset was only developed to document those changes. Those datasets are summarized for this Flood Risk Project below:

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the coastal regions of the Lower Delaware River Watershed, Pennsylvania were updated due to new engineering analysis performed within the Flood Risk Project. The updated modeling produced new flood zone areas and new base flood elevations in some areas and leveraged recently developed LiDAR-based topographic data for the Flood Risk Project. The data in this section reflects a comparison between the effective FIRM(s) and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

    The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the study area.

Area of Study*	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	18.6	1.7	4.1	-2.4
Within Non-SFHA	6.0	1.7	2.9	-1.2
Within Floodway	2.0	0.0	0.1	-0.1
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of Lower Delaware River Watershed, Pennsylvania, the figures in this table only represent information within the coastal areas of Bucks, Delaware, and Philadelphia counties of the Lower Delaware River Watershed, Pennsylvania.

Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.

- Evidence of actual flood losses can be one of the most compelling factors for increasing a community's flood risk awareness. Specific areas within each jurisdiction are detailed within the individual community summaries.

- **Tidal Flood Depth Grids**
    - The FRD contains datasets in the form of depth grids for the entire Flood Risk Project that can be used for additional analysis, enhanced visualization, and communication of flood risks for hazard mitigation planning and emergency management. The data provided within the FRD should be used to further isolate areas where flood mitigation potential is high and may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation. Section 2 of the FRR provides general information regarding the development of and potential uses for this data.
- **Tidal Flood Risk Results**
    - Lower Delaware River Watershed, Pennsylvania's flood risk analysis incorporates results from the Total Exposure in Floodplain (TEIF) loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.
    - The TEIF flood risk analysis has been derived for the entirety of Lower Delaware River Watershed, Pennsylvania, and is not limited to areas of updated coastal analysis.

Table 3-1: Tidal Lower Delaware River Watershed, Pennsylvania: Comparison of Estimated Potential Losses for Structures in the SFHA
The table below compares the potential economic losses for TEIF and the AAL (For all communities in the tidal portion of the watershed).

Project Area Information			Total	TEIF			AAL	
CID-NFIP	County	Community	Estimated Value[1,2]	Dollar Losses[1]	TEIF Rank[4]	Loss Ratio[3]	Dollar Losses[1]	AAL Rank[5]
420181	Bucks	Township of Bensalem	$1,851,310,000	$344,550,000	23	19%	$21,480,000	6
420192	Bucks	Township of Lower Southampton	$725,840,000	$116,840,000	127	16%	$2,040,000	149
421602	Delaware	Township of Aston	$678,730,000	$85,620,000	197	13%	$1,280,000	244
420404	Delaware	City of Chester	$794,450,000	$284,810,000	30	36%	$5,440,000	46
420405	Delaware	Township of Chester	$256,130,000	$55,580,000	359	22%	$1,170,000	266
420408	Delaware	Borough of Collingdale	$128,130,000	$18,760,000	909	15%	$0	2026
420409	Delaware	Borough of Colwyn	$66,390,000	$31,720,000	606	48%	$1,650,000	186
420411	Delaware	Borough of Darby	$217,640,000	$72,460,000	250	33%	$5,120,000	52
421603	Delaware	Township of Darby	$312,090,000	$85,840,000	196	28%	$380,000	657
420413	Delaware	Borough of Eddystone	$228,930,000	$73,190,000	247	32%	$1,070,000	293
420415	Delaware	Borough of Folcroft	$364,950,000	$161,010,000	83	44%	$1,160,000	269
420416	Delaware	Borough of Glenolden	$294,460,000	$74,690,000	241	25%	$0	2026
420418	Delaware	Borough of Lansdowne	$116,160,000	$31,990,000	601	28%	$630,000	451
420419	Delaware	Borough of Marcus Hook	$7,450,000	$700,000	2356	9%	$10,000	1865
420424	Delaware	Township of Nether Providence	$891,030,000	$92,580,000	177	10%	$1,320,000	230
420425	Delaware	Borough of Norwood	$54,020,000	$11,370,000	1318	21%	$590,000	472
420426	Delaware	Borough of Parkside	$22,330,000	$1,590,000	2260	7%	$80,000	1358
420427	Delaware	Borough of Prospect Park	$77,610,000	$13,140,000	1201	17%	$560,000	499
420430	Delaware	Borough of Ridley Park	$227,530,000	$31,550,000	610	14%	$70,000	1412
420429	Delaware	Township of Ridley	$1,259,470,000	$251,540,000	40	20%	$1,420,000	211
420433	Delaware	Borough of Sharon Hill	$105,690,000	$15,810,000	1057	15%	$890,000	340
421605	Delaware	Township of Tinicum	$533,530,000	$224,090,000	48	42%	$760,000	399
420437	Delaware	Borough of Trainer	$137,470,000	$26,460,000	703	19%	$10,000	1922
420438	Delaware	Borough of Upland	$277,640,000	$75,320,000	237	27%	$2,180,000	139
420440	Delaware	Township of Upper Darby	$1,786,410,000	$426,370,000	15	24%	$5,670,000	43
420442	Delaware	Borough of Yeadon	$408,130,000	$108,820,000	140	27%	$1,810,000	173
420757	Philadelphia	City of Philadelphia	$12,518,780,000	$4,666,060,000	1	37%	$43,190,000	3

Source: TEIF and AAL results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000.
[2]Estimated Value = Asset Replacement Value of all buildings for the community within the extent of the countywide floodplains.
[3]Loss ratio = Dollar Losses / Estimated Value. Loss Ratios reflect community TEIF values and are rounded to the nearest integer percent.
[4]TEIF Rank = TEIF Rank within Commonwealth of Pennsylvania as compared to other communities.
[5]AAL Rank = AAL Rank within Commonwealth of Pennsylvania as compared to other communities.

*The AAL indicates the estimated economic loss value to property in any single year. It is generated by calculating losses for the 0.2%, 1%, 2%, 5% and 10% annual chance flood events and creating an average of those values. However, in many communities, the AAL inaccurately reports economic losses, and therefore should be used only to compare potential losses between states and counties. TEIF aims to address these inaccuracies by providing a total potential economic loss value to property, for all communities with development within the special flood hazard area. The total economic loss value can be used to understand the degree of risk in each community relative to others.

- **Non-Tidal Flood Depth Grids**
  - The FRD contains datasets in the form of depth grids for the entire Flood Risk Project that can be used for additional analysis, enhanced visualization, and communication of flood risks for hazard mitigation planning and emergency management.
  - Flood Depth Grids were developed for the non-tidal portions of the Lower Delaware River Watershed in Bucks, Chester, Delaware, Montgomery and Philadelphia Counties in Pennsylvania. It is important to note that no new engineering studies were performed in the non-tidal areas of the counties, but rather, effective special flood hazard areas were used to develop the non-tidal depth grids. This was done for approximately 225 miles of stream in the five counties of the watershed on all available flood frequency events, which varied by stream.
  - The general process used to create the non-tidal flood depth grids is as follows:
    - Develop water surface elevation grids from effective water surface profiles in the Flood Insurance Study for all available flood frequency events.
    - Develop preliminary flood depth grids by subtracting ground surface from water surface.
    - For the 1% and 0.2% annual chance flood events, use the National Flood Hazard Layer to clip and fill preliminary flood depth grids so they exactly match the outline of the effective special flood hazard layer.

- **Non-Tidal Flood Risk Results**
  - Lower Delaware River Watershed, Pennsylvania's flood risk analysis also incorporates results from the upland or non-tidal areas of the Total Exposure in Floodplain (TEIF) loss estimation tool.

Table 3-2: Non-tidal Lower Delaware River Watershed, Pennsylvania: Comparison of Estimated Potential Losses for Structures in the SFHA
The table below compares the potential economic losses for TEIF and the AAL (For all communities in the non-tidal portion of the watershed).

Project Area Information			Total	TEIF			AAL	
CID-NFIP	County	Community	Estimated Value[1,2]	Dollar Losses[1]	TEIF Rank[4]	Loss Ratio[3]	Dollar Losses[1]	AAL Rank[5]
420989	Bucks	Township of Upper Southampton	$541,720,000	$80,810,000	213	15%	$0	2,026
420990	Bucks	Township of Warminster	$508,610,000	$51,830,000	382	10%	$540,000	507
421474	Chester	Township of Birmingham	$476,920,000	$61,400,000	313	13%	$230,000	885
420277	Chester	Township of East Goshen	$1,790,690,000	$193,140,000	63	11%	$10,000	1,860
420279	Chester	Township of East Whiteland	$1,094,290,000	$75,960,000	234	7%	$0	2,026
422600	Chester	Township of Easttown	$389,930,000	$40,510,000	481	10%	$0	2,026
420281	Chester	Borough of Malvern	$37,140,000	$3,980,000	1,969	11%	$0	2,026
420290	Chester	Township of Thornbury	$236,030,000	$30,230,000	637	13%	$210,000	946
420291	Chester	Township of Tredyffrin	$1,312,200,000	$135,070,000	103	10%	$1,610,000	193
420292	Chester	Borough of West Chester	$273,640,000	$65,060,000	286	24%	$0	2,026
420293	Chester	Township of West Goshen	$2,176,340,000	$216,990,000	54	10%	$0	2,026
420295	Chester	Township of West Whiteland	$2,500,080,000	$369,620,000	18	15%	$220,000	920
420294	Chester	Township of Westtown	$518,650,000	$51,370,000	388	10%	$250,000	853
422282	Chester	Township of Willistown	$898,410,000	$113,230,000	132	13%	$960,000	320
420401	Delaware	Borough of Aldan	$70,410,000	$11,530,000	1,302	16%	$90,000	1,321
421606	Delaware	Township of Bethel	$435,150,000	$17,350,000	981	4%	$0	2,026
420403	Delaware	Borough of Brookhaven	$290,310,000	$40,170,000	484	14%	$690,000	420
420402	Delaware	Township of Chadds Ford	$283,230,000	$27,630,000	680	10%	$910,000	334
420406	Delaware	Borough of Chester Heights	$148,960,000	$8,330,000	1,542	6%	$270,000	791
420407	Delaware	Borough of Clifton Heights	$17,310,000	$3,960,000	1,974	23%	$390,000	646
420410	Delaware	Township of Concord	$649,940,000	$36,400,000	533	6%	$480,000	561
420412	Delaware	Borough of East Lansdowne	$0	$0	N/A	N/A	$0	N/A
420414	Delaware	Township of Edgmont	$317,270,000	$20,690,000	857	7%	$420,000	630
420417	Delaware	Township of Haverford	$833,090,000	$195,080,000	62	23%	$3,940,000	73
421604	Delaware	Township of Lower Chichester	$46,820,000	$8,590,000	1,522	18%	$0	2,026
420420	Delaware	Township of Marple	$1,223,510,000	$126,880,000	110	10%	$2,020,000	152
420421	Delaware	Borough of Media	$53,180,000	$12,350,000	1,249	23%	$0	2,026

Table 3-2 continued

Project Area Information			Total	TEIF			AAL	
CID-NFIP	County	Community	Estimated Value[1,2]	Dollar Losses[1]	TEIF Rank[4]	Loss Ratio[3]	Dollar Losses[1]	AAL Rank[5]
420422	Delaware	Township of Middletown	$1,064,350,000	$119,380,000	123	11%	$1,280,000	242
422408	Delaware	Borough of Millbourne	$34,940,000	$16,930,000	1,004	48%	$0	1,951
420423	Delaware	Borough of Morton	$122,350,000	$23,380,000	790	19%	$0	2,026
420991	Delaware	Township of Newton	$631,980,000	$44,080,000	445	7%	$580,000	484
420428	Delaware	Township of Radnor	$2,050,910,000	$261,680,000	35	13%	$710,000	413
420431	Delaware	Borough of Rose Valley	$216,230,000	$25,800,000	718	12%	$360,000	672
420432	Delaware	Borough of Rutledge	$12,270,000	$1,550,000	2,265	13%	$0	2,026
420434	Delaware	Township of Springfield	$853,140,000	$99,790,000	159	12%	$1,610,000	191
420435	Delaware	Borough of Swarthmore	$260,470,000	$39,730,000	489	15%	$1,450,000	207
425390	Delaware	Township of Thornbury	$811,540,000	$52,800,000	375	7%	$250,000	833
420439	Delaware	Township of Upper Chichester	$1,070,280,000	$102,350,000	153	10%	$0	2,026
420441	Delaware	Township of Upper Providence	$552,050,000	$48,850,000	411	9%	$700,000	417
420695	Montgomery	Township of Abington	$1,377,170,000	$258,320,000	38	19%	$1,040,000	301
421899	Montgomery	Borough of Bryn Athyn	$88,050,000	$48,690,000	412	55%	$3,520,000	86
420696	Montgomery	Township of Cheltenham	$1,200,210,000	$199,210,000	60	17%	$640,000	447
420697	Montgomery	Borough of Hatboro	$249,970,000	$49,310,000	408	20%	$10,000	1,875
420700	Montgomery	Township of Horsham	$2,346,770,000	$205,310,000	59	9%	$80,000	1,355
422717	Montgomery	Borough of Jenkintown	$25,000,000	$1,530,000	2,266	6%	$0	2,026
420701	Montgomery	Township of Lower Merion	$2,044,260,000	$233,300,000	42	11%	$220,000	926
420702	Montgomery	Township of Lower Moreland	$619,080,000	$207,880,000	58	34%	$5,130,000	51
421903	Montgomery	Borough of Narberth	$93,040,000	$19,710,000	881	21%	$0	2,026
420706	Montgomery	Borough of Rockledge	$0	$0	N/A	N/A	$0	N/A
425388	Montgomery	Township of Springfield	$818,860,000	$164,540,000	80	20%	$590,000	470
420708	Montgomery	Township of Upper Dublin	$956,290,000	$219,720,000	51	23%	$190,000	993
421909	Montgomery	Township of Upper Moreland	$1,290,340,000	$264,430,000	34	20%	$1,390,000	214

Source: TEIF and AAL results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000.
[2]Estimated Value = Asset Replacement Value of all buildings for the community within the extent of the countywide floodplains.
[3]Loss ratio = Dollar Losses / Estimated Value. Loss Ratios reflect community TEIF values and are rounded to the nearest integer percent.
[4]TEIF Rank = TEIF Rank within Commonwealth of Pennsylvania as compared to other communities.
[5]AAL Rank = AAL Rank within Commonwealth of Pennsylvania as compared to other communities.

*The AAL indicates the estimated economic loss value to property in any single year. It is generated by calculating losses for the 0.2%, 1%, 2%, 5% and 10% annual chance flood events and creating an average of those values. However, in many communities, the AAL inaccurately reports economic losses, and therefore should be used only to compare potential losses between states and counties. TEIF aims to address these inaccuracies by providing a total potential economic loss value to property, for all communities with development within the special flood hazard area. The total economic loss value can be used to understand the degree of risk in each community relative to others.

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3.3 Communities

The following sections provide an overview of the community's floodplain management program as of the date of this publication, as well as summarize the flood risk analysis performed for each project area in the Lower Delaware River Watershed, Pennsylvania.

3.3.1 Township of Bensalem Summary (CID 420181)

The following pages include Flood Risk data for the Township of Bensalem, Bucks County, Pennsylvania.

3.3.1.1 Overview

Bucks County is located in the southeastern corner of Pennsylvania, northeast of the City of Philadelphia along the Delaware River in the Piedmont Plateau. The Delaware River, to the east, is the major watercourse, which is fed by several tributaries flowing directly from the uplands. The historic floodplain consists of relatively flat lowlands adjacent to the river.

The Township of Bensalem, with an area of approximately 20 square miles and a population of over 60,400 in 2010, is the buffer township between Philadelphia on the west and the rest of Bucks County on the east and northeast. Through it passes four of the most important arteries of transportation in the United States - Interstate 95, U.S. Route 13 (Bristol Pike), U.S. Route 1 (the Lincoln Highway) and the eastern extension of the Pennsylvania Turnpike. Bristol Pike, which runs parallel with the Delaware River in the southern part of the township, was also known as "The Kings Highway" and was the first road cut through Bucks County by order of the Provincial Council and a number of the milestones are still standing.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Bensalem	420181	60,427	9	19.8	6	Y	10	Y

- Participating in the Bucks County Hazard Mitigation Plan which expires December 13, 2016
- Past Federal Disaster Declarations for flooding = 13
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 169 policies totaling approximately $46,068,200
- NFIP-recognized repetitive loss properties = 30
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Township of Bensalem. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.1.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Township of Bensalem were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

    The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study*	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.2	0.1	0.0	0.1
Within Non-SFHA	0.1	0.0	0.0	0.0
Within Floodway	0.9	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of Township of Bensalem, the figures in this table only represent information within the Township of Bensalem. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
  - The Township of Bensalem's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

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3.3.2 Township of Lower Southampton Summary (CID 420192)

The following pages include Flood Risk data for the Township of Lower Southampton, Bucks County, Pennsylvania.

3.3.2.1 Overview

The Township of Lower Southampton, one of fifty-four municipalities (townships and boroughs) in Bucks County, covers 6.7 square miles and had a population of approximately 18,900 in 2010. Poquessing Creek, a tributary to the Delaware River, winds through the southern portion of the township. Major transportation arteries include the Pennsylvania Turnpike and Bustleton Pike, which serves as a commercial hub in the community.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Lower Southampton	420192	18,909	16	6.7	3	Y	10	Y

- Participating in the Bucks County Hazard Mitigation Plan which expires December 13, 2016
- Past Federal Disaster Declarations for flooding = 13
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 96 policies totaling approximately $28,175,900
- NFIP-recognized repetitive loss properties = 15
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Township of Lower Southampton. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.2.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Township of Lower Southampton were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study*	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.1	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.1	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Lower Southampton, the figures in this table only represent information within the Township of Lower Southampton. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Township of Lower Southampton's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.3 Township of Aston Summary (CID 421602)

The following pages include Flood Risk data for the Township of Aston, Delaware County, Pennsylvania.

3.3.3.1 Overview

Aston was first settled in 1682 as a municipality and was incorporated as a township in 1688. In 1906 it became a first class township. Aston covers almost 6 square miles and had a population of almost 16,600 according to the 2010 Census. Chester Creek flows along the eastern portion of the township and meanders through the Township of Chester, the Borough of Upland, and the City of Chester into the Delaware River northeast of the Commodore Barry Bridge between Pennsylvania and New Jersey.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Aston	421602	16,592	0.4	5.8	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 28 policies totaling approximately $7,318,600
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Township of Aston. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.3.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Township of Aston were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations.

The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Aston, the figures in this table only represent information within the Township of Aston. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
  - The Township of Aston's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.4 City of Chester Summary (CID 420404)

The following pages include Flood Risk data for the City of Chester, Delaware County, Pennsylvania.

3.3.4.1 Overview

Originally settled in 1644 by the Swedish as "Upland", the name was changed to Chester in 1682, incorporated in 1701 as a borough, and as a city in 1866. Chester is the oldest City in Pennsylvania. For the first two hundred years of its history, Chester was a prosperous and wealthy manufacturing community with industries concentrating on machinery, metal manufacturing, locomotive, shipbuilding, and textiles. These strong industries, paired with the city's proximity to the Delaware River and major railways generated jobs and fuelled a steady population growth. In 2010, the population of the City of Chester was 33,972 with paper products manufacturing and a casino serving as major employers in the area. Chester Creek bisects the city and flows into the Delaware River, while Ridley Creek traverses along the northeastern border of the city until it drains into the river.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
City of Chester	420404	33,972	15	4.8	48	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 74 policies totaling approximately $15,159,000
- NFIP-recognized repetitive loss properties = 25
- NFIP-recognized severe repetitive loss properties = 9

Data provided below only includes areas in the City of Chester. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.4.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the City of Chester were updated due to new engineering analysis performed within the flood risk project. The

updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	1.1	0.1	0.6	-0.5
Within Non-SFHA	0.4	0.1	0.1	0.0
Within Floodway	0.1	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the City of Chester, the figures in this table only represent information within the City of Chester. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
  - The City of Chester's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.5 Township of Chester Summary (CID 420405)

The following pages include Flood Risk data for the Township of Chester, Delaware County, Pennsylvania.

3.3.5.1 Overview

The Township of Chester consists of the territory lying between the City of Chester and the Borough of Upland, and the townships of Upper Chichester, Aston, Middletown and Nether Providence. Chester Township was one of the first municipal districts erected after Penn's first visit to the Province in 1682, when he divided the territory into counties. The township is relatively small, covering 1.4 square miles of land area with less than 4,000 people in 2010. Chester Creek enters the township from the north and winds around the southern boundary of a residential community until it passes the Upland Park and flows downstream to the Delaware River.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Chester	420405	3,940	41	1.4	7	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 57 policies totaling approximately $6,996,100
- NFIP-recognized repetitive loss properties = 24
- NFIP-recognized severe repetitive loss properties = 9

Data provided below only includes areas in the Township of Chester. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.5.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Township of Chester were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.1	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Chester, the figures in this table only represent information within the Township of Chester. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Township of Chester's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.6 Borough of Collingdale Summary (CID 420408)

The following pages include Flood Risk data for the Borough of Collingdale, Delaware County, Pennsylvania.

3.3.6.1 Overview

For 200 years prior to the 1880's, the inhabitants of the area now known as "The Borough of Collingdale" lived a predominantly agrarian life. The majority of this almost 1 square mile of land (0.93 square miles at 120 feet above sea level) was owned by the Mortons. Gradually, the large land tracts were divided by inheritance or sale. This permitted commercial and residential development. The borough is currently the 4th largest borough in the county of Delaware and is located in the southeastern area of Pennsylvania. Darby Creek, a tributary to the Delaware River, runs adjacent to the eastern border of the borough.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Collingdale	420408	8,786	8	0.9	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 19 policies totaling approximately $3,245,800
- NFIP-recognized repetitive loss properties = 6
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Borough of Collingdale. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.6.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Collingdale were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood

elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Collingdale, the figures in this table only represent information within the Borough of Collingdale. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
  - The Borough of Collingdale's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.7 Borough of Colwyn Summary (CID 420409)

The following pages include Flood Risk data for the Borough of Colwyn, Delaware County, Pennsylvania.

3.3.7.1 Overview

Incorporated in 1682, Colwyn consists of 0.3 square miles of primarily residential land bordering the City of Philadelphia. Positioned just over two miles from Philadelphia International Airport and Interstate 95, Colwyn is easily accessible from the entire metropolitan area and beyond. Additionally, the borough is well-served by public transit, with SEPTA train, trolley and bus service linking Colwyn to Center City Philadelphia and greater Delaware County. Darby Creek runs adjacent to the western border of the borough while its tributary, Cobbs Creek, follows the eastern border of Colwyn until it meets the mainstem near the southern tip of the borough.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Colwyn	420409	2,546	26	0.3	33	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 16 policies totaling approximately $3,950,300
- NFIP-recognized repetitive loss properties = 13
- NFIP-recognized severe repetitive loss properties = 5

Data provided below only includes areas in the Borough of Colwyn. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.7.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Borough of Colwyn were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations.

The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.1	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Colwyn, the figures in this table only represent information within the Borough of Colwyn. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
  - The Borough of Colwyn's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.8 Borough of Darby Summary (CID 420411)

The following pages include Flood Risk data for the Borough of Darby, Delaware County, Pennsylvania.

3.3.8.1 Overview

The name Darby is derived from the English city of Derby (pronounced “Darby”), the county town of Derbyshire (pronounced “Darbyshire”), the origin of many early settlers. The Borough of Darby, with most of its 0.8 square miles situated along the left bank of Darby Creek, is 5 miles southwest of downtown Philadelphia. Darby was settled in about 1654 and inhabited by Quakers early in the colonial era. Incorporated in 1852, it had 3,429 residents in 1900, 6,305 in 1910, 10,334 in 1940, and 10,687 at the 2010 Census.

The information below provides an overview of the community’s floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Darby	420411	10,687	22	0.8	13	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 58 policies totaling approximately $11,728,000
- NFIP-recognized repetitive loss properties = 34
- NFIP-recognized severe repetitive loss properties = 14

Data provided below only includes areas in the Borough of Darby. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.8.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Borough of Darby were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.1	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Darby, the figures in this table only represent information within the Borough of Darby. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Darby's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.9 Township of Darby Summary (CID 421603)

The following pages include Flood Risk data for the Township of Darby.

3.3.9.1 Overview

Darby Township was settled in 1683 by English and Swedish immigrants who became friendly with Native American tribes who lived in wigwams along the Muckinapates Creek. The farms and mills of Darby Township provided meat, vegetables, and meal to its immediate neighbor to the North, Philadelphia, and over the past 300 years it has left its mark in the historical records of the United States. The Township of Darby became, then and is now, an important link in the line of transportation from Philadelphia to Chester and is adjacent to a wildlife refuge into which Darby Creek flows before meeting its confluence with the Delaware River.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Darby	421603	9,264	14	1.4	14	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 32 policies totaling approximately $6,664,400
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Township of Darby. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.9.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Township of Darby were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.2	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Darby, the figures in this table only represent information within the Township of Darby. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Township of Darby's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.10 Borough of Eddystone Summary (CID 420413)

The following pages include Flood Risk data for the Borough of Eddystone, Delaware County, Pennsylvania.

3.3.10.1 Overview

The Borough of Eddystone was formed around the Eddystone Print Works. William Simpson & Sons established the Eddystone Print Works on the land that is now Eddystone in 1873 after the land on which their previous factory had operated was condemned to make way for Fairmount Park. Eddystone Borough was incorporated in 1888. Its one square mile of land area is located on the right bank of the Delaware River and between two tributaries, Ridley Creek and Crum Creek, which flow into the mainstem.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Eddystone	420413	2,410	39	1.0	100	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 31 policies totaling approximately $5,641,900
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Eddystone. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.10.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Eddystone were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.5	0.0	0.2	-0.2
Within Non-SFHA	0.2	0.0	0.1	-0.1
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Eddystone, the figures in this table only represent information within the Borough of Eddystone. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Eddystone's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

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3.3.11 Borough of Folcroft Summary (CID 420415)

The following pages include Flood Risk data for the Borough of Folcroft, Delaware County, Pennsylvania.

3.3.11.1 Overview

The name Folcroft comes from an Old English word meaning "Leafy Fields". The name was recorded first by the Pennsylvania Railroad in the early 1880's. The state historical marker which was on Chester Pike says "Folcroft: Old English for leafy green meadow/field." The property was originally part of a 350-acre land grant given by William Penn. In 2010, just over 6,600 people lived in the borough of 1.3 square miles. Darby Creek is located in the southern portion of the municipality with a smaller tributary, Muckinipattis Creek, threading in and out of the western side of the borough and the adjacent Boroughs of Glenolden and Norwood.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Folcroft	420415	6,606	20	1.3	46	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 9 policies totaling approximately $2,063,800
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Folcroft. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.11.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Folcroft were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.6	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Folcroft, the figures in this table only represent information within the Borough of Folcroft. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Folcroft's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.12 Borough of Glenolden Summary (CID 420416)

The following pages include Flood Risk data for the Borough of Glenolden, Delaware County, Pennsylvania..

3.3.12.1 Overview

In 1875, Glenolden consisted of two streets, each only one block long; Marshall Avenue (today's Knowles Avenue) and Glenolden Avenue. Lots were sold by investors, and custom houses were built. The borough of one square mile and over 7,000 residents has commercial corridors located along MacDade Boulevard and U.S. Route 13 (Chester Pike). Muckinipattis Creek intersects the western portion of the Borough of Glenolden and within Glenolden Park near the middle of the municipality.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Glenolden	420416	7,153	16	1.0	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 17 policies totaling approximately $4,683,500
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Glenolden. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.12.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Glenolden were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Glenolden, the figures in this table only represent information within the Borough of Glenolden. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Glenolden's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.13 Borough of Lansdowne Summary (CID 420418)

The following pages include Flood Risk data for the Borough of Lansdowne, Delaware County, Pennsylvania.

3.3.13.1 Overview

The area that is now known as the Borough of Lansdowne was settled in the early 1700's and named after the English estate of Lord Lansdowne. At just over one square mile, Lansdowne is small in stature and big in what it has to offer. One hundred years before it was incorporated as a separate entity from Upper Darby, the area which is now Lansdowne Borough was historically home to various industries: textile, paper and cotton. By the mid-19th century a single rail track ran through the town. In 2010, the Borough of Lansdowne was the third largest borough in the county with 10,620 people. Darby Creek flows along the southwestern boundary of Lansdowne and is crossed by U.S. Route 1 (W. Baltimore Avenue), a major thoroughfare in the county.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Lansdowne	420418	10,620	3	1.2	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 22 policies totaling approximately $5,595,400
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Lansdowne. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.13.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Lansdowne were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood

elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Lansdowne, the figures in this table only represent information within the Borough of Lansdowne. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
  - The Borough of Lansdowne's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.14 Borough of Marcus Hook (CID 420419)

The following pages include Flood Risk data for the Borough of Marcus Hook, Delaware County, Pennsylvania.

3.3.14.1 Overview

The Marcus Hook area of the Delaware River waterfront has attracted settlement since the movement of the Lenni Lenape into this region. Reputedly, the town derives its name from an early Finnish settler who resided in a Swedish trading outpost and colonization site in the late 1630's or early 1640's. The word “Hook” meant a point of land and presumably referred to the natural harbor formed below Marcus Hook Creek which empties into the Delaware River at the northeastern boundary of the borough.

The information below provides an overview of the community’s floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Marcus Hook	420419	2,397	2	1.1	82	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 3 policies totaling approximately $1,190,800
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Marcus Hook. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.14.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Borough of Marcus Hook were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.3	0.1	0.3	-0.2
Within Non-SFHA	0.2	0.0	0.2	-0.2
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Marcus Hook, the figures in this table only represent information within the Borough of Marcus Hook. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Marcus Hook's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.15 Township of Nether Providence Summary (CID 420424)

The following pages include Flood Risk data for the Township of Nether Providence, Delaware County, Pennsylvania.

3.3.15.1 Overview

The first recorded inhabitants of what was to become Nether Providence Township were indigenous Native Americans of the Lenape tribe. They had been living in the area for five hundred years. The eastern border of the township follows Crum Creek and includes Crum Woods for most of its length. In 2010, the population of over 13,700 people are served by Interstate 476, a major access highway located in the eastern portion of Nether Providence, and Route 252 (Providence Road), an important north-south thoroughfare which bisects the community. Ridley Creek hugs the southwestern boundary of the township. Both Crum Creek and Ridley Creek flow into the Delaware River.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Nether Providence	420424	13,706	3	4.7	2	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 66 policies totaling approximately $17,735,800
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Township of Nether Providence. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.15.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Township of Nether Providence were updated due to new engineering analysis performed within the

flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Nether Providence, the figures in this table only represent information within the Township of Nether Providence. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
    - The Township of Nether Providence's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

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3.3.16 Borough of Norwood Summary (CID 420425)

The following pages include Flood Risk data for the Borough of Norwood, Delaware County, Pennsylvania.

3.3.16.1 Overview

The Borough of Norwood is less than one square mile with a population of less than 6,000 in 2010. The Morton House in the borough was listed on the National Register of Historic Places in 2000. Muckinipattis Creek runs along the southeastern boundary of the borough and empties into the Darby Creek which is located in the southern portion of Norwood.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Norwood	420425	5,890	9	0.8	13	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 9 policies totaling approximately $2,480,200
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Norwood. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.16.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Norwood were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.1	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Norwood, the figures in this table only represent information within the Borough of Norwood. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Norwood's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.17 Borough of Parkside Summary (CID 420426)

The following pages include Flood Risk data for the Borough of Parkside, Delaware County, Pennsylvania.

3.3.17.1 Overview

Parkside, since its inception, has been a suburban residential community with a small commercial sector. In the years of its existence as a borough, there have been no dramatic land developments. The gradual change in property usage from residential to commercial along Route 352 (Edgmont Avenue), the major road in the borough, is nearly complete. A very small porion of Ridley Creek flows through the northern tip of the Borough of Parkside.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Parkside	420426	2,328	10	0.2	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 6 policies totaling approximately $573,100
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Parkside. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.17.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Parkside were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Parkside, the figures in this table only represent information within the Borough of Parkside. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Parkside's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.18 Borough of Prospect Park Summary (CID 420427)

The following pages include Flood Risk data for the Borough of Prospect Park, Delaware County, Pennsylvania.

3.3.18.1 Overview

The Borough of Prospect Park was formerly called Moore and was incorporated in 1894. Slightly less than one square mile in area, it was the home of under 7,000 residents in 2010. The main roads in the small community are U.S. Route 13 and Route 420 (Lincoln Avenue). Darby Creek flows in the southern part of the borough.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Prospect Park	420427	6,454	4	0.7	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 10 policies totaling approximately $2,459,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Prospect Park. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.18.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Prospect Park were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Prospect Park, the figures in this table only represent information within the Borough of Prospect Park. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Prospect Park's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.19 Township of Ridley Summary (CID 420429)

The following pages include Flood Risk data for the Township of Ridley, Delaware County, Pennsylvania.

3.3.19.1 Overview

Ridley was first recognized as a township in 1687 and became a first class township in 1906. In 2010, it was the fourth largest township in the county in terms of population with almost 31,000 residents. The Township of Ridley is situated in a busy travel corridor with Interstates 95 and 476 and U.S. State Route 13 crossing to the south. Several streams, such as Ridley, Crum, Little Crum, Stony, and Shipley Creeks, also flow through the township.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Ridley	420429	30,768	9	5.1	73	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 100 policies totaling approximately $28,722,800
- NFIP-recognized repetitive loss properties = 8
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Township of Ridley. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.19.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Township of Ridley were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.4	0.0	0.1	-0.1
Within Non-SFHA	0.2	0.0	0.2	-0.2
Within Floodway	0.1	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Ridley, the figures in this table only represent information within the Township of Ridley. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Township of Ridley's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.20 Borough of Ridley Park Summary (CID 420430)

The following pages include Flood Risk data for the Borough of Ridley Park, Delaware County, Pennsylvania.

3.3.20.1 Overview

The Borough of Ridley Park was incorporated in 1887. Ridley Park is a small suburban Philadelphia community founded by the owners of the Pennsylvania Railroad as a summer retreat. It's located near Interstates 95 and 476 with train service to Philadelphia and to Washington, D.C. Stony Creek flows downstream to Darby Creek in the eastern part of the borough and Little Crum Creek flows in and out of Ridley Park Lake before meeting at its confluence with Crum Creek.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Ridley Park	420430	7,002	13	1.1	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 8 policies totaling approximately $2,615,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Ridley Park. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.20.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Ridley Park were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Ridley Park, the figures in this table only represent information within the Borough of Ridley Park. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Ridley Park's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.21 Borough of Sharon Hill Summary (CID 420433)

The following pages include Flood Risk data for the Borough of Sharon Hill, Delaware County, Pennsylvania.

3.3.21.1 Overview

The Borough of Sharon Hill is located in southeastern Delaware County. Chartered in 1890, the borough is named for an estate which was known as "Sharon" and which at one time comprised almost 75 acres of the town, which covers approximately 0.8 square miles. U.S. Route 13 (Chester Pike) is the major road through the town. Darby Creek runs adjacent to the eastern borough boundary with Cobbs Creek flowing into Darby Creek at the eastern border. Hermesprota Creek flows through the western part of the Borough of Sharon Hill.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Sharon Hill	420433	5,697	17	0.8	13	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 7 policies totaling approximately $1,366,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Sharon Hill. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.21.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Sharon Hill were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Sharon Hill, the figures in this table only represent information within the Borough of Sharon Hill. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Sharon Hill's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.22 Township of Tinicum Summary (CID 421605)

The following pages include Flood Risk data for the Township of Tinicum, Delaware County, Pennsylvania.

3.3.22.1 Overview

The area now known as the Township of Tinicum was originally inhabited by the Lenni Lenape tribe. The township is located in southeastern Pennsylvania and is approximately 9 square miles bordered by the Delaware River, Darby Creek, and what was Bow Creek and the back channel around Hog Island. Interstate 95 passes through Tinicum Township and Philadelphia International Airport is partly located in the municipality.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Tinicum	421605	4,091	49	8.8	91	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 191 policies totaling approximately $47,782,000
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Township of Tinicum. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.22.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Township of Tinicum were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	5.1	0.6	1.1	-0.5
Within Non-SFHA	1.4	0.2	1.1	-0.9
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Tinicum, the figures in this table only represent information within the Township of Tinicum. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Township of Tinicum's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.23 Borough of Trainer Summary (CID 420437)

The following pages include Flood Risk data for the Borough of Trainer, Delaware County, Pennsylvania.

3.3.23.1 Overview

The Borough of Trainer was incorporated in 1919. It lies along the Delaware River and contains part of Marcus Hook and Stoney Creeks within its boundaries. As part of the "river tier", it is now heavily industrialized; its development follows a 300 year course of settlement beginning with the Swedes in the 1650's.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Trainer	420437	1,828	32	1.1	55	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 9 policies totaling approximately $1,558,600
- NFIP-recognized repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)
- NFIP-recognized severe repetitive loss properties = there are less than 5 (per Operational Standard 443 this is recorded as NULL in the FRD)

Data provided below only includes areas in the Borough of Trainer. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.23.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Trainer were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.3	0.1	0.2	-0.1
Within Non-SFHA	0.1	0.0	0.1	-0.1
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Trainer, the figures in this table only represent information within the Borough of Trainer. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Trainer's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.24 Borough of Upland Summary (CID 420438)

The following pages include Flood Risk data for the Borough of Upland, Delaware County, Pennsylvania.

3.3.24.1 Overview

The first European settlers in this area were from the Swedish colony of New Sweden. They arrived in the area in 1643 and built a permanent settlement at Tinicum Island. Although the name literally means "up land", it also reflects the Swedish province of Uppland. The settlement of Upland was built around the point where the Chester Creek flows into the Delaware River, which is part of the City of Chester (formerly also called "Upland").

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Upland	420438	3,239	38	0.7	14	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 66 policies totaling approximately $7,226,700
- NFIP-recognized repetitive loss properties = 32
- NFIP-recognized severe repetitive loss properties = 12

Data provided below only includes areas in the Borough of Upland. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.24.2 Community Analyses and Results

- **Changes Since Last FIRM**
    - Special Flood Hazard Area (SFHA) boundaries within the Borough of Upland were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	<1	0.0	0.0	0.0
Within Non-SFHA	<1	0.0	0.0	0.0
Within Floodway	0.1	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Upland, the figures in this table only represent information within the Borough of Upland. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Upland's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.25 Township of Upper Darby Summary (CID 420440)

The following pages include Flood Risk data for the Township of Upper Darby, Delaware County, Pennsylvania.

3.3.25.1 Overview

Upper Darby became incorporated as a township in 1736 from Darby Township. Today, Upper Darby is classified as a first class township operating under the Pennsylvania Home Rule Charter. In 2010, it was the most populated municipality in Delaware County with over 82,000 residents. The floodplain is influenced by the presence of Darby Creek in the west and Cobbs Creek, which overlaps the border with the City of Philadelphia, in the eastern part of the township.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Township of Upper Darby	420440	82,795	1	7.8	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 277 policies totaling approximately $52,515,400
- NFIP-recognized repetitive loss properties = 41
- NFIP-recognized severe repetitive loss properties = 7

Data provided below only includes areas in the Township of Upper Darby. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.25.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Township of Upper Darby were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Township of Upper Darby, the figures in this table only represent information within the Township of Upper Darby. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Township of Upper Darby's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

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3.3.26 Borough of Yeadon Summary (CID 420442)

The following pages include Flood Risk data for the Borough of Yeadon, Delaware County, Pennsylvania.

3.3.26.1 Overview

Prior to its incorporation in 1893, the Borough of Yeadon evolved from the original occupation of the Lenni Lenape Native American group to the early colonial settlement of four different governments; first the Dutch, then the Swedes, then the English, and finally, into the control of the Colonial American government. Yeadon thrived early due to its proximity to Philadelphia markets and the energy that Cobbs Creek and Darby Creek provided for industry.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
Borough of Yeadon	420442	11,443	14	1.6	0	Y	10	Y

- Participating in the Delaware County Hazard Mitigation Plan which expires March 5, 2017
- Past Federal Disaster Declarations for flooding = 9
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 18 policies totaling approximately $4,843,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized severe repetitive loss properties = 0

Data provided below only includes areas in the Borough of Yeadon. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.26.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Borough of Yeadon were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

  The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	0.0	0.0	0.0	0.0
Within Non-SFHA	0.0	0.0	0.0	0.0
Within Floodway	0.0	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the Borough of Yeadon, the figures in this table only represent information within the Borough of Yeadon. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
- **Flood Risk Results**
  - The Borough of Yeadon's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

3.3.27 City of Philadelphia Summary (CID 420757)

The following pages include Flood Risk data for the City of Philadelphia, Pennsylvania.

3.3.27.1 Overview

Founded in 1682, the City of Philadelphia is situated at the confluence of the Delaware and Schuylkill Rivers. Once the second largest city in the English speaking world (during colonial times), it has now lost some of its preeminence in terms of population. In the bicentennial year of 1976, it ranked as the fourth largest city in the United States with a population of 1,950,098, falling below the two million mark for the first time since the 1940s. In 2010, the population of the city was 1,526,606. Despite this reduction, the city is still densely populated with little acreage available for future development except in the southwest (2,090 acres), the northeast (1,883 acres), and Upper Roxborough (132 acres). Serving originally as the capital of the fledgling nation, and an innovative leader in the areas of political and social experimentation, city planning, culture, commerce, seaport development, shipbuilding, transportation, industry, engineering, science and medicine, Philadelphia still plays an important role in most of these areas. However, the city retains its predominately residential character along with the provincial and ethnic variety derived from its many component neighborhoods.

The Delaware River flows in a southwesterly direction and forms the boundary between the Commonwealth of Pennsylvania and the State of New Jersey. The floodplains along the Philadelphia side of the Delaware River are largely flat with sparse vegetation consisting of grass, trees, weeds, and marsh grass, and a multiplicity of activities. Port and industrial facilities dominate the area; however, other important facilities and installations are also located along the river.

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

Community Name	CID	Total Community Population	Percent of Population in Watershed (Coastal)	Total Community Land Area (sq mi)	Percent of Land Area in Watershed (Coastal)	NFIP	CRS Rating	Mitigation Plan
City of Philadelphia	420757	1,526,006	1	134.1	11	Y	10	Y

- Participating in the City of Philadelphia Hazard Mitigation Plan which expires June 13, 2017
- Past Federal Disaster Declarations for flooding = 10
- National Flood Insurance Program (NFIP) policy coverage (policies/value) = 4,235 policies totaling approximately $961,672,800
- NFIP-recognized repetitive loss properties = 112
- NFIP-recognized severe repetitive loss properties = 18

Data provided below only includes areas in the City of Philadelphia. Section 2 of the FRR provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.

3.3.27.2 Community Analyses and Results

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the City of Philadelphia were updated due to new engineering analysis performed within the flood risk project. The updated modeling produced new flood zone areas and new base flood elevations. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
  - The Changes Since Last FIRM data for this study has been calculated only for areas that fall within the updated coastal analysis.

    The table below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	9.6	0.7	1.6	-0.9
Within Non-SFHA	3.4	1.4	1.1	0.3
Within Floodway	0.5	0.0	0.0	0.0
Within CHHA (Zone VE or V)	0.0	0.0	0.0	0.0

**Although the Flood Risk Database may contain Changes Since Last FIRM information outside of the City of Philadelphia, the figures in this table only represent information within the City of Philadelphia. Section 2 of the FRR provides more information regarding the source and methodology used to develop this table.*

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Water surface elevation grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events
    - Coastal flood depth grids for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events

    Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The

FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results**
    - The City of Philadelphia's flood risk analysis uses the TEIF flood loss estimation tool. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

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4 Actions to Reduce Flood Risk

In order to fully leverage the Flood Risk Datasets and Products created for this Flood Risk Project, local stakeholders should consider many different flood risk mitigation tactics, including, but not limited the items shown in the sub-sections below.

Before Mitigation and After Mitigation

Communities will need to prioritize projects as part of the planning process. FEMA can then help route federal mitigation dollars to fund these projects.

4.1 Types of Mitigation Actions

Mitigation provides a critical foundation on which to reduce loss of life and property by avoiding or lessening the impact of hazard events. This creates safer communities and facilitates resiliency by enabling communities to return to normal function as quickly as possible after a hazard event. Once a community understands its flood risk, it is in a better position to identify potential mitigation actions that can reduce the risk to its people and property.

The mitigation plan requirements in 44 CFR Part 201 encourage communities to understand their vulnerability to hazards and take actions to minimize vulnerability and promote resilience. Flood mitigation actions generally fall into the following categories:

4.1.1 Preventative Measures

Preventative measures are intended to keep flood hazards from getting worse. They can reduce future vulnerability to flooding, especially in areas where development has not yet occurred or where capital improvements have not been substantial. Examples include:

- Comprehensive land use planning
- Zoning regulations
- Subdivision regulations
- Open space preservation
- Building codes
- Floodplain development regulations
- Stormwater management
- Purchase development rights or conservation

NFIP's CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions meeting the three goals of the CRS: to reduce flood losses, to facilitate accurate insurance rating, and to promote the awareness of flood insurance.

For CRS participating communities, flood insurance premium rates are discounted in increments of 5%; i.e., a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount. (A Class 10 is not participating in the CRS and receives no discount.)

easements

- Participation in the NFIP Community Rating System (CRS)

4.1.2 Property Protection Measures

Property protection measures protect existing buildings by modifying the building to withstand floods, erosion, and waves or by removing buildings from hazardous locations. Examples include:

- Building relocation
- Acquisition and clearance
- Building elevation
- Barrier installation
- Building retrofit

4.1.3 Natural Resource Protection Activities

Natural resource protection activities reduce the impact of floods by preserving or restoring natural areas such as floodplains, wetlands, and dunes and their natural functions. Examples include:

- Wetland protection
- Habitat protection
- Erosion and sedimentation control
- Best management practices (BMP)
- Prevention of stream dumping activities (anti-litter campaigns)
- Improved forestry practices such as reforesting or selective timbering (extraction)
- Beach Nourishment
- Dune Construction
- Dune protection measures such as walkovers, sand fencing, and vegetation

4.1.4 Structural Mitigation Projects

Structural mitigation projects lessen the impact of floods by modifying the environmental natural progression of the flooding event. Structural protection such as upgrading dams/levees for already existing development and critical facilities may be a realistic alternative. However, citizens should be made aware of their residual risk. Examples include:

- Reservoirs, retention, and detention basins

- Levees and floodwalls
- Channel modifications
- Channel maintenance
- Seawalls, reventments, and bulkheads
- Groins, offshore breakwaters, and jetties

4.1.5 Public Education and Awareness Activities

Public education and awareness activities advise residents, business owners, potential property buyers, and visitors about floods, hazardous areas, and mitigation techniques they can use to reduce the flood risk to themselves and their property. Examples include:

- Readily available and readable updated maps
- Outreach projects
- Libraries
- Technical assistance
- Real estate disclosure
- Environmental education
- Risk information via the nightly news

For more information regarding hazard mitigation techniques, best practices, and potential grant funding sources, visit www.fema.gov or contact your local floodplain manager, emergency manager, or State Hazard Mitigation Officer.

4.1.6 Emergency Service Measures

Although not typically considered a mitigation technique, emergency service measures minimize the impact of flooding on people and property. These are actions commonly taken immediately prior to, during, or in response to a hazard event. Examples include:

- Hazard warning system
- Emergency response plan
- COOP and COG planning
- Critical facilities protection
- Health and safety maintenance
- Post flood recovery planning

4.2 Identifying Specific Actions for Your Community

As many mitigation actions are possible to lessen the impact of floods, how can a community decide which ones are appropriate to implement? There are many ways to identify specific actions most appropriate for a community. Some factors to consider may include the following:

Refer to FEMA Mitigation Planning How To Guide #3 (FEMA 386-3) "Developing the Mitigation Plan - Identifying Mitigation Actions and Implementation Strategies" for more information on how to identify specific mitigation actions to address hazard risk in your community.

- **Site characteristics.** Does the site present unique challenges (e.g., significant slopes or erosion potential)?
- **Flood characteristics.** Are the flood waters affecting the site fast or slow moving? Are there wave hazards? Is there debris associated with the flow? How deep is the flooding?
- **Social acceptance.** Will the mitigation action be acceptable to the public? Does it cause social or cultural problems?
- **Technical feasibility.** Is the mitigation action technically feasible (e.g., making a building watertight to a reasonable depth)?
- **Administrative feasibility.** Is there administrative capability to implement the mitigation action?
- **Legal.** Does the mitigation action meet all applicable codes, regulations, and laws? Public officials may have a legal responsibility to act and inform citizens if a known hazard has been identified.
- **Economic.** Is the mitigation action affordable? Is it eligible under grant or other funding programs? Can it be completed within existing budgets?
- **Environmental.** Does the mitigation action cause adverse impacts on the environment or can they be mitigated? Is it the most appropriate action among the possible alternatives?

FEMA in collaboration with the American Planning Association has released the publication, "Integrating Hazard Mitigation into Local Planning." This guide explains how hazard mitigation can be incorporated into several different types of local planning programs. For more information, go to www.planning.org or http://www.fema.gov/library.

Your local Hazard Mitigation Plan is a valuable place to identify and prioritize possible mitigation actions. The plan includes a mitigation strategy with mitigation actions that were developed through a public and open process. You can then add to or modify those actions based on what is learned during the course of the Risk MAP project and the information provided within this FRR.

4.3 Mitigation Programs and Assistance

Not all mitigation activities require funding (e.g., local policy actions such as strengthening a flood damage prevention ordinance), and those that do are not limited to outside funding sources (e.g., inclusion in local capital improvements plan, etc.). For those mitigation actions that require assistance through funding or technical expertise, several State and Federal agencies have flood hazard mitigation grant programs and offer technical assistance. These

programs may be funded at different levels over time or may be activated under special circumstances such as after a presidential disaster declaration.

Communities can link hazard mitigation plans and actions to the right FEMA grant programs to fund flood risk reduction. More information about FEMA HMA programs can be found at http://www.fema.gov/government/grant/hma/index.shtm.

4.3.1 FEMA Mitigation Programs and Assistance

FEMA awards many mitigation grants each year to states and communities to undertake mitigation projects to prevent future loss of life and property resulting from hazard impacts, including flooding. The FEMA Hazard Mitigation Assistance (HMA) programs provide grants for mitigation through the programs listed in Table 4-1 below.

Table 4-1: FEMA Hazard Mitigation Assistance Programs

Mitigation Grant Program	Authorization	Purpose
Hazard Mitigation Grant Program (HMGP)	Robert T. Stafford Disaster Relief and Emergency Assistance Act	Activated after a presidential disaster declaration; provides funds on a sliding scale formula based on a percentage of the total federal assistance for a disaster for long-term mitigation measures to reduce vulnerability to natural hazards
Flood Mitigation Assistance (FMA)	National Flood Insurance Reform Act	Reduce or eliminate claims against the NFIP
Pre-Disaster Mitigation (PDM)	Disaster Mitigation Act	National competitive program focused on mitigation project and planning activities that address multiple natural hazards
Repetitive Flood Claims (RFC)	Bunning-Bereuter-Blumenauer Flood Insurance Reform Act	Reduce flood claims against the NFIP through flood mitigation; properties must be currently NFIP insured and have had at least one NFIP claim
Severe Repetitive Loss (SRL)	Bunning-Bereuter-Blumenauer Flood Insurance Reform Act	Reduce or eliminate the long-term risk of flood damage to SRL residential structures currently insured under the NFIP

The HMGP and PDM programs offer funding for mitigation planning and project activities that address multiple natural hazard events. The FMA, RFC, and SRL programs focus funding efforts on reducing claims against the NFIP. Funding under the HMA programs is subject to availability of annual appropriations, and HMGP funding is also subject to the amount of FEMA disaster recovery assistance provided under a presidential major disaster declaration.

FEMA's HMA grants are awarded to eligible states, tribes, and territories (applicant) that, in turn, provide sub-grants to local governments and communities (sub-applicant). The applicant selects

and prioritizes sub-applications developed and submitted to them by sub-applicants and submits them to FEMA for funding consideration. Prospective sub-applicants should consult the office designated as their applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers (SHMO) is available on the FEMA website (www.fema.gov).

4.3.2 Additional Mitigation Programs and Assistance

Several additional agencies including USACE, Natural Resource Conservation Service (NRCS), U.S. Geological Survey (USGS), NOAA, and others have specialists on staff and can offer further information on flood hazard mitigation. The State NFIP Coordinator and SHMO are state-level sources of information and assistance, which vary among different states.

The Silver Jackets program, active in several states, is a partnership of USACE, FEMA, and state agencies. The Silver Jackets program provides a state-based strategy for an interagency approach to planning and implementing measures for risk reduction.

5 Acronyms and Definitions

5.1 Acronyms

A

AAL	Average Annualized Loss
ALR	Annualized Loss Ratio
AoMI	Areas of Mitigation Interest

B

BCA	Benefit-Cost Analysis
BFE	Base Flood Elevation
BMP	Best Management Practices

C

CFR	Code of Federal Regulations
CID	Community Idenfitication Number
COG	Continuity of Government Plan
COOP	Continuity of Operations Plan
CRS	Community Rating System
CSLF	Changes Since Last FIRM

D

DHS	Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000

E

EOP	Emergency Operations Plan

F

FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FRD	Flood Risk Database
FRM	Flood Risk Map
FRR	Flood Risk Report
FY	Fiscal Year

G

GIS	Geographic Information System

H

HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program

I

IA	Individual Assistance

N

NFIA	National Flood Insurance Act
NFIP	National Flood Insurance Program
NRCS	Natural Resource Conservation Service

P

PA	Public Assistance
PDM	Pre-Disaster Mitigation

R

RFC	Repetitive Flood Claims
Risk MAP	Mapping, Assessment, and Planning

S

SFHA	Special Flood Hazard Area
SHMO	State Hazard Mitigation Officer
SRL	Severe Repetitive Loss

T

TEIF	Total Exposure in Floodplain

U

USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

5.2 Definitions

0.2-percent-annual-chance flood – The flood elevation that has a 0.2-percent chance of being equaled or exceeded each year. Sometimes referred to as the 500-year flood.

1-percent-annual-chance flood – The flood elevation that has a 1-percent chance of being equaled or exceeded each year. Sometimes referred to as the 100-year flood.

Accredited Levee System – A levee system that FEMA has shown on a FIRM that is recognized as reducing the flood hazards posed by a 1-percent-annual-chance or greater flood. This determination is based on the submittal of data and documentation as required by 44CFR65.10 of the NFIP regulations. The area landward of an accredited levee system is shown as Zone X (shaded) on the FIRM except for areas of residual flooding, such as ponding areas, which are shown as Special Flood Hazard Area (SFHA).

Annualized Loss Ratio (ALR) – Expresses the annualized loss as a fraction of the value of the local inventory (total value/annualized loss).

Average Annualized Loss (AAL) – The estimated long-term weighted average value of losses to property in any single year in a specified geographic area.

Base Flood Elevation (BFE) – Elevation of the 1-percent-annual-chance flood. This elevation is the basis of the insurance and floodplain management requirements of the NFIP.

Berm – A small levee, typically built from earth.

Cfs – Cubic feet per second, the unit by which discharges are measured (a cubic foot of water is about 7.5 gallons).

Coastal High Hazard Area (CHHA) – Portion of the SFHA extending from offshore to the inland limit of a primary frontal dune along an open coast or any other area subject to high velocity wave action from storms or seismic sources.

Consequence (of flood) – The estimated damages associated with a given flood occurrence.

Crest – The peak stage or elevation reached or expected to be reached by the floodwaters of a specific flood at a given location.

Dam – An artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water.

Design flood event – The greater of the following two flood events: (1) the base flood, affecting those areas identified as SFHAs on a community's FIRM; or (2) the flood corresponding to the area designated as a flood hazard area on a community's flood hazard map or otherwise legally designated.

Erosion – Process by which floodwaters lower the ground surface in an area by removing upper layers of soil.

Essential facilities – Facilities that, if damaged, would present an immediate threat to life, public health, and safety. As categorized in Hazus, essential facilities include hospitals, emergency operations centers, police stations, fire stations, and schools.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters or (2) the unusual and rapid accumulation or runoff of surface waters from any source.

Flood Insurance Rate Map (FIRM) – An official map of a community, on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. See also Digital Flood Insurance Rate Map.

Flood Insurance Study (FIS) Report – Contains an examination, evaluation, and determination of the flood hazards of a community, and if appropriate, the corresponding water-surface elevations.

Flood risk – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of flooding. This is sometimes referred to as flood vulnerability.

Flood vulnerability – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of flooding. This is sometimes referred to as flood risk.

Flood-borne debris impact – Floodwater moving at a moderate or high velocity can carry flood-borne debris that can impact buildings and damage walls and foundations.

Floodwall – A long, narrow concrete or masonry wall built to protect land from flooding.

Floodway (regulatory) – The channel of a river or other watercourse and that portion of the adjacent floodplain that must remain unobstructed to permit passage of the base flood without cumulatively increasing the water surface elevation more than a designated height (usually 1 foot).

Floodway fringe – The portion of the SFHA that is outside of the floodway.

Freeboard – A factor of safety usually expressed in feet above a flood level for purposes of flood plain management. “Freeboard” tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed (44CFR§59.1).

Hazus – A GIS-based risk assessment methodology and software application created by FEMA and the National Institute of Building Sciences for analyzing potential losses from floods, hurricane winds and storm surge, and earthquakes.

High velocity flow – Typically comprised of floodwaters moving faster than 5 feet per second.

Levee – A human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding. (44CFR§59.1)

Loss ratio – Expresses loss as a fraction of the value of the local inventory (total value/loss).

Mudflow – Mudslide (i.e., mudflow) describes a condition where there is a river, flow or inundation of liquid mud down a hillside usually as a result of a dual condition of loss of brush cover, and the subsequent accumulation of water on the ground preceded by a period of unusually heavy or sustained rain. A mudslide (i.e., mudflow) may occur as a distinct phenomenon while a landslide is in progress, and will be recognized as such by the Administrator only if the mudflow, and not the landslide, is the proximate cause of damage that occurs. (44CFR§59.1)

Non-Accredited Levee System – A levee system that does not meet the requirements spelled out in the NFIP regulations at Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44CFR65.10), Mapping of Areas Protected by Levee Systems, and is not shown on a FIRM as reducing the flood hazard posed by a 1-percent-annual-chance flood.

Primary frontal dune (PFD) – A continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms.

The inland limit of the primary frontal dune occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

Probability (of flood) – The likelihood that a flood will occur in a given area.

Provisionally Accredited Levee (PAL) – A designation for a levee system that FEMA has previously accredited with reducing the flood hazards associated with a 1-percent-annual-chance or greater flood on an effective FIRM, and for which FEMA is awaiting data and/or documentation that will demonstrate the levee system's compliance with the NFIP regulatory criteria cited at 44CFR65.10.

Risk MAP – Risk Mapping, Assessment, and Planning, a FEMA strategy to work collaboratively with state, local, and tribal entities to deliver quality flood data that increases public awareness and leads to action that reduces risk to life and property.

Riverine – Of, or produced by, a river. Riverine floodplains have readily identifiable channels.

Special Flood Hazard Area (SFHA) – Portion of the floodplain subject to inundation by the 1-percent-annual or base flood.

Stafford Act – Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-707, signed into law November 23, 1988; amended the Disaster Relief Act of 1974, PL 93-288. This Act constitutes the statutory authority for most federal disaster response activities especially as they pertain to FEMA and FEMA programs.

Stillwater – Projected elevation that flood waters would assume, referenced to National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or other datum, in the absence of waves resulting from wind or seismic effects.

Stream Flow Constrictions – A point where a human-made structure constricts the flow of a river or stream.

Total Exposure in Floodplain - An analysis of the total potential economic losses (exposure) in the special flood hazard area (SFHA).

6 Additional Resources

ASCE 7 – National design standard issued by the American Society of Civil Engineers (ASCE), *Minimum Design Loads for Buildings and Other Structures*, which gives current requirements for dead, live, soil, flood, wind, snow, rain, ice, and earthquake loads, and their combinations, suitable for inclusion in building codes and other documents.

ASCE 24-05 – National design standard issued by the ASCE, *Flood Resistant Design and Construction*, which outlines the requirements for flood resistant design and construction of structures in flood hazard areas.

National Flood Insurance Program (NFIP), Federal Emergency Management Agency (FEMA), www.floodsmart.gov

FEMA, www.fema.gov

FEMA, *Guidelines and Standards for Flood Risk Analysis and Mapping*, www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping

ASCE, 2010. *So, You Live Behind a Levee!* Reston, VA.

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FEMA, 1999. Riverine Erosion Hazard Areas Mapping Feasibility Study. Washington, DC, September 1999.

FEMA, 2000. *Above the Flood: Elevating Your Floodprone House,* FEMA 347. Washington, DC, May 2000.

FEMA, 2001a. *Understanding Your Risks: Identifying Hazards and Estimating Losses*, FEMA 386-2. Washington, DC, August 2001.

FEMA, 2001b. *Flood Insurance Study, Montgomery County, PA (All Jurisdictions),* Washington, D.C., Revised, October 19, 2001.

FEMA, 2002a. *Getting Started: Building Support for Mitigation Planning*, FEMA 386-1. Washington, DC, September 2002.

FEMA, 2002b. *Integrating Manmade Hazards into Mitigation Planning*, FEMA 386-7. Washington, DC, September 2002.

FEMA, 2003a. *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies*, FEMA 386-3. Washington, DC, April 2003.

FEMA, 2003b. *Bringing the Plan to Life: Implementing the Hazard Mitigation Plan*, FEMA 386-4. Washington, DC, August 2003.

FEMA, 2003c. *Interim Guidance for State and Local Officials - Increased Cost of Compliance Coverage*, FEMA 301. Washington, DC, September 2003.

FEMA, 2004a. *Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds*, FEMA 424. Washington, DC, January 2004.

FEMA, 2004b. *Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners*, FEMA 64. Washington, DC, April 2004.

FEMA, 2004c. *Flood Insurance Study, Bucks County, PA (All Jurisdictions),* Washington, D.C., Revised, April 2, 2004.

FEMA, 2005. *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*, FEMA 386-6. Washington, DC, May 2005.

FEMA, 2006a. *Multi-Jurisdictional Mitigation Planning*, FEMA 386-8. Washington, DC, August 2006.

FEMA, 2006b. *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*, FEMA 386-9. Washington, DC, August 2008.

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FEMA, 2006d. *Flood Insurance Study, Chester County, PA (All Jurisdictions),* Washington, D.C., Revised, September 29, 2006.

FEMA, 2007a. *Flood Insurance Study, City of Philadelphia, Philadelphia County, PA (All Jurisdictions),* Washington, D.C., Revised, January 17, 2007.

FEMA, 2007b. *Property Acquisition Handbook for Local Communities*, FEMA 317. Washington, DC, September 2007.

FEMA, 2007c. *Public Assistance Guide*, FEMA 322. Washington, DC, June 2007.

FEMA, 2007d. *Using Benefit-Cost Review in Mitigation Planning*, FEMA 386-5. Washington, DC, May 2007.

FEMA, 2007e. *Design Guide for Improving Critical Facility Safety from Flooding and High Winds: Providing Protection to People and Buildings*, FEMA 543. Washington, DC, January 2007.

FEMA, 2007f. *Selecting Appropriate Mitigation Measures for Floodprone Structures*, FEMA 551. Washington, DC, March 2007.

FEMA, 2007g. *Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds: Providing Protection to People and Buildings,* FEMA 577. Washington, DC, June 2007.

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FEMA, 2009a. *Local Officials Guide for Coastal Construction,* FEMA P-762. Washington, DC, February 2009.

FEMA, 2009b. *Flood Insurance Study, Delaware County, PA (All Jurisdictions),* Washington, D.C., Revised, November 18, 2009.

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FEMA, 2015b. *Flood Insurance Study, Bucks County, PA,* Washington, D.C., Preliminary, March 24, 2015.

FEMA, 2015c. *Flood Insurance Study, Delaware County, PA and Incorporated Areas,* Washington, D.C., September 2, 2015.

FEMA, 2015d. *Flood Insurance Study, Philadelphia County, PA and Incorporated Areas,* Washington, D.C., November 18, 2015.

USGS. *USGS National Assessment of Shoreline Change Project,* http://coastal.er.usgs.gov/shoreline-change/

Community Description Sources

FEMA, 2014a. FEMA Disaster Declarations, http://www.fema.gov/disasters

FEMA, 2014b. FEMA Community Information System, https://portal.fema.gov/famsVuWeb/home

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FEMA, 2015e. FEMA Community Status Book Report, Pennsylvania, March 23, 2015, http://www.fema.gov/cis/PA.pdf

FEMA, 2016. FEMA policy statistics, Pennsylvania, January 31, 2016, http://bsa.nfipstat.fema.gov/reports/1011.htm#PAT

Local Government Websites

Delaware River Basin Commission (DRBC), http://nj.gov/drbc/

Delaware Valley Regional Planning Commission (DVRPC), http://www.dvrpc.org/

Commonwealth of Pennsylvania Emergency Management Agency (PEMA), http://www.pema.pa.gov/responseandrecovery/Disaster-Assistance/Pages/Mitigation.aspx#.Vqo8H8lOlaQ

Bucks County, http://www.buckscounty.org/

Bucks County Emergency Management, http://www.buckscounty.org/government/EmergencyServices/EmergencyManagement

Delware County, http://www.co.delaware.pa.us

Delware County Emergency Services, http://www.co.delaware.pa.us/delcoready/emergency.html

City of Philadelphia Managing Director's Office of Emergency Management (MDO-OEM), http://oem.readyphiladelphia.org/HazardMitigation

Township of Bensalem, Bucks County, http://www.bensalempa.gov/

Township of Lower Southampton, Bucks County,

Township of Aston, Delaware County, www.astontownship.net

City of Chester, Delaware County, www.chestercity.com

Township of Chester, Delaware County, www.townshipofchesterpa.com
Borough of Collingdale, Delaware County, www.collingdaleborough.com
Borough of Colwyn, Delaware County, www.colwynborough.com
Borough of Darby, Delaware County, www.darbyborough.com
Township of Darby, Delaware County, www.darbytwp.org
Borough of Eddystone, Delaware County, www.eddystoneboro.com
Borough of Folcroft, Delaware County, www.folcroftpa.net
Borough of Glenolden, Delaware County, www.glenoldenborough.com
Borough of Lansdowne, Delaware County, www.lansdowneborough.com
Borough of Marcus Hook, Delaware County, www.marcushookboro.com
Township of Nether Providence, Delaware County, www.netherprovidence.org
Township of Aston, Delaware County, www.astontownship.net
Borough of Norwood, Delaware County, http://norwood-borough.org
Borough of Parkside, Delaware County, www.parksideboro.com
Borough of Prospect Park, Delaware County, www.prospeckparkboro.com
Township of Ridley, Delaware County, www.twp.ridley.pa.us
Borough of Ridley Park, Delaware County, www.ridleyparkborough.org
Borough of Sharon Hill, Delaware County, www.sharonhillboro.com
Township of Tinicum, Delaware County, www.tinicumtownshipdelco.com
Borough of Trainer, Delaware County, www.trainerboro.com
Borough of Upland, Delaware County, www.uplandboro.org
Township of Upper Darby, Delaware County, www.upperdarby.org
Borough of Yeadon, Delaware County, http://yeadonborough.com

7 Data Used to Develop Flood Risk Products

Engineering study information was leveraged from Risk Assessment, Mapping, and Planning Partners (RAMPP) with coordination from FEMA Region III and the United States Army Corps of Engineers (USACE).

Hazard Mitigation Plan information was provided by FEMA.

AAL data was based on FEMA's National Hazus Level 1 analysis, published in 2010. This data has limited distribution and can be made available upon request.

Flood Insurance Claim, Policy, and additional Mitigation Plan information were acquired from FEMA.

Photos shown on the Flood Risk Map were taken from publically available sources on the Internet.

HUC boundaries were provided by the U.S. Department of Agriculture (USDA).

Digital elevation models (DEM) for coastal and noncoastal areas were downloaded in 2014 from PA Spatial Data Access (PASDA), the Pennsylvania Geospatial Data Clearinghouse.

Bucks County: GIS basemap information was acquired from the FIS DFIRM database. This dataset is available for download from the FEMA Map Service Center at http://msc.fema.gov/portal. The Bucks County FIS DFIRM database is posted within Preliminary Products under the *NFHL-Data County* directory and dated March 24, 2015.

Chester County: GIS basemap information was acquired from the FIS DFIRM database. This dataset is available for download from the FEMA Map Service Center at http://msc.fema.gov/portal. The Chester County FIS DFIRM database was posted under the *NFHL-Data County* directory after the new study effective date on December 9, 2015.

Delaware County: GIS basemap information was acquired from the FIS DFIRM database. This dataset is available for download from the FEMA Map Service Center at http://msc.fema.gov/portal. The Delaware County FIS DFIRM database was posted within Effective Products under the *NFHL-Data County* directory after the new study effective date on September 2, 2015.

Montgomery County: GIS basemap information was acquired from the FIS DFIRM database. This dataset is available for download from the FEMA Map Service Center at http://msc.fema.gov/portal. The Montgomery County FIS DFIRM database was posted within the *NFHL-Data County* directory after the new study effective date on March 2, 2016.

City of Philadelphia: GIS basemap information was acquired from the FIS DFIRM database. This dataset is available for download from the FEMA Map Service Center at http://msc.fema.gov/portal. The City of Philadelphia FIS DFIRM database was posted within Effective Products under the *NFHL-Data County* directory after the new study effective date on November 18, 2015.

Census Information

Census information was collected from FEMA's HAZUS version 2.1 software products. Population data reported for each community is based on the 2010 census. As such, there may be minor discrepancies in the FRD when comparing census blocks to communities to arrive at total population.

TEIF Dataset

TEIF ranks each community by its total potential structural economic losses in the special flood hazard area, and geospatially associates those losses, aggregated to each Census block. The economic losses are estimates, derived from national level datasets – 2010 Census and ACS data applying 2012 RS Means valuations. The National Flood Hazard Layer that was used to develop TEIF was extracted in May 2013.

Changes Since Last FIRM (CSLF)

CSLF are provided both for the project area, only as summarized in this Flood Risk Report, as developed for the most recent map revision of the Flood Insurance Rate Map (FIRM). All data was digitally captured from the previously effective maps.

Hillshade

Hillshade, also known as Shaded Relief is shown on the background of the Flood Risk Map. It is a cartographic process of 3-D visualization of the terrain on maps and charts that implements graded shadows created by light shining from the north-west direction. These data were acquired from the USGS. This data layer is called a "Hillshade" in the Flood Risk Database.