Levee Analysis and Mapping Plan
Village of Deposit Levees

Village of Deposit

June 2018

FEMA

RiskMAP
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Acronyms

BFE	Base Flood Elevation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
LLPT	Local Levee Partnership Team
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
NYSDEC	New York State Department of Environmental Conservation
USACE	U.S. Army Corps of Engineers

Definitions

The terms below have been used in this document. Additional terms are provided in FEMA's *Analysis and Mapping Procedures for Non-Accredited Levee Systems* (July 2013) in the Glossary of Levee Terms. This document is available from the FEMA Library at https://www.fema.gov/media-library-data/20130726-1922-25045-4455/20130703_approachdocument_508.pdf.

Base Flood Elevation (BFE) – The elevation of a flood having a 1-percent chance of being equaled or exceeded in any given year.

Levee Analysis and Mapping Procedure Approach* – Levee Analysis and Mapping Procedures include Sound Reach, Freeboard Deficient Procedure, Overtopping Analysis, Structural Based Inundation, and Natural Valley. Details on these approaches can be found in FEMA's *Analysis and Mapping Procedures for Non-Accredited Levee Systems* (July 2013).

Levee Impact Area – All land areas that would be subject to inundation by the one percent annual chance flood if the levee system was not present.

Levee Reach – Any continuous section of a levee system to which a single analysis and mapping procedure may be applied.

Levee Segment - A discrete portion of a levee system that is operated and maintained by a single entity.

Levee System – A flood hazard-reduction system that consists of a levee, or levees, and associated structures, such as closures, pumps and drainage devices, which are constructed and operated in accordance with sound engineering practices**.**

Local Levee Partnership Team (LLPT) – A work group that can be facilitated by FEMA when a non-accredited levee system in a community or project area will be analyzed and the areas landward of the levee system will be mapped. The primary function of this group is to share information/data and identify options based on stakeholder roles and knowledge.

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

Zone D – Area of undetermined but possible flood hazard.

*All definitions on this page except for this one are from FEMA's Analysis and Mapping Procedures for Non-Accredited Levee Systems (July 2013)

0.0 Executive Summary

The Federal Emergency Management Agency's (FEMA's) Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for the Village of Deposit, Broome County, New York must be revised to reasonably account for the hazard reduction impacts of non-accredited levees. FEMA's guidance was revised in 2013 to incorporate a new Levee Analysis and Mapping Procedure which provides a suite of flexible procedures to perform flood hazard analysis and mapping (see Section 1). The Village of Deposit has a flood management project where the levee system is being studied using the Levee Analysis and Mapping Procedures (see Section 2).

In September of 2017, FEMA Region II partnered with stakeholders in the Village of Deposit to form a collaborative Local Levee Partnership Team (LLPT) and worked to determine potential Levee Analysis and Mapping Procedures for the Village of Deposit levee system (see Sections 3 and 4 respectively). The process involved the collection and group evaluation of available data, creation and evaluation of analysis and mapping, and detailed discussions on mapping needs.

The information gained through the extensive coordination of the LLPT is now supplemented by a recently completed "first pass" Levee Analysis and Mapping Procedure analysis (see Section 5). The information collected and the analysis performed allows for the development of this document—a plan outlining potential reach procedures. This document informs the path forward (see Section 6). A meeting of the LLPT in December of 2017 allowed FEMA to present the first pass Levee Analysis and Mapping Procedure analyses and discuss the options for moving forward. The Village of Deposit has expressed interest in a detailed study of the many flooding sources that impact the community, in order to understand the combined flood risk in the area. Regarding the levees included in this report, the communities will not proceed with activities related to accreditation, and therefore elect to move forward with the Natural Valley.

This Levee Analysis and Mapping Plan summarizes the discussions and decisions by FEMA and project stakeholders on how best to map the flood hazards landward of the Village of Deposit levee system.

1.0 Introduction

Under FEMA's prior levee approach, a levee system that did not meet the National Flood Insurance Program (NFIP) requirements was analyzed and mapped as if it provided no protection during a base (1-percent-annual-chance) flood. This was known as the "without levee" approach.

Some stakeholders expressed concern about the "without levee" approach. Members of both the U.S. House of Representatives and the U.S. Senate echoed this concern and asked FEMA to consider discontinuing the "without levee" approach. Accordingly, FEMA drew on current modeling techniques to refine the identification of flood hazard reduction that non-accredited levee system provide. This process recognizes that such modeling is never precise.

FEMA, its Production and Technical Services contractor (STARR II) and Community Engagement and Risk Communication contractor (CERC) initiated the Levee Analysis and Mapping Procedures process for the levees in the Village of Deposit. Recent technological advances in data collection methods and hydrologic and hydraulic modeling were leveraged as part of this process. Levee

Analysis and Mapping Procedures is a more refined approach to mapping flood hazards in areas landward of levee system than the former approach.

The Levee Analysis and Mapping Procedures process also:

- Leverages local knowledge and data, with proactive stakeholder engagement in LLPTs;
- Aligns available resources for engineering analyses and mapping commensurate with the level of risk in the areas impacted by the levee; and
- Considers the unique characteristics of each levee system from an engineering perspective.

The levee system in the Village of Deposit is not currently accredited. FEMA is using the Levee Analysis and Mapping Procedures process to develop refined flood hazard mapping in areas landward of the levees. This will provide a more realistic representation of levee-related flood hazards in the Village of Deposit.

The Levee Analysis and Mapping Procedures process is conducted in four phases:

- **Phase 0: Flood Structure Identification and Review:** Levee systems are identified and verified as being constructed, operated, and maintained as flood risk reduction structures. An LLPT is established during this phase.
- **Phase 1: Analysis and Mapping Plan Preparation:** LLPT meetings are held periodically to review available data and documentation. Discussions assist in the preparation of an Analysis and Mapping Plan based on the available information.
- **Phase 2: Analysis Preparation and Results Review (if applicable):** Analysis is performed by FEMA and shared with the LLPT to validate results against available data and documentation. Results are compared to effective FISs to update the LAMP Plan, if necessary. Draft maps prepared at this stage may be used as best available data for floodplain management.
- **Phase 3: FIRM Update, Due Process and Effective FIRM Issuance:** FIRM panels are updated with Phase 2 results. Communities and FEMA follow all NFIP regulatory due process procedures, and updated FIRM panels are adopted as the regulatory basis for local floodplain management.

This report describes the Levee Analysis and Mapping Plan for the Village of Deposit levee system, a result of the collaboration between FEMA, the Village of Deposit, and Broome County, New York State Department of Environmental Conservation (NYSDEC), U.S. Army Corps of Engineers (USACE), and other local stakeholders. This report documents the progress through Phase 1, including the first pass analysis results and data evaluation, as well as the community's selection of the preferred Levee Analysis and Mapping Procedures scenario.

2.0 Levee System Description

2.1 Flood Protection Measures in the Village of Deposit

The Village of Deposit levee system (see Figure 1) is comprised of a series of riverine flood control structures designed to reduce the flood risk from Butler Brook and Big Hollow Creek (see Figure 1) in the Village of Deposit, Broome County, New York. The levee system consists of two earthen levees (~4,300 ft.), one with a short stretch of sheet pile floodwall (~167 ft.), that guides the flow of Butler Brook and Big Hollow Creek through a concrete transition structure into a concrete channel that diverts the flow directly to the West Branch Delaware River, bypassing the original Butler Brook channel. The flood control structure is operated and maintained by Broome County.

Table 1. Village of Lisle Deposit Data.

Owner	Natural Resources Conservation Service (NRCS)
Maintained by	Broome County
Built	Natural Resources Conservation Service (NRCS)
Flooding Source	Big Hollow Creek/Butler Brook
Length	Approximately 4,500 feet
Pump Stations	0
Closure Structures	0
Drainage Structures	No Structures (assessment based on imagery)

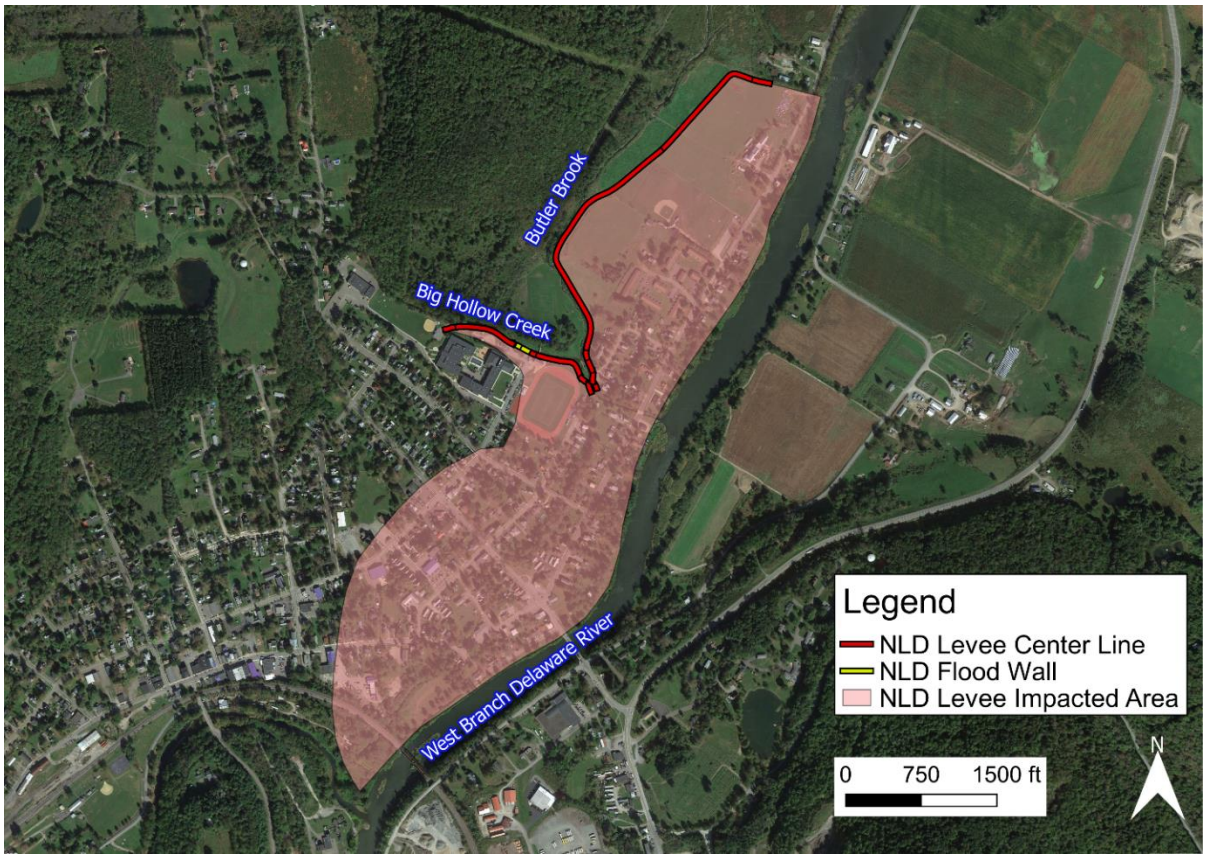

Figure 1. General Location Map.

2.2 Pump Stations

No pump stations were identified for the Village of Deposit.

2.3 Levee Analysis and Mapping Procedures Flood Risk Project

Table 2 and Table **3** summarize the communities' NFIP and FIRM history.

Table 2. Summary of Communities in Project Area.

County	Community	Participating in the NFIP?	Approximate Number of Structures Impacted by Levee System
Broome & Delaware Counties	Village of Deposit	Yes	93

Table 3. Community Map History.

Community Name	Initial Identification	Flood Hazard Boundary Map Revision Date(s)	FIRM Effective Date	FIRM Revision Date(s)	Preliminary FIRM*
Village of Deposit	June 14, 1974	October 24, 1975	February 1, 1979	-	February 5, 2010

*Preliminary FIRM has not been published.

The effective FIS for the Village of Deposit predates the construction of the levee system, and show flood extents inside the levee impacted area.

A countywide FIS was issued in preliminary form for Broome County, New York on February 5, 2010. According to the preliminary results, the levee impacted area is shown as in the Special Flood Hazard area, including floodways on the landward side of the levees for Butler Brook, Big Hollow Creek and the West Branch Delaware River.

2.4 Levee Analysis And Mapping Procedures Process Tasks

The Levee Analysis and Mapping Procedures process is divided into six distinct tasks: LLPT formation, Field Reconnaissance, Perform Initial Levee Analysis, Flood Risk Outreach, Complete Levee Analysis and Mapping Plan, and Produce Preliminary Products/Issue Preliminary (see Table 4).

Table 4. Project Tasks.

Task	Details	Tentative Start/End Dates*
LLPT Compilation (Phase 0)	Identification and outreach to individuals to serve on the LLPT.	July- September 2017
Field Reconnaissance (Phase 1)	LLPT to determine levee reaches to study and potential analysis of those reaches. Perform field reconnaissance of these reaches.	September 14, 2017- September 15, 2017
Perform Initial Levee Analysis and develop Levee Analysis and Mapping Plan (Phase 1)	FEMA to collaborate with the LLPT to develop analysis based on Field Reconnaissance findings and Levee Analysis and Mapping Plan.	September – December 2017

Task	Details	Tentative Start/End Dates*
Flood Risk Outreach (Phase 2)	LLPT to assess results of the Field Reconnaissance and Perform Levee Analysis tasks. LLPT to work at the local level to disseminate findings that could impact local communities.	December 11, 2017
Complete Levee Analysis and Mapping Plan; Finalize Levee Analysis and Mapping Procedures mapping (Phase 2)	FEMA to complete detailed analysis based on chosen approach, develop mapping, and finalize Levee Analysis and Mapping Plan; develop final analysis and mapping.	TBD
Produce Preliminary Products / Issue Preliminary (Phase 3)	FEMA to develop Preliminary Products (including FIRM database) from revised analysis above if that is the direction from FEMA and LLPT.	TBD

*All schedules are tentative and will be adjusted at the pace of the LLPT.

3.0 Local Levee Partnership Team

Based on the community meeting associated with the 2010 preliminary FIRM issuance, several stakeholders were identified as members of the LLPT (See Table 5). The LLPT was formed to provide FEMA with data and input, including feedback on the procedures to be used for analyzing and mapping the levee reach, based on local levee conditions. The stakeholders who participated in the LLPT for this project are listed in Table 5.

Table 5. Local Levee Partnership Team Participants.

LLPT Member	Contact Information
Daniel Axtell	Town of Deposit
Thomas A. Axtell	Town Supervisor
Ronald O'Connell	Village of Deposit
Peter Hathaway	Village of Deposit
Don Cantwall	Village of Deposit
Lonny Schaefer	Town of Deposit
Michael Salvator	Town of Deposit
Jay Vantermark	Village of Deposit
Mike Ballard	Broome County
Wayne Reynolds	Delaware County
Shelly Johnson	Delaware County
Steve Hood	Delaware County
Frank Evangeilisti	Broome County Planning
Dan Fuller	NYSDEC
Bruce Rogers	USACE, Philadelphia District
Curtis Smith	STARR II

LLPT Member	Contact Information
Shudipto Rahman	FEMA Region II 26 Federal Plaza, New York NY 13820 202-702-4273 ; shudipto.rahman@fema.dhs.gov
Alan Springett	FEMA Region II 26 Federal Plaza, New York NY 13820 (212) 680-8557; alan.springett@fema.dhs.gov
Srikanth Koka	STARR II 8401 Arlington Blvd., Fairfax, VA 22031 (703) 849-0584 ; skoka@Dewberry.com
Seth Lawler	STARR II 8401 Arlington Blvd., Fairfax, VA 22031 (703) 849-0213; slawler@dewberry.com
Amber Greene	Community Engagement and Risk Communication (CERC) amber.greene@ogilvy.com
Paige Mandy	Community Engagement and Risk Communication(CERC) 212 880 5295; paige.mandy@ogilvy.com
Thomas Song	Community Engagement and Risk Communication(CERC) thomas.song@mbakerintl.com
Cara Spidle	Community Engagement and Risk Communication(CERC) 202-729-4288; cara.spidle@ogilvy.com

4.0 Stakeholder Engagement

4.1 Stakeholder Engagement Meeting #1.1 (Community Meeting, LLPT 1.1)

A FEMA-led project team engaged with Village of Deposit, levee owners/operators, and other stakeholders during the LLPT meeting # 1.1 on September 14, 2017. During this meeting, a brief review of levee Analysis and Mapping Procedures was conducted by the FEMA project team, and a discussion pertinent to those sections of levee impacting the Village of Deposit followed. During this discussion, the LLPT reviewed particulars for the components of the levee system, history of performance, and provided an overview of the levee analysis and mapping procedures and potential analysis scenarios. (See Appendix A for minutes for the LLPT 1.1) Srikanth Koka and Seth Lawler of FEMA's contractor team, carried out limited field reconnaissance on September 14-15, 2017 to examine levee features (See Appendix D for site photographs).

4.2 Stakeholder Engagement Meeting # 1.2 (Community Meeting, LLPT 1.2)

On December 12, 2017 the LLPT 1.2 meeting was held to review the first pass analysis and discuss outcomes from the data collection process. During the meeting, the FEMA project team discussed the results of the First Pass Analysis for the Natural Valley Procedure, the Freeboard Deficient Procedure and Structural-Based Inundation (SBI) Procedure. During the discussion, it was stated that Structural Based Inundation Procedure, Overtopping Procedure and Sound Reach Procedure

were less applicable and Natural Valley and Freeboard Deficient Procedure were potentially applicable. FEMA will coordinate further engagement with the community to finalize which procedure to move forward with. (See Appendix B for minutes for the LLPT 1.2)

4.3 Stakeholder Engagement Meeting # 1.3 (Community Meeting, LLPT 1.3)

On May 16, 2018 the LLPT 1.3 meeting was held to review the first phase of the Levee Analysis and Mapping Procedure. During the meeting, the FEMA project team discussed the results of the first phase and the approximate timeline moving forward. (See Appendix C for minutes for the LLPT 1.3)

5.0 First Pass Analysis

FEMA developed a First Pass Analysis, which is an approximate analysis using a relatively low level of detail, to approximate the floodplain boundary for each relevant Levee Analysis and Mapping Procedures approach. This informed the discussions in LLPT Meeting 1.2.

5.1 Natural Valley Procedure

The Natural Valley Procedure allows flow to be conveyed on both sides of a non-accredited levee. This procedure is typically analyzed using a 1-Dimensional (1D) steady state HEC-RAS model, however due to the sloping conditions of the town and the presence of the West Branch Delaware River, 1D assumptions are not applicable. Therefore a 2-Dimensional (2D) analysis was performed to assess the Natural Valley. Figure 2 illustrates the results of the Natural Valley First Pass Analysis using HEC-RAS 5.0 (2D, unsteady-state flow).

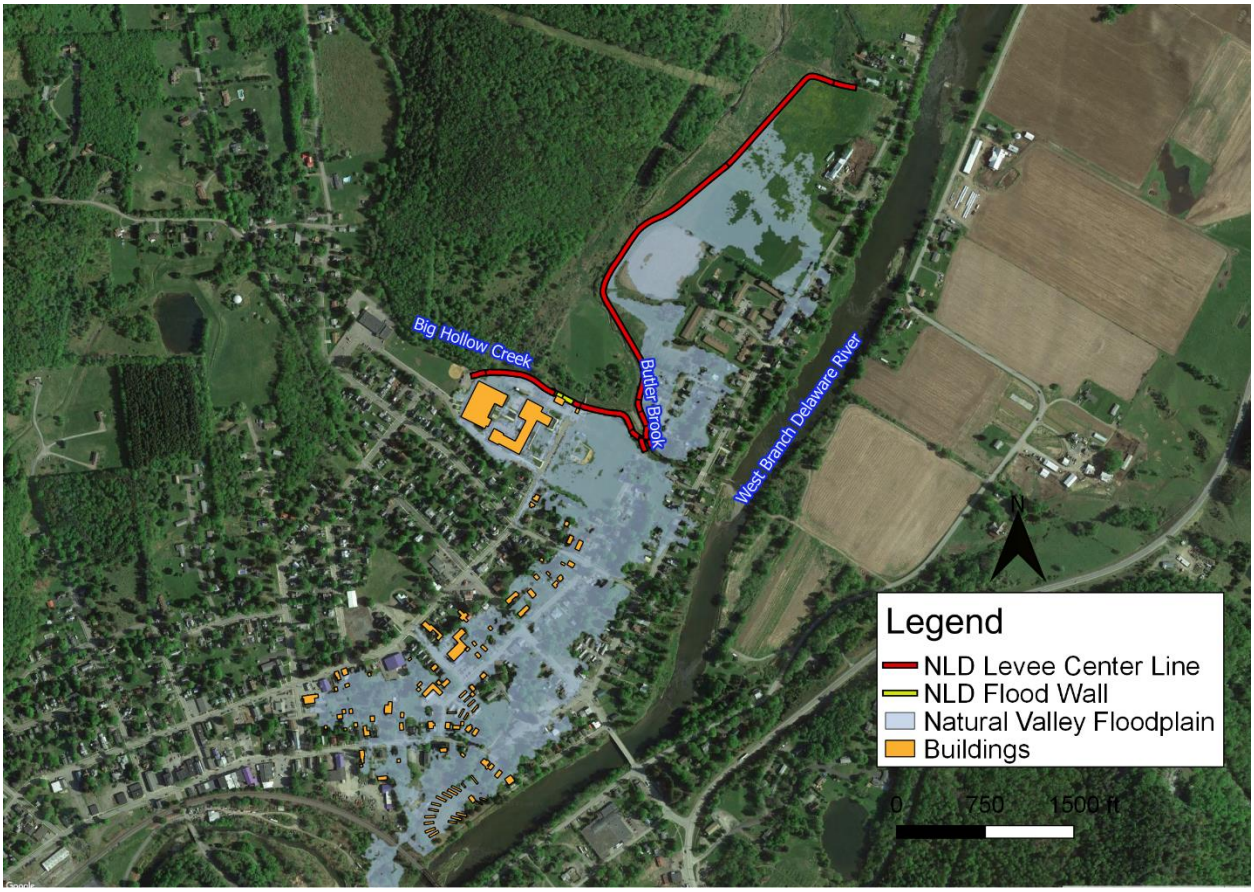

Figure 2. Natural Valley Procedure Mapping

5.2 Structural-based Inundation Procedure

First Pass Analyses (2 dimensional flow) were developed for two levee breaching scenarios using HEC- RAS 5.0. The results of these analyses are mapped in Figure 3.

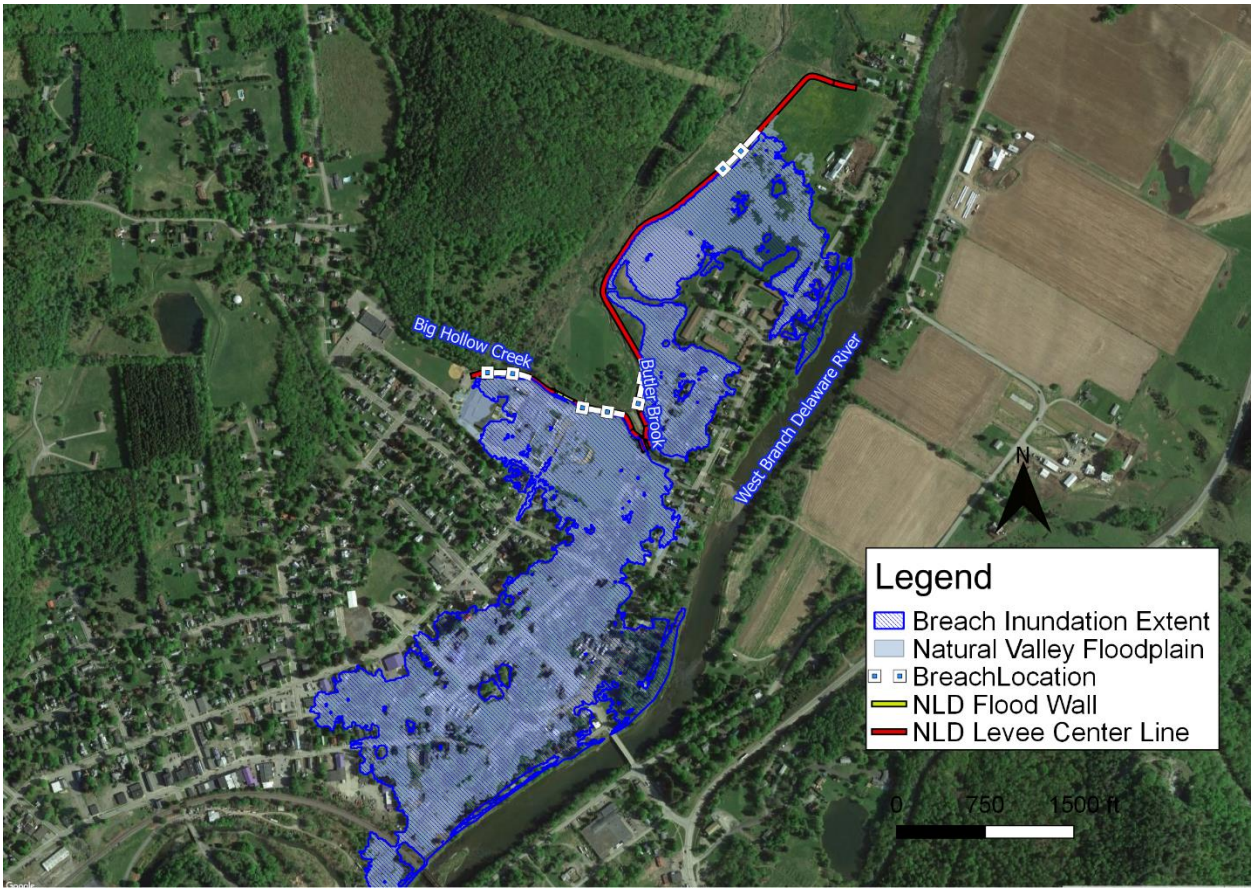

Figure 3. Structural-based Inundation Procedure Mapping

5.3 Freeboard Deficient Procedures

For the freeboard deficient analysis, points were taken along the levee crests for all sections included in this study. Where possible, elevations were taken directly from the USACE National Levee Database. The top of levee profile was compared to the 44 CFR§65.10 required freeboard profile for each segment of the levee system covering areas within the Village of Deposit. The freeboard analyses for the levees on Butler Brook and Big Hollow Creek are presented in Figures 4 and 5.

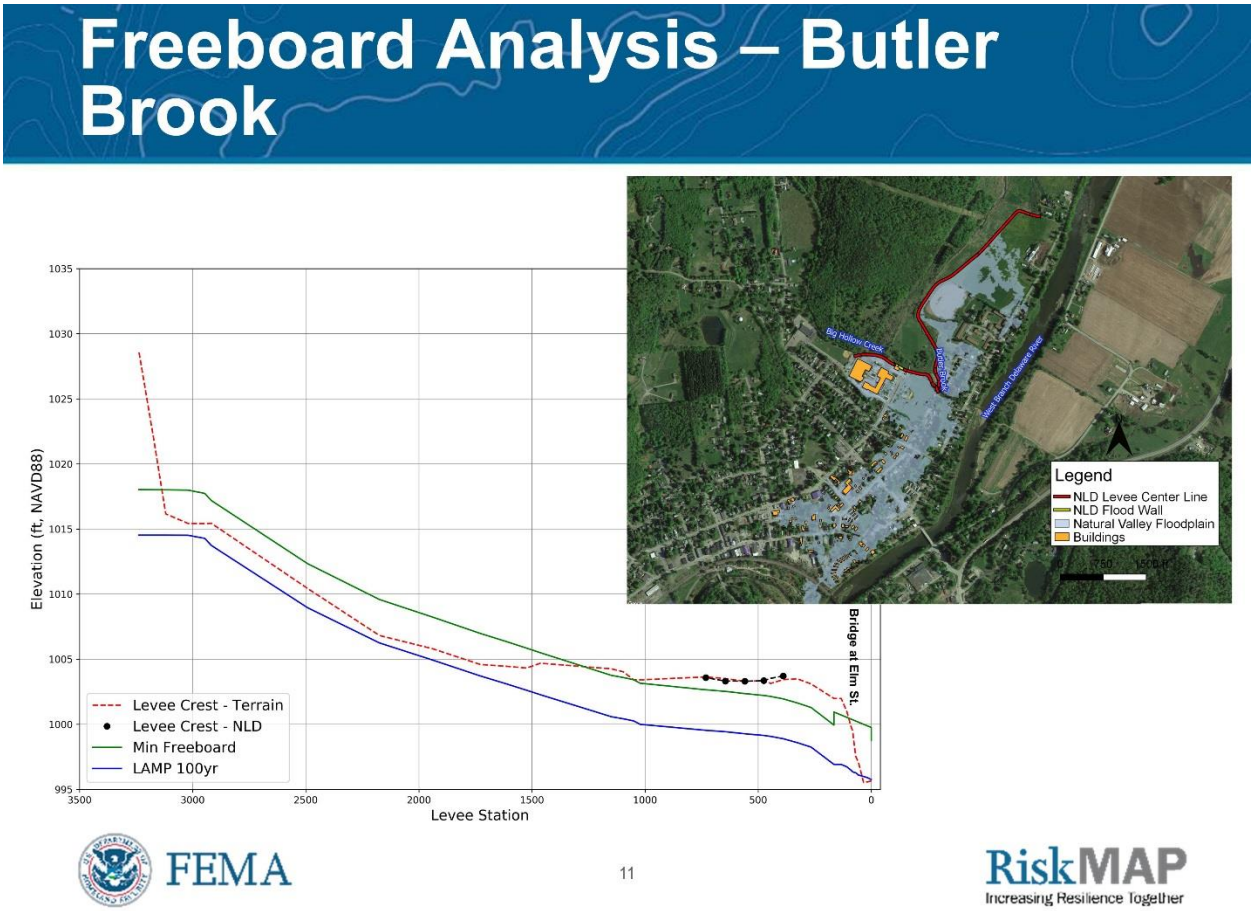

Figure 4. First Pass results for Butler Brook

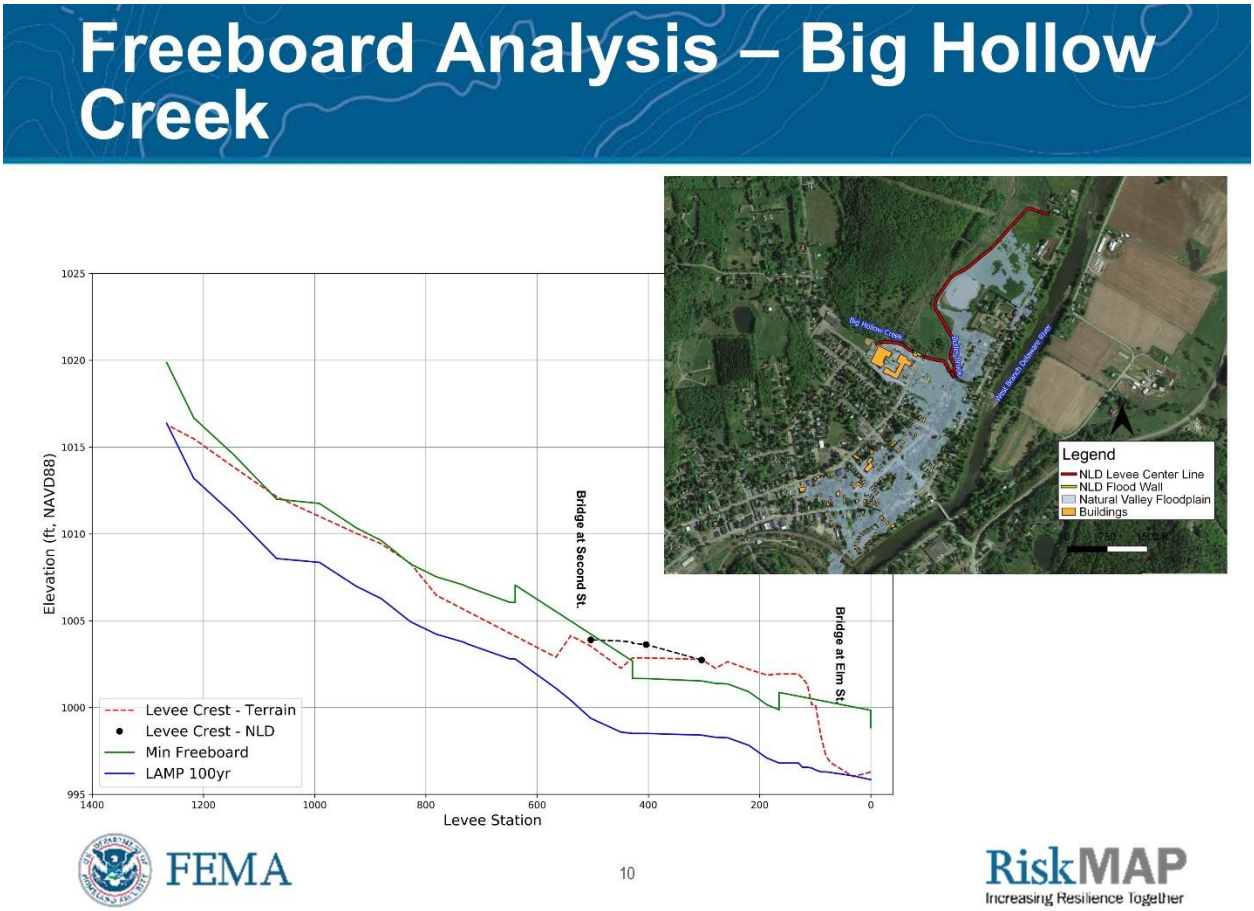

Figure 5. First Pass results for Big Hollow Creek

5.4 Review of First Pass Analyses

Summary results from the first pass analysis are included in Table 6. (See Appendix B for LLPT 1.2 Meeting Notes):

Table 6. Results from the First Pass Analysis.

Type	Approximate Length of Levee Segment (ft)	Flooding Source(s)	Approximate # Structures Impacted	Comments: Natural Valley Procedure	Comments: Freeboard Deficient Procedure	Comments: Structural-based Inundation Procedure	Comments: General
Levee	1096	Big Hollow Creek	93	• The West Branch Delaware River shows a larger area as subject to inundation and ultimately supersedes the natural valley flooding modeled for Big Hollow and Butler Brook.	• Levee crest freeboard exists for both levees but is not above the minimum requirements in some areas.	• Structural-based inundation shows flood elevations generally higher than the natural valley procedure (0-2 feet).	• The NRCS built the levee, and USACE was asked to do an environmental assessment of the levee and included it in the PL84-99.
Flood Wall	167	Big Hollow Creek					
Levee	3237	Butler Brook					

6.0 Path Forward

6.1 Levee Analysis and Mapping Procedures Phase 2 Analysis

The levees included in this study are shown as accredited on the current FIRMs but have not been accredited as a result of 44 CFR§65.10 review, therefore FEMA will undertake a Levee Analysis and Mapping Procedures Phase 2 and Levee Analysis and Mapping Procedures Phase 3 study to take into account the hazard reduction impacts of the non-accredited levees. Minimum freeboard for accreditation would be two feet with a favorable risk assessment by a federal agency with the authorization to design and construct such structures.

Where feasible, the Levee Analysis and Mapping Procedures Phase 2 analysis will focus on refining community identified procedures. The models and source data will be reviewed and refined with any updated information (e.g. updated discharges, recent surveyed cross sections, updated land cover data, and topographic data).

A subsequent Levee Analysis and Mapping Procedures Phase 3 study will incorporate the Phase 2 results into the regulatory NFIP products, namely the FIS and FIRM. This will likely become part of the data utilized during a restudy of the county-wide Flood Insurance Study at an as-yet unidentified future time.

6.2 Levee Accreditation

The Village of Deposit has indicated an interest in identifying the combined flood risk from the many flooding sources impacting the area, and will not pursue accreditation at this time. If the system can be brought into compliance with 44 CFR§65.10, the levees can be shown as accredited in the Broome County FIS and on the FIRM. Should this occur, FEMA will cease work on the Levee Analysis and Mapping Phase 2 and 3 efforts. If the FIRM and FIS have already been updated by the time of accreditation, FEMA will revise the maps via a Letter of Map Revision or Physical Map Revision.

FEMA's Levee Accreditation Checklist has been included in Appendix E for reference.

7.0 References

FEMA: Non-Accredited Levee Analysis and Mapping Guidance, September 2013

USACE, National Levee Database (GeoDatabase Version 3.0 dated 07-28-2015), 2015.

Appendix A
Stakeholder Engagement - LLPT Meeting #1.0 Information

Appendix B
Stakeholder Engagement - LLPT Meeting #1.2 Information

Appendix C
Stakeholder Engagement - LLPT Meeting #1.3 Information

Appendix D
Site Photographs

(These site photographs correspond to all the communities)

Appendix E
Levee Accreditation Checklist

Appendix F
Modeling and Mapping files