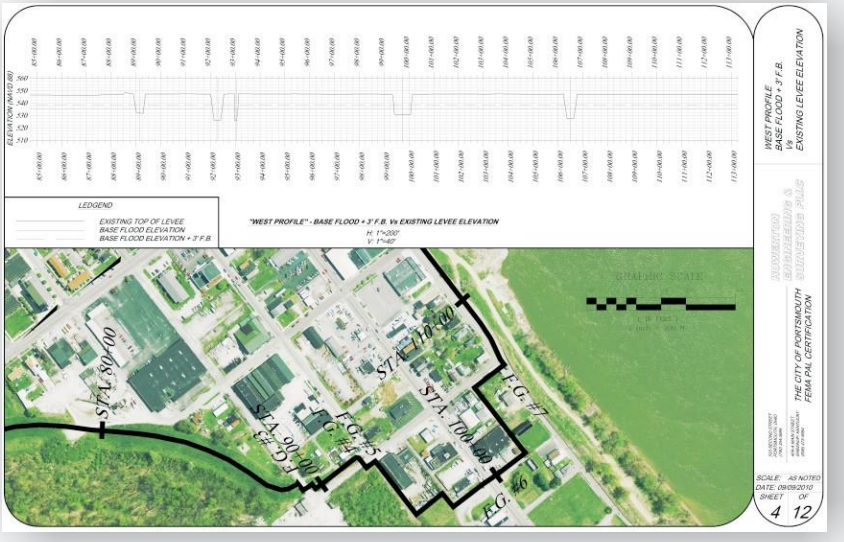
The City of Portsmouth
FEMA PAL Certification
Portsmouth, Ohio



Project Description

Howerton Engineering & Surveying was selected by The City of Portsmouth in
2010 to provide certification to the satisfaction of the Federal Emergency Management Agency (FEMA) that the levees and flood walls comply with the requirements set forth in Title 44 of the Code of Federal Regulations (CFR), Section 65.10, or if not, Howerton Engineering & Surveying will identify any deficiencies that must be addressed in order to bring The City of Portsmouth into compliance with 44 CFR 65.10. A cost estimate for the levee and/or flood wall rehabilitation will be prepared if any levees and/or flood walls are found not to comply with 44 CFR 65.10.

The FEMA PAL Certification project included:·

Freeboard – 65.10 (b) (1)

Howerton Engineering & Surveying provided a site plan showing the levee layout, additionally a surveyed levee centerline was accomplished by providing the 1% annual base flood mapped along the profile of the levee. The 1% annual flood base was obtained from the published FIS for Scioto County.

Client/Location

The City of Portsmouth
728 Second Street
Portsmouth, OH 45662

Client Reference

The City of Portsmouth
Richard Duncan
Director of Waste Water
(740) 354-0241

Project Status

Complete

Dates of Service

2015

Special Features

- Centerline Survey
- Levee Cross-Sections
- Geotechnical
- Structural Engineering
- Internal Drainage Analysis

CITY OF PORTSMOUTH OHIO 1803

HOWERTON ENGINEERING & SURVEYING PLLC

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Closures – 65.10 (b) (2)
Howerton Engineering provided a site plan showing the location of all closures. We then provided detailed drawings, manufacturer specifications of closure devices and operations procedures for implementing and storage of closure devises.

Embankment Protection – 65.10 (b) (3)
Thelen and Associates prepared an engineering analysis to demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability. The factors addressed in such analyses included: Expected flow velocities; expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.

The submittals included: Engineering analysis demonstrating anticipated velocities, wave action, ice loading for 1% annual chance flood event along levee; Detailed drawings, manufacturer specifications and photos of current embankment protection; as well as Engineering analysis or manufacturer specifications demonstrating current embankment protection is adequate for anticipated velocities, wave action, ice loading, etc.

Embankment & Foundation Stability – 65.10 (b) (4)
Engineering analyses evaluating the levee embankment's stability was submitted. The analyses provided evaluated expected seepage during loading conditions associated with the base flood and demonstrated that seepage into or through the levee foundation and embankment would not jeopardize embankment or foundation stability. This item required analysis per The U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110–2–1913); as well as laboratory test of borings and boring log locations.

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Howerton Engineering & Surveying performed the bore hole location surveying for Thelen and Associates. There were a total of 70 bores holes that were located. Along with the bore holes 32 cross-sections were surveyed along the levee. A full topographic survey was conducted along the 32 cross-sections to accurately display the land

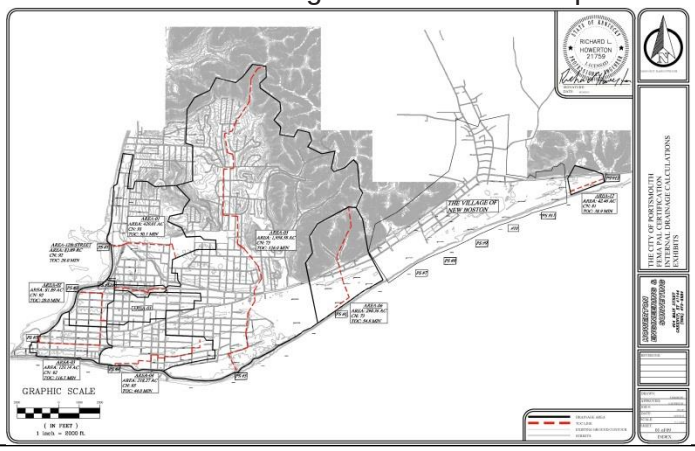
Settlement Analysis – 65.10 (b) (5)

Engineering analyses was submitted to assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrated that freeboard will be maintained within the minimum standards. The analysis addressed embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, "Soil Mechanics Design— Settlement Analysis" (EM 1100–2–1904) was submitted.

Interior Drainage – 65.10 (b) (6)

An analysis was submitted that identified the source(s) of such flooding, the extent of the flooded area, and, if the average depth was greater than one foot, the water-surface elevation(s) of the base flood. This analysis was based on the joint probability of interior and exterior flooding and the capacity of facilities for evacuating interior floodwaters.

The submittals for this included: Identification of areas of interior flooding (overland flow, under designed pumps, backflow from gravity pipes, etc); Interior flooding analysis per COE EM 1110-2-1413 including coincidental peaks analysis; Site map with areas of interior flooding. Base flood elevations were shown on areas with greater than 1 foot depth.



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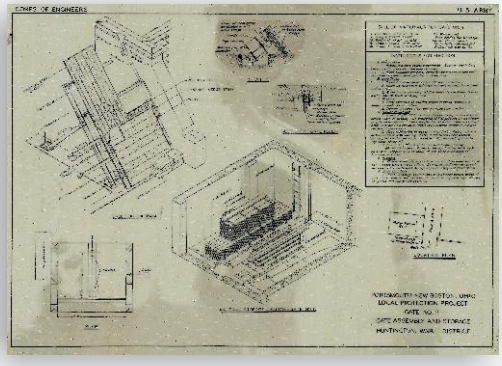
Operation Plans & Maintenance Plans - 65.10 (c) (d)

An operation & Maintenance plans were already in existence and very little action was required to bring these items up to the FEMA PAL Certification required. The project team worked with The City of Portsmouth in evolving the O & M plans and worked closely with The City of Portsmouth to ensure the current O&M Manual was up to the FEMA PAL standard set forth in CFR 65.10 (c)(d).



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