Chicopee, Hampden County, MA

Rivermills at Chicopee Falls

154 Grove Street & 75 West Main Street

April 2021

USACE SECTION 408 REQUEST

BETA

1 Springfield Street
Suite 4
Chicopee, MA 01013
413.331.5326
www.BETA-Inc.com

Rivermills at Chicopee Falls

Chicopee, Hampden County, MA

154 Grove Street & 75 West Main Street

USACE SECTION 408 REQUEST

Prepared by: BETA GROUP, INC.

On Behalf Of: City of Chicopee
Department of Planning and Development
274 Front Street
4th Floor City Hall Annex
Chicopee, MA 01013

Prepared for: US Army Corps of Engineers, New England District

April 2021

EXECUTIVE SUMMARY

On behalf of the City of Chicopee (The "City"), BETA Group, Inc. (BETA) has prepared this United States Army Corps of Engineers (USACE) Section 408 request to allow for the placement of backfill material along the landward side of an earthen levee that forms a portion of the Chicopee Falls Flood Control System. This request is also made to allow for the demolition of the existing Oak Street Pumping Station and the closure of two concrete gate valve structures. The completion of this work will facilitate future redevelopment of two former mill complexes: the former Uniroyal and Facemate properties.

The City will not conduct work on any federally-owned property for any of these activities, and the entire project will be completed on property owned by the City. The flood control works were designed and constructed by the USACE for locations along the Chicopee and Connecticut Rivers in the City of Chicopee in response to floods in the 1930s and 1950s. The USACE was responsible for the design and construction of the levees, while the City provided all of the lands, easements, and rights-of-way necessary for their construction. A permanent easement to the levee was provided to the City by the US Rubber Company in 1965 and the City subsequently acquired the former Uniroyal property (formerly US Rubber) and former Facemate property. Information on the real estate ownership, along with survey plans and deed references is provided in Section 2.1.7 and Appendices B and C.

The City of Chicopee has prepared a redevelopment plan for the former manufacturing complex. This project represents a significant economic opportunity for the City to meet its redevelopment goals for the site. An endorsement of the project from the City is included as Appendix A.

Commented [SB1]: From 2016, under a different Mayor. Still valid?

Backfill material for the proposed work will be supplied by importing material in accordance with the City's Fill Management Plan (FMP). Material appropriate for use at the Site include uncontaminated soils, contaminated soils meeting specific re-use criteria, dredged sediments, and street sweepings from the City of Chicopee and area communities. The FMP also allows for the use of uncoated and processed asphalt, brick, and concrete (ABC) rubble generated from on-site activities as approved by MassDEP through its Beneficial Use Determination (BUD) process. Additional details and key excerpts from the FMP, related to the fill procedures, acceptance criteria, and quality control are provided in Section 3.0.

The fill material will be placed and compacted so as to raise the elevation of the project site to the crest of the flood control levee and to re-grade the entire site for future redevelopment. Abandoned site buildings located in the proposed fill areas have either been demolished or future demolition is planned. As the levee was installed on this portion of the property to protect these abandoned buildings, it is the City's opinion that this alteration will not impair the usefulness of the USACE flood control project (including the projects authorized purpose).

Commented [MN2]: Should we propose the density of the compactions?

A Slope Stability Analysis in support of the project was completed in September 2016 (Appendix E). A Stormwater Management Plan in support of the project is included as Appendix F. Refer to the attached figures for a detailed view of existing site conditions and the proposed project limits.

TABLE OF CONTENTS

List of Figures

List of Appendices

Commented [SB3]: We may want to consider revising this as it mentions Mike Vedovelli

Commented [SB4]: Need updated version from OTO

Commented [SB5]: Requires stamp and final review

Commented [SB6]: Requires further review

1.0 PROJECT DESCRIPTION

On behalf of the City of Chicopee ("City"), BETA Group, Inc. (BETA) has prepared the following Section 408 Request to support re-development of a portion of the former Uniroyal Site, located at 154 Grove Street in Chicopee, MA and a portion of the former Facemate Site known as the Baskin Parcel, located at 75 West Main Street in Chicopee, MA. This request has been compiled in accordance with procedural guidance published by the United States Army Corps of Engineers (USACE) entitled "Poly and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408," also identified as EC 1165-2-220.

Under this project, the City proposes to backfill a portion of the Chicopee Falls Local Protection Project easement and adjacent upland areas in order to facilitate future redevelopment of the former Uniroyal and Facemate properties (the "Site"). The Site is bounded by the Chicopee River and the Chicopee Falls Local Protection Project on the west, the Rivermills senior center to the north, Grove Street and West Main Street to the east, and Front Street to the southeast. Refer to Figure 1 for the location of the Site and Figure 3 for an Overall Site Plan.

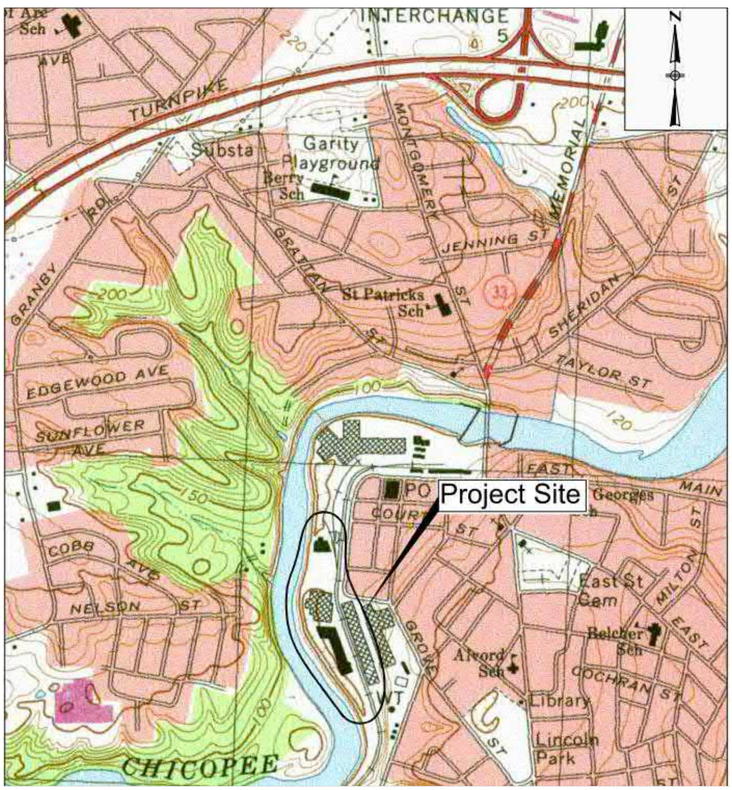


Figure 1. Project Locus

1.1 Site Overview and History

1.1.1 Former Uniroyal Site

The former Uniroyal Site ("Uniroyal") was originally developed during the late 1800s. By 1870, the property was used as a lumber yard by the Chicopee Manufacturing Company. From 1896 to 1898 the property was owned by the Spaulding and Pepper Company, which manufactured bicycle tires. From 1898 to 1981, the Fisk Rubber Company, which later changed its name to United States Rubber Company and then to Uniroyal, Inc., manufactured bicycle, automobile and truck tires and adhesives at the Site. Uniroyal, Inc. closed its plant in 1980 and sold the property to the Facemate Corporation in 1981. Facemate leased portions of the Uniroyal buildings to various companies for manufacturing, printing, machine shops, office, storage and health care facilities. The property was acquired by the City of Chicopee in 2009 for non-payment of taxes.

The existing Uniroyal Site includes six buildings formerly associated with the mill complex. Remediation and demolition activities have been ongoing at the Site, and the majority of the Site's original structures have been demolished. The activities proposed under this submittal are to primarily occur on Exposure Unit 7 (EU-7), a low-lying portion of the property located on its western side. The area includes former Uniroyal Buildings 1 through 7 (demolished), Buildings 8 and 14 (demolished) and Building 15 (demolition to be conducted). The former building foundations have been demolished to a depth of approximately two (2) feet below grade; in most locations, the concrete slabs associated with the former buildings are still in place. Remediation activities conducted at the Uniroyal Site since circa 2015-2016 have left portions of EU-7 partially backfilled with demolition wastes that have been capped-in-place with uncontaminated soil generated by the City. EU-7 also includes the Oak Street Pumping Station, located in the southeastern portion of the Site on the landward side of the levee. The Pump Station is discussed further in Section 2.

1.1.2 Former Facemate Site

Between 1823 and 1915, the former Facemate property and much of the surrounding area was owned by the Chicopee Manufacturing Company. During this time, the property was used for the manufacture and processing of cotton cloth. In 1915, Johnson & Johnson Services, Inc. purchased the property, and continued the production of cotton cloth. Circa 1977, the Property was purchased by the Facemate Corporation which produced finished cotton and synthetic cloth at the Property. In 2003, Facemate filed for bankruptcy and was forced to shut down due to bank foreclosure proceedings. The property has been vacant since 2003. The City of Chicopee acquired ownership of the property in 2010 for the non-payment of taxes, and subsequently conducted assessment and remediation activities subdivided the former Facemate property into four separate lots for re-development: Lot 1, Senior Center Parcel (Lot 2), Rivermills Drive (Lot 3), and Lot 4.

The activities proposed under this submittal are to occur on Lot 1, located on the southern portion of the former Facemate property nearest to the former Uniroyal property. Lot 1 includes a single building, identified as BLDG C or the "Baskin Building." Recent remediation activities have left a significant portion of Lot 1 backfilled and capped-in-place with uncontaminated soil generated by the City.

Refer to Figure 3 for the layout and orientation of the proposed Sites.

1.2 CHICOPEE FALLS FLOOD CONTROL SYSTEM DESCRIPTION

In response to floods occurring in the 1930s and 1950s, flood control works were designed and constructed by the United States Army Corps of Engineers (USACE) for locations along the Chicopee and Connecticut Rivers in the City of Chicopee. Construction along the Connecticut River and the North and South Banks of the Chicopee River was conducted in a series of construction contracts initiated in 1938 and completed in 1942, collectively known as the Chicopee Local Protection Project (CLPP).

The Flood Control Works in the City of Chicopee was constructed by the United States Army Corps of Engineers (USACE) in four separate systems (the Plainfield Street Flood Control System, the South Bank Chicopee River Flood Control System, the Willimansett Flood Control System, and the Chicopee Falls Flood Control System).

The Rivermills project will be completed along a portion of an earthen levee associated with the Chicopee Falls Flood Control System. On behalf of the City of Chicopee, Baystate Environmental Consultants (BEC) prepared a FEMA accreditation report for the Chicopee Falls Flood Control System in 2010. The purpose of the report was for submittal to FEMA for their use in establishing risk zones for the National Flood Insurance Program (NFIP) maps and document compliance with the minimum design, operation, and maintenance standards for levee systems established in 44 CFR 65.10. This included an embankment, foundation and stability analysis. Excerpts of the BEC report are included in Appendix D.

Riprap slope protection on the riverside and a toe drain on the landside were constructed on the levee. According to the BEC report, the typical cross section consists of compacted random fill on the landside with compacted impervious soil on the riverside with an impervious foundation cutoff. The Oak Street Pumping Station was built into the levee at Station 49+15. Two gate valves with catwalk access are located in this segment in close proximity to the pumping station. One was an intake for the now defunct U.S. Rubber Company facility with associated improvements, while the other is an outlet from the Oak Street Pumping Station.

This project includes a portion of the segment of earthen levee that extends from Station 25+45 to Station 54+15 (See Figure 2 from the BEC report below). A typical cross section of the levee is provided in Appendix D.

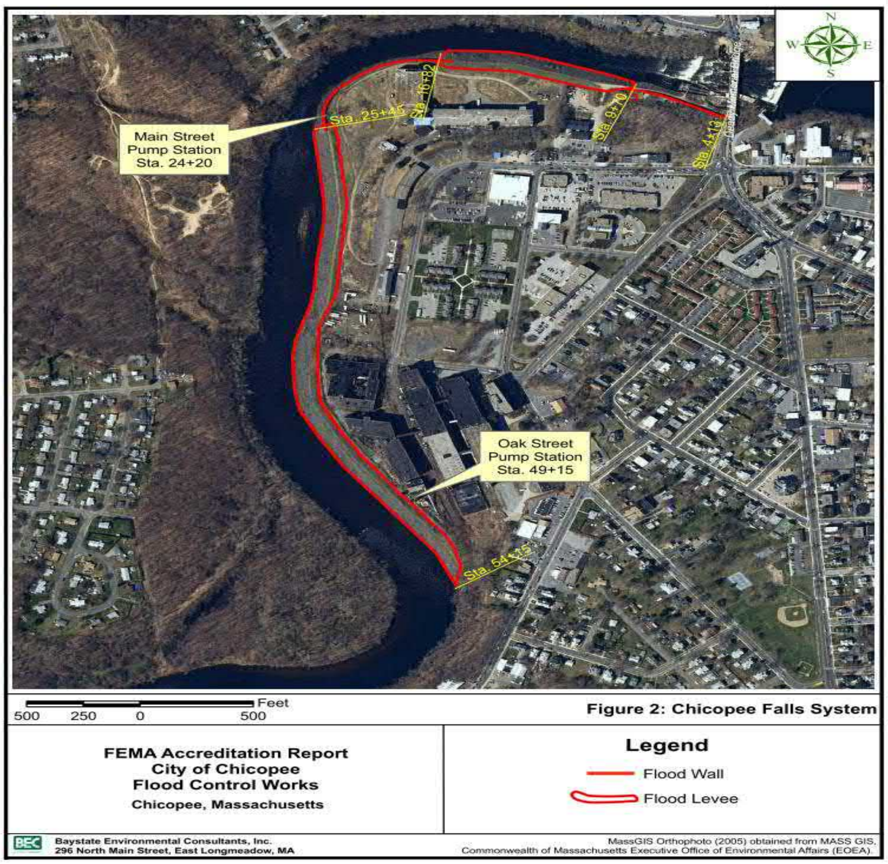


Figure 2. Chicopee Falls System, from BEC Report

2.0 Purpose, Need and Scope for the Proposed Action

2.1 Project Purpose

The purpose of the project is to backfill several low-lying portions of the subject Site in accordance with overall re-development goals. These low-lying areas once included former Site buildings and other features, but ongoing remediation and demolition activities have rendered them vacant and suitable for re-development.

2.2 Project Need/City Endorsement

Photos of the flood control levee near Oak Street Pump Station (top) and the former Facemate Property (bottom) circa 2018-2019.

The City of Chicopee is currently in the process of devising re-development plans for the former Uniroyal and Facemate properties. At the time of this report, anticipated future uses will likely include public recreational facilities.

Under this project, the city proposes to re-grade low-lying portions of the Site to the height of the existing flood control levee. This will serve to facilitate future development by providing a wide, flat surface along the bank of the Chicopee River. If this work cannot be completed, then all re-development activities conducted at the Site will require a grading design such that topography along the western property line slopes downwards to meet the existing levee toe of slope elevation.

In addition, the City of Chicopee is currently responsible for operation and maintenance for the Chicopee Falls flood control levee storm drainage system. Maintaining the system in its current state requires the City to incur ongoing operation and maintenance costs for the Oak Street Pumping Station, the toe drain, and other features. Placement of fill adjacent to the levee will enable the partial abandonment of the existing storm drainage system while still providing flood control protection, thereby reducing the ongoing O&M costs.

Finally, the proposed fill area will allow for a significant quantity of material to be placed on the Site, rather than disposed of at a landfill facility. Due to the property's status as a Brownfields Site, the Massachusetts Contingency Plan (MCP) allows for certain contaminated media to be placed at the Site provided it meets specific re-use criteria and is properly placed to mitigate exposure. The placement of fill along the landward side of the levee represents an opportunity to develop such a site, suitably managed and properly constructed, to fulfill both the regional need for disposal sites and meet the City's redevelopment goals for the site. An endorsement of the project from the City is included as Appendix A.

2.3 Description of Proposed Alteration

The scope of work (SOW) includes two fill areas:

2.3.1 Former Uniroyal Site (EU-7)

This proposed fill area is located on the western portion of the Uniroyal site, and includes a low-lying area that once encompassed numerous site buildings. The limits of the area are generally bounded by the flood control levee to the west, a line parallel to Oak Street to the north, an elevated area formerly used as a rail line to the east, and an elevated grassed area to the south. The proposed SOW will include backfilling the entire area to no higher than the elevation of the levee's crest, or elevation 98' to 102'. The lowest portions of EU-7 will be raised approximately fifteen (15) feet, providing a gentle slope from the eastern portions of the Site to the levee. These areas are approximately located between levee STA 37+20 and STA 51+80. Refer to Figure 4 for a description of existing site features and drainage components. Refer to Figures 5 and 6 for proposed backfill areas and alterations. A cross section showing the typical backfill elevations relative to existing topography is provided as Figure 8.

2.3.1.1 Oak Street Pump Station

The Oak Street Pump Station is located on the southwestern portion of the Uniroyal property, along the landward side of the levee. Toe drains and interceptor drains located along the landward side of the levee direct stormwater runoff from portions of the Uniroyal Property to this pump station, where it is collected and conveyed through the levee to the Chicopee River. The pump station outfall is located directly west of the station, controlled via a concrete structure with a gate valve. The proposed SOW will demolish this structure as proposed grading will prevent runoff from collecting at the toe of the levee. Drain lines and structures which convey stormwater to the pump station will be abandoned, and the structures backfilled in place. The associated outfall structure will be removed, and the existing pipeline sealed with a concrete bulkhead. The Oak Street Pump Station is approximately located at levee STA 49+25. Refer to Figure 11 for additional information on this area.

2.3.1.2 Stormwater Management - uniroyal

To manage stormwater in the absence of the Oak St. Pump Station, three stormwater basins will be installed along the landward side of the levee. The basins have been designed such that the peak elevation is at least 1' below the top of the levee, and site grading has been designed to convey local flow towards the basins rather than over the levee. Stormwater runoff collected in the basins will be quickly conveyed via drain inlets and underdrains towards an existing outfall located immediately south of the Uniroyal property which discharges into the Chicopee River. Refer to Figures 9 and 10 for details and profiles of this stormwater management system. A Stormwater Management Report, including information and calculations related to drainage, is provided as Appendix F.

2.3.2 Former Facemate Site (Lot 1)

The proposed fill area is along the western side of the property. Although Lot 1 has been partially backfilled, a low-ling area remains between the flood control levee and the remainder of the property. The proposed SOW will include backfilling this area to no higher than the levee's crest, or elevation 101' – 102'. The lowest portions of this area will be raised approximately ten (10) feet, providing a providing a gentle slope from the eastern portions of the Site to the levee. These areas are approximately located between levee STA 29+30 and STA 36+00. Refer to Figure 7 for a description for existing conditions int his area and proposed alterations. A cross section showing the typical backfill elevations relative to existing topography is provided as Figure 8.

2.3.2.1 Main Street. Pumping Station

The Main Street Pumping Station is located a short distance north of the Facemate property, west of the nearby Senior Center. Toe and interceptor drains collect runoff from the low-lying portion of the Facemate property to this pumping station, where it is discharged to the Chicopee River. No alterations are proposed to the Main St. Pump Station under this application. However, the existing drain lines and structures within the fill area footprint will be abandoned, and the structures backfilled in place.

2.3.2.2 Stormwater Management - Facemate

To manage stormwater following removal of the low-lying area, two stormwater basins will be installed along the landward side of the levee. The basins have been designed such that the peak elevation is at least 1' below the top of the levee, and site grading has been designed to convey local flow towards the basins rather than over the levee. Stormwater runoff collected in the basins will be quickly conveyed via drain inlets and underdrains towards an existing drain-line to the north that connects to the Main St. Pumping Station. To ensure that the pump station can manage post-development flows, the system has been designed such that post-development peak discharge rates are no greater than pre-development rates for all events up to the 100-year storm. Refer to Figures 9 and 10 for details and profiles of this stormwater management system. A Stormwater Management Report, including information and calculations related to drainage, is provided as Appendix F.

2.4 Technical Analysis and Design

Backfill material will be generated from site activities or imported from off-site locations in accordance with the Fill Management Plan (FMP). The fill will be placed and compacted so as to raise the elevation of the Project site to just below the height of the flood control levee and to grade the entire site for future redevelopment. Abandoned Site buildings located in the lower tier of the former Uniroyal property have either been demolished or future demolition is planned. Stormwater management features are proposed to mitigate impacts to the flood control system. As the levee was installed on this portion of the property to protect these abandoned buildings, it is the City's opinion that this alteration will not impair the usefulness of the USACE flood control project (including the projects authorized purpose).

In September 2016, a Slope Stability Analysis was completed for the proposed work. This study is described in Section 2.8 and included as Appendix C. Cross sections detailing the proposed fill area are included as Figure 8. Construction sequencing plans showing the measures that will be taken to mitigate impacts to the flood control system are included as Figures 12 and 13.

2.5 Authorization Pursuant of Section 10/404/103

The City is not pursuing authorization pursuant to Sections 10/404/103. There are no Navigable Waters or Waters of the United States that will be affected by the proposed project. Further, the proposed project does not involve the transportation of dredged material to a designated ocean disposal site.

2.6 Section 221 of the Flood Control Act of 1970

As described on federalregister.gov (Guidelines for Carrying Out Section 221(a)(4) of the Flood Control Act of 1970, as Amended):

- Section 221 is a comprehensive authority that addresses the affording of credit for the value of in-kind contributions provided by a non-Federal sponsor toward its required cost share (excluding the required 5 percent cash for structural flood damage reduction projects and the additional 10 percent cash payment over 30 years for navigation projects) if those in-kind contributions are determined to be integral to a study or project.
- The types of in-kind contributions eligible for credit include planning activities (including data collection and other services needed for a feasibility study); design related to construction; and construction (including management; mitigation; and construction materials and services).

Credit under Section 221 of the Flood Control Act of 1970, as amended, or other law or approval under Section 204(f) of the WRDA 1986 will not be sought.

2.7 Property Ownership/Real Estate Requirements

The project does not involve any federally owned property. The project will be fully constructed on property owned by the City. As described in the BEC report, the flood control project was a "cooperative Federal/City effort; the USACE was responsible for the design and construction of the levees, while the City provided all of the lands, easements, and rights-of-way necessary for the construction. The City also agreed to maintain and operate the flood control works after completion, in accordance with federally prescribed regulations. These requirements are detailed in the Code of Federal Regulations, 33 CFR 208.10 which is entitled, "Local flood protection works; maintenance and operation of structures and facilities."

A permanent easement to the levee was granted to the City by the US Rubber Company in 1965. A copy of the easement recorded in the Hampden County Registry of Deeds is provided in Appendix B. The City acquired the former Uniroyal property (formerly US Rubber) and former Facemate property in 2009. A 2009 survey plan of the Chicopee Flood Control Works (by Heritage Surveys, Inc.) is also provided in Appendix C. The Heritage survey plan depicts the former Uniroyal and Facemate properties including the easement, property boundaries, levee and provides associated deed references. The layout and property information for the Site is provided in Figure 3. Any future conveyance by the City of all or any relevant portion of the subject property would retain an easement to the City to the easement areas as shown on survey plans provided in Appendix C. Documentation supporting the current and former ownership of the property is included as Appendix D.

2.8 Hydrologic and Hydraulic System Performance Analysis

A Massachusetts-registered Professional Engineer, Michael J. Talbot of O'Reilly, Talbot and Okun (OTO), conducted a slope stability analysis for the Uniroyal Filling project to evaluate the potential impacts of the project. The OTO work included review of previous plans and reports prepared by the U.S. Army Corps of Engineers (USACE) and Baystate Environmental Consultants (BEC), stability analyses of the proposed conditions, and preparation of a report (See Appendix C).

The OTO slope stability analysis was based on information provided in the following documents:

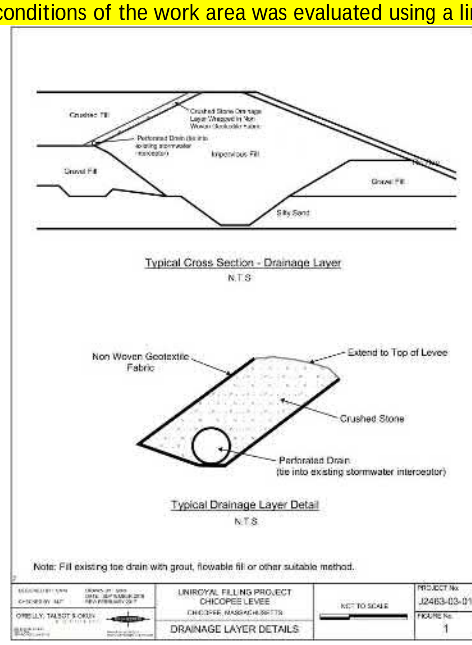
- Plan titled "Topographic Plan of Land in Chicopee, Massachusetts, Surveyed for The City of Chicopee" by Heritage Surveys, Inc., dated December 12, 2009;
- Plan set titled "Connecticut River Flood Control Project, Chicopee Falls, Mass" prepared by Green Engineering Affiliates, Inc. for the U.S. Army Engineer Division, New England, dated April 1963;
- Design memorandum titled "Chicopee Falls Local Protection Project, Design Memorandum No. 5" by the U.S. Army Engineering Division, New England, dated March 1963;
- "FEMA Accreditation Report, Chicopee Falls Flood Control System" by Baystate Environmental Consultants, Inc., dated November 2010; and
- "Design and Construction of Levees Engineering Manual"- EM 1110-2-1913, U.S. Army Corps of Engineers, dated April 2000.

The information obtained from these sources that were used in their evaluation included the following:

- Details on levee construction;
- Design flood elevations and river levels;
- Existing ground surface topography;
- Subsurface information; and
- Soil properties.

2.8.1 Slope Stability Analysis

Slope stability was evaluated by OTO using the SLOPE/W computer program using the Spencer method. The SLOPE/W program performs a limit equilibrium analysis using various analytical methods to determine the factor of safety and the critical failure surface. The Spencer method, which assumes that the resultant interslice forces have constant slope through the sliding mass, was chosen per USACE guidance. The slope stability for typical design conditions of the work area was evaluated using a limit equilibrium analyses. The Spencer Method determines the critical failure surface and the minimum factor of safety. Levee slope stability was analyzed for critical design condition as described in the USACE Design and Construction of Levees, EM 1110-2- 1913, namely under normal, 100-year flood conditions, and rapid drawdown. For these analyses, only failure into the river side was considered, since the placement of fill on the landward side increases the resistance to failures in that direction.



Results

In the USACE design manual, the recommended minimum factor of safety for rapid drawdown is between 1.0 to 1.2, and the recommended minimum factor of safety for long term (steady seepage) is 1.4. OTO used a value of 1.4 for normal water conditions as a specific factor of safety for normal conditions was not provided in the USACE design manual. OTO concluded that the computed factors of safety for the proposed conditions met or exceeded the required minimums specified above. Additionally, values computed by OTO were similar to those computed by BEC. Based upon their evaluation, OTO concluded that the proposed fill will likely have little effect on the stability of the levee.

To limit the buildup of hydrostatic pressures against the landside of the levee, OTO recommended that a drainage layer be placed between the landside slope and proposed construction fill. The drainage layer should consist of a minimum of one foot of crushed stone wrapped in a non-woven geotextile fabric and be tied into the existing toe drain. This drain has been accounted for in the stormwater management design and will be installed as a series of perforated HDPE pipes which will convey runoff to either the Main St. Pump Station or the outfall south of the Uniroyal Property.

A typical drainage detail from the OTO is shown on the previous page and included in the cross sections on Figure 8. The OTO report is included as Appendix E.

2.9 Environmental Compliance

To comply with the National Environmental Policy Act (NEPA), the planning and decision-making process for actions proposed by Federal agencies involves a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace procedural or substantive requirements of other environmental statutes and regulations. It instead addresses them collectively in the form of an Environmental Assessment (EA) or Environmental Impact Statement (EIS), which enables the decision maker to have a comprehensive view of major environmental issues and requirements associated with the proposed action. According to CEQ regulations (40 CFR 1500.2), the requirements of NEPA must be integrated "with other planning and environmental review procedures required by law or by agency so that all such procedures run concurrently rather than consecutively."

BETA prepared an Environmental Assessment (EA) to examine potential effects of the proposed action and No Action alternative on resource areas including land use; air quality; noise; geology and soils; water resources; biological resources; cultural resources; socioeconomics and environmental justice; utility infrastructure; and hazardous and toxic materials/wastes. This EA is included as Appendix G.

2.10 Executive Order 11988 Considerations

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

Compliance: The Proposed Action would not affect the 1% Annual Chance floodplain or the Regulatory Floodway associated with the Chicopee River adjacent to the site. The Chicopee Falls Local Protection Project borders the project site to the west and confines the floodplain and floodway in the project area. The project complies with the Executive Order.

2.11 Requester Review Plan Requirement

Per EC 1165-2-214, a Type II independent external peer review (IEPR) shall be conducted on design and construction activities for any project where potential hazards pose a significant threat to human life (public safety). The reviews shall consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health, safety, and welfare. This applies to new projects and to the major repair, rehabilitation, replacement, or modification of existing facilities.

Commented [SB7]: I don't see the need for an IEPR mentioned in the new guidance

Other factors to consider for conducting a Type II review of a project or components of a project are:

a. The project involves the use of innovative materials or techniques where the engineering is based on novel methods, presents complex challenges for interpretations, contains precedent-setting methods or models, or presents conclusions that are likely to change prevailing practices;

b. The project design requires redundancy, resiliency, and robustness:
   - Redundancy is the duplication of critical components of a system with the intention of increasing reliability of the system, usually in the case of a backup or failsafe.
   - Resiliency is the ability to avoid, minimize, withstand, and recover from the effects of adversity, whether natural or manmade, under all circumstances of use.
   - Robustness is the ability of a system to continue to operate correctly across a wide range of operational conditions (the wider the range of conditions, the more robust the system), with minimal damage, alteration, or loss of functionality, and to fail gracefully outside of that range.

c. The project has unique construction sequencing or a reduced or overlapping design construction schedule; for example, significant project features accomplished using the Design-Build or Early Contractor Involvement (ECI) delivery systems.

If the district determines, by following the procedures of EC 1165-2-214, that a Type TII IEPR is required, the City will be required to submit a Type II IEPR review Plan. The City believes, based upon the nature of the project and the findings of the stability analysis that the project does not pose a significant threat to human life or safety.

2.12 Levee Operation and Maintenance

Until the City obtains approvals from the USACE for modifications, all current operation and maintenance activities and required inspections related to the levee and Oak Street Pumping Station will be adhered to.

3.0 Fill Material Handling and Placement

3.1 Fill Management Plan

Commented [SB8]: I can include the full FMP if you want, though it needs updating to remove references to Alan

BETA has prepared a Fill Management Plan (FMP) in support of the filling activities at the former Uniroyal and Facemate Sites. Key excerpts from the FMP, related to the fill procedures, proposed fill acceptance criteria, and quality control are provided below. Additional clarifications to these except are provided in underlined text where necessary. Note that soils used for the proposed stormwater basins are described on Figures 8 and 9; such soils will be clean fill and do not include the fill materials discussed in the FMP.

The purpose of the FMP is to formalize the fill management/acceptance process in order to meet the applicable soil re-use requirements and to give Generators a sufficient level of comfort that their material is being handled appropriately. The City's Licensed Site Professional (LSP), in coordination with LSPs/QEPs at Generator sites, is responsible for reviewing fill characterization data so that only fill meeting acceptance standards and approved under this FMP are brought to the proposed fill areas.

Soils may be accepted for re-use from properties that are Massachusetts Contingency Plan (MCP) Disposal Sites, as defined in 310 CMR 40.0006, and from properties that are not MCP Disposal Sites so long as they meet the screening requirements. It is estimated that approximately 160,000 cubic yards (240,000 tons) of soil of acceptable chemical and physical quality will be needed to bring the site to required grade for development. Upon completion of the filling and remedial activities, an Activity and Use Limitation (AUL) will be implemented in connection with Massachusetts Contingency Plan (MCP) and Toxic Substance

Control Act (TSCA) cleanup work being undertaken at the former Uniroyal Site by Michelin North America, Inc.

3.2 Suitable Fill Materials

Fill materials that may be acceptable for re-use at EU-7 and Lot 1 include the following:

- Naturally occurring, uncontaminated soils that do not originate from a Massachusetts Contingency Plan (MCP) Disposal Site, and are not otherwise regulated;
- Soils from MCP Disposal Sites that do not exceed applicable reportable criteria for EU-7 and Lot 1, and meets the specific requirements of 310 CMR 40.0032(3):
- Soils and/or Sediments that do not meet the definition of "Remediation Waste" as defined in 310 CMR 40.0006;
- Dredged Sediments with no free draining liquids;
- Uncoated and processed asphalt pavement, brick, and concrete (ABC) rubble generated from on-site sources; and
- Street sweepings from the City of Chicopee and area communities.

Note that fill may be accepted from any state, provided that it meets the acceptance criteria outlined in this management plan as well as any relevant local regulations pertinent to the material's source location.

3.3 Initial Screening Requirements

All fill materials considered acceptable for use at EU-7 and Lot 1 must meet the following initial screening criteria:

- Material must not contain a listed or characteristic hazardous waste as defined by CMR 40.0006;
- Fill material must not include large stones (cobbles or boulders), masonry, stumps, asphalt, or waste material, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or associated parts;
- Fill materials must not meet the MCP definition of "Contaminated Soil" or "Remediation Waste," as defined in 310 CMR 40.0006. Specifically, the concentrations of analytes in soil must be below the MCP Reportable Concentrations in Soil applicable to the generation site. Note that release notification exemptions are not transferrable from one location to another;
- Fill material generated from a disposal site must not exceed the applicable reportable criteria for EU-7 and Lot 1 and must not be significantly more contaminated than existing soils at the receiving location (refer to Tables 1 through 3).
- Field screening results of soil headspace from representative samples must not exhibit an average reading of Total Organic Vapors (TOV) in the jar headspace exceeding five parts per million by volume (ppmv) due to constituents attributable to volatile compounds. Additional screening will be performed at EU-7 and Lot 1 by the City, Site LSP, or another designated party as appropriate to verify certain loads. If screening at EU-7 and Lot 1 results in exceedances of the criteria above, the load(s) will be rejected;
- Visually, the fill materials must not exhibit any staining, odors, or other discolorations indicative of OHM releases as demonstrated by the representative of the soil to be imported. Fill materials containing nuisance odors such as petroleum, chemicals, solvents, and/or organic material/hydrogen sulfide will not be accepted;
- The soil may contain ancillary non-coated or non-painted brick pieces or non-coated/stained or non-impregnated concrete pieces less than 6-inches diameter or cobbles/rock fragments less

than 6-inches diameter if it is contained within certain fill soils in very small quantities. This material must be less than 50% of the fill material. If soils contain more than this amount, they must be designated as Asphalt, Brick, Concrete (ABC) rubble and meet the acceptance criteria described in Section 4.5. Loads received that contain more than the acceptable amount of solid debris will be rejected by the City and sent back to its origin at the Generator's expense; and

- Soil may contain naturally deposited silt and clay and naturally occurring organic content, provided there is no free liquid present. The physical quality will be reviewed by the Operations Manager and soil will be placed in accordance with the soil blending plan for final disposition. The City reserves the right to limit shipments of clay, since there are specific blending and placement requirements for that material.

3.4 Geotechnical Testing Requirements

Soils to be placed at EU-7 and Lot 1 may also be required to meet certain geotechnical requirements, based on the proposed final development of EU-7 and Lot 1.

If geotechnical analysis is required by the City's LSP, soil must be sampled at a frequency of one composite sample per 5,000 cubic yards of soil. The sample(s) shall be submitted to a geotechnical laboratory for analysis of the following parameters:

- Particle Size Analysis by ASTM method D422; and
- Modified Proctor Compaction by ASTM method D698.

The results of these analyses shall be reviewed for consistency with future site development goals. Additional geotechnical parameters may be required at the discretion of the City's LSP.

3.5 Fill Placement and Handling

In general, fill materials will be accepted between 7:00 am and 5:00 pm Monday through Friday. Material may be accepted after these hours or on weekends if approved in advance by the Operations Manager and the City's On-Site Operations Coordinator.

There will be no scale available at the Site. Any truck with material approved for re-use at EU-7 and/or Lot 1 must provide certified weight slips from a scale operation of their choice. If the amount of soil to be disposed is greater than 10,000 cubic yards, a drone survey will be completed to determine the volume of soil, which will then be converted to tonnage at a rate of 1.5 tons/cubic yard. If the amount of soil to be disposed is less than 10,000 cubic yards, then a drone survey may be performed in lieu of weight slips, at the Generator's expense.

The Operations Manager will collect the Material Shipping Record (MSR) or Bill of Lading (BOL) from the driver, record the name of the trucking company, verify the source of the material against the "approved list," and visually inspect the contents of the trucks for unacceptable fill materials and any visual or olfactory evidence of contamination, including nuisance odors.

If the fill materials do not contain unacceptable material and there is no visual or olfactory evidence of contamination, it will be directed to an area designated by the Operations Coordinator for off-loading. Otherwise, it will be rejected, and it will need to be returned to the Generator's site at the Generator's expense.

The Generator of any rejected material will be notified immediately not to ship any additional fill to the EU-7 and/or Lot 1 until the source of the unacceptable fill is identified and corrective action is taken to prevent recurrence.

The Generator of any rejected material will be notified immediately not to ship any additional fill to EU-7 and/or Lot 1 until the source of the unacceptable fill is identified and corrective action taken to prevent recurrence.

The fill material will be spread by the City DPW in loose lifts not exceeding 24 inches and compacted by a minimum of six (6) passes of a vibratory drum roller with a minimum drum weight of 10,000 pounds and a minimum dynamic force of 20,000 pounds. Placement of materials will be phased based on the property redevelopment plans.

The Operation's Manager will maintain a log of the following activities:

- City's Fill Approval Number;
- Identification of the truck transporting fill material to EU-7 and Lot 1;
- Weight slips and source of material for each truck; and
- Physical characteristic and results of headspace screening, if any, for each truck.

3.6 Grading Plan

Prior to filling operations, a survey of EU-7 and Lot 1 will be conducted to confirm existing surface elevations, to establish a benchmark for elevation reference, and to determine the final elevations for the fill material and the cap.

As previously stated, it is intended that imported fill materials will be brought to an elevation of three (3) feet below the top of the flood control levee, or as depicted on Figures 3 through 6, which will then be capped under a layer of geotextile fabric and at least three (3) feet of clean, uncontaminated soil, or two feet of granular sub-base. In the area of the proposed stormwater basins, the top of the imported fill material shall be 3 feet below the bottom of the basin, above which will be placed a layer of geotextile fabric and at least three (3) feet of clean, uncontaminated soil. The uncontaminated soil shall meet the requirements indicated on Figure 9.

~~During filling activities, surface elevations within EU-7 and Lot 1 will be surveyed on a semi-annual basis using a drone to monitor the progress of fill operations, and to adjust operations, as needed. Survey frequency will be adjusted based on the amount and/or frequency of loads. To assist in evaluating the need for a survey, the load tonnage will be calculated to volume for comparison with the volume calculated by the drone surveys.~~

~~Final elevations will be surveyed at the completion of filling activities, and after construction of the final cap. These elevations will be used to create record drawings of EU-7 and Lot 1 upon completion of the project, including plan and section views of the backfill area and cap.~~

3.7 Stormwater

A Stormwater Pollution Prevention Plan (SWPPP) has been prepared for EU-7 and Lot 1 to provide for the effective management of stormwater runoff during filling activities. The overall objectives of the plan will be to mitigate erosion and sediment pollution from site runoff, to prevent and contain accidental leaks and/or spillage, and to mitigate the risk of impact to local subsurface utilities.

Refer to Appendix F for the project's Stormwater Management Plan.

~~Copies of the SWPPPs for EU-7 and Lot 1 are provided in Appendix B. For brevity, only the text and figures of the SWPPPs have been included.~~

~~To limit the buildup of hydrostatic pressure against the land side of the levee, a drainage layer will be constructed along the western side of the proposed fill area near the flood control levee prior to the start~~

Commented [MN9]: This information is inconsistent on Figures and other reports I have read. Fill height needs to be consistent throughout permit documents.

Commented [MN10]: Why do we need to say how elevations will be obtained? It could end up being a simple survey. Means and methods.

Commented [SB11]: Do we need this included as an Appendix?

~~of backfill activities. As work commences, the drainage layer shall be raised to match the rising elevation of the fill area. The proposed drainage layer will consist of a minimum of one foot of crushed stone wrapped in a non-woven geotextile fabric. Perforated drainage pipe will be installed within the drainage layer that will be tied into the existing stormwater interceptor. Refer to Figure 6 for a cross section showing the proposed drainage layer.~~

~~Manholes and drain inlets associated with the existing storm water interceptor drain are located in the proposed fill areas. All drain inlets shall be refitted with manhole frame and cover to prevent unwanted discharge into the drainage system. All drainage structures will be raised in elevation to meet the final proposed grade at the Site, and the drain lines will be connected to the existing storm water interceptor. Any existing storm drain lines will be connected to the existing storm water interceptor as needed. The existing toe drains will be filled in place and abandoned. Following completion of these adjustments, all drainage structures will be surveyed to confirm invert elevation relative to the new proposed grade.~~

3.8 Existing Utilities

Currently, overhead power lines are located along the toe of the levee. These lines will be relocated so that electrical power to the Oak Street Pumping Station is maintained until it is ready to be decommissioned. It is anticipated that these lines will be rerouted to the east of the fill area. No material shall be placed in the vicinity of these utility lines until this relocation has been completed.

4.0 Implementation Schedule

An implementation schedule for the project is provided below.

Commented [MN12]: Again, this information is unclear and inconsistent in other sections of this document. This is a key issue.

Commented [MN13]: I find this confusing. Are we raising the manholes from the existing drain line or will there be new drain lines? The figures are not clear either.

Commented [SB14]: I don't know what the plan was for this, but it ain't here.

Do we have a schedule?

Is there a timeline or is it ongoing? I can reference the construction sequencing plan.

5.0 DETERMINATION CRITERIA

As outlined in EC_1165-220, review of the project by the USACE requires a determination that the proposed activities are consistent will several review criteria. The following sections outline how the project is intended to meet each criterion.

5.1 IMPACTS TO THE USEFULNESS OF THE USACE PROJECT

Under this criterion, the proposed alteration must be designed such that it will not limit the ability of the USACE project to function as authorized. The intended function of the existing levee is to serve as a flood control system, and as such the proposed alterations must not impair the ability of the levee to provide flood control or result in a situation wherein the levee is not structurally, geotechnically, or hydraulic stable.

The proposed activities are located on the landward side of the flood control levee and will not affect its ability to retain floodwater levels within he Chicopee River. As demonstrated in Section 2.8, the proposed backfill will not have a noticeable impact on the stability of the levee.

The Oak Street Pumping Station is currently used to control the collection of stormwater on the landward side of the levee. When the pump station is removed and the area has been backfilled, this function will no longer be necessary as runoff will no longer collect in this area. To limit build-up of hydrostatic pressure along the levee, and to control stormwater runoff into the Chicopee River, stormwater basins and a closed drainage system will be installed at both the Uniroyal and Facemate properties.

5.2 INJURIOUS TO THE PUBLIC INTEREST

Under this criterion, the proposed alteration must be reviewed for the probably impacts on the public interest. Typical factors considered under this determination include, but are not limited to, conservation, economic development, historic properties, cultural resources, environmental impacts, water supply, water quality, flood hazards, floodplains, residual risk, induced damages, navigation, shore erosion or accretion, and recreation.

A discussion of these factors is provided in the following sections, but are more completely described in the attached Environmental Assessment included as Appendix G.

Conservation

Jurisdictional resource areas relevant to the proposed alterations include the Riverfront Area and Inland Bank associated with the Chicopee River. Riverfront Area is defined as the area of land between a river's mean annual high water and a line measured horizontally outward to a distance of 200-feet. Portions of the proposed work will be included in this area. However, the Massachusetts Wetland Regulations define activities within a "Historic Mill Complex" as exempt from regulatory performance standards of the Riverfront Area. The Inland Bank is defined as the "portion of a land surface which normally abuts and confines a water body." While the project proposed alterations close to the bank, no activities are proposed that will alter the bank itself. In addition, portions of the work will be conducted within the 100' wetland buffer zone from the Chicopee River.

Prior to the start of work, the applicant will make all required submittals to the City of Chicopee Conservation Commission. Additional discussion of this topic is provided in the Environmental Assessment.

Commented [MN15]: I would be non-committal as to what type of filing. I.E. RDA vs NOI.

Economic Development

The purpose of the proposed alterations is to re-grade low-lying portions of the Site in order to facilitate future re-development. If this project is not completed, then any future use at the Site must include grading along the western area of the Site to match existing toe-of-slope grades, likely limiting usable space. In addition, the Oak Street pumping station will need to be operated and maintained. Completion of this project will encourage economic development of the subject properties. Additional discussion of this topic is provided in the Environmental Assessment.

Historic Properties & Cultural Resources

The project Site is a historic mill complex which has been determined eligible for the National Register of Historic Place by the Massachusetts Historical Commission (MHC). The proposed work will require the demolition of Building 15 and the Oak Street Pumping Station. The City and MHC have executed a Memorandum of Agreement recognizing the need for demolition of buildings on the Site due to structural instability and environmental contamination.

Commented [SB16]: Is Oak St Pump Station historic?

Notification letters have been sent to the Wampanoag Tribe of Gay Head and the Mashpee Tribe for information or concerns, and neither tribe has submitted any written comments or concerns. The MHC provided a determination that "the project was unlikely to affect significant historic or archeological resources." Additional discussion of this topic, including copies of the referenced letters, is provided in the Environmental Assessment.

Environmental Impacts

The project is a previously developed Brownfields Site, and no Greenfields will be disturbed as part of the proposed alterations. Changes to Site hydrology are minimal, as all runoff in the area of interest will continue to be directed to the Chicopee River. Stormwater basins are proposed to control his runoff, and the project has been designed in accordance with eh Massachusetts Stormwater Handbook.

Environmental concerns relating to the Site's historic use are currently ongoing under the Massachusetts Contingency Plan (MCP). Certain oil and/or hazardous materials may be removed from Building 15 during remediation, but not as part of this project.

Backfill used at the Site will be in accordance with the City's Fill Management Plan. Fill material may include both clean fill and other materials managed under the MCP as approved by the Site's Licensed Site Professional. To mitigate risk to the environmental and human health, the top 3' of the backfill area will be clean fill underlain by a layer of geotextile fabric in accordance with MCP provisions. An Activity and Use Limitation (AUL) will be implemented at the Site if warranted based on the material used.

Additional discussion of this topic is provided in the Environmental Assessment.

Water Supply & Water Quality

The Site is not located within a mapped aquifer or wellhead protection area, and no public water supply wells are located within 0.5 miles of the Site. The placement of fill is not likely to impact groundwater resources, and all material placed will be sufficiently separated from seasonal high groundwater elevations in accordance with the MCP. Impacts to surface water will be controlled via the installation of Stormwater Basins. Additional discussion of this topic is provided in the Environmental Assessment.

Flood Hazards & Floodplains

The Site is not located within mapped 1% Annual Chance floodplain, as all floodwaters in the Chicopee River are contained within the flood control levee. As demonstrated in Section 5.1, the proposed project will not impact the ability of the levee to serve this function. No impacts to floodplains or increase of flood hazard risk is anticipated as part of this project.

Residual Risk & Induced Damages

Induced damages anticipated as a result of the proposed alterations are controlled through the installation of stormwater management features and backfill screening criteria. Remaining residual risk will be reduced through strict compliance with the Fill Management Plan, oversight during backfill activities, and ongoing maintenance/inspections of the flood control levee. The proposed alterations are not anticipated to significantly increase residual risk compared to existing conditions. An analysis of the proposed scope and the no-build alternative is presented in Section 2.0 of the Environmental Assessment.

Navigation

The proposed alterations are limited to the landward side of the flood control levee, except for work needed to seal the existing outfall. The work is not anticipated to impact the Chicopee River or its capacity for navigation.

Shore Erosion or Accretion

The proposed alterations will generally maintain existing hydrology and drainage patterns. Stormwater basins are proposed to capture flow and prevent runoff from flowing over the levee. No runoff is proposed to be directed towards the seaward side of the levee, which is protected by a riprap-armored slope. Increases to shore erosion or accretion are thus not anticipated.

Recreation

The Site is located on a vacant, historic mill complex and access to the majority of the Site is restricted. Pedestrian movement along the top of the levee is currently permitted, allowing scenic views of the Chicopee River.

The proposed alterations will not restrict existing recreation. The proposed backfill activities are intended to promote future development, which will likely include public recreational facilities. Completion of this project is anticipated to promote further recreational opportunities and improve access to opportunities which currently exist.

5.3 Legal and Policy Compliance

This project has been designed with the intention of meeting all appropriate legal and policy requirements. Compliance with federal statutes, executive orders, and executive memoranda is discussed in the Environmental Assessment. Policies and guidance referenced in the creation of this report include, but are not limited to:

Council on Environmental Quality, Considering Cumulative Effects Under the National Environmental Policy Act, January 1997

City of Chicopee, Massachusetts, Wetlands Protection Ordinance, Chapter 272

City of Chicopee, Massachusetts, Wetlands Regulations

Massachusetts Wetlands Regulations, Title 310 Code of Massachusetts Regulations Section 10.00 et. seq.

Vanesse Hangen Brustlin, RiverMills - Redevelopment Scenarios and Impacts Assessment, April 2011.

US Army Corps of Engineers, Engineer Manual, Design and Construction of Levees, EM 1110-2-1913

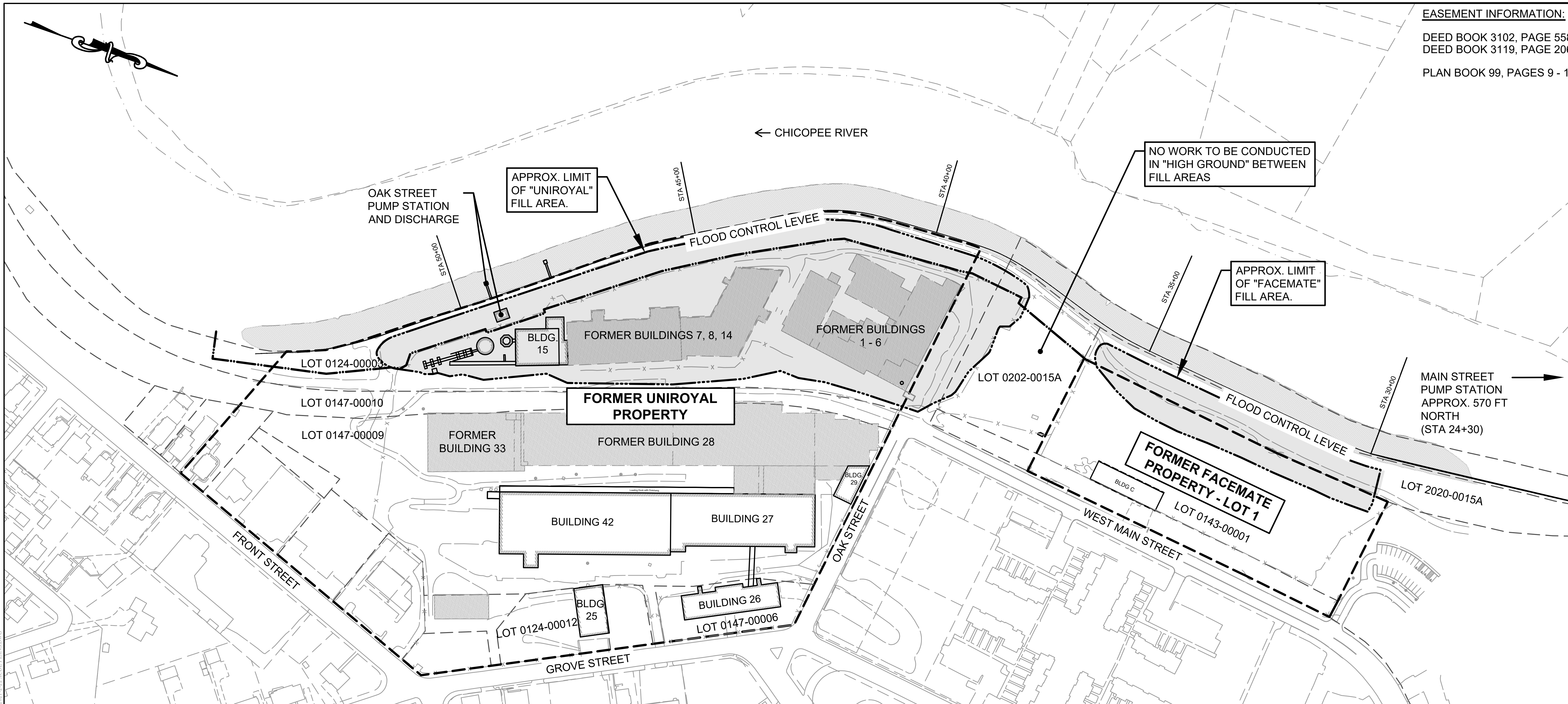
US Army Corps of Engineers, 33 CFR 230, Procedures for Implementing NEPA

US Army Corps of Engineers, Engineering Circular 1165-2-220, Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408

5.4 CONCLUSION

As demonstrated in this report, the project has been designed to meet all requirements of a Single-Phased Review as outlined in EC 1165-2-220. The Applicant respectfully requests that this application be reviewed by the Department and, if deemed to have met all requirements, the project be authorized under 33 USC 408 (Section 408).

FIGURES



NOTES:

1. COORDINATES, IN FEET, ARE BASED UPON THE NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. THE NAVD88 ELEVATIONS ARE APPROXIMATELY 0.708 FT LOWER THAN THE NGVD29 ELEVATIONS USED IN HE ORIGINAL FLOOD CONTROL DESIGN PLANS, BASED ON AN ANALYSIS PERFORMED BY CIVILVIEW, INC.
3. EXISTING CONDITIONS INFORMATION OBTAINED VIA:
   - AERIAL AND ON-THE-GROUND SURVEY COMPLETED BY CIVIL DESIGN CONSULTANTS, INC. IN DECEMBER OF 2018 AND 2019.
   - PLAN ENTITLED "CHICOPEE RIVER FLOOD CONTROL CHICOPEE FALLS" BY HERITAGE SURVEYS IN MARCH OF 2014
   - PLANIMETRIC AND TOPOGRAPH DATASET PROVIDED BY INFOTECH, INC. IN JANUARY OF 2010.
   - PLAN OF LAND COMPLETED BY DURKEE, WHITE, TOWNE, AND CHAPDELAINE IN 2012.
   - FIELD OBSERVATIONS AND ON-THE-GROUND SURVEY BY BETA GROUP, INC FROM 2016 TO 2020.

0 200 400

SCALE IN FEET: 1" = 200'

LEGEND

- EXISTING SITE BUILDING
- BUILDING DEMOLISHED AS OF JULY 2020
- PROPERTY LINE
- APPROX. LIMIT OF CHICOPEE RIVER
- APPROX. LIMIT OF ACOE PARCEL (TRACT R8)
- PROPOSED FILL AREA

BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

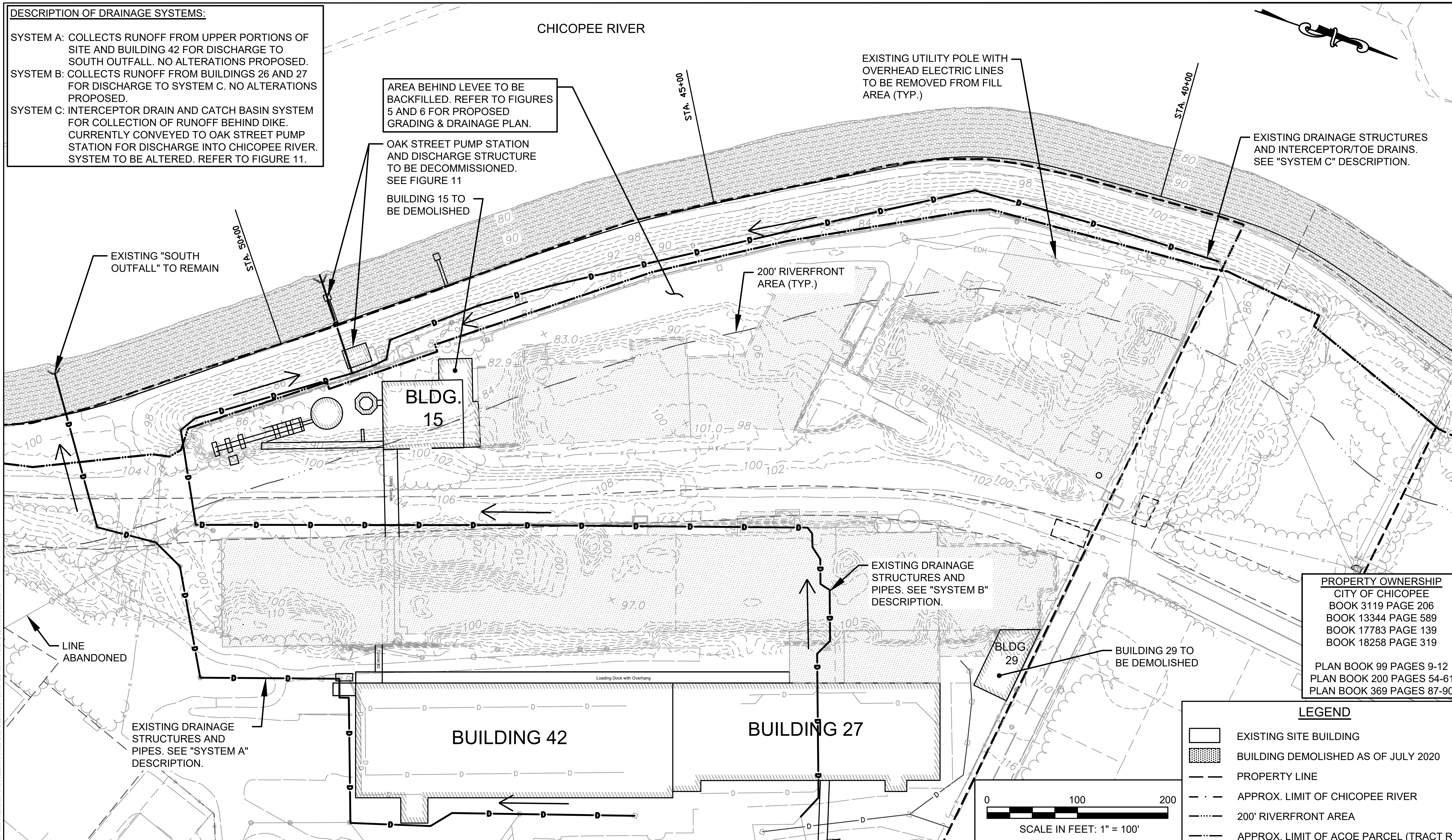
154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Figure No. 3

Overall Site Plan



BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

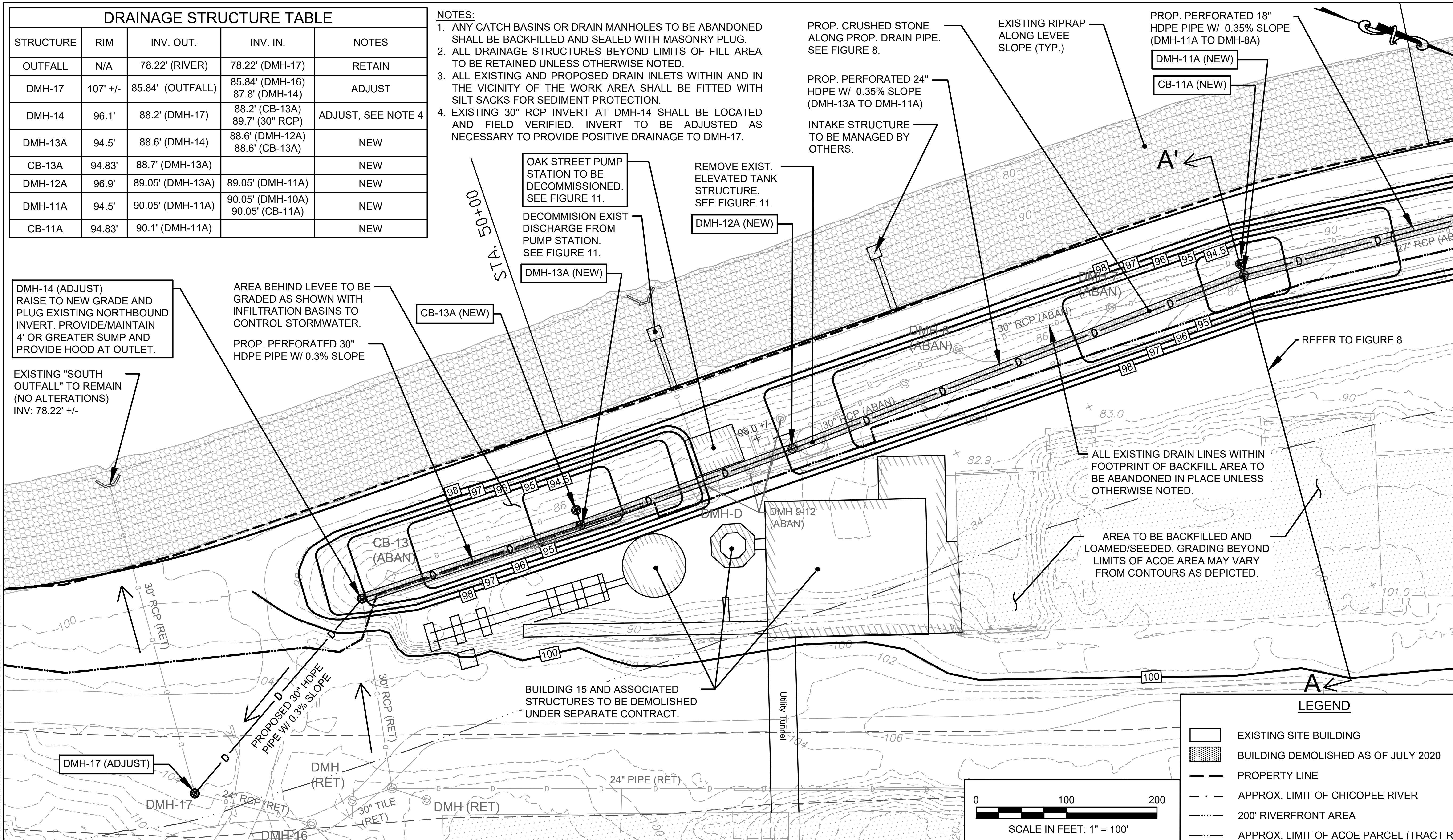
Figure No. 4

Existing Drainage Plan
Uniroyal Property

DRAINAGE STRUCTURE TABLE				
STRUCTURE	RIM	INV. OUT.	INV. IN.	NOTES
OUTFALL	N/A	78.22' (RIVER)	78.22' (DMH-17)	RETAIN
DMH-17	107' +/-	85.84' (OUTFALL)	85.84' (DMH-16) 87.8' (DMH-14)	ADJUST
DMH-14	96.1'	88.2' (DMH-17)	88.2' (CB-13A) 89.7' (30" RCP)	ADJUST, SEE NOTE 4
DMH-13A	94.5'	88.6' (DMH-14)	88.6' (DMH-12A) 88.6' (CB-13A)	NEW
CB-13A	94.83'	88.7' (DMH-13A)		NEW
DMH-12A	96.9'	89.05' (DMH-13A)	89.05' (DMH-11A)	NEW
DMH-11A	94.5'	90.05' (DMH-11A)	90.05' (DMH-10A) 90.05' (CB-11A)	NEW
CB-11A	94.83'	90.1' (DMH-11A)		NEW

NOTES:

1. ANY CATCH BASINS OR DRAIN MANHOLES TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.
3. ALL EXISTING AND PROPOSED DRAIN INLETS WITHIN AND IN THE VICINITY OF THE WORK AREA SHALL BE FITTED WITH SILT SACKS FOR SEDIMENT PROTECTION.
4. EXISTING 30" RCP INVERT AT DMH-14 SHALL BE LOCATED AND FIELD VERIFIED. INVERT TO BE ADJUSTED AS NECESSARY TO PROVIDE POSITIVE DRAINAGE TO DMH-17.



BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

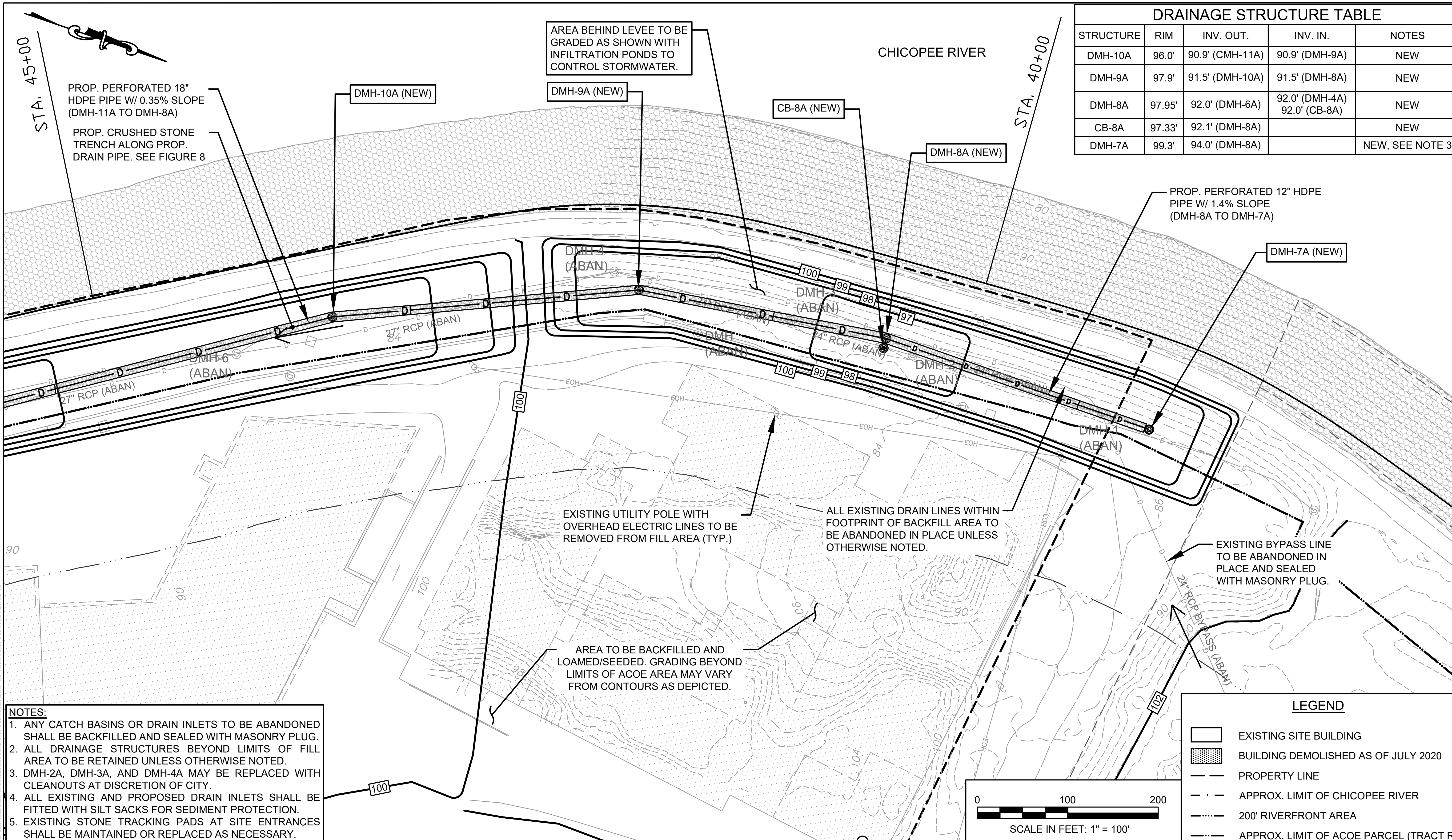
154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Figure No. 5

Enlarged Grading & Drainage Plan I
Uniroyal Property



DRAINAGE STRUCTURE TABLE

STRUCTURE	RIM	INV. OUT.	INV. IN.	NOTES
DMH-10A	96.0'	90.9' (CMH-11A)	90.9' (DMH-9A)	NEW
DMH-9A	97.9'	91.5' (DMH-10A)	91.5' (DMH-8A)	NEW
DMH-8A	97.95'	92.0' (DMH-6A)	92.0' (DMH-4A) 92.0' (CB-8A)	NEW
CB-8A	97.33'	92.1' (DMH-8A)		NEW
DMH-7A	99.3'	94.0' (DMH-8A)		NEW, SEE NOTE 3

NOTES:
1. ANY CATCH BASINS OR DRAIN INLETS TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.
3. DMH-2A, DMH-3A, AND DMH-4A MAY BE REPLACED WITH CLEANOUTS AT DISCRETION OF CITY.
4. ALL EXISTING AND PROPOSED DRAIN INLETS SHALL BE FITTED WITH SILT SACKS FOR SEDIMENT PROTECTION.
5. EXISTING STONE TRACKING PADS AT SITE ENTRANCES SHALL BE MAINTAINED OR REPLACED AS NECESSARY.

LEGEND
- EXISTING SITE BUILDING
- BUILDING DEMOLISHED AS OF JULY 2020
- PROPERTY LINE
- APPROX. LIMIT OF CHICOPEE RIVER
- 200' RIVERFRONT AREA
- APPROX. LIMIT OF ACOE PARCEL (TRACT R8)

BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties
ACOE Permit Review Only
154 Grove Street & 75 West Main Street
Chicopee, MA

Issue Date: 3-10-2021

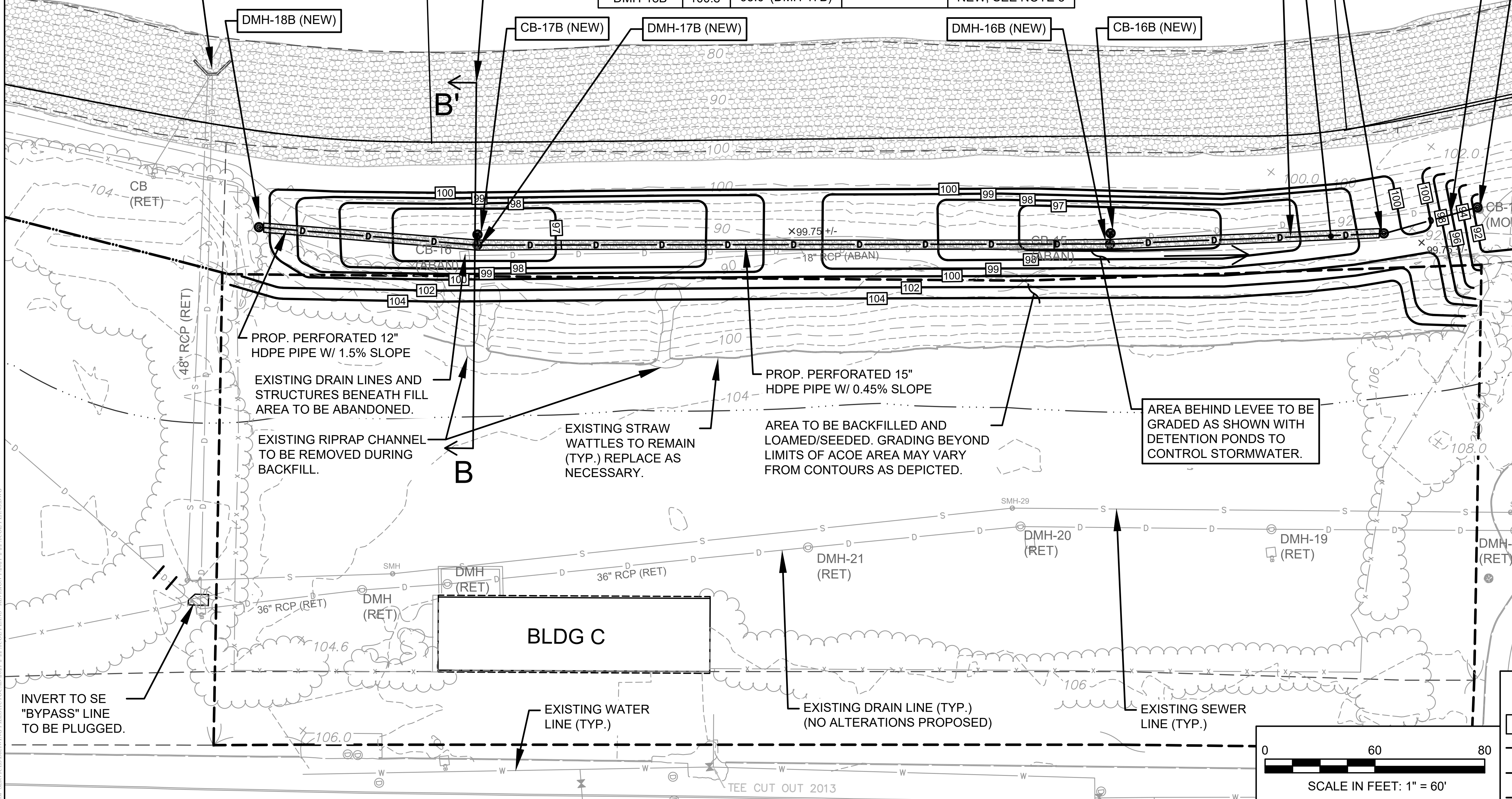
Figure No. 6

Enlarged Grading & Drainage Plan II
Uniroyal Property

NOTES:
1. ANY CATCH BASINS OR DRAIN INLETS TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.
3. DMH-18B MAY BE REPLACED WITH CLEANOUT AT DISCRETION OF CITY.
4. ALL EXISTING AND PROPOSED DRAIN INLETS SHALL BE FITTED WITH SILT SACKS FOR SEDIMENT PROTECTION.

DRAINAGE STRUCTURE TABLE

STRUCTURE	RIM	INV. OUT.	INV. IN.	NOTES
DMH-14	92'	82.9' (DMH-13)	87.5' (DMH-15B)	ADJUST
DMH-15B	99.6'	90.15' (DMH-14)	90.15' (DMH-16B)	NEW
DMH-16B	97.0	91.65' (DMH-15B)	91.65' (DMH-17B) 91.65' (CB-16B)	NEW
CB-16B	97.33'	91.75' (DMH-15B)		NEW
DMH-17B	97.0	93.25' (DMH-16B)	93.25 (DMH-18B) 93.25' (CB-17B)	NEW
CB-17B	97.33'	93.3' (DMH-17B)		NEW
DMH-18B	100.8'	95.0' (DMH-17B)		NEW, SEE NOTE 3



PROPERTY OWNERSHIP
CITY OF CHICOPEE
BOOK 3102 PAGE 558
BOOK 13344 PAGE 589
BOOK 15274 PAGE 379
BOOK 18247 PAGE 351
BOOK 18258 PAGE 319

PLAN BOOK 99 PAGES 9-12
PLAN BOOK 161 PAGES 6-9
PLAN BOOK 369 PAGES 87-90

NOTES:
1. ANY CATCH BASINS OR DRAIN INLETS TO BE ABANDONED SHALL BE BACKFILLED AND SEALED WITH MASONRY PLUG.
2. ALL DRAINAGE STRUCTURES BEYOND LIMITS OF FILL AREA TO BE RETAINED UNLESS OTHERWISE NOTED.

LEGEND
- EXISTING SITE BUILDING
- PROPERTY LINE
- APPROX. LIMIT OF CHICOPEE RIVER
- 200' RIVERFRONT AREA

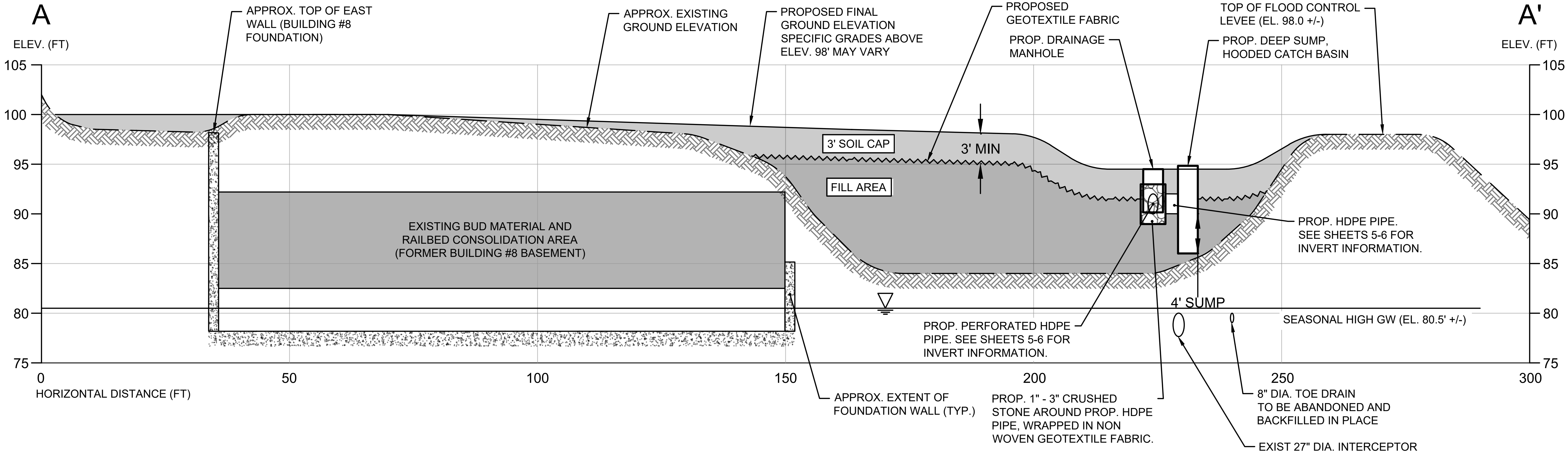
BETA
www.BETA-Inc.com

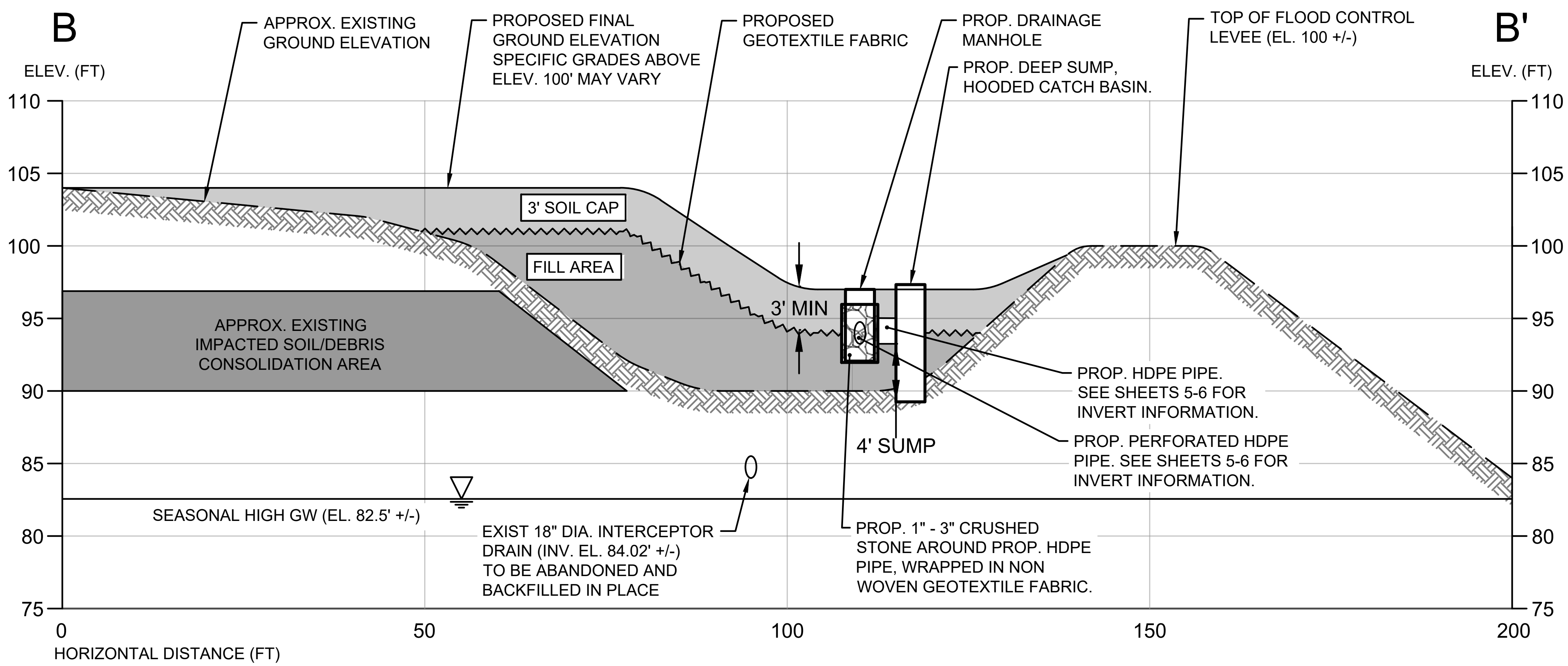
Former Unioryal & Facemate Properties
ACOE Permit Review Only
75 West Main Street
Chicopee, MA

Issue Date: 3-10-2021

Figure No. 7

Grading & Drainage Plan
Facemate Property





NOTES:

1. COORDINATES, IN FEET, ARE BASED UPON THE NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. EXISTING PIPE INFORMATION BASED ON PLAN TITLED "CHICOPEE RIVER FLOOD CONTROL CHICOPEE FALLS" PREPARED BY US ARMY CORPS OF ENGINEERS, DATED DECEMBER 1962. ELEVATIONS TO BE CONFIRMED DURING CONSTRUCTION.
3. REFER TO FIGURE 3 FOR SOURCE OF EXISTING TOPOGRAPHY DATA
4. REFER TO FIGURES 5 AND 7 FOR LOCATIONS OF CROSS SECTIONS.
5. PROPOSED CRUSHED STONE AND BACKFILL DESIGN SHALL BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEERING REPORT PREPARED FOR THIS PROJECT OR AN EQUIVALENT DESIGN REVIEWED BY A GEOTECHNICAL ENGINEER.

VERT. SCALE IN FEET: 1" = 10'

0 10 20

0 20 40

HORR. SCALE IN FEET: 1" = 20'

www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

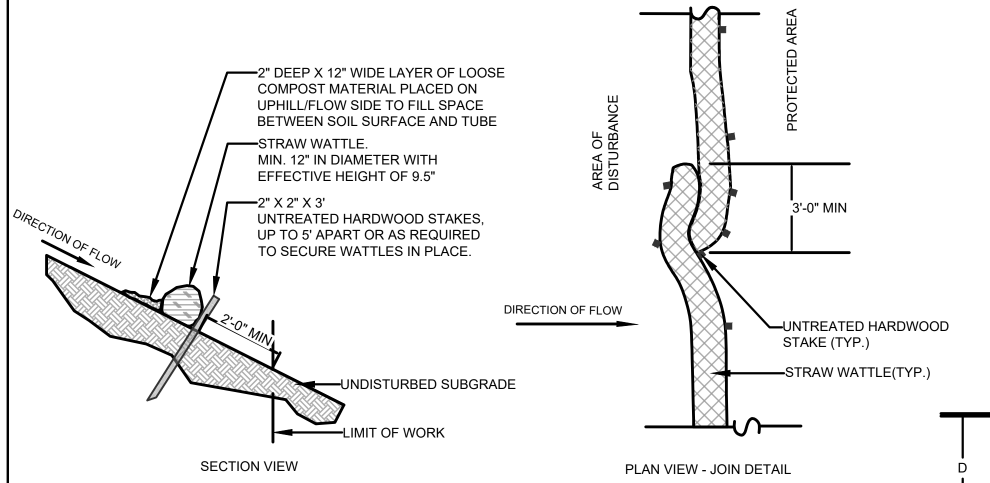
154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Figure No. 8

Cross Sections

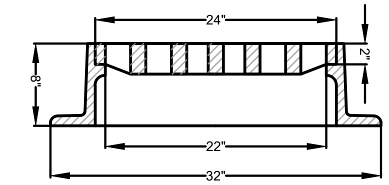


EROSION CONTROL BARRIER NOTES:

1. PROVIDE A MINIMUM DIAMETER OF 12 INCHES FOR SLOPES UP TO 50 FEET IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. WATTLES SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL WATTLES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
4. STAMP WATTLES IN PLACE TO GOOD CONTACT WITH SOIL SURFACE. PROVIDE A 3' MINIMUM OVERLAP AT ENDS TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW. STAKE JOINING WATTLES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
5. SECURE ENDS WITH STAKES SPACED 18" APART THROUGH TOPS OF TUBES.

EROSION CONTROL BARRIER

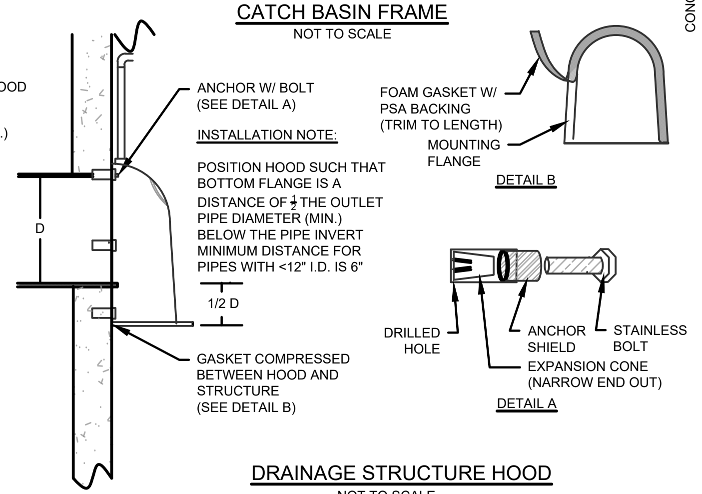
SCALE: NTS



NOTE:
1. FRAME AND GRATE SHALL BE LEBARON FOUNDRY CATALOG NO. LF248-2 WITH COMBINED WEIGHT OF 380 LBS. OR APPROVED EQUIVALENT

CATCH BASIN FRAME

NOT TO SCALE

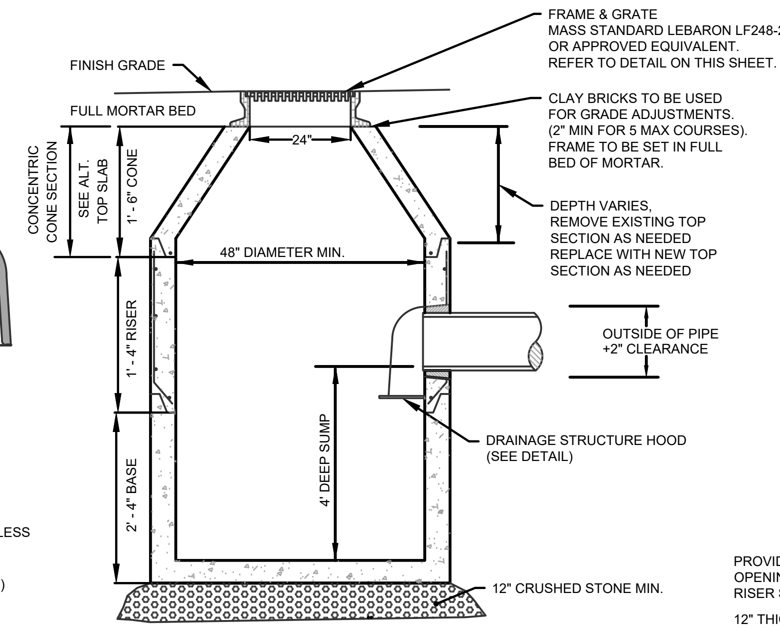


INSTALLATION NOTE:

POSITION HOOD SUCH THAT BOTTOM FLANGE IS A DISTANCE OF ½ THE OUTLET PIPE DIAMETER (MIN.) BELOW THE PIPE INVERT MINIMUM DISTANCE FOR PIPES WITH <12" I.D. IS 6"

DRAINAGE STRUCTURE HOOD

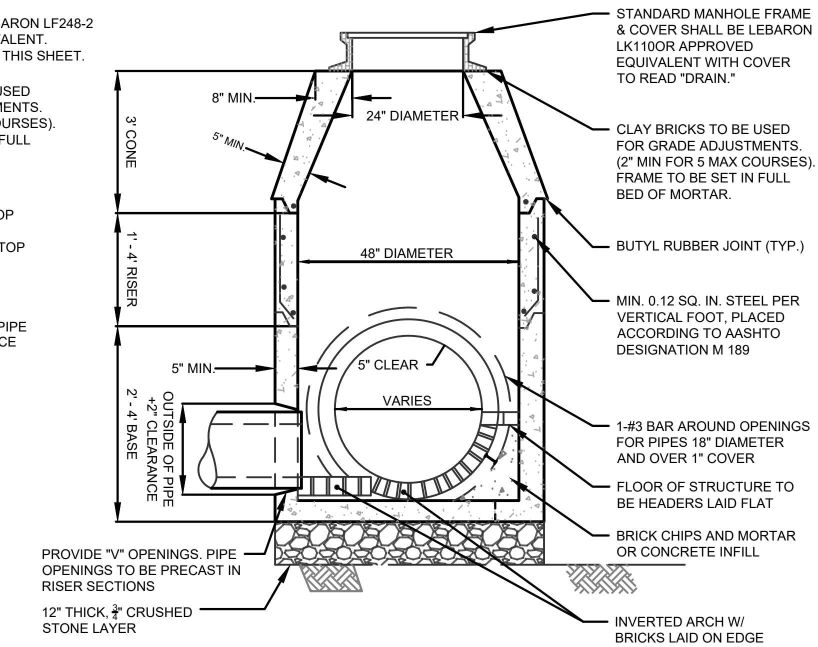
NOT TO SCALE



DRAINAGE STRUCTURE NOTES:
1. REFER TO FIGURES 5 THROUGH 7 FOR DRAINAGE STRUCTURE INVERTS AND SPECIFICATIONS.
2. ALL STRUCTURES SHALL CONFORM TO CITY OF CHICOPEE DPW REQUIREMENTS.
3. CONCRETE SHALL BE 4,500 PSI MANUFACTURED TO LATEST ASTM C-478 SPECIFICATIONS.
4. BUTYL FLEXIBLE JOINT SEALANT SHALL CONFORM TO LATEST ASTM C-990 SPECIFICATIONS.
5. REINFORCEMENT SHALL CONFORM TO THE FOLLOWING:
   WALL SECTIONS: 0.12 SQ. IN. PER LINEAR FOOT
   FLOOR SLAB: 0.12 SQ. IN. EACH WAY
   SLAB TOP: AASHTO HS20-44

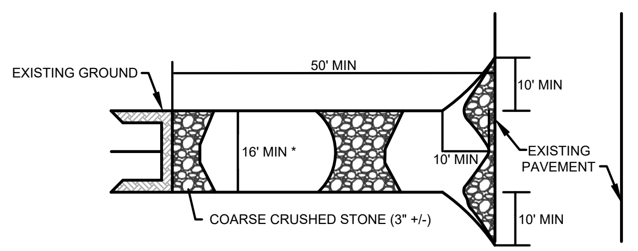
PRECAST CONCRETE CATCH BASIN WITH DEEP SUMP

NOT TO SCALE



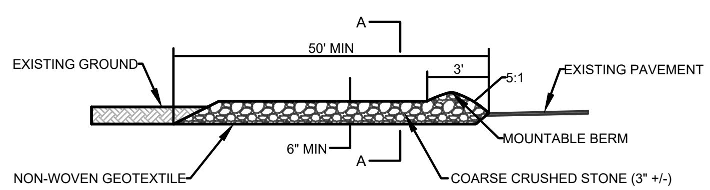
PRECAST CONCRETE DRAIN MANHOLE

NOT TO SCALE

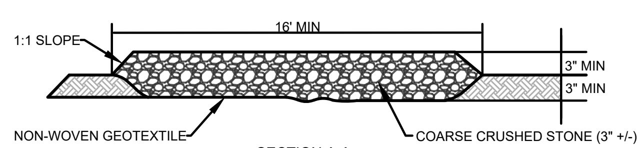


* MUST EXTEND FULL WIDTH OF INGRESS AND EGRESS OPERATION

PLAN VIEW



SIDE ELEVATION



SECTION A-A

TEMPORARY CONSTRUCTION ENTRANCE NOTES

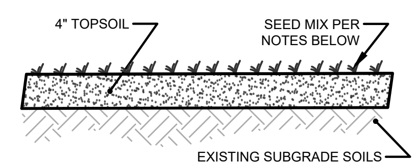
1. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE. EXISTING PAVEMENT MAY REMAIN.
2. IF SLOPE TOWARDS THE PUBLIC ROAD EXCEED 2%, CONSTRUCT A 6- TO 8-INCH RIDGE WITH 3H:1V SIDE SLOPES ACROSS THE FOUNDATION APPROXIMATELY 15 FEET FROM THE EDGE OF THE PUBLIC ROAD TO DIVERT RUNOFF FROM IT.
3. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES ALONG PUBLIC ROADS.
4. PLACE STONE TO DIMENSIONS AND GRADE AS SHOWN ON PLANS. LEAVE SURFACE SLOPED FOR DRAINAGE.

MAINTENANCE

1. RESHAPE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL
2. TOP DRESS WITH CLEAN STONE AS NEEDED.

STABILIZED CONSTRUCTION ENTRANCE

SCALE: NTS

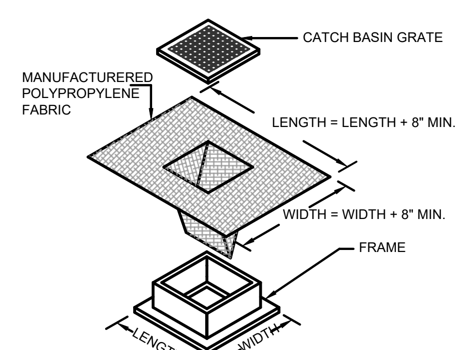


SEED MIX NOTES:

- SEED SHALL BE LOW UPLAND MIX - FULL SUN PER MASSDOT ITEM NUMBER 765.412. OR APPROVED EQUIVALENT.
- APPLY SEED AT A RATE OF 75 LB/ACRE OR 175 LB/ACRE ON AREAS OF GREATER THAN 3:1 SLOPE
- APPLY 30LB/ACRE OF A COVER CROPS. FOR COVER CROP USE EITHER GRAIN OATS (1 JAN TO 31 JULY) OR GRAIN RYE (1 AUG TO 31 DEC).
- FERTILIZER SHALL NOT BE USED.

GROUND COVER FOR RESTORED AREAS

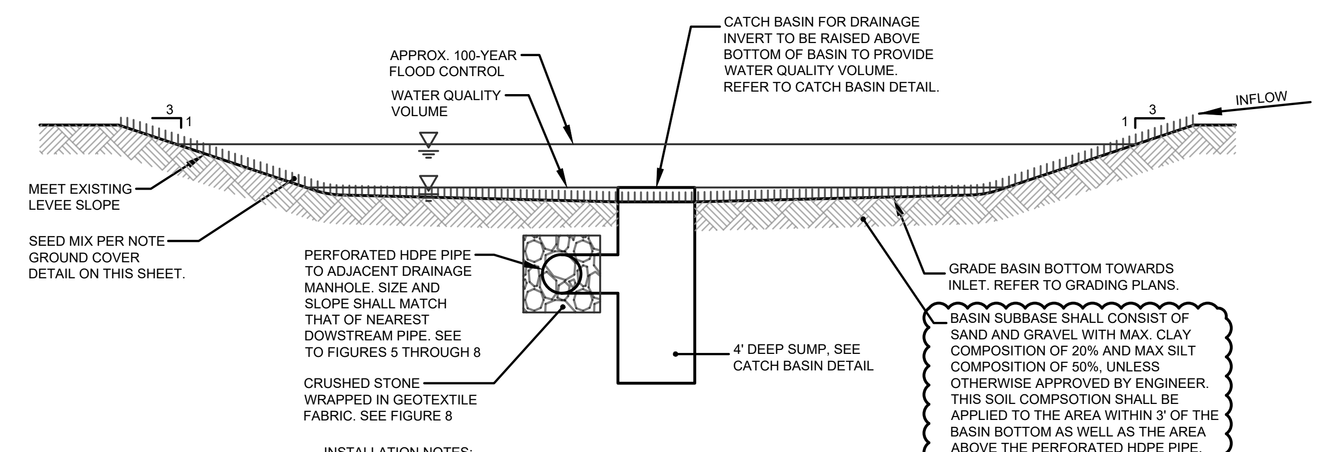
SCALE: NTS



NOTES:
1. LENGTH AND WIDTH OF POLYPROPYLENE FABRIC MUST EXCEED EXISTING CATCH BASIN FRAME DIMENSIONS BY A MINIMUM OF 8".
2. REMOVE CATCH BASIN GRATE AND INSTALL POLYPROPYLENE FABRIC OVER CATCH BASIN FRAME. REPLACE CATCH BASIN GRATE TO SECURE POLYPROPYLENE FABRIC IN PLACE.
3. CATCH BASIN EROSION CONTROL TO BE PLACED AT EXISTING AND PROPOSED ALL CATCH BASINS IN VICINITY OF WORK AREA.

CATCH BASIN SEDIMENTATION CONTROL PROTECTION - SILT SACK

SCALE: NTS



INSTALLATION NOTES:

1. PRIOR TO INSTALLATION, VERIFY SOIL CONDITIONS OF PLACED BACKFILL MATERIAL TO CONFIRM ADEQUATE DRAINAGE WILL BE ACHIEVED.
2. EXCAVATE/CONSTRUCT BASIN ONLY WITH LIGHT EARTH-MOVING EQUIPMENT TO AVOID EXCESSIVE COMPACTING OF SOILS BENEATH BASIN FLOOR. AVOID CONSTRUCTION IN WINTER OR DURING RAIN EVENTS TO EXTENT POSSIBLE.
3. AFTER THE BASIN FLOOR IS SHAPED, PLACE SOIL ADDITIVES ON THE BASIN FLOOR TO AMEND THE SOIL, INCLUDING COMPOST (PROPERLY AGED TO KILL ANY SEED STOCK CONTAINED WITHIN) AND MIXED NATIVE SOILS FROM A OR B HORIZONS.
4. SCARIFY NATIVE MATERIALS AND COMPOST INTO THE PARENT MATERIAL USING A CHISEL PLOW OR ROTARY DEVICE TO A DEPTH OF 12 INCHES.
5. IMMEDIATELY AFTER BASIN IS CONSTRUCTED, STABILIZE BOTTOM AND SIDE SLOPES WITH DENSE GRASS TURF (SEE SEED MIX NOTES ON THIS SHEET).
6. INSPECT BASIN REGULARLY DURING THE FIRST TWO MONTHS FOLLOWING INSTALLATION TO DETERMINE IF REMEDIAL ACTIONS (E.G. RESEEDING, IRRIGATING) ARE NECESSARY.

INFILTRATION BASIN

SCALE: NTS

www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

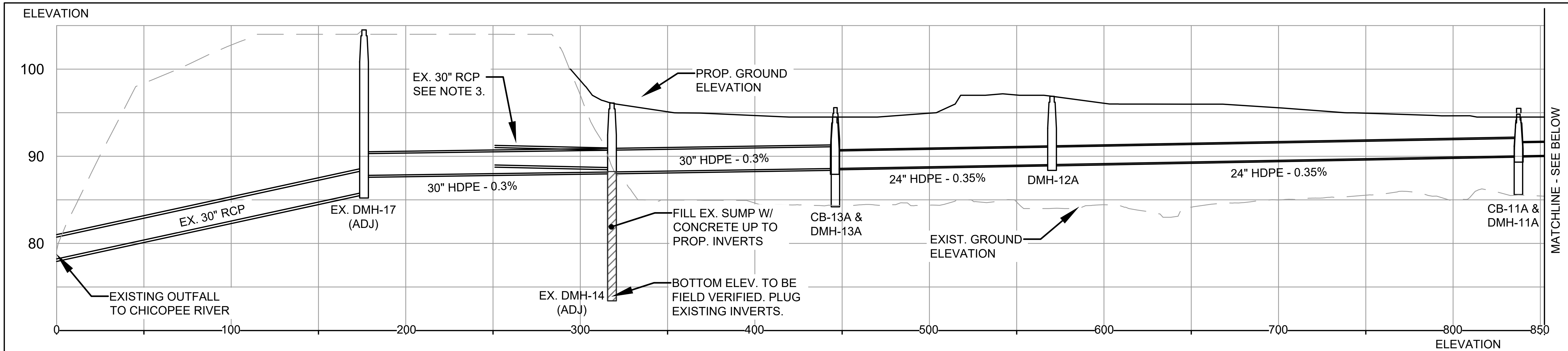
154 Grove Street & 75 West Main Street

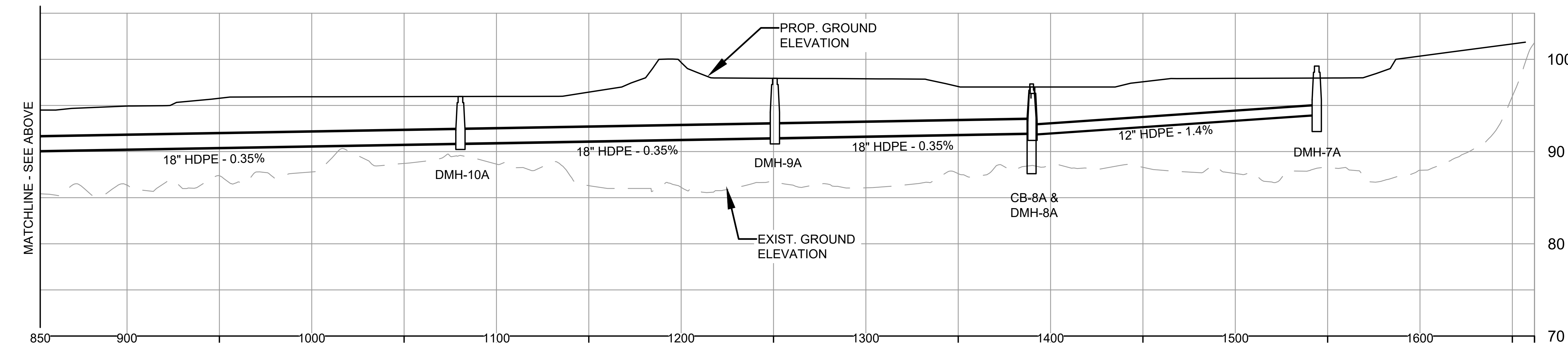
Chicopee, MA

Issue Date: 3-10-2021

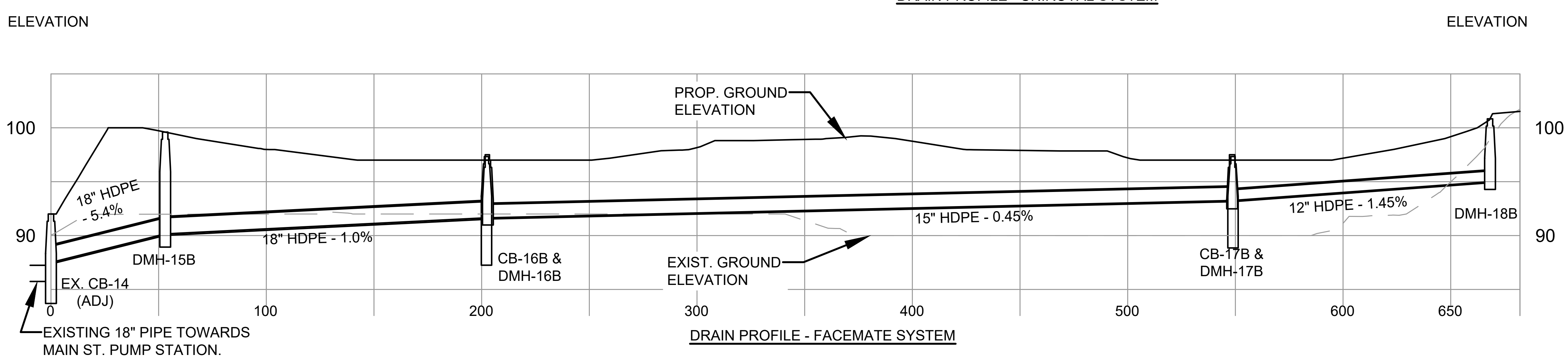
Figure No. 9

Details





DRAIN PROFILE - UNIROYAL SYSTEM



DRAIN PROFILE - FACEMATE SYSTEM

NOTES:

1. REFER TO FIGURES 5 THROUGH 7 FOR DRAINAGE STRUCTURE SCHEDULE AND FIGURE 9 FOR STRUCTURE DETAILS.
2. STRUCTURE SUMP ELEVATIONS MAY DIFFER FROM THOSE SHOWN. REFER TO DETAIL ON FIGURE 9.
3. EXISTING 30" RCP INVERT AT DMH-14 SHALL BE LOCATED AND FIELD VERIFIED. INVERT TO BE ADJUSTED AS NECESSARY TO PROVIDE POSITIVE DRAINAGE TO DMH-17.

VERT. SCALE IN FEET: 1" = 12'

0 12 24

0 60 120

HORR. SCALE IN FEET: 1" = 60'

BETA

www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

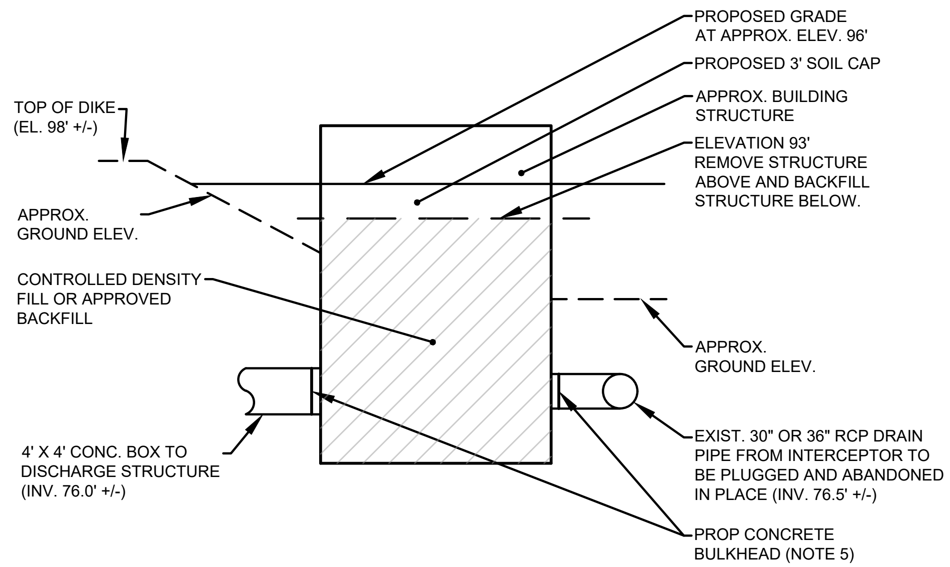
154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Figure No. 10

Drainage Profile



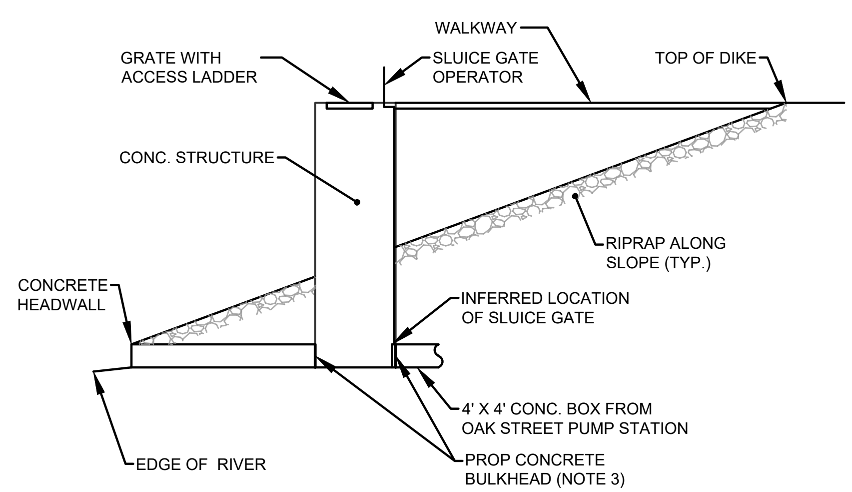
DECOMMISSIONING OF
OAK ST. PUMP STATION
NOT TO SCALE

GENERAL SEQUENCE OF WORK - PUMP STATION

1. ENSURE EROSION CONTROLS ARE PLACED IN ALL NEARBY DRAIN INLETS.
2. DISMANTLE AND REMOVE ALL EXISTING ELECTRICAL CONNECTIONS AND UTILITIES, INCLUDING ABOVE-GROUND TANK AND ASSOCIATED FENCING.
3. DISMANTLE AND REMOVE ALL EQUIPMENT WITHIN THE PUMP STATION TO BE PRESERVED OR DISCARDED.
4. DEWATER STRUCTURE AS NEEDED AND INSTALL TEMPORARY MEASURES TO PREVENT WATER FROM ENTERING STRUCTURE.
5. INSTALL CONCRETE BULKHEAD AT ALL DISCHARGE AND INTERCEPTOR DRAIN PIPES.
6. DEMOLISH EXISTING PUMP STATION ROOF AND BUILDING WALLS TO AT LEAST 3' BELOW PROPOSED GRADE (TO APPROX. ELEV. 93')
7. DEMOLISH ELEVATED TANK STRUCTURE LOCATED TO THE NORTH OF THE PUMP STATION. LOWER ASSOCIATED CONCRETE FOOTINGS TO AT LEAST 3' BELOW PROPSOED GRADE.
8. BACKFILL REMAINING PUMP STATION WITH CONTROLLED DENSITY FILL OR APPROVED BACKFILL.
9. ABANDON REMAINING PUMP STATION STRUCTURE IN PLACE AND BACKFILL IN ACCORDANCE WITH FILL MANAGEMENT PLAN, INCLUDING LAYER OF GEOTEXTILE FABRIC AND AT LEAST 3' OF CLEAN FILL WHERE NECESSARY.

NOTES:

1. INTERIOR OF STRUCTURE IS APPROXIMATE ONLY BASED ON LIMITED VISUAL OBSERVATIONS AND RECORD PLANS. ACTUAL LAYOUT MAY VARY.



DECOMMISSIONING OF OAK ST. PUMP
STATION DISCHARGE STRUCTURE
NOT TO SCALE

GENERAL SEQUENCE OF WORK - DISCHARGE STRUCTURE

1. DEWATER STRUCTURE AS NEEDED AND INSTALL TEMPORARY MEASURES TO PREVENT WATER FROM ENTERING STRUCTURE.
2. REMOVE SLUICE GATE AND SEAL BOTTOM PORTION OF STRUCTURE WITH CONCRETE BULKHEAD TO BLOCK FLOW FROM BOTH SIDES.
3. DISMANTLE AND REMOVE ALL EQUIPMENT FOR OPERATIONS OF SLUICE GATE.
4. DEMOLISH WALKWAY, INTAKE STRUCTURES, AND SOUTH HEADWALL.
5. BACKFILL THE PORTION OF PIPE THAT CROSSES BENEATH THE LEVEE WITH FLOWABLE FILL.
6. BACKFILL LOWER PORTION OF INTAKE STRUCTURES WITH CLEAN FILL TO GRADE.
7. PROVIDE RIPRAP OVER FOOTPRINT OF INTAKE STRUCTURE TO MATCH EXISTING SLOPE.

NOTES:

1. INTERIOR OF STRUCTURE IS APPROXIMATE ONLY BASED ON LIMITED VISUAL OBSERVATIONS. ACTUAL LAYOUT MAY VARY.

SITE PREPARATION AND EROSION CONTROL NOTES

1. THE CONSTRUCTION SEQUENCING PLAN IS FOR CONCEPTUAL PURPOSES ONLY. THE ACTUAL SEQUENCE OF WORK IMPLEMENTED FOR THIS PROJECT MAY DEVIATE FROM THIS PLAN SO LONG AS IT MEETS THE REQUIREMENTS OF THE PROJECT SITE PLANSET, PROJECT STORMWATER MANAGEMENT REPORT, CITY OF ACUSHNET REGULATIONS, AND ACOE REQUIREMENTS. ADDITIONAL CONSTRUCTION ACTIVITIES MAY BE REQUIRED AT THE SITE BEYOND THOSE PRESENTED ON THIS PLAN.
2. PRIOR TO TRANSITIONING FROM ONE PHASE TO ANOTHER, AT LEAST 75% OF THE EXISTING WORK AREA SHALL BE TEMPORARILY OR PERMANENTLY STABILIZED.
3. ENGINEER WILL PROVIDE A STORMWATER POLLUTION PREVENTION PLAN (SWPPP), INCLUDING THE FILING OF A NOTICE OF INTENT WITH THE U.S. EPA TO OBTAIN A NPDES CONSTRUCTION GENERAL PERMIT (CGP) PRIOR TO THE CONTRACTOR COMMENCING WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO PERFORM INSPECTIONS, MONITORING, AND MAINTENANCE, IF WARRANTED, IN ACCORDANCE WITH THE SWPPP TO COMPLY WITH THE CGP. THE SOIL EROSION SEDIMENT CONTROL PROCEDURES AND DETAILS SHOWN AND DESCRIBED IN THE SWPPP SHALL BE STRICTLY FOLLOWED AND INSTALLED IN A MANNER TO MINIMIZE EROSION FROM DISTURBED AREAS.
4. ALL EXISTING AND PROPOSED STEEP SLOPES WITHIN THE FILL AREA (2:1 OR STEEPER, OR AS DIRECTED BY ENGINEER) TO BE STABILIZED WITH JUTE MESH EROSION CONTROL MAT OR APPROVED EQUIVALENT.
5. THE ACCESS, STAGING, AND STORAGE AREAS SHALL BE LOCATED WITHIN THE LIMITS OF THE PROJECT SITE. NO WORK, STOCKPILING OF MATERIALS, STORAGE OF EQUIPMENT, OR OTHER OPERATIONS OF THE CONTRACTOR SHALL TAKE PLACE OUTSIDE THE LIMITS OF WORK UNLESS AUTHORIZED IN WRITING BY THE ENGINEER.
6. EROSION CONTROL DEVICES SHALL BE FULLY INSTALLED PRIOR TO THE START OF ANY SITE WORK, AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. THESE DEVICES SHALL BE REMOVED AND LEGALLY DISPOSED OF UPON COMPLETION OF ALL WORK WHEN ALL DISTURBED AREAS ARE STABILIZED AND PERMANENT GROUND COVER IS ESTABLISHED, TO THE SATISFACTION OF THE ENGINEER AND THE TOWN. ALL EROSION CONTROL BMPS SHALL CONFORM TO US EPA, NPDES, MA DEP, AND MASSACHUSETTS EROSION AND SEDIMENTATION CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS.
7. THE CONTRACTOR SHALL MONITOR ALL AREAS WITHIN AND AROUND THE LIMIT OF THE WORK FOR SIGNS OF EROSION, AND REPAIR/STABILIZE ANY ERODED AREAS, AS REQUIRED, UNTIL FINAL STABILIZATION CAN BE ACHIEVED.
8. THE CONTRACTOR IS RESPONSIBLE FOR MONITORING DOWNSTREAM CONDITIONS THROUGHOUT THE CONSTRUCTION PERIOD AND CLEARING ANY DEBRIS AND/OR SEDIMENT IMPEDING PROPER DRAINAGE DURING CONSTRUCTION.
9. NO SEDIMENT SHALL BE PERMITTED TO LEAVE THE SITE DURING CONSTRUCTION. IF HEAVY RAIN AND/OR UNUSUAL SITE CONDITIONS RESULT IN THE POLLUTION OF ROADWAYS, BUFFER ZONES, RESOURCE AREAS, OR ADJACENT PARCELS, CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY. CONTRACTOR SHALL CLEAN ANY DISTURBED AREAS AS SOON AS PRACTICABLE AND RESTORE THEIR ORIGINAL CONDITIONS. CLEANING AND RESTORATION WITHIN BUFFER ZONES AND RESOURCE AREAS MUST BE PERFORMED UNDER THE SUPERVISION OF A WETLAND CONSULTANT, AS COORDINATED BY ENGINEER. WORK MAY ALSO BE OBSERVED BY THE CONSERVATION COMMISSION.
10. CONTRACTOR SHALL SWEEP GROVE STREET, OAK STREET, AND WEST MAIN STREET AT THE END OF EACH WORK DAY (OR MORE FREQUENTLY AS REQUESTED BY THE CITY OR ITS AGENT) TO REMOVE SEDIMENT TRACKING CAUSED BY PROJECT-RELATED CONSTRUCTION VEHICLES.
11. SILT SACKS SHALL BE INSTALLED WITHIN ANY CATCH BASINS AND DRAIN INLETS WITHIN THE LOTS AND WITHIN THE VICINITY OF THE LIMIT OF WORK AS NECESSARY TO PREVENT SILT-LADEN RUNOFF FROM ENTERING THE CITY OR ACOE STORM DRAIN SYSTEM.
12. ALL DISTURBED AREAS SHALL BE STABILIZED NO LATER THAN 14 DAYS AFTER A CONSTRUCTION ACTIVITY HAS TEMPORARILY OR PERMANENTLY CEASED ON THAT PORTION OF THE SITE.
13. ANY DISTURBED AREA EXPOSED FOR MORE THAN 7 DAYS SHALL BE STABILIZED WITH PERENNIAL RYE GRASS SEEDING OR APPROVED EQUIVALENT. ADDITIONALLY, A ROW OF STRAW WATTLES SHALL BE PLACED AND STAKED ON THE DOWNGRADIENT SIDE OF ALL SUCH AREAS. SEEDED AREAS SHALL BE RE-SEEDED AS NECESSARY TO ENSURE VEGETATION ESTABLISHMENT.
14. ALL STOCKPILES AND DISTURBED AREAS TO BE STABILIZED IF EXPOSED FOR MORE THAN 7 DAYS. ALL STOCKPILES SHALL BE SURROUNDED BY COMPOST FILTER RUBES, AND COVERED IN A MANNER THAT STORMWATER DOES NOT INFILTRATE THE MATERIAL.ALL STOCKPILES OVER 10' IN HEIGHT SHALL BE SURROUNDED BY SAFETY FENCING. NO STOCKPILE SHALL BE PLACED NORTH OF EAST OF THE PERIMETER EROSION CONTROLS.

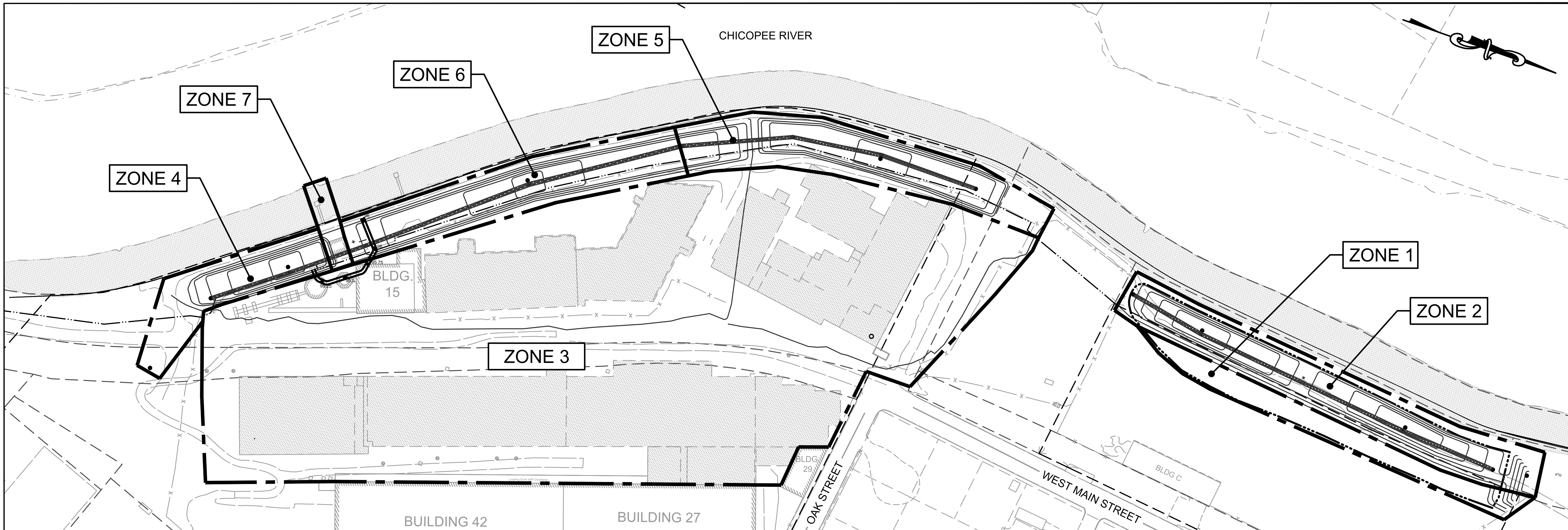
BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties
ACOE Permit Review Only
154 Grove Street & 75 West Main Street
Chicopee, MA

Issue Date: 3-10-2021

Figure No. 11

Oak Street Pump Station
And Construction Notes



CONCEPTUAL CONSTRUCTION SEQUENCE

- PHASES 1 AND 2 CAN BE CONDUCTED CONCURRENTLY WITH PHASES 3 - 8.

PHASE 0 (SITEWIDE)
- COORDINATE SCHEDULE WITH OTHER ON-SITE CONTRACTORS
- INSTALL SITEWIDE PERIMETER EROSION CONTROLS, INLET PROTECTION, AND STABILIZED CONSTRUCTION ENTRANCES.
- REVIEW GUIDELINES OF CITY FILL MANAGEMENT PLAN, INCLUDING PROCEDURE FOR ACCEPTANCE AND MANAGEMENT OF BACKFILL MATERIAL.
- ESTABLISH STOCKPILE AND STAGING AREAS.
- FIELD-LOCATE ALL EXISTING DRAINAGE STRUCTURE IN THE VICINITY OF THE FLOOD CONTROL LEVEE AND THOSE ASSOCIATED WITH BUILDING 26 & 27 ROOF DRAINAGE SYSTEM..
- RAISE EXISTING MONITORING WELLS AS DEEMED NECESSARY BY THE CITY OR ITS LICENSED SITE PROFESSIONAL.
- IDENTIFY AND RELOCATE/REMOVE ANY ITEMS THAT MAY OBSTRUCT BACKFILL OPERATIONS, SUCH AS FENCING AND UTILITY POLES. SITE SECURITY FOR UNIROYAL TO BE RESET AT DISCRETION OF CITY.

PHASE 1 (ZONE 1)
- REMOVE EXISTING RIPRAP FLOW CHANNELS FROM ZONE 1. EVALUATE EXISTING STRAW WATTLES FOR RE-USE.
- PLUG EXISTING BYPASS LINE SOUTH OF BUILDING C.
- CONDUCT GRADING OF ZONE 1 IN ACCORDANCE WITH FILL MANAGEMENT PLAN, INCLUDING PLACEMENT OF FILL MATERIAL, GEOTEXTILE FABRIC LAYER, AND CLEAN SOIL CAP.
- TEMPORARILY GRADE WEST SIDE OF ZONE 1 TO MAXIMUM SLOPE OF 3:1 (H:V) TO MEET EXISTING GRADES.

PHASE 2 (ZONE 2)
- FILL AND/OR ABANDON EXISTING DRAINAGE STRUCTURES IN ACCORDANCE WITH SITE PLANSET.
- BACKFILL ZONE TO THE APPROXIMATE BOTTOM ELEVATION OF THE PROPOSED INFILTRATION BASINS, EXCLUDING THE FOOTPRINT AND IMMEDIATE VICINITY OF PROPOSED DRAINAGE STRUCTURES AND DRAIN LINES.
- ADJUST CB/DMH-14 AND PLUG EXISTING SOUTH INVERT.
- INSTALL PROPOSED DRAINAGE STRUCTURES, DRAINAGE PIPES, AND CRUSHED STONE AROUND PERFORATED PIPE.
- CONSTRUCT INFILTRATION BASINS AND BACKFILL ZONE TO FINAL GRADES.

PHASE 3 (ZONE 3)
- ENSURE THAT ACCESS TO PUMP STATION IS MAINTAINED THROUGHOUT DURATION OF PHASES 3 THROUGH 6.
- CONDUCT GRADING OF ZONE 3 IN ACCORDANCE WITH FILL MANAGEMENT PLAN, INCLUDING PLACEMENT OF FILL MATERIAL, GEOTEXTILE FABRIC LAYER, AND CLEAN SOIL CAP.
- TEMPORARILY GRADE WEST SIDE OF ZONE 3 TO MAXIMUM SLOPE OF 3:1 TO MEET EXISTING GRADES.
- ENSURE THAT DEMOLITION OF BUILDING 15 IS COMPLETED PRIOR TO START OF PHASE 4 (UNDER SEPARATE CONTRACT).
- DEMOLISH ELEVATED TANK STRUCTURE NEAR PUMP STATION.

PHASE 4 (ZONE 4)
- FILL AND/OR ABANDON EXISTING DRAINAGE STRUCTURES IN ACCORDANCE WITH SITE PLANSET.
- ADJUST DMH-14 AND DMH-17, AND INSTALL 24" HDPE BETWEEN THE TWO STRUCTURES. EVALUATE EXISTING NORTHBOUND INVERT AT DMH-14.
- BACKFILL ZONE TO THE APPROXIMATE BOTTOM ELEVATION OF THE PROPOSED INFILTRATION BASIN, EXCLUDING THE FOOTPRINT AND IMMEDIATE VICINITY OF PROPOSED DRAINAGE STRUCTURES AND DRAIN LINES.
- TEMPORARILY GRADE NORTH SIDE OF ZONE 4 TO MAXIMUM SLOPE OF 3:1 TO MEET EXISTING GRADES.
- INSTALL PROPOSED DRAINAGE STRUCTURES, DRAINAGE PIPES, AND CRUSHED STONE AROUND PERFORATED PIPE. PIPE BETWEEN DMH-13A AND DMH-12A TO BE CONSTRUCTED DURING PHASE 7.
- CONSTRUCT INFILTRATION BASIN AND BACKFILL ZONE TO FINAL GRADES.

PHASE 5 (ZONE 5)
- FILL AND/OR ABANDON EXISTING DRAINAGE STRUCTURES IN ACCORDANCE WITH SITE PLANSET.
- BACKFILL ZONE TO THE APPROXIMATE BOTTOM ELEVATION OF THE PROPOSED INFILTRATION BASIN, EXCLUDING THE FOOTPRINT AND IMMEDIATE VICINITY OF PROPOSED DRAINAGE STRUCTURES AND DRAIN LINES.
- TEMPORARILY GRADE SOUTH SIDE OF ZONE TO MAXIMUM SLOPE OF 3:1 TO MEET EXISTING GRADES.
- INSTALL PROPOSED DRAINAGE STRUCTURES, DRAINAGE PIPES, AND CRUSHED STONE AROUND PERFORATED PIPE. TEMPORARILY GRADE PIPE-LESS OUTLET FROM DMH-10A TO CONVEY FLOWS TO NEARBY EXISTING CATCH BASIN.
- CONSTRUCT INFILTRATION BASIN AND BACKFILL ZONE TO FINAL GRADES.

PHASE 6 (ZONE 6)
- FILL AND/OR ABANDON EXISTING DRAINAGE STRUCTURES IN ACCORDANCE WITH SITE PLANSET, EXCLUDING STRUCTURES NECESSARY FOR PUMP STATION OPERATION.
- BACKFILL ZONE TO THE APPROXIMATE BOTTOM ELEVATION OF THE PROPOSED INFILTRATION BASIN, EXCLUDING THE FOOTPRINT AND IMMEDIATE VICINITY OF PROPOSED DRAINAGE STRUCTURES AND DRAIN LINES.
- TEMPORARILY GRADE SOUTH SIDE OF ZONE TO MAXIMUM SLOPE OF 3:1 TO MEET EXISTING GRADES.
- INSTALL PROPOSED DRAINAGE STRUCTURES, DRAINAGE PIPES, AND CRUSHED STONE AROUND PERFORATED PIPE. TEMPORARILY GRADE PIPE-LESS OUTLET FROM DMH-12A TO CONVEY FLOWS TO NEARBY EXISTING CATCH BASIN.
- CONSTRUCT INFILTRATION BASIN AND BACKFILL ZONE TO FINAL GRADES.

PHASE 7 (ZONE 7)
- CONSTRUCT TEMPORARY SWALE TO DIVERT STORMWATER RUNOFF AWAY FROM PUMP STATION. PROVIDE TEMPORARY PLUG FOR PIPE-LESS OUTLET FROM DMH-12A.
- COMPLETE DECOMISSIONING OF OAK ST. PUMP STATION (REFER TO FIGURE 11)
- FILL AND/OR ABANDON EXISTING DRAINAGE STRUCTURES IN ACCORDANCE WITH SITE PLANSET, EXCLUDING STRUCTURES NECESSARY FOR PUMP STATION OPERATION.
- BACKFILL ZONE TO APPROX. ELEVATION 88', EXCLUDING THE FOOTPRINT AND IMMEDIATE VICINITY OF PROPOSED DRAINAGE STRUCTURES AND DRAIN LINES.
- INSTALL DRAINAGE PIPE FROM DMH-12A TO DMH-13A AND CRUSHED STONE AROUND PERFORATED PIPE.
- COMPLETE DECOMMISSIONING OF OAK ST. PUMP STATION DISCHARGE STRUCTURE.
- REMOVE TEMPORARY SWALE AND BACKFILL ZONE TO FINAL GRADES.

PHASE 8 (SITEWIDE)
- REMOVE PHASE 7 DIVERSION SWALE
- CONDUCT FINE GRADING OF ANY AREAS NOT YET FINALIZED.
- VERIFY DRAINAGE PATTERNS, ENSURING NO RUNOFF IS DIRECTED OVER THE LEVEE.
- COMPLETE SITE-WIDE PERMANENT RESTORATION (UNLESS PRECLUDED BY OTHER SITE ACTIVITIES).
- REMOVE EROSION CONTROLS ONCE FINAL STABILIZATION IS ACHIEVED, UNLESS OTHERWISE NEEDED FOR FUTURE SITEWORK.

0 150 300

SCALE IN FEET: 1" = 150'

LEGEND

EXISTING SITE BUILDING
BUILDING DEMOLISHED AS OF JULY 2020
PROPERTY LINE
APPROX. LIMIT OF CHICOPEE RIVER
APPROX. LIMIT OF ACOE PARCEL (TRACT R8)
PROPOSED FILL AREA

BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

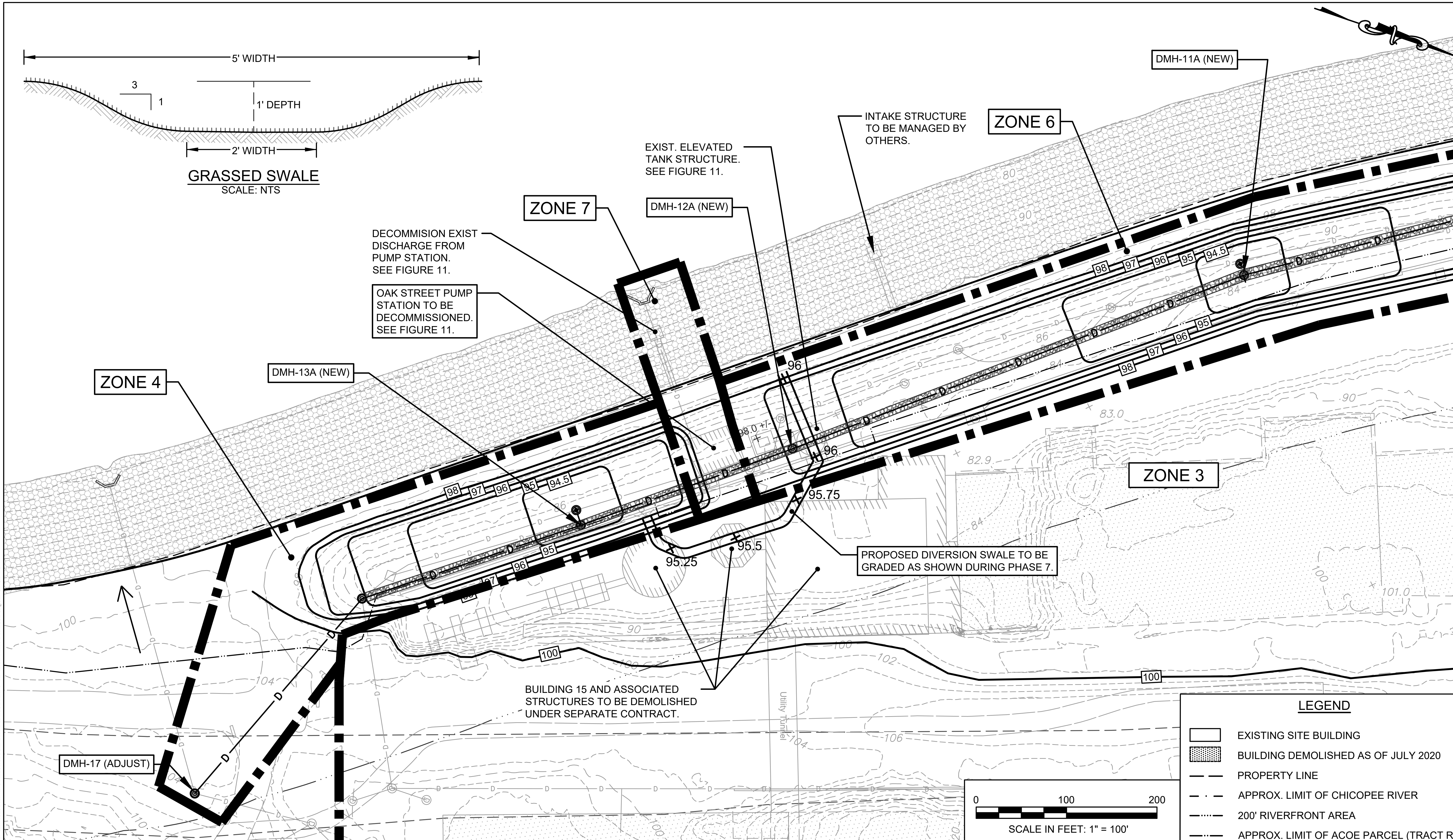
154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Figure No. 12

Overall Sequencing Plan



www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Figure No. 13

Enlarged Sequencing Plan

APPENDIX A – City of Chicopee Project Endorsement

Richard J. Kos
Mayor

CITY OF CHICOPEE

May 16, 2016

Michael L. Bachand, P.E.
Levee Safety Program Manager
United States Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742

Re: **City of Chicopee**
Chicopee Falls – Flood Control Works
Intent to Apply for Section 408 Approval

Dear Mr. Bachand:

The City of Chicopee is proposing to backfill the lower tier of the former Uniroyal property in Chicopee with excess construction soils prior to redevelopment. Earlier this year we discussed the proposal with you at an initial coordination meeting attended by City Department of Public Works and Community Development staff, our Consultants, BETA Group Inc., and Special Environmental Counsel, Louis Moore. We believe that the proposed backfilling can be done safely and cost effectively to enhance the property and eliminate long term operating and maintenance costs related to the flood control structure.

Please consider this the City's Letter of Intent to Apply for Approval under 33 U.S.C., § 408. It is the City's understanding that the U.S. Army Corps of Engineers (USACE) will assign staff to this project to provide assistance with and coordination of the necessary permitting and approval requirements. We are proceeding with the technical review and initiating design calculations for the proposal. We will be working with designated USACE staff on these issues as well as coordinating on real estate issues and permitting requirements.

Accordingly, I am requesting that you advise Michael Vedovelli, the City's Director of Community Development, of the USACE technical and legal staff assigned to this project. In the meantime, please contact Mr. Vedovelli at (413) 594-1489 or mvedovelli@chicopeema.gov with any questions or concerns related to this matter.

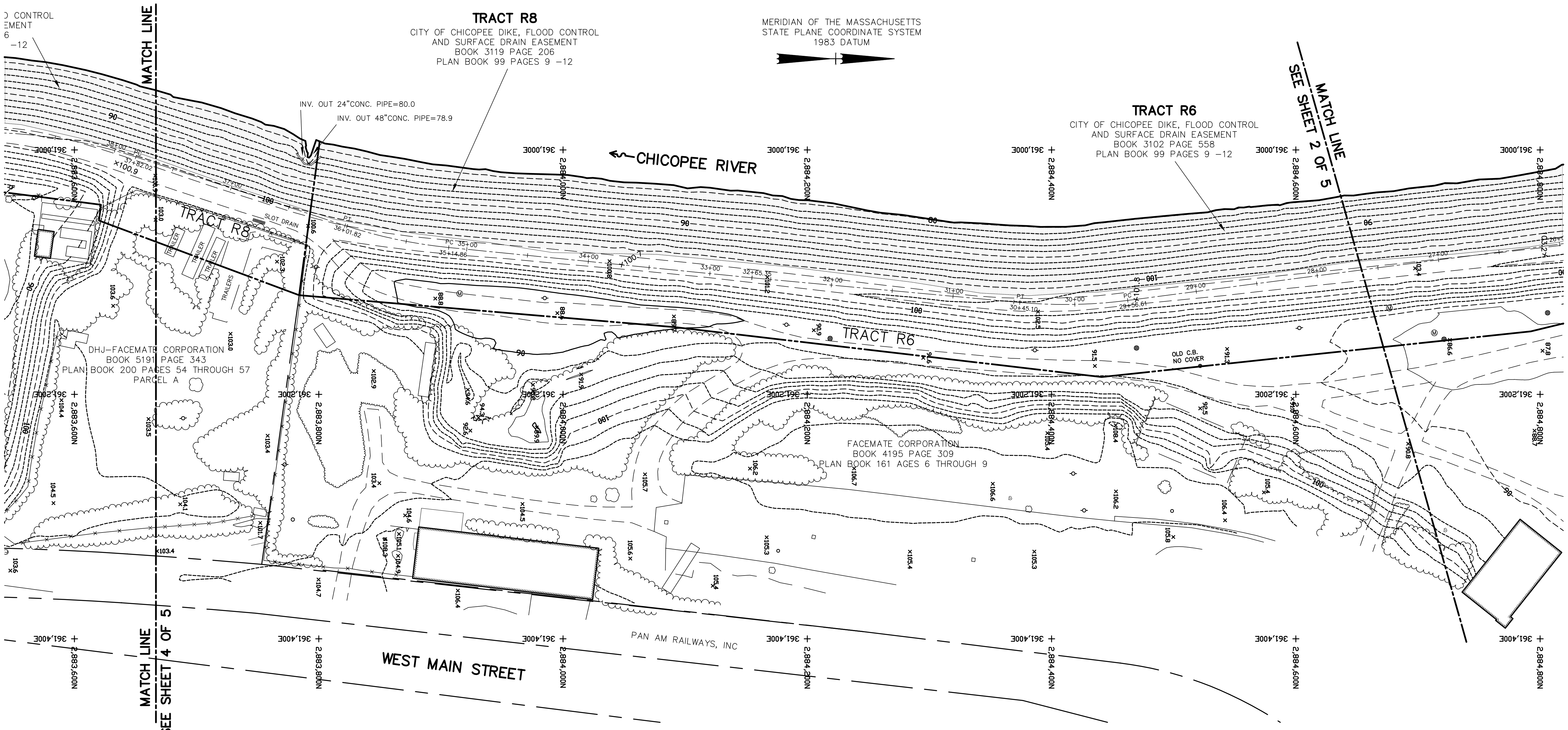
Very truly yours,

Richard J. Kos
Mayor

cc: Jeff Neece, Chicopee DPW
Joe Kietner, Chicopee DPW
Michael Vedovelli, Chicopee OCD
Alan Hanscom, BETA Associates, Inc.
Louis S. Moore, Esq., Annino, Draper & Moore, P.C.

City Hall • Market Square • 17 Springfield Street • Chicopee, Massachusetts 01013
Tel. (413) 594-1500 • Fax (413) 594-1504 • E-Mail mayorkos@chicopeema.gov

APPENDIX B – Easement and Survey Plans



LINE & SYMBOL LEGEND

TRAFFIC SIGNAL
RAILROAD CONTROL BOX
RAILROAD SWITCH
SHRUB
ROCK
MARSH SYMBOL
HYDRANT
GATE/VALVE
UTILITY VAULT
UNCERTAIN HYDRANT
MANHOLE
UNCERTAIN MANHOLE
CATCH BASINS
UNCERTAIN CATCH BASIN
UTILITY POLE
UTILITY POLE WITH LIGHT
STREET LIGHT
GUY ANCHOR
UNCERTAIN UTILITY POLE
UTILITY BOX
POLE
POST
UNCERTAIN POLE
ROAD SIGN
MONUMENT
UNCERTAIN OBJECT
×723.8 SPOT HEIGHT
x74.0 FIELD LOCATED GRADE
TREE
RIP-RAP

FENCE
GUARD RAIL
PARTLY VISIBLE FENCE
RETAINING WALL
INTERMEDIATE CONTOUR
INDEX CONTOUR
FLOOD CONTROL EASEMENT
CONCRETE FLOOD WALL
APPROXIMATE LEVEE BASELINE
OTHER EASEMENT LINES
PAVED ROAD
DIRT DRIVE
RAILROAD
BUILDING
TREE LINE
SCRUB LINE
HEDGE ROW
BOUNDARY LINE

SURVEYOR'S NOTES:

1. TOPOGRAPHIC DATA SHOWN HEREON IS BASED UPON AERIAL PHOTOGRAPHY TAKEN DURING APRIL, 2008. PHOTOGRAPHY AND MAPPING WERE PERFORMED BY COL-EAST, INC. OF NORTH ADAMS, MA AND SUPPLEMENTED WITH GROUND SURVEYS PERFORMED BY HERITAGE SURVEYS, INC. FROM MAY, 2008 THROUGH SEPTEMBER, 2009.

2. FOR REFERENCE TO BOUNDARY LINE AND EASEMENTS SEE A PLAN PREPARED BY HERITAGE SURVEYS, INC. TITLED "PLAN OF FLOOD CONTROL AND LEVEE EASEMENT IN CHICOPEE, MASSACHUSETTS SURVEYED FOR THE CITY OF CHICOPEE", DATED JUNE 15, 2009, SHEETS 1 THROUGH 4.

3. UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON SURFACE FEATURES AS LOCATED BY SURVEY AND AVAILABLE RECORD DATA, AND ARE APPROXIMATE. ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO FINAL DESIGN AND/OR CONSTRUCTION.

4. LOCATION OF FLOODWALL AND LEVEE BASELINES SHOWN ARE APPROXIMATE AND ARE BASED UPON PLANS PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS FOR CHICOPEE RIVER FLOOD CONTROL DATED APRIL, 1963. NO MONUMENTATION OF BASELINES WAS FOUND AND IS HISTORICAL ONLY.

5. TOP CONCRETE FLOODWALL AND CENTERLINE LEVEE GRADES IN BOLD TYPE ARE FIELD LOCATED BY SURVEY AND ARE NOT THE RESULT OF AERIAL MAPPING. REFER TO LEGEND FOR AERIAL SPOT HEIGHT INDICATORS.

NORTH AMERICAN VERTICAL DATUM 1988

NOTE: FOR THIS FLOOD CONTROL SYSTEM, ELEVATIONS IN NGVD29 CAN BE OBTAINED BY ADDING 0.70 FEET TO THE ELEVATIONS SHOWN ON THIS PLAN.

CHICOPEE FLOOD CONTROL WORKS
CHICOPEE FALLS SYSTEM SHEET 3 OF 5

TOPOGRAPHIC PLAN OF LAND IN
CHICOPEE, MASSACHUSETTS
SURVEYED FOR
THE CITY OF CHICOPEE

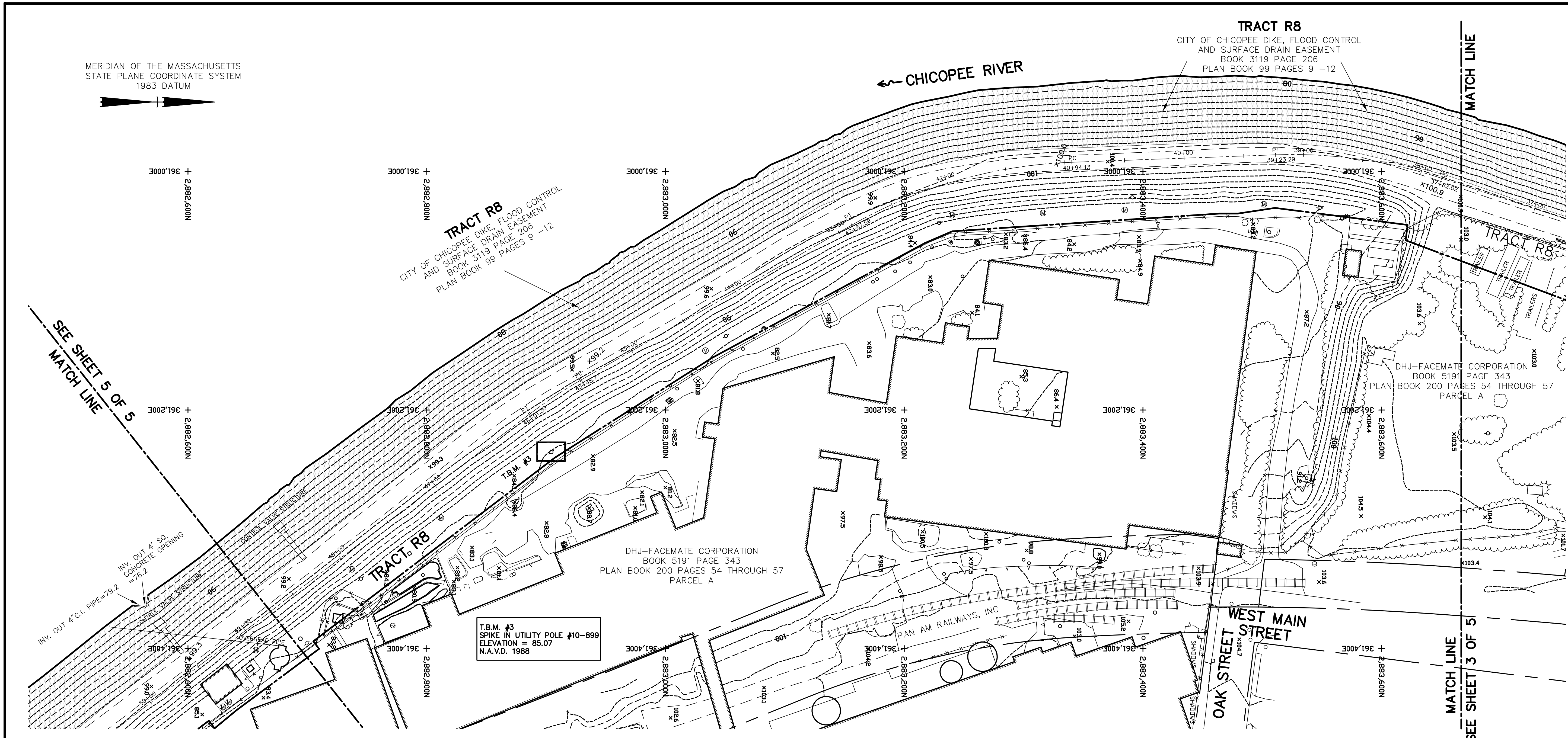
SCALE: 1" = 40'
0' 20' 40' 60' 80' 120'

DATE: DECEMBER 12, 2009

HERITAGE SURVEYS, INC.
REGISTERED PROFESSIONAL LAND SURVEYORS
COLLEGE HIGHWAY & CLARK STREET
POST OFFICE BOX 1
SOUTHAMPTON, MASSACHUSETTS
(413) 527-3600

COMMONWEALTH OF MASSACHUSETTS
BRUCE A. COOMBS
No. 27814

JOB #	6289-080505	DWG #	6289FALLS TOPO	MAP #	6289-091212



LINE & SYMBOL LEGEND

TRAFFIC SIGNAL
RAILROAD CONTROL BOX
RAILROAD SWITCH
SHRUB
ROCK
MARSH SYMBOL
HYDRANT
GATE/VALVE
UTILITY VAULT
UNCERTAIN HYDRANT
MANHOLE
UNCERTAIN MANHOLE
CATCH BASINS
UNCERTAIN CATCH BASIN
UTILITY POLE
UTILITY POLE WITH LIGHT
STREET LIGHT
GUY ANCHOR
UNCERTAIN UTILITY POLE
UTILITY BOX
POLE
POST
UNCERTAIN POLE
ROAD SIGN
MONUMENT
UNCERTAIN OBJECT
×723.8 SPOT HEIGHT
x74.0 FIELD LOCATED GRADE
TREE
RIP–RAP

FENCE
GUARD RAIL
PARTLY VISIBLE FENCE
RETAINING WALL
INTERMEDIATE CONTOUR
INDEX CONTOUR
FLOOD CONTROL EASEMENT
CONCRETE FLOOD WALL
APPROXIMATE LEVEE BASELINE
OTHER EASEMENT LINES
PAVED ROAD
DIRT DRIVE
RAILROAD
BUILDING
TREE LINE
SCRUB LINE
HEDGE ROW
BOUNDARY LINE

SURVEYOR'S NOTES:

1. TOPOGRAPHIC DATA SHOWN HEREON IS BASED UPON AERIAL PHOTOGRAPHY TAKEN DURING APRIL, 2008. PHOTOGRAPHY AND MAPPING WERE PERFORMED BY COL–EAST, INC. OF NORTH ADAMS, MA AND SUPPLEMENTED WITH GROUND SURVEYS PERFORMED BY HERITAGE SURVEYS, INC. FROM MAY, 2008 THROUGH SEPTEMBER, 2009.

2. FOR REFERENCE TO BOUNDARY LINE AND EASEMENTS SEE A PLAN PREPARED BY HERITAGE SURVEYS, INC. TITLED "PLAN OF FLOOD CONTROL AND LEVEE EASEMENT IN CHICOPEE, MASSACHUSETTS SURVEYED FOR THE CITY OF CHICOPEE", DATED JUNE 15, 2009, SHEETS 1 THROUGH 4.

3. UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON SURFACE FEATURES AS LOCATED BY SURVEY AND AVAILABLE RECORD DATA, AND ARE APPROXIMATE. ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO FINAL DESIGN AND/OR CONSTRUCTION.

4. LOCATION OF FLOODWALL AND LEVEE BASELINES SHOWN ARE APPROXIMATE AND ARE BASED UPON PLANS PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS FOR CHICOPEE RIVER FLOOD CONTROL DATED APRIL, 1963. NO MONUMENTATION OF BASELINES WAS FOUND AND IS HISTORICAL ONLY.

5. TOP CONCRETE FLOODWALL AND CENTERLINE LEVEE GRADES IN BOLD TYPE ARE FIELD LOCATED BY SURVEY AND ARE NOT THE RESULT OF AERIAL MAPPING. REFER TO LEGEND FOR AERIAL SPOT HEIGHT INDICATORS.

NORTH AMERICAN VERTICAL DATUM 1988

NOTE: FOR THIS FLOOD CONTROL SYSTEM, ELEVATIONS IN NGVD29 CAN BE OBTAINED BY ADDING 0.70 FEET TO THE ELEVATIONS SHOWN ON THIS PLAN.

CHICOPEE FLOOD CONTROL WORKS
CHICOPEE FALLS SYSTEM SHEET 4 OF 5

TOPOGRAPHIC PLAN OF LAND IN
CHICOPEE, MASSACHUSETTS
SURVEYED FOR
THE CITY OF CHICOPEE

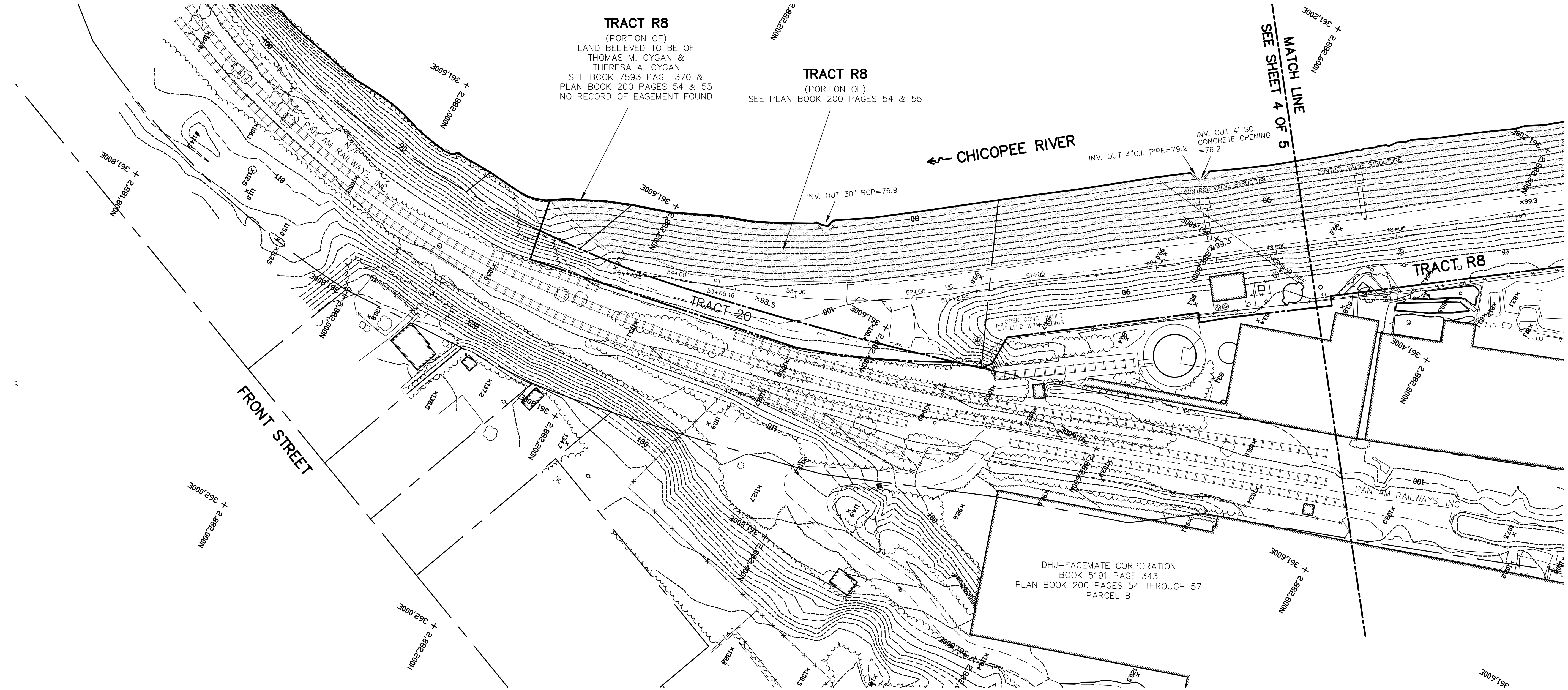
SCALE: 1" = 40'
0' 20' 40' 60' 80' 120'

DATE: DECEMBER 12, 2009

HERITAGE SURVEYS, INC.
REGISTERED PROFESSIONAL LAND SURVEYORS
COLLEGE HIGHWAY & CLARK STREET
POST OFFICE BOX 1
SOUTHAMPTON, MASSACHUSETTS
(413) 527–3600

COMMONWEALTH OF MASSACHUSETTS
BRUCE A. COOMBS
No. 27814
Bruce A. Coombs

JOB # 6289–080505 | DWG # 6289FALLS TOPO | MAP # 6289–091212



LINE & SYMBOL LEGEND

TRAFFIC SIGNAL
RAILROAD CONTROL BOX
RAILROAD SWITCH
SHRUB
ROCK
MARSH SYMBOL
HYDRANT
GATE/VALVE
UTILITY VAULT
UNCERTAIN HYDRANT
MANHOLE
UNCERTAIN MANHOLE
CATCH BASINS
UNCERTAIN CATCH BASIN
UTILITY POLE
UTILITY POLE WITH LIGHT
STREET LIGHT
GUY ANCHOR
UNCERTAIN UTILITY POLE
UTILITY BOX
POLE
POST
UNCERTAIN POLE
ROAD SIGN
MONUMENT
UNCERTAIN OBJECT
×723.8 SPOT HEIGHT
x74.0 FIELD LOCATED GRADE
TREE
RIP-RAP

FENCE
GUARD RAIL
PARTLY VISIBLE FENCE
RETAINING WALL
INTERMEDIATE CONTOUR
INDEX CONTOUR
FLOOD CONTROL EASEMENT
CONCRETE FLOOD WALL
APPROXIMATE LEVEE BASELINE
OTHER EASEMENT LINES
PAVED ROAD
DIRT DRIVE
RAILROAD
BUILDING
TREE LINE
SCRUB LINE
HEDGE ROW
BOUNDARY LINE

SURVEYOR'S NOTES:

1. TOPOGRAPHIC DATA SHOWN HEREON IS BASED UPON AERIAL PHOTOGRAPHY TAKEN DURING APRIL, 2008. PHOTOGRAPHY AND MAPPING WERE PERFORMED BY COL-EAST, INC. OF NORTH ADAMS, MA AND SUPPLEMENTED WITH GROUND SURVEYS PERFORMED BY HERITAGE SURVEYS, INC. FROM MAY, 2008 THROUGH SEPTEMBER, 2009.

2. FOR REFERENCE TO BOUNDARY LINE AND EASEMENTS SEE A PLAN PREPARED BY HERITAGE SURVEYS, INC. TITLED "PLAN OF FLOOD CONTROL AND LEVEE EASEMENT IN CHICOPEE, MASSACHUSETTS SURVEYED FOR THE CITY OF CHICOPEE", DATED JUNE 15, 2009, SHEETS 1 THROUGH 4.

3. UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON SURFACE FEATURES AS LOCATED BY SURVEY AND AVAILABLE RECORD DATA, AND ARE APPROXIMATE. ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO FINAL DESIGN AND/OR CONSTRUCTION.

4. LOCATION OF FLOODWALL AND LEVEE BASELINES SHOWN ARE APPROXIMATE AND ARE BASED UPON PLANS PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS FOR CHICOPEE RIVER FLOOD CONTROL DATED APRIL, 1963. NO MONUMENTATION OF BASELINES WAS FOUND AND IS HISTORICAL ONLY.

5. TOP CONCRETE FLOODWALL AND CENTERLINE LEVEE GRADES IN BOLD TYPE ARE FIELD LOCATED BY SURVEY AND ARE NOT THE RESULT OF AERIAL MAPPING. REFER TO LEGEND FOR AERIAL SPOT HEIGHT INDICATORS.

NORTH AMERICAN VERTICAL DATUM 1988

NOTE: FOR THIS FLOOD CONTROL SYSTEM, ELEVATIONS IN NGVD29 CAN BE OBTAINED BY ADDING 0.70 FEET TO THE ELEVATIONS SHOWN ON THIS PLAN.

CHICOPEE FLOOD CONTROL WORKS
CHICOPEE FALLS SYSTEM SHEET 5 OF 5

TOPOGRAPHIC PLAN OF LAND IN
CHICOPEE, MASSACHUSETTS
SURVEYED FOR
THE CITY OF CHICOPEE

SCALE: 1" = 40'

0' 20' 40' 60' 80' 120'

DATE: DECEMBER 12, 2009

HERITAGE SURVEYS, INC.
REGISTERED PROFESSIONAL LAND SURVEYORS
COLLEGE HIGHWAY & CLARK STREET
POST OFFICE BOX 1
SOUTHAMPTON, MASSACHUSETTS
(413) 527-3600

COMMONWEALTH OF MASSACHUSETTS
BRUCE A. COOMBS
No. 27814

Bruce A. Coombs

JOB # 6289-080505 | DWG # 6289FALLS TOPO | MAP # 6289-091212

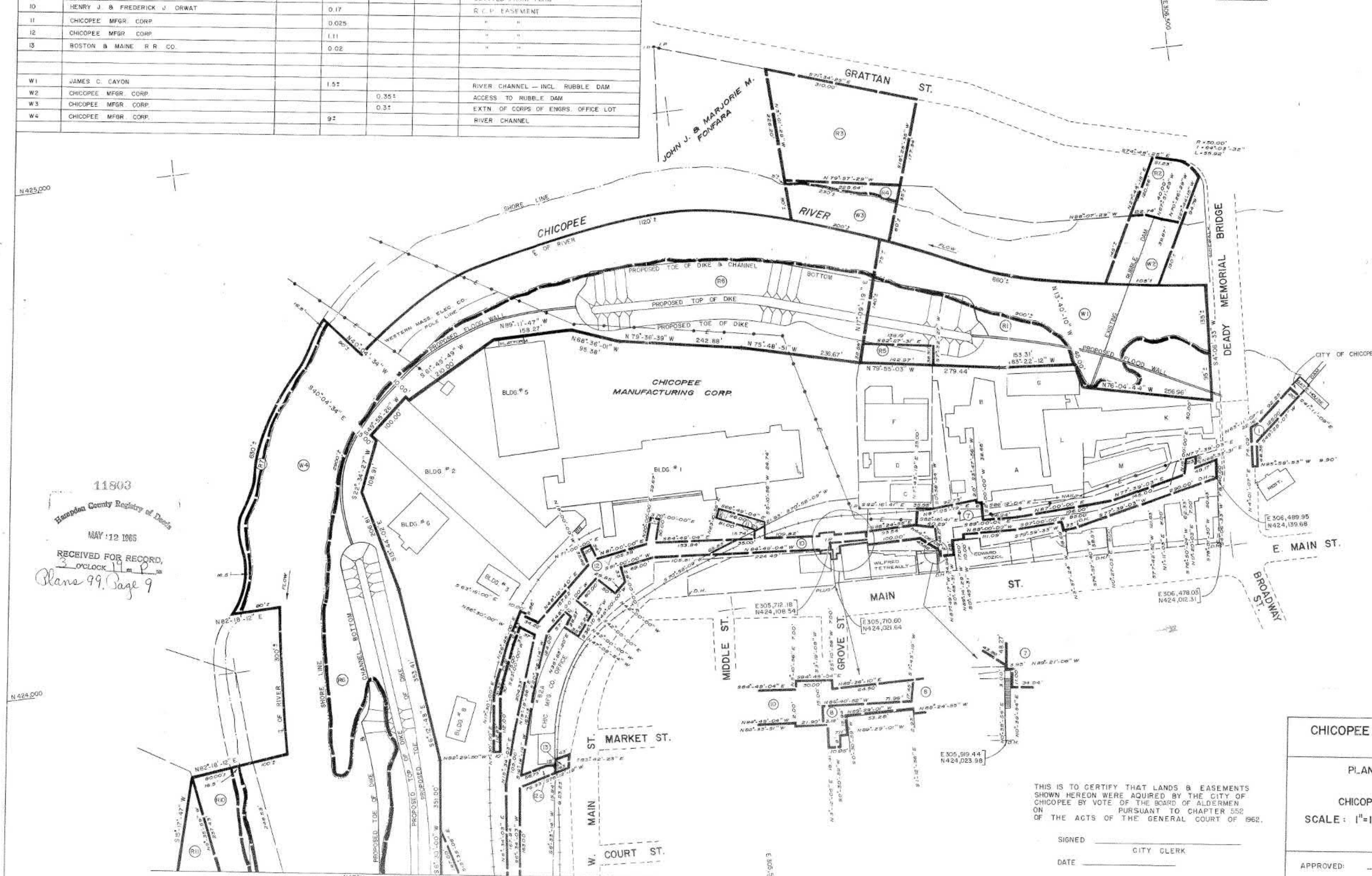
REGISTER OF ACQUISITION

TRACT NO.	GRANTOR	ACREAGE				REMARKS
		FEE	EASM'T.	LEASED	PERMIT	
1	JOHN M. & HELEN A. SROKA		0.071			R.C.P. EASEMENT
~~2~~	THEODORE R. THERRIEN *NOT ACQUIRED*		0.0076			DELETED FROM PLAN
3	~~EARL & SADIE M. BROVERMAN~~ "		~~0.011~~			" "
~~4~~	~~PENELOPE PAPPATRIANDAFILLOPOULOS~~ "		~~0.022~~			" "
~~5~~	~~EMILE J. & BELANISE DARCY~~ "		~~0.012~~			" "
~~6~~	~~CHICOPEE FALLS SAVINGS BANK~~ "		~~0.0011~~			" "
7	JAMES C. CAYON		0.48			R.C.P. EASEMENT
8	STANLEY J. & AUDREY M. SZLACHETKA		0.15			" "
~~9~~	~~ORZEK FUEL INC.~~ *NOT ACQUIRED*		~~0.0056~~			DELETED FROM PLAN
10	HENRY J. & FREDERICK J. ORWAT		0.17			R.C.P. EASEMENT
11	CHICOPEE MFGR. CORP.		0.025			" "
12	CHICOPEE MFGR. CORP.		1.11			" "
13	BOSTON & MAINE R.R. CO.		0.02			" "
W1	JAMES C. CAYON		1.5±			RIVER CHANNEL — INCL. RUBBLE DAM
W2	CHICOPEE MFGR. CORP.			0.35±		ACCESS TO RUBBLE DAM
W3	CHICOPEE MFGR. CORP.			0.3±		EXTN. OF CORPS OF ENGRS. OFFICE LOT
W4	CHICOPEE MFGR. CORP.		9±			RIVER CHANNEL

TRACT NO.	GRANTOR	ACREAGE				REMARKS
		FEE	EASM'T.	LEASED	PERMIT	
R1	JAMES C. CAYON		1.5±			
R2	EDWARD J. LIEBERMAN			0.32		ACCESS TO RUBBLE DAM
R3	EDWARD J. LIEBERMAN			1.21		CORPS OF ENGRS. OFFICE LOT
R4	CHICOPEE MFGR. CORP.			0.09±		" " " " "
R5	GLENWOOD TRUCKING CO.		0.11			
R6	CHICOPEE MFGR. CORP.		6±			
R7	CHICOPEE MFGR. CORP.		0.24±			

LEGEND

- • I.P. — IRON PIPE OR IRON PIN FOUND.
- • D.H. — DRILL HOLE FOUND.



11803
Hampden County Registry of Deeds
MAY 12 1965
RECEIVED FOR RECORD,
3 O'CLOCK 19 m. P. m.
Plans 99 Page 9

11803
Hampden County Registry of Deeds
MAY 12 1965
RECEIVED FOR RECORD,
3 O'CLOCK 19 m. P. m.
Plans 99 Page 10

5-6-65
PLANNING BOARD APPROVAL UNDER SUBDIVISION CONTROL LAW NOT REQUIRED.
SIGNED Walter Iwanicki
CHAIRMAN PLANNING BOARD

PLAN AND SURVEY BY
TIGHE & BOND, CONSULTING ENGINEERS
BOWERS ST., AT PEQUOT ST.
HOLYOKE, MASS.
SIGNED E. J. Bayon
E. J. BAYON
DATE: 23 AUG. 1963
SHEET 1 OF 2
F.B.; CHICOPEE 12 & 13

THIS IS TO CERTIFY THAT LANDS & EASEMENTS SHOWN HEREON WERE AQUIRED BY THE CITY OF CHICOPEE BY VOTE OF THE BOARD OF ALDERMEN ON PURSUANT TO CHAPTER 552 OF THE ACTS OF THE GENERAL COURT OF 1962.

SIGNED ______________________
CITY CLERK
DATE ______________

CHICOPEE FALLS LOCAL FLOOD PROTECTION PROJECT
CHICOPEE, MASS.

PLAN OF LAND AQUIRED BY THE CITY OF CHICOPEE
FOR
CHICOPEE FALLS LOCAL FLOOD PROTECTION PROJECT

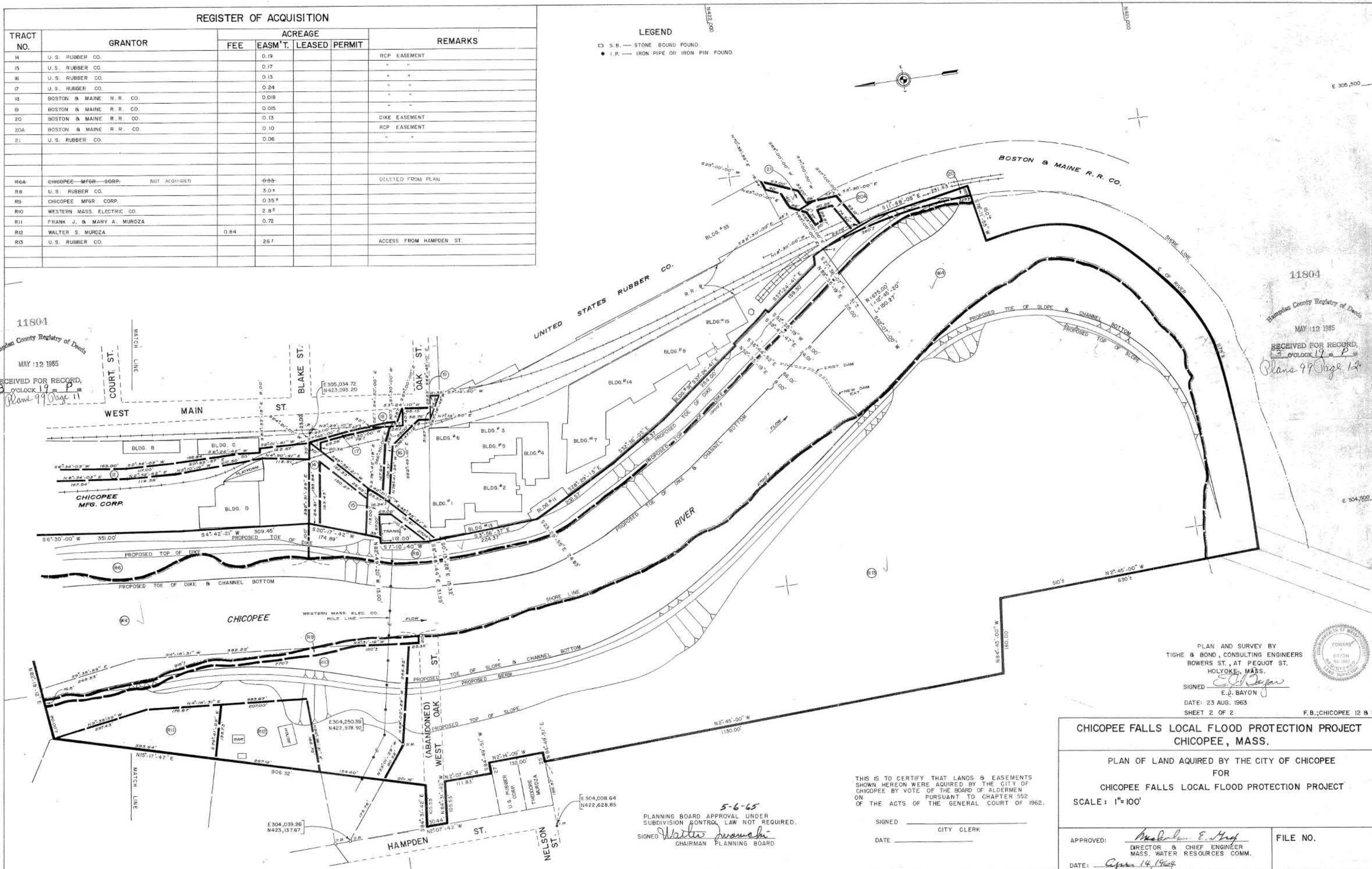
SCALE: 1"=100'

APPROVED: Malcolm E. Hay
DIRECTOR & CHIEF ENGINEER
MASS. WATER RESOURCES COMM.
DATE: Apr. 14, 1964

FILE NO.

REGISTER OF ACQUISITION

TRACT NO.	GRANTOR	ACREAGE				REMARKS
		FEE	EASM'T.	LEASED	PERMIT	
14	U. S. RUBBER CO.		0.19			RCP EASEMENT
15	U. S. RUBBER CO.		0.17			" "
16	U. S. RUBBER CO.		0.13			" "
17	U. S. RUBBER CO.		0.24			" "
18	BOSTON & MAINE R. R. CO.		0.018			" "
19	BOSTON & MAINE R. R. CO.		0.015			" "
20	BOSTON & MAINE R. R. CO.		0.13			DIKE EASEMENT
20A	BOSTON & MAINE R. R. CO.		0.10			RCP EASEMENT
21	U. S. RUBBER CO.		0.06			" "
~~R6A~~	~~CHICOPEE MFGR. CORP.~~ NOT ACQUIRED		~~0.33~~			DELETED FROM PLAN
R8	U. S. RUBBER CO.		3.0±			
R9	CHICOPEE MFGR. CORP.		0.35±			
R10	WESTERN MASS. ELECTRIC CO.		2.8±			
R11	FRANK J. & MARY A. MURDZA		0.72			
R12	WALTER S. MURDZA	0.84				
R13	U. S. RUBBER CO.		26±			ACCESS FROM HAMPDEN ST.



PLAN AND SURVEY BY
TIGHE & BOND, CONSULTING ENGINEERS
BOWERS ST., AT PEQUOT ST.
HOLYOKE, MASS.

SIGNED E. J. Bayon
E. J. BAYON

DATE: 23 AUG. 1963

SHEET 2 OF 2

F.B.;CHICOPEE 12 & 13

COMMONWEALTH OF MASSACHUSETTS EDWARD J. BAYON No. 1981 REGISTERED LAND SURVEYOR

5-6-65
PLANNING BOARD APPROVAL UNDER SUBDIVISION CONTROL LAW NOT REQUIRED.
SIGNED Walter Iwanski
CHAIRMAN PLANNING BOARD

THIS IS TO CERTIFY THAT LANDS & EASEMENTS SHOWN HEREON WERE AQUIRED BY THE CITY OF CHICOPEE BY VOTE OF THE BOARD OF ALDERMEN ON PURSUANT TO CHAPTER 552 OF THE ACTS OF THE GENERAL COURT OF 1962.

SIGNED ______________
CITY CLERK

DATE ______________

CHICOPEE FALLS LOCAL FLOOD PROTECTION PROJECT
CHICOPEE, MASS.

PLAN OF LAND AQUIRED BY THE CITY OF CHICOPEE
FOR
CHICOPEE FALLS LOCAL FLOOD PROTECTION PROJECT

SCALE: 1"= 100'

APPROVED: Malcolm E. Graf
DIRECTOR & CHIEF ENGINEER
MASS. WATER RESOURCES COMM.

DATE: Apr. 14, 1964

FILE NO.

558

BOOK 3102 PAGE 558

7977

E A S E M E N T

KNOW ALL MEN BY THESE PRESENTS, that JOHNSON & JOHNSON, a New Jersey corporation, having a place of business in the City of Chicopee, County of Hampden, Commonwealth of Massachusetts, as grantor, in consideration of the sum of ONE (1) DOLLAR and other good and valuable consideration paid by the City of Chicopee, the receipt whereof is hereby acknowledged, does hereby give, grant, sell and convey unto the said City of Chicopee and its successors and assigns forever, a perpetual, permanent and assignable easement and right-of-way in and to the lands more particularly described herein to construct, maintain, repair, operate, patrol, replace or remove "A dike, flood wall, surface drain system with fittings, and all appliances attached thereto, together with all reasonable facilities in relation to the Chicopee Falls Local Flood Protection Project" and to pass freely to and from the same in any manner with vehicles and equipment for the purpose of maintaining, constructing and repairing said Project, and including the rights hereinafter described, in, upon, under, over and across a certain parcel of land situated in the City of Chicopee, County of Hampden, Commonwealth of Massachusetts, being more particularly bounded and described as follows:

FIRST PARCEL -

Beginning at the southeasterly corner of the tract herein described, said point being the northlymost corner and projection of Tract 10 as shown on Sheet 1 of plans titled "Chicopee Falls Local Flood Protection Project, Chicopee, Massachusetts, Scale : 1"=100', Tighe & Bond, Consulting Engineers";

thence S 70°58'09" W a distance of twenty-one and ninety-three hundredths (21.93) feet along a northwesterly property line of land now or formerly of Henry J. and Frederick J. Orwat, also being a northwesterly line of Tract 10 to a point;

thence N 66°49'04" W a distance of eighty-one (81) feet to a point;

thence N 23°10'56" E a distance of twenty (20) feet to a point;

thence S 66°49'04" E a distance of ninety-six (96) feet to a point;

thence S 5°10'56" W a distance of seven (7) feet to the point of beginning and containing about twenty-five thousandths (0.025) acres; being Tract 11 as shown on Sheet 1 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", which plans are on file in the office of the City Engineer of the City of Chicopee.

SECOND PARCEL -

Beginning at the southeasterly corner of the tract herein described, said point being N 82°31'29" W a distance of twenty-three (23) feet along the northerly property line of land now or formerly of the United States Rubber Company from an iron pipe marking the northeast corner of said United States Rubber Company and having coordinates of N 423,093.20, E 305,034 .72 in the Massachusetts State Coordinate System; Tract 12

thence N 82°31'29" W a distance of thirty (30) feet along the northerly property line of the United States Rubber Company to a point;

thence N 4°50'41" E a distance of one hundred thirteen and ninety-one hundredths (113.91) feet to the easterlymost projection of a platform attached to Building D of the Chicopee Manufacturing Corp.;

thence N 2°10'16" W a distance of two hundred twelve and fifty hundredths (212.50) feet to the northeasterly corner of Tract R6A;

thence N 2°32'42" E a distance of one hundred nineteen and fifty-eight hundredths (119.58) feet to a point;

thence N 6°34'03" E a distance of one hundred sixty-seven and eighty-four hundredths (167.84) feet to a point;

thence N 15°34'03" E a distance of one hundred five (105) feet to a point;

thence N 19°18'56" E a distance of two hundred four and thirty-three hundredths (204.33) feet to a point;

thence N 56°30'00" W a distance of thirty-seven (37) feet to a point;

thence S 26°45'00" W a distance of thirty-five (35) feet to a point;

thence S 23°00'00" W a distance of seventy-five (75) feet to a point;

thence S 17°30'00" W a distance of thirty (30) feet to a point;

thence S 7°30'00" W a distance of one hundred twelve (112) feet to a point;

thence N 82°29'50" W a distance of ten (10) feet to a point;

thence N 7°30'00" E a distance of one hundred twelve and eighty-seven hundredths (112.87) feet to a point;

thence N 17°30'00" E a distance of thirty-one and thirty-five hundredths (31.35) feet to a point;

thence N 23°00'00" E a distance of seventy-five and eighty-one hundredths (75.81) feet to a point;

thence N 26°45'00" E a distance of sixty-four and thirty-three hundredths (64.33) feet to a point;

thence S 63°15'00" E a distance of ten (10) feet to a point;

thence S 26°45'00" W a distance of eight and eighty-six hundredths (8.86) feet to a point;

thence S 56°30'00" E a distance of thirty-four and twenty-two hundredths (34.22) feet to a point;

thence N 48° 12'40" E a distance of one hundred fifty-seven and twenty-two hundredths (157.22) feet to a point;

thence N 19°00'00" W a distance of thirty-five and forty-six hundredths (35.46) feet to a point;

thence N 71°00'00" E a distance of twenty (20) feet to a point;

thence S 19°00'00" E a distance of thirty-four and no hundredths (34.00) feet to a point;

thence N 81°00'00" E a distance of one hundred five and thirty-eight hundredths (105.38) feet to a point;

thence N 20°00'00" E a distance of fifty-eight and sixty-seven hundredths (58.67) feet to a point;

thence S 70°00'00" E a distance of twenty and no hundredths (20.00) feet to a point;

thence S 20°00'00" W a distance of fifty and no hundredths (50.00) feet to a point;

thence S 84°49'04" E a distance of one hundred fifty-three and eighty-four hundredths (153.84) feet to the north-westerly property line of land now or formerly of Henry J. and Frederick J. Orwat;

thence S 70°58'09" W a distance of sixty-five and eighty-three hundredths (65.83) feet along said westerly property line of Henry J. and Frederick J. Orwat, also being a northwesterly line of Tract 10 to a point being the westerly corner of Tract 10;

thence N 84°49'04" W a distance of one hundred five and eighty-one hundredths (105.81) feet to a point;

thence S 81°00'00" W a distance of sixty-nine and no hundredths (69.00) feet to a point;

thence S 9°00'00" E a distance of thirty-three and no hundredths (33.00) feet to a point;

thence S 48°00'00" W a distance of twenty-nine and eighty-five hundredths (29,85) feet to a point;

thence N 42°00'00" W a distance of fifty and no hundredths (50.00) feet to a point;

thence S 48°00'00" W a distance of sixty and no hundredths (60.00) feet to a point;

thence S 42°00'00" E a distance of forty-one and no hundredths (41.00) feet to a point;

thence S 36°10'23" W a distance of fifty-five and twenty-five hundredths (55.25) feet to the northeasterly face of Building B2A of the Chicopee Manufacturing Corp.;

thence N 47°08'54" W a distance of thirty-five and no hundredths (35.00) feet along the northeasterly face of said Chicopee Manufacturing Corp. building to a point;

thence N 35°53'20" E a distance of twenty-eight and twenty-seven hundredths (28.27) feet to a point;

thence N 42°00'00" W a distance of twelve and no hundredths (12.00) feet to a point;

thence S 48°00'00" W a distance of fifty-seven and no hundredths (57.00) feet to a point;

thence S 20°46'14" W a distance of one hundred twenty-four and no hundredths (124.00) feet to a point, said point being a distance of 2 ft. westerly of the westerly face of Chicopee Manufacturing Corp. Building B2A;

thence S 16°16'14" W a distance of one hundred sixty-seven and thirteen hundredths (167.13) feet to a point;

thence N 76°12'18" E a distance of fifty-six and seventy-five hundredths (56.75) feet to a point;

thence S 83°42'23" E a distance of about fifteen (15) feet to a westerly property line of the Boston & Maine Railroad Company, said last course being a distance of one (1) foot from the southerly face of Chicopee Manufacturing Corp. Building B2A;

thence S 6°33'14" W a distance of fifteen and eighty-four hundredths (15.84) feet along said westerly property line of Boston & Maine Railroad Company to a point;

thence S 76°12'18" W a distance of seventy-six and ninety-three (76.93) feet to a point, said last four courses describing a projection designated as Tract 12A for identification purposes;

thence S 6°34'03" W a distance of one hundred sixty-three and no hundredths (163.00) feet;

thence S 2°34'03" W a distance of one hundred seventeen and no hundredths (117.00) feet to a point;

thence S 0°55'57" E a distance of one hundred fifty-six and ninety-four (156.94) feet to a point, said point being one (1) foot westerly of the westerly face of Chicopee Manufacturing Corp. Building C;

thence S 6°26'42" W a distance of fifty and no hundredths (50.00) feet to a point, said last course being a distance of one (1) foot westerly and parallel to the westerly face of Chicopee Manufacturing Corp. Building C;

thence S 83°33'18" E a distance of nine and no hundredths (9.00) feet, said course being one (1) foot southerly and parallel to the southerly face of Chicopee Manufacturing Corporation Building C;

thence S 2°01'41" W a distance of one hundred twenty-two and sixty-seven hundredths (122.67) feet to the land now or formerly of the United States Rubber Company and the point of beginning and containing about one and eleven hundredths (1.11) acres; being Tract 12 as shown on Sheets 1 and 2 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass.,Scale: 1"=100', Tighe & Bond, Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee.

THIRD PARCEL -

Beginning at the northwesterly corner of property now or formerly of the U. S. Rubber Company at the Chicopee River;

thence southerly along the easterly shore of the Chicopee River a distance of about nineteen hundred (1900) feet to the southwesterly corner of Tract R8 as shown on Sheet 2 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers;

thence S 78°11'55" W a distance of about one hundred (100) feet to the center of the Chicopee River;

thence southerly and/or westerly along the centerline of the Chicopee River a distance of about eleven hundred seventy-five (1175) feet to a point;

thence N 2°45'00" W a distance of about one hundred twenty (120) feet to the northerly shore of the Chicopee River;

thence easterly and/or northerly along the northerly and/or westerly shore of the Chicopee River a distance of about twenty-seven hundred (2700) feet to land of the Chicopee Manufacturing Corporation, said point being the southeasterly corner of Tract R9;

thence northerly along the low water mark of the westerly shore of the Chicopee River a distance of about nine hundred fifteen (915) feet to a point;

thence N 82°18'12" E a distance of about one hundred (100) feet to the center of the Chicopee River;

thence in a northerly direction along the centerline of the Chicopee River a distance of about three hundred feet (300ft.) to a point;

thence S 82°18'12" W a distance of about eighty (80) feet to the low water line of the westerly shore of the Chicopee River, said point being the southeasterly corner of Tract R7;

thence northeasterly along the low water line of the westerly shore of the Chicopee River a distance of about six hundred thirty (630) feet to a point; said point being the northeasterly corner of Tract R7;

thence S 40°04'34" E a distance of about ninety (90) feet to the center of the Chicopee River;

thence northerly and easterly along the centerline of the Chicopee River a distance of about eleven hundred twenty (1120) feet to a point; said point being the northwesterly corner of Tract W1;

thence S 17°09'19" W a distance of about seventy-five (75) feet to the southerly shore of the Chicopee River, said point being a southwesterly corner of Tract W1, also being the northwesterly corner of Tract R1;

thence westerly and southerly along the southerly and easterly shore of the Chicopee River a distance of about twenty-nine hundred (2900) feet to the northerly property line of U.S. Rubber Company, being the point of beginning, and containing about nine (9) acres; being Tract W4 as shown on Sheet 1 and Sheet 2 of plans titled "Chicopee Falls Local Flood Protection

56

BOOK 3102 PAGE 566

Project, Chicopee Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee.

FOURTH PARCEL -

Beginning at a northerly corner of the tract herein described, said point being the northwesterly corner of Tract R1, also being the northwesterly corner of property now or formerly of James C. Cayon;

thence S 17°09'19" W a distance of about one hundred forty (140) feet from the southerly shore of the Chicopee River to the northwesterly corner of the land now or formerly of the Glenwood Trucking Co., also being the northwesterly corner of Tract R5;

thence continuing on same course a distance of thirty-two and fifty-eight (32.58) feet along the westerly line of the Glenwood Trucking Co. to a point;

thence N 75°48'51" W a distance of two hundred thirty-six and sixty-seven hundredths (236.67) feet to a point;

thence N 79°36'39" W a distance of two hundred forty-two and eighty-eight hundredths (242.88) feet to a point;

thence N 68°36'01" W a distance of ninety-five and thirty-eight hundredths (95.38) feet to a point;

thence N 89°11'47" W a distance of one hundred fifty-eight and twenty-seven hundredths (158.27) feet to a point, said last course being parallel to and two (2) feet northerly of the northerly face of the platform attached to Building 5 of the Chicopee Manufacturing Corp.;

thence S 61°49'49" W a distance of two hundred ten (210) feet to a point one (1) foot northeasterly from the northeasterly face of Building 2 of the Chicopee Manufacturing Corp.;

thence N 40°04'34" W a distance of ten (10) feet, said course being one (1) foot northeasterly of the northeast face of said Building 2;

thence S 49°55'26" W a distance of one hundred (100) feet, said course being parallel to and one (1) foot from the northwesterly face of said Building 2;

thence S 40°04'34" E a distance of fifteen (15) feet, said course being parallel to and at a distance of two (2) feet from the southwesterly face of Building 2 of the Chicopee Manufacturing Corp.;

thence S 22°34'27" W a distance of one hundred eight and ninety-one (108.91) feet to a point;

thence S 13°44'02" E a distance of two hundred six and eighty-one hundredths (206.81) feet to a point;

thence S 6°12'48" E a distance of three hundred fifty-three and forty-one hundredths (353.41) feet to a point;

thence S 6°30'00" W a distance of three hundred fifty-one (351) feet to a point;

thence S 4°42'21" W a distance of three hundred nine and forty-five hundredths (309.45) feet to the northerly boundary of the United States Rubber Company;

thence N 82°31'29" W a distance of about one hundred (100) feet along the northerly property line of the United States Rubber Company to the easterly shore of the Chicopee River;

thence northerly and easterly along the easterly and southerly shore of the Chicopee River for a distance of about twenty-nine hundred (2900) feet to the point of beginning and containing about six (6) acres, being Tract R6 as shown on Sheets 1 and 2 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee Massachusetts, Scale: 1"=100', Tighe & Bond,

568

Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee. Tract R6 subject to Western Mass. Electric Co. rights of way for electrical transmission lines.

FIFTH PARCEL -

R7

Beginning at the northeasterly corner of the tract herein described, said point being at the intersection of the low water mark of the northwesterly shore of the Chicopee River and the line of the northeasterly face of Chicopee Manufacturing Corp. Building 2 extended, said line having a bearing of N 40°04'34" W from the northeasterly corner of said Building 2;

thence southwesterly along the northwesterly shore of the Chicopee River a distance of about six hundred thirty (630) feet to a point;

thence S 82°18'12" W a distance of about seventeen and no hundredths (17.00) feet to a point, said point being a distance of sixteen and five-tenths (16.5) feet westerly of the low water mark of the westerly shore of the Chicopee River;

thence northeasterly along a line being parallel to and sixteen and five-tenths (16.5) feet northwesterly from the low water mark of the northwesterly shore of the Chicopee River a distance of about six hundred thirty (630) feet to a point;

thence S 40°04'34" E a distance of about seventeen (17) feet to the point of beginning, and containing about twenty-four hundredths (0.24) acres, being Tract R-7 as shown on Sheet 1 of plans titled "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee.

SIXTH PARCEL -

Beginning at the northeasterly corner of the tract herein described, said point being located as follows: Beginning at an iron pin, lying along the southerly line of Nelson St. at the intersection of the westerly line of Hampden St.; thence N 3°26'31" E a distance of five hundred nine and ninety-four hundredths (509.94) ft. to a stone bound on the easterly line of Hampden St. said land located at coordinates N 423,137.87; E 304,039.26 Mass. State Board Coordinate System; thence S 53° 01'29" E a distance of one hundred seventy-three and seventy-six hundredths (173.76) ft. along property now or formerly of the United States Rubber Company and property now or formerly of the Western Mass. Electric Company to a point; thence N 15° 17'47" E a distance of seven hundred five and sixteen hundredths (705.16) ft. along the westerly lines of Tracts R-11 and R-12 to a point; thence N 82°18'12" E a distance of about ninety-six and fifty hundredths (96.50) ft. to the low water mark of the westerly shore of the Chicopee River, said point being the northeasterly corner of Tract R-9;

thence along the low water mark of the westerly shore of the Chicopee River in a southerly direction a distance of about nine hundred fifteen (915) feet to property now or formerly of the United States Rubber Company;

thence N 84°31'42" W a distance of about twenty (20) ft. along land of United States Rubber Company to a point;

thence N 5°31'16" E a distance of about one hundred forty-five and thirty-five hundredths (145.35) ft. along property now or formerly of United States Rubber Company and Western Mass. Electric Co., to a point being sixteen and five tenths (16.5) ft. westerly of the low water mark of the westerly shore of the Chicopee River;

thence northerly along a line parallel to and sixteen and five tenths (16.5) ft. westerly of the low water line of the westerly shore of the Chicopee River for a distance of about seven hundred seventy (770) ft. to a point;

thence N 82°18'12" E a distance of about sixteen and five tenths (16.5) ft. to the point of beginning and containing about 0.35 acres; being Tract R-9 as shown on Sheet 2 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers, and which said plans are on file in the office of the City Engineer of the City of Chicopee.

\- - - - - - -

Together with the right to trim, cut, fell and remove therefrom all trees, underbrush and other vegetation within the limits of said easement or right-of-way, and for such distance beyond said limits and adjacent thereto as is necessary to provide adequate clearance and to eliminate interference with, or hazards to the structures or utilities placed or constructed on, over or under said land within the limits of said easement.

Reserving, however, to the grantor, its successors and assigns forever, all right, title, interest and privilege, as may be exercised and enjoyed without interference with or abridgement of the easement and right-of-way.

The grantor agrees to the following covenants which shall run with the land subjected to easement.

(a) That the City of Chicopee may grant, convey, transfer, assign or permit the use and occupation of, by grant of easement, lease, license, permit or otherwise, all or any part of the easement and rights granted herein, to any individual, partnership, corporation or political body, for any purpose related to the construction, maintenance or repair of the dikes, flood walls and drain system of the Chicopee Falls Local Flood Protection Project.

(b) That the payment by the City of Chicopee of the consideration recited herein shall constitute full, fair value and full compensation to the grantor, for the easement and rights herein granted, whether such easement and rights shall be exercised by the City of Chicopee or by any of its grantees, transferees, assignees, lessees, licensees, or permittees as described in the foregoing subsection (a) of this paragraph; and the grantor expressly releases and relinquishes any and all claims against any of the aforementioned for further or future payment of consideration for the aforesaid easement and rights except as stated herein.

Said easement and rights shall continue in perpetuity from the date of this instrument conveying the same to the City of Chicopee and its successors and assigns.

Subject to existing easements for public roads and highways, for public utilities, for railroads, and pipe lines.

Meaning and intending to convey an easement entered in the same premises conveyed to the grantor herein by deed of Chicopee Manufacturing Corp. dated December 31, 1962, and recorded with the Hampden County Registry of Deeds, Book 3091 , Page 236 .

TO HAVE AND TO HOLD the easement and right-of-way with all the privileges thereof, unto the said City of Chicopee and its successors and assigns, to its and their use and behoof forever.

By acceptance of this grant the City of Chicopee and its successors and assigns covenant, for the duration of, and with respect to the easement and rights set forth herein, that:

(a) They will, at their expense, on completion of any construction, maintenance or repair of the Chicopee Falls Local Flood Protection Project on the lands of the grantor, fill all holes and trenches and restore the surface of the grantor's property to its normal condition and if the ground settles or subsides at any place, such settlement shall be refilled and the ground level restored to its normal condition. All debris will be removed and all surface and subsurface appurtenances of the grantor will be restored.

(b) All private roadways, parking lots, etc., on the lands of the grantor which are used by the City of Chicopee, its successors and assigns, or any contractors or agents in connection with the Chicopee Falls Local Flood Protection Project will be maintained in a safe and usable condition at all times and, if damaged, will be restored to their normal condition and all such roadways, parking lots, etc., under which the surface drain system is installed will be restored after any construction, maintenance or repair to their normal condition.

(c) Grantor shall have the right to inspect the easement and right-of-way at any time and the City of Chicopee, its successors and assigns, will perform such acts as may be reasonably requested by the grantor to protect its property.

(d) The City of Chicopee, its successors and assigns, will bear the expense of all damage to the property of the grantor located outside of the above-described easement and right-of-way caused by the construction, maintenance or repair of the Chicopee Falls Local Flood Protection Project.

IN WITNESS WHEREOF, the said grantor, JOHNSON & JOHNSON has hereunto set its hand and seal this 12th day of February 1965.

JOHNSON & JOHNSON

By J. J. Smith
President
Chicopee Manufacturing Company
Division of Johnson & Johnson

ATTEST:

David E. Collins
Assistant Secretary

STATE OF NEW JERSEY)
COUNTY OF MIDDLESEX)

Then personally appeared the above named David E. Collins and acknowledged the foregoing instrument to be the free act and deed of the corporation, before me

Notary Public

My commission expires

NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Oct. , 1966

574

BOOK 3102 PAGE 574

STATE OF NEW JERSEY)
) ss.:
COUNTY OF MIDDLESEX)

Then personally appeared the above-named JOHN J. SMITH, President of Chicopee Manufacturing Company, Division of Johnson & Johnson, and acknowledged the attached instrument to the City of Chicopee to be the free act and deed of the corporation, before me

Joan E. Kelsey
Notary Public
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Oct. 17, 1966.

CITY OF CHICOPEE
MASSACHUSETTS
OFFICE OF THE CITY CLERK

ARTHUR BALTHAZAR
CITY CLERK

March 29, 1965

Mayor Edward Lysek:

I hereby certify that the following order, recommended by the Mayor, was passed by the Board of Aldermen at a meeting held March 23, 1965, presented to the Mayor March 26, 1965, and approved by the Mayor March 26, 1965:

ORDERED THAT, the City of Chicopee accept from the Chicopee Manufacturing Company, a division of Johnson & Johnson, a deed dated February 12, 1965, wherein the said Chicopee Manufacturing Company conveys to the City of Chicopee certain rights and easements in relation to the Chicopee Falls Local Flood Protection Project.

Attest:
Arthur Balthazar
City Clerk

AB/jg

575

BOOK 3102 PAGE 575

I, JAMES SCOTT HILL, Secretary of Johnson & Johnson, a corporation duly organized and existing under the laws of the State of New Jersey, hereby certify that a meeting of the Board of Directors of said Corporation was duly called and held on the 18th day of January, 1965, and that at said meeting, at which a quorum was present and voting throughout, the following resolution, upon motion duly made and seconded, was duly and unanimously adopted:

RESOLVED: that John J. Smith, President, Chicopee Manufacturing Company, a division of the Corporation, or the President, any Vice-President, the Secretary and any Assistant Secretary, be, and each of them hereby is, authorized to execute and deliver, on behalf of this Corporation, any and all deeds and other instruments necessary to grant and convey unto the City of Chicopee, County of Hampden, Commonwealth of Massachusetts, an easement and right-of-way to the lands of the Corporation in the City of Chicopee to be used in connection with the Chicopee Falls Local Flood Protection Project, and to take whatever other action is necessary or advisable in furtherance of the foregoing resolution.

As said Secretary of Johnson & Johnson, I further certify that the foregoing resolution has not been repealed, annulled, altered or amended in any respect but remains in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of Johnson & Johnson this day of March, 1965.

JOHNSON & JOHNSON SEAL 1887

J. S. Hill
James Scott Hill
Secretary
Johnson & Johnson

BOOK 3119 PAGE 206

61A-6
2/1/65

15911

E A S E M E N T

KNOW ALL MEN BY THESE PRESENTS that UNITED STATES RUBBER COMPANY, a corporation organized and existing under the laws of the State of New Jersey, having its principal office at Rockefeller Center, Number 1230 Avenue of the Americas, New York 20, N. Y., in consideration of ONE (1) DOLLAR paid by the CITY OF CHICOPEE, the receipt whereof is hereby acknowledged, do hereby grant, unto the said City of Chicopee and its successors and assigns forever, a perpetual, permanent and assignable easement and rights for the right-of-way to construct, maintain, repair, operate, patrol, replace and/or remove "A dike, Flood wall, a surface drain system with fittings and all appliances attached thereto together with all reasonable facilities in relation to Chicopee Falls Local Flood Protection Project", and to pass freely over the same in any manner with vehicles and equipment for the purpose of maintaining, constructing and repairing said system, and including the rights hereinafter described in, upon, under over and across certain parcels of land situated in the City of Chicopee, County of Hampden, Commonwealth of Massachusetts, being more particularly bounded and described as follows: -

FIRST PARCEL - Beginning at the northeasterly corner of the tract herein described, said point being N 82°31' 29" W, a distance of twenty-three and no hundredths (23.00) feet along the southerly property line of land of the Chicopee Manufacturing Corp. from an iron pipe marking the northeasterly corner of United States Rubber Company property at land of the Chicopee Manufacturing Corp. and the Boston & Maine Railroad Company, said iron pipe located at coordinates N 423,093.20, E 305,034.72 in the Massachusetts State Coordinate System

thence S 45°38'21" W a distance of one hundred eighty-two and fifty-three hundredths (182.53) feet to a point;

thence N 78°42'18" W a distance of twenty-six and sixty-five hundredths (26.65) feet along the northerly line of Tract 13 to a point;

thence N 45°38'21" E a distance of one hundred fifty and twenty-seven hundredths (150.27) feet to a point;

thence N 82°31'29" W, a distance of one hundred fifty-three and forty-three (153.43) feet to a point;

thence N 20°17'42" E, a distance of twenty-four and sixty-one hundredths (24.61) feet along an easterly line of Tract R8 to the property line of the Chicopee Manufacturing Corporation;

thence S 82°31'29" E a distance of two hundred twenty-three and ninety-four hundredths (223.94) feet along the southerly property of Chicopee Manufacturing Corporation to the place of beginning and containing about nineteen hundredths (0.19) acres; being Tract 14 as shown on Sheet 2 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Massachusetts, Scale: 1"=100', Tighe & Bond, Consulting Engineers", which plans are on file in the office of the City Engineer of the City of Chicopee and which was filed in the Hampden County Registry of Deeds on May 12, 1965, Book of Plans 99, Pages 9, 10, 11 and 12.

SECOND PARCEL - Beginning at the northerly corner of the tract herein described, said point being N 82°31'29" W a distance of twenty-three and no hundredths (23.00) feet along the southerly property line of land of the Chicopee Manufacturing Corp. from an iron pipe marking the northeast corner of United States Rubber Company property at land of the Chicopee Manufacturing Corp. and the Boston & Maine Railroad Company, said iron pipe located at Coordinates N 423,093.20, E 305,034.72 in the Massachusetts State Coordinate System.

thence S 7°45'00" E a distance of ninety-three and no hundredths (93.00) feet to a point;

thence S 4°30'00" E a distance of about forty-seven (47) feet to land now or formerly of the Boston & Maine Railroad Company;

thence S 3°24'10" W a distance of about thirty-two (32) feet along the westerly property line of land now or formerly of the Boston & Maine Railroad Company to a point;

thence N 4°30'00" W a distance of about seventy-nine (79) feet to a point;

thence N 7°45'00" W a distance of sixty-nine and twenty-six hundredths (69.26) feet to a point;

thence N 82°31'20" W a distance of twenty and thirty-eight hundredths (20.38) feet to a point;

thence N 45°38'21" E a distance of thirty and no hundredths (30.00) feet along the southeasterly line of Tract 14 to the point of beginning and containing about twenty-four hundredths (0.24) acres; being Tract 17 as shown on Sheet 2 of plans aforementioned titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", which said plans are on file in the office of the City Engineer of the City of Chicopee.

THIRD PARCEL - Beginning at the northeasterly corner of the tract herein described, said point being S 70°39'35" W a distance of five (5) feet from the southeasterly corner of United States Rubber Company building No. 33;

thence S 23°00'00" W a distance of ninety-three and no hundredths (93.00) feet to a point;

thence S 63°00'00" W a distance of thirty-three and no hundredths (33.00) feet to a point;

thence S 5°30'00" E a distance of about twenty-six (26) feet to the easterly line of property now or formerly of the Boston & Maine Railroad Company;

thence N 22°30'00" W a distance of about forty-five (45) feet along the easterly line of property of the Boston & Maine Railroad Company to a point;

thence N 23°00'00" E a distance of about twenty-six (26) feet to a point;

thence N 63°00'00" E a distance of forty and no hundredths (40.00) feet to a point;

thence N 23°00'00" E a distance of forty and no hundredths (40.00) feet to the southerly face of United States Rubber Company building No. 33;

thence N 70°39'35" E a distance of eighteen and ninety-four hundredths (18.94) feet along the southerly face of the United States Rubber Company building No. 33 to the point of beginning and containing about six hundredths (0.06) acres; being Tract 21 as shown on Sheet 2 of plans aforementioned titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee.

<u>FOURTH PARCEL</u> - That portion of the below described parcel which runs from the westerly shoreline of the Chicopee River to a line measured twenty-five (25) feet westerly from the top of slope to the dike and parallel thereto, and also including that part of ABANDONED WEST OAK STREET which is the access road to said dike:

Beginning at a westerly corner of the tract herein described, said point being N 84°49'51" E a distance of one hundred fifty-six and fifty-seven hundredths (156.57) feet projected along the southerly line of Nelson St. extended from an iron pin at the intersection of the southerly line of Nelson St. and the westerly line of Hampden St.;

thence S 2°45'00" E a distance of eleven hundred thirty

(1130) feet thru land of the United States Rubber Company to a point;

thence S 84°45'00" E a distance of one hundred eighty and no hundredths (180.00) feet to a point;

thence S 2°45'00" E a distance of about five hundred ten (510) feet along other land of the United States Rubber Company to the northerly shore of the Chicopee River;

thence easterly and northerly along the shore of the Chicopee River a distance of about twenty-seven hundred (2700) feet to a point;

thence N 84°31'42" W a distance of about twenty (20) feet along land now or formerly of the Chicopee Manufacturing Corp. to a point;

thence N 5°31'16" E a distance of twenty-five and thirty-five hundredths (25.35) feet along land now or formerly of the Chicopee Manufacturing Corp. to a point;

thence N 68°02'29" W a distance of two hundred fifty-five and thirty-two hundredths (255.32) feet along property now or formerly of the Western Mass. Electric Company to a stone bound;

thence N 53°01'29" W a distance of ninety and fifty-two hundredths (90.52) feet along a southerly line of land now or formerly of Western Mass. Electric Company to a point;

thence S 15°17'47" W a distance of two hundred one and sixteen hundredths (201.16) feet to a point;

thence N 84°31'42" W a distance of one hundred five and fifty-three hundredths (105.53) feet to the easterly line of Hampden Street;

thence S 2°07'42" E a distance of fifty and forty-four hundredths (50.44) feet along the easterly line of Hampden St. to a point;

thence S 84°31'42" E a distance of one hundred five and fifty-three hundredths (105.53) feet to a point;

thence S 2°07'42" E a distance of one hundred eleven and eighty-three hundredths (111.83) feet to a point;

thence N 84°49'51" E a distance of twenty-seven and no hundredths (27.00) feet to a point;

thence S 2°14'09" E a distance of one hundred thirty-two and no hundredths (132.00) feet along the easterly line of other property of the United States Rubber Company and the easterly property line of land now or formerly of Theodore Murdza to a point marking the southeasterly corner of the said land of Theodore Murdza;

thence S 84°49'51" W a distance of twenty-five (25) feet along the southerly line of land now or formerly of Theodore Murdza to the point of beginning, and containing about twenty-six (26) acres; being Tract R-13 as shown on Sheet 2 of plans aforementioned titled "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee.

FIFTH PARCEL - Beginning at the northeasterly corner of the tract herein described, said point also being the southeasterly corner of Tract 14 as shown on Sheet 2 of plans titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Tighe & Bond, Consulting Engineers";

thence S 42°21'01" W a distance of fifty-five and thirty-seven hundredths (55.37) feet to a point;

thence S 45°38'21" W a distance of one hundred fifty-one and sixty-one hundredths (151.61) feet to a point;

thence N 8°48'44" W a distance of twenty-seven and four hundredths (27.04) feet along an easterly line of Tract R-8 to a point; thence N 45°38'21" E a distance of one hundred ten and ninety-four hundredths (110.94) feet to a point;

thence N 7°10'40" E a distance of twenty-five and no hundredths (25.00) feet to a point;

thence N 82°49'20" W a distance of fifty-seven and no hundredths (57.00) feet to a point;

thence N 20°17'42" E a distance of thirty-five and no hundredths (35.00) feet along an easterly line of Tract R-8 to a point;

thence S 78°42'18" E a distance of one hundred thirteen and no hundredths (113.00) feet to the point of beginning and containing about seventeen hundredths (0.17) acres;

being Tract 15 as shown on Sheet 2 of plans aforementioned titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Inc., Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee.

SIXTH PARCEL - Beginning at the intersection of the southerly line of Oak Street and the westerly line of West Main Street;

thence N 82°45'10" W a distance of thirty-one and sixty-seven hundredths (31.67) feet along the southerly line of Oak Street extended to a point;

thence N 7°14'50" E a distance of thirty-two and seventy-five hundredths (32.75) feet to a point;

thence N 36°47'18" W a distance of eighty-five and no hundredths (85.00) feet to a point;

thence N 78°41'34" W a distance of one hundred thirty-six and thirty-seven hundredths (136.37) feet to a point;

thence N 42°21'01" E a distance of sixteen and thirty-four hundredths (16.34) feet along the southeasterly line of Tract 15 to a point;

thence S 78°41'34" E a distance of one hundred twenty-seven and ninety-four hundredths (127.94) feet to a point;

thence S 66°30'00" E a distance of about forty-nine (49) feet to the westerly property line of land now or formerly of the Boston & Maine Railroad Company;

thence S 3°24'10" E a distance of about twenty-eight (28) feet along a westerly property line of land now or formerly of the Boston & Maine Railroad Company to a point;

thence S 3°24'10" E a distance of about forty (40) feet along a southerly property line of land now or formerly of the Boston & Maine Railroad Company to the westerly line of West Main Street;

thence S 3°24'10" W a distance of sixty-six and fifteen hundredths (66.15) feet along the westerly line of West Main Street to the point of beginning and containing about thirteen hundredths (0.13) acres; being Tract 16 as shown on Sheet 2 of plans aforementioned titled; "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", and which said plans are on file in the office of the City Engineer of the City of Chicopee. Said Tract 16 being subject to railroad track location rights and railroad crossing rights of the Boston & Maine Railroad Company.

<u>SEVENTH PARCEL</u> - Beginning at the northeasterly corner of said parcel herein described, said point being N 82°31'29" W a distance of two hundred forty-six and ninety-four hundredths (246.94) feet along the southerly property line of the Chicopee Manufacturing Corp. from an iron pipe marking the northeasterly corner of the United States Rubber Company property at the land of Chicopee Manufacturing Corp. and the Boston & Maine Railroad Company, said iron pipe located at Coordinates N 423,093.20, E 305,034.72 in the Massachusetts State Coordinate System;

thence S 20°17'42" W a distance of one hundred seventy-four and eighty-nine hundredths (174.89) feet to a point;

BOOK 3119 PAGE 214

thence N 82°49'20" W a distance of thirteen and no hundredths (13.00) feet to a point, said course being two (2) feet northerly of the north face of the foundation of the Western Mass. Electric Company Transformer Station;

thence S 7°10'40" W a distance of one hundred twelve and no hundredths (112.00) feet, said course being 2 ft. westerly and parallel to the westerly face of the foundation of the Western Mass. Electric Company Transformer Station;

thence S 8°48'44" E a distance of thirty-one and fifty-nine hundredths (31.59) feet to a point;

thence S 0°13'28" E a distance of fifteen and thirty-two hundredths (15.32) feet along the westerly face of the United States Rubber Company concrete retaining wall;

thence S 3°56'37" E a distance of two hundred twenty-four and thirty-seven hundredths (224.37) feet along the westerly face of said wall and United States Rubber Company buildings No. 13 and No. 11 to a point;

thence S 23°29'55" E a distance of twenty-four and eighty-three hundredths (24.83) feet along the westerly face of building No. 11 to a point;

thence S 28°29'15" E a distance of two hundred two and fifty-seven hundredths (202.57) feet along the westerly wall of Building No. 11 and the westerly face of said concrete wall to a point;

thence S 32°36'05" E a distance of one hundred fifty-six and thirty-seven hundredths (156.37) feet along the westerly face of said concrete wall to a point;

thence S 37°24'41" E a distance of two hundred fifty-four and no hundredths (254.00) feet along the westerly face of the concrete wall and the westerly face of Building No. 9 to a point;

thence N 52°35'19" E a distance of eight and no hundredths (8.00) feet to a point;

thence S 36°44'52" E a distance of eighty-six and one hundredths (86.01) feet to a point;

thence S 39°47'47" E a distance of twenty-four and one hundredths (24.01) feet to a point;

thence S 52°35'19" W a distance of eight and no hundredths (8.00) feet to the westerly face of said concrete retaining wall;

thence S 37°24'41" E a distance of one hundred fifty-nine and thirty hundredths (159.30) feet along the westerly face of the concrete wall to a point;

thence N 89°35'19" E a distance of twenty-five and no hundredths (25.00) feet to a point;

thence S 27°36'07" E a distance of about thirty-one (31) feet to a point at the westerly property line of the Boston & Maine Railroad Company, said point being point "X" for identification;

thence southerly along the curve to the right a distance of about three hundred sixty (360) feet to a point, said last course being along the westerly line of property of the Boston & Maine Railroad Company;

thence S 78°11'55" W about twenty-five and no hundredths (25.00) feet to the easterly shore of the Chicopee River;

thence northerly along the shoreline of the river a distance of about nineteen hundred (1900) feet to the southerly property line of the Chicopee Manufacturing Corp.;

thence S 82°31'29" E a distance of about one hundred (100) feet along the southerly property line of the Chicopee Manufacturing Corp. to the point of beginning and containing about three (3) acres; being Tract R-8 as shown on Sheet 2 of plans aforementioned titled: "Chicopee Falls Local Flood Protection Project, Chicopee, Mass., Scale: 1"=100', Tighe & Bond, Consulting Engineers", and which said plans are on file in the office of the

City Engineer of the City of Chicopee.

\- - - - - - - - - -

Together with the right to trim, cut, fell and remove therefrom all trees and underbrush and obstructions and any other vegetation, structures or obstacles within the limits of said easement of right-of-way.

Reserving, however, to the grantors, their heirs, executors, administrators, successors and assigns, all right, title, interest and privilege, as may be exercised and enjoyed without interference with or abridgement of the easement and rights granted for said right-of-way.

The grantor further agrees to abide by the following covenants which shall run with the land subjected to easement.

(a) That the City of Chicopee may grant, convey, transfer or assign or permit the use and occupation of, by grant of easement, lease, license, permit or otherwise, all or any part of the easement and rights granted herein, to an individual, partnership, corporation or political body, for any purpose consistent with the purpose of rights herein granted and the rights retained by the grantor.

(b) That the payment of the United States of America and/or the City of Chicopee of the consideration recited herein shall constitute full fair value and full compensation to the grantor, for the easement and rights granted herein, whether such easement and rights shall be exercised by the City of Chicopee or by any of its grantees, transferees, assignees, lessees, licensees, or permittees as described in the foregoing subsection (a) of this paragraph; and the grantor expressly releases and relinquishes any and all claims against any of the aforementioned for further or future payment of consideration for the aforesaid easement and rights granted herein.

BOOK 3119 PAGE 217

Said aforementioned easement and rights shall continue in perpetuity from the date of this instrument conveying the same to the City of Chicopee and its successors and assigns.

Subject to existing easements for public roads and highways, for public utilities, for railroads, and pipe lines.

To HAVE and to HOLD the easement and rights for right of way with all the privileges thereof, unto the said City of Chicopee and its successors and assigns, to its and their use and behoof forever.

IN WITNESS WHEREOF, the said grantor, UNITED STATES RUBBER COMPANY, has hereunto set its hand and seal this 28th day of April 1965.

Signed, Sealed and Delivered in the presence of:

[signature]

UNITED STATES RUBBER COMPANY

By H N Barrett
Attorney-in-Fact

UNITED STATES RUBBER COMPANY ORGANIZED 1892 (seal)

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

Then personally appeared the above named H. N. Barrett and acknowledged the foregoing instrument to be the free act and deed of the corporation, before me this 28th day of April ~~March~~, 1965.

Marion Lacey
Notary Public

MARION LACEY
Notary Public, State of New York
No. 31-[illegible]
Qualified in New York County
Commission Expires March 30, 1967

My Commission Expires ....

MARION LACEY NOTARY PUBLIC NEW YORK COUNTY (seal)

Form 1

State of New York, } ss.:
County of New York, }

No. 83818

I, JAMES McGURRIN, County Clerk and Clerk of the Supreme Court, New York County, a Court of Record having by law a seal, DO HEREBY CERTIFY that Marion Lacey whose name is subscribed to the annexed affidavit, deposition, certificate of acknowledgment or proof, was at the time of taking the same a NOTARY PUBLIC in and for the State of New York, duly commissioned and sworn and qualified to act as such throughout the State of New York; that pursuant to law a commission, or a certificate of his official character, and his autograph signature, have been filed in my office; that as such Notary Public he was duly authorized by the laws of the State of New York to administer oaths and affirmations, to receive and certify the acknowledgment or proof of deeds, mortgages, powers of attorney and other written instruments for lands, tenements and hereditaments to be read in evidence or recorded in this State, to protest notes and to take and certify affidavits and depositions; and that I am well acquainted with the handwriting of such Notary Public, or have compared the signature on the annexed instrument with his autograph signature deposited in my office, and believe that the signature is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal this APR 30 1965

FEE PAID 50¢

James McGurrin
County Clerk and Clerk of the Supreme Court, New York County

94

BOOK 3119 PAGE 218

CITY OF CHICOPEE
MASSACHUSETTS
OFFICE OF THE CITY CLERK

ARTHUR BALTHAZAR
CITY CLERK

May 21, 1965

Law Department:

I hereby certify that the following order, recommended by the Mayor, was passed by the Board of Aldermen at a meeting held May 18, 1965, presented to the Mayor May 21, 1965 and approved by the Mayor May 21, 1965:

ORDERED THAT THE CITY OF CHICOPEE ACCEPT A DEED FROM THE UNITED STATES RUBBER COMPANY CONCERNING CERTAIN EASEMENTS AND RIGHTS IN RELATION TO LAND ON WHICH IS LOCATED THE CHICOPEE FALLS LOCAL FLOOD PROTECTION FACILITIES, AS SHOWN ON A DEED, DATED APRIL 28, 1965, AND PRESENTLY ON FILE IN THE OFFICE OF THE LAW DEPARTMENT.

Attest:

Arthur Balthazar
City Clerk

EXTRACT FROM MINUTES OF MEETING OF THE BOARD OF DIRECTORS OF UNITED STATES RUBBER COMPANY, HELD MAY 9, 1962
ORGANIZATION MATTERS

Execution of
Contracts and Other Documents

Upon motion, duly made and seconded, it was unanimously

VOTED: That, effective July 1, 1962, the President (namely, George R. Vila), or the Financial Vice President (namely, Frank J. McGrath), be and each of them hereby is authorized, in the name and on behalf of the Company, to enter into any contract or to execute and deliver any instrument necessary or proper in connection with the affairs of the Company, and in the usual course of its business, and in connection therewith, to pledge the credit of the Company, to purchase, sell, lease or convey assets or rights affecting assets, to execute powers of attorney, and to compromise or settle any claim, action, suit or proceeding by or against the Company; and it was

FURTHER VOTED: That, effective July 1, 1962, the President (namely, George R. Vila), or the Financial Vice President (namely, Frank J. McGrath), be and each of them hereby is authorized to delegate to any other officer, employee or agent of the Company, the authority, or any part thereof, granted to him by the Board of Directors or the Executive Committee to enter into any contract or to execute and deliver any instrument in the name and on behalf of the Company, any such delegation to be specific, and to be subject to such limitations and restrictions, as the person making such delegation shall determine.

I HEREBY CERTIFY that the foregoing is a true and correct extract from the minutes of a meeting of the Board of Directors of United States Rubber Company, duly called and held May 9, 1962, at which meeting a quorum was present and acting throughout.

I FURTHER CERTIFY that said resolutions and the authority thereby granted are in full force and effect and have not been modified or revoked.

BOOK 3119 PAGE 219

WITNESS my hand and the seal of said United States Rubber Company, this 7th day of June, 1962.

Henry N. Booth
ASSISTANT SECRETARY

64-4
6/7/65

I, FRANK J. McGRATH, Financial Vice President of United States Rubber Company, acting under the authority given to me by the Board of Directors of said Company at its meeting held May 9, 1962, do hereby delegate to Harold N. Barrett, Divisional President of U. S. Rubber Tire Company, authority in the name and on behalf of the Company to execute and deliver the following types of contracts, agreements and other documents insofar as they relate to the operations of the U. S. Rubber Tire Company:

1. The following types of contracts, agreements and other documents relating to real estate. Authority under items 1(a) through 1(d) may not be delegated to others.

a. Contracts, agreements and other documents relating to the purchase or sale of real estate, provided the subject real estate is within the scope of an approved appropriation request:

b. Leases and sub-leases of real property provided (1) they are within the scope or an approved appropriation request or (2) the annual rental does not exceed $100,000 and the aggregate rental for the term of the lease, excluding optional renewals, does not exceed $500,000;

c. Grants of easements or rights of way; and

d. Side trade agreements.

BOOK 3119 PAGE 220

2. Bids, bonds, proposals, contracts or other instruments relating to the sale of goods and services to Federal, State of Local Governments or Agencies thereof. This authority may be delegated to others.

3. Other contracts and agreements for the sale, rental or other conveyance of goods, materials or other things produced by the Company or purchased for resale in the normal course of business, provided such contracts do not extend beyond one year without a six months' cancellation clause. This authority may be delegated to others.

Further delegations by you, as and to the extent authorized above, shall be made by written instrument setting forth the specific delegation and the limitations and restrictions, if any. One copy of each such instrument shall be delivered to the person to whom the authority is delegated and one copy to the Secretary of the Company.

F. J. McGrath
Financial Vice President

UNITED STATES RUBBER COMPANY ORGANIZED 1892

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

On this 11th day of June, 1965 before me personally appeared F. J. McGrath to me known to be the person described in and who executed the foregoing instrument, and acknowledged that he executed the same as his free act and deed.

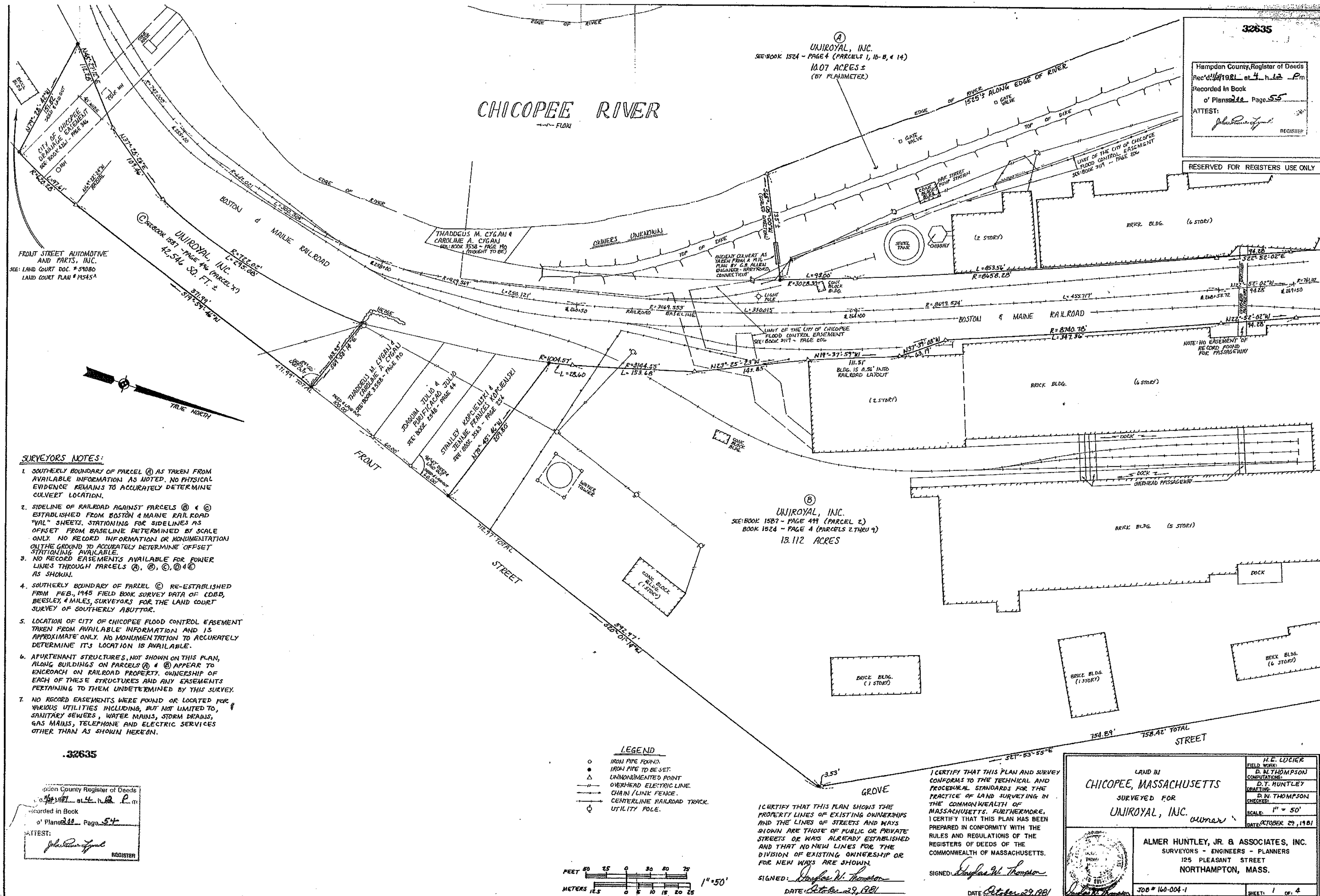
Notary Public
GRACE I. PETTERSON
Notary Public, State of New York
No. 30-3079630 Qualified in Nassau Co.
Certificate Filed in New York County
Term Expires March 30, 1967

GRACE I. PETTERSON NOTARY PUBLIC STATE OF NEW YORK

RECEIVED
JUN 1 6 1965
AT 8.38 AM AND
REC'D FROM THE ORIGINAL

My Commission Expires:

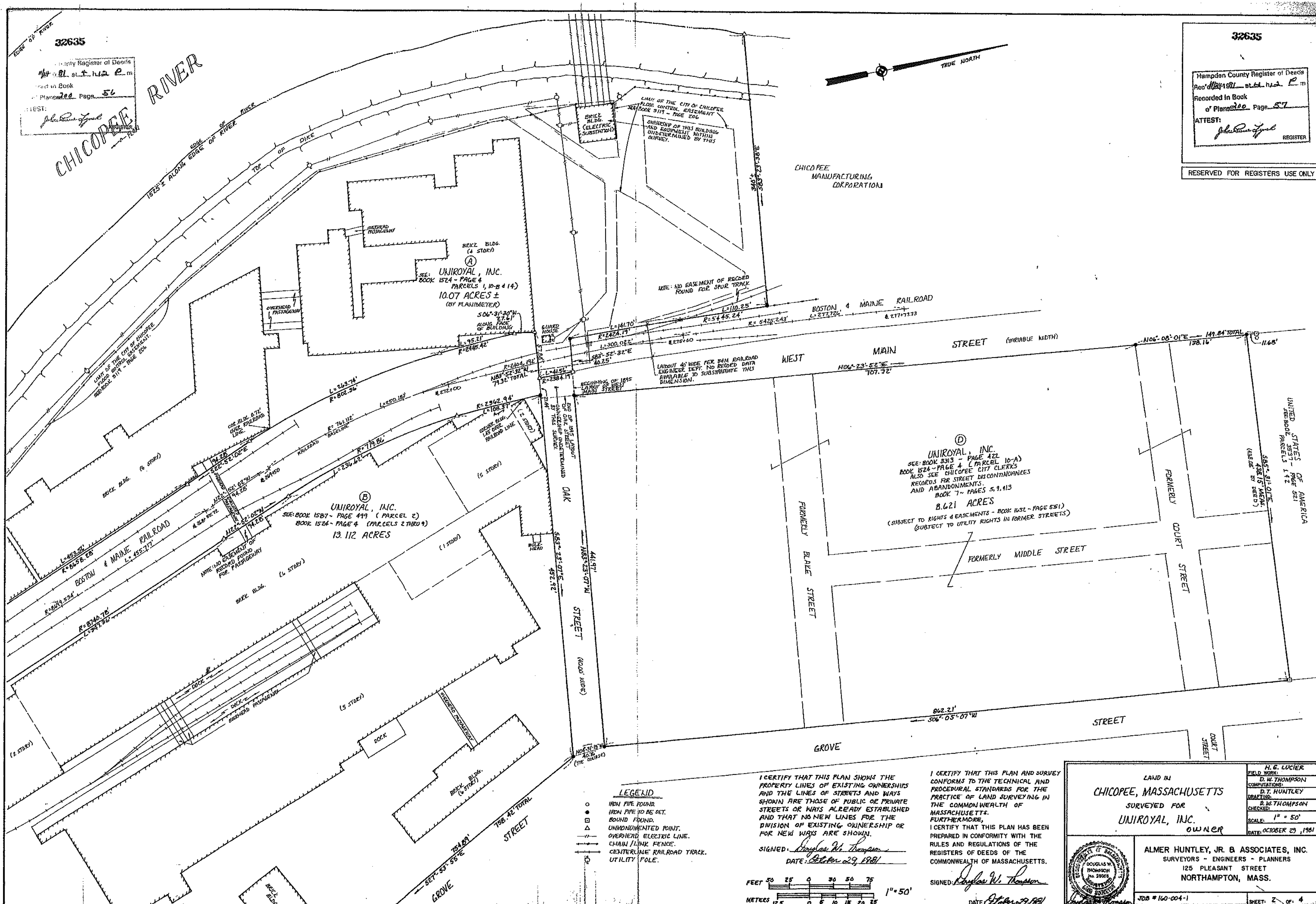
APPENDIX C – Property Ownership



32635
Hampden County Register of Deeds
Rec'd 11/4/1981 at 4 h 12 P m
Recorded in Book
o' Plans 210 Page 55
ATTEST:
REGISTER
RESERVED FOR REGISTERS USE ONLY
CHICOPEE RIVER
FLOW
EDGE OF RIVER
1525'± ALONG EDGE OF RIVER
TOP OF DIKE
GATE VALVE
Ⓐ UNIROYAL, INC.
SEE: BOOK 1524 ~ PAGE 4 (PARCELS 1, 10-B, & 14)
10.07 ACRES ±
(BY PLANIMETER)
LIMIT OF THE CITY OF CHICOPEE FLOOD CONTROL EASEMENT
SEE: BOOK 3119 ~ PAGE 206
CITY OF CHICOPEE DRAINAGE EASEMENT
BOSTON & MAINE RAILROAD
THADDEUS M. CYGAN & CAROLINE A. CYGAN
SEE: BOOK 3558 ~ PAGE 110 (THOUGHT TO BE)
OWNERS UNKNOWN
ANCIENT CULVERT AS TAKEN FROM A R.R. PLAN BY C.B. ALLEN ENGINEER - HARTFORD, CONNECTICUT
STEEL TANK
CHIMNEY
CONC. BLOCK BLDG.
LIGHT POLE
BRICK BLDG. (6 STORY)
(2 STORY)
FRONT STREET AUTOMOTIVE AND PARTS, INC.
SEE: LAND COURT DOC. # 54080
LAND COURT PLAN # 19545^A
Ⓒ UNIROYAL, INC.
SEE: BOOK 1587 ~ PAGE 496 (PARCEL 4)
42,546 SQ. FT. ±
RAILROAD BASELINE
HEDGE
TRUE NORTH
THADDEUS M. CYGAN & CAROLINE A. CYGAN
SEE: BOOK 3558 ~ PAGE 110
JOAQUIM JULIO & PURIFICACAO JULIO
SEE: BOOK 2548 ~ PAGE 44
STANLEY KOPCIENSKI & JENNIE FRANCES KOPCIENSKI
SEE: BOOK 3563 ~ PAGE 254
BLDG. IS 0.56' INTO RAILROAD LAYOUT
NOTE: NO EASEMENT OF RECORD FOUND FOR PASSAGEWAY
WATER TOWER
Ⓑ UNIROYAL, INC.
SEE: BOOK 1587 ~ PAGE 499 (PARCEL 2)
BOOK 1524 ~ PAGE 4 (PARCELS 2 THRU 9)
13.112 ACRES
OVERHEAD PASSAGEWAY
DOCK
BRICK BLDG. (5 STORY)
CONC. BLOCK BLDG. (1 STORY)
BRICK BLDG. (1 STORY)
BRICK BLDG. (6 STORY)
FRONT STREET
712.97' TOTAL
758.42' TOTAL
GROVE STREET
SURVEYORS NOTES:
1. SOUTHERLY BOUNDARY OF PARCEL Ⓐ AS TAKEN FROM AVAILABLE INFORMATION AS NOTED. NO PHYSICAL EVIDENCE REMAINS TO ACCURATELY DETERMINE CULVERT LOCATION.
2. SIDELINE OF RAILROAD AGAINST PARCELS Ⓑ & Ⓒ ESTABLISHED FROM BOSTON & MAINE RAILROAD "VAL" SHEETS. STATIONING FOR SIDELINES AS OFFSET FROM BASELINE DETERMINED BY SCALE ONLY. NO RECORD INFORMATION OR MONUMENTATION ON THE GROUND TO ACCURATELY DETERMINE OFFSET STATIONING AVAILABLE.
3. NO RECORD EASEMENTS AVAILABLE FOR POWER LINES THROUGH PARCELS Ⓐ, Ⓑ, Ⓒ, Ⓓ & Ⓔ AS SHOWN.
4. SOUTHERLY BOUNDARY OF PARCEL Ⓒ RE-ESTABLISHED FROM FEB., 1945 FIELD BOOK SURVEY DATA OF COBB, BEESLEY, & MILES, SURVEYORS FOR THE LAND COURT SURVEY OF SOUTHERLY ABUTTOR.
5. LOCATION OF CITY OF CHICOPEE FLOOD CONTROL EASEMENT TAKEN FROM AVAILABLE INFORMATION AND IS APPROXIMATE ONLY. NO MONUMENTATION TO ACCURATELY DETERMINE IT'S LOCATION IS AVAILABLE.
6. APURTENANT STRUCTURES, NOT SHOWN ON THIS PLAN, ALONG BUILDINGS ON PARCELS Ⓐ & Ⓑ APPEAR TO ENCROACH ON RAILROAD PROPERTY. OWNERSHIP OF EACH OF THESE STRUCTURES AND ANY EASEMENTS PERTAINING TO THEM UNDETERMINED BY THIS SURVEY.
7. NO RECORD EASEMENTS WERE FOUND OR LOCATED FOR VARIOUS UTILITIES INCLUDING, BUT NOT LIMITED TO, SANITARY SEWERS, WATER MAINS, STORM DRAINS, GAS MAINS, TELEPHONE AND ELECTRIC SERVICES OTHER THAN AS SHOWN HEREON.
32635
Hampden County Register of Deeds
Rec'd 11/4/1981 at 4 h 12 P m
Recorded in Book
o' Plans 210 Page 54
ATTEST:
REGISTER
LEGEND
IRON PIPE FOUND.
IRON PIPE TO BE SET.
UNMONUMENTED POINT
OVERHEAD ELECTRIC LINE.
CHAIN/LINK FENCE.
CENTERLINE RAILROAD TRACK.
UTILITY POLE.
FEET 50 25 0 30 50 75
METERS 12.5 0 5 10 15 20 25
1" = 50'
I CERTIFY THAT THIS PLAN SHOWS THE PROPERTY LINES OF EXISTING OWNERSHIPS AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR THE DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.
SIGNED: Douglas W. Thompson
DATE: October 29, 1981
I CERTIFY THAT THIS PLAN AND SURVEY CONFORMS TO THE TECHNICAL AND PROCEDURAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE COMMONWEALTH OF MASSACHUSETTS. FURTHERMORE, I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.
SIGNED: Douglas W. Thompson
DATE October 29, 1981
LAND IN
CHICOPEE, MASSACHUSETTS
SURVEYED FOR
UNIROYAL, INC. owner
FIELD WORK: H.E. LUCIER
COMPUTATIONS: D.W. THOMPSON
DRAFTING: D.T. HUNTLEY
CHECKED: D.W. THOMPSON
SCALE: 1" = 50'
DATE OCTOBER 29, 1981
ALMER HUNTLEY, JR. & ASSOCIATES, INC.
SURVEYORS - ENGINEERS - PLANNERS
125 PLEASANT STREET
NORTHAMPTON, MASS.
JOB # 160-004-1
SHEET 1 OF 4

71-59 A

71-59 A


32635
Hampden County Register of Deeds
Rec'd 11/24/1981 at 4 h 42 P m
Recorded in Book
of Plans 200 Page 57
ATTEST:
REGISTER
RESERVED FOR REGISTERS USE ONLY
32635
of Plans 200 Page 56
TRUE NORTH
CHICOPEE RIVER
EDGE OF RIVER
1525'± ALONG EDGE OF RIVER
TOP OF DIKE
LIMIT OF THE CITY OF CHICOPEE FLOOD CONTROL EASEMENT SEE BOOK 3119 ~ PAGE 206
BRICK BLDG. (ELECTRIC SUBSTATION)
OWNERSHIP OF THIS BUILDING AND EQUIPMENT WITHIN UNDETERMINED BY THIS SURVEY.
CHICOPEE MANUFACTURING CORPORATION
BRICK BLDG. (4 STORY)
A
UNIROYAL, INC.
SEE: BOOK 1524 ~ PAGE 4 PARCELS 1, 10-B & 14)
10.07 ACRES ±
(BY PLANIMETER)
OVERHEAD PASSAGEWAY
NOTE: NO EASEMENT OF RECORD FOUND FOR SPUR TRACK
BOSTON & MAINE RAILROAD
WEST MAIN STREET (VARIABLE WIDTH)
N06°-08'-01"E 149.84' TOTAL
138.16'
11.68'
N06°-23'-52"E 707.32'
LAYOUT 40' WIDE PER B&M RAILROAD ENGINEER DEPT. NO RECORD DATA AVAILABLE TO SUBSTANTIATE THIS DIMENSION.
BEGINNING OF 1895 LAYOUT OF WEST MAIN STREET
END OF 1895 LAYOUT OF OAK STREET UNDETERMINED BY THIS SURVEY.
GUARD HOUSE
D
UNIROYAL, INC.
SEE: BOOK 3313 ~ PAGE 422
BOOK 1524 ~ PAGE 4 (PARCEL 10-A)
ALSO SEE CHICOPEE CITY CLERKS RECORDS FOR STREET DISCONTINUANCES AND ABANDONMENTS. BOOK 7 ~ PAGES 5, 9, 13
8.621 ACRES
(SUBJECT TO RIGHTS & EASEMENTS - BOOK 1632 - PAGE 551)
(SUBJECT TO UTILITY RIGHTS IN FORMER STREETS)
FORMERLY BLAKE STREET
FORMERLY MIDDLE STREET
FORMERLY COURT STREET
UNITED STATES OF AMERICA SEE BOOK 3531 - PAGE 521 PARCELS 1 & 2
B
UNIROYAL, INC.
SEE: BOOK 1587 ~ PAGE 419 (PARCEL 2)
BOOK 1524 ~ PAGE 4 (PARCELS 2 THRU 9)
13.112 ACRES
BOSTON & MAINE RAILROAD
NOTE: NO EASEMENT OF RECORD FOUND FOR PASSAGEWAY
BRICK BLDG. (6 STORY)
(5 STORY)
(1 STORY)
(2 STORY)
DOCK
OVERHEAD PASSAGEWAY
BRICK BLDG. (4 STORY)
OAK STREET (60.00' WIDE)
S83°-23'-07"E 452.92'
N83°-23'-07"W 441.91'
S06°-05'-07"W 862.21'
GROVE STREET
COURT STREET
S27°-53'-55"E 754.89'
758.42' TOTAL
LEGEND
IRON PIPE FOUND.
IRON PIPE TO BE SET.
BOUND FOUND.
UNMONUMENTED POINT.
OVERHEAD ELECTRIC LINE.
CHAIN LINK FENCE.
CENTERLINE RAILROAD TRACK.
UTILITY POLE.
I CERTIFY THAT THIS PLAN SHOWS THE PROPERTY LINES OF EXISTING OWNERSHIPS AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR THE DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.
SIGNED: Douglas W. Thompson
DATE: October 29, 1981
I CERTIFY THAT THIS PLAN AND SURVEY CONFORMS TO THE TECHNICAL AND PROCEDURAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE COMMONWEALTH OF MASSACHUSETTS.
FURTHERMORE,
I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.
SIGNED: Douglas W. Thompson
DATE: October 29, 1981
FEET 50 25 0 30 50 75
METERS 12.5 0 5 10 15 20 25
1" = 50'
LAND IN
CHICOPEE, MASSACHUSETTS
SURVEYED FOR
UNIROYAL, INC.
OWNER
FIELD WORK: H. G. LUCIER
COMPUTATIONS: D. W. THOMPSON
DRAFTING: D. T. HUNTLEY
CHECKED: D. W. THOMPSON
SCALE: 1" = 50'
DATE: OCTOBER 29, 1981
ALMER HUNTLEY, JR. & ASSOCIATES, INC.
SURVEYORS - ENGINEERS - PLANNERS
125 PLEASANT STREET
NORTHAMPTON, MASS.
JOB # 160-004-1
SHEET 2 OF 4

32639

See
B 5194 P 145
" 5221 " 344
" 5846 " 39
" 5846 " 40
" 7088 " 418

UNIROYAL, Inc.
a corporation duly established under the laws of the State of New Jersey
and having its usual place of business at 154 Grove St., Chicopee, MA 01020
Hampden County, Massachusetts

for consideration paid, and in full consideration of One Million Three Hundred Thousand ($1,300,000) Dollars
grants to DHJ-Facemate Corporation, a Massachusetts Corporation and having its usual place of business at 5 West Main Street, Chicopee, MA 01020
with quitclaim covenants

the land located in the City of Chicopee, County of Hampden, Commonwealth of Massachusetts and as bounded and described in the attachment hereto marked "Description", together with all buildings and improvements and structures located thereon.

Subject to any easements and rights of others arising out of instruments of record made by UNIROYAL, Inc.

Subject to facts shown on survey prepared by Almer Huntley, Jr. & Associates, Inc. dated October 29, 1981.

Plans 200 Pgs 54 thru 61

The name of United States Rubber Company was changed to Uniroyal, Inc. on February 27, 1967.

In witness whereof, the said UNIROYAL, Inc.
has caused its corporate seal to be hereto affixed and these presents to be signed, acknowledged and delivered in its name and behalf by W. J. Crane
its Senior Vice President-Finance hereto duly authorized, this 10th
day of November in the year one thousand nine hundred and eighty-one

Signed and sealed in presence of

[signature]
ASSISTANT SECRETARY

UNIROYAL, Inc.
by [signature]
W.J. Crane, Senior Vice President-Finance

State of Connecticut
County of New Haven } SS.

On this 10th day of November, 1981 before me, appeared W. J. Crane, to me personally known, who, being by me duly sworn, did say that he is the Senior Vice President-Finance of UNIROYAL, INC. and that the seal affixed to the foregoing instrument is the corporate seal of said corporation and that said instrument was signed and sealed in behalf of said corporation by authority of its board of directors and said W.J. CRANE acknowledged said instrument to be the free act and deed of said corporation.

Margaret C. O'Reilly
Notary Public — Justice of the Peace
My commission expires My Commission Expires ... 1985

CHAPTER 183 SEC. 6 AS AMENDED BY CHAPTER 497 OF 1969

Every deed presented for record shall contain or have endorsed upon it the full name, residence and post office address of the grantee and a recital of the amount of the full consideration thereof in dollars or the nature of the other consideration therefor, if not delivered for a specific monetary sum. The full consideration shall mean the total price for the conveyance without deduction for any liens or encumbrances assumed by the grantee or remaining thereon. All such endorsements and recitals shall be recorded as part of the deed. Failure to comply with this section shall not affect the validity of any deed. No register of deeds shall accept a deed for recording unless it is in compliance with the requirements of this section.

DESCRIPTION

The following are descriptions of six (6) parcels of land in Chicopee, Massachusetts, shown on 4 sheets of a plan by Almer Huntley, Jr., & Associates, Inc., Surveyors, Engineers, Planners, 125 Pleasant Street, Northampton, Massachusetts entitled "Land in Chicopee, Massachusetts Surveyed for - Uniroyal, Inc." and are bounded and described according to said plan as follows:

PARCEL - A

Beginning at an iron pin on the Westerly line of land of the Boston & Maine Railroad at the Southeasterly corner of land of Chicopee Manufacturing Corporation;

Thence, running Southerly along a curve to the left having a radius of 5445.24 feet an arc distance of 110.25 feet to a point of compound curvature;

Thence, running Southerly along a curve to the left having a radius of 2424.19 feet an arc distance of 141.70 feet to an iron pin;

Thence, running S83°-52'-32"E a distance of 40.25 feet to a point, the last three (3) courses being along the Westerly line of Boston & Maine Railroad;

Thence, running Southerly along land of unknown owners along a curve to the left having a radius of 2384.19 feet an arc distance of 41.56 feet to a point;

Thence, running N83°-52'-32"W a distance of 57.88 feet to the Northeast corner of a 4 story brick building;

Thence, running S06°-31'-30"W along the East face of said building 27.61 feet to a point;

Thence, running Southerly along a curve to the left having a radius of 2445.42 feet an arc distance of 95.21 feet to a point of compound curvature;

Thence, running Southerly and Southeasterly along a curve to the left having a radius of 802.36 feet an arc distance of 263.74 feet to a point;

Thence, running S22°-52'-02"E a distance of 94.28 feet to a point;

Thence, running Southeasterly along a curve to the right having a radius of 8658.28 feet an arc distance of 453.56 feet to a point of compound curvature;

Thence, running Southerly along a curve to the right having a radius of 3028.30 feet an arc distance of 93.00 feet to an iron pin at the Southeasterly corner of the parcel herein described, the last seven (7) courses being along land of the Boston & Maine Railroad;

Thence, running S65°-05'-00"W along land of unknown owners a distance of 135 feet, more or less, to a point on the East edge of the Chicopee River;

Thence, running Northwesterly and Northerly along the East edge of the Chicopee River 1525 feet, more or less, to a point;

Thence, running S83°-23'-38"E along land of Chicopee Manufacturing Corporation 340 feet, more or less, to the point of beginning.

The above described parcel contains 10.07 acres, more or less.

ALMER HUNTLEY, JR., & ASSOCIATES, INC.
SURVEYORS . ENGINEERS . PLANNERS

PARCEL - B

Beginning at an iron pin on the Southerly line of Oak Street at the intersection with the Southwesterly line of Grove Street;

Thence, running S27°-53'-55"E along the Southwesterly line of Grove Street 758.42 feet to an iron pin on the Northwesterly line of Front Street;

Thence, running S20°-01'-14"W along the Northwesterly line of Front Street 592.97 feet to an iron pin at the Northeasterly corner of land of Stanley Kopcienski & Jennie Frances Kopcienski;

Thence, running N70°-45'-46"W along said Kopcienski 209.80 feet to an iron pin on the Easterly line of the Boston & Maine Railroad;

Thence, running Northwesterly along a curve to the left having a radius of 1004.57 feet an arc distance of 28.60 feet to a point of compound curvature;

Thence, running Northwesterly along a curve to the left having a radius of 3144.55 feet an arc distance of 153.68 feet to a point;

Thence, running N23°-25'-23"W a distance of 143.85 feet to a point;

Thence, running N19°-37'-59"W a distance of 111.51 feet to a point;

Thence, running N37°-39'-08"W a distance of 63.19 feet to a point;

Thence, running Northwesterly along a curve to the left having a radius of 8740.78 feet an arc distance of 347.36 feet to a point;

Thence, running N22°-52'-02"W a distance of 94.28 feet to a point;

Thence, running Northwesterly and Northerly along a curve to the right having a radius of 719.86 feet an arc distance of 236.62 feet to a point of compound curvature;

Thence, running Northerly along a curve to the right having a radius of 2,362.94 feet an arc distance of 108.37 feet to a point, the last nine (9) courses being along the Easterly line of the Boston & Maine Railroad;

Thence, running S83°-23'-07"E along land of unknown owners and along the Southerly line of Oak Street 452.92 feet to the point of beginning.

The above described parcel contains 13.112 acres.

PARCEL - C

Beginning at an iron pin on the Northwesterly line of Front Street at the Southeasterly corner of land of Thaddeus M. Cygan & Caroline A. Cygan;

Thence, running S19°-59'-46"W along the Northwesterly line of Front Street 371.99 feet to a point;

Thence, running Southwesterly along said Front Street along a curve to the right having a radius of 620.28 feet an arc distance of 97.61 feet to an iron pin at the Northeasterly corner of land of Front Street Automotive and Parts, Inc.;

Thence, running N79°-28'-42"W along said Front Street Automotive and Parts, Inc. 151.82 feet to an iron pin in the Northeasterly line of land of the Boston & Maine Railroad;

Thence, running N48°-27'-12"E a distance of 112.28 feet to a point;

Thence, running N37°-28'-26"E a distance of 109.46 feet to a point;

Thence, running Northeasterly and Northerly along a curve to the left having a radius of 722.02 feet an arc distance of 295.08 feet to an iron pin at the Southwesterly corner of the aforementioned Cygan; the last three (3) courses being along land of the Boston & Maine Railroad;

Thence, running S69°-50'-14"E along said Cygan 103.95 feet to the point of beginning.

The above described parcel contains 42,546 square feet, more or less.

PARCEL - D

Beginning at an iron pin on the Easterly line of West Main Street at the Southwesterly corner of land of United States of America;

Thence, running S85°-31'-01"E along said land of United States of America 438.15 feet to a concrete bound on the Westerly line of Grove Street;

Thence, running S06°-05'-07"W along the Westerly line of Grove Street 862.21 feet to an iron pin on the Northerly line of Oak Street, said iron pin bearing N04°-31'-15"W and 40.76 feet from the Northeasterly corner of Parcel - B herein-before described;

Thence, running N83°-23'-07"W along the Northerly line of Oak Street 441.97 feet to an iron pin on the Easterly line of West Main Street;

Thence, running N06°-23'-52"E along the Easterly line of West Main Street 707.72 feet to an iron pin;

Thence, running N06°-08'-01"E along the Easterly line of West Main Street 138.16 feet to the point of beginning.

The above described parcel contains 8.621 acres.

PARCEL - E

Beginning at an iron pin on the Easterly line of Hampden Street at the intersection with the Southerly line of West Oak Street;

Thence, running S85°-16'-15"E along the Southerly line of West Oak Street and along land of the Quinnehtuk Company 355.00 feet to an iron pin;

Thence, continuing S85°-16'-15"E along the Quinnehtuk Company 11 feet, more or less, to a point on the West edge of the Chicopee River;

Thence, running Southerly, Southeasterly, Southerly, Southwesterly and Westerly along the edge of the Chicopee River as the same exists presently in accordance with the relocation of the same under plan of U.S. Army Corps of Engineers recorded with Book 3119, Page 206, 2,800 feet, more or less, to a point on the North edge of the Chicopee River;

Thence, running N09°-11'-21"W along land of the Quinnehtuk Company 16 1/2 feet, more or less to an iron pin;

Thence, continuing N09°-11'-21"W along land of Labelle Construction, Inc., land of John J. Senecal & Linda M. Senecal, land of Gary M. Bowler & Judy M. Bowler, land of David M.

Pietras & Dolores A. Pietras, land of George H. Menard & Suzanne M. Menard and land of Eugene Salwa & Zofia Salwa 926.00 feet to an iron pin at the Southeast corner of Mayflower Avenue;

Thence, running N10°-37'-51"E along the Easterly end of Mayflower Avenue, land of Curtis W. Lippert & Rita J. Lippert, land of Stanley Grygiel & Molly K. Grygiel, land of Donald J. Benoit & Doris T. Benoit, land of Roger W. Proulx & Doris T. Benoit, land of Nellie A. Bielanski, land of Antonia F. Moran, land of Gerald R. Plante & Elaine Plante, land of Joel J. Cotè & Joyce M. Cote and land of the City of Chicopee 804.39 feet to an iron pin at the Southwesterly corner of land of Theodore Murdza & Ann M. Murdza, said iron pin also being at the intersection of the Southerly line of Nelson Street with the Easterly line of Hampden Street;

Thence, running N84°-05'-25"E along said Murdza 132.00 feet to an iron pin;

Thence, running N02°-52'-15"W along said Murdza 66.00 feet to an iron pin;

Thence, running S84°-05'-25"W along said Murdza 132.00 feet to an iron pin on the Easterly line of Hampden Street;

Thence, running N02°-52'-15"W along the Easterly line of Hampden Street 197.34 feet to the point of beginning.

Excepting from Parcel - E the following description of a parcel of land of the Quinnehtuk Company being 16 1/2 feet in width and bounded and described as follows:

Beginning at a point on the Westerly edge of the Chicopee River; said point being S85°-16'-15"E and 16 1/2 feet, more or less, from the Southeasterly terminus of West Oak Street;

Thence, running Southerly, Southeasterly, Southerly, Southwesterly and Westerly along the edge of the Chicopee River 2,800 feet, more or less, to a point on the North edge of the Chicipee River;

Thence, running N09°-11'-21"W along other land of the Quinnehtuk Company 16 1/2 feet, more or less, to an iron pin;

Thence, running Easterly, Northeasterly, Northerly, Northwesterly and Northerly 16 1/2 feet from and parallel with the edge of the Chicopee River to a point on the Southeasterly terminus of West Oak Street;

Thence, running S85°-16'-15"E along other land of the Quinnehtuk Company 16 1/2 feet, more or less, to the point of beginning.

The area of Parcel - E after exclusion of the above described Quinnehtuk Company exception is 30.94 acres, more or less.

PARCEL - F

Beginning at an iron pin on the Easterly line of Hampden Street at the Southwesterly corner of land of Western Massachusetts Electric Company;

Thence, running S53°-47'-58"E along land of Western Massachusetts Electric Company and land of the City of Chicopee 264.13 feet to a concrete bound;

Thence, running S79°-48'-58"E along land of the City of Chicopee and land of the Quinnehtuk Company 165.00 feet to an iron pin;

Thence, continuing S79°-48'-58"E along land of the Quinnehtuk Company 10 feet, more or less, to a point on the Westerly edge of the Chicopee River;

Thence, running Southerly along the West edge of the Chicopee River 36 feet, more or less to a point on the West edge of the Chicopee River;

Thence, running N85°-16'-15"W along land of the Quinnehtuk Company 12 feet, more or less, to an iron pin;

Thence, continuing N85°-16'-15"W along land of the Quinnehtuk Company and along the Northerly line of West Oak Street 360.00 feet to an iron pin on the Northerly line of West Oak Street at the intersection with the Easterly line of Hampden Street;

Thence, running N02°-52'-15"W along the Easterly line of Hampden Street 191.10 feet to the point of beginning.

Excepting from Parcel - F the following description of a parcel of land of the Quinnehtuk Company being 16 1/2 feet in width and bounded and described as follows;

Beginning at a point on the West edge of the Chicopee River, said point being S85°-16'-15"E and 16 1/2 feet, more or less, from the Northeasterly terminus of West Oak Street;

Thence, running N85°-16'-15"W along other land of the Quinnehtuk Company 16 1/2 feet, more or less, to a point at the Northeasterly terminus of West Oak Street;

Thence, running Northerly 16 1/2 feet from and parallel with the West Edge of the Chicopee River 30 feet, more or less, to a point at the Southeasterly corner of land of the City of Chicopee;

Thence, running N79°-48'-58"E along other land of the Quinnehtuk Company 16 1/2 feet, more or less, to a point on the West edge of the Chicopee River;

Thence, running Southerly along the West edge of the Chicopee River 36 feet, more or less, to the point of beginning.

The area of Parcel - F after exclusion of the above described Quinnehtuk Company exception is 34,775 square feet, more or less.

COMMONWEALTH OF MASSACHUSETTS
DEEDS EXCISE
0 9 3 6 1 2
NOV24'81
999.99
P.B.11035
11/10/81

COMMONWEALTH OF MASSACHUSETTS
DEEDS EXCISE
0 9 3 6 1 3
NOV24'81
999.99
P.B.11035
11-10-81

COMMONWEALTH OF MASSACHUSETTS
DEEDS EXCISE
HAMPDEN
0 9 3 6 1 4
NOV24'81
964.02
P.B.11035
11-10-81

RECEIVED
NOV 24 1981
AT 4:13 PM AND
REC'D FROM THE ORIGINAL

QUITCLAIM DEED

KNOW ALL MEN BY THESE PRESENTS that **FACEMATE CORPORATION a/k/a DHJ FACEMATE CORPORATION** of 5 West Main Street, Chicopee, Hampden County, Massachusetts,

In accordance with an Agreement for Judgment filed with the Hampden County Superior Court, Civil Docket No. HDCV2005-00299

grant to THE **CITY OF CHICOPEE,** a municipal corporation duly established under the laws of the Commonwealth of Massachusetts and having its usual place of business at 17 Springfield Street, Chicopee, Hampden County, Massachusetts

WITH QUITCLAIM COVENANTS

The land located in the City of Chicopee, County of Hampden, Commonwealth of Massachusetts and as bounded and described in the attachment hereto marked "Exhibit A", together with all buildings and improvements and structures located thereon.

Subject to facts shown on survey prepared by Almer Huntley, Jr. & Associates, Inc. dated October 29, 1981 as set forth in Book of Plans 200, Pages 54 thru 61.

BEING a portion of the premises conveyed to the grantor herein by deed of UNIROYAL, INC. dated November 10, 1981 and recorded with the Hampden County Registry of Deeds in Book 5191, Page 343.

"THIS TRANSFER DOES NOT CONSTITUTE ALL OR SUBSTANTIALLY ALL OF THE ASSETS OF THE GRANTOR CORPORATION."

Executed as a sealed instrument this 30th day of April 2009.

WITNESS

FACEMATE CORPORATION
Its President and Treasurer
Walter F. Mrozinski

COMMONWEALTH OF MASSACHUSETTS

HAMPDEN, SS. **April 30, 2009**

On this 30th day of April 2009 the undersigned notary public, personally appeared Walter F. Mrozinski, who proved to me through satisfactory evidence of identification, which was a Massachusetts Drivers License, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose on behalf of Facemate Corporation.

LAURA EDEN HEEMSKERK
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Dec. 24, 2015

Notary Public LAURA EDEN HEEMSKERK
My Commission Expires: 12/24/15

EXHIBIT "A"

The following are descriptions of three (3) parcels of land in Chicopee, Massachusetts, shown on 4 sheets of a plan by Almer Huntley, Jr., & Associates, Inc., Surveyors, Engineers, Planners, 125 Pleasant Street, Northampton, Massachusetts entitled "Land in Chicopee, Massachusetts Surveyed for – Uniroyal, Inc." and are bounded and described according to said plan as follows:

PARCEL – A

Beginning at an iron pin on the Westerly line of land of the Boston & Maine Railroad at the Southeasterly corner of land of Chicopee Manufacturing Corporation;

Thence, running Southerly along a curve to the left having a radius of 5445.24 feet an arc distance of 110.25 feet to a point of compound curvature;

Thence, running Southerly along a curve to the left having a radius of 2424.19 feet an arc distance of 141.70 feet to an iron pin;

Thence, running S83°-52'-32"E a distance of 40.25 feet to a point, the last three (3) courses being along the Westerly line of Boston & Maine Railroad;

Thence, running Southerly along land of unknown owners along a curve to the left having a radius of 2384.19 feet an arc distance of 41.56 feet to a point;

Thence, running N83°-52'-32"W a distance of 57.88 feet to the Northeast corner of a 4 story brick building;

Thence, running S06°-31'-30"W along the East face of said building 27.61 feet to a point;

Thence, running Southerly along a curve to the left having a radius of 2445.42 feet an arc distance of 95.121 feet to a point of compound curvature;

Thence, running Southerly and Southeasterly along a curve to the left having a radius of 802.36 feet an arc distance of 263.74 feet to a point;

Thence, running S22°-52'-02"E a distance of 94.28 feet to a point;

Thence, running Southeasterly along a curve to the right having a radius of 8658.28 feet an arc distance of 453.56 feet to a point of compound curvature;

Thence, running Southerly along a curve to the right having a radius of 3028.30 feet an arc distance of 93.00 feet to an iron pin at the Southeasterly corner of the parcel herein described, the last seven (7) courses being along land of the Boston & Maine Railroad;

Thence, running S65°-05'-00"W along land of unknown owners a distance of 135 feet, more or less, to a point on the East edge of the Chicopee River;

Thence, running Northwesterly and Northerly along the East edge of the Chicopee River 1525 feet, more or less, to a point;

Thence, running S83°-23'-38"E along land of Chicopee Manufacturing Corporation 340 feet, more or less, to the point of beginning.

The above described parcel contains 10.07 acres, more or less.

PARCEL – B

Beginning at an iron pin on the Southerly line of Oak Street at the intersection with the Southwesterly line of Grove Street;

Thence, running S27°-53'=55"E along the Southwesterly line of Grove Street 758.42 feet to an iron pin on the Northwesterly line of Front Street;

Thence, running S20°-01'-14"W along the Northwesterly line of Front Street 592.96 feet to an iron pin at the Northeasterly corner of land of Stanley Kopcienski & Jennie Frances Kopcienski;

Thence, running N70°-45'-46"W along said Kopcienski 209.80 feet to an iron pin on the Easterly line of the Boston & Maine Railroad;

Thence, running Northwesterly along a curve to the left having a radius of 1004.57 feet an arc distance of 28.60 feet to a point of compound curvature;

Thence, running Northwesterly along a curve to the left having a radius of 3144.55 feet an arc distance of 153.68 feet to a point;

Thence, running N23°-25'-23"W a distance of 143.85 feet to a point;

Thence, running N19°-37'-95"W a distance of 111.51 feet to a point;

Thence, running N37°-39'-08"W a distance of 63.19 feet to a point;

Thence, running Northwesterly along a curve to the left having a radius of 8740.78 feet an arc distance of 347.36 feet to a point;

Thence, running N22°-52'-02"W a distance of 94.28 feet to a point;

Thence, running Northwesterly and Northerly along a curve to the right having a radius of 719.86 feet an arc distance of 236.62 feet to a point of compound curvature;

Thence, running Northerly along a curve to the right having a radius of 2,362.94 feet an arc distance of 108.37 feet to a point, the last nine (9) courses being along the Easterly line of the Boston & Maine Railroad;

Thence, running S83°-23'-07"E along land of unknown owners and along the Southerly line of Oak Street 452.92 feet to the point of beginning.

The above described parcel contains 13.112 acres.

EXCEPTING THEREFROM said parcel previously conveyed to Chicopee Municipal Employees Credit Union by deed dated January 9, 1987 and recorded with the Hampden County Registry of Deeds in Book 6493, Page 595.

EXCEPTING THEREFROM said parcel previously conveyed to Thomas M. Zombik and Veronica T. Zombik by deed dated January 31, 1989 and recorded with the Hampden County Registry of Deeds in Book 7089, Page 304.

EXCEPTING THEREFROM said parcel previously conveyed to John Salema a/k/a Joao Salema and Natalia Salema a/k/a Maria N. Salema by deed dated May 8, 1997 and recorded with the Hampden County Registry of Deeds in Book 9855, Page 107.

PARCEL – C

Beginning at an iron pin on the Northwesterly line of Front Street at the Southeasterly corner of land of Thaddeus M. Cygan & Caroline A. Cygan;

Thence, running S19°-59'-46"W along the Northwesterly line of Front Street 371.99 feet to a point;

Thence, running Southwesterly along said Front Street along a curve to the right having a radius of 620.28 feet an arc distance of 97.61 feet to an iron pin at the Northeasterly corner of land of Front Street Automotive and Parts, Inc.;

Thence, running N79°-28'-42"W along said Front Street Automotive and Parts, Inc. 151.82 feet to an iron pin in the Northeasterly line of land of the Boston & Maine Railroad;

Thence, running N48°-27'-12"E a distance of 112.28 feet to a point;

Thence, running N37°-28'-26"E a distance of 109.46 feet to a point;

Thence, running Northeasterly and Northerly along a curve to the left having a radius of 722.02 feet an arc distance of 295.08 feet to an iron pin at the Southwesterly corner of the aforementioned Cygan; the last three (3) courses being along land of the Boston & Maine Railroad;

Thence, running S69°-50'-14"E along said Cygan 103.95 feet to the point of beginning.

The above described parcel contains 42,545 square feet, more or less;

Bk 17783 Pg143 #30021
05-11-2009 @ 02:32p

QUITCLAIM DEED

KNOW ALL MEN BY THESE PRESENTS that **DHJ FACEMATE CORPORATION A/K/A FACEMATE CORPORATION** of 5 West Main Street, Chicopee, Hampden County, Massachusetts,

In accordance with an Agreement for Judgment filed with the Hampden County Superior Court, Civil Docket No. HDCV2005-00299

grant to THE **CITY OF CHICOPEE,** a municipal corporation duly established under the laws of the Commonwealth of Massachusetts and having its usual place of business at 17 Springfield Street, Chicopee, Hampden County, Massachusetts

Hereby grants to the Grantee all the Grantor's right, title and interest, without any warranties or covenants of title whatsoever, in a certain parcel of land, and the buildings, fixtures and improvements thereon, if any, situated in Chicopee, Hampden County, Massachusetts (hereinafter referred to as the "Premises") described as follows:

SEE EXHIBIT "A' ATTACHED HERETO AND MADE A PART HEREOF BY THIS REFERENCE

This conveyance is made subject to the following reservations, conditions, covenants and agreements:

1. This conveyance is made without granting any right of way, either by necessity or otherwise over any remaining land or location of the Grantor.

2. The Grantor hereby reserves to itself, its successors, assigns, affiliates and licensees, a permanent right of way, license and easement in, on, over, under, across and through the Premises for the purpose of accessing, constructing, installing, operating, maintaining, modifying, repairing, replacing, relocating and removing a telecommunications system or other system for transmission of intelligence or information by any means, whether now existing or hereafter devised, including such poles, pipes, wires, fibers, fiberoptic cables, repeater stations, attachments, appurtenances, structures or other equipment and property

of any description necessary or useful for the same (hereinafter referred to as the "Telecommunications Easement"). The Grantor further reserves the right to freely lease, license, mortgage, assign, pledge and otherwise alienate the Telecommunications Easement. The Grantee hereby covenants with the Grantor to recognize the Telecommunications Easement and, without the payment of any further consideration, to execute, acknowledge and deliver such instruments suitable for recording with the registry of deeds as the Grantor may reasonably require to confirm and acknowledge title to the Telecommunications Easement in the Grantor.

3. There is excepted from this conveyance any and all railroad tracks, railroad track materials (including, but not limited to, ties, connections, switches and ballast), and/or related equipment located in whole or in part within the Premises (hereinafter referred to as the "Trackage") and this conveyance is subject to the right of the Grantor to enter the Premises from time to time and at any and all times within the ninety (90) day period commencing with and subsequent to the date of delivery of this deed, with such men, equipment and materials as, in the sole and reasonable opinion of the Principal Engineering Officer of the Grantor, are necessary for the removal of such Trackage. Days during the months December, January, February and March shall not be counted or included in the aforesaid ninety (90) day period. If the Trackage is not removed from the Premises by the expiration of said ninety (90) day period, the Trackage shall be deemed abandoned by the Grantor and shall then become the property of the Grantee. **Nothing in this paragraph shall affect the rights of Facemate Corporation, its agents or assigns, from its right to remove personal property and railroad tracks as provided under a Settlement Agreement between Facemate Corporation and the City of Chicopee dated March 7, 2009.**

4. There is excepted from this conveyance any and all advertising signs and/or billboards located upon the Premises which are not owned by the Grantor. Furthermore, this conveyance is subject to the right of the owners of said signs and/or billboards to remove them from the Premises within ninety (90) days from the date of delivery of this deed.

5. By the acceptance of this deed and as part consideration therefor, the Grantee hereby assumes any and all agreements, covenants, obligations and liabilities of the Grantor in respect to any underground facilities, drainage culverts, walls, crossings and/or other structures of any nature and description located in whole or in part within the Premises.

6. By the acceptance of this deed and as part consideration therefor, the Grantee covenants and agrees to indemnify, defend and hold harmless the Grantor (including its officers, employees, agents, directors, shareholders and affiliates) from and against any and all loss, liability, damage, cost and expense (including reasonable attorneys' fees) occasioned by or associated with any claims, suits and/or enforcement actions (including any administrative or judicial proceedings and any remedial, removal or response actions) ever asserted, threatened, instituted or requested by any person and/or governmental agency on account of: (a) any release of oil or hazardous materials or substances of any description on, upon or into the Premises in contravention of any ordinance, law or statute (including, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. Section 9601, et. seq., as amended); and (b) any and all damage to real or personal property, natural resources and/or harm or injury to persons alleged to have resulted from such release of oil or hazardous materials or substances.

7. By the acceptance of this deed and as part consideration therefor, the Grantee hereby covenants and agrees to build and forever maintain fences (together with any necessary gates), suitable to the Principal Engineering Officer of the Grantor, along the boundaries of the Premises which are common to remaining land or location of the Grantor (hereinafter referred to as the "Fences"), if such Fences are ever required in the sole and reasonable opinion of said Principal Engineering Officer. If the Grantee fails to install, maintain, repair or replace the Fences within sixty (60) days after having been requested or ordered to do so by the said Principal Engineering Officer of the Grantor, then the Grantor shall have the right to so install, maintain, repair or replace the Fences. The Grantee further covenants and agrees that, upon the rendering of a bill for the expense of such installation, maintenance, repair or replacement of the Fences, the Grantee shall pay said bill in full within thirty (30) days fro the date of receiving it. The Grantee further covenants and agrees that if said bill is not paid within thirty (30) days, it shall become subject to a finance charge computed at a periodic rate of 1.5% per month applied to the previous balance after deducting any current payment. If said finance charge is now lawful, then the finance charge shall then be the highest lawful amount which does not exceed said 1.5% per month charge. If the Grantee, for any reason whatsoever, fails to pay said bill (and finance charges, if applicable) the Grantee shall pay all Grantor's costs of collection, including reasonable attorneys' fees and expenses.

8. This conveyance is subject to the following restrictions for the benefit of other land or location of the Grantor, to wit: that from the date of this deed, the Grantor shall not be liable to the Grantee or any lessee or user of the Premises (or any part thereof) for any damage to any buildings or property upon them caused by fire, whether communicated directly or indirectly by or from locomotive engines or any description upon the railroad operated by the Grantor, or otherwise.

9. By the acceptance of this deed and as part consideration therefor, the Grantee hereby covenants and agrees to make no use of the Premises which, in the sole and reasonable opinion of the Principal Engineering Officer of the Grantor, adversely affects, increases or decreases drainage to, from, upon or in any remaining land or location of the Grantor. The Grantee further covenants and agrees not to permit or allow, either directly or indirectly, any drainage to flow from the Premises onto other land or location of the Grantor (including, but not limited to, flowing drainage from the Premises into or to existing drainage ditches or culverts located either in part or entirely upon remaining land and location of the Grantor.) Furthermore, the Grantee covenants and agrees to indemnify and save the Grantor harmless from and against any and all loss, cost, damage or expense including, but not limited to, the cost of defending all claims and/or suits for property damage, personal injury or death arising out of or in any way attributable to any breach of these covenants in respect to drainage.

10. There is excepted from this conveyance any and all overhead, surface or underground signal and communication line facilities of the Grantor located within the limits of the Premises and this conveyance is subject to the Grantor and its licensees to use any such facilities in their present locations and to enter upon the Premises from time to time to maintain, repair, replace, renew, relay or remove such facilities.

11. Whenever used in this deed, the term "Grantor" shall not only refer to the FACEMATE CORPORATION, but also its successors, assigns, affiliates and the term "Grantee" shall not only refer to CITY OF CHICOPEE, but also its successors, assigns and grantees, as the case may be.

12. The several reservations, conditions, covenants and agreements contained in this deed are to be considered as running with the land and are to be binding upon the Grantee forever.

"THIS TRANSFER DOES NOT CONSTITUTE ALL OR SUBSTANTIALLY ALL OF THE ASSETS OF THE GRANTOR CORPORATION."

Executed as a sealed instrument this day of April, 2009.

WITNESS

FACEMATE CORPORATION
Its President and Treasurer
Walter F. Mrozinski

COMMONWEALTH OF MASSACHUSETTS

HAMPDEN, SS. **April 30, 2009**

On this 30th day of April 2009 the undersigned notary public, personally appeared Walter F. Mrozinski, who proved to me through satisfactory evidence of identification, which was a Massachusetts Drivers License, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose on behalf of Facemate Corporation.

LAURA EDEN HEEMSKERK
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Dec. 24, 2015

Notary Public LAURA EDEN HEEMSKERK
My Commission Expires: 12/24/15.

EXHIBIT A

A certain line of railroad of varying width, including all the fixtures and improvements thereon, known as the "Chicopee Falls Branch", located in Chicopee, Hampden County, Massachusetts (the "Line"). The Line is described on unrecorded federal valuation plans as lying on valuation section 42.2, maps 1, 2 and 3 between station points 208+20 and 282+52 along the centerline of the railroad tracks on said Line. The Line contains two parcels, extending a distance of approximately 7,432 feet and is more particularly described as follows:

PARCEL I

Beginning at said station point 208+20, which is approximately 170 feet east of the easterly sideline of Grape Street in said Chicopee, thence running north to a point approximately 40 feet south of the south bank of the Chicopee River, thence running and running in a generally southerly and easterly direction parallel to, and approximately 40 feet south of, said southerly bank of the Chicopee River a distance of approximately 320 feet to a point, thence turning and running in a generally northerly direction to said south bank of the Chicopee River, thence continuing generally south, east and north along said south bank of the Chicopee River to the point of intersection therewith with land now or formerly of U.S. Rubber Co., thence continuing by sad land of U.S. Rubber Co. to Oak Street, thence turning and running east along the southerly sideline of said Oak Street a distance of approximately 80 feet to other land now or formerly of U.S. Rubber Co., thence turning and running generally south, west and north in various courses by said other land of U.S. Rubber Co. and by land now or formerly of J. Hafet, Burtworth Carpet Company, Darcy Pie Company, City of Chicopee (Chicopee Power Station, Manual Training School and Chicopee High School), G. Blaisdell, Richard Crowin, Starzyk, Murphy, Ludden, J. Devan, Ryate Estate, City of Chicopee, Kinna Heirs, and others, to a point 25 feet south of said station point 208+20, thence turning and running approximately 25 feet north to said station point 208+20, and the place of beginning.

Meaning and intending to convey all the Grantor's right, title and interest in Parcel I of said Line as acquired by virtue of the following instruments (running successively south, east and north towards Oak Street):

(1) Deed of Merrick Murphy dated May 29, 1846 and recorded with the Hampden County Registry of Deeds at Book 132, Page 154;

(2) Deed of John Chase dated February 8, 1847 and recorded with said Deeds at Book 132, page 498;

(3) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Charles McClellan;

(4) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against John Chase;

(5) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Charles McClellan;

(6) Deed of George Rumrill dated July 3, 1846 and recorded with said Deeds at Book 132, Page 201;

(7) County Commissioner's Decree dated May 20, 1846 against Erastus Taylor, as filed with the records of the County Commissions of Hampden County, April Term 1846;

(8) Deed of Erastus Taylor dated August 8, 1846 and recorded with said Deeds at Book 132, Page 276;

(9) Deed of Delia Towne dated July 29, 1846 and recorded with said Deeds at Book 132, Page 234;

(10) Deed of Daniel Warren dated July 3, 1846 and recorded with said Deeds at Book 132, Page 228; and

(11) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Chicopee Manufacturing Co.

BEING a portion of the premises conveyed to the grantor herein by deed of The Boston and Maine Corporation dated January 4, 1990 and recorded with the Hampden County Registry of Deeds in Book 7362, Page 362.

[SEAL]

Bk 18258 Pg319 #217
04-16-2010 @ 03:03p

COMMONWEALTH OF MASSACHUSETTS
LAND COURT
DEPARTMENT OF THE TRIAL COURT

Case No.: 09 TL 139009

JUDGMENT IN TAX LIEN CASE

City of Chicopee

vs.

Facemate Corporation

This case came on to be heard and was argued by counsel, and thereupon, upon consideration thereof, it is

ADJUDGED and ORDERED that all rights of redemption are forever foreclosed and barred under the following deed(s) given by and/or the tax taking(s) made by the Collector of Taxes for the City of Chicopee in Hampden County and said Commonwealth:

Land Type	Tax Taking Date	Book No.	Page No.	Document No.	Certificate of Title No.
Recorded	06/16/2003	13344	589		

By the Court: Deborah J. Patterson

Attest:

Deborah J. Patterson
Recorder

Entered: April 14, 2010

A TRUE COPY
ATTEST:
Deborah J. Patterson
RECORDER
DONALD E. ASHE, REGISTER
HAMPDEN COUNTY REGISTRY OF DEEDS

2719

DEED effective as of the close of business on the thirty-first day of December, 1962, by and between CHICOPEE MANUFACTURING CORPORATION, a corporation of the Commonwealth of Massachusetts (hereinafter called "Chicopee"), party of the first part, and JOHNSON & JOHNSON, a corporation of the State of New Jersey, with principal offices at 501 George Street, New Brunswick, New Jersey, (hereinafter called "Johnson"), party of the second part.

WHEREAS Chicopee is being dissolved as of the close of business on December 31, 1962, and thereby all and singular the rights, privileges, powers and franchises, and all property, real, personal and mixed, of Chicopee and all debts due to Chicopee, including subscriptions to shares and other choses in action belonging to Chicopee, are being vested in Johnson, the sole stockholder of Chicopee, and all property, rights, privileges, powers and franchises, and all and every other interest, of Chicopee are to be as effectually the property of Johnson as they were of Chicopee; and

WHEREAS the parties desire that, in order to carry out more effectually the intent and purposes of such dissolution, Johnson shall be in possession of instruments, in such form as to be entitled to record, evidencing the vesting in Johnson, pursuant to such dissolution, of all the properties and assets of Chicopee hereinafter described;

NOW, THEREFORE, THIS DEED WITNESSETH that Chicopee, for and in consideration of good and valuable consideration by it received at or before the execution and delivery of this Deed, the receipt and sufficiency of which are hereby acknowledged, has granted, assigned, aliened, remised, released, conveyed, transferred, set over, confirmed, and warranted, and by this Deed does grant, assign, alien, remise, release, convey, transfer, set over, confirm, and warrant, unto Johnson, its successors and assigns, forever, all the following tracts or parcels of land and premises, together with all buildings and building equipment and improvements located thereon and together with all and singular the tenements and appurtenances thereunto belonging or in anywise appertaining, more particularly described as follows:

PARCEL ONE: All of the land owned of record in Hampton County, Commonwealth of Massachusetts, on the date of this instrument as disclosed by the records of the Hampton County Registry of Deeds;

PARCEL TWO: All of the land owned of record in Hillsborough County, State of New Hampshire, on the date of this instrument as disclosed by the records of the Hillsborough County Registry of Deeds;

PARCEL THREE: All of the land owned of record in Bergen County, State of New Jersey, on the date of this instrument as disclosed by the records in the Bergen County Clerk's Office; and all those certain tracts in Township of Lyndhurst, County of Bergen, State of N.J., as more particularly described in deeds recorded in Bergen County Clerk's Office in Bk.4029 pg.484 and Bk.4144 pg.317.

PARCEL FOUR: All of the land owned of record in Pulaski County, State of Arkansas, on the date of this instrument as disclosed by the records of Pulaski County;

PARCEL FIVE: All of the land owned of record in Oconee County, State of South Carolina, on the date of this instrument as disclosed by the records of the Clerk of Court's Office of Oconee County;

PARCEL SIX: All of the land owned of record in Clarke County, State of Georgia, on the date of this instrument as disclosed by the records of Clarke County.

RECEIVED
1964 JUN 26 PM 12:35
BERGEN COUNTY CLERK

It is the intention by this Deed to convey to Johnson the entire plant of Chicopee in each of said Counties, including lands, buildings, fixtures, machinery and machinery repair parts, and all office furniture and equipment, together with all hereditaments and appurtenances thereto belonging or in anywise appertaining, and all rights, privileges, and easements of every kind and nature appertaining to said properties or any part thereof, and remainders belonging to Chicopee and included in the general boundaries of the properties above described even if not specifically bounded and described.

TO HAVE AND TO HOLD the said granted premises, with all the privileges and appurtenances to the same belonging to it, the

CHICOPEE MANUFACTURING CORPORATION,

a corporation duly established under the laws of Massachusetts
and having its usual place of business at CHICOPEE
HAMPDEN County, Massachusetts, for consideration paid

grants to JOHNSON & JOHNSON, a corporation of the State of New Jersey with place business at 501 George Street, New Brunswick, New Jersey

~~the land in~~ with quitclaim covenants

All of the land owned of record in Hampden County, Commonwealth of Massachusetts, as disclosed by the records of the Hampden County Registry of Deeds.

This deed is given to correct and confirm the grant and conveyance of the premises herein described as set forth in instrument recorded with Hampden County Registry of Deeds, Book 3091, Page 236,

No stamps required

In witness Whereof the said CHICOPEE MANUFACTURING CORPORATION

has caused its corporate seal to be hereto affixed and these presents to be signed, acknowledged and delivered in its name and behalf by John J. Smith
its President hereto duly authorized, this 8th
day of December in the year one thousand nine hundred and sixty-five.

Signed and sealed in presence of

CHICOPEE MANUFACTURING CORPORATION

by John J. Smith
President

CHICOPEE MANUFACTURING CORPORATION 1916 SEAL MASSACHUSETTS

~~The Commonwealth of Massachusetts~~

STATE OF NEW JERSEY)
COUNTY OF MIDDLESEX) ss.: December 8, 1965

Then personally appeared the above named John J. Smith

and acknowledged the foregoing instrument to be the free act and deed of the CHICOPEE MANUFACTURING CORPORATION,

before me

Joan E. Kiesler
Notary Public
~~Justice of the Peace~~

My commission expires October 27, 1966

RECEIVED
DEC 2 0 1965
AT 10:33 a.m. AND
REC'D FROM THE ORIGINAL

KNOW ALL MEN BY THESE PRESENTS: BK 4195 PG 309

that JOHNSON & JOHNSON, 25793

Plans 161 Pages 6 to 9. inc.

a corporation duly established under the laws of THE State of New Jersey
and having its usual place of business at New Brunswick, Middlesex County, New Jersey
~~XXXXXXXXXXXXX~~, for consideration paid
grants to FACEMATE CORPORATION, a Massachusetts corporation, with its usual place of business at 5 West Main Street, Chicopee, Hampden County, Massachusetts,
~~the~~ with quitclaim covenants
the land in Chicopee, Hampden County, Massachusetts, bounded and described as follows:

All land owned by JOHNSON & JOHNSON in Chicopee, Hampden County, Massachusetts, of record in the Hampden County Registry of Deeds, including in the land hereby granted, the premises shown on a plan of land drawn by Durkee, White, Towne and Chapdelaine, Civil Engineers and Land Surveyors, Drawing Number 91-5196, to be recorded in Hampden County Registry of Deeds herewith, said premises being shown thereon as bounded: SOUTHERLY by land of Uniroyal, Inc.; WESTERLY, NORTHWESTERLY and NORTHERLY by the Chicopee River; EASTERLY by land of Chico Realty Trust and others; SOUTHERLY by land of Chico Realty Trust and others; and SOUTHEASTERLY and EASTERLY by the Boston and Maine Railroad.

Subject to easements of record insofar as the same may be now in force and applicable.

Being the same premises conveyed to the grantee herein by deed of Chicopee Manufacturing Company, dated December 31, 1962 and recorded in the Hampden County Registry of Deeds in Book 3091, Page 236. See also deed dated December 8, 1965 and recorded as aforesaid in Book 3160, Page 276.

The consideration for the within deed is One Million Forty Thousand and 00/100 ($1,040,000.00) Dollars.

The grantor further warrants to the grantee that it will secure at its cost such documents to clear the record title of the above-described premises from any and all recorded liens, encumbrances and easements which impair marketability of the said premises, except for easement, if any, for old canal between office building and plant, which is now filled in.

In witness whereof the said Johnson & Johnson has executed this deed as a Massachusetts sealed instrument and has caused ~~its corporate seal to be hereto affixed and~~ these presents to be signed, acknowledged and delivered in its name and behalf by D. P. Becker, its Treasurer, hereto duly authorized, this thirtieth day of October in the year one thousand nine hundred and seventy-five.

Signed and sealed in presence of

~~Chicopee Manufacturing Company, Division of~~
JOHNSON & JOHNSON

by D. P. Becker
its Treasurer

The Commonwealth of Massachusetts

Hampden ss. October 30, 1975

Then personally appeared the above named D. P. Becker, Treasurer of Chicopee Manufacturing Company, division of Johnson and Johnson and acknowledged the foregoing instrument to be the free act and deed of the corporation

before me

Martin D. Turpie
MARTIN D. TURPIE
Notary Public

My commission expires January 26 1979

COMMONWEALTH OF MASSACHUSETTS DEEDS EXCISE 999.99

COMMONWEALTH OF MASSACHUSETTS DEEDS EXCISE 999.99

COMMONWEALTH OF MASSACHUSETTS DEEDS EXCISE 371.22

RECEIVED OCT 30 1975 AT 2:52 P.M. AND REC'D FROM THE ORIGINAL

1975

RELEASE DEED

THE BOSTON AND MAINE CORPORATION, a corporation duly organized and existing under the laws of the State of Delaware, with offices at Iron Horse Park, North Billerica, Middlesex County, Massachusetts (hereinafter referred to as the "Grantor") in consideration of Fifteen Thousand ($15,000.00) Dollars paid to it by **FACEMATE CORPORATION**, a Massachusetts corporation having an address of 5 West Main Street, Chicopee, Massachusetts, **AS NOMINEE OF C.I.P. CORPORATION**, a Massachusetts corporation (hereinafter referred to as the "Grantee") hereby grants to the Grantee all the Grantor's right, title and interest, without any warranties or covenants of title whatsoever, in a certain parcel of land, and the buildings, fixtures and improvements thereon, if any, situated in Chicopee, Hampden County, Massachusetts (hereinafter referred to as the "Premises") described as follows:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF BY THIS REFERENCE.

This conveyance is made subject to the following reservations, conditions, covenants and agreements:

1. This conveyance is made without granting any right of way, either by necessity or otherwise over any remaining land or location of the Grantor.

WEST MAIN ST.
CHICOPEE, MA

2. The Grantor hereby reserves to itself, its successors, assigns, affiliates and licensees, a permanent right of way, license and easement in, on, over, under, across and through the Premises for the purpose of accessing, constructing, installing, operating, maintaining, modifying, repairing, replacing, relocating and removing a telecommunications system or other system for transmission of intelligence or information by any means, whether now existing or hereafter devised, including such poles, pipes, wires, fibers, fiberoptic cables, repeater stations, attachments, appurtenances, structures or other equipment and property of any description necessary or useful for the same (hereinafter referred to as the "Telecommunications Easement"). The Grantor further reserves the right to freely lease, license, mortgage, assign, pledge and otherwise alienate the Telecommunications Easement. The Grantee hereby covenants with the Grantor to recognize the Telecommunications Easement and, without the payment of any further consideration, to execute, acknowledge and deliver such instruments suitable for recording with the registry of deeds as the Grantor may reasonably require to confirm and acknowledge title to the Telecommunications Easement in the Grantor.

3. There is excepted from this conveyance any and all railroad tracks, railroad track materials (including, but not limited to, ties, connections, switches and ballast), and/or related equipment located in whole or in part within the Premises (hereinafter referred to as the "Trackage") and this conveyance is subject to the right of the Grantor to enter the Premises from time to time and at any and all times within the ninety (90) day period commencing with and subsequent to the date of delivery of this deed, with such men, equipment and materials as, in the sole and reasonable opinion of the Principal Engineering Officer of the Grantor, are necessary for the removal of such Trackage. Days during the months of December, January, February and March shall not be counted or included in the aforesaid ninety (90) day period. If the Trackage is not removed from the Premises by the expiration of said ninety (90) day period, the Trackage shall be deemed abandoned by the Grantor and shall then become the property of the Grantee.

4. There is excepted from this conveyance any and all advertising signs and/or billboards located upon the Premises which are not owned by the Grantor. Furthermore, this conveyance is subject to the right of the owners of said signs and/or billboards to remove them from the Premises within ninety (90) days from the date of delivery of this deed.

5. By the acceptance of this deed and as part consideration therefor, the Grantee hereby assumes any and all agreements, covenants, obligations and liabilities of the Grantor in respect to any underground facilities, drainage culverts, walls, crossings and/or other structures of any nature and description located in whole or in part within the Premises.

6. By the acceptance of this deed and as part consideration therefor, the Grantee covenants and agrees to indemnify, defend and hold harmless the Grantor (including its officers, employees, agents, directors, shareholders and affiliates) from and against any and all loss, liability, damage, cost and expense (including reasonable attorneys' fees) occasioned by or associated with any claims, suits and/or enforcement actions (including any administrative or judicial proceedings and any remedial, removal or response actions) ever asserted, threatened, instituted or requested by any person

and/or governmental agency on account of: (a) any release of oil or hazardous materials or substances of any description on, upon or into the Premises in contravention of any ordinance, law or statute (including, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. Section 9601, et seq., as amended); and (b) any and all damage to real or personal property, natural resources and/or harm or injury to persons alleged to have resulted from such release of oil or hazardous materials or substances.

7. By the acceptance of this deed and as part consideration therefor, the Grantee hereby covenants and agrees to build and forever maintain fences (together with any necessary gates), suitable to the Principal Engineering Officer of the Grantor, along the boundaries of the Premises which are common to remaining land or location of the Grantor (hereinafter referred to as the "Fences"), if such Fences are ever required in the sole and reasonable opinion of said Principal Engineering Officer. If the Grantee fails to install, maintain, repair or replace the Fences within sixty (60) days after having been requested or ordered to do so by the said Principal Engineering Officer of the Grantor, then the Grantor shall have the right to so install, maintain, repair or replace the Fences. The Grantee further covenants and agrees that, upon the rendering of a bill for the expense of such installation, maintenance, repair or replacement of the Fences, the Grantee shall pay said bill in full within thirty (30) days from the date of receiving it. The Grantee further covenants and agrees that if said bill is not paid within thirty (30) days, it shall become subject to a finance charge computed at a periodic rate of 1.5% per month applied to the previous balance after deducting any current payment. If said finance charge is not lawful, then the finance charge shall then be the highest lawful amount which does not exceed said 1.5% per month charge. If the Grantee, for any reason whatsoever, fails to pay said bill (and finance charges, if applicable) the Grantee shall pay all Grantor's costs of collection, including reasonable attorneys' fees and expenses.

8. This conveyance is subject to the following restrictions for the benefit of other land or location of the Grantor, to wit: that from the date of this deed, the Grantor shall not be liable to the

Grantee or any lessee or user of the Premises (or any part thereof) for any damage to any buildings or property upon them caused by fire, whether communicated directly or indirectly by or from locomotive engines of any description upon the railroad operated by the Grantor, or otherwise.

9. By the acceptance of this deed and as part consideration therefor, the Grantee hereby covenants and agrees to make no use of the Premises which, in the sole and reasonable opinion of the Principal Engineering Officer of the Grantor, adversely affects, increases or decreases drainage to, from, upon or in any remaining land or location of the Grantor. The Grantee further covenants and agrees not to permit or allow, either directly or indirectly, any drainage to flow from the Premises onto other land or location of the Grantor (including, but not limited to, flowing drainage from the Premises into or to existing drainage ditches or culverts located either in part or entirely upon remaining land and location of the Grantor). Furthermore, the Grantee covenants and agrees to indemnify and save the Grantor harmless from and against any and all loss, cost, damage or expense including, but not limited to, the cost of defending all claims and/or suits for property damage, personal injury or death arising out of or in any way attributable to any breach of these covenants in respect to drainage.

10. There is excepted from this conveyance any and all overhead, surface or underground signal and communication line facilities of the Grantor located within the limits of the Premises and this conveyance is subject to the Grantor and its licensees to use any such facilities in their present locations and to enter upon the Premises from time to time to maintain, repair, replace, renew, relay or remove such facilities.

11. Whenever used in this deed, the term "Grantor" shall not only refer to the **BOSTON AND MAINE CORPORATION**, but also its successors, assigns and affiliates and the term "Grantee" shall not only refer to **FACEMATE CORPORATION**, but also its successors, assigns and grantees, as the case may be.

12. The several reservations, conditions, covenants and agreements contained in this deed are to be considered as running with the land and are to be binding upon the Grantee forever.

IN WITNESS WHEREOF, the said **BOSTON AND MAINE CORPORATION** has caused this release deed to be executed in its name and its corporate seal to be hereto affixed by David A. Fink, its President, thereunto duly authorized this 4th day of JANUARY, 1990.

BOSTON AND MAINE CORPORATION

Witness
JOHN BYRNE CARROLL

By: David A. Fink
David A. Fink, President

The Grantee hereby accepts and agrees to become bound by the several reservations, conditions, covenants and agreements contained in this release deed.

FACEMATE CORPORATION

Witness

By: Gilbert A. Barrett, Jr.
Gilbert A. Barrett, Jr., Vice-President and Chief Financial Officer

COMMONWEALTH OF MASSACHUSETTS

Middlesex, ss. January 4, ~~1989~~ 1990

Then personally appeared the above-named David A. Fink, the President of the **BOSTON AND MAINE CORPORATION** and acknowledged the foregoing release deed to be his free act and deed and the free act and deed of said **BOSTON AND MAINE CORPORATION**, before me.

Notary Public JOHN BYRNE CARROLL
My Commission Expires: 7-12-90

Hampden,

Then p
Vice-President and C.
foregoing
the free a
me.

DEEDS

01/08/9

TAX
CHCK

5670A388
EXCISE

COMMONWEALTH OF MASSACHUSETTS

Hampden, ss. December 29, 1989

Then personally appeared GILBERT A. BARRETT, JR., the Vice-President and C.F.O. of **FACEMATE CORPORATION** and acknowledged the foregoing release deed to be his/her free act and deed and the free act and deed of said **FACEMATE CORPORATION**, before me.

Notary Public: GARY L. FIALKY
My Commission Expires: 8/23/96

DEEDS REG 12
HAMPDEN
01/08/90
DMC
TAX 68.40
CHCK 68.40
5670A308 11:57
EXCISE TAX

EXHIBIT A

A certain line of railroad of varying width, including all the fixtures and improvements thereon, known as the "Chicopee Falls Branch", located in Chicopee, Hampden County, Massachusetts (the "Line"). The Line is described on unrecorded federal valuation plans as lying on valuation section 42.2, maps 1, 2 and 3 between station points 208+20 and 282+52 along the centerline of the railroad tracks on said Line. The Line contains two parcels, extending a distance of approximately 7,432 feet and is more particularly described as follows:

PARCEL I.

Beginning at said station point 208+20, which is approximately 170 feet east of the easterly sideline of Grape Street in said Chicopee, thence running north to a point approximately 40 feet south of the south bank of the Chicopee River, thence turning and running in a generally southerly and easterly direction parallel to, and approximately 40 feet south of, said southerly bank of the Chicopee River a distance of approximately 320 feet to a point, thence turning and running in a generally northerly direction to said south bank of the Chicopee River, thence continuing generally south, east and north along said south bank of the Chicopee River to the point of intersection therewith with land now or formerly of U.S. Rubber Co., thence continuing by said land of U.S. Rubber Co. to Oak Street, thence turning and running east along the southerly sideline of said Oak Street a distance of approximately 80 feet to other land now or formerly of U.S. Rubber Co., thence turning and running generally south, west and north in various courses by said other land of U.S. Rubber Co. and by land now or formerly of J. Hafey, Burtworth Carpet Company, Darcy Pie Company, City of Chicopee (Chicopee Power Station, Manual Training School and Chicopee High School), G. Blaisdell, Richard Crowin, Starzyk, Murphy, Ludden, J. Devan, Ryan Estate, City of Chicopee, Kinna Heirs, and others, to a point 25 feet south of said station point 208+20, thence turning and running approximately 25 feet north to said station point 208+20, and the place of beginning.

Meaning and intending to convey all the Grantor's right, title and interest in Parcel I of said Line as acquired by virtue of the following instruments (running successively south, east and north towards Oak Street):

(1) Deed of Merrick Murphy dated May 29, 1846 and recorded with the Hampden Registry of Deeds at Book 132, Page 154;

(2) Deed of John Chase dated February 8, 1847 and recorded with said Deeds at Book 132, Page 498;

(3) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Charles McClellan;

(4) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against John Chase;

(5) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Charles McClellan;

(6) Deed of George Rumrill dated July 3, 1846 and recorded with said Deeds at Book 132, Page 201;

(7) County Commissioner's Decree dated May 20, 1846 against Erastus Taylor, as filed with the records of the County Commissions of Hampden County, April Term 1846;

(8) Deed of Erastus Taylor dated August 8, 1846 and recorded with said Deeds at Book 132, Page 276;

(9) Deed of Delia Towne dated July 29, 1846 and recorded with said Deeds at Book 132, Page 234;

(10) Deed of Daniel Warren dated July 3, 1846 and recorded with said Deeds at Book 132, Page 228; and

(11) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Chicopee Manufacturing Co.

PARCEL II

Beginning at the northerly sideline of Oak Street in said Chicopee at the point of intersection thereof with land now or formerly of Chicopee Manufacturing Co., said point being approximately 25 feet west of the point of intersection of said northerly sideline of Oak Street and centerline station point 273+56.5, thence running in a generally northerly direction along said land of Chicopee Manufacturing Co. a distance of approximately 896 feet to a point, thence turning and running in a generally easterly direction by other land of the Grantor a distance of approximately 40 feet to a point, thence turning and running in a generally southerly direction along West Main Street in said Chicopee a distance of approximately 896 feet to a point approximately 30 feet west of the point of intersection between the easterly sideline of West Main Street and the northerly sideline of Oak Street, thence turning and running in a generally westerly direction along the northerly sideline of said Oak Street to the point of beginning.

Meaning and intending to convey all the Grantor's right, title and interest in Parcel II of said Line as acquired by virtue of the following instruments:

(1) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against Chicopee Manufacturing Co.; and

(2) Condemnation by Location filed with the Clerk of Courts for Hampden County on March 27, 1847 against the Town of Springfield.

Also including a right to cross Oak Street acquired by Condemnation by Location dated March 27, 1847 against the Town of Springfield.

Parcel I contains approximately 1,139,290 square feet, more or less and Parcel II contains approximately 40,383 square feet, more or less.

The Line is conveyed subject to all rights, conveyances, covenants, easements or encumbrances, if any, and with the benefit of all rights, covenants and easements appurtenant thereto, if any.

This Deed creates no new boundaries.

BOSTON AND MAINE CORPORATION

Assistant Secretary's Certificate

December 11, 1989

I, David H. Anderson, being the duly elected and presently serving Secretary of the Boston and Maine Corporation (the "Corporation"), do hereby certify that the following vote was duly adopted by the directors of the Corporation at a meeting of the Board of Directors of the Corporation held on October 22, 1988:

VOTED: That David A. Fink, President of the Corporation, in connection with sales of parcels of real estate of the Corporation with purchase prices of less than one hundred thousand dollars ($100,000.00), is hereby authorized, empowered and directed, on behalf of and in the name of the Corporation, to execute, seal and deliver such agreements of sale, deeds, certificates or instruments and to take such other action as he may deem necessary, appropriate or convenient to sell such parcels, consummate such transactions, and effect the purposes of this vote.

I further certify that such vote has not been altered, amended or rescinded and remains in full force and effect as of the date hereof.

WITNESS my hand and seal of the Corporation as of this 11th day of December, 1989.

David H. Anderson,
Assistant Secretary

The Commonwealth of Massachusetts
Executive Office of Transportation & Construction
Office of the Secretary
10 Park Plaza, Room 3510
Boston, MA 02116-3969
Telephone 973-7000
TDD (617) 973-7306
Telefax (617) 523-6454

Michael S. Dukakis
Governor
Frederick P. Salvucci
Secretary
and
M.B.T.A. Chairman

December 14, 1989

John Byrne Carroll, Assistant Counsel
Guilford Transportation Industries, Inc.
7 Executive Park Drive
Merrimack, N.H. 03054

RE: Offer of Railroad Property under M.G.L. Chapter 161C, Section 7, Offer No. 89-20, Boston & Maine Corporation; Sale to the CIP Corporation, Chicopee, Massachusetts.

Dear Mr. Carroll:

This office is in receipt of your letter dated September 12, 1989, regarding the proposed sale of the Chicopee Falls Spur track to the CIP Corporation, pursuant to CIP's exercise of its option to purchase contained in a certain lease between the Boston & Maine Railroad and the CIP Corporation dated September 7, 1984.

It is my understanding that the CIP Corporation currently uses the spur track for freight rail purposes, and will continue to do so after acquisition of this track. Since the spur track will continue to be used for such purposes, the Executive Office of Transportation and Construction (EOTC) hereby notifies you that it will not acquire the railroad property referred to above, pursuant to Massachusetts General Laws Chapter 161C, Section 7, with the condition any future sale of this property or any portion thereof by CIP shall be subject to the provisions of M.G.L. Ch. 161C, Sec. 7. Moreover, the EOTC will not designate an agency, authority, political subdivision or other party to act in this matter at this time.

Since the Executive Office of Transportation and Construction finds that the requirements of the statute have been satisfied, with respect to this transaction, you may transfer the above-cited property to a party other than this office or its designee as provided on the statute. Please be advised, however, that this property falls under the Massachusetts General Laws, Chapter 40, Section 54A which provides that construction on former railroad property requires prior approval by EOTC. EOTC has a responsibility under this statute to protect those properties which were formerly used for railroad purposes for

Mr. Carroll
page 2

present or future public use.

EOTC will review each request for a building permit approval under Chapter 40, Section 54A on case by case basis. To this end, if the Boston & Maine will provide the address of the CIP Corporation to our office, EOTC will inform the CIP Corporation of the statutory requirements of Chapter 40, Section 54A. In the event Boston & Maine chooses not to inform EOTC of the address of the purchaser, the EOTC requests that the Boston & Maine forward a copy of this letter to the CIP Corporation.

If you have any questions regarding this matter, please contact Jorge E. Borda of this office at (617) 973-7015.

Sincerely,

Frederick P. Salvucci
Secretary

FPS:jeb

cc: City of Chicopee
Department of Environmental Management

RECEIVED
JAN-8 1990
AT 11:58 AM AND
REC'D FROM THE ORIGINAL

Bk 13344 Pg589 #728(
07-02-2003 @ 10:26a

STATE FORM 301 INSTRUMENT OF

THE COMMONWEALTH OF MASSACHUSETTS
CITY OF CHICOPEE TT# 2002(
OFFICE OF THE COLLECTOR OF TAXES

I, CAROLE J. HARMS , Collector of Taxes for the City
CHICOPEE , pursuant and subject to the provisi
of General Laws, Chapter 60, Sections 53 and 54, hereby take for saic
town the following described land:

DESCRIPTION OF LAND

PROPERTY:	LAND
LOCATION:	WEST MAIN ST
ASSESSORS:	0173-00004
REGISTRY:	7362/00362
LAND COURT:	-
RECORDED AT:	Hampden County Registry of Deeds

Said land is taken for non-payment of taxes as defined in Section 43 of said Chapter 60 assessed thereon to:
FACEMATE CORPORATION

for the year 2002, which were not paid within fourteen (14) days afte demand therefore made upon FACEMATE CORPORATION on June 28, 2002 , and now remain unpaid together with interest and incidental expenses and costs to the date of taking in the amounts herinafter specified, after notice of intention to take said land given as required by law.

2002 TAXES REMAINING UNPAID. . . . . .$	$193.68
INTEREST to the date of taking . . . .$	$36.51
INCIDENTAL EXPENSES AND COSTS. . . . .$ to the date of taking	$31.58
SUM FOR WHICH LAND IS TAKEN. . . . . .$	$261.77

WITNESS my hand and seal this June 16, 2003

Carole J Harms
CAROLE J. HARMS
CITY OF CHICOPEE

THE COMMONWEALTH OF MASSACHUSETTS

HAMPDEN , ss. DATE: 6-24-03

Then personally appeared the above named CAROLE J. HARMS and acknowledged the foregoing instrument to be of his free act and deed as Collector of Taxes, before me, Nancy A Mulvey Notary Public

My commission expires 8/7/03

DONALD E. ASHE, REGIS
HAMPDEN COUNTY REGISTRY O

STATE FORM 301 INSTRUMENT OF TAKING

Bk 15274 Pg379 #72
08-24-2005 @ 03:09p

THE COMMONWEALTH OF MASSACHUSETTS
CITY OF CHICOPEE TT# 2003500
OFFICE OF THE COLLECTOR OF TAXES

I, CAROLE J. HARMS, Collector of Taxes for the City of CHICOPEE, pursuant and subject to the provisions of General Laws, Chapter 60, Sections 53 and 54, hereby take for said town the following described land:

DESCRIPTION OF LAND

PROPERTY:	LAND & BUILD
LOCATION:	5 W MAIN ST
ASSESSORS:	0173-00001
REGISTRY:	4195/00309
LAND COURT:	-
RECORDED AT:	Hampden County Registry of Deeds

Said land is taken for non-payment of taxes as defined in Section 43 of said Chapter 60 assessed thereon to:
FACEMATE CORPORATION

for the year 2003, which were not paid within fourteen (14) days after demand therefore made upon FACEMATE CORPORATION on June 24, 2003, and now remain unpaid together with interest and incidental expenses and costs to the date of taking in the amounts herinafter specified, after notice of intention to take said land given as required by law.

2003 TAXES REMAINING UNPAID. . . . . . $	$249,589.55
INTEREST to the date of taking . . . . $	$93,503.31
INCIDENTAL EXPENSES AND COSTS. . . . . $ to the date of taking	$113.26
SUM FOR WHICH LAND IS TAKEN. . . . . . $	$343,206.12

WITNESS my hand and seal this July 26, 2005

Carole J. Harms
CAROLE J. HARMS
CITY OF CHICOPEE

THE COMMONWEALTH OF MASSACHUSETTS

HAMPDEN, ss. DATE: July 26, 2005

Then personally appeared the above named CAROLE J. HARMS and acknowledged the foregoing instrument to be of his free act and deed as Collector of Taxes,
before me, Janina Surdyka Notary Public

My commission expires March 24, 2006

JANINA SURDYKA
Notary Public
Commonwealth of Massachusetts
My Commission Expires Mar 24, 2006

DONALD E. ASHE, REGISTER
HAMPDEN COUNTY REGISTRY OF DEEDS

[SEAL]

COMMONWEALTH OF MASSACHUSETTS
LAND COURT
DEPARTMENT OF THE TRIAL COURT

Case No.: 09 TL 139010

JUDGMENT IN TAX LIEN CASE

City of Chicopee

vs.

Facemate Corporation

This case came on to be heard and was argued by counsel, and thereupon, upon consideration thereof, it is

ADJUDGED and ORDERED that all rights of redemption are forever foreclosed and barred under the following deed(s) given by and/or the tax taking(s) made by the Collector of Taxes for the City of Chicopee in Hampden County and said Commonwealth:

Land Type	Tax Taking Date	Book No.	Page No.	Document No.	Certificate of Title No.
Recorded	07/26/2005	15274	379		

Bk 18247 Pg351 #197
04-07-2010 @ 01:39p

By the Court: Deborah J. Patterson

Attest:

A TRUE COPY
ATTEST:
Deborah J. Patterson
RECORDER

Deborah J. Patterson
Recorder

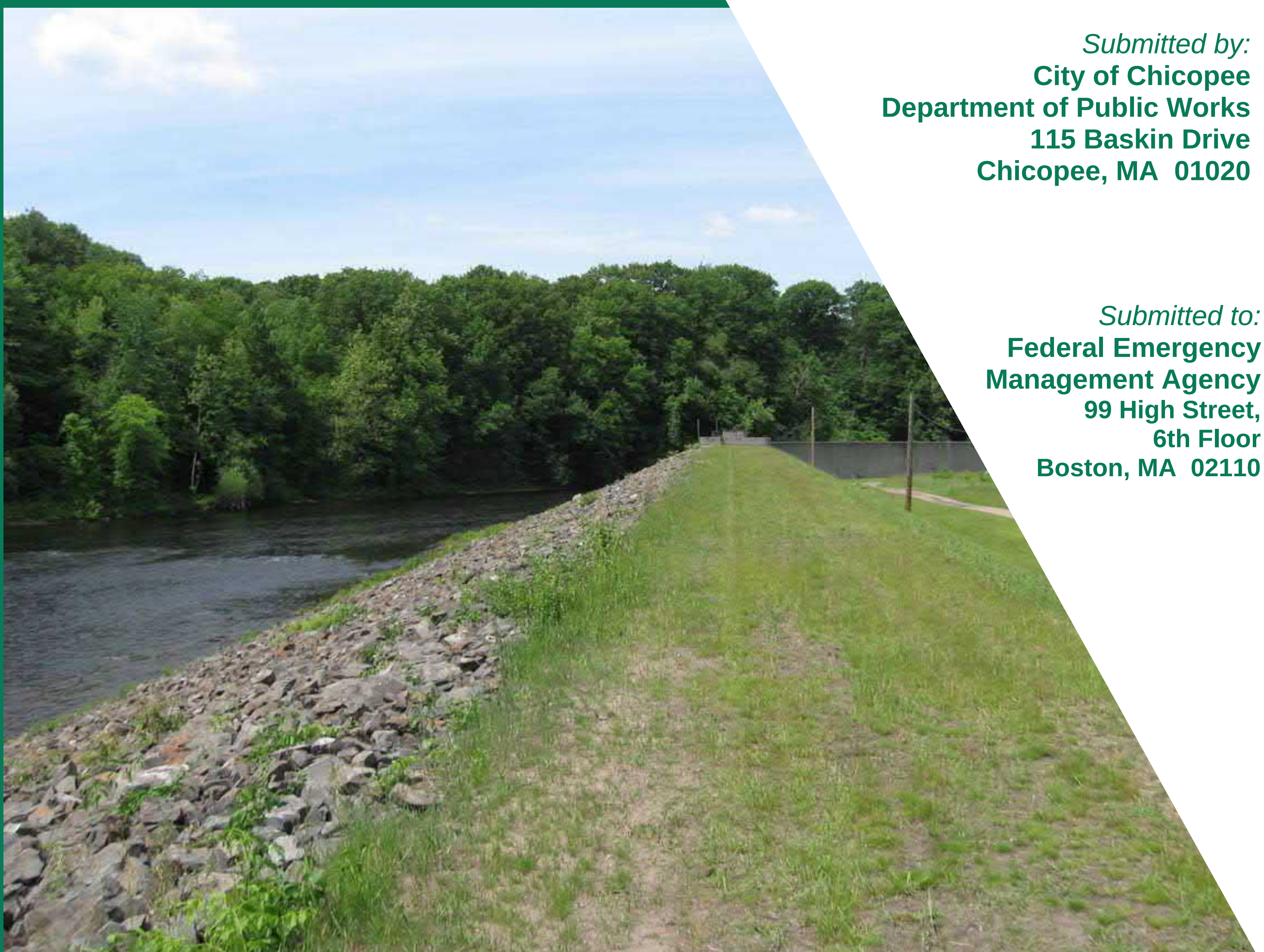
Entered: April 1, 2010

DONALD E. ASHE, REGISTER
HAMPDEN COUNTY REGISTRY OF DEEDS

APPENDIX D - Excerpts of FEMA Accreditation Report, BEC, Nov 2010

FEMA Accreditation Report
Chicopee Falls Flood Control System
Chicopee, Massachusetts

November, 2010



Submitted by:
City of Chicopee
Department of Public Works
115 Baskin Drive
Chicopee, MA 01020

Submitted to:
Federal Emergency
Management Agency
99 High Street,
6th Floor
Boston, MA 02110

Prepared by:
Baystate Environmental Consultants , Inc.
1350 Main Street, Suite 1400
Springfield, MA 01103
413-726-2100

FEMA ACCREDITATION REPORT
CHICOPEE FALLS FLOOD CONTROL SYSTEM
CHICOPEE, MASSACHUSETTS

TABLE OF CONTENTS

APPENDICES

SECTION 1

INTRODUCTION

1.1 PURPOSE AND STANDARD OF CARE

The purpose of this report is to compile and present engineering opinions, survey documentation and analyses of the Chicopee Falls Flood Control System in Chicopee, Massachusetts to the Federal Emergency Management Agency (FEMA) for their sole use in establishing risk zones for the National Flood Insurance Program (NFIP) maps. Use of this report or the opinions and findings in the report in whole or in part by any other party, or for any other project or purpose is not intended nor authorized and may lead to inappropriate conclusions. Reliance upon the information presented in this report by any other party other than FEMA, without Baystate Environmental Consultants, Inc. (BEC) prior written permission shall be at that other party's sole risk and without any liability to BEC.

The findings, opinions and conclusions contained herein are based on the work conducted as part of the contracted scope of services undertaken pursuant to contractual terms with the City and reflect professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as professional opinions and judgments built upon the limited data gathered during the course of the work. To understand how these opinions were developed, and to understand the intended use of the report, the report must be read in its entirety including the stated limitations.

The Code of Federal Regulations, Title 44 Part 65 addresses "Identification and Mapping of Special Hazard Areas" within which is Paragraph 65.10, "Mapping of areas protected by levee systems". This report is intended to document compliance with the minimum design, operation, and maintenance standards for levee systems established in 44 CFR 65.10, a copy of which is appended to this report.

This report opines that the Chicopee Falls Flood Control System meets the minimum criteria for design, operation and maintenance as established in 44 CFR 65.10 during a one-percent annual chance flood as determined by FEMA and issued in April, 2009, within the preliminary Flood Insurance Study and Flood Insurance Rate Maps for Hampden County, Massachusetts which includes all of the City of Chicopee. It must be noted that the one-percent annual chance flood is used by FEMA only as a flood insurance criterion.

1.2 LOCATION AND DESCRIPTION OF FLOOD CONTROL SYSTEM

The Flood Control Works in the City of Chicopee, Hampden County, Massachusetts was constructed by the United States Army Corps of Engineers (USACE) in four separate systems, namely the Plainfield Street Flood Control System, the South Bank Chicopee River Flood Control System, the Willimansett Flood Control System, and the Chicopee Falls Flood Control System. In total, the Flood Control Works within the City consists of 25,820 linear feet of earthen levee, 7,500 linear feet of flood control walls, eight pumping stations, three cast-in-place concrete closure structures, and various appurtenant drainage features. Figure 1 is a locus plan of the four systems in Chicopee. Although all four systems do share a common Operation and Maintenance Manual, each system is physically independent from one another. As such, individual Accreditation Reports have been prepared for each system.

The Chicopee Falls Flood Control System consists of two segments of cast-in-place concrete flood walls and two segments of earthen levee, extending along the southern bank of the Chicopee River from the Deady Memorial Bridge to higher ground at a railroad, for a total length of 5,002 linear feet. USACE plans for this section are dated 1963. In addition, two stormwater pumping stations were constructed: the Main Street Pumping Station and the Oak Street Pumping Station. Following is a description of the system based upon the USACE plans and other available information.

From the Deady Bridge at Station 4+13, a segment of cast-in-place cantilever concrete wall extends westerly (downstream) for 557 linear feet to Station 9+70. The first 400± feet of wall is founded directly on ledge with rock anchors, while the last 157 feet is founded on earth. The exposed wall height is approximately 20 feet on both the landside and riverside. A perforated pipe toe drain surrounded by stone and filter sand was installed adjacent to the wall footing on the landward side from Station 6+80 to the downstream end of the wall. Stone slope protection was installed on the riverside of the wall starting at Station 5+90 and continues to the earthen levee slope protection, which begins at Station 9+70.

An earthen levee was constructed from Station 9+70 to Station 16+82 for a length of 712 feet, including riprap slope protection on the riverside and a perforated pipe toe drain surrounded with stone and filter sand along the bottom of the levee slope on the landside. The typical levee cross section consists of compacted random fill on the landside and compacted impervious soil on the riverside, including an impervious foundation cutoff. The top of levee is approximately 17 feet higher than the landside grading.

A second segment of cast-in-place cantilever concrete floodwall extends from Station 16+82 to Station 25+45 for a length of 863 feet. This wall segment is located on the inside of a bend of the Chicopee River where flow direction turns approximately 90 degrees from westerly to southerly. This entire segment of wall is founded directly on ledge, and a perforated pipe toe drain surrounded by stone and filter sand was installed adjacent to the wall footing on the landside. Riprap slope protection was installed on the riverside. The wall stem has an exposure of approximately 16 feet on the landside and 20 feet facing the river. The Main Street Pumping Station was constructed into the wall at Station 24+20.

A second segment of earthen levee extends 2,870 linear feet from Station 25+45 to Station 54+15. Riprap slope protection on the riverside and a toe drain on the landside were also constructed. The typical cross section consists of compacted random fill on the landside with compacted impervious soil on the riverside with an impervious foundation cutoff. The Oak Street Pumping Station was built into the levee at Station 49+15. Two gate valves with catwalk access are located in this segment in close proximity to the pumping station. One was an intake for the now defunct U.S. Rubber Company facility with associated improvements, while the other is an outlet from the Oak Street Pumping Station. A new downstream pressure drain is also shown on the USACE plans downstream from the pumping station near Station 52+50.

A collector drain line was constructed on the landside of the system from Station 7+00 to the Main Street Pumping Station and also from Station 34+70 to the Main Street Pumping Station. A second drainage line that discharges to the Oak Street Pumping Station was also built adjacent to the levee toe on the landside from Station 39+00 to Station 51+20. The USACE constructed a pressure drain with an inlet upstream of the Deady Bridge at the Chicopee River Falls gatehouse to an outlet through the levee at Station 36+10. The pressure line was controlled by various sluice gates and appears to have provided process water to various manufacturing facilities within the area protected by the Chicopee Falls system. The USACE plans indicate that the section of the drain from the gatehouse to the manhole at Station 3+00 was only temporary and was to be removed when the process water line was no longer needed. A bypass was also constructed that tied the pressure drain into the collector drain at Station 39+00.

The Chicopee Falls Flood Control System also included the relocation and/or widening of a 3,700± ft segment of the Chicopee River. From approximately Sta. 30+17 to 52+00±, the river was relocated from east to west by excavation of the western (right) bank to an elevation of 75.0 ft (Mean Sea Level Datum) with a newly constructed bank rising on a 1 on 2 slope to a 15-ft wide shelf at elevation 81.0. The eastern (left) bank was filled in association with construction of the earthen levee. Three storm drain outfalls discharging at the right bank were modified to accommodate the relocated riverbank. From Sta. 52+00± to a point approximately 1,330 ft downstream of the end of the Chicopee Falls Flood Control Works, the channel was widened by excavation of the western (right) bank to an elevation of 75.0 ft (Mean Sea Level Datum) with a newly constructed bank rising on a 1 on 2 slope to a 15-ft wide shelf at elevation 81.0. The elevation increases from the shelf at a 1 on 2.5 slope until meeting natural high ground. No alterations were made to the eastern (left) bank downstream of the end of the levee.

During a visual inspection of current conditions along this system and based upon a comparison to prior documents, a number of changes were noted to have taken place since the original construction by the Corps of Engineers. Although not intended to be a complete listing, identified changes include:

1) The Oak Street and Main Street Pumping Stations were upgraded in a contract by the City in approximately 1999. All work was approved by USACE according to the City. Under that contract the roofs were replaced. New fuel tanks were installed to meet standards for spill prevention.

2) The Deady Memorial Bridge over the Chicopee River was rebuilt and the last concrete floodwall panel adjacent to and connecting with the bridge abutment appears to have been reconstructed.

3) The USACE plans indicate that the section of the former industrial water intake (leading to the pressure flow process water line) in the Deady Bridge area from the gatehouse to the manhole at Station 3+00 was only temporary and was to be removed when the process water line was no longer needed. According to the City, the line has reportedly been abandoned and is understood to be closed.

4) Storm drainage has been installed at the rebuilt Deady Memorial Bridge with manholes at the corners of the southern abutment connected to a pipe installed along the riverside face of the flood control wall. A small concrete wall was constructed in front of the floodwall and the storm drain pipe installed between the two walls at a shallow depth with the pipe partially exposed. The pipe is corrugated metal approximately 30 inches in diameter and visually terminates at a concrete (thrust) block cast against the floodwall on the riverside near Station 6+50. It is surmised that the drain line turns perpendicular to the wall at this concrete block and discharges to the river.

5) A power line was installed with a vertical riser on the riverside face of the floodwall near Station 6+75.

6) A hydropower generating facility was built on the riverside of the floodwall with an intake at the Chicopee Falls.

7) A gravel vehicle access drive to the power generating facility was installed near Station 10+00. An access way on the landside from Main Street ramps up to the top of the levee, crosses over to the riverside, turns parallel to the river and slopes downward in front of the upstream floodwall. The drive has a locked gate on the landside of the levee.

8) Access to the Oak Street Pumping Station is no longer possible through the closed U.S. Rubber Company plant site. A gravel vehicle access drive has been constructed from the right of way near Station 10+00 along the landward toe of slope to the Main Street Pumping Station. The gravel drive continues toward the Oak Street Pumping Station including a paved ramp from the landside toe at Station 35+50 to Station 36+25. Thereafter, the access drive is along the top of levee to a turnaround at the downstream limit of the levee.

9) The industrial water intake for the former U.S. Rubber Company plant near the Oak Street Pumping Station has been closed since the factory stopped operation and is exercised annually by the City.

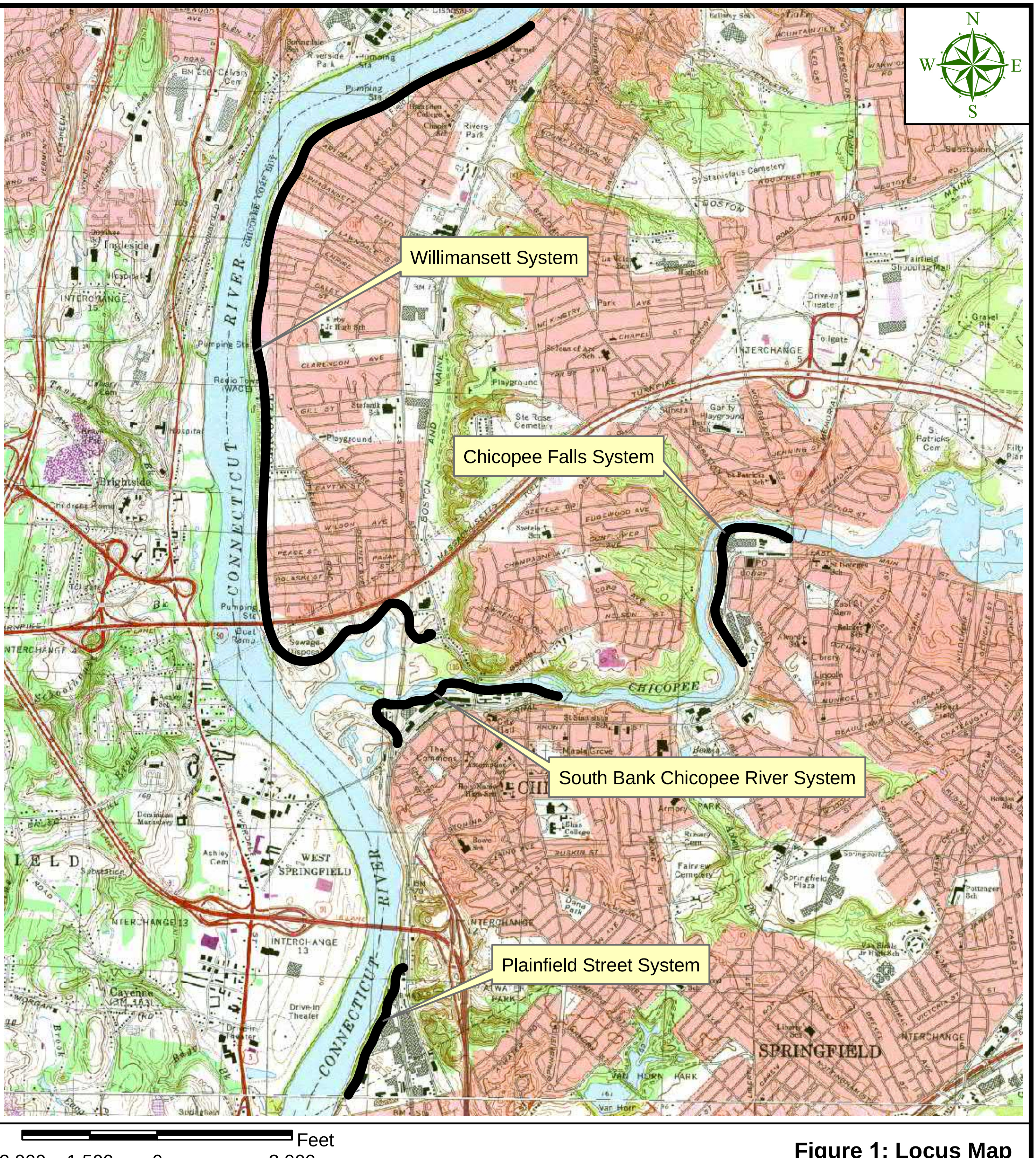


Figure 1: Locus Map

FEMA Accreditation Report
City of Chicopee
Flood Control Works

Chicopee, Massachusetts

USGS TOPOGRAPHIC QUADRANGLE MAP
SPRINGFIELD NORTH, MA, 1979

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA

Data obtained from MASS GIS, Commowealth of Massachusetts
Executive Office of Environmental Affairs (EOEA)

Figure 2: Chicopee Falls System

FEMA Accreditation Report
City of Chicopee
Flood Control Works
Chicopee, Massachusetts

Legend

Flood Wall

Flood Levee

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA

MassGIS Orthophoto (2005) obtained from MASS GIS,
Commonwealth of Massachusetts Executive Office of Environmental Affairs (EOEA).

1.3 REPORT LIMITATIONS

1. This Report has been prepared for the exclusive use by FEMA for specific application to the accreditation of these flood control works for their sole purpose of establishing risk zones for the National Flood Insurance Program, in accordance with generally accepted engineering practices. No other warranty, express or implied, is made.

2. This Report has been prepared for the purpose of allowing the City of Chicopee, MA to fulfill its responsibility to provide data and documentation to FEMA demonstrating that the flood control system meets the criteria within 44 CFR 65.10. This Report is a compliance determination by Baystate Environmental Consultants, Inc. (BEC) and is not a determination of how the flood control works will perform in an actual flood event.

3. The observations described in this Report were made under the conditions stated. The opinions, conclusions and results presented in the Report were based solely on the services described, and not on scientific tasks or procedures beyond the scope of described services or the time constraints of the project.

4. In preparing this Report, BEC has relied on certain information provided by the City of Chicopee as well as Federal, state, and local officials and other parties referenced. BEC has also relied on certain information contained in the files of the City as well as Federal, state, and local officials and other parties which were available to BEC at the time of the analysis. Although there may have been some degree of overlap in the information provided by these various sources, BEC did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this work.

5. In reviewing this Report, it should be realized that the reported existing conditions of the various components of the flood control system are based on observations of field conditions during the course of the evaluation along with data made available to BEC. The observations of conditions in the field reflect only the situation present at the specific moment in time the observations were made, under the specific conditions present.

6. It is important to note that the condition of any flood control system depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the flood control system will continue to represent the condition of the flood control system at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions or increased risk may be detected.

7. BEC based any hydraulic analyses on existing conditions, site plans made available to BEC as of the date of this Report, prior hydraulic studies completed by others and made available, or upon field reconnaissance. In the event that any changes in the nature,

design or location of the flood control system, its appurtenant structures, or drainage areas contributing to the pumping stations are planned, the conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed and conclusions of this Report are modified or verified by BEC. Any BEC hydrologic analyses presented herein are for the rainfall volumes and distributions stated herein. For storm or riverine flood conditions other than those analyzed, the response of the flood control works and pumping stations has not been evaluated.

8. Relative to subsurface conditions, the generalized soil profiles provided in this Report and on our subsurface exploration logs are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location, refer to the exploration logs. Actual subsurface conditions are likely more complex than indicated in the Report. Mathematical modeling is, by its very nature, a simplification of actual conditions. In constructing the model, point specific data was generalized and extrapolated across the study area. In addition, in areas where field data was not available, professional judgment, based on experiences and regional information, was relied upon to construct the model.

9. Water level readings have been made in test holes and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. However, fluctuations in the level of the groundwater occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The observed water table may be other than indicated in the Report.

10. Our services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

11. Observations or opinions regarding foundation drainage, waterproofing, and moisture control address the conventional geotechnical aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

1.4 AUTHORIZATION

On May 23, 2007 the City of Chicopee entered into a contract for professional services with BEC relative to the City's Flood Control Works. This contract was subsequently amended on September 9, 2009, to include the work task to, "conduct an engineering evaluation of the flood control works and prepare data and documentation for the City to submit to FEMA for accreditation to demonstrate the flood control works meets the requirement of the National Flood Insurance Program as per current Code of Federal Regulations, (44 CFR Section 65.10)". A copy of the original contract with terms and conditions as well as a copy of the September 9, 2009 amendment are appended to this report. This report concludes this work task as related to the Chicopee Falls Flood Control System and is subject to the terms and conditions of the amended contract.

SECTION 2

LEVEE SYSTEM EVALUATION

2.1 STATEMENT OF LEVEE SYSTEM EVALUATION
Date of Statement: November 12, 2010

This Statement of Levee System Evaluation is made solely to the U.S. Federal Emergency Management Agency (FEMA) for the purpose of obtaining accreditation of the Chicopee Falls Flood Control System in the City of Chicopee, Hampden County, Massachusetts, one of four separate systems owned, operated and maintained by the City. Reliance upon this Statement by any other party without written authorization from the signatory is at such other party's sole risk and without any liability to BEC or the signatory.

This Statement is made in accordance with the requirements stated in the Code of Federal Regulations, Title 44 – Emergency Management and Assistance, Part 65 – Identification and Mapping of Special Hazard Areas (10-1-07 Edition). The meaning and context of the term "certification", is derived from the definition provided in 44 CFR 65.2 (b), which states:

> *For the purpose of this part, a certification by a registered professional engineer or other party does not constitute a warranty or guarantee of performance, expressed, or implied. Certification of data is a statement that the data is accurate to the best of certifier's knowledge. Certification of analyses is a statement that the analyses have been performed correctly and in accordance with sound engineering practices. Certification of structural works is a statement that the works are designed in accordance with sound engineering. Certification of "as-built" conditions is a statement that the structure(s) has been built according to the plans being certified, is in place, and is fully functioning.*

"Sound engineering practices" are defined by the signatory as performed in a manner consistent with the degree of skill and care ordinarily exercised by members of the engineering profession currently practicing in the same locality under similar conditions.

Analyses have been limited to the "Base flood" test condition only, to be utilized by FEMA to establish risk zone determinations under the NFIP. For the purposes of this Statement, the "Base flood" is defined by FEMA as the one-percent annual chance flood, documented in the Flood Insurance Study, Hampden County, Massachusetts and Incorporated Areas, Volume 1, 2 and 3 and dated "Preliminary, April 30, 2009".

"As-built" is defined as and limited by the signatory to those visual attributes which could be observed, mapped and documented on the enclosed topographic survey and the field investigations documented in this report. BEC did not observe nor document the original construction of the Chicopee Falls Flood Control System or subsequent construction activities and use of the "As-built" plans other than for general informational purposes is at the user's sole risk.

"Fully functional" is defined by the signatory as the physical conditions as of the Date of Statement.

This Statement applies solely to the development of National Flood Insurance Program insurance rates and is not a representation that any accredited levee will provide for the safety, health, and welfare of the public.

In accordance with 44 CFR 65.2 (b) and as supported by the information contained within this report, this is to state that:

- DATA – The data presented within this submission is accurate to the best of the signatory's knowledge.

- ANALYSES – The analyses have been performed correctly and in accordance with sound engineering practices.

- STRUCTURAL WORKS – The works are designed in accordance with sound engineering practices to provide protection from the base flood.

- "AS-BUILT" CONDITION – The structure(s) has been built according to the plans, is in place, and is fully functional to the best of the signatory's knowledge.

This Statement is provided in accordance and consistent with the definitions provided in 44 CFR 65.2(b) and further per the definitions and limitations described within this report and the subsequent Engineer's Opinions, mapping and documentation.

COMMONWEALTH OF MASSACHUSETTS
HARRY R. JONES
No. 30037
REGISTERED PROFESSIONAL ENGINEER

Harry R. Jones, P.E.
Baystate Environmental Consultants, Inc.
296 North Main Street
East Longmeadow, MA 01028

Date: Nov. 12, 2010

2.2 RESIDUAL RISK AND PUBLIC SAFETY

Under the NFIP, levee certification is a prerequisite for receiving levee accreditation from FEMA. With an accredited levee, areas which would otherwise be subject to flooding by the one-percent annual chance flood event will be designated as Zone X or moderate risk zone, as opposed to Zone A or high risk zone. The single and only purpose for this report is a determination of compliance with 44 CFR 65.10, and as such, a distinction must be emphasized between this report's purpose and the issue of public safety.

Risk is the product of the probability of an event's occurrence and the consequences or damages related thereof. FEMA has established a uniform probability factor of one-percent for the annual chance flood event as the means of determining flood insurance rates on a national basis. Since FEMA applies this same probability to a site with nominal or low consequences as well as to those sites with a severe or high consequence, the degree of risk varies and is not uniformly applied to all flood control systems. At the Chicopee Falls system, significant loss of lives and property could result. Thus, a significant public safety risk remains associated with the Chicopee Falls Flood Control System regardless of any designation under the NFIP. The Chicopee Falls system may reduce the probability of flooding but it does not eliminate the risk.

The Chicopee River has a long history of severe flooding events that have impacted the vicinity of the Chicopee Falls Flood Control System. The flooding events of September, 1938 and August, 1955 directly led to the USACE's construction of the Chicopee Falls system. According to the December, 1962 Chicopee Falls Local Protection Project Design Memorandum No. 2 by the USACE, the maximum flood of record on the Chicopee River had a peak discharge of 45,200 CFS in September, 1938, as recorded in Springfield. The report also noted that the Chicopee Falls Local Protection Project was designed for a flood discharge of 70,000 CFS at Chicopee Falls. The current FEMA Flood Insurance Study documents the estimated flood discharge for the one-percent annual chance flood (100-year) event as 32,000 CFS whereas that of the 0.2-percent annual chance flood (500-year) event to be 62,000 CFS. From a numerical perspective, this accreditation documents the performance of this system when subjected to an annual chance flood peak flow rate which is just over 70% of the documented flood of record flow rate and only 45% of that in the original USACE design.

SECTION 3

ENGINEER'S OPINIONS OF DESIGN CRITERIA

3.1 EVALUATION OF FREEBOARD - 44 CFR 65.10(b)(1)

This minimum design standard as stated in 44 CFR 65.10(b)(1) specifies the following:

1.) *Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood* (one-percent annual chance flood).

2.) *An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted.*

3.) *An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.*

To verify this design standard, a system profile was prepared and is reproduced in the attached Appendix A-4.1. The system extends from the Deady Bridge downstream 5,002 feet to higher ground at a railroad embankment. Actual field spot elevations along the top of the system were obtained by Heritage Surveys, Inc. in October-November, 2009 taken at an approximate five hundred foot interval and are reproduced on the "As-Built" drawings, dated December, 2009. The top of system is illustrated on the profile as a solid black line with spot elevations indicated. The base flood profile information was obtained from the Preliminary Flood Insurance Study, Hampden County, Massachusetts, FIS #25013CV001, April, 2009 and is represented as a blue line on the system profile.

The freeboard criteria are also illustrated on the profile in red shading, Criteria One being a uniform three feet above the base flood elevation. Criteria Two applies at the Deady Bridge site. Criteria Three is additive to Criteria One and Two and is also illustrated in red. At all locations along the Chicopee Falls system, the top of wall or top of levee elevations are higher than the base flood elevations plus the applicable freeboard criteria.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System in Chicopee, Massachusetts meets the 44 CFR 65.10(b)(1) freeboard requirements for the base (one-percent annual chance) flood.

Opinion offered by:

COMMONWEALTH OF MASSACHUSETTS
THOMAS E. JENKINS, JR.
CIVIL
No. 36450
REGISTERED PROFESSIONAL ENGINEER

Thomas E. Jenkins, P.E.
BEC, Inc.
296 North Main Street
East Longmeadow, MA 01028

(Seal and Date)

11/12/10

3.2 EVALUATION OF CLOSURES - 44 CFR 65.10(b)(2)

This minimum design standard as stated in 44 CFR 65.10(b)(2) specifies the following:

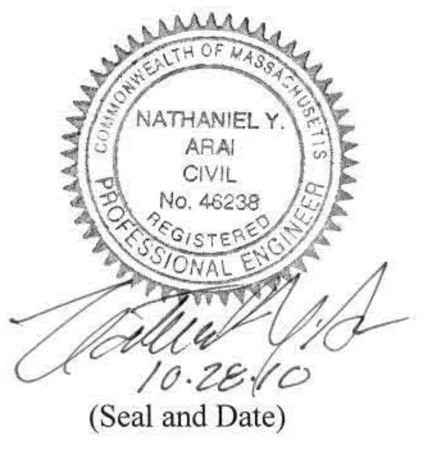
All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.

To verify this design standard, a closures report was prepared including a matrix of Flood System Penetrations Summary which is reproduced in Appendix A-4.2. All documented openings passing through the Chicopee Falls system outlet to the Chicopee River. In addition to the discharge lines from the Main Street and Oak Street Pumping Stations, four penetrations identified in the USACE plans were field verified. One is a pressure drain controlled by a sluice gate located upstream near West Main Street that is operated and maintained by the City. Another is the discharge pipe from a single grated basin located at the crest of the levee, well above the one-percent chance flood elevation. The third opening is a prior industrial intake line closed by a gate valve that is now operated and maintained by the City. Last is a pressure drain pipe from a storm drain system located well above the one-percent chance annual flood elevation.

Both pumping stations have outfalls that discharge by gravity flow during normal river flow events. During high flow conditions, gates are closed on the gravity discharge lines and interior flows are diverted to the pumping stations which then pump drainage flows to the river. Each pump is protected against backflow in the event that it may not be in operation at any time during river flooding. All gates and valves are maintained and operated by the City.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System in Chicopee, Massachusetts meets the 44 CFR 65.10(b)(2) closures requirements for the base flood (one-percent annual chance flood).

Opinion offered by:



Nathaniel Y. Arai, P.E.
BEC, Inc.
296 North Main Street
East Longmeadow, MA 01028

(Seal and Date)

3.3 EVALUATION OF EMBANKMENT PROTECTION - 44CFR65.10(b)(3)

This minimum design standard as stated in 44 CFR 65.10(b)(3) specifies the following:

Engineering analyses must be submitted that 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 to be addressed in such analyses include, but are not limited to: Expected flow velocities (especially in constricted areas); 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.

To verify this design standard, an Embankment Protection Analysis, Chicopee Falls Flood Control System was prepared, dated October 2010. A copy of this analysis is reproduced in the attached Appendix A-4.3. The analysis was performed in accordance with applicable methods and guidelines in the USACE Engineering Manual on Hydraulic Design of Flood Control Channels (EM 1110-2-1601, Change 1, 30 Jun 94), USACE Coastal Engineering Manual, Part II (EM 1110-2-1100, Change 2, 1 August 2008), and the United States Department of Agriculture, Soil Conservation Service (USDA SCS) Handbook of Channel Design for Soil and Water Conservation (TP-61, 1954).

The side slope flow velocities at various cross sections of the Chicopee River along the reach of the Chicopee Falls Flood Control System were below the acceptable velocities for riprap slope protection as present and thus the riprap protection is adequate. In the area where riprap is not present, the floodwall is founded directly on ledge with rock anchors, thus any erosion of the embankment in this area is unlikely to cause failure of the floodwall. Wind and wave action was based upon wave height determined at this site to be 1.6 feet. The available freeboard for the base flood is approximately 7.1 feet thus indicating that overtopping and related erosion and failure is not expected to occur. Average channel velocities are such that it is not expected that any impacts of ice or debris will cause significant damage to the system.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System in Chicopee, Massachusetts meets the 44 CFR 65.10(b)(3) embankment protection requirements for the base (one-percent annual chance) flood.

Opinion offered by:

COMMONWEALTH OF MASSACHUSETTS
ROSALIE T STARVISH
CIVIL
No. 46718
REGISTERED PROFESSIONAL ENGINEER

Rosalie T. Starvish, P.E.
BEC, Inc.
296 North Main Street
East Longmeadow, MA 01028

(Seal and Date)

3.4 EVALUATION OF EMBANKMENT AND FOUNDATION STABILITY – 44 CFR 65.10(b)(4)

This minimum design standard as stated in 44 CFR 65.10(b)(4) specifies the following:

Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II), may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical location, embankment and foundation materials, embankment compaction, penetration, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).

To verify this design standard, seepage was evaluated by creating typical levee cross-sections based upon recent topographic survey information, recent boring logs, historical boring logs (USACE pre-construction borings), laboratory data, empirical correlations from SPT N-value data and engineering literature. These parameters were input into SEEP/W 2007, a two-dimensional finite element seepage modeling software created by GEO-SLOPE International, Ltd. Models were analyzed with and without the toe-drain to analyze additional load cases that could impact seepage through the levee. Flow and exit gradients were computed within the toe drain and at the landside toe of the levee and were all below the limiting gradient of 0.5 per US Army Corps Technical Letter ETL 110-2-569 *Design Guidance for Levee Underseepage* for Normal and 100 Year Flood elevations.

The parent SEEP/W model was incorporated into SLOPE/W, a two-dimensional finite element slope stability modeling software created by GEO-SLOPE International, Ltd. with additional parameters including unit weight, strength and internal friction angle based upon laboratory data and empirical correlations from SPT N-value data and engineering literature. Factors of Safety against slope failure on the landside and riverside were analyzed under normal and 100 flood (steady-state and sudden drawdown conditions).

Based upon our slope stability evaluation of the Chicopee Falls levee, it is our opinion that the levee is in compliance with 44 CFR 65.10 (4). Summary sheets showing computed factors of safety for the various loading conditions and for each cross-section can be found in Appendix A-4.4.

A qualitative liquefaction analysis was performed on the Chicopee Falls Levee to evaluate whether the levee exhibited certain characteristics that would make it more susceptible to liquefaction (i.e. soil samples with high N-values and high fines contents are generally not as susceptible to liquefaction as loose, clean sands with low fines contents). It is our opinion that based upon the qualitative liquefaction analysis, a more in-depth quantitative analysis was not required.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System in Chicopee, Massachusetts meets the 44 CFR 65.10(b)(4) embankment and foundation requirements for the base flood (one-percent annual chance flood).

Opinion offered by:

Anders B. Bjarngard, P.E.
GZA GeoEnvironmental, Inc.
1 Edgewater Drive
Norwood, MA 02062

COMMONWEALTH OF MASSACHUSETTS
ANDERS B.
BJARNGARD
CIVIL
No. 39768
REGISTERED
PROFESSIONAL ENGINEER

(Seal and Date)

3.5 EVALUATION OF SETTLEMENT - 44 CFR 65.10(b)(5)

This minimum design standard as stated in 44 CFR 65.10(b)(5) specifies the following:

Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address 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) must be submitted.

To verify this design standard, primary and secondary settlement of the varved foundation soils were estimated using one-dimensional consolidation theory, empirical correlations and published literature, as well as GZA's recent boring and survey information. Consolidation of granular soils was considered to occur immediately and to have been accounted for during the construction of the levee. Settlement analysis was conducted in general accordance with EM 1110-1-1904 *Settlement Analysis*, published by the USACE, dated September 30, 1990.

Primary settlement was estimated at approximately 3 inches, 90% of which was estimated to have been completed by 1964. Since end of primary consolidation, an estimated one-half inch of secondary settlement has occurred, resulting in a total of about 3.5 inches since construction. Approximately ¼ to ½ inch of secondary settlement (also known as creep) is expected to occur over the next 50-100 years.

Based upon our settlement evaluation of the Chicopee Falls Levee, it is our opinion that the levee is in compliance with 44 CFR 65.10(b)(5) and that freeboard has not sufficiently been affected by resulting post-construction settlement. Any increase in fill or loading above the USACE record drawings and recent survey by Heritage Survey renders this opinion null and void.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System in Chicopee, Massachusetts meets the 44 CFR 65.10(b)(5) settlement requirements for the base flood (one-percent annual chance flood).

COMMONWEALTH OF MASSACHUSETTS
ANDERS B. BJARNGARD
CIVIL
No. 39766
REGISTERED PROFESSIONAL ENGINEER

Opinion offered by:

Anders B. Bjarngard, P.E.
GZA GeoEnvironmental, Inc.
1 Edgewater Drive
Norwood, MA 02062

(Seal and Date)

3.6 EVALUATION OF INTERIOR FLOODING - 44CFR65.10(b)(6)

This minimum design standard as stated in 44 CFR 65.10(b)(6) specifies the following:

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

To verify this design standard, an Interior Flooding Analysis, Chicopee Falls Flood Control System was prepared, dated May, 2010 and submitted to FEMA for review and acceptance under the technical appeal process. A copy of this analysis along with the appeal resolution letter from FEMA dated July 19, 2010 are reproduced in the attached Appendix A-4.6. The analysis was conducted in accordance with the USACE's Engineering Circular on Certification of Levee Systems (EC 1110-2-6067) and their Engineer Manual, Hydrologic Analysis of Interior Areas (EM 1110-2-1413). The Coincident Frequency Method was utilized for this analysis due to the relative independence of the exterior (i.e., river flooding) event to the interior (localized flooding) event.

A total area of 16 acres drains to the Main Street Pumping Station and 15 acres drains to the Oak Street Pumping Station based upon information provided by the City and existing topographic mapping from the digital elevation model provided by FEMA which in turn was based upon a Light Detection and Ranging(LiDAR) survey. The discharge rates of the pumping stations were based upon the original pump test curves provided by the manufacturer of the installed pumps. The Chicopee River Stage Frequency curves were developed from USGS gage data at Indian Orchard, Springfield which had a record period of 82 years.

The Coincident Frequency Analysis concluded that the one-percent chance interior flooding elevation was lower than the lowest ground surface elevation within the Main Street and the Oak Street Pumping Station drainage areas and therefore there is no interior flooding associated with the base flood at the Chicopee Falls Flood Control System.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System in Chicopee, Massachusetts meets the 44 CFR 65.10(b)(6) interior drainage requirements for the base flood.

Opinion offered by:

Rosalie T. Starvish, P.E.
BEC, Inc.
296 North Main Street
East Longmeadow, MA 01028

(Seal and Date)

3.7 EVALUATION OF OTHER DESIGN CRITERIA (STRUCTURAL) - 44CFR65.10(b)(7)

This minimum design standard as stated in 44CFR65.10(b)(7) specifies the following:

In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide the rationale for requiring this additional information.

To the best of our knowledge FEMA has not identified other design criteria in need of evaluation for the Chicopee Falls Flood Control System. However it is the signatory's opinion that a structural evaluation of the flood protection walls was warranted. The objectives of our structural evaluation were to determine, with reasonable certainty, that the structures meet current design standards and are in a suitable condition to perform as intended and therefore meet the requirements of 44CFR65.10(b)(7). This evaluation of the Chicopee Falls Flood Control System floodwalls was accomplished by visiting the site and viewing the structures; reviewing available original design drawings, Construction Drawings, calculations, and previous inspection reports; evaluating recently collected site data; and performing structural calculations in accordance with current design standards.

Guidance in the performance of our structural evaluation was taken from the U. S. Army Corps of Engineers Draft Technical Letter No. 1110-570, *Certification of Levee Systems for the National Flood Insurance Program (NFIP)*, 12 September 2007. Parameters used in our calculations included the existing available design and construction documentation and data obtained from recently completed topographic surveys, subsurface exploration programs, laboratory testing and hydraulic analyses.

Our structural engineers visited the subject site on December 17, 2009. They walked the length of the system to visually observe the condition of the exposed portions of the flood wall.
Our structural engineers reviewed the original design documents in order to determine the assumed loading conditions and to review how the structural elements were designed. The result of the original analysis was compared to the current USACE guidance to verify that the structures meet current design requirements specified in the following documents:

1. USACE Manual EM 1110-2-2100 *Stability Analysis of Concrete Structures.*
2. USACE Manual EM 1110-2-2104 *Strength Design for Reinforced Concrete Hydraulic Structures.*
3. USACE Manual EM 1110-2-2502 *Retaining and Flood Walls.*

A total of 11 different wall sections have been evaluated using methods prescribed in USACE Manual EM 1110-2-2502 *Retaining and Flood Walls.* Our engineers evaluated each section for the load condition resulting from the one-percent-annual chance flood as required by FEMA Regulations 44 CFR 65.10. The floodwalls were evaluated for sliding stability, overturning stability, foundation soil bearing capacity and strength and serviceability of the structural members. A presentation of our analyses, methods and results can be found in Appendix A-4.7.

Based on our observations, the floodwalls appear to be constructed as indicated in the Record Drawings and to be structurally sound. The results of our analyses indicate that, as originally designed, the structures meet current design standards for the base flood event.

It is the opinion of this professional engineer that the Chicopee Falls Flood Control System floodwalls meet the requirements of 44CFR65.10(b)(7) for the base flood (one-percent annual chance flood).

Opinion offered by
Dino D. Fiscaletti, P.E.
GZA GeoEnvironmental, Inc.
530 Broadway
Providence, RI 02909

COMMONWEALTH OF MASSACHUSETTS
DINO D.
FISCALETTI
STRUCTURAL
No. 35621
REGISTERED
PROFESSIONAL ENGINEER

10/22/10

SECTION 4

ENGINEER'S OPINION OF OPERATION PLANS AND CRITERIA

4. ENGINEER'S OPINION OF OPERATION PLANS AND CRITERIA

Operation of the Chicopee Falls Flood Protection System levee embankment, floodwalls, pump stations, and penetrations is the responsibility of the Chicopee Department of Public Works as detailed in the appended Operation and Maintenance (O&M) Manual, Chicopee and Chicopee Falls, Massachusetts, Local Protection Projects, Connecticut and Chicopee Rivers, October, 2010. This document was officially adopted by the City Council as the Operations and Maintenance Manual for all flood protection systems in the City of Chicopee, MA.

In BEC's opinion, this operation plan as detailed in the O&M Manual:

- Establishes all operation activities are under the jurisdiction of the City of Chicopee Department of Public Works;

- For Closures: Documents the flood warning system used to trigger emergency operation activities and demonstrates that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before flood waters reach the base of the closure; a formal plan of operation including specific actions and assignments of responsibility by individual name or title, and provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes;

- For Interior Drainage Systems: Documents the flood warning system used to trigger emergency operation activities and demonstrates that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system, a formal plan of operation including specific actions and assignments of responsibility by individual name or title; provision for manual backup for the activation of automatic systems, and provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes with no more than one year lapse between either the inspections or the operations.

Other operating plans and criteria to ensure that adequate protection is provided in specific situations have not been identified by FEMA to the knowledge of BEC.

In accordance with the definitions and limitations set forth in 44 CFR 65.2(b), it is the opinion of this professional engineer that this O&M Manual meets the minimum operation requirements specified in 44 CFR 65.10(c).

Opinion offered by:

COMMONWEALTH OF MASSACHUSETTS
ROSALIE T
STARVISH
CIVIL
No. 46718
REGISTERED
PROFESSIONAL ENGINEER

Rosalie T. Starvish, P.E.
BEC, Inc.
296 North Main Street
East Longmeadow, MA 01028

(Seal and Date)

SECTION 5

ENGINEER'S OPINION OF MAINTENANCE PLANS AND CRITERIA

5. ENGINEER'S OPINION OF MAINTENANCE PLANS AND CRITERIA

Maintenance of the Chicopee Falls Flood Protection System levee embankment, floodwalls, pump stations, and penetrations is the responsibility of the Chicopee Department of Public Works as detailed in the appended Operations and Maintenance (O&M) Manual, Chicopee and Chicopee Falls, Massachusetts Local Protection Projects, Connecticut and Chicopee Rivers, October, 2010. This document was officially adopted by the City Council as the Operations and Maintenance Manual for all flood protection systems in the City of Chicopee, MA.

In BEC's opinion, this maintenance plan as detailed in the O&M Manual:

- Establishes that all maintenance activities are under the jurisdiction of the City of Chicopee Department of Public Works;
- Documents the formal procedures that ensures that the stability, height, and overall integrity of the levee and its associated structures and system are maintained;
- Specifies the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

In accordance with the definitions and limitations set forth in 44 CFR 65.2(b), it is the opinion of this professional engineer that this O&M Manual meets the minimum maintenance requirements specified in 44 CFR 65.10(d).

Opinion offered by:

Rosalie R. Starvish, P.E.
BEC, Inc.
296 North Main Street
East Longmeadow, MA 01028

COMMONWEALTH OF MASSACHUSETTS
ROSALIE T
STARVISH
CIVIL
No. 46718
REGISTERED
PROFESSIONAL ENGINEER

(Seal and Date)

SECTION 6

AS BUILT PLANS

SECTION 6. AS BUILT PLANS

44CFR65.10(e), titled "Certification requirements" includes the statement, "Also, certified as-built plans of the levee must be submitted." Also within 44CFR65.2, titled "Definitions" is the statement, "Certification of "as-built" conditions is a statement that the structure(s) has been built according to the plans being certified, is in place, and is fully functioning." In response to these requirements a topographic survey of the Chicopee Falls Flood Control System was prepared based upon aerial photography and supplemented with ground surveys performed from May, 2008 through September, 2009. "As-built" is defined as and limited to those visual attributes which could be observed and documented. BEC did not observe nor document the original construction of the Chicopee Falls Flood Control System or that of subsequent construction activities and use of the "As-built" plans other than for general informational purposes is at the user's sole risk.

The five sheet plan set of topographic mapping is enclosed within this report in Appendix A-5. Plans are titled "Chicopee Falls System, Chicopee Flood Control Works, Chicopee, MA", dated December 12, 2009 and stamped by a MA Licensed Land Surveyor.

APPENDIX A-3

GEOTECHNICAL DATA
AND
LABORATORY ANALYSES

GEOTECHNICAL DATA

CHICOPEE FALLS FLOOD CONTROL SYSTEM

CHICOPEE FLOOD CONTROL WORKS

CITY OF CHICOPEE

HAMPDEN COUNTY, MASSACHUSETTS

November, 2010

GZA GeoEnvironmental, Inc.

TABLE OF CONTENTS

Tables

Figures

Appendices

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

August 19, 2010
File No. 15.0702100.50

1 Edgewater Drive
Norwood
Massachusetts
02062
Ph: 781-278-3700
FAX 781-278-5701
http://www.gza.com

INTRODUCTION:

GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this geotechnical data report for the Chicopee Falls Levee of the Chicopee Flood Control Works in Chicopee, Massachusetts. This report presents the results of field and laboratory programs completed as part of our geotechnical study. Conclusions and recommendations relative to levee seepage and stability analysis will be provided separately. Please note that this report is subject to the limitations provided in Section 1.3. Elevations included in this report are referenced to the North American Vertical Datum of 1988 (NAVD 88). Please note that many original U.S. Army Corps. of Engineers project plans and documentation are in the Means Sea Level datum, approximately 0.7 feet above the NAVD 88 datum in the Chicopee local area. (MSL-0.7'=NAVD 88)

BACKGROUND

GZA's understanding of the project is based on our work at the site, discussions with the City of Chicopee Department of Public Works, and the following project documents:

- A drawing set entitled "Chicopee Falls, Chicopee River, Massachusetts," prepared by Green Engineering Affiliates, Inc., Boston, MA for the U.S Army Engineer Division, Waltham, MA, dated April 1963, sheets 1-63;

- A design memorandum entitled, "Chicopee Falls, Local Protection Project, Chicopee River, Massachusetts, Design Memorandum No. 5, Embankments and Foundations," prepared by the U.S Army Engineer Division, New England Waltham, MA, dated March 1963, 16 pp;

- A five sheet plan set of topographic mapping prepared by Heritage Surveys, Inc. dated December 12, 2009 and entitled "Topographic Plan of Land in Chicopee, Massachusetts, Surveyed for the City of Chicopee.

EXISTING CONDITIONS

In response to significant flooding events in the 1930s and 1950s, flood control works were designed and constructed by the United States Army Corps of Engineers (USACE) for locations along the Chicopee and Connecticut Rivers in the City of Chicopee (City). Construction along the Connecticut River and the North and South Banks of the Chicopee River was conducted in a series of construction contracts initiated in 1938 and completed in 1942, collectively known as the Chicopee Local Protection Project (CLPP).

In total, the Chicopee Flood Control Works (CFCW) consists of 25,820 linear feet of earthen levee, 7,500 linear feet of flood control walls, eight pump stations, three cast-in-place concrete closure structures, and various appurtenant drainage features. The CFCW was constructed in four separate systems, namely the Plainfield Street system, the South Bank Chicopee River system, the Willimansett system, and the Chicopee Falls system. The Chicopee Falls system is shown on Figure 1, consisting of improved embankment and concrete floodwall from Station 0+00 at the Deady Memorial Bridge to high ground near Front Street at Station 54+15.

As a cooperative Federal/City effort, the USACE was responsible for the design and construction, while the City provided all of the lands, easements, and rights-of-way necessary for the construction. The City also agreed to maintain and operate the flood control works after completion, in accordance with federally prescribed regulations. These requirements are detailed in the Code of Federal Regulations, 33 CFR 208.10 which is entitled, "Local flood protection works; maintenance and operation of structures and facilities".

SUBSURFACE EXPLORATIONS

The subsurface explorations presented herein include borings from previous subsurface investigations by the USACE (designated by "BH") prior to construction, as well as the program of recent subsurface explorations performed for this project. The previous and recent subsurface explorations are described below.

Previous Explorations

In addition to the recent explorations, our study included the review of subsurface explorations and data from previous subsurface evaluations performed prior to the levee's construction.

Subsurface conditions from record drawings were used to supplement the current geotechnical evaluation and provide confirmation on levee and flood wall foundation soils. These test boring locations and exploration logs from the previous study are included in Section A-3.1. Soil samples were classified using the USACE Providence District Soil Classification System which corresponds to a soil unit number and grain size distribution. The previous borings generally encountered fill over fluvial sands, silts and gravels (often noted as till) underlain by red shale (and occasionally conglomerate and sandstone). Varved soils were identified on previous USACE boring logs in the vicinity of Station 50+00 and further south.

Recent Explorations

The subsurface exploration program performed for this project consisted of 11 borings which are described below. Borings were completed using the rotary (drive and wash) method with cased techniques in general accordance with our Comprehensive Work Plan dated December 29, 2009 and accepted by the USACE in a letter dated January 7, 2010, applicable ASTM and USACE standards and observed fulltime by GZA personnel. Standard Penetration Tests (SPTs) and split spoon sampling were generally performed continuously in the upper 8 feet of the borings, and at 5-foot intervals thereafter. Representative soil samples were collected from the split spoon samples and stored in jars for later review and laboratory testing. Boreholes were tremie-grouted with a bentonite/cement grout upon completion. Logs of the recently performed borings are included in Section A-3.2 and the approximate boring locations are shown on Figures 2 through 5.

Borings

Eleven test borings were performed between January 6, 2009 and February 4, 2010 at the Chicopee Falls levee section (CF-1 through CF-11) by A&A Test Boring of South Windsor, CT using a Diedrich D-120 all-terrain drill rig, and were observed by GZA personnel. Borings were generally spaced 500 linear feet apart along the top of the levee and at transitions between earth embankment and flood wall sections. Completed boring depths ranged between 20 and 80 feet below ground surface.

LABORATORY ANALYSES

GZA performed thirteen laboratory gradation analyses and one percent organics test from recovered soil samples along the Chicopee Falls Levee in accordance with applicable ASTM Standards D422 and D2974. The geotechnical laboratory test results are included in Section A-3.3, and summarized on Table 1.

SUBSURFACE CONDITIONS

Ground surface elevations on the landside of the Chicopee Falls were generally between 89 and 92 feet (NAVD 88), slightly higher west of Station 10 (rising up to El. 95) and slightly lower alongside the former Facemate property (sloping down to El. 84). River-side toe elevations range from approximately El. 82 at the east end to approximately El. 78 at the west end. Top of levee/floodwall elevations of the Chicopee Falls system ranged between El. 110 and El. 99, decreasing in elevation with increasing Station (NAVD 88).

Soils

Brief soil descriptions are provided below. Detailed information about subsurface conditions based on recent and historical borings, as well as assumed parameters for unit weight, hydraulic conductivity and internal friction angle can be found in the attached summary sheets and analysis profiles located in Appendix A-4.4 of the FEMA Accreditation report.

Fill – Four to thirty-seven feet of fill, consisting of dense to very dense, fine to coarse SAND, with little to some fine to coarse gravel and trace to some Silt and trace amounts of loose to medium fine to coarse sand and Silt, with occasional trace amounts of brick, ash, wood, plastic and organics. Average fill thickness was around 25 feet, with the smallest amount of fill occurring near the Deady Memorial Bridge where rock elevation is closest to the ground surface. Bottom of fill elevations generally seemed to correspond to the river elevation, where loose blow counts and losses of washwater were occasionally observed.

USACE drawings identify multiple fill zones consisting of compacted impervious fill and compacted random fill in the typical levee sections. These two soil types are also specified in the Chicopee Falls Design Memo. Compacted impervious fill "is a well graded gravelly, silty, clayey sand (SM-SC) with at least 20% passing the No. 200 sieve" (USACE, 9). Compacted random fill can consist of "any granular materials which contain no organic or decaying matter, are essentially non-plastic in nature, and contain no gravel sizes larger than 2/3 the allowable life thickness will be usable" (USACE, 10). No distinction between these soil types was observed in the borings as would be expected based on the geometry shown on the USACE drawings. Laboratory gradations were performed on both sample types and plotted against USACE Design Memo gradations. Sample gradations from the zones classified as either random or impervious were found to satisfy both gradation curves. It is GZA's opinion that the levee was likely constructed of the more conservative compacted impervious fill to simplify construction, or based on availability, while satisfying design requirements.

Sand and Gravel/Till – A very dense brown to red-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt was observed beneath the fill except in boring CF-9. Top of Sand and Gravel/Till elevations ranged between 82 and 86 at Stations 10+00 and 16+70 (dipping briefly to El. 74 at Station 13+30) decreasing to El. 60 at Station 60.5 and 65 at Stations 44+60 and 50+00, respectively.

Varved Silt/Clay – Hard, brown, varved soils were encountered in boring CF-11 at Station 50+00, approximately 22.5 feet in thickness (also noted in the design memo). Field torvane measurements of shear strength on recovered split-spoon samples ranged from 0.65 to 1.45 tons per square foot. Pocket penetrometer readings ranged from 3.25 to over 4 tons per square foot.

Weathered Rock/Sandstone Bedrock – Red-brown Sandstone with occasional Shale zones was encountered below the Fill in borings CF-1 and CF-9, the Varved Silt/Clay in boring CF-11 and below the Sand and Gravel/Till in the remaining borings (except for CF-7 which was terminated prior to encountering bedrock). In general the top of rock decreases in elevation from upstream (El. 89 in CF-1) to downstream (El. 20 in CF-11). The bedrock generally increased in quality with depth, ranging from completely weathered to slightly weathered with RQD values (defined as the sum of lengths over 4" divided by the total run length) as high as 72 percent.

Groundwater

Groundwater levels were measured during performance of the test borings and generally seemed to correspond with the approximate river elevation at the test boring location, with average elevation ranging between Elevation 82 and 83 NAVD88. This data is similar to data collected prior to construction (varying date). No observation wells or piezometers were installed. River elevation data for both the Chicopee and Connecticut Rivers are recorded daily by City Flood Control. In conversations with the Flood Control Foreman, Ernest Laflamme, an electronic database of river levels is also maintained and updated yearly.

Note that fluctuations in the groundwater levels will occur due to variations in season, precipitation, temperature, river level, impacts from existing utilities, and other factors different than those existing at the time of the explorations.

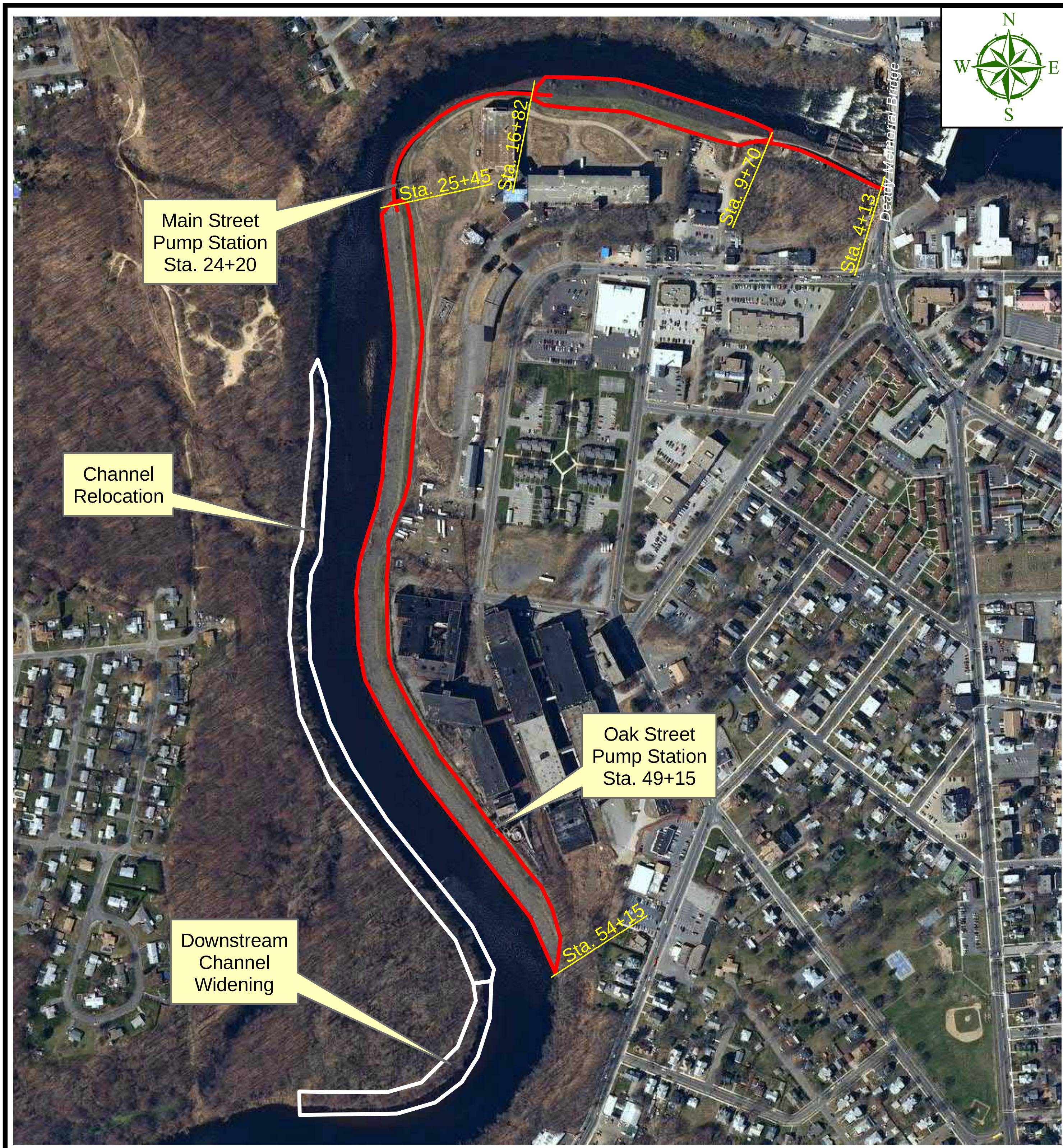
TABLE

Chicopee Flood Control Works
GZA Project No. 15.0702100.50
Chicopee Falls Levee - Geotechnical Laboratory Testing Summary

							Percent By Weight:								
									Fines						
Boring	Sample	Station (1)	Depth (ft.)	Elevation (2)	USACE (3)	Stratum (4)	Gravel	Sand	Silt	Clay	WC (5)	LL	PL	PI	Comments
CF-3	S-2	13+30 LC	3	104	Cpt. Imp. Fill	Fill	15	54	31		--	--	--	--	
CF-3	S-5	13+30 LC	11	96	Cpt. Rdm. Fill	Fill	27	54	19		--	--	--	--	
CF-3	S-7	13+30 LC	21	86	Cpt. Rdm. Fill	Fill	25	60	15		--	--	--	--	
CF-3	S-9	13+30 LC	28	79	-	Fill	13	72	15		--	--	--	--	5.4% Organic
CF-5	S-2	13+30 RC	3	104	Cpt. Imp. Fill	Fill	21	51	28		--	--	--	--	
CF-5	S-5	13+30 RC	11	96	Cpt. Rdm. Fill	Fill	32	45	22		--	--	--	--	
CF-5	S-11	13+30 RC	29	78	Cpt. Rdm. Fill	Fill	11	74	15		--	--	--	--	
CF-6	S-5	25+50 RC	11	93	Cpt. Imp. Fill	Fill	15	60	25		--	--	--	--	
CF-7	S-5	30+00 RC	11	91			19	53	28		--	--	--	--	
CF-7	S-12	30+00 RC	36	66	Till	S+G	53	37	10		--	--	--	--	
CF-11	S-3	50+00 RC	5	94	Cpt. Imp. Fill	Fill	11	63	26		--	--	--	--	
CF-11	S-5	50+00 RC	11	88	Cpt. Rdm. Fill	Fill	18	59	24		--	--	--	--	
CF-11	S-13	50+00 RC	32	67	Cpt. Imp. Fill	Fill	10	62	28		--	--	--	--	

1. Stationing is approximate. "RC" = Riverside Crest, "LC" = Landside Crest
2. Elevations referenced to the NAVD88 datum and are in the text.
3. "USACE" refers to stratum description from typical levee sections in record drawings or Design Memo by U.S. Army Engineers.
"Imp. Blkt." = Impervious Blanket, "Perv. Mat." = Pervious Material
4. "S+G" = Sand and Gravel, "Varved" = Varved Silt and Clay, N/A = Not Analyzed
5. WC = Water Content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index, Tv = Torvane, readings in tons/square foot.
6. All tests conducted in general accordance with applicable ASTM Standards D2216, D4318, 2974, and D422.

FIGURES



Feet
500 250 0 500

Figure 1: Chicopee Falls System

Comprehensive Work Plan
for Drilling Services and Geotechnical Testing
of the Flood Control Works

Chicopee, Massachusetts

Legend

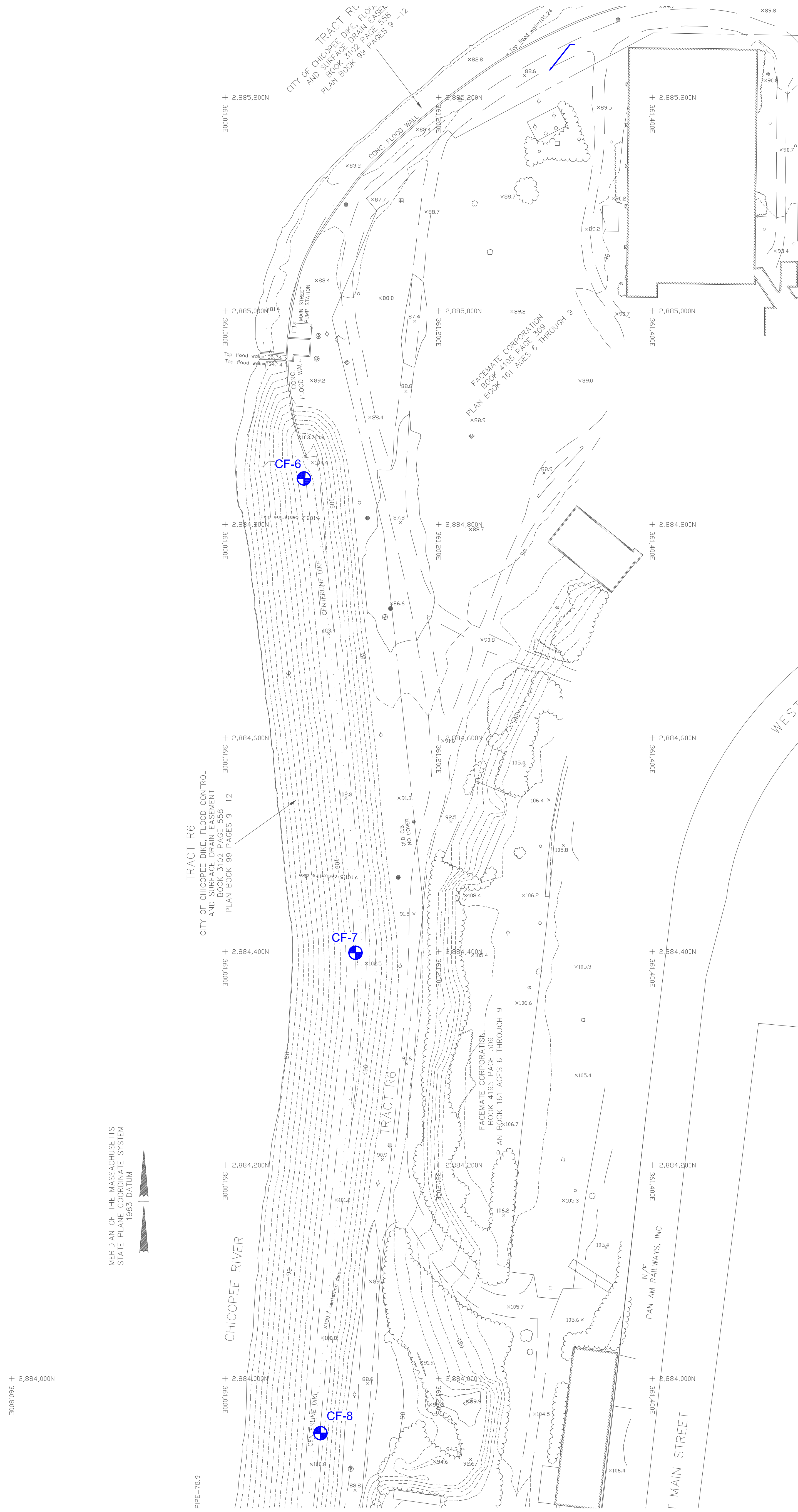
Flood Wall

Flood Levee

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA

MassGIS Orthophoto (2005) obtained from MASS GIS,
Commonwealth of Massachusetts Executive Office of Environmental Affairs (EOEA).

©2009- GZA GeoEnvironmental, Inc. GZA-J:\Branch\NORWOOD\CHICOPEE-LEVEE\Figures\CAD\Chicopee-Falls XLP.dwg [Sheet 3] September 24, 2010 - 10:33am robert.house



MERIDIAN OF THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM 1983 DATUM

SURVEYOR'S NOTES:

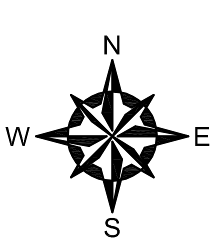
1. TOPOGRAPHIC DATA SHOWN HEREON IS BASED UPON AERIAL PHOTOGRAPHY TAKEN DURING APRIL, 2008. PHOTOGRAPHY AND MAPPING WERE PERFORMED BY COL-EAST, INC. OF NORTH ADAMS, MA AND SUPPLEMENTED WITH GROUND SURVEYS PERFORMED BY HERITAGE SURVEYS, INC. FROM MAY, 2008 THROUGH SEPTEMBER, 2009.

2. FOR REFERENCE TO BOUNDARY LINE AND EASEMENTS SEE A PLAN PREPARED BY HERITAGE SURVEYS, INC. TITLED "PLAN OF FLOOD CONTROL AND DIKE EASEMENT IN CHICOPEE, MASSACHUSETTS SURVEYED FOR THE CITY OF CHICOPEE", DATED JUNE 15, 2009, SHEETS 1 THROUGH 4.

3. UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON SURFACE FEATURES AS LOCATED BY SURVEY AND AVAILABLE RECORD DATA, AND ARE APPROXIMATE. ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO FINAL DESIGN AND/OR CONSTRUCTION.

4. LOCATION OF FLOOD WALL AND DIKE BASELINES SHOWN ARE APPROXIMATE AND ARE BASED UPON PLANS PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS FOR CHICOPEE RIVER FLOOD CONTROL DATED APRIL, 1963. NO MONUMENTATION OF BASELINES WAS FOUND AND IS HISTORICAL ONLY.

5. TOP OF CONCRETE FLOOD WALL AND CENTERLINE DIKE GRADES IN BOLD TYPE ARE FIELD LOCATED BY SURVEY AND ARE NOT THE RESULT OF AERIAL MAPPING.



0 50' 100' 200'

SCALE IN FEET

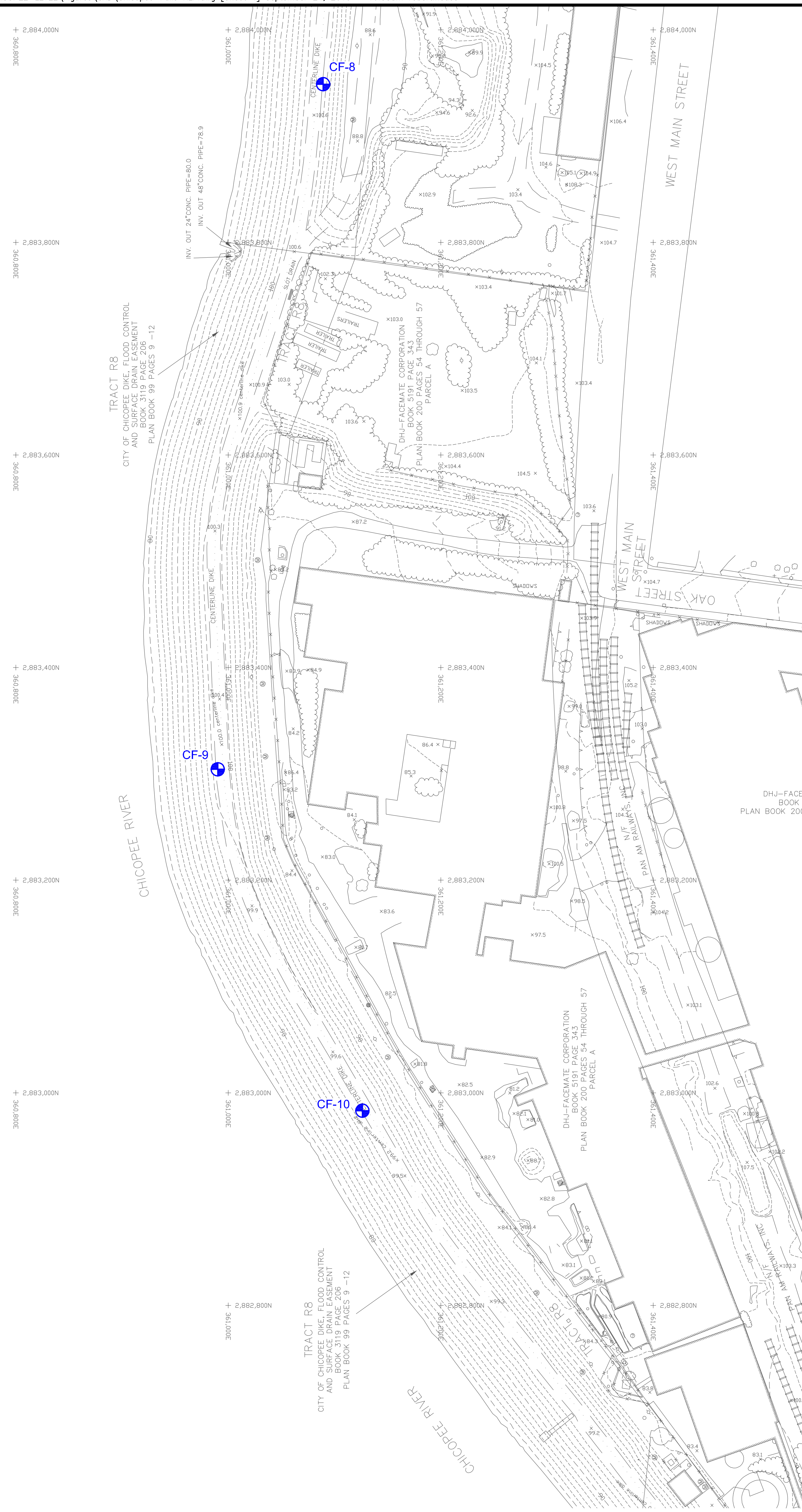
BORING COMPLETED BY A&A TEST BORING OF SOUTH WINDSOR, CT AND OBSERVED BY GZA PERSONNEL BETWEEN JANUARY 6, 2010 AND FEBRUARY 4, 2010

CHICOPEE FALLS

CHICOPEE, MASSACHUSETTS

CHICOPEE FALLS FLOOD PROTECTION SYSTEM
EXPLORATION LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists ONE EDGEWATER DRIVE NORWOOD, MA 02062 781-278-3700		PREPARED FOR: CITY OF CHICOPEE DEPT. OF PUBLIC WORKS	
PROJ MGR: NA	REVIEWED BY: ABB	CHECKED BY: CT	FIGURE 3
DESIGNED BY: DF/ABB	DRAWN BY: GAS	SCALE: 1 INCH = 100 FEET	
DATE: 6-30-2010	PROJECT NO. 15.0702100	REVISION NO.	



SURVEYOR'S NOTES:

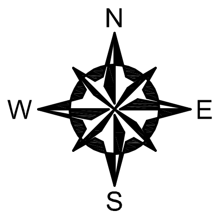
1. TOPOGRAPHIC DATA SHOWN HEREON IS BASED UPON AERIAL PHOTOGRAPHY TAKEN DURING APRIL, 2008. PHOTOGRAPHY AND MAPPING WERE PERFORMED BY COL-EAST, INC. OF NORTH ADAMS, MA AND SUPPLEMENTED WITH GROUND SURVEYS PERFORMED BY HERITAGE SURVEYS, INC. FROM MAY, 2008 THROUGH SEPTEMBER, 2009.

2. FOR REFERENCE TO BOUNDARY LINE AND EASEMENTS SEE A PLAN PREPARED BY HERITAGE SURVEYS, INC. TITLED "PLAN OF FLOOD CONTROL AND DIKE EASEMENT IN CHICOPEE, MASSACHUSETTS SURVEYED FOR THE CITY OF CHICOPEE", DATED JUNE 15, 2009, SHEETS 1 THROUGH 4.

3. UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON SURFACE FEATURES AS LOCATED BY SURVEY AND AVAILABLE RECORD DATA, AND ARE APPROXIMATE. ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO FINAL DESIGN AND/OR CONSTRUCTION.

4. LOCATION OF FLOOD WALL AND DIKE BASELINES SHOWN ARE APPROXIMATE AND ARE BASED UPON PLANS PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS FOR CHICOPEE RIVER FLOOD CONTROL DATED APRIL, 1963. NO MONUMENTATION OF BASELINES WAS FOUND AND IS HISTORICAL ONLY.

5. TOP OF CONCRETE FLOOD WALL AND CENTERLINE DIKE GRADES IN BOLD TYPE ARE FIELD LOCATED BY SURVEY AND ARE NOT THE RESULT OF AERIAL MAPPING.



0 50' 100' 200'

SCALE IN FEET

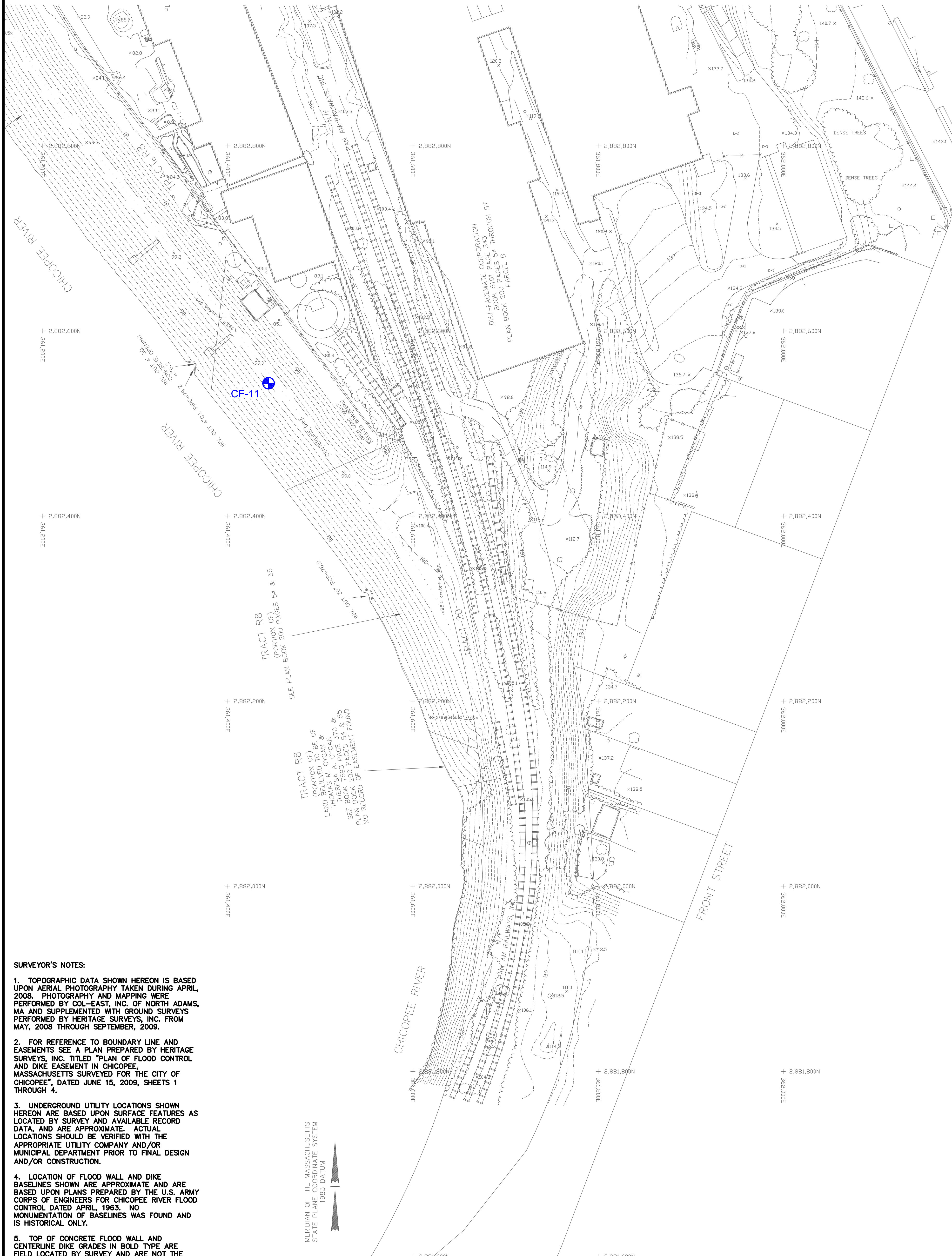
BORING COMPLETED BY A&A TEST BORING OF SOUTH WINDSOR, CT AND OBSERVED BY GZA PERSONNEL BETWEEN JANUARY 6, 2010 AND FEBRUARY 4, 2010

CHICOPEE FALLS

CHICOPEE, MASSACHUSETTS

CHICOPEE FALLS FLOOD PROTECTION SYSTEM
EXPLORATION LOCATION PLAN

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists ONE EDGEWATER DRIVE NORWOOD, MA 02062 781-278-3700		CITY OF CHICOPEE DEPT. OF PUBLIC WORKS	
PROJ MGR: NA	REVIEWED BY: ABB	CHECKED BY: CT	FIGURE
DESIGNED BY: DF/ABB	DRAWN BY: GAS	SCALE: 1 INCH = 100 FEET	4
DATE: 6-30-2010	PROJECT NO. 15.0702100	REVISION NO.	



SURVEYOR'S NOTES:

1. TOPOGRAPHIC DATA SHOWN HEREON IS BASED UPON AERIAL PHOTOGRAPHY TAKEN DURING APRIL, 2008. PHOTOGRAPHY AND MAPPING WERE PERFORMED BY COL-EAST, INC. OF NORTH ADAMS, MA AND SUPPLEMENTED WITH GROUND SURVEYS PERFORMED BY HERITAGE SURVEYS, INC. FROM MAY, 2008 THROUGH SEPTEMBER, 2009.

2. FOR REFERENCE TO BOUNDARY LINE AND EASEMENTS SEE A PLAN PREPARED BY HERITAGE SURVEYS, INC. TITLED "PLAN OF FLOOD CONTROL AND DIKE EASEMENT IN CHICOPEE, MASSACHUSETTS SURVEYED FOR THE CITY OF CHICOPEE", DATED JUNE 15, 2009, SHEETS 1 THROUGH 4.

3. UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON SURFACE FEATURES AS LOCATED BY SURVEY AND AVAILABLE RECORD DATA, AND ARE APPROXIMATE. ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO FINAL DESIGN AND/OR CONSTRUCTION.

4. LOCATION OF FLOOD WALL AND DIKE BASELINES SHOWN ARE APPROXIMATE AND ARE BASED UPON PLANS PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS FOR CHICOPEE RIVER FLOOD CONTROL DATED APRIL, 1963. NO MONUMENTATION OF BASELINES WAS FOUND AND IS HISTORICAL ONLY.

5. TOP OF CONCRETE FLOOD WALL AND CENTERLINE DIKE GRADES IN BOLD TYPE ARE FIELD LOCATED BY SURVEY AND ARE NOT THE RESULT OF AERIAL MAPPING.

N
W E
S

0 50' 100' 200'
SCALE IN FEET

BORING COMPLETED BY A&A TEST BORING OF SOUTH WINDSOR, CT AND OBSERVED BY GZA PERSONNEL BETWEEN JANUARY 6, 2010 AND FEBRUARY 4, 2010

CHICOPEE FALLS
CHICOPEE, MASSACHUSETTS

CHICOPEE FALLS FLOOD PROTECTION SYSTEM
EXPLORATION LOCATION PLAN

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists ONE EDGEWATER DRIVE NORWOOD, MA 02062 781-278-3700		CITY OF CHICOPEE DEPT. OF PUBLIC WORKS	
PROJ MGR: NA	REVIEWED BY: ABB	CHECKED BY: CT	FIGURE
DESIGNED BY: DF/ABB	DRAWN BY: GAS	SCALE: 1 INCH = 100 FEET	5
DATE: 6-30-2010	PROJECT NO. 15.0702100	REVISION NO.	

SECTION A-3.2

RECENT BORING LOGS
(CF-1 THROUGH CF-11)

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-6
Page: 1 **of** 2
File No.: 15.0702100.50
Check: DMB

Contractor: A&A Drilling, LLC
Foreman: A. Augustine
Logged by: R. House
Date Start/Finish: 1-18-10 / 1-19-10
Boring Location: See Plan
GS Elev.: 103'± **Datum:** NAVD88

	Auger/Casing	Sampler
Type:	HSA/Steel	S.S.
I.D.:	2-1/4"/4"	2" O.D.
Hammer Wt.:	300 lbs.	140 lb.
Hammer Fall:	24"	30"
Other:		NX Core

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See	Note 3.			
1/18/10	1545	17'	40'	45 min.
1/19/10	0715	23'	40'	15.5 hours

Sample Information

Depth	No.	Pen./Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
	S-1	24/4	0-2	31-22 18-11		S-1: Dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt, trace Organics	FILL	1	None
1								2	
2	S-2	24/12	2-4	11-21 22-18		Piece of Gravel observed in spoon tip. S-2: Dense, brown, fine to coarse SAND, some fine Gravel, trace Silt		3	
4	S-3	24/16	4-6	17-22 20-23	33	S-3: Dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt			
5					54				
6	S-4	24/18	6-8	19-22 25-25	59	S-4: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, trace Ash			
7					87				
8					125				
9					60				
10	S-5	24/13	10-12	22-15 15-23	43	S-5: Brown, fine to coarse SAND, some Silt, little fine Gravel			
11					87				
12					72				
13					65				
14					63				
15	S-6	24/12	15-17	22-23 31-25	67	S-6: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, some Silt, trace Brick			
16					260				
17					272				
18					119				
19					65		19' SAND AND GRAVEL		
20	S-7	24/11	20-22	22-28 26-48	53	S-7: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt		4	
21					61				
22					64				
23					70				
24					60				
25	S-8	24/13	25-27	31-42 30-27	49	S-8: Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
26					57				
27					62				
28					70				
29							30'		

REMARKS

1. SPT conducted using "safety" hammer and 2" diameter split spoon sampler.
2. Borehole advanced from 0 to 4 feet below grade using 2 1/4" I.D. hollow stem augers. Borehole advanced 4 to 40 feet below grade with 4" flush joint casing and rotary wash methods. Drilling wash water introduced to borehole at 8 feet below grade to completion of boring.
3. No groundwater encountered prior to drilling wash water being introduced to borehole at 8 feet below grade. Groundwater reading performed after introduction of drilling wash water to borehole and may represent perched drilling fluid and may not be representative of actual groundwater conditions.
4. Driller roller bitted ahead prior to driving casing from 20 to 40 feet.
5. Shale fragments present in samples S-9 and S-10.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-6

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
	S-9	24/13	30-32	51-33 35-32	63	S-9: Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt	TILL	5	
31					49				
32					62				
33					61				
34					121				
35	S-10	17/14	35-36.5	31-57 100/5"	68	S-10: Brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
36					71				
37					57				
38					51				
39					80				
40	S-11	4/4	40-40.3	100/4"		S-11: Brown, completely weathered SHALE	40' SANDSTONE		
41	CR-1	60/48	41-46	min/ft 5:00		CR-1: Soft to moderately hard, moderate to very severely weathered, fine grained, red-brown SANDSTONE with very close to closely spaced, horizontal joints/fractures RQD = 20%		6	
42				6:00					
43				5:30					
44				8:15					
45				8:00					
46	CR-2	60/60	46-51	7:00		CR-2: Soft to moderately hard, moderate to severely weathered, fine grained, red-brown SANDSTONE with very close to closely spaced, horizontal to sub-horizontal joints/fractures RQD = 41%			
47				10:00					
48				4:30				7	
49				5:00					
50				5:15					
51	CR-3	60/60	51-56	3:15		CR-3: Soft to moderately hard, moderately severe to slight weathering, medium grained, red-brown to brown SANDSTONE with very close to closely spaced, horizontal to vertical joints/fractures RQD = 33% Last 21": Dark brown in color			
52				2:30					
53				3:00					
54				3:15					
55				3:00					
56						End of Exploration at 56'	56'	8	
57									
58									
59									
60									
61									
62									
63									
64									

REMARKS

6. Times represent penetration in minutes/foot. RQD = Rock Quality Deesignation.
7. Driller increased penetration rate between 48 and 49 feet.
8. Borehole tremie grouted to ground surface with 2/3 tub (~30 gallons/tub) bentonite/cement grout upon completion. (Approximately 20 gallons actual vs 28 gallons theoretical.)

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-7
Page: 1 **of** 2
File No.: 15.0702100.50
Check: DMB

Contractor: A&A Drilling, LLC
Foreman: A. Augustine
Logged by: R. House
Date Start/Finish: 1-19-10 / 1-20-10
Boring Location: See Plan
GS Elev.: 102'± **Datum:** NAVD88

	Auger/ Casing	Sampler
Type:	HSA/Steel	S.S.
I.D.:	2-1/4"/4"	2" O.D.
Hammer Wt.:	300 lbs.	140 lb.
Hammer Fall:	24"	30"
Other:		NX Core

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See	Note 4.			
1/19/10	1555	18'	38.5'	5 min.
1/20/10	0715	21.5'	38.5'	15.3 hours

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
	S-1	24/12	0-2	37-23 11-14		S-1: Dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt, trace Organics	0.2' TOPSOIL / FILL	1	None
1								2	
2	S-2	24/0	2-4	39-39		S-2: No sample recovered		3	
3	S-2A	24/18	2-4	30-13		S-2A: Brown, fine to coarse SAND, little fine Gravel, little Silt		4	
4	S-3	24/12	4-6	8-17 14-39	35	S-3: Dense, brown to red-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt			
5					43				
6	S-4	24/17	6-8	49-22 15-8	49	S-4: Dense, red-brown to dark brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, trace Brick			
7					69				
8					78				
9					64				
10	S-5	24/12	10-12	22-23 27-28	27	S-5: Brown, fine to coarse SAND, some Silt, little fine to coarse Gravel			
11					37				
12					52				
13					62				
14					52			5	
15	S-6	24/2	15-17	17-18 17-34	34	S-6: Dense, red BRICK, some fine to coarse Sand, trace Silt			
16					29				
17	S-7	24/11	17-19	14-9 12-17	39	S-7: Medium dense, red-brown to dark brown, fine to coarse SAND and BRICK, little Silt, little Ash			
18					55				
19	S-8	24/7	19-21	16-14 19-26	36	S-8: Dense, brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt (possible wash)			
20					61				
21	S-9	24/6	21-23	51-71 40-29	68	(Piece of Gravel observed in spoon tip.) S-9: Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt	21' SAND AND GRAVEL (TILL)		
22					90				
23					195				
24					155				
25	S-10	24/8	25-27	35-47 43-69	39	S-10: Very dense, red-brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt Piece of Gravel observed in spoon tip.		6	
26					43				
27					68				
28					117				
29					160				

REMARKS

1. SPT conducting using "safety" hammer and 2" diameter split spoon sampler. 7"x5" cobble removed from top 1 foot.
2. Borehole advanced from 0 to 4 feet below grade using 2 1/4" I.D. hollow stem augers. Borehole advanced from 4 to 38.5 feet below grade with 4" flush joint casing and rotary wash methods. Drilling wash water introduced to borehole at 8 feet below grade to completion of boring.
3. No recovery in sample S-2. Therefore sample S-2A redrove into side of borehole.
4. No groundwater encountered prior to drilling wash water being introduced to borehole at 8 feet below grade. Groundwater reading performed after introduction of drilling wash water to borehole and may represent perched drilling fluid and may not be representative of actual groundwater conditions.
5. Driller noted change in wash color from brown to black at 14.5 feet. Loss of casing fluid at 15 feet.
6. Driller roller bitted ahead prior to driving casing from 25 to 38.5 feet. Shale fragments observed in S-10 and S-12.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-7

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-7
Page: 2 **of** 2
File No.: 15.0702100.50
Check: DMB

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
30	S-11	9/1	30-30.8	73-100/3"	50	S-11: Brown, fine to coarse GRAVEL and fine to coarse SAND, little Silt (Piece of Gravel observed in spoon tip.)	SAND AND GRAVEL (TILL)		
31					42			7	
32					69				
33					80				
34					117				
35	S-12	24/11	35-37	42-40 40-66	40	S-12: Brown, fine to coarse GRAVEL and fine to coarse SAND, little Silt			
36					60				
37					95				
38					300/6"		38.5' SANDSTONE		
39									
40	S-13 CR-1	1/1 54/50	39.9-40 40-44.5	100/1" 7:30 4:30 5:30 9:00 5:45/6"		S-13: Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt CR-1: Soft to moderately hard, moderately to very severe weathering, fine grained, red-brown SANDSTONE with very close to close, horizontal to vertical joints/fractures Extremely weathered from 43.5 to 44 feet RQD = 0%			
44						End of Exploration at 44.5'	44.5'	8	
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									

REMARKS

7. Moderate to heavy drill chatter from 30 to 40 feet. Driller noted change in drilling effort at 38.5 feet.
8. Borehole tremie grouted to ground surface with 2/3 tub (~30 gallons) bentonite/cement grout (approximately 23 gallons actual vs 23 gallons theoretical).

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-7

GZA GeoEnvironmental, Inc. *Engineers and Scientists*

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-8
Page: 1 of 2
File No.: 15.0702100.50
Check: DMB

Contractor: A&A Drilling, LLC
Foreman: A. Augustine
Logged by: R. House
Date Start/Finish: 1-20-10 / 1-21-10
Boring Location: See Plan
GS Elev.: 101'± Datum: NAVD88

	Auger/Casing	Sampler
Type:	HSA/Steel	S.S.
I.D.:	2-1/4"/3"	2" O.D.
Hammer Wt.:	300 lbs.	140 lb.
Hammer Fall:	24"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See	Note 3.			
1/20/10	1540	13.5'	16'	10 min.
1/21/10	0730	15'	16'	16 hours
1/21/10	1140	14'	37'	10 min.

Depth	No.	Pen./Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
0-1	S-1	24/17	0-2	9-19 20-32		S-1: Top 6": Dark brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace Organics	0.5' TOPSOIL / FILL	1, 2	None
2	S-2	9/7	2-2.8	47-100/3"		S-2: Brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt Piece of Gravel in spoon tip.		3	
3	S-3	24/16	3-5	23-30 41-62		S-3: Very dense, brown to red-brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
5	S-4	9/5	5-5.8	31-100/3"		S-4: Brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt			
6					38				
7	S-5	24/16	7-9	24-52 42-45	52	S-5: Very dense, dark brown to gray, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Brick			
8					130				
9					138				
10	S-6	24/6	10-12	35-34 37-80	37	S-6: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt (Piece of Gravel observed in spoon tip.)			
11					20				
12	S-7	24/6	12-14	18-28 17-15	32	S-7: Dense, brown to yellow, fine to coarse SAND and fine to coarse GRAVEL, trace Silt, trace Brick			
13					48				
14	S-8	24/16	14-16	20-19 19-32	22	S-8: Dense, brown, fine to coarse SAND, some Silt, little fine Gravel, trace Brick			
15					53				
16	S-9	24/4	16-18	10-11 5-3	13	S-9: Medium dense, brown, fine to coarse SAND, little Silt, little fine Gravel, trace Brick, trace Ceramic			
17					20				
18	S-10	24/6	18-20	4-2 4-5	22	S-10: Top 3" Gray ASH Bottom 3": Tan-brown, fine SAND, some Silt			
19					24				
20	S-11	24/8	20-22	6-7 9-13	14	S-11: Medium dense, tan, fine to medium SAND, little Silt			
21					20				
22	S-12	24/16	22-24	8-22 51-39	33	S-12: Top 9": Tan, fine to medium SAND, little Silt Bottom 7": Brown to red-brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt	23' SAND AND GRAVEL (TILL)		
23					73				
24					110				
25	S-13	24/13	25-27	44-43 54-78	37	S-13: Very dense, brown to red-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt		4	
26					37				
27					51				
28					64				
29									

REMARKS

1. SPT conducted using "safety" hammer and 2" diameter split spoon sampler.
2. Borehole advanced from 0 to 5 feet below grade using 2 1/4" I.D. hollow stem augers. Borehole advanced from 5 to 37 feet below grade with 3" flush joint casing and rotary wash methods. Drilling wash water introduced to borehole at 5 feet below grade to completion of boring.
3. No groundwater encountered prior to drilling wash water being introduced to borehole at 5 feet below grade. Groundwater reading performed after introduction of drilling wash water to borehole and may represent perched drilling fluid and may not be representative of actual groundwater conditions.
4. Driller roller bitted ahead prior to driving casing from 25 to 37 feet.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-8

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-8
Page: 2 **of** 2
File No.: 15.0702100.50
Check: DMB

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
31	S-14	14.5/9	30-31.2	38-129 100/2.5"	20	S-14: Brown, fine to coarse GRAVEL, some fine to coarse Sand, little Silt	SAND AND GRAVEL (TILL)		
32					25				
33					46				
34					117				
35					145				
36	S-15	3/1	35-35.3	100/3"	58	S-15: Brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt	36' WEATHERED BEDROCK		
37					191				
38	S-16	1/1	38-38.1	100/1"		S-16: Red-brown, fine to coarse SAND and fine to coarse GRAVEL (Weathered Rock)	38.1'	5 6	
39						End of Exploration at 38.1'			
40–64									

REMARKS

5. Driller noted change in wash water color from brown to red-brown at 38 feet possibly indicating change in material.
6. Borehole tremie grouted to ground surface with 2/3 tub bentonite/cement grout (~30 gallons/tub) upon completion. (Approximately 20 gallons actual vs 19 gallons theoretical.)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-8

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-9
Page: 1 **of** 2
File No.: 15.0702100.50
Check: DMB

Contractor: A&A Drilling, LLC
Foreman: A. Augustine
Logged by: R. House
Date Start/Finish: 1-21-10 / 1-26-10
Boring Location: See Plan
GS Elev.: 99'± **Datum:** NAVD88

	Auger/ Casing	Sampler
Type:	HSA	S.S.
I.D.:	2-1/4"/3"	2" O.D.
Hammer Wt.:	300 lbs.	140 lb.
Hammer Fall:	24"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/22/10	0715	2.5'	14'	15 hours
1/22/10	1510	19.5'	50'	10 min.
1/26/10	0720	21'	50'	3.5 days
1/26/10	1015	17.5'	60'	5 min.

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
	S-1	24/8	0-2	19-25 8-8		S-1: Top 1": Dark brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt, trace Organics Bottom 7": Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt	0.5' ROADWAY MATERIAL FILL	1 2 3	None
2	S-2	24/12	2-4	12-18 21-25		S-2: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt			
4	S-3	24/7	4-6	16-22 9-11	13 13	S-3: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt Piece of gravel observed in spoon tip.			
6	S-4	24/20	6-8	16-26 20-18	47 60 71 103	S-4: Top 13": Brown, fine to coarse SAND, little Silt, little fine to coarse Gravel Bottom 7": Tan to brown, fine SAND, some Silt			
10	S-5	16/4	10-11.3	69-105 100/4"	14 14 27 52	S-5: Top 3": Tan to brown, fine SAND, some Silt Bottom 1": Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt Piece of Gravel observed in spoon tip.		4	
14	S-6	17/8	14-15.4	33-61 100/5"	27 44 39 30 37 40	S-6: Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace Brick			
20	S-7	24/13	20-22	27-50 96-80	38 30 28 21 42	S-7: Very dense, brown to dark brown, fine to coarse SAND, little fine to coarse Gravel, little Silt, trace Brick, trace Glass, trace Fiber (Piece of Gravel observed in spoon tip)			
25	S-8	24/10	25-27	35-32 29-28	60 57	S-8: Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
27	S-9	24/11	27-29	32-31 23-24	96 63	S-9: Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
29	S-10	24/9	29-31	21-24	59	S-10: Dense, brown, fine to coarse SAND,			

REMARKS

1. SPT conducted using "safety" hammer and 2" diameter split spoon sampler. Cobbles 4"x4" 6x4" (2), and 8"x14" removed from top 6 inches.
2. Borehole advanced from 0 to 4 feet below grade using 2 1/4" I.D. hollow stem augers. Borehole advanced from 4 to 61 feet below grade with 3" flush joint casing and rotary wash methods. Drilling wash water introduced to borehole at 8 feet below grade to completion of boring.
3. No groundwater encountered prior to drilling wash water being introduced to borehole at 8 feet below grade. Groundwater reading performed after introduction of drilling wash water to borehole and may represent perched drilling fluid and may not be representative of actual groundwater conditions.
4. Driller roller bitted ahead prior to driving casing from 10 to 25 feet.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-9

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
				17-8		some fine to coarse Gravel, little Silt	FILL		
31	S-11	24/6	31-33	44-31 16-11	34	S-11: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, some Silt			
32					67				
33	S-12	24/3	33-35	11-10 6-5	48	S-12: Medium dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel			
34					37				
35	S-13	24/6	35-37	3-7 19-37	30	S-13: Top 2": Brown, fine to coarse SAND and SILT, little fine to coarse Gravel Bottom 4": Brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt		5	
36					41				
37	S-14	6/6	37-37.5	100/6"	34	S-14: Brown, fine to coarse SAND, little Gravel, trace Silt (Piece of Gravel observed in spoon tip.)	37' TILL		
38					189				
39					310				
40	S-15	4/1	40-40.3	100/4"	450	S-15: Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt			
41					77				
42					111				
43					74				
44					112				
45	S-16	10/4	45-45.8	105-100/4"	82	S-16: Brown, fine to coarse SAND, some Silt, little fine Gravel			
46					64				
47					44				
48					50				
49					79				
50	S-17	10/8	50-50.8	99-100/4"	83	S-17: Brown, fine to coarse SAND, some Silt, little fine Gravel			
51					83				
52					107				
53					69				
54					82				
55	S-18	24/16	55-57	60-67 72-39	82	S-18: Very dense, brown, fine SAND and SILT, trace fine Gravel			
56					54				
57					42				
58					67			6	
59					262		59' WEATHERED BEDROCK		
60	S-20 S-19	2/1 2/1	61-61.2 60-60.2	100/2" 100/2"	309/1"	S-20: Red-brown WEATHERED ROCK S-19: Red-brown WEATHERED ROCK			
61						End of Exploration at 61.2'	61.2'	7	
62									
63									
64									

REMARKS

5. Driller roller bitted ahead prior to driving casing from 35 to 61 feet. Possible obstructions 37 to 40 feet.
6. Driller noted change in drilling effort at 58.5 to 59 feet.
7. Borehole tremie grouted to ground surface with 1 tub bentonite/cement grout (~30 gallons/tub) upon completion. (Approximately 30 gallons actual vs 30 gallons theoretical.)

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-10
Page: 1 **of** 3
File No.: 15.0702100.50
Check: DMB

Contractor: A&A Drilling, LLC
Foreman: A. Augustine
Logged by: R. House
Date Start/Finish: 1-26-10 / 2-1-10
Boring Location: See Plan
GS Elev.: 99'± **Datum:** NAVD88

	Auger/ Casing	Sampler
Type:	HSA/Steel	S.S.
I.D.:	2-1/4"/3"	2" O.D.
Hammer Wt.:	300 lbs.	140 lb.
Hammer Fall:	24"	30"
Other:		NX Core

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/27/10	0735	11'	15'	16 hours
1/28/10	0740	18.5'	55'	16.5 hours
2/1/10	0725	18'	35'	2.5 days
2/1/10	1235	14.5'	55'	45 min.

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
0	S-1	24/2	0-2	6-13 16-16		S-1: Medium dense, dark brown, fine to coarse GRAVEL, little fine to coarse Sand, trace Organics, trace Silt	ROADWAY MATERIAL 0.9' FILL	1	None
1								2	
2	S-2	24/8	2-4	5-7 12-15		S-2: Medium dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Organics		3	
3									
4	S-3	24/10	4-6	8-15 10-20	11	S-3: Medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt			
5					33				
6	S-4	24/17	6-8	23-23 28-19	46	S-4: Top 14": Brown to red-brown, fine to coarse SAND and fine to coarse GRAVEL, some Silt			
7					90	Bottom 3": Gray, fine SAND, some Silt			
8	S-5	24/10	8-10	34-33 38-42	39	S-5: Very dense, gray-brown, fine SAND, some Silt, trace fine Gravel			
9					147				
10					21			4	
11					28			5	
12					44				
13					61				
14					200				
15	S-6	24/10	15-17	73-68 50-57	32	S-6: Very dense, gray-brown, fine to coarse SAND, some Silt, little fine Gravel, trace Brick			
16					34				
17					39				
18					40				
19					64				
20	S-7	24/12	20-22	41-46 36-21	72	S-7: Very dense, gray-brown to red-brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt (Piece of gravel observed in spoon tip.)			
21					46				
22					64				
23					48				
24					48				
25	S-8	24/8	25-27	13-9 9-8	38	S-8: Medium dense, brown, fine to coarse SAND, some Silt, little fine Gravel			
26					46				
27	S-9	24/10	27-29	3-5 7-6	46	S-9: Medium dense, brown, fine to coarse SAND, some Silt, little fine Gravel			
28					49				
29	S-10	24/6	29-31	7-22	60	S-10: Dense, brown to red-brown, fine to			

REMARKS

1. SPT conducted using "safety" hammer and 2" diameter split spoon sampler.
2. Borehole advanced from 0 to 4 feet below grade using 2-1/4 I.D. hollow stem augers. Borehole advanced from 4 to 57 feet below grade with 3" flush joint casing and rotary wash methods. Drilling wash water introduced to borehole at 8 feet below grade to completion of boring.
3. No groundwater encountered prior to introduction of drilling wash water at 8 feet below grade. Groundwater readings above 18 feet likely perched drill fluid and not indicative of actual groundwater. Groundwater reading performed after introduction of drilling wash water to borehole and may represent perched drilling fluid and may not be representative of actual groundwater conditions.
4. Driller roller bitted ahead, prior to driving casing from 10 to 25 feet.
5. Additional groundwater readings were taken on 1/26/10 and 1/27/10 with minimal stablization periods. Groundwater was measured 6 feet below ground surface on 1/26/10 (casing 15 feet below ground surface). Groundwater measured 18 feet below ground surface on 1/27/10 (casing 55 feet below ground surface).

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
				17-17	61	coarse SAND and fine to coarse Gravel, trace Silt	FILL		
31	S-11	10.5/5	31-31.9	14-100/4.5"	56	(Piece of gravel observed in spoon tip.)		6	
32					37	S-11: Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt			
33					40	(Piece of gravel observed in spoon tip.)			
34					76				
35	S-12	24/8	35-37	30-42 55-49	61	S-12: Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt			
36					40				
37					59	(Piece of gravel observed in spoon tip.)			
38					127		38.5' SAND AND GRAVEL (TILL)		
39					193				
40	S-13	10/7	40-41.8	96-100/4"	120	S-13: Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt			
41					260				
42					275				
43					350				
44					440				
45	S-14	10/7	45-45.8	73-100/4"	75	S-14: Brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt			
46					50				
47					184				
48					95				
49					500				
50	S-15	6/2	50-50.5	125/6"	140	S-15: Brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
51					67			7	
52					68				
53					63				
54					134				
55	S-16	6/5	55-55.5	110/6"	170	S-16: Brown, fine to coarse SAND, little fine to coarse Gravel, little Silt			
56					500		56' WEATHERED SHALE		
57								8	
58								9	
59	S-17	1/0	59.9-60	100/1"		S-17: No sample obtained. Shale fragments in spoon tip.			
60	CR-1	60/54	60-65	10:00		CR-1: Top 9": Soft, moderately severe to very severe weathering, medium grained,		10	
61				6:15		gray SANDSTONE with horizontal to sub-horizontal, iron-oxide stained	61' SANDSTONE	11	
62				12:00		joints/fractures			
63				9:45		Bottom 45": Medium, moderate to slightly weathered, fine-grained, red-brown			
64				13:00		SANDSTONE with horizontal to			

REMARKS

6. Shale fragments observed in samples S-10, S-12 and S-13.
7. Driller roller bitted ahead, prior to driving casing from 51 to 57 feet.
8. Casing refusal at 57 feet.
9. Driller noted brief change in washwater color from brown to orange-brown around 58 feet.
10. Washwater briefly changed color to milky-gray at 60.8 feet, turned to red-brown around 61.5 feet.
11. Times represent penetration in min/foot. RQD = Rock Quality Designation.

GZA GeoEnvironmental, Inc. *Engineers and Scientists*	CHICOPEE FALLS LEVEE CHICOPEE, MASSACHUSETTS	Boring No.: CF-10 Page: 3 of 3 File No.: 15.0702100.50 Check: DMB

Depth	Sample Information: No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
66 67 68 69	CR-2	60/60	65-70	11:30 13:00 8:45 7:00 5:00		sub-horizontal joints/fractures RQD = 40% CR-2: Soft to moderately hard, moderate weathering, fine grained, red-brown SANDSTONE with horizontal to sub-horizontal, iron-oxide stained joints/fractures with gray Shale transition zones from 66 to 66.7 feet and 67.5 to 68.3 feet RQD = 21%	SANDSTONE 70'	12	
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99						End of Exploration at 70'		13	

REMARKS

12. Driller increased penetration rate around 66.8 feet. No significant fluid loss during coring.
13. Borehole grouted to ground surface with 1 tub bentonite/cement grout (~30 gallons/tub) upon completion.

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-11
Page: 1 of 3
File No.: 15.0702100.50
Check: DMB

Contractor: A&A Drilling, LLC
Foreman: A. Augustine
Logged by: R. House
Date Start/Finish: 2-1-10 / 2-4-10
Boring Location: See Plan
GS Elev.: 98'± Datum: NAVD88

	Auger/ Casing	Sampler
Type:	HSA/Steel	S.S.
I.D.:	2-1/4"/4"	2" O.D.
Hammer Wt.:	300 lbs.	140 lb.
Hammer Fall:	24"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
2/2/10	1250	6'	25'	40 min.
2/3/10	0736	14'	31'	16.5 hours
2/3/10	1545	10'	60'	10 min.
2/4/10	0725	10'	60'	15.5 hours
2/4/10	1256	12.5'	75'	45 min.

Depth	Sample Information: No.	Pen./Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
	S-1	24/12	0-2	24-30 13-13		S-1: Top 1": Dark brown, fine SAND and SILT, trace Organics; Middle 6": Brown, fine to coarse SAND, little fine to coarse Gravel, little Silt; Bottom 5": Light brown, fine to medium SAND, some fine to coarse Gravel, little Silt	0.1' TOPSOIL / FILL	1	None
1								2	
2	S-2	24/11	2-4	27-27 26-16		S-2: Very dense, brown, fine to medium SAND, some Silt, little fine to coarse Gravel, trace Brick		3	
3									
4	S-3	24/16	4-6	13-33 28-32	59	S-3: Brown, fine to medium SAND, little Silt, little fine Gravel			
5					75				
6	S-4	24/12	6-8	24-25 32-30	97	S-4: Very dense, brown, fine to medium SAND, some fine to coarse Gravel, little Silt			
7					172				
8					193				
9					120				
10	S-5	24/12	10-12	63-66 42-22	41	S-5: Brown, fine to coarse SAND, some Silt, little fine to coarse Gravel		4	
11					31				
12					30				
13					89				
14					200				
15	S-6	24/7	15-17	82-88 63-34	83	S-6: Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, some Silt		5	
16					47				
17					36				
18					46				
19					90				
20	S-7	24/0	20-22	47-46 54-53	44	S-7: No sample recovered		6	
21					37				
22	S-8	24/0	22-24	41-53 23-22	34	S-8: No sample recovered			
23					50				
24					60				
25	S-9	24/7	25-27	24-37 28-32	44	S-9: Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, some Silt			
26					41				
27	S-10	24/7	27-29	32-26 19-15	79	S-10: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt			
28					49				
29	S-11	24/0	29-31	13-8	40	S-11: No sample recovered			

REMARKS

1. SPT conducted using "safety" hammer and 2" diameter split spoon sampler. Cobbles 3"x4" and 5"x4" removed from top foot.
2. Borehole advanced from 0 to 4 feet below grade using 2-1/4" I.D. hollow stem augers. Borehole advanced from 4 to 75 feet below grade with 4" flush joint casing and rotary wash methods. Drilling wash water introduced to borehole at 8 feet below grade to completion of boring.
3. Groundwater readings taken after introduction of drilling fluid and measured groundwater readings likely perched drilling fluid and not indicative of actual groundwater.
4. Driller roller bitted ahead, prior to driving casing from 10 to 29 feet.
5. Shale fragments observed in sample S-6.
6. Driller noted little to no resistance when removing spoon S-7 from sampling depth. Possible that cobble was encountered and advanced down by spoon based on blows and lack of recoveries.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-11

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-11
Page: 2 of 3
File No.: 15.0702100.50
Check: DMB

Depth	No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/ Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
				6-5	30		FILL		
31	S-12	24/0	31-33		71	S-12: No sample recovered		7	
32	S-13	10/18	31-31.8		73	S-13: Brown, fine to coarse SAND, some Silt, little fine Gravel		8 9	
33	S-14	24/6	33-35	31-15 10-16	75	S-14: Medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt	33' SAND AND GRAVEL		
34					60				
35	S-15	24/0	35-37	19-22 22-29	99	S-15: No sampled recovered			
36					120				
37	S-16	24/3	37-39	32-20 15-13	123	S-16: Dense, brown, fine to coarse GRAVEL, some fine to coarse Sand, little Silt			
38					91				
39					350/6"				
40	S-17	24/12	40-42	28-31 28-24	88	S-17: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt (Piece of gravel observed in spoon tip.)			
41					68				
42					76				
43					77				
44					143				
45	S-18	24/16	45-47	31-31 51-69	74	S-18: Very dense, brown, fine to coarse SAND, some Silt, little fine Gravel			
46					69				
47					75				
48					91				
49					300				
50	S-19	3/1	50-50.3	100/3"	251	S-19: Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt		10	
51					187				
52					135				
53					75			11	
54					87				
55	S-20	24/9	55-57	21-25 26-30	100	S-20: Top 6": Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt Bottom 3": Brown, CLAY and SILT, little coarse Gravel	56' SILT AND CLAY		
56					103				
57					100				
58					81				
59					116				
60	S-21	24/24	60-62	12-17 20-21	89	S-21: Hard, brown, SILT and CLAY, trace fine Sand Tv = 0.65 tsf		12	
61					72				
62					72				
63					76				
64					93				

REMARKS

7. No recovery of sample S-12. Therefore sample S-13 redrove into other side of borehole. Sample S-12 not conducted in accordance with ASTM D1586. Hammer dropped greater than 30" in attempt to obtain recovery. Upon retrieval, playtex liner, inserted in spoon and resampled. Recovery successful. Liner also used in sample S-14.
8. Falling head test conducted over zone between 31 to 35 feet, following sampling.
9. Driller roller bitted ahead, prior to driving casing from 31 to 35 feet and 39.5 to 75 feet. S-17 sampled open hole.
10. Shale fragments observed in sample S-19.
11. Driller noted heavy roller bit resistance at 53 feet.
12. Tv = Field Torvane Shear Strength in tons per square feet (tsf).
13. PP = Pocket penetrometer compressive strength readings in tons per square foot (tsf).

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-11

GZA GeoEnvironmental, Inc.
Engineers and Scientists

CHICOPEE FALLS LEVEE
CHICOPEE, MASSACHUSETTS

Boring No.: CF-11
Page: 3 **of** 3
File No.: 15.0702100.50
Check: DMB

Depth	Sample Information: No.	Pen./Rec. (in.)	Depth (Ft.)	Blows (/6")	Casing Blows/Ft.	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
65	S-22	24/24	65-67	19-37 39-82	97	S-22: Hard, brown, Clayey SILT, little fine Sand PP = >4 tsf (Silt)	SILT AND CLAY	13	
66					70				
67					52				
68					66			14	
69					86				
70	S-23	24/24	70-72	22-20 17-21	63	S-23: Hard, brown, SILT and CLAY, trace fine Gravel, trace fine Sand PP = 3.25 tsf Tv = 1 tsf			
71					55				
72					65				
73					69				
74					81				
75	S-24	24/24	75-77	22-14 20-24		S-24: Hard, brown, CLAY and SILT PP = 3.5 tsf Tv = 1.45 tsf			
78							78.5' WEATHERED BEDROCK	15	
80	S-25	1/0.5	80-80.1	100/1"		S-25: Red-brown, fine to coarse GRAVEL (WEATHERED ROCK), little fine to coarse Sand, little Silt End of Exploration at 80.1'	80'	16	

Depth scale: 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99

REMARKS

14. Driller noted rod chatter at 68 feet.
15. Driller noted heavy roller bit resistance at 78 feet. Roller bitted additional two feet and sampled S-25.
16. Borehole tremie grouted to ground surface with 1 1/2 tubs bentonite/cement grout (~30 gallons/tub) upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: CF-11

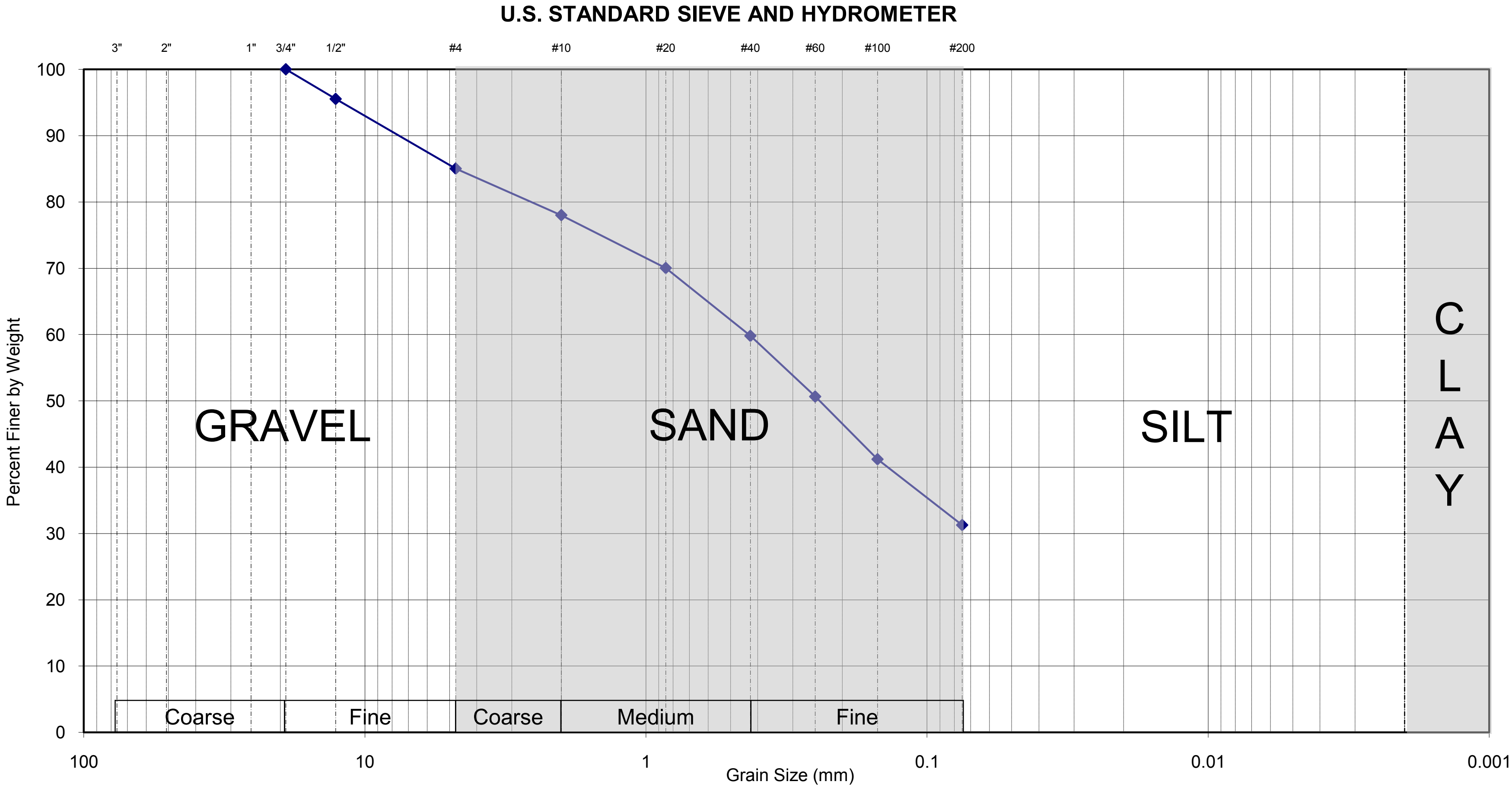
SECTION A-3.3

GEOTECHNICAL LABORATORY RESULTS

LABORATORY TESTING DATA SHEET

Project Name	Chicopee Flood Control Works	Location	Chicopee, MA	Reviewed By	
Project No.	15.0702100.50	Assigned By	R. House		
Project Engineer	M. Taylor/A. Bjarngard	Report Date	3/24/2010	Date Reviewed	3/24/2010

				Identification Tests							Strength Tests						
Boring No.	Sample No.	Depth ft.	Lab No.	Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	Dry unit wt. pcf	Perme-ability cm/sec	Torvane or Type Test	$\overline{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Laboratory Log and Soil Description
CF-3	S-2	2-4	25				31										Brown f-c SAND some Silt, little fine Gravel (SM)
CF-3	S-5	10-12	26				19										Brown f-c SAND some f-c Gravel, little Silt (SM)
CF-3	S-7	20-22	27				15										Brown f-c SAND some fine Gravel, little Silt (SM)
CF-3	S-9	27-29	28				15		5.4								Brown f-c SAND, little Silt little fine Gravel (trace Org.) (SM)
CF-5	S-2	2-4	29				28										Brown f-c SAND some Silt, some f-c Gravel (SM)
CF-5	S-5	10-12	30				22										Brown f-c SAND some f-c Gravel, some Silt (SM)
CF-5	S-11	28-30	31				15										Brown f-c SAND little Silt, little fine Gravel (SM)
CF-6	S-5	10-12	32				25										Brown f-c SAND some Silt, little fine Gravel (SM)
CF-7	S-5	10-12	33				28										Brown f-c SAND some Silt, little f-c Gravel (SM)
CF-7	S-12	35-37	34				10										Brown f-c GRAVEL and f-c SAND, little Silt (GW-GM)
CF-11	S-3	4-6	35				26										Brown f-m SAND little Silt, little fine Gravel (SM)
CF-11	S-5	10-12	36				24										Brown f-c SAND some Silt, little f-c Gravel (SM)
CF-11	S-13	31-33	37				28										Brown f-c SAND some Silt, little Gravel (SM)



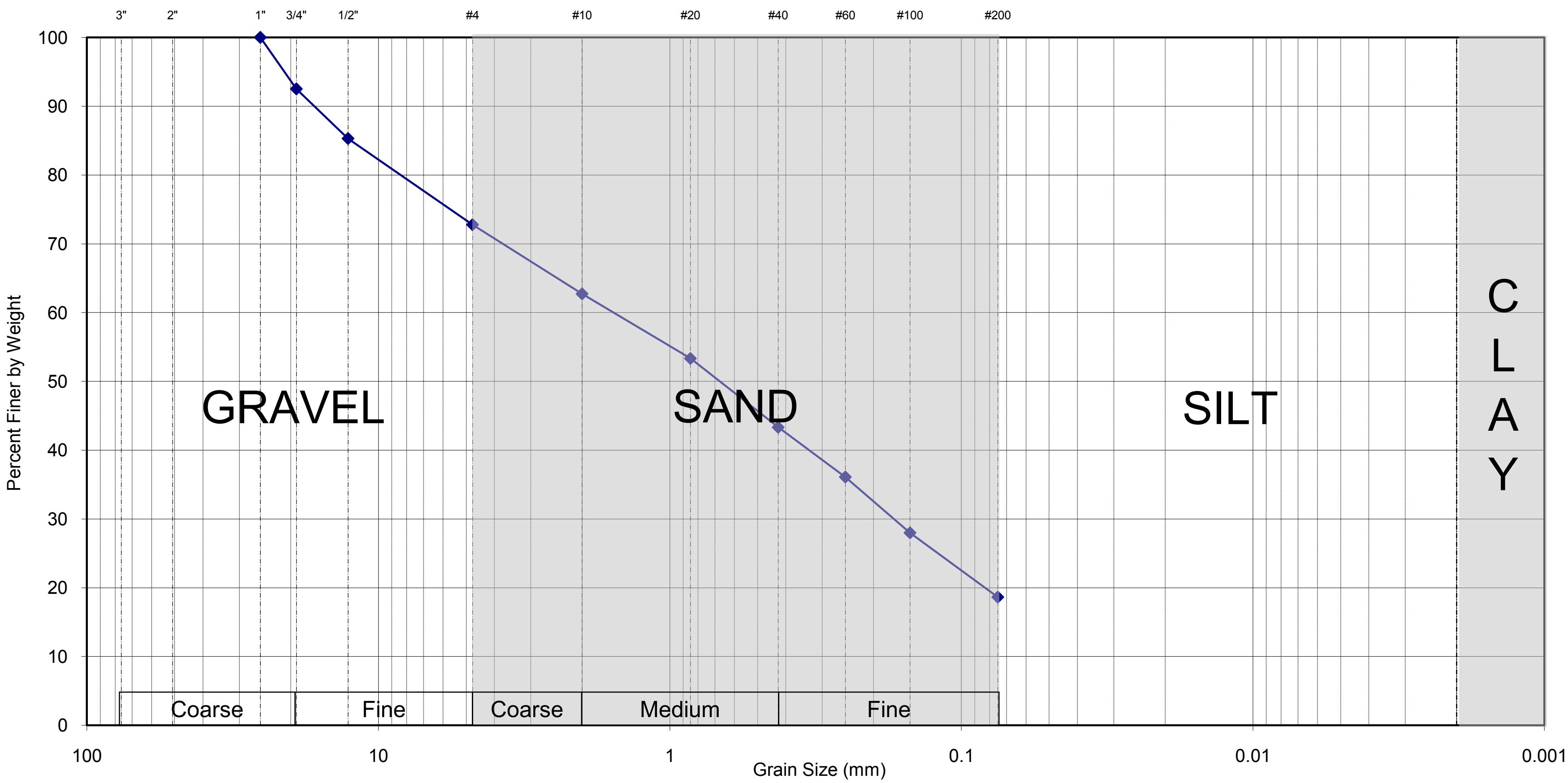
Gravel	Sand	Fines
15.0%	53.7%	31.3%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
25	CF-3	S-2	2-4'	Brown f-c SAND, some Silt, little fine Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by:	MST/PEC	Date:	3/18/10
Reviewed by:	MBP	Date:	3/24/10

U.S. STANDARD SIEVE AND HYDROMETER



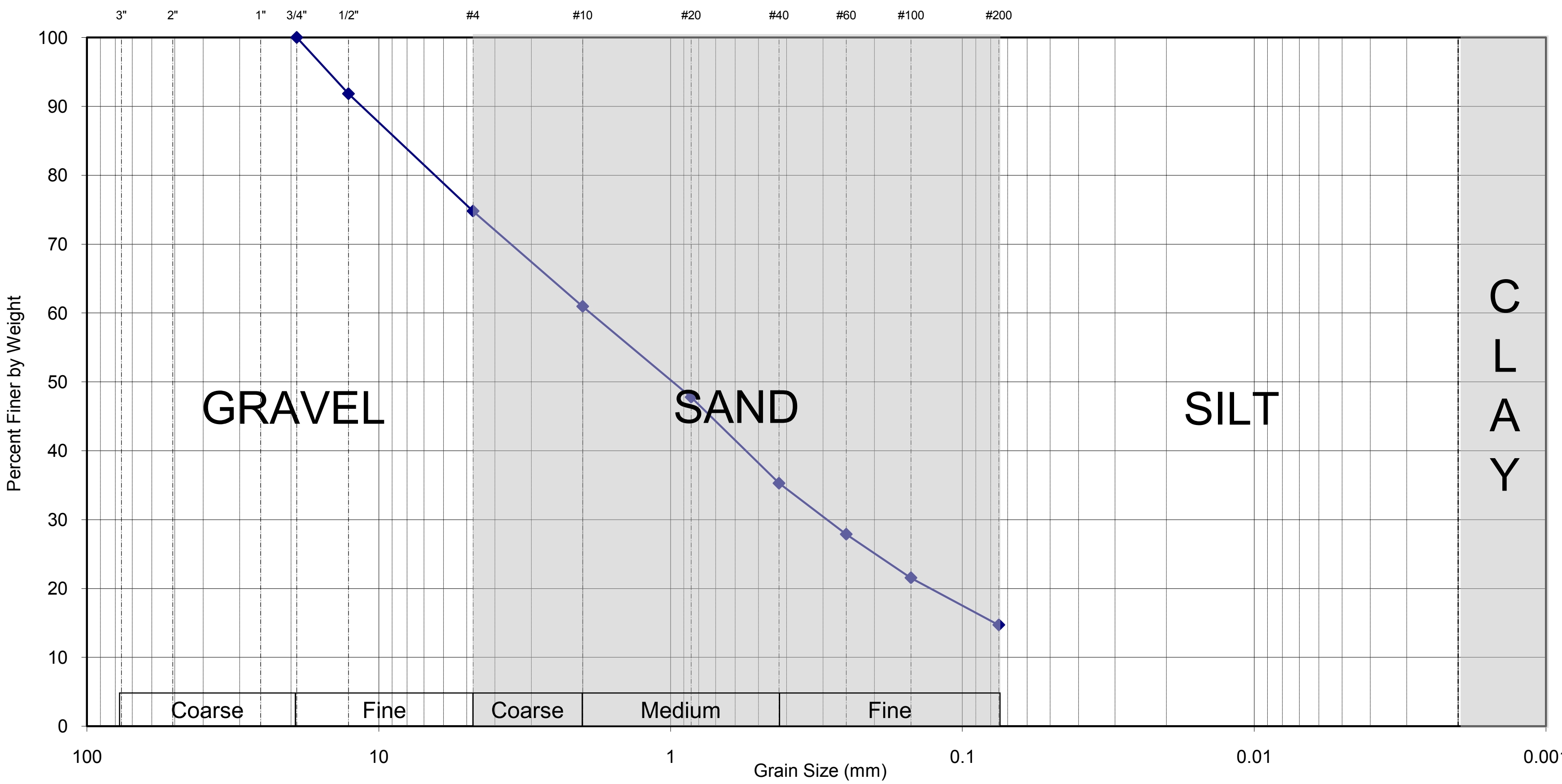
Gravel	Sand	Fines
27.2%	54.1%	18.6%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
26	CF-3	S-5	10-12'	Brown f-c SAND, some f-c Gravel, little Silt (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10

U.S. STANDARD SIEVE AND HYDROMETER



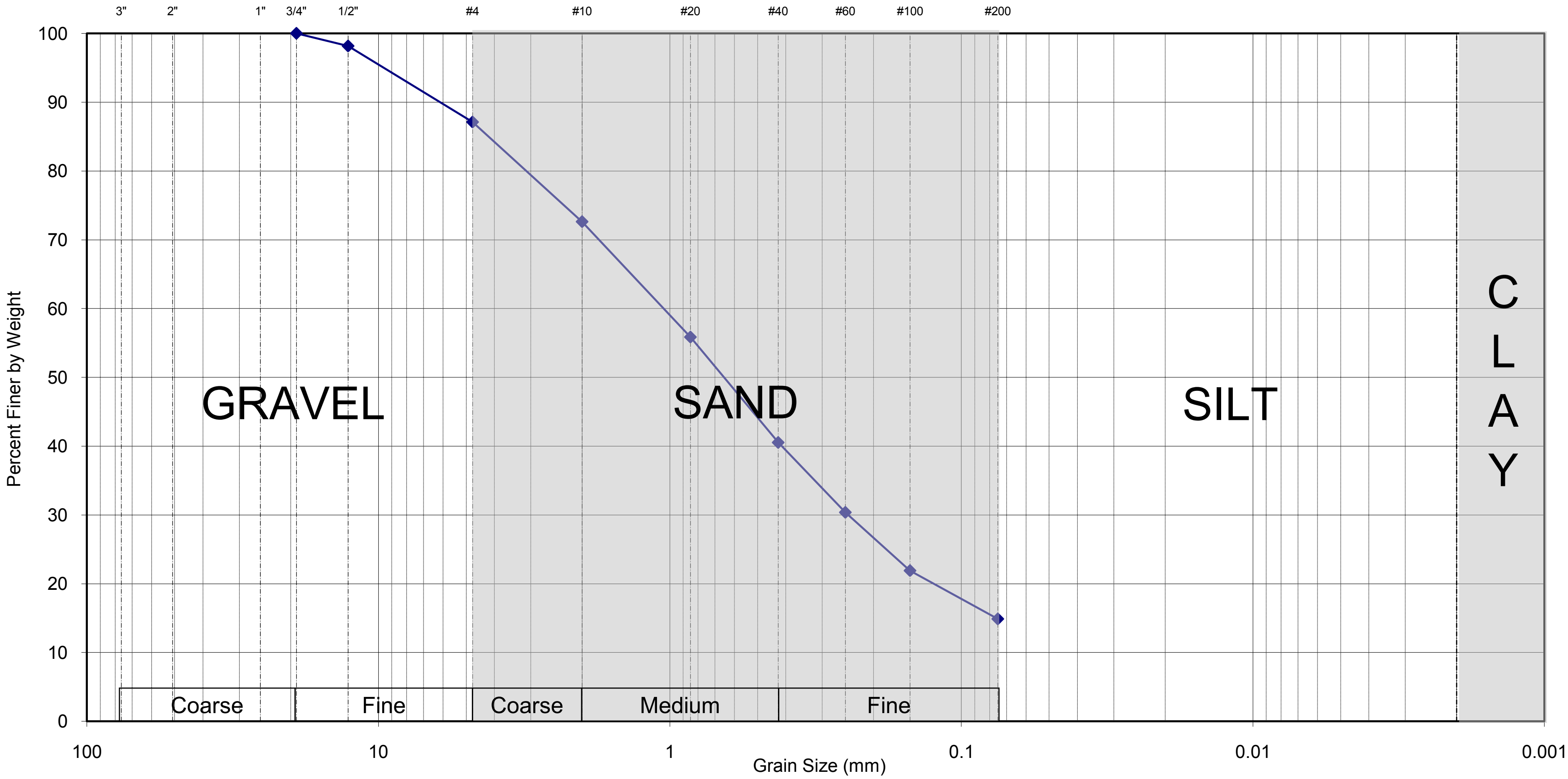
Gravel	Sand	Fines
25.2%	60.1%	14.7%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
27	CF-3	S-7	20-22'	Brown f-c SAND, some fine Gravel, little Silt (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10

U.S. STANDARD SIEVE AND HYDROMETER

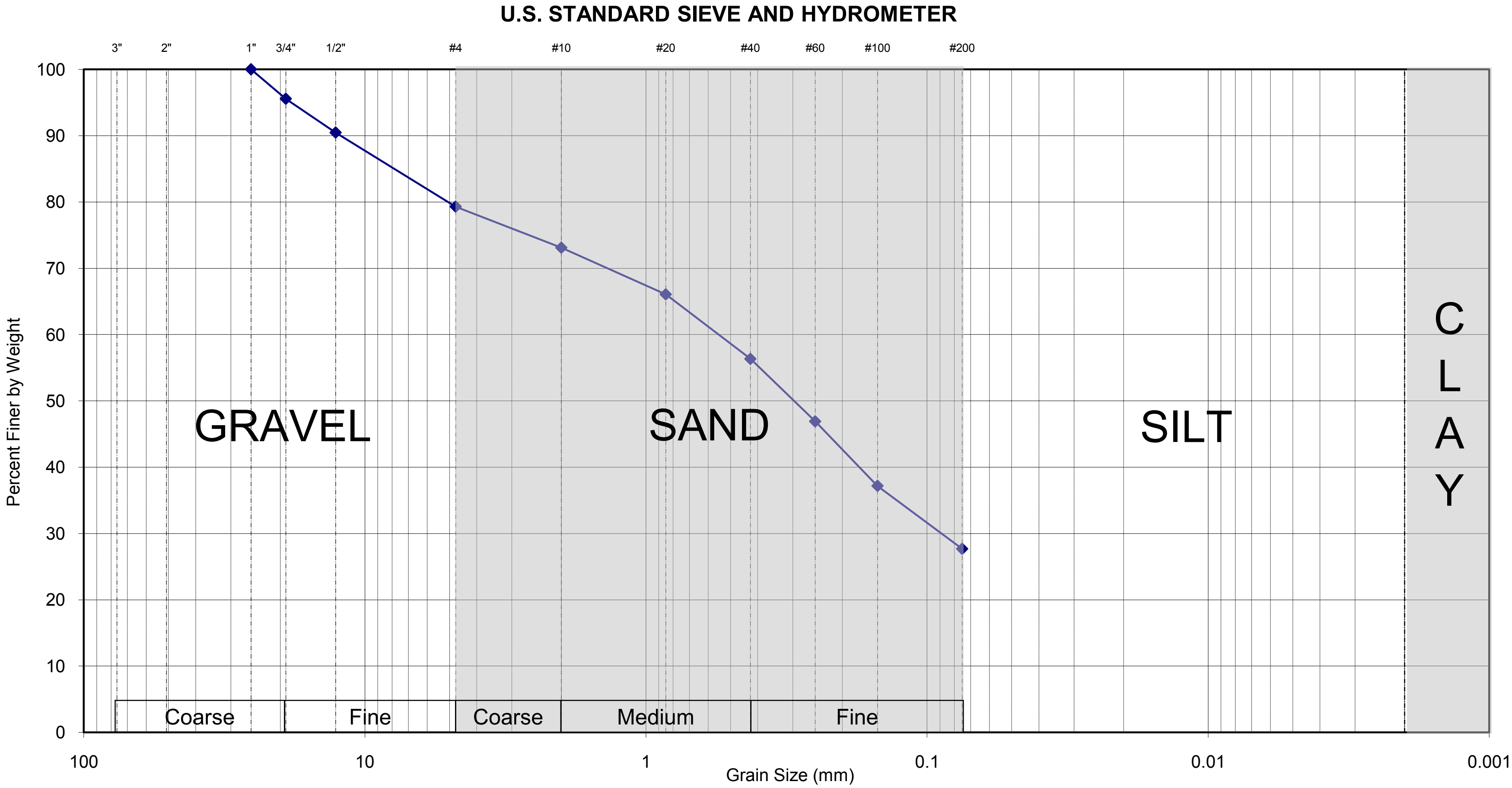


Gravel	Sand	Fines
12.9%	72.2%	14.9%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
28	CF-3	S-9	27-29'	Brown f-c SAND, little Silt, little fine Gravel (tr. Organics) (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by:	MST/PEC	Date:	3/18/10
Reviewed by:	MBP	Date:	3/24/10

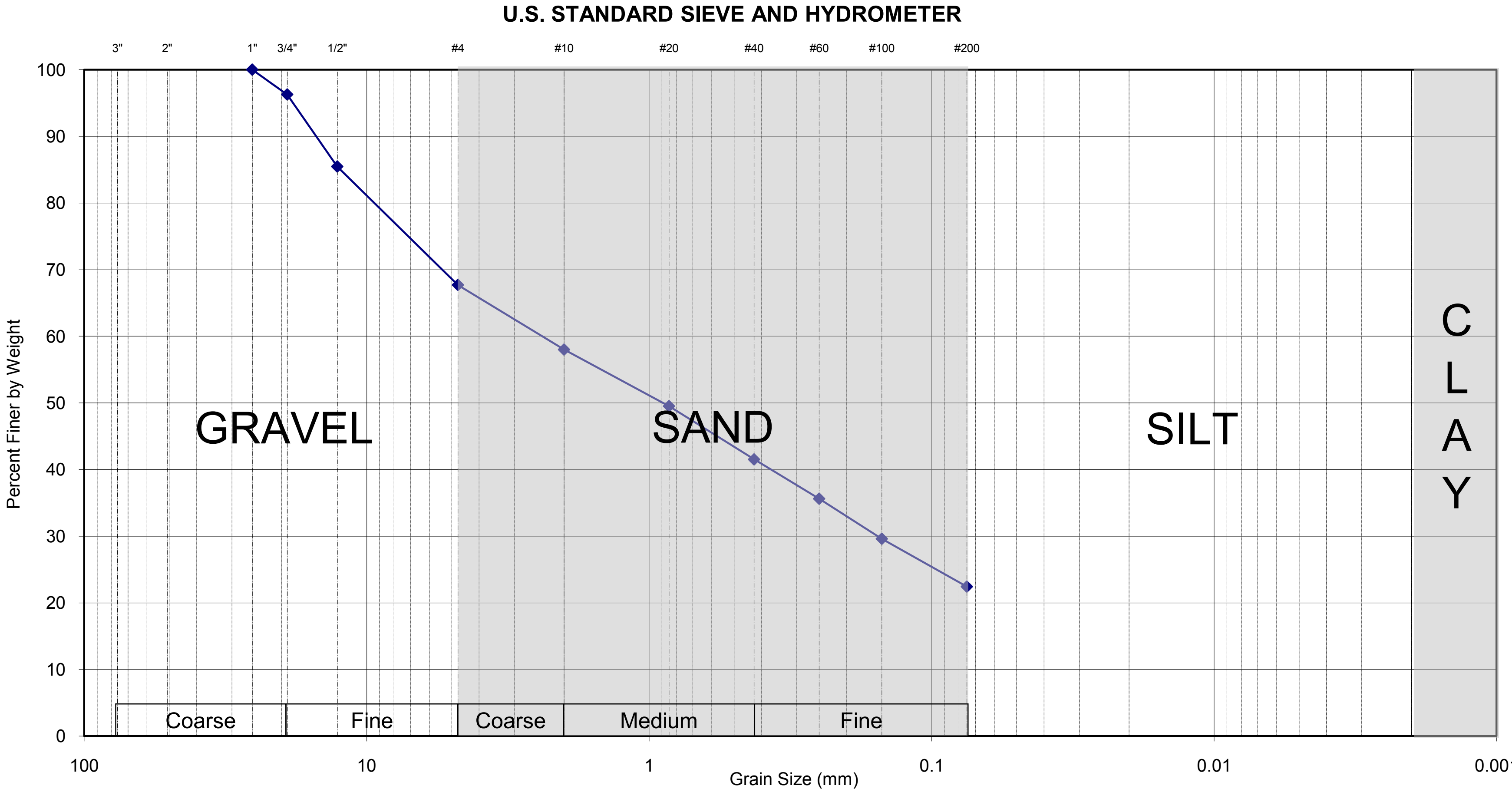


Gravel	Sand	Fines
20.7%	51.6%	27.7%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
29	CF-5	S-2	2-4'	Brown f-c SAND, some Silt, some f-c Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10

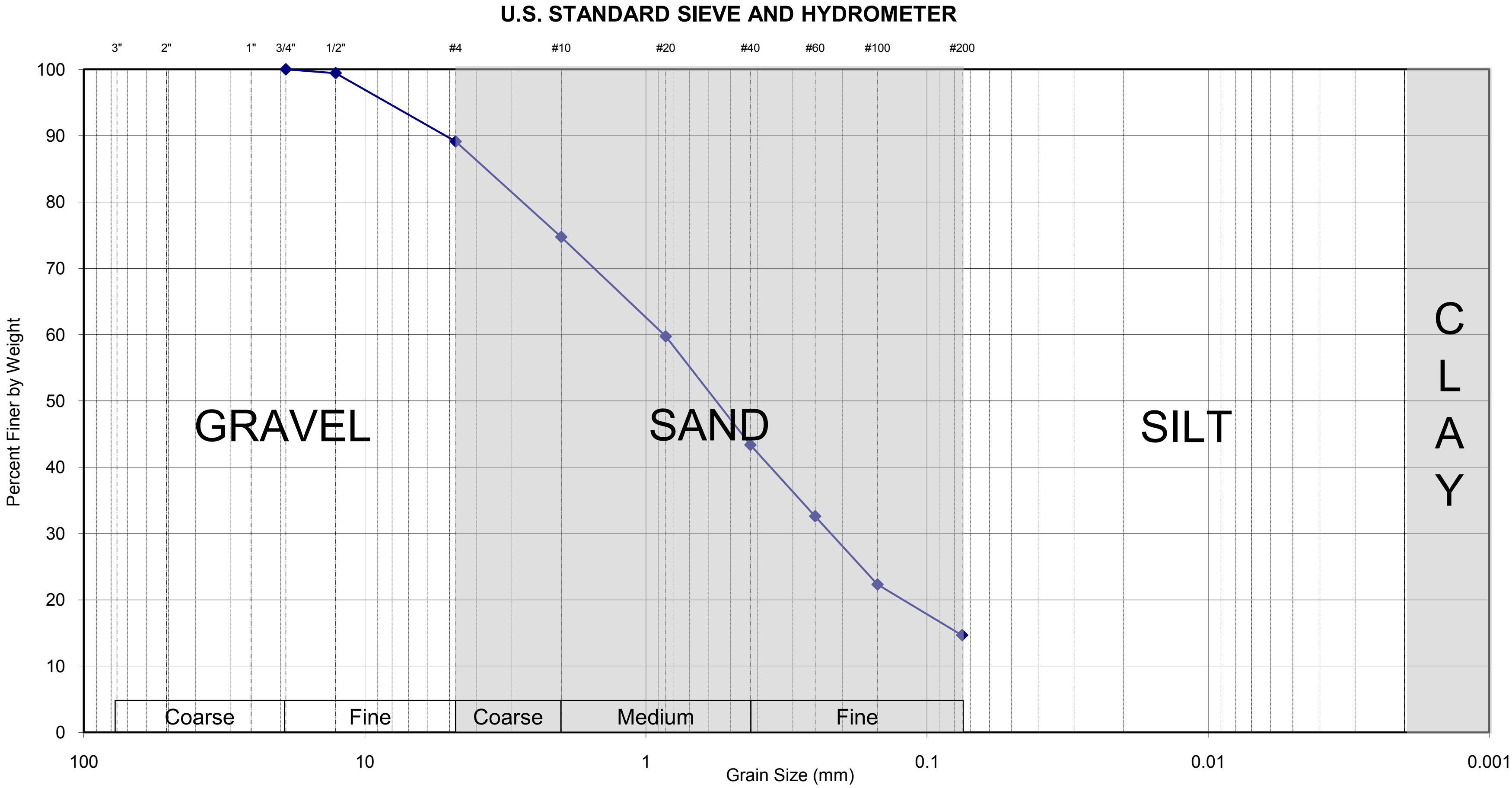


Gravel	Sand	Fines
32.3%	45.3%	22.4%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
30	CF-5	S-5	10-12'	Brown f-c SAND, some f-c Gravel, some Silt (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by:	MST/PEC	Date:	3/18/10
Reviewed by:	MBP	Date:	3/24/10

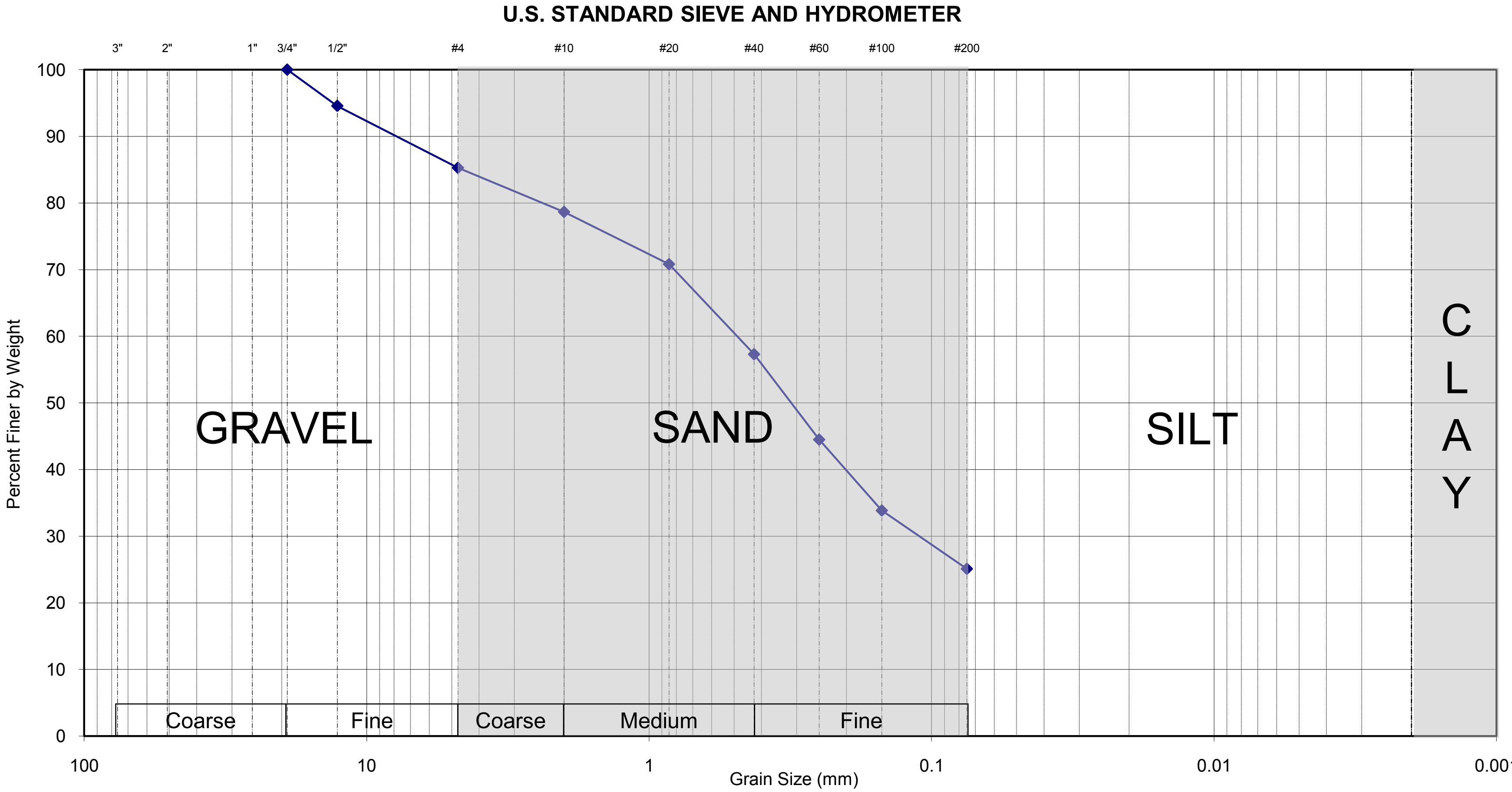


Gravel	Sand	Fines
10.9%	74.5%	14.7%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
31	CF-5	S-11	28-30'	Brown f-c SAND, little Silt, little fine Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10

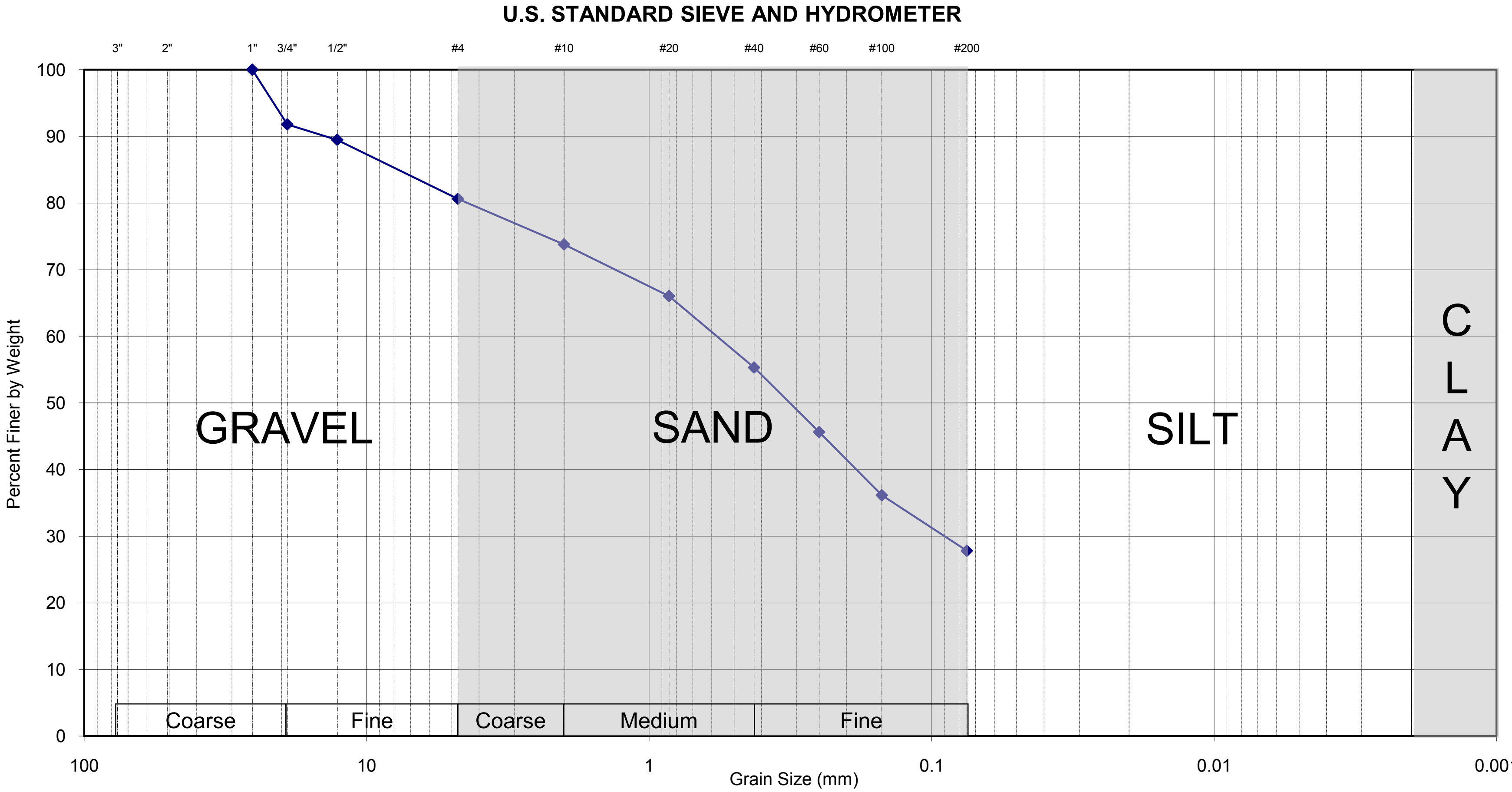


Gravel	Sand	Fines
14.7%	60.2%	25.1%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
32	CF-6	S-5	10-12'	Brown f-c SAND, some Silt, little fine Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

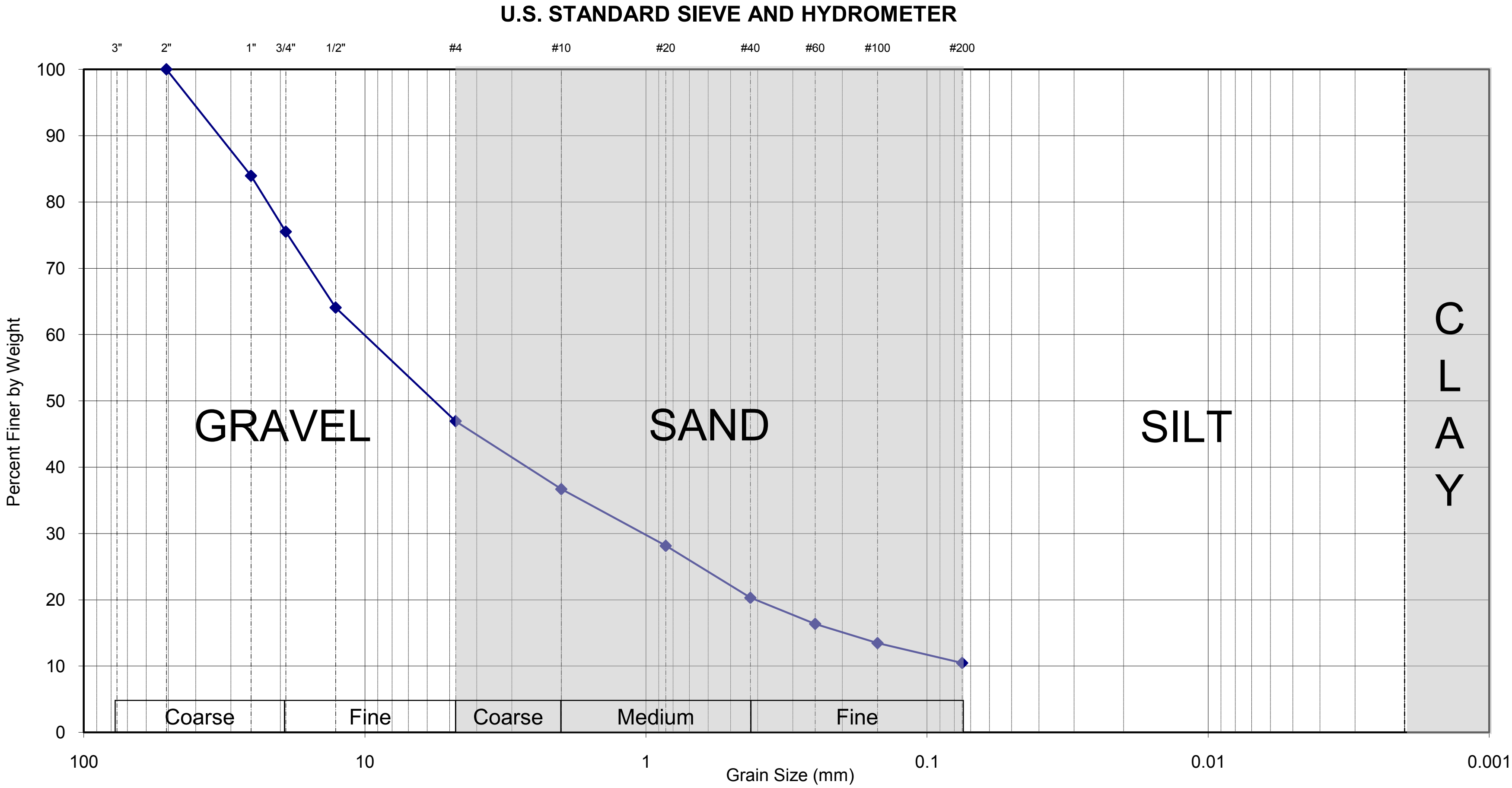
Tested by:	MST/PEC	Date:	3/18/10
Reviewed by:	MBP	Date:	3/24/10



Gravel	Sand	Fines
19.4%	52.8%	27.8%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
33	CF-7	S-5	10-12'	Brown f-c SAND, some Silt, little f-c Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50
Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10

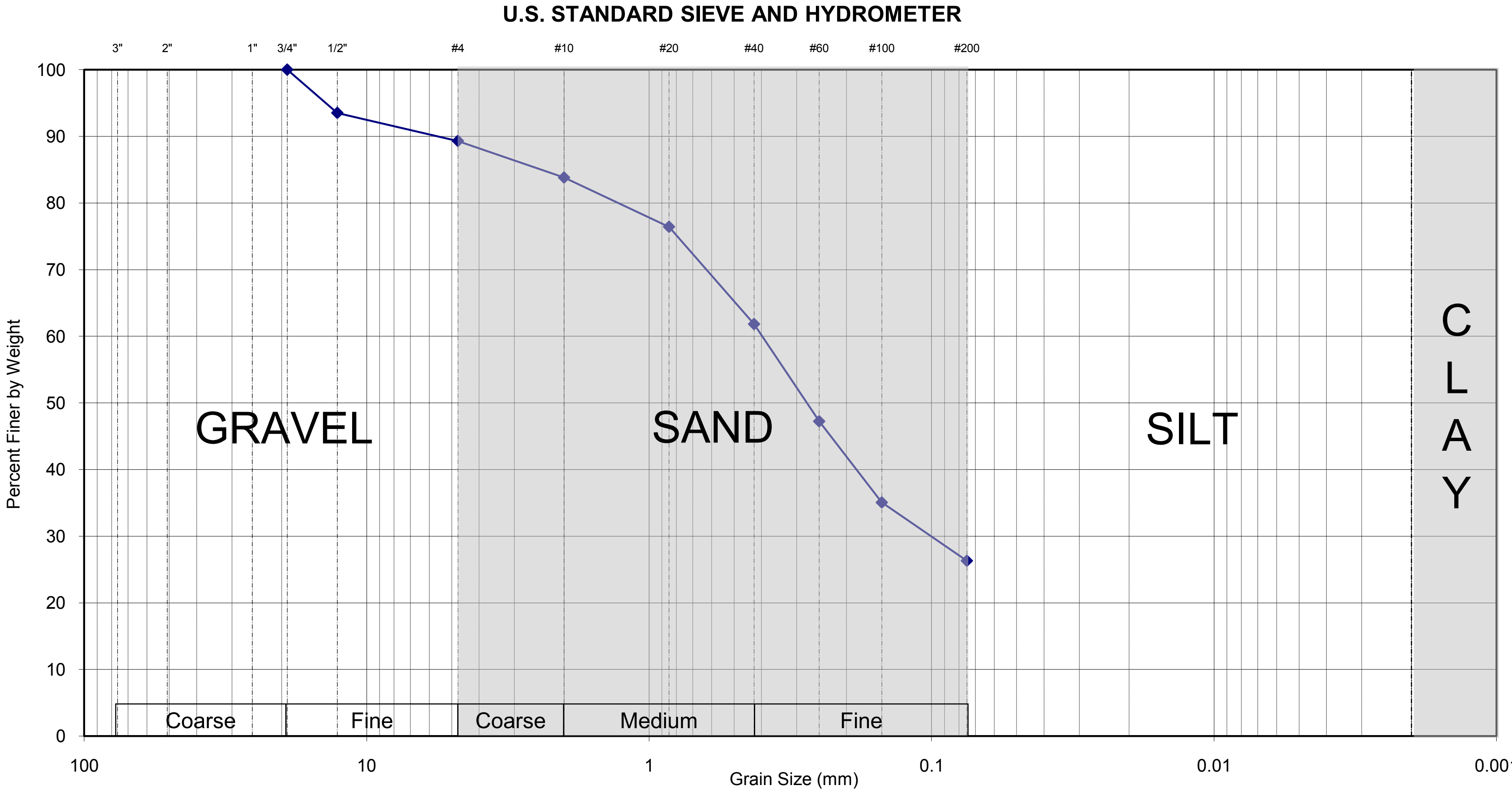


Gravel	Sand	Fines
53.1%	36.5%	10.5%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
34	CF-7	S-12	35-37'	Brown f-c GRAVEL and f-c SAND, little Silt (GW-GM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10

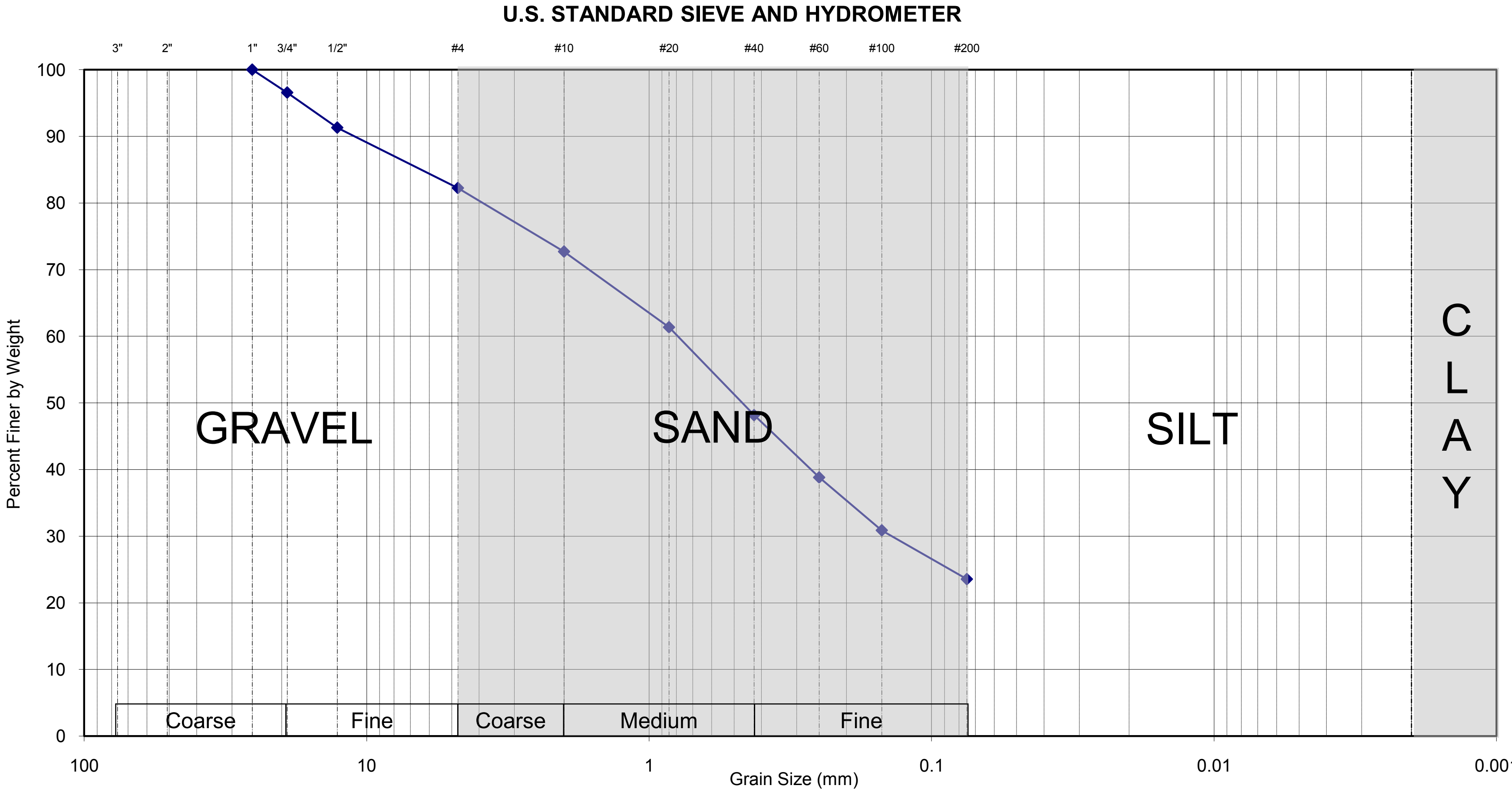


Gravel	Sand	Fines
10.7%	63.0%	26.3%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
35	CF-11	S-3	4-6'	Brown f-m SAND, some Silt, little fine Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by:	MST/PEC	Date:	3/18/10
Reviewed by:	MBP	Date:	3/24/10

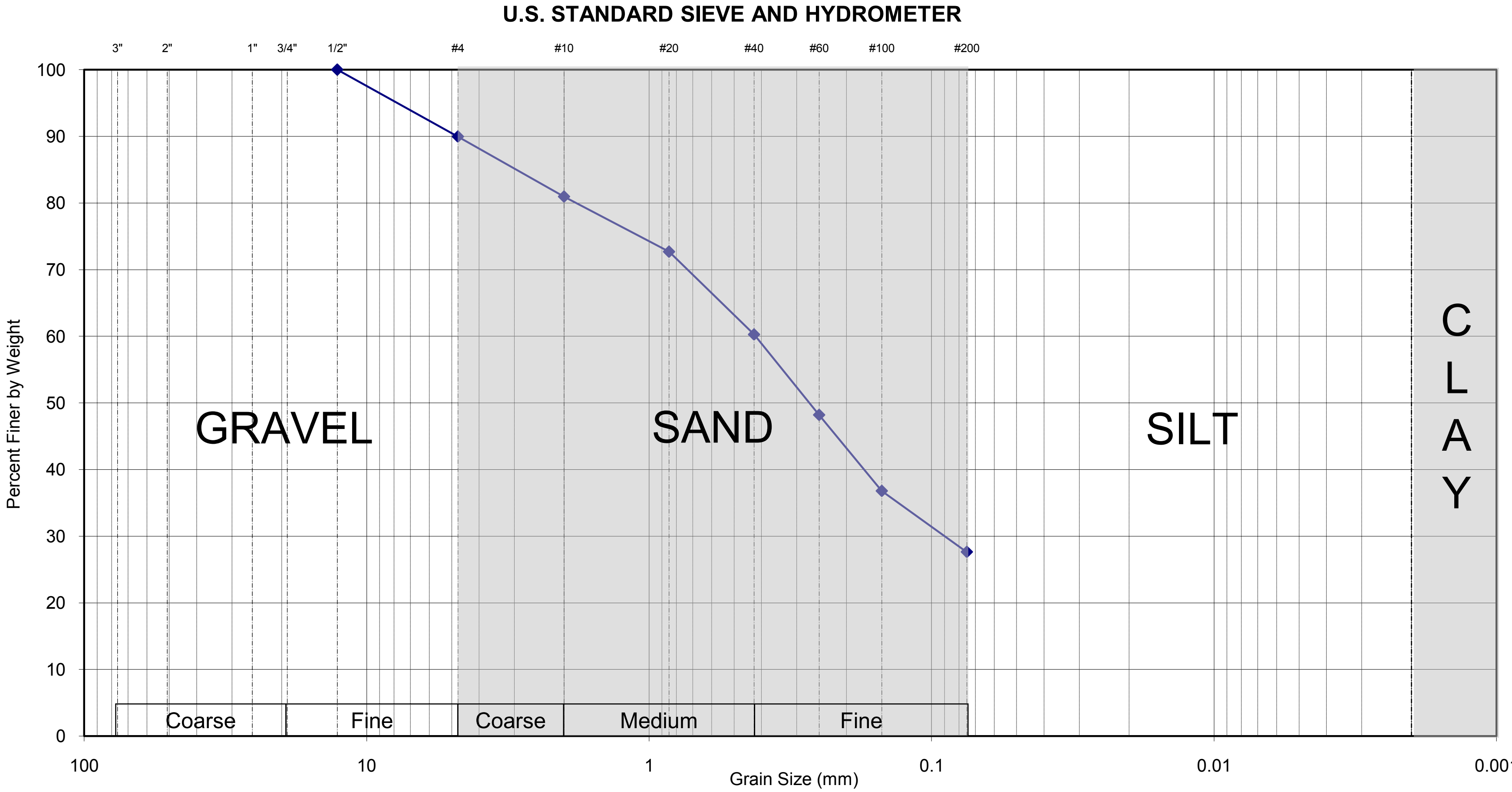


Gravel	Sand	Fines
17.8%	58.7%	23.6%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
36	CF-11	S-5	10-12'	Brown f-c SAND, some Silt, little f-c Gravel (SM)				

Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by: MST/PEC Date: 3/18/10
Reviewed by: MBP Date: 3/24/10



Gravel	Sand	Fines
10.0%	62.3%	27.6%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
37	CF-11	S-13	31-33'	Brown f-c SAND, some Silt, little fine Gravel (SM)				

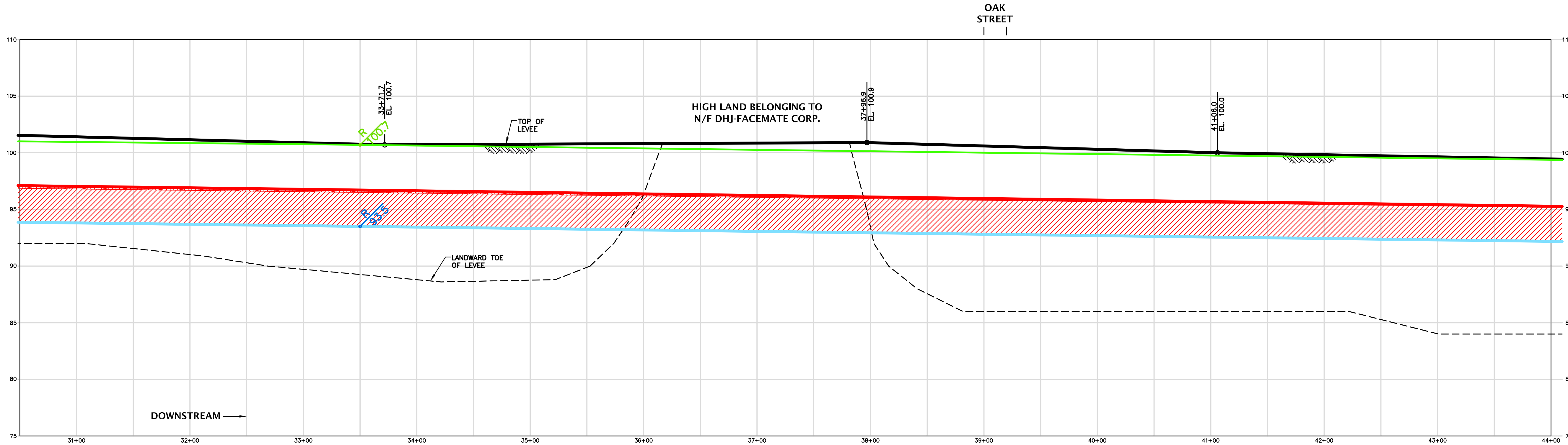
GZA

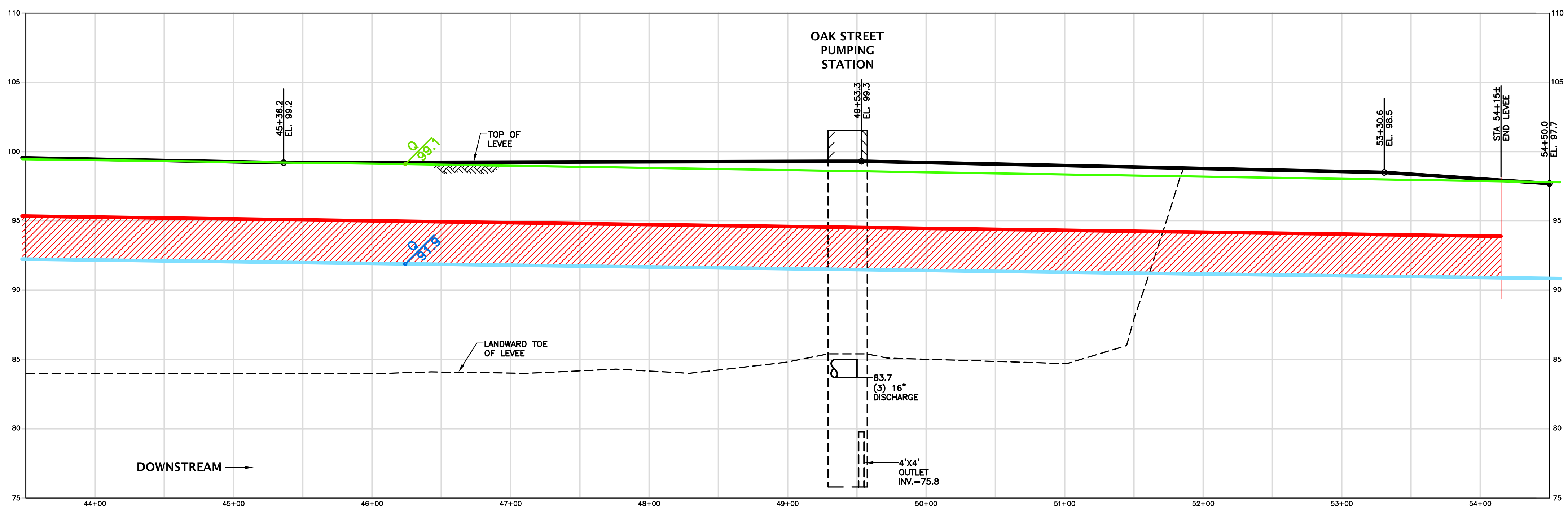
Chicopee Flood Control Works
Chicopee, MA
GZA File # 15.0702100.50

Tested by:	MST/PEC	Date:	3/18/10
Reviewed by:	MBP	Date:	3/24/10

APPENDIX A-4.1

FREEBOARD





GENERAL NOTES:

1. ALL ELEVATIONS SHOWN ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. TOP OF LEVEE INFORMATION OBTAINED BY HERITAGE SURVEYS, INC., OCTOBER-DECEMBER, 2009, AND AS SHOWN ON THE FLOOD CONTROL SYSTEM "AS-BUILT" DRAWINGS, DECEMBER, 2009.
3. STATIONING REFERS TO THE FLOOD CONTROL SYSTEM LEVEE CENTERLINE AS DEPICTED ON THE ORIGINAL U.S. ARMY CORPS OF ENGINEERS CONSTRUCTION DRAWINGS OR RECORD DRAWINGS, AS AVAILABLE.
4. BASE FLOOD (1-PERCENT-ANNUAL CHANCE) AND 500-YEAR FLOOD PROFILE INFORMATION WAS OBTAINED FROM THE PRELIMINARY FLOOD INSURANCE STUDY, HAMPDEN COUNTY, MASSACHUSETTS, FIS # 25013CV001, FEDERAL EMERGENCY MANAGEMENT AGENCY, APRIL 30, 2009.

No.	DATE	REVISION	BY

LEGEND

- 5+47 BEL. 88.7 — TOP OF LEVEE ELEVATION BY FIELD SURVEY MAY 2008 – SEPT. 2009
- TOP OF EARTHEN LEVEE
- TOP OF CONCRETE FLOODWALL
- LANDWARD TOE OF LEVEE
- LANDWARD GRADE AT FLOODWALL
- RIVERWARD GRADE AT FLOODWALL
- BASE (1% CHANCE) FLOOD PROFILE
- AJ 71.2 — BASE FLOOD ELEVATION AT FIS CROSS SECTION
- TOTAL REQUIRED FREEBOARD
- 500-YR. FLOOD PROFILE

FREEBOARD CRITERIA:

[AS PER 44 CFR 65.10(b)(1)(i)]

CRITERION #1: PROVIDE MINIMUM FREEBOARD OF THREE FEET ABOVE THE WATER-SURFACE LEVEL OF THE BASE (1% CHANCE) FLOOD

CRITERION #2: AN ADDITIONAL ONE FOOT ABOVE THE MINIMUM IS REQUIRED WITHIN 100 FEET IN EITHER SIDE OF STRUCTURES (SUCH AS BRIDGES) RIVERWARD OF THE LEVEE OR WHEREVER THE FLOW IS CONSTRICTED.

CRITERION #3: AN ADDITIONAL ONE-HALF FOOT ABOVE THE MINIMUM AT THE UPSTREAM END OF THE LEVEE, TAPERING TO NOT LESS THAN THE MINIMUM AT THE DOWNSTREAM OF THE LEVEE, IS ALSO REQUIRED.

SHEET TITLE:

CHICOPEE FALLS SYSTEM
STA 31+00 TO
STA 54+15± (HIGH GROUND)

PROJECT AND LOCATION:

FREEBOARD EVALUATIONS
CITY OF CHICOPEE, MA
FLOOD CONTROL WORKS

PREPARED FOR:

CITY OF CHICOPEE
DEPARTMENT OF PUBLIC WORKS
CHICOPEE MA

BAYSTATE ENVIRONMENTAL CONSULTANTS INC.
A GZA Company
Civil Engineers – Planners – Environmental Scientists
296 North Main Street
East Longmeadow, MA 01028
120 Mountain Avenue
Bloomfield, CT 06002

BEC PROJECT No. 15.0702100.40

SCALE VERT. 1"=10' HOR. 1"=100'

DATE JUNE, 2010

DRAWN BY EDM

CHECKED BY TEJ

SHEET No. 2 OF 2 SHTS

<u>APPENDIX A-4.2</u>

CLOSURES

Item	Location	Station	Description	Shown on USACE	Observed in field?	Comments	O&M MANUAL INFO.
1	Chicopee Falls	36+10	48" diam. RCP pressure drain with gate structure	YES	YES	Previously utilized by US Rubber Co. Gate located near Main Street in chamber operated and maintained by CIty	Sluice gates formerly operated for flushing lower level drainage system of former U.S. Rubber Co. consist of 48" diam. gravity discharge conduit, 24" sluice gate and a 48" sluice gate; under both normal & flood conditions, the 48" gate should remain wide open & the 24" tightly closed. During a localized storm causing local runoff not accompanied by a rise in the river level above el. 90.0, the 24" gate should be opened completely and slowly closing the 48" gate to flush 24" diam. bypass pipe.
2	Chicopee Falls	36+10	24" diam. RCP storm drain connected to drop inlet	YES	YES	Outfall shares same headwall as 48" diam. RCP. Pipe outlets slotted drain near top of levee which is higer than the one percent chance flood elevation.	
3	Chicopee Falls	48+00	30"x30" intake with gate structures on both sides	YES	YES	Previously utilized by U.S. Rubber Co. and no longer in use. Gate closed and pumps not operating.	See below * U.S. Rubber Co. no longer in operation. Gate is to be maintained in the CLOSED position.
4	Chicopee Falls	52+50	30" diam. RCP pressure drain	YES	YES	Outfall is from an area higher than the one percent chance flood elevation.	

* From Section VI of *Operation and Maintenance Manual,* USACE, 1984: "6-01. DESCRIPTION - Located at Sta. 48+00 are process water intake (30x30 sluice gate) and intake cooling water structure (30" wafer butterfly valve and 30" gate valve). Wafer butterfly maintains water levels between el. 77 and 79 in existing intake structure. 30" gate valve is, normally open but should be closed with cooling water pumps stopped. 6-03. OPERTION - When the river level is rising and reaches El. 79, the 30" wafer butterfly valve in the gate structure behind the dike should be throttled and constantly controlled to maintain the water level in the pit between El. 77 & 79. The elev. of the top of the gate structure is 84.5. Therefore, the water must be so controlled that the level at all times is between 5.5 and 7.5 ft below the top of the structure. This must be constantly watched as the level will change as the river level changes and also as the demand from the pumps change. The 30" gate valve also located in the gate structure should be closed if the cooling water pumps are stopped and the pressure through the wafer butterfly valve causes the water level in the pit to exceed El. 79. The sluice gate located on the river side of the dike should be kept open at all times. It should be closed only in the event of a rupture in the conduit between the 30" gate valve and the river."

APPENDIX A-4.3

EMBANKMENT PROTECTION

ANALYSIS OF EMBANKMENT PROTECTION

CHICOPEE FALLS FLOOD CONTROL SYSTEM

CHICOPEE FLOOD CONTROL WORKS

CITY OF CHICOPEE

HAMPDEN COUNTY, MASSACHUSETTS

October 2010

Baystate Environmental Consultants, Inc.

A GZA Company

TABLE OF CONTENTS

Tables

Figures

Appendices

1 INTRODUCTION

The federal regulations pertaining to mapping of areas protected by levee systems require an analysis of embankment protection which demonstrates "*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 to be addressed in such analyses include, but are not limited to: Expected flow velocities (especially in constricted areas); 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*" (44 CFR 65.10(b)(3)).

The analysis of embankment protection was performed in accordance with 44 CFR 65.10(b)(3) and by the application of methods and guidelines found in the United States Army Corps of Engineers (USACE) Engineering Manual on Hydraulic Design of Flood Control Channels (EM 1110-2-1601, Change 1, 30 Jun 94), USACE Coastal Engineering Manual, Part II (EM 1110-2-1100, Change 2, 1 August 2008), and United States Department of Agriculture, Soil Conservation Service (USDA SCS) Handbook of Channel Design for Soil and Water Conservation (TP-61, 1954).

The following sources were consulted for information supporting the analysis of embankment protection:

- Federal Emergency Management Agency (FEMA), *Preliminary Flood Insurance Study Number 25013CV001* (April 30, 2009).
- Heritage Surveys, Inc. *Topographic Plan of Land in Chicopee, MA*, (December, 2009).
- National Climatic Data Center, "Climatic Wind Data for the United States" (November 1998).

1.1 Chicopee Falls Flood Control System Description

The Chicopee River is described by lettered cross-sections in the Preliminary Flood Insurance Study (FIS) for Hampden County, MA (April 30, 2009). The segment of the Chicopee River along which the Chicopee Falls Flood Control System is located extends from approximately Cross-Section "U" (upstream) to Cross-Section "Q" (downstream). The Chicopee Falls Flood Control System consists of two segments of cast-in-place concrete floodwall and two segments of earthen levee, for a total length of 5,002 linear feet. From the Deady Bridge upstream extending for 557 linear feet downstream, the system consists of cast-in-place cantilever concrete floodwall. The upstream 400± feet of wall is founded directly on ledge with rock anchors, while the last 157± feet is founded on earth. The exposed wall height is approximately 20 feet on both the landside and the riverside. The next downstream segment of the system consists of 712± feet of earthen levee. The top of levee is approximately 17 feet higher than the landside grading. The second segment of cast-in-place cantilever concrete floodwall extends for another 863± feet downstream. This wall section is located on the inside of a bend in the Chicopee River where flow direction turns approximately 90 degrees from westerly to southerly. This entire segment of wall is founded directly on ledge, and the exposed wall height is approximately 16 feet on the landside and 20 feet on the riverside. The second segment of earthen levee extends 2,870± linear feet downstream to complete the system.

Approximately eleven soil borings were recently performed along the Chicopee Falls Flood Control System and observed by GZA, and were advanced to depths ranging from approximately 20 to 80 feet below the ground surface (January/February, 2010). Seven (7) of the borings were performed either at the top of the levee near the riverside edge, or on the riverside slope. The borings indicated that soils near the surface of the levee consist primarily of sand with some gravel and silt.

Almost the entire length of the Chicopee Falls Flood Control System is protected on the riverside with hand- or machine-placed stone riprap. The riprap is angular rock, 1± ft in diameter, on average, and placed to provide a reasonably smooth surface approximately 18 inches thick. The USACE Specifications for construction of the Chicopee Falls Flood Control System indicate that "The material for stone slope protection shall consist of a well graded, angular quarry run stone which can be placed in an 18-inch layer. The maximum size stone shall weigh more than 200 pounds. The minimum size stone shall weigh less than 40 pounds. Material shall contain not more than 10 percent by weight of fragments that pass a two inch screen." Along the upstream section of floodwall, between the Deady Bridge and the beginning of the earthen levee section, the embankment riverward of the floodwall is covered mostly by grassy vegetation.

The City of Chicopee maintains the levees with regular mowing of the grass turf, repair of animal burrows, removal of drift and debris, repair of displaced riprap, and repair of erosion. Grass is generally maintained at a height between 4 and 8 inches.

2 EMBANKMENT PROTECTION ANALYSIS

2.1 Flow Velocity Impacts

Equation 3-3 of EM 1110-2-1601 computes the allowable characteristic side slope velocity of a channel based on the minimum riprap size of which 30% is finer by weight (D_{30}) and the local depth of flow. Based on the USACE's material specifications for stone slope protection described above in Section 1.1, the minimum size stone shall weigh less than 40 pounds. Assuming a unit weight of 100 pounds per cubic foot, a stone of 40 pounds is approximately 0.4 cubic foot in volume. A stone of 0.4 cubic foot in volume equates approximately to a rock of 0.91 feet in diameter. As most of the stone, as specified, must be greater than this size, it was assumed that the D_{30} for existing riprap along the Chicopee Falls Flood Control System is at least 0.91 ft, or 11± inches. Field inspections confirmed that the existing riprap generally conforms to the specifications. Therefore, as a check on slope protection along the Chicopee Falls Flood Control System, Equation 3-3 of EM 1110-2-1601 was used to estimate the characteristic side slope velocity for a D_{30} of 11 inches, under the consideration that existing riprap has a D_{30} of greater than 11 inches. The characteristic side slope velocity may be considered the allowable velocity for areas with riprap.

Equation 3-3 computes the characteristic side slope velocity based on the local depth of flow, both of which are typically taken at the subsection adjacent to the bank in the cross-section modeled in a water-surface profile computation. However, FEMA did not perform a new detailed study of the Chicopee River as part of the *Preliminary Flood Insurance Study* (FIS) *Number 25013CV001* (April 30, 2009). Therefore, a hydraulic model from which characteristic side slope velocities and local depths of flow along the Chicopee River could be estimated was unavailable. The best available source for velocity and depth data was the tabulated mean floodway velocities and flood profiles for the Chicopee River published in the Preliminary FIS. Cross-sections 'Q' through 'U' from the Preliminary FIS overlap the Chicopee Falls Flood Control System along the Chicopee River. The mean floodway velocities and levee surface cover at the locations of these cross-sections are listed in the following table.

Based on the maximum depth of flow at the applicable cross-sections for the 1% annual chance event, as shown on the Flood Profiles for the Chicopee River in the FEMA FIS, the computed characteristic side slope (allowable) velocity as computed by Equation 3-3 for a D_{30} of 11 inches ranged from approximately 12.9 to 13.6 feet per second (fps). Calculations are attached in Appendix A.

Table 1. Flow Velocities for Chicopee Falls Flood Control System along the Chicopee River.

Cross-section*	Distance in feet above confluence with Connecticut River*	Floodway Width (feet)*	Mean Floodway Velocity (feet per second)*	Levee Surface Cover
Q	12,100	339	6.1	Riprap
R	13,470	283	6.5	Riprap
S	15,040	201	10.5	Riprap
T	16,090	282	6.8	Riprap
U	16,360	351	7.4	Vegetation

*From Federal Emergency Management Agency (FEMA), *Preliminary Flood Insurance Study Number 25013CV001* (April 30, 2009).

The mean floodway velocities indicated in the FEMA Preliminary FIS are under 12.9 fps at all of the cross-sections. At cross-sections 'Q', 'R', 'S', and 'T', the existing cover at the levee is adequate to protect against erosion, even conservatively assuming that the characteristic side slope velocities are equal to the mean floodway velocities from the 1% annual chance flood. In open channel flow, velocity is not uniform across the area in flow, due to the adhesion between the wetted surface of the channel and the water. Generally, the velocity is at a maximum towards the center of the channel cross-section, and decreases towards the edges of the channel cross-section. Thus, it is concluded that the existing riprap protection is more than adequate to protect the embankment against erosion from the 1% annual chance flood.

The embankment riverward of the floodwall at cross-section 'U' is vegetated, rather than surfaced with riprap. Table 2-5 of EM 1110-2-1601 provides suggested maximum permissible mean channel velocities for design of non-scouring flood control channels based on channel material. For a channel material of sandy silt with Kentucky bluegrass, the maximum permissible mean channel velocity is 5.0 feet per second (fps), provided that the grass cover is good and maintained properly. This is equal to the recommended permissible velocity for "easily eroded soil" covered with Kentucky bluegrass indicated in Table 3 of the Handbook of Channel Design for Soil and Water Conservation, TP-61 (USDA SCS, 1954).

The mean floodway velocity at cross-section ‘U’ of 7.4 fps exceeds the suggested maximum permissible mean channel velocity of 5.0 fps. However, it is likely that the velocity adjacent to the earthen slope is significantly less than 7.4 fps, due to the typical variations in velocity across an open channel. Furthermore, the section of the floodwall in the vicinity of cross-section ‘U’ is founded directly on ledge with rock anchors; thus, erosion of the embankment riverward of the floodwall in this area is unlikely to cause failure of the floodwall.

In summary, the majority of the riverside embankment along the Chicopee Falls Flood Control System is adequately protected against erosion from the 1% annual chance flood due to cover of riprap. Within the upstream section where the embankment riverward of the floodwall is covered by vegetation, the characteristic side slope velocity is likely such that the vegetation provides adequate protection against erosion from the 1% annual chance flood. Even if the vegetation did not provide adequate protection against erosion, the floodwall in this area is founded on ledge with rock anchors, and erosion of the embankment would be unlikely to cause failure of the floodwall.

2.2 Wind and Wave Action

The effects of wind and wave action were evaluated by estimating the maximum wave height using the simplified procedures in EM 1110-2-1100, Coastal Engineering Manual (Part II), 1 August 2008 (Change 2).

Wave prediction was based on an assumed sustained wind equivalent to the peak recorded wind gust at the Chicopee Falls/Westover Air Force Base recording station, located 75.0 meters above sea level. The peak gust of 79 miles per hour had a prevailing wind direction of west-northwest (WNW). Data were obtained from “Climatic Wind Data for the United States” (National Climatic Data Center, November 1998).

Using the “Step-by-step procedure for simplified estimate of winds for wave prediction” outlined in EM 1110-2-1100, the wind speed of 79 miles per hour (35 meters/second) was adjusted to represent overwater wind speed. The resulting wind speed used in subsequent analyses was 42 meters/second. Calculations are shown in Appendix B.

Wave height was estimated using the equations in EM 1110-2-1100 applicable to wave growth with fetch, in which the wave height depends on straight line fetch distance and wind speed. The straight line fetch distance was approximated by determining the location along the flood control system at which the longest fetch could occur over water in a WNW direction and during the base flood as indicated by FEMA floodplain mapping.

The longest fetch along the Chicopee Falls Flood Control System is 292± meters, located at the downstream end of the levee, as shown in Figure 1. At this location, available base flood freeboard is approximately 7.1 feet, which is representative of the lowest available freeboard along the system.

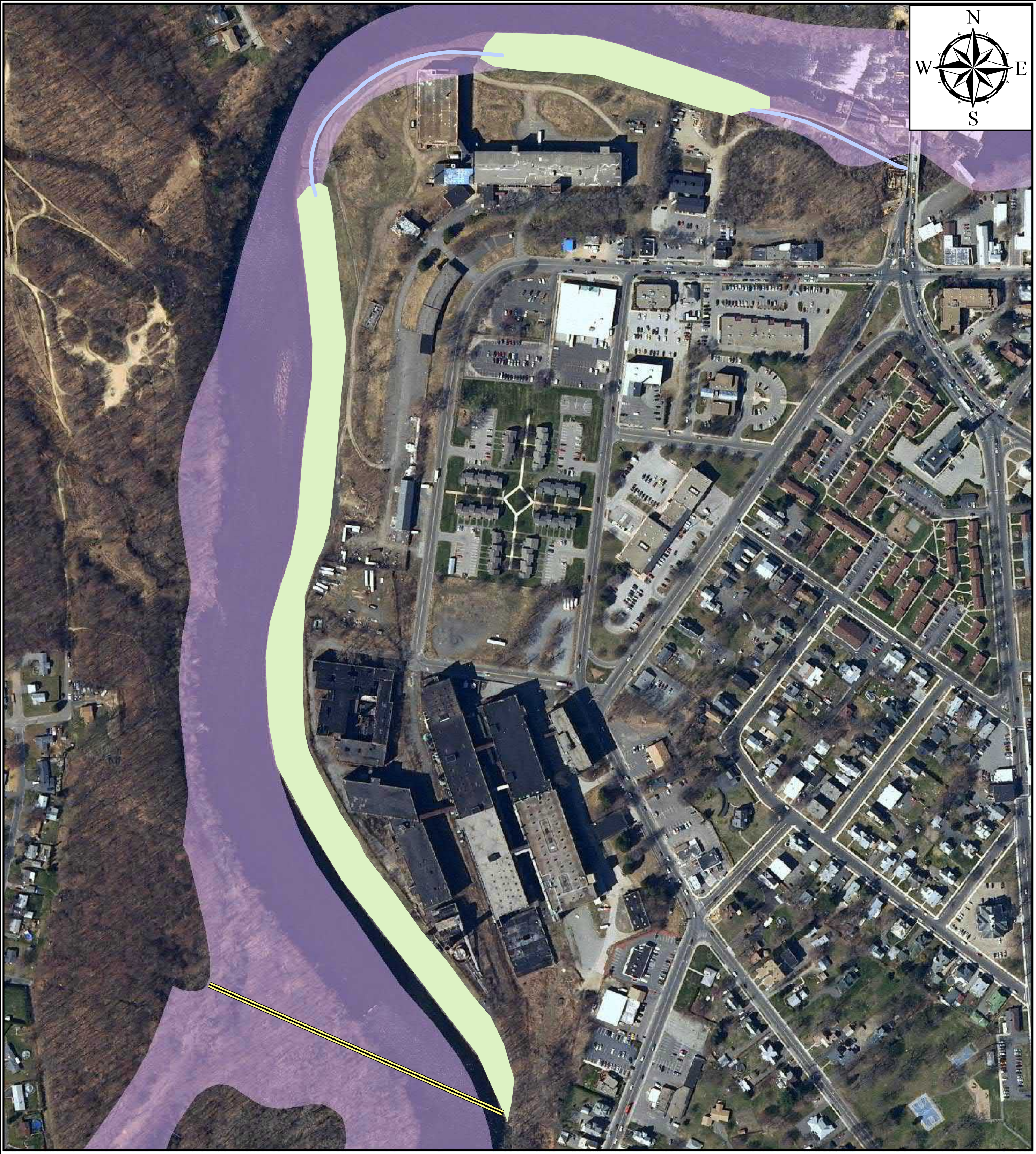
The estimated wave height was checked for shallow water limitations in accordance with the procedures in EM 1110-2-1100. Calculations are shown in Appendix B.

The input parameters and results are summarized in the following Table 2.

As the predicted wave height is less than the available freeboard for the base flood, overtopping is not expected to occur. Therefore, appreciable erosion and failure of the flood control system due to wave action is unlikely.

Table 2. Wave Height Computation Input and Results

Flood Control System	**Chicopee Falls**
Peak Gust Wind Speed (mph)	79
Peak Gust Wind Speed (m/s)	35
Peak Gust Prevailing Wind Direction	WNW
Wind Speed Adjusted for Overwater (m/s)	42
Fetch (m)	292
Wave Height (m)	0.48
Wave Height (ft)	1.6
Available Freeboard for Base Flood (ft)	7.1



LONGEST FETCH

Project No: 15.0702100.40

Legend

- FEMA Flood Zone A
- Floodwall
- Fetch
- Earthen Dike

Embankment Protection Analysis
Chicopee Falls Flood Control System
Chicopee, Massachusetts

Drawn by: RTS

Checked by: TEJ

Date: August 2010

MassGIS Orthophoto (2005)

Figure No: 1

FEMA Flood Zone A from Q3 Flood Data produced by FEMA, July 1997.

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA
A GZA Company

2.3 Ice and Debris Impacts

There are no areas of the Chicopee Falls Flood Control System along the Chicopee River that are likely to experience direct impacts of ice or debris. The hydroelectric dam located upstream of the Deady Bridge will contain some of the ice and debris during the 1% annual chance flood. Ice formation on the Chicopee River through Chicopee is rare, and does not coincide with the typical timing of flood events during the spring months when the temperatures are above freezing. Average channel velocities of about 6 to 10 feet per second are such that it is not expected that any impacts of ice or debris will cause significant damage to the system.

3 CONCLUSION

No appreciable erosion of the levee embankment is expected during the base flood due to currents, waves, or ice and debris impacts which would result in failure of the levee embankment. The Chicopee Falls Flood Control System levee meets the requirements of 44 CFR 65.10 for embankment protection.

<u>APPENDIX A-4.4</u>

EMBANKMENT
AND
FOUNDATION
SEEPAGE & STABILITY

EMBANKMENT AND FOUNDATION SEEPAGE AND STABILITY ANALYSIS
CHICOPEE FALLS FLOOD CONTROL SYSTEM

CHICOPEE FLOOD CONTROL WORKS
CITY OF CHICOPEE
HAMPDEN COUNTY, MASSACHUSETTS

November, 2010
GZA GeoEnvironmental, Inc.

1 SEEPAGE

Seepage was evaluated for the Chicopee Falls Levee using SEEP/W 2007 a two-dimensional finite element seepage modeling software created by GEO-SLOPE International, Ltd, and analyzed in general accordance with USACE Technical Letter ETL 110-2-569 *Design Guidance for Levee Underseepage*. Seepage was evaluated for Normal and 100 Year Flood per FEMA regulations 44 CRF 65.2 and 65.10, assuming steady-state seepage conditions. Flow and exit gradients were estimated in the vicinity of the drain from SEEP/W results and compared to the limiting gradient criteria of 0.5. The seepage analyses were also performed with an assumed non-functional toe drain in order to determine if the required criteria would be met even with a compromised or non-functioning drain.

2 STABILITY

Slope Stability simulations were performed using guidance from USACE *Design and Construction of Levees*, EM 1110-2-1913 under normal and 100 year flood (steady-state seepage and sudden drawdown), for the landside and riverside slopes. Models were evaluated using SLOPE/W, a two-dimensional finite element slope stability modeling software created by GEO-SLOPE International, Ltd. utilizing the Spencer method and incorporating the parent SEEP/W model's seepage forces and phreatic surfaces. Staged Rapid Drawdown was modeled using the USACE 3-stage method.

3 TYPICAL SECTIONS

Station 13+30 (typical of Station 9+50 to 16+82 and 25+25 to 39+25) was selected as a representative cross-section to analyze the Chicopee Falls Levee system, as Station 13+30 had the loosest fill and loss of washwater was noted during boring (indicative of high permeability). Station 13+30 appears to represent the "worst case" along the Chicopee Falls Levee. An additional cross section was analyzed at Station 41+00 (typical of Station 39+25 to Station 50+00) that did not incorporate the gravelly sand layer. Two final cross sections were analyzed for seepage only at Station 9+00 (typical of Station 0+00 to 9+50) and 20+00 (typical of Station 16+82 to 25+50), as representative "worst-case" wall sections, where the difference between flood elevation and landside grade and/or difference between bottom of footing and top of bedrock were greatest.

4 SEEPAGE ANALYSES AND RESULTS

Hydraulic conductivities were estimated from grain-size distribution correlations and from published literature. Material properties and a typical cross-section can be found at the end of Appendix A-4.4. Boundary conditions were applied along the landside ground and wall surface. The toe drain was modeled as a point element with zero pressure head, surrounded by a flux section to estimate drain flow. An additional load case was modeled without the toe drain to check whether seepage would present an issue if the toe-drain was not functioning as designed. Elevations for normal and flood pools can be found in the Calculation Summary Sheets and the Freeboard Evaluation Plans at the end of Appendix A-4.4.

The computed exit gradients for the Chicopee Falls Levee system were found to be less than the limiting gradient criteria of 0.5, per ETL 110-2-569 *Design Guidance for Levee Underseepage.* The evaluated sections of the Chicopee Falls Levee had acceptable gradients for the 100-year flood with and without a functioning toe drain. Estimates of gradients and unit flow rates through the toe drain can be found in the Calculation Summary Sheet at the end of Appendix A-4.4.

5 STABILITY ANALYSES AND RESULTS

Minimum factors of safety against normal and flood conditions were conservatively assumed to be 1.4 using USACE guidance from EM 1110-2-1913. A specific factor of safety for sudden drawdown is not given in EM 1110-2-1913, but rather a range from 1.0 to 1.2 based upon the period of sustained flood level is recommended. GZA used a value of 1.0 for factor of safety against sudden drawdown in our analyses, which we consider appropriate based upon our assumption of steady-state seepage and instantaneous flood elevations. Material unit weights, strength and internal friction angle values were estimated using SPT N-value correlations and values from published engineering literature.

All computed factors of safety against sliding were greater than the minimums specified above.

GZA
GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, MA 02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Engineers and Scientists

JOB	15.0702100.50 - Chicopee River Levee		
SHEET NO.	1	**OF**	2
CALCULATED BY	RDH/JGD	**DATE**	5/13/2010
CHECKED BY	JGD	**DATE**	5/13/2010
SCALE	N/A		

Objective: To assess seepage and stability of the **Chicopee Falls Section** of the Chicopee Flood Control Works

Method:

1) Develop typical cross section of levee at **Station 13+30, typical from Station 9+50 to 16+82 and 25+25 to 39+25** (See attached figure).
2) Determine material parameters from test borings and typical values of similar materials.
3) Calculate location of phreatic surface within levee for normal and flood conditions, using SEEP/W. Calculate factor of safety against piping failure (where applicable).
4) Using pore water data from SEEP/W, calculate factors of safety against slope failure for the following load cases defined by requirements of EM 1110-2-1913, Section 6-7302. Steady-state factors of safety calculated for both riverside and landside slopes using Spencer method. Rapid drawdown factor of safety calculated using USACE 3-stage method.

Case #1 - Steady-state seepage at normal pool
Case #2 - Steady-state seepage at 100yr Flood
Case #3 - Rapid Drawdown from 100 yr Flood (Riverside only)

5) Where applicable, the above load cases were also checked for non-functioning drains and/or cutoffs

Subsurface Information:

- Test borings CF-1 through CF-11 and Exploration Location Plan by GZA (2009)
- "Chicopee River Flood Control - Chicopee Falls, Chicopee River, Massachusetts" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated April 1963
- "Chicopee Falls Local Protection Project - Design Memorandum No. 5 - Embankments and Foundations" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated March 1963

Assumptions:

- Soil strata interpreted from available test boring data and design drawings, actual configuration may vary.

Material Properties:

Strata	Total Unit Weight, γ_t	Effective Strength Cohesion,	Effective Strength Friction	Total Strength Cohesion, c	Total Strength Friction	K Ratio (k_v/k_h)	Saturated Horizontal Permeability, k_{sat}		Notes
Impervious Fill	118	0	35	0	35	1	4.6E-06	1.4E-04	(2),(3)
Existing Fill	120	0	30	0	30	1	3.3E-05	1.0E-03	(4),(5)
Silty Sand	110	0	30	0	27	1	4.6E-06	1.4E-04	(2),(4)
Gravelly Sand	130	0	35	0	35	1	6.6E-05	2.0E-03	(2),(4)
Riprap	140	0	42	0	42	1	8.0E-03	2.4E-01	(1)
Sandstone	-	-	-	-	-	1	1.6E-06	5.0E-05	(1),(6)

(1) - Unit weight and permeability values based on typical values for similar materials
(2) - Permeability values estimated from correlations with grain size distribution
(3) - Drained strength values based on correlations from SPT-N testing, total strength values are estimated
(4) - Drained strength based on values in USACE design
(5) - Permeability values based values used in USACE report
(6) - Strength of sandstone not included in slope stability analysis (assumed impenetrable)

Analysis Results:

SEEPAGE ANALYSIS RESULTS - EXISTING CONDITIONS

Case	River Elevation	Unit Flowrate, Q (1) (through slope into drain)	Exit Gradient, i_e (1)	Limiting Gradient(2)	OK?
1	Normal (El. ±83)	0 $ft^3/s/ft$	N/A	0.5	Y
2	100yr Flood (El. 97.9)	3.3E-05 $ft^3/s/ft$	0.04	0.5	Y
2a	100yr Flood (No Drain)	0 $ft^3/s/ft$	0.14	0.5	Y

- Note: Factor of safety values less than recommended values are shown in italics
(1) - Flow and exit gradient estimated from results of SEEP/W analysis at toe drain or landside face of the levee
(2) - Limiting gradient per requirements of US Army Corps Technical Letter ETL 1110-2-569 "DESIGN GUIDANCE FOR LEVEE UNDERSEEPAGE"

GZA
GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, MA 02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Engineers and Scientists

JOB	15.0702100.50 - Chicopee River Levee		
SHEET NO.	2	OF	2
CALCULATED BY	RDH/JGD	DATE	5/13/2010
CHECKED BY	JGD	DATE	5/13/2010
SCALE	N/A		

SLOPE STABILITY ANALYSIS RESULTS - EXISTING CONDITIONS

Load Case	Loading Condition	Levee Face	Factor of Safety		Comments / Notes
			Minimum	Existing	
1	Normal Conditions	Riverside	1.4	1.61	
		Landside		1.64	
2	100-year Flood (Steady State)	Riverside	1.4	1.73	
		Landside		1.62	
3	Sudden drawdown from 100yr Flood	Riverside	1.0 - 1.2(1)	1.27	

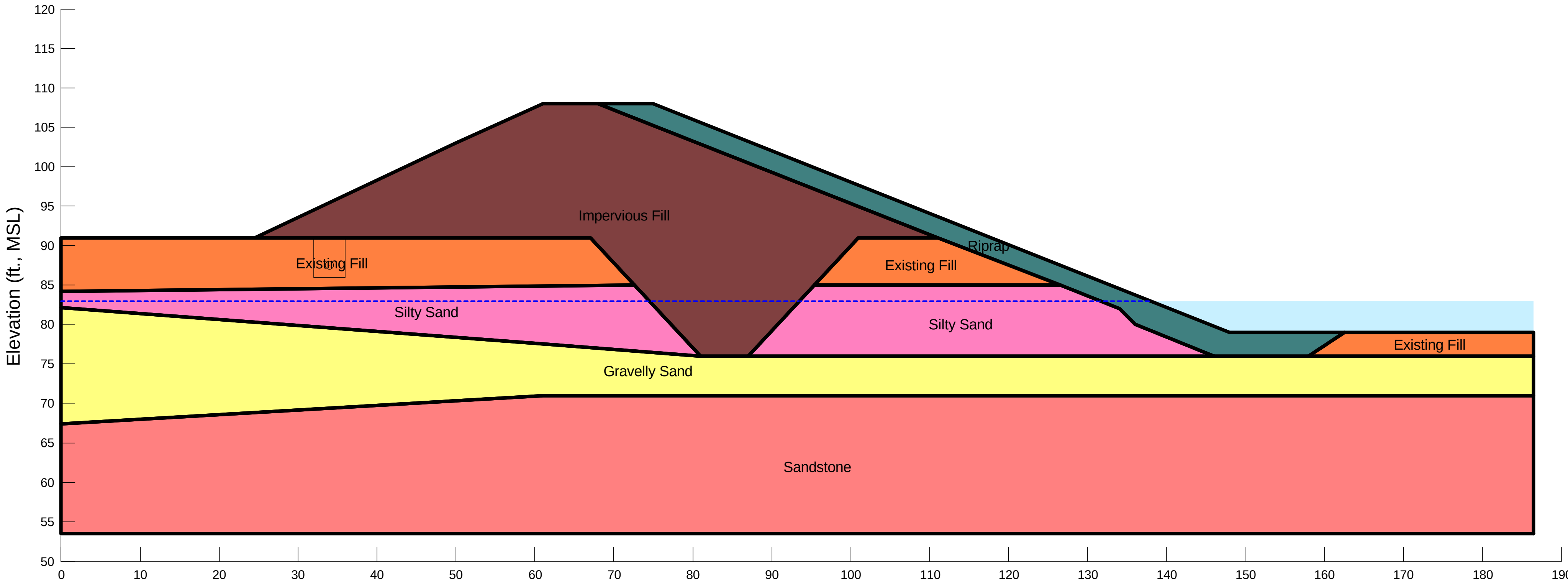
SLOPE STABILITY ANALYSIS RESULTS - EXISTING CONDITIONS - NON-FUNCTIONING DRAINS

Load Case	Loading Condition	Levee Face	Factor of Safety		Comments / Notes
			Minimum	Existing	
1	Normal Conditions	Riverside	1.4	-	Same as Previous
		Landside		-	Same as Previous
2	100-year Flood (Steady State)	Riverside	1.4	1.70	
		Landside		1.47	
3	Sudden drawdown from 100yr Flood	Riverside	1.0 - 1.2(1)	1.27	

- Note: Factor of safety values less than recommended values are shown in italics
(1) - FS = 1.0 applies to flood levels unlikely to persist for long periods prior to drawdown, FS = 1.2 applies to levels likely to persist for long periods prior to drawdown.

- Refer to Attached SLOPE/W slope stability analysis graphical results

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

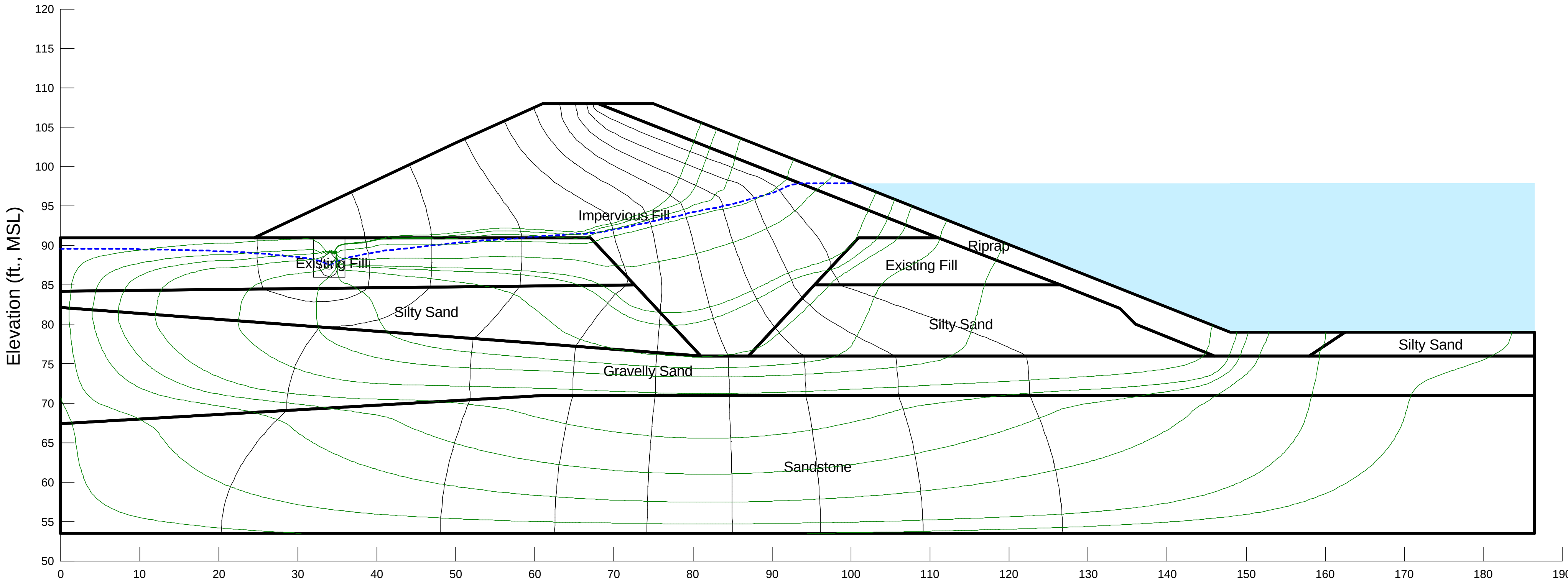


Station 13+30 - Normal Conditions

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

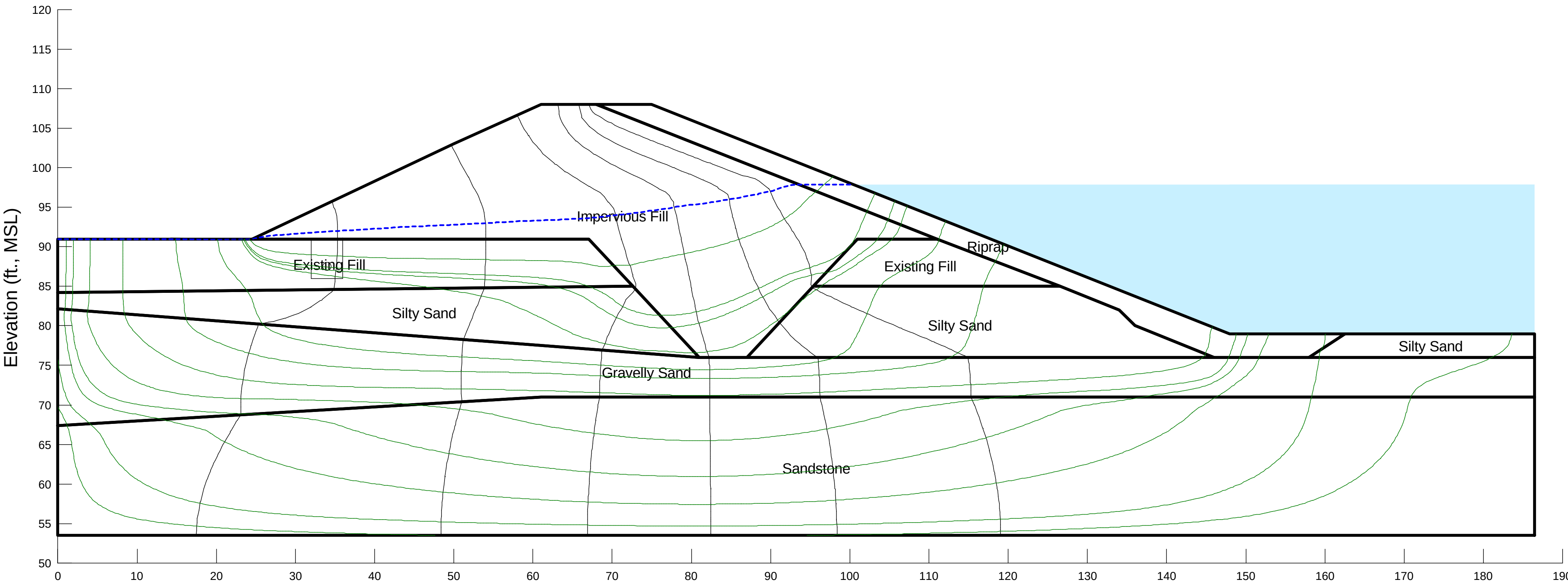


Station 13+30 - 100yr Flood

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

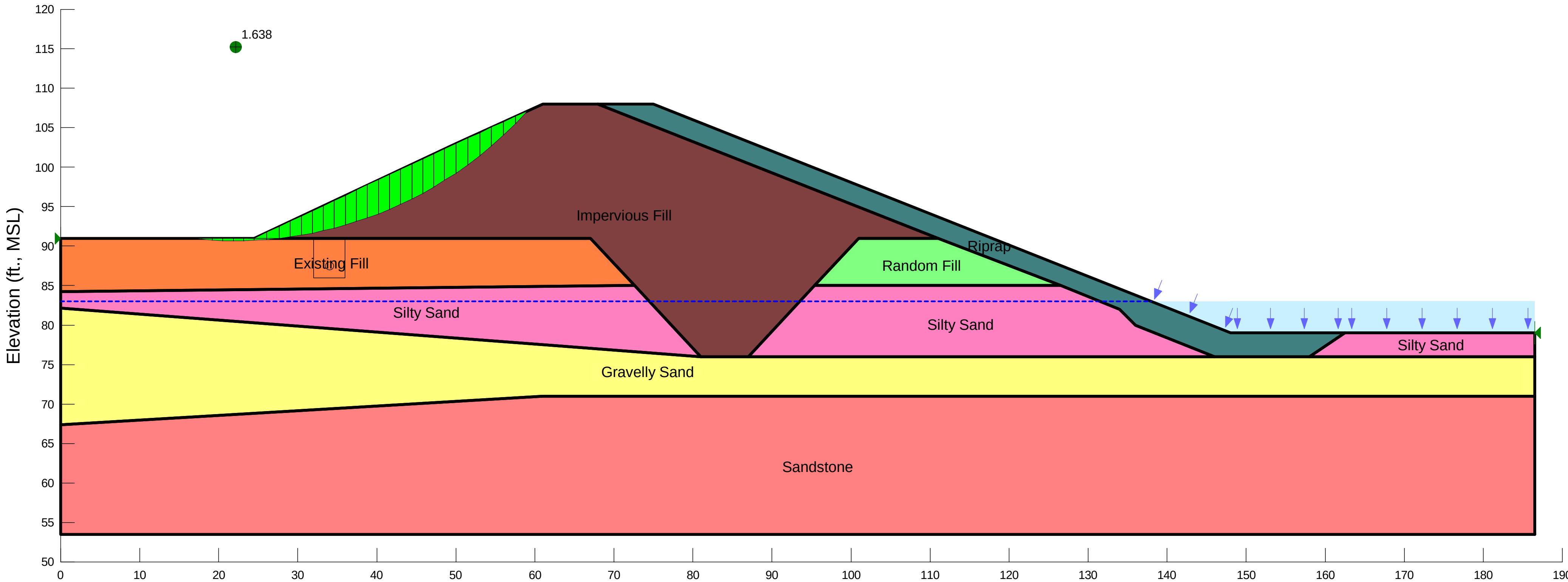


Station 13+30 - 100yr Flood (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

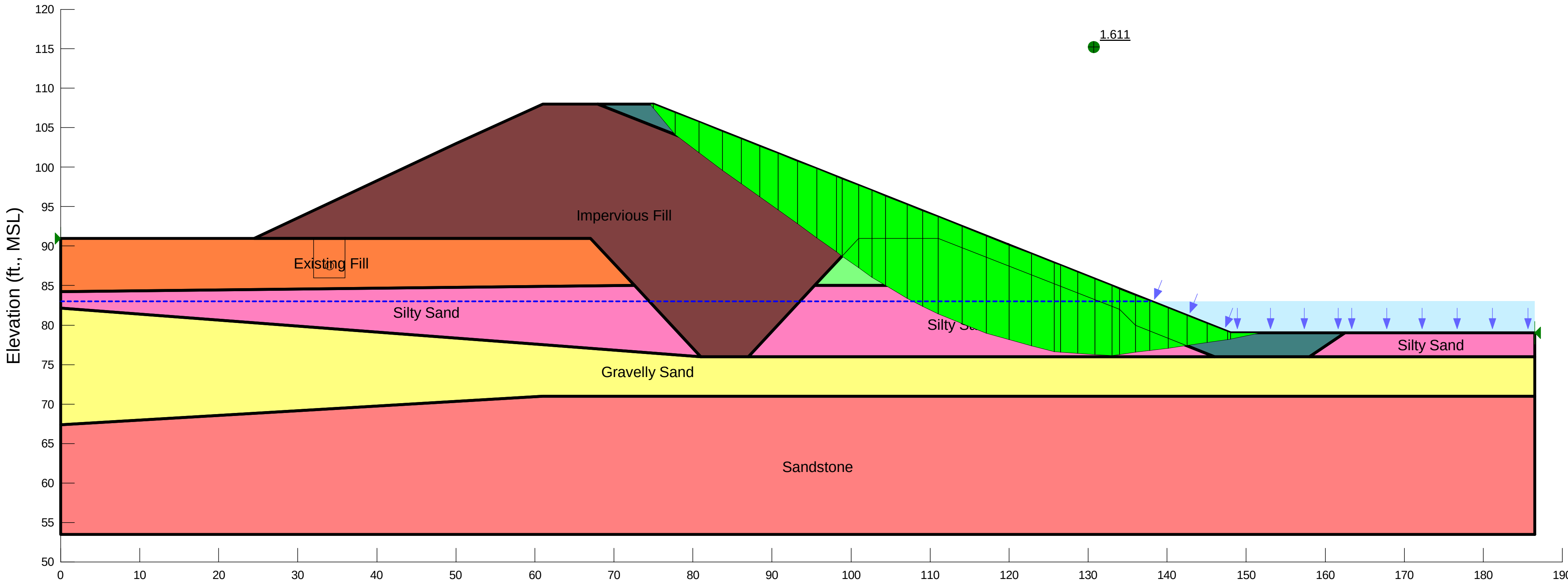


Station 13+30 Landside Slope Stability - Normal Conditions

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

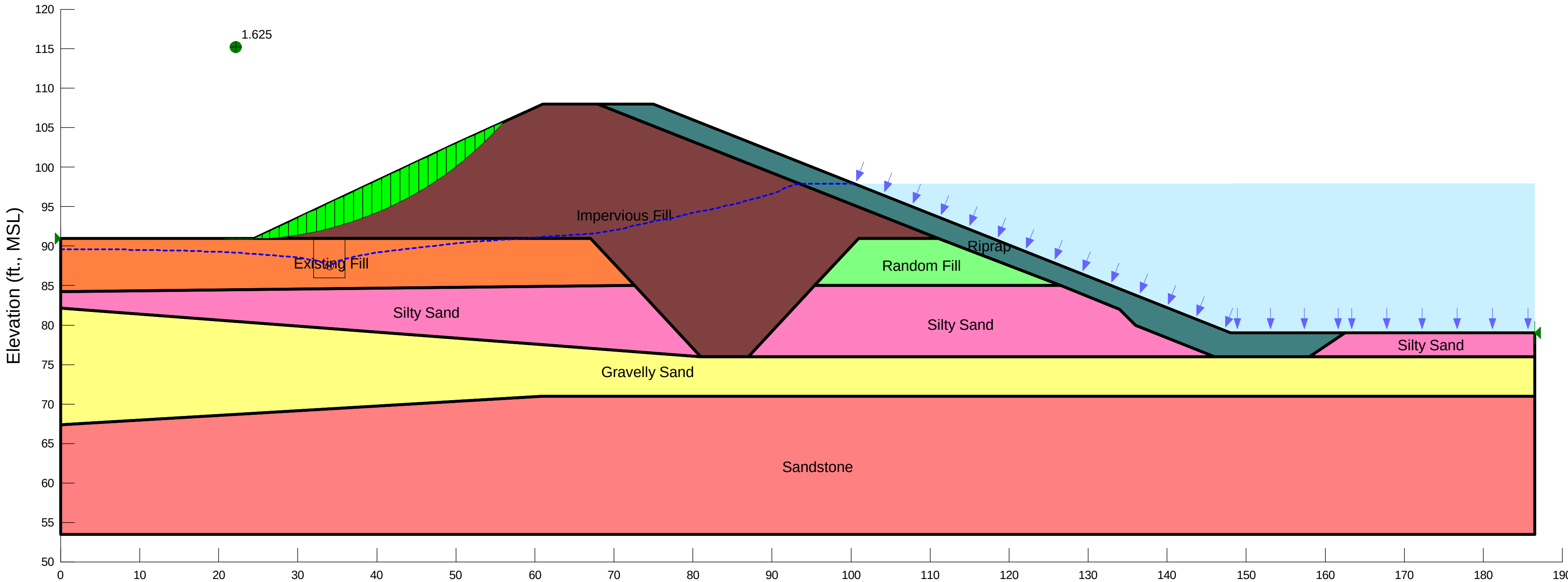
Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50



Station 13+30 Riverside Slope Stability - Normal Conditions

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

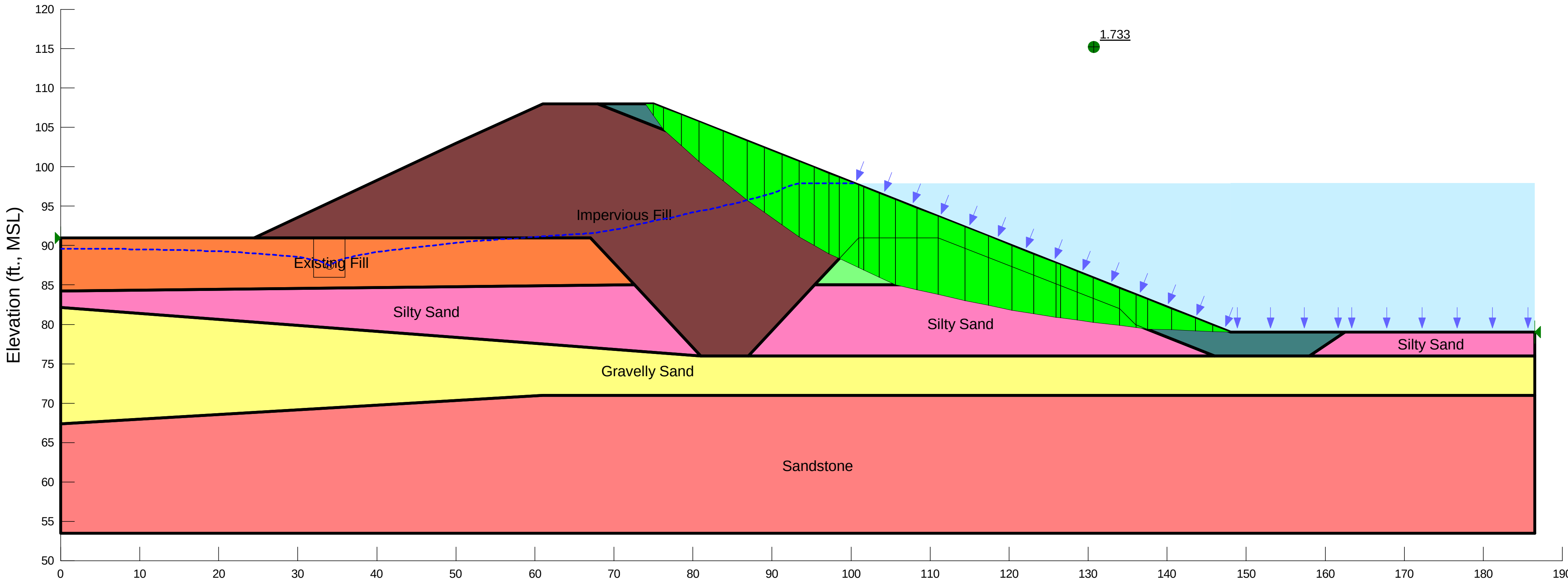


Station 13+30 Landside Slope Stability - 100yr Flood

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

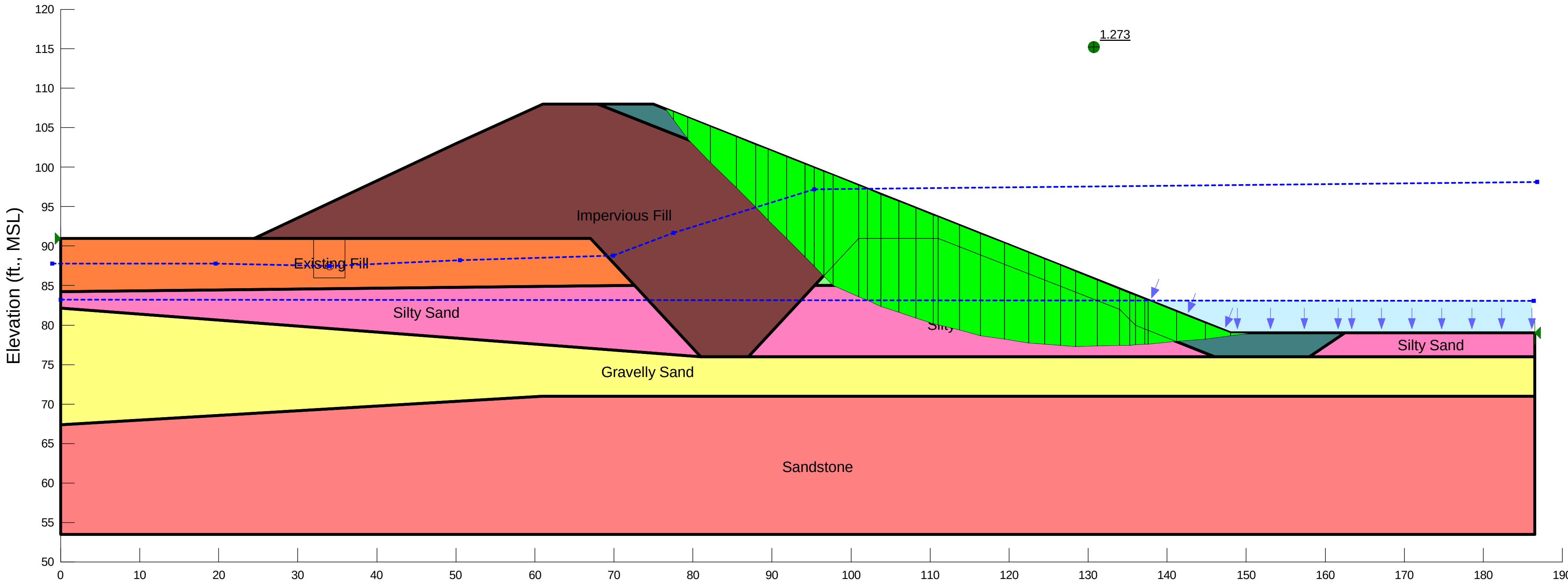


Station 13+30 Riverside Slope Stability - 100yr Flood

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50



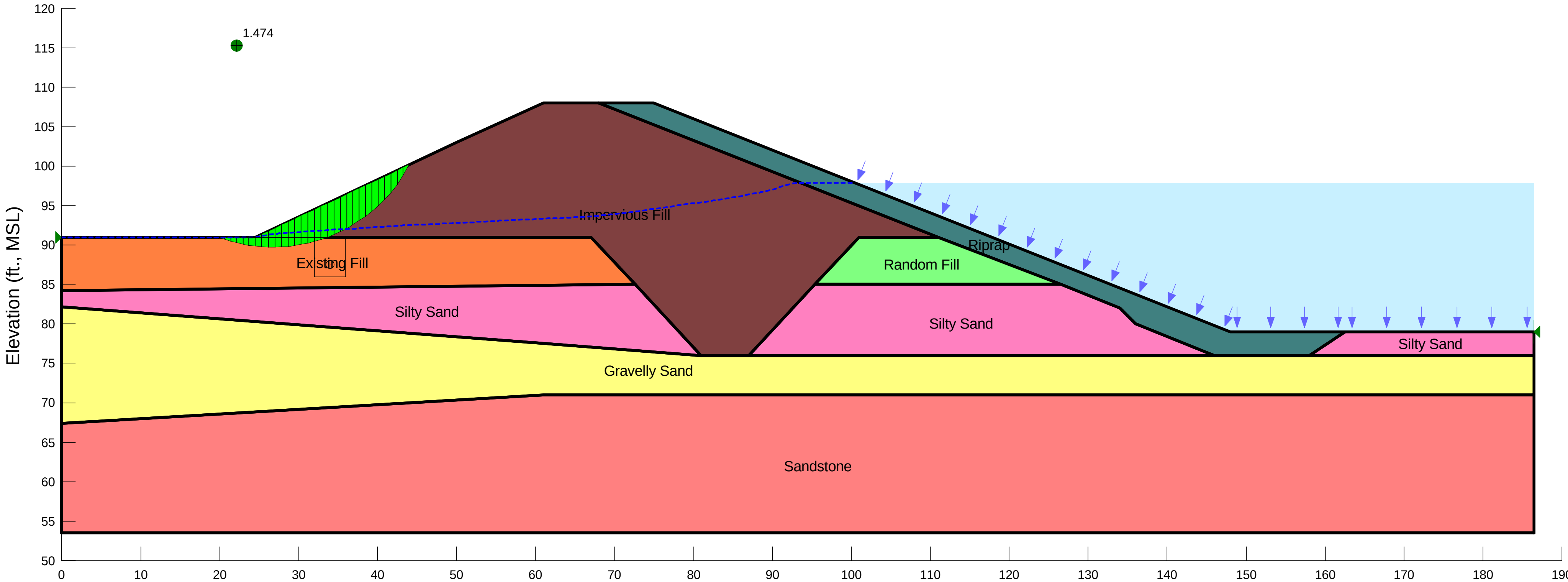
Station 13+30 Riverside Slope Stability - 100yr Drawdown

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

GZA

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

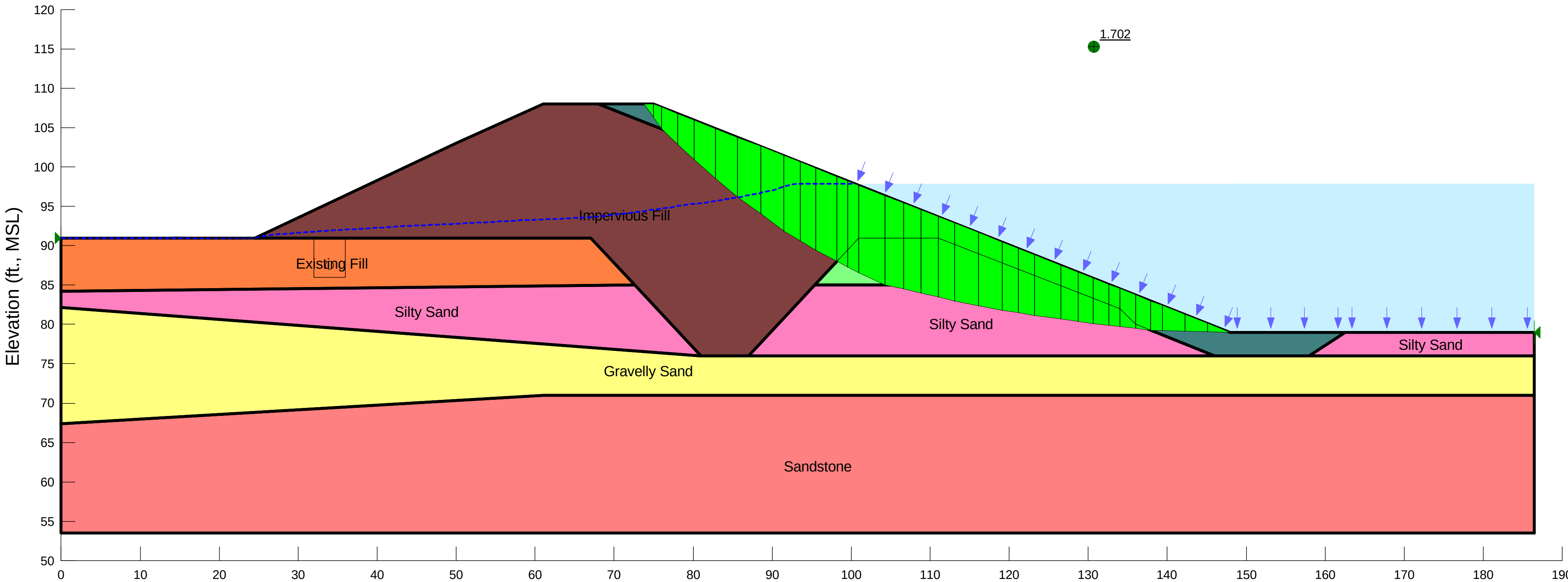


Station 13+30 Landside Slope Stability - 100yr Flood (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

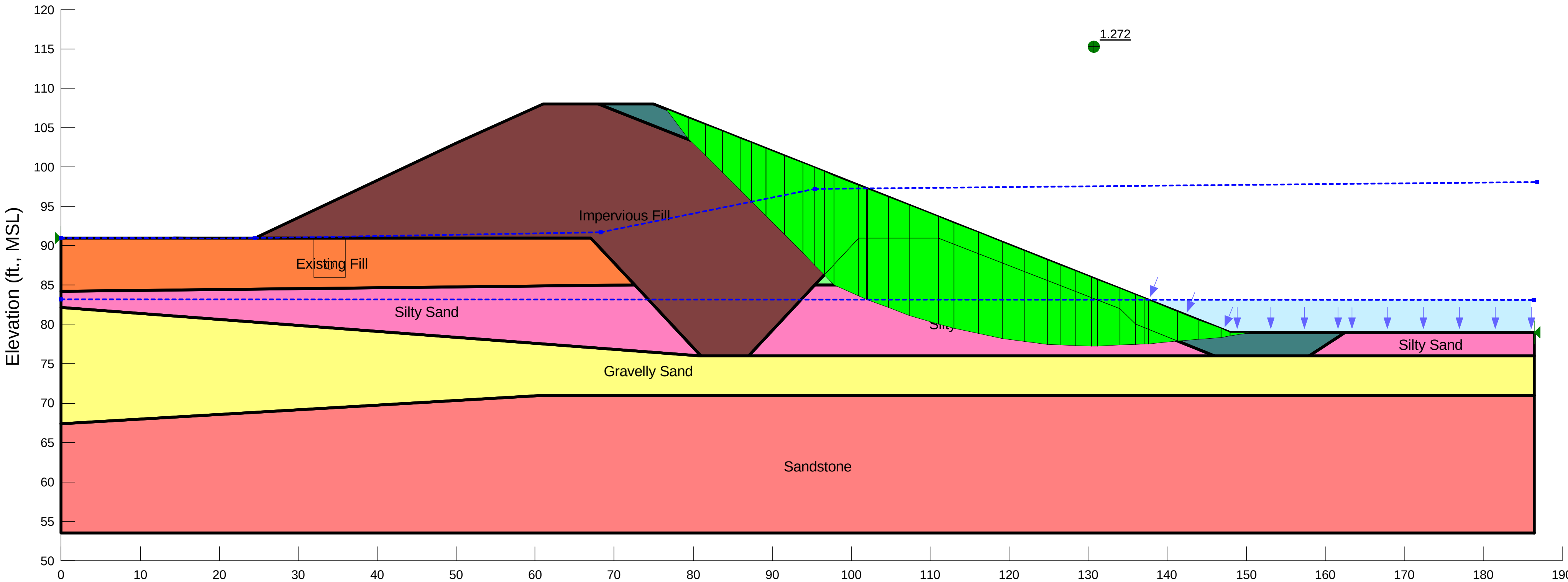


Station 13+30 Riverside Slope Stability - 100yr Flood (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50



Station 13+30 Riverside Slope Stability - 100yr Drawdown (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Station 0+00 to 39+25\

GZA
GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, MA 02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Engineers and Scientists

JOB	15.0702100.50 - Chicopee River Levee		
SHEET NO.	1	**OF**	2
CALCULATED BY	RDH/JGD	**DATE**	5/13/2010
CHECKED BY	JGD	**DATE**	5/13/2010
SCALE	N/A		

Objective: To assess seepage and stability of the **Chicopee Falls Section** of the Chicopee Flood Control Works

Method:

1) Develop typical cross section of levee at **Station 41+00, typical from Station 39+25 to 51+15** (See attached figure).
2) Determine material parameters from test borings and typical values of similar materials.
3) Calculate location of phreatic surface within levee for normal and flood conditions, using SEEP/W. Calculate factor of safety against piping failure (where applicable).
4) Using pore water data from SEEP/W, calculate factors of safety against slope failure for the following load cases defined by requirements of EM 1110-2-1913, Section 6-7302. Steady-state factors of safety calculated for both riverside and landside slopes using Spencer method. Rapid drawdown factor of safety calculated using USACE 3-stage method.

Case #1 - Steady-state seepage at normal pool
Case #2 - Steady-state seepage at 100 yr Flood
Case #3 - Rapid Drawdown from 100 yr Flood (Riverside only)

5) Where applicable, the above load cases were also checked for non-functioning drains

Subsurface Information:

- Test borings CF-8 through CF-11 and Exploration Location Plan by GZA (2009)
- "Chicopee River Flood Control - Chicopee Falls, Chicopee River, Massachusetts" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated April 1963
- "Chicopee Falls Local Protection Project - Design Memorandum No. 5 - Embankments and Foundations" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated March 1963

Assumptions:

- Soil strata interpreted from available test boring data and design drawings, actual configuration may vary.

Material Properties:

Strata	Total Unit Weight, γ_t	Effective Strength Cohesion,	Effective Strength Friction	Total Strength Cohesion, c	Total Strength Friction	K Ratio (k_v/k_h)	Saturated Horizontal Permeability, k_{sat}		Notes
Impervious Fill	118	0	35	0	35	1	4.6E-06	1.4E-04	(2),(3)
Random Fill	120	0	32	0	32	1	2.5E-03	7.6E-02	(1),(3)
Existing Fill	120	0	25	0	25	1	3.3E-04	1.0E-02	(4),(5)
Silty Sand	110	0	30	0	27	1	4.6E-06	1.4E-04	(2),(4)
Gravelly Sand	130	0	35	0	35	1	6.6E-05	2.0E-03	(2),(4)
Riprap	140	0	42	0	42	1	8.0E-03	2.4E-01	(1)

(1) - Unit weight and permeability values based on typical values for similar materials
(2) - Permeability values estimated from correlations with grain size distribution
(3) - Drained strength values based on correlations from SPT-N testing, total strength values are estimated
(4) - Drained strength based on values in USACE design
(5) - Permeability values based values used in USACE report
(6) - Strength of sandstone not included in slope stability analysis (assumed impenetrable)

Analysis Results:

SEEPAGE ANALYSIS RESULTS - EXISTING CONDITIONS

Case	River Elevation	Unit Flowrate, Q (1) (through slope into drain)	Exit Gradient, i_e (1)	Limiting Gradient(2)	OK?
1	Normal (El. ±80)	-	N/A	0.5	Y
2	100yr Flood (El. 93)	9.7E-05	0.05	0.5	Y
2a	100yr Flood (No Drain)	-	0.08	0.5	Y

- Note: Factor of safety values less than recommended values are shown in italics
(1) - Flow and exit gradient estimated from results of SEEP/W analysis at toe drain or landside face of the levee
(2) - Limiting gradient per requirements of US Army Corps Technical Letter ETL 1110-2-569 "DESIGN GUIDANCE FOR LEVEE UNDERSEEPAGE"

GZA
GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, MA 02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Engineers and Scientists

JOB	15.0702100.50 - Chicopee River Levee		
SHEET NO.	2	**OF**	2
CALCULATED BY	RDH/JGD	**DATE**	5/13/2010
CHECKED BY	JGD	**DATE**	5/13/2010
SCALE	N/A		

SLOPE STABILITY ANALYSIS RESULTS - EXISTING CONDITIONS

Load Case	Loading Condition	Levee Face	Factor of Safety		Comments / Notes
			Minimum	Existing	
1	Normal Conditions	Riverside	1.4	1.57	
		Landside		1.56	
2	100-year Flood (Steady State)	Riverside	1.4	1.71	
		Landside		1.56	
3	Sudden drawdown from 100yr Flood	Riverside	1.0 - 1.2(1)	1.51	

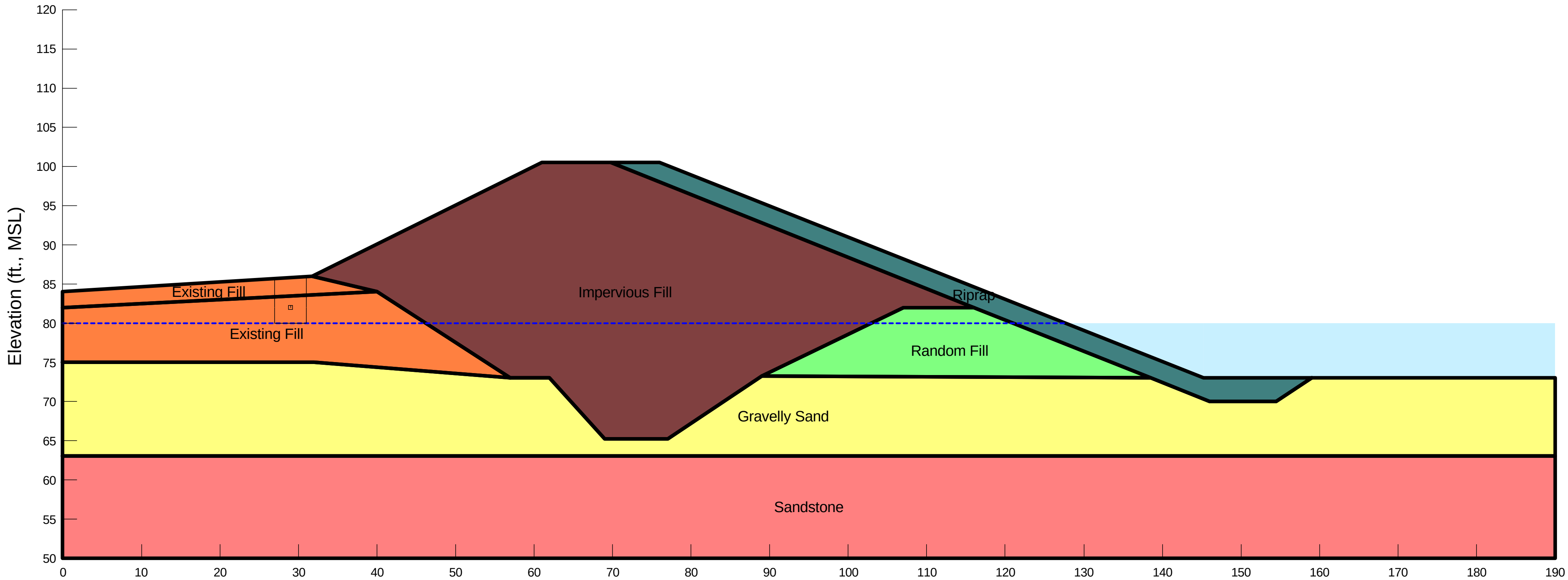
SLOPE STABILITY ANALYSIS RESULTS - EXISTING CONDITIONS - NON-FUNCTIONING DRAINS

Load Case	Loading Condition	Levee Face	Factor of Safety		Comments / Notes
			Minimum	Existing	
1	Normal Conditions	Riverside	1.4	-	Same as Previous
		Landside		-	Same as Previous
2	100-year Flood (Steady State)	Riverside	1.4	1.70	
		Landside		1.55	
3	Sudden drawdown from 100yr Flood	Riverside	1.0 - 1.2(1)	1.51	

- Note: Factor of safety values less than recommended values are shown in italics
(1) - FS = 1.0 applies to flood levels unlikely to persist for long periods prior to drawdown, FS = 1.2 applies to levels likely to persist for long periods prior to drawdown.
(2) - Factor of safety not provided in EM 1110-2-1913

- Refer to Attached SLOPE/W slope stability analysis graphical results

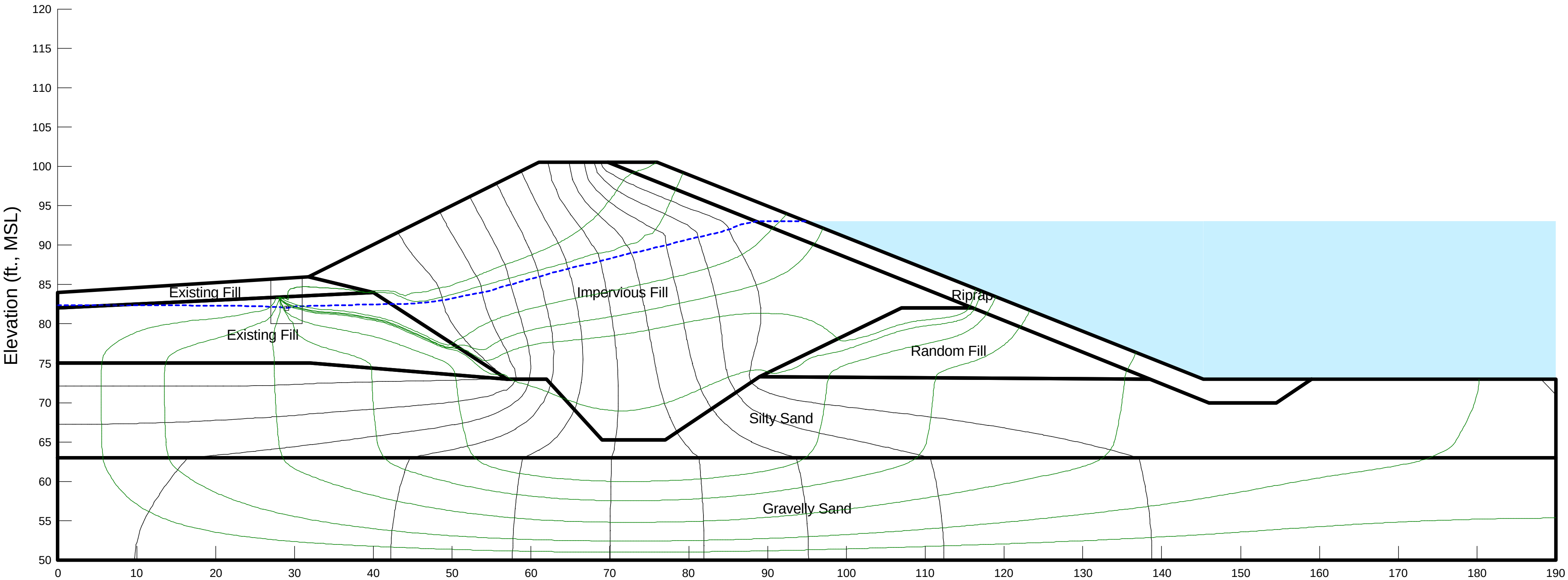
Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50



Station 41+00 - Normal Conditions

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

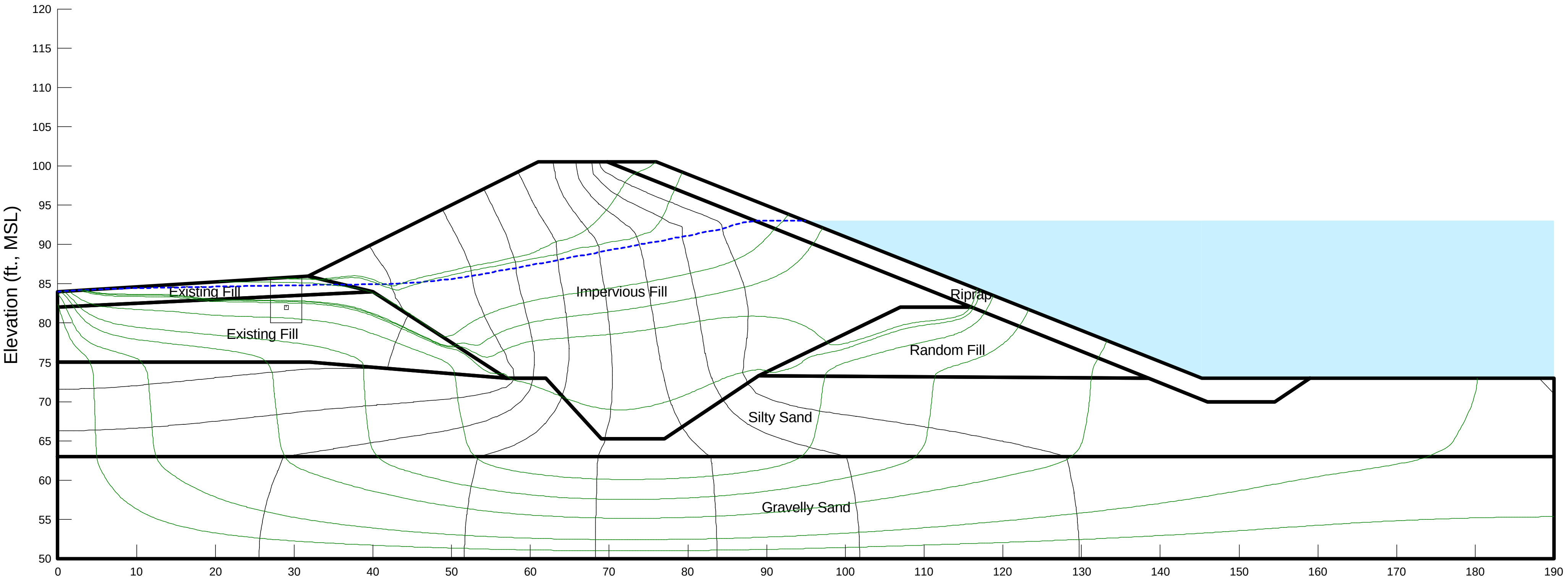


Station 41+00 - 100yr Flood

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51-

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

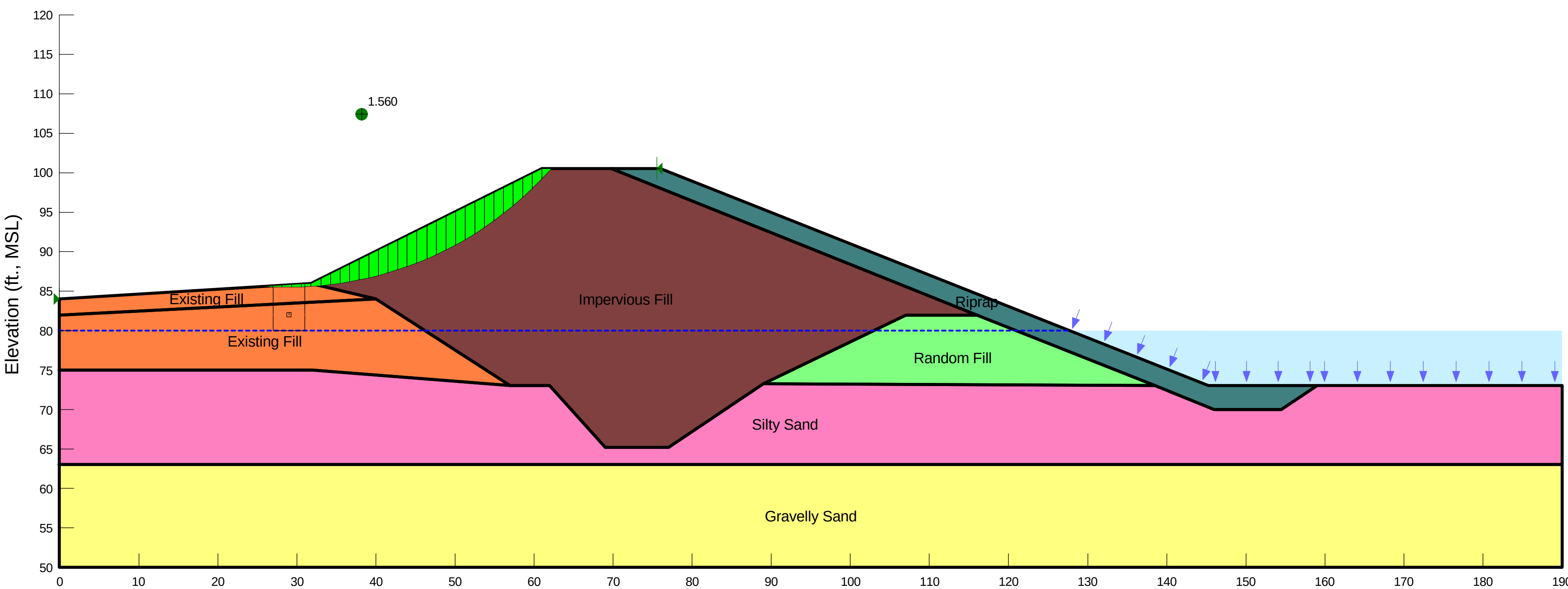


Station 41+00 - 100yr Flood (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51-

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

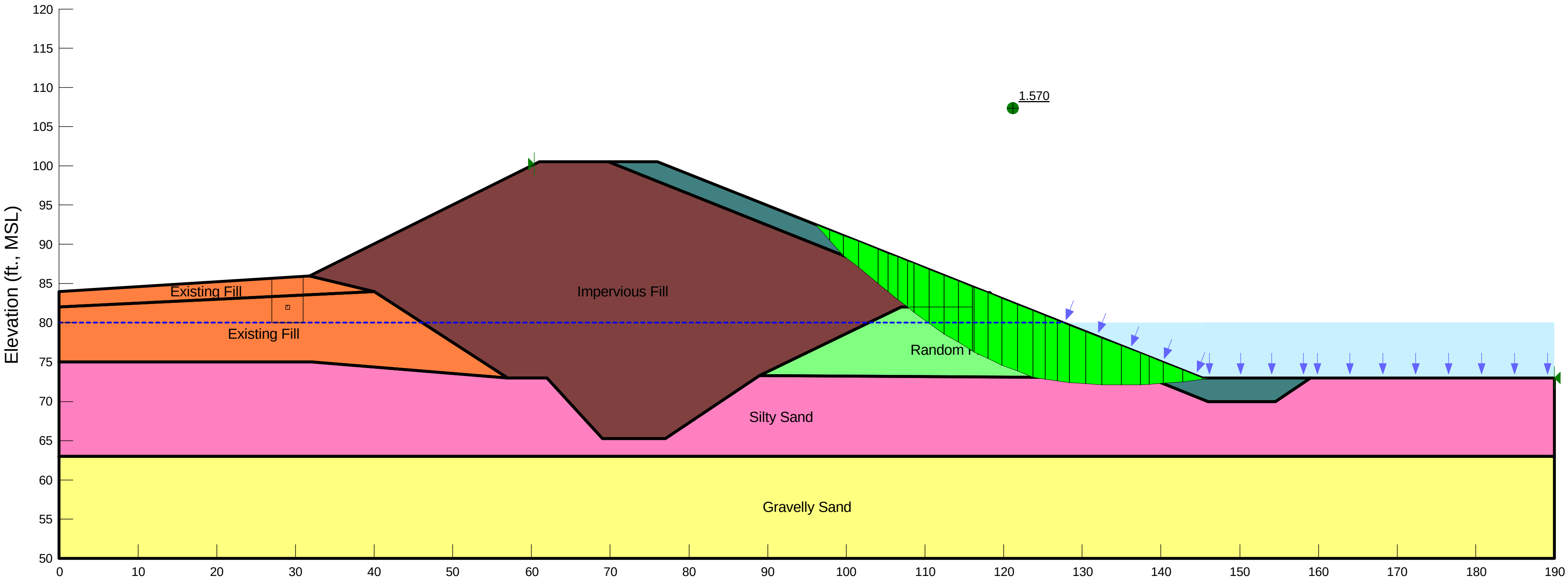


Station 41+00 - Landside Slope Stability - Normal Conditions

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51+15\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

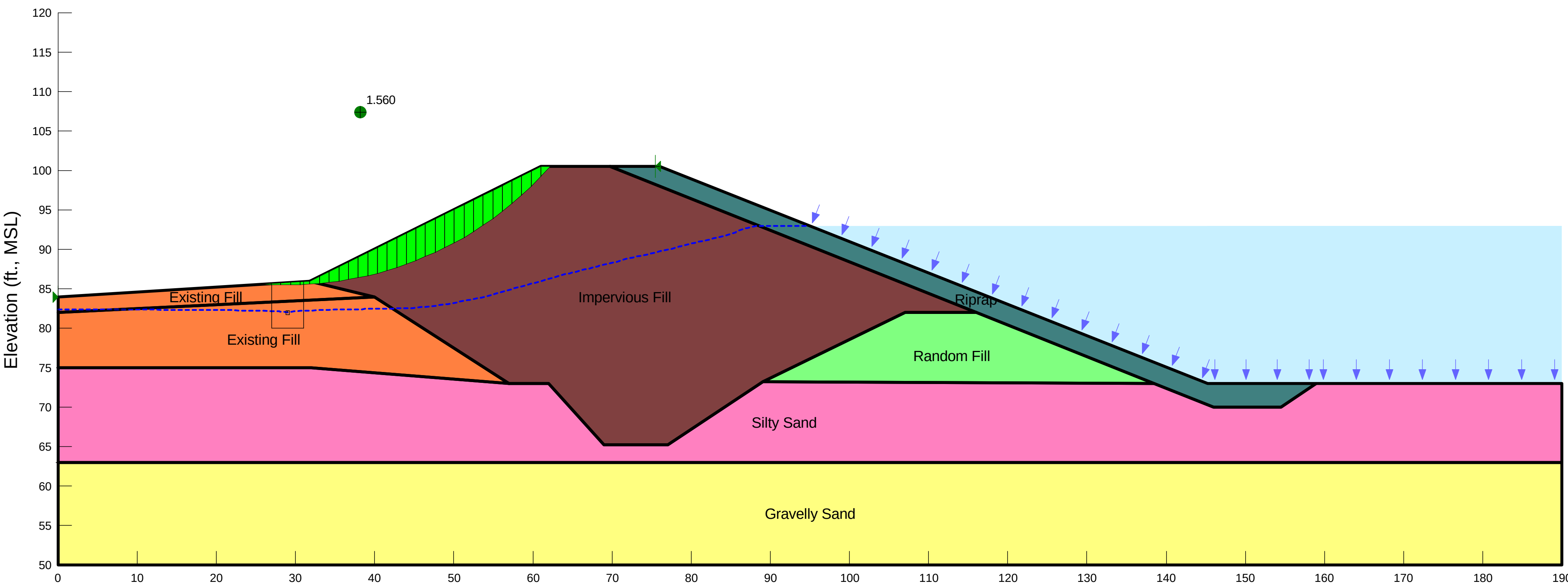


Station 41+00 - Riverside Slope Stability - Normal Conditions

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51-

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

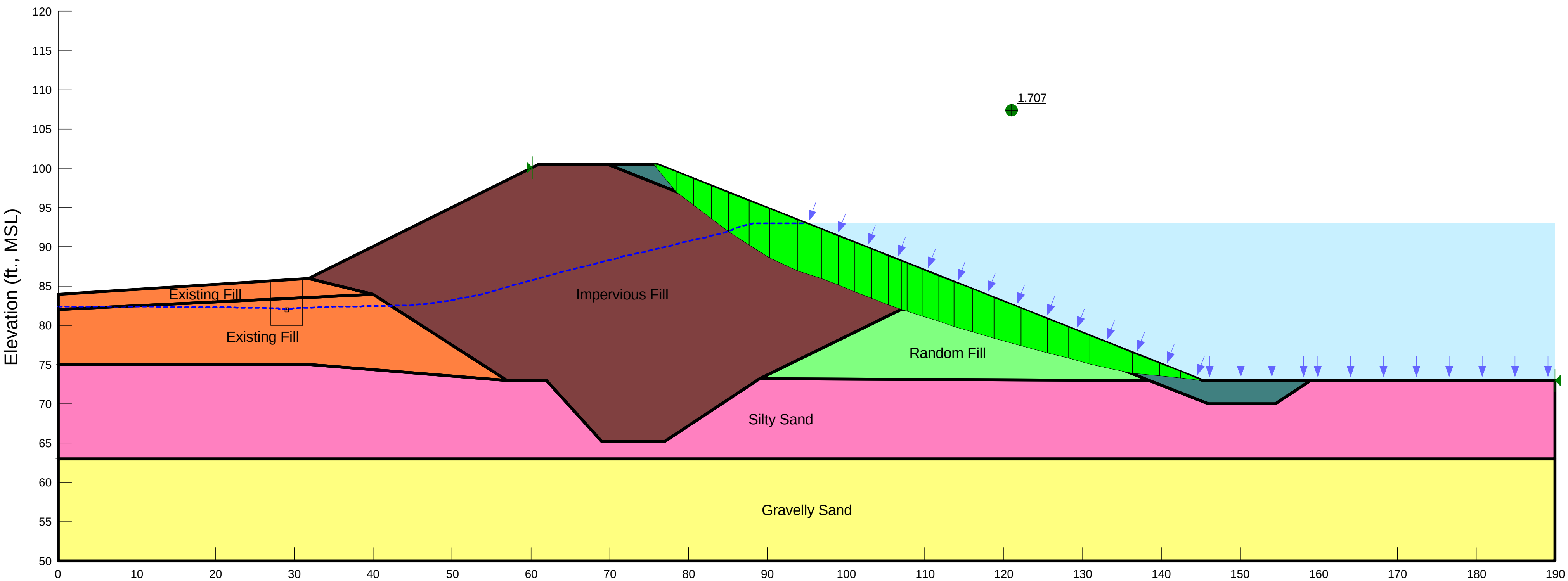


Station 41+00 - Landside Slope Stability - 100yr Flood

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51+15\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

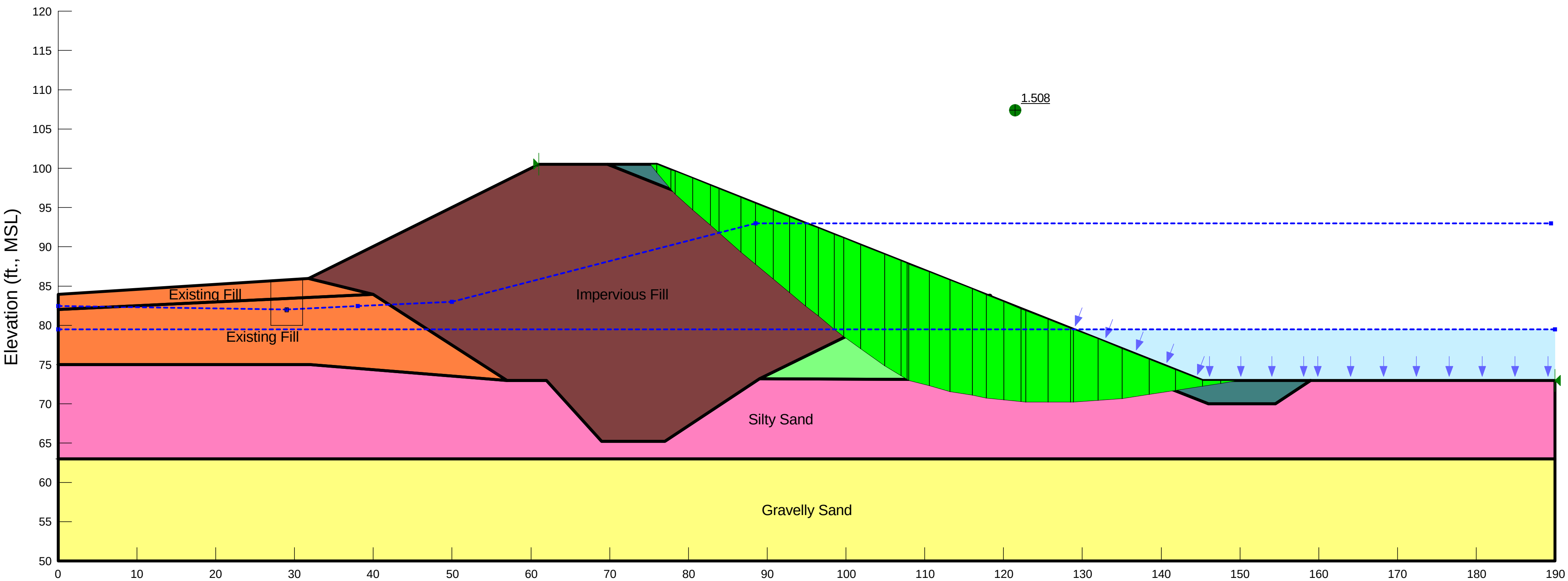


Station 41+00 - Riverside Slope Stability - 100yr Flood

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51+15\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

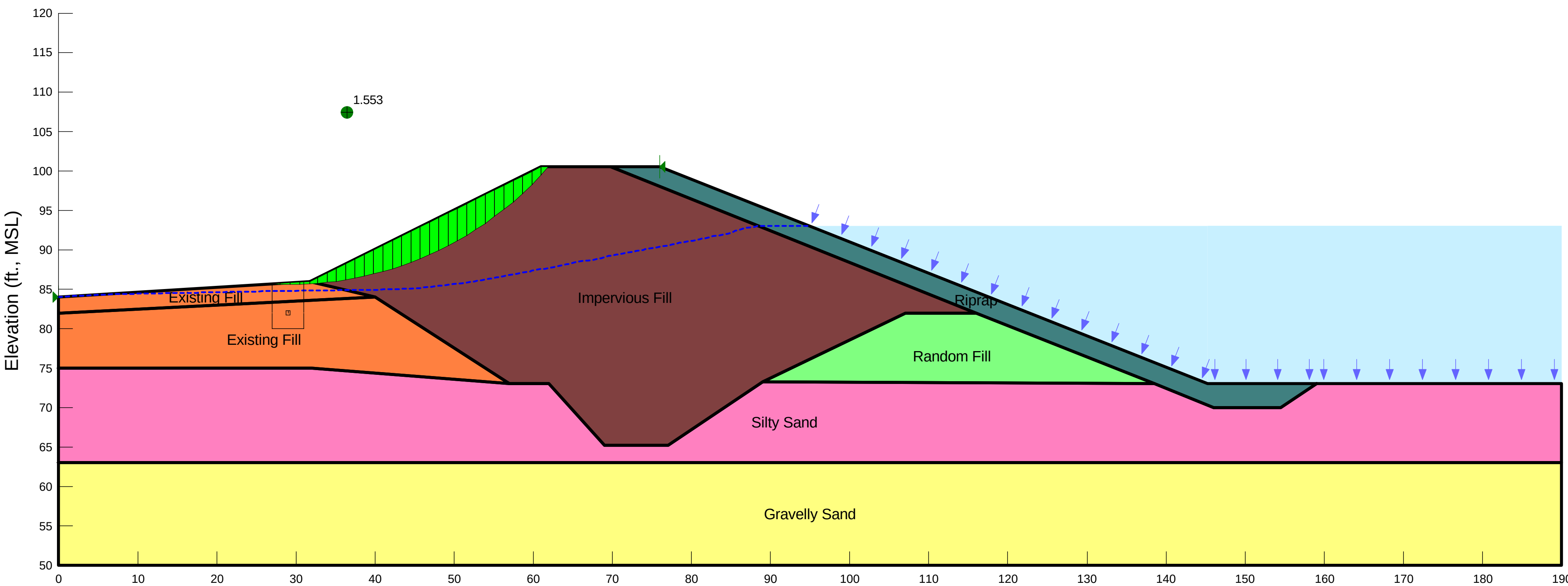


Station 41+00 - Riverside Slope Stability - 100yr Drawdown

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51+15\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

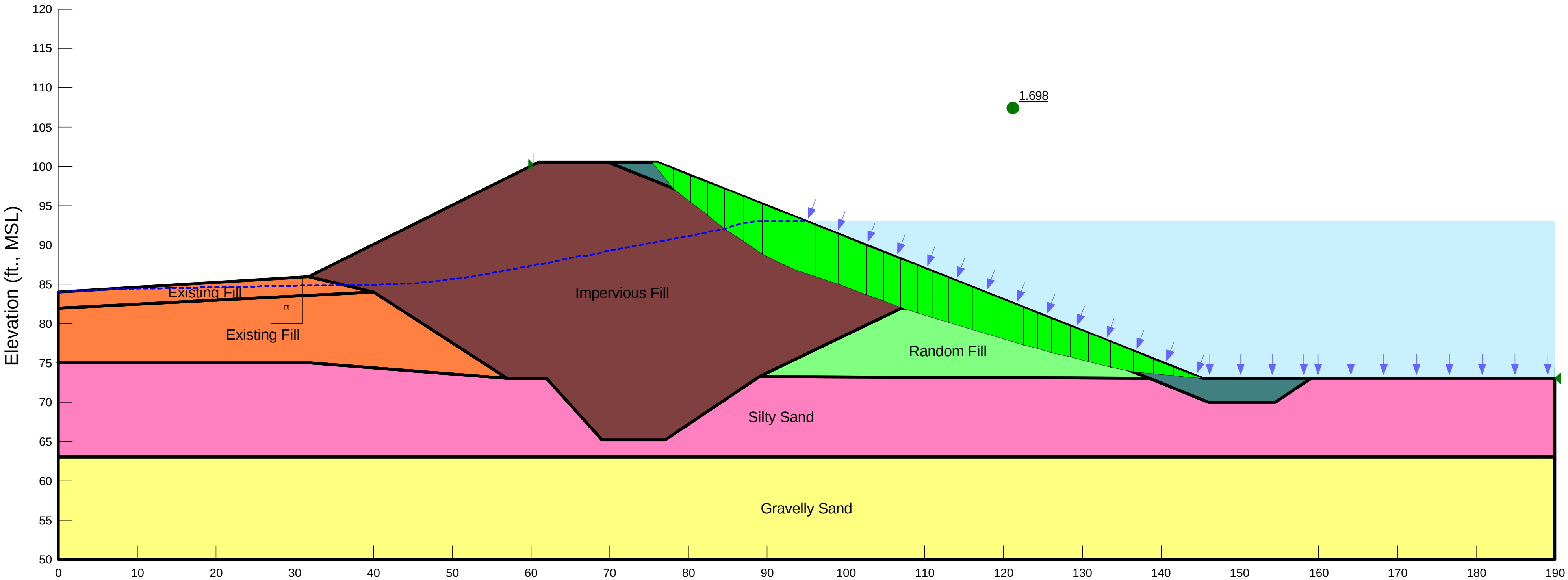


Station 41+00 - Landside Slope Stability - 100yr Flood (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51+15\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50

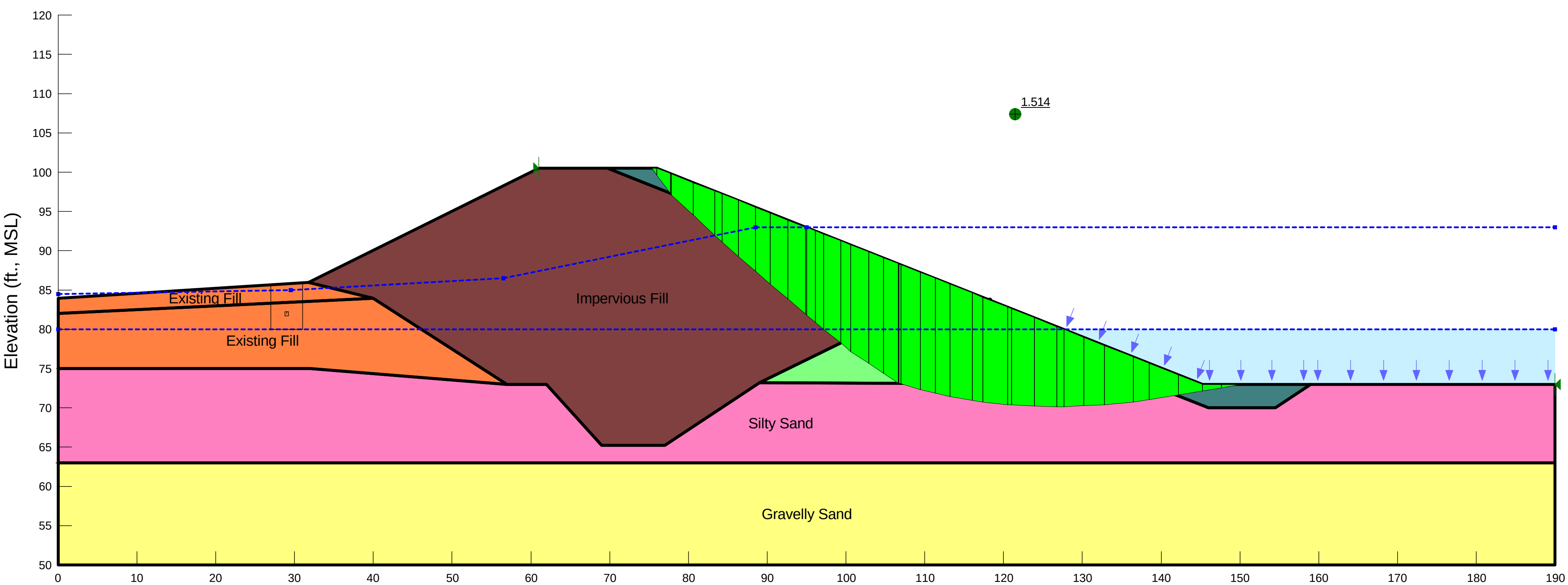


Station 41+00 - Riverside Slope Stability - 100yr Flood (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

J:\Branch\NORWOOD\CHICOPEE-LEVEE\Chicopee Falls Explorations\Calcs\Final\Sta 39+25 to 51+15\

Chicopee Flood Control - Chicopee Falls Section
Chicopee, Massachusetts
GZA Project No. 15.0702100.50



Station 41+00 - Riverside Slope Stability - 100yr Drawdown (No Drain)

Note: Elevations in Means Sea Level datum. To convert to NAVD88, subtract 0.7' (MSL = NAVD88 + 0.7').

GZA
GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, MA 02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Engineers and Scientists

JOB	15.0702100.50 - Chicopee River Levee		
SHEET NO.	1	**OF**	2
CALCULATED BY	JGD	**DATE**	6/17/2010
CHECKED BY	ABB	**DATE**	
SCALE	N/A		

Objective: To assess seepage FS for the flood walls of the **Chicopee Falls Section** of the Chicopee Flood Control Works

Method:

1) Develop typical cross section of flood wall at "worst-case" stations.
   a) Stations having the largest difference bewteen flood elevations and landside grade
   b) Stations having the largest difference bewteen the bottom of footing and top of bedrock.
2) Determine subsurface profile from closest test borings and Corps design drawings.
3) Using soil parameters developed for levee embankment analyses, calculate exit gradient using SEEP/W. If a soil layer exists for the wall section which wasn't used in the embankment analyses, estimate permeability using grain-size correlations (if tested) or typical values for similar materials.
4) The following cases were analyzed and compared to the USACE limiting gradient of 0.5:

Case #1 - 100-yr Flood - Operating Drain
Case #2 - 100-yr Flood - No Drain

Subsurface Information:

- Test borings CF-1 through CF-11 and Exploration Location Plan by GZA (2009)
- "Chicopee River Flood Control - Chicopee Falls, Chicopee River, Massachusetts" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated April 1963
- "Chicopee Falls Local Protection Project - Design Memorandum No. 5 - Embankments and Foundations" U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Mass. Dated March 1963

Assumptions:

- Soil strata interpreted from available test boring data and design drawings, actual configuration may vary.

Material Properties:

Strata	K Ratio (k_v/k_h)	Saturated Horizontal Permeability, k_{sat}		Notes
		ft/s	cm/s	
Random Fill	1	3.3E-04	1.0E-02	(3)
Existing Fill	1	3.3E-05	1.0E-03	(1)
Silty Sand	1	4.6E-06	1.4E-04	(2)
Gravelly Sand	1	6.6E-05	2.0E-03	(2)
Riprap	1	8.0E-03	2.4E-01	(1)
Sandstone	1	1.6E-06	5.0E-05	(1)
Concrete	1	3.3E-11	1.0E-09	(1)

(1) - Permeability values based on typical values for similar materials
(2) - Permeability values estimated from correlations with grain size distribution
(3) - Permeability values based values used in USACE report

Analysis Results:

SEEPAGE ANALYSIS RESULTS - STATION 9+00 (TYPICAL FROM STATION 0+00 TO 9+50)

Case	River Elevation	Landside Elevation(1)	Max. Exit Gradient, i_e(2)	Limiting Gradient(3)	OK?
1	100yr Flood (El. 99.3)	83	0.03	0.5	OK
2	100yr Flood (No Drain)	92	0.13	0.5	OK

SEEPAGE ANALYSIS RESULTS - STATION 20+00 (TYPICAL FROM STATION 16+82 TO 25+50)

Case	River Elevation	Landside Elevation(1)	Max. Exit Gradient, i_e(2)	Limiting Gradient(3)	OK?
1	100yr Flood (El. 99.3)	84	<0.01	0.5	**OK**
2	100yr Flood (No Drain)	88.5	0.03	0.5	OK

- Note: Factor of safety values less than recommended values are shown in italics
(1) - Landside elevation refers to grade or toe drain, depending on the case
(2) - Flow and exit gradient estimated from results of SEEP/W analysis at toe drain or landside ground surface
(3) - Limiting gradient per requirements of US Army Corps Technical Letter ETL 1110-2-569 "DESIGN GUIDANCE FOR LEVEE UNDERSEEPAGE'

APPENDIX A-4.5

SETTLEMENT

APPENDIX A-4.6

INTERIOR FLOODING

U.S. Department of Homeland Security
Region I
99 High Street, 6th Floor
Boston, Massachusetts, 02110-2320

FEMA

July 19, 2010

The Honorable Michael D. Bissonnette
17 Springfield Street
Chicopee, MA 01013

Appeal Resolution and Revised Preliminary Digital Flood Insurance Rate Map

Dear Mayor Bissonnette:

Thank you for your interest and engagement with us through the floodmap revision process. As you recall, preliminary Hampden County Digital Flood Insurance Rate Maps (DFIRMs) and Flood Insurance Study (FIS) report were provided to your community on April 30, 2009. We recognize the impact the revised flood mapping could have on the community and have devoted close and serious attention to the matter. The purpose of this letter is to provide you with a revised preliminary DFIRM for your community, as well as to give you a status update and describe next steps in the process.

We have completed our preliminary review of the Interior Drainage Analysis submitted to FEMA on May 26, 2010 in support of the City of Chicopee's prior technical appeal that was submitted to FEMA during the 90-day appeal period offered for Hampden County. This appeal addressed the extent of the flooding represented on the preliminary DFIRMs in the vicinity of the drainage pump station locations behind the Chicopee Flood Control Systems and demonstrated a new extent of flooding based on an interior drainage analysis. While the technical analyses submitted for each individual pumping station demonstrates the ability of the flood control system to reduce flooding on the protected side of the levee system, FEMA cannot accept the appeal until the City attains certification of the Chicopee flood control system as providing protection from the 1-percent-annual-chance flood. We are aware that the City continues to work closely with USACE to make improvements so that the Chicopee flood control systems may ultimately be certifiable. FEMA greatly appreciates your continued efforts towards reaching this goal. Once certification is achieved, the City may submit data at any time showing that the criteria of Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10) have been met. If the required data and documentation are acceptable, FEMA will initiate a map revision to accredit the levee system and map the impacted areas on the landward side of the levee system as being protected from the 1-percent-annual-chance flood. As the interior drainage analysis submitted appears to be technically valid, we will retain this appeal information so that it may be used in future mapping updates as described above and as appropriate.

In accordance with 44 CFR 65.10, it is the responsibility of the community or other party seeking recognition of a levee system, to provide the data and documentation defined and outlined in 44 CFR 65.10. Specifically, the design and construction data provided must be certified by a registered professional engineer or by a Federal agency with responsibility for levee design.

As was noted in the supporting analyses of your appeal, Plainfield Street Flood Control System along the Connecticut River is a continuation of a flood control system in the City of Springfield. As a result of the Springfield accredited flood control system and Springfield appeal resolution, the following current preliminary DFIRM panel has been revised and affects a portion of the City of Chicopee: 25013C0213C.

For your review and comment, we have mailed you a CD containing a PDF of the above-mentioned revised preliminary DFIRM panel and a hard copy of the revised preliminary DFIRM panel was forwarded to your community's Floodplain Administrator. The revised copy will replace the current preliminary map panel for the community. Please note that not all panels in your community were affected by this revised preliminary issuance.

Your community will have 30 days from the receipt of this letter to comment on this revised information. All comments should be compiled and verified by the community and sent to FEMA Region I, attention:

David Mendelsohn
99 High Street, 6th Floor
Boston, MA 02110

After this comment period has ended and all comments have been addressed, the Letter of Final Determination (LFD) will be sent to you. The new DFIRMs and FIS report for your community will become effective 6 months later. Following the LFD date and before the effective date, you will be reminded that your community must adopt new floodplain ordinances or modify existing ordinances as necessary to reflect any changes in the DFIRMs or FIS report, including reference to the new effective date. If you or other community officials have any questions regarding the floodplain ordinance for your community, you may raise them at the community coordination meeting if such a meeting is held, or you may discuss those issues with your State NFIP Coordinator. Approximately 1 or 2 months before the effective date, we will send your community printed copies of the DFIRMs and FIS report.

The floodmap gives your community the means to mitigate flood risk through improved floodplain management policies and tactics and enables your citizens to mitigate their risk through implementing flood-resistant building techniques and/or buying flood insurance. These maps can also play an important part of your community's disaster planning. It is important to FEMA that we collaborate with you to develop the most accurate flood maps possible. If you have any questions about the flood map update process , have suggested areas for improvement, or are interested in discussing the enclosed data, please contact Kerry Bogdan with FEMA Region I, at (617) 956-7576 or David Mendelsohn with FEMA Region I, at (617) 832-4713.

Sincerely,

Michael J. Goetz, Branch Chief
Mitigation Division

Enclosure: Revised Preliminary DFIRM CD

cc: (Enclosure not included)
The Honorable Deval Patrick, Governor
The Honorable John F. Kerry, U.S. Senator
The Honorable Scott Brown., U.S. Senator
The Honorable John W. Olver, U.S. Congressman
The Honorable Richard E. Neal, U.S. Congressman
The Honorable James T. Welch, State Representative
Natalie M. Blais, Congressman Olver's Office
Thomas Hamel, Chief Operator, Chicopee DPW
Stanley W. Kulig, Superintendent of Public Works
Rosalie Starvish, Baystate Environmental Consultants, Inc.
Scott Michalak, U.S. Army Corps of Engineers
Richard Zingarelli, State Floodplain Manager, MA Dept. of Conservation and Recreation
Kerry Bogdan, FEMA Region I
David Mendelsohn, FEMA Region I
Stuart Rooney, AECOM
Laura Keating, Regional Service Center

INTERIOR FLOODING ANALYSIS

CHICOPEE FALLS FLOOD CONTROL SYSTEM

CHICOPEE FLOOD CONTROL WORKS

CITY OF CHICOPEE

HAMPDEN COUNTY, MASSACHUSETTS

May, 2010

Baystate Environmental Consultants, Inc.

A GZA Company

TABLE OF CONTENTS

Tables

Figures

Appendices

1 INTRODUCTION

The interior drainage analysis for the City of Chicopee's Chicopee Falls Flood Control System was performed in accordance with 44 CFR 65.10(b)(6), and the United States Army Corps of Engineers (USACE) Engineering Circular on Certification of Levee Systems (EC 1110-2-6067).

The following sources were consulted for information supporting the interior drainage analysis:

- U.S. Army Corps of Engineers, *Connecticut River Flood Control; Chicopee Falls Local Protection Project; Chicopee River, Massachusetts; Design Memorandum No. 2; General Design, Hydrology, Hydraulics & Geology* (December 1962).
- U.S. Army Corps of Engineers, *Operation and Maintenance Manual For Flood Protective Works on Connecticut and Chicopee Rivers at Chicopee - Chicopee Falls, Massachusetts* (1984).
- Federal Emergency Management Agency, *Preliminary Flood Insurance Study Number 25013CV001* (April 30, 2009)

All elevations referenced in this report are NAVD88 datum.

1.1 Sources of Flooding

The Chicopee Falls Flood Control System protects the Chicopee Falls section of the City of Chicopee from flooding along the Chicopee River.

1.2 Chicopee Flood Control Works Overview

The Chicopee Flood Control Works (CFCW) includes the Chicopee Local Protection Project (CLPP) and the Chicopee Falls Local Protection Project (CFLPP). The CFCW was constructed in four separated systems, namely the Willimansett System, the Plainfield Street System, the South Bank Chicopee River System, and the Chicopee Falls System. The CFCW, its four systems, and the sources of flooding are summarized below.

Table 1. City of Chicopee Flood Control Works

Chicopee Flood Control Works (CFCW)	
Chicopee Local Protection Project (CLPP)	**Source of Flooding**
Willimansett System	Connecticut River
Plainfield Street System	Connecticut River
South Bank Chicopee River System	Chicopee River
Chicopee Falls Local Protection Project (CFLPP)	**Source of Flooding**
Chicopee Falls System	Chicopee River

This report describes the interior drainage analysis for the Chicopee Falls System. In total, the Chicopee Falls System includes two (2) pumping stations. The attached locus plan (Figure 1) illustrates the locations of the Main Street and Oak Street pumping stations.

1.3 Chicopee Falls System

The Chicopee Falls System includes two pumping stations: the Main Street Pumping Station and the Oak Street Pumping Station, which discharge stormwater runoff and toe drain seepage from the low-lying areas landward of the flood control system. The 31±acre interior drainage area is divided between the Main Street Pumping Station to the north (upstream), at 16± acres, and the Oak Street Pumping Station to the south (downstream), at 15± acres. Collector drains which run alongside the flood control system discharge to both pumping stations. There also are floodwall and levee toe drains which discharge to the collector drains.

The two pumping stations are of a similar design. Each pumping station has one (1) gravity-flow outlet to the Chicopee River, which is used during low river stages. Each has sluice gates which control and direct the flow of stormwater runoff to either the gravity outlet or the pumping wet well, depending upon river conditions.

The Main Street Pumping Station's gravity outlet is a 36-inch square conduit. The pumping station houses two (2) Detroit diesel engines driving two (2) 16-inch propeller pumps, each with a rated capacity of 20 cubic feet per second (cfs) at a static head of 19.4 feet and a total dynamic head of 21.4 feet (river at high stage). Both pumps discharge through the pumping station's riverward wall, directly to the Chicopee River.

The Oak Street Pumping Station's gravity outlet is a 48-inch square conduit. The pumping station houses three (3) Detroit diesel engines and three (3) 16-inch propeller pumps, each with a rated capacity of 16 cfs at a static head of 21.1 feet and a total dynamic head of 23.5 feet (river at high stage). All three pumps discharge to the 48-inch outlet, which serves as a pressure conduit discharging to the Chicopee River when the appropriate sluice gates are closed.

2 INTERIOR HYDROLOGIC ANALYSIS

The U.S. Army Corps of Engineers Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) was used to apply the Soil Conservation Service (SCS) curve number loss and unit hydrograph models to generate runoff hydrographs from each of the interior drainage areas. For each pumping station, the HEC-HMS model includes one or more subwatershed(s) that represents the interior drainage area. The model uses applied precipitation in the form of a hypothetical, SCS Type III, 24-hour storm distribution, and drainage area characteristics to generate runoff.

2.1 Precipitation

Precipitation was applied to each drainage area in the HEC-HMS model as a hypothetical, SCS Type III, 24-hour storm distribution. The depth in inches applied for each storm event frequency is summarized as follows.

Table 2. Precipitation

Storm Event Frequency	24-Hour Precipitation Depth (inches)
1-Year	2.5
2-Year	3.1
5-Year	3.8
10-Year	4.5
25-Year	5.2
50-Year	5.8
100-Year	6.6
500-Year	7.9

The precipitation depths for the 2-, 5-, 10-, 25-, 50-, and 100-year frequency storm events were obtained from the Intensity-Duration-Frequency (IDF) curve for Springfield, Massachusetts, from the Massachusetts Department of Transportation (MassDOT), Highway Design Manual (1997). These curves were compiled from information included in Technical Paper No. 25, *Rainfall Intensity-Duration-Frequency Curves*, U.S. Weather Bureau (December, 1955). The depth for the 1-year frequency storm event was taken from Technical Paper (TP) No. 40, *Rainfall Frequency Atlas of the United States* (1963), as the Springfield IDF curves did not exhibit a 1-year frequency event. The depth for the 500-year frequency storm event was extrapolated from the existing data.

2.2 Interior Drainage Areas

The City of Chicopee provided mapping of the areas draining to each pumping station based upon stormwater collection systems and the current status of combined sewer system diversions and separation efforts. Neither of the Chicopee Falls System pumping stations are believed to receive wet weather flow discharges from combined sewer systems within Chicopee Falls. Drainage areas were delineated based on the information provided by the City, as well as a review of existing topography taken from *Topographic Plan of Land in Chicopee, MA*, Heritage Surveys, Inc. (Preliminary-December 12, 2009), and the Massachusetts Geographic Information System (MassGIS) Digital Elevation Model (February, 2005). Other sources of information which were reviewed as part of the drainage area delineations include the USACE design documents for each of the pumping stations, and the following plans as they relate to drainage:

1. Map of Phased Recommended Plan, Final Long-Term CSO Control Plan, Chicopee, Massachusetts, Tighe & Bond Consulting Engineers (October, 2009)

Existing conditions were reviewed in the field to validate these prior plans. The interior drainage areas for the Main Street and Oak Street Pumping Stations are shown on Figures 2 and 3, and the computed areas in acres of each drainage area are included in Table 3.

The SCS (USDA's Soil Conservation Service, now the Natural Resources Conservation Service) runoff curve number (CN) is an empirical parameter used in hydrology for predicting direct runoff or infiltration from rainfall excess. The CN is widely used and is an efficient method for determining the approximate amount of direct runoff from a rainfall event in a particular watershed or drainage area. It is a function of the hydrologic soil group (HSG), the land use/cover complex, and the antecedent moisture condition.

These three watershed factors have the most significant impact in determining runoff from a watershed, and, in conjunction with precipitation data, provide the basis for runoff volume estimation.

The HSG is identified for each soil type in the SCS soil classification system. There are four groups ranging from A, for soils with high infiltration rates and low runoff potential, to D, for soils with low infiltration rates and high runoff potential. The MassGIS SCS soil group datalayer was utilized to identify the soil types within each drainage area. Each soil type was then categorized according to its HSG by reference to the Hampden County Soil Survey (SCS). For those soils which had a compound classification (e.g. were classified as C/D, B/C, etc.), a single representative HSG was calculated, based on a weighting of the individual soils in the map unit. A map of soil types within the drainage areas to the Main Street and Oak Street Pumping Stations is included as Figure 4.

The land uses within each drainage area were identified by reference to the MassGIS Land Use 2005 datalayer. The land uses were modified to reflect current conditions as needed. Each land use is associated with a curve number depending on the HSG within the area. A composite curve number for each drainage area was generated based on the areas of each HSG within each land use. Tables summarizing the composite curve number calculation for both drainage areas are included in Appendix A. Average antecedent soil moisture conditions (Condition II) were assumed. The resulting curve numbers are listed in Table 3.

The SCS unit hydrograph method applies the lag time to scale the dimensionless generalized hydrograph to produce the unit hydrograph used in the analysis. The standard lag is defined as the length of time between the centroid of precipitation mass and the peak flow of the resulting hydrograph. Studies by the SCS found that in general the lag time can be approximated as 60% of the time of concentration, which was applied for this analysis.

The time of concentration is the time required for water to travel from the most hydrologically remote point in the drainage area to the point of collection. It is computed as the sum of the travel times of sheet flow, shallow concentrated flow, and channel or pipe flow. The travel time of sheet flow depends on the length of flow, surface cover, precipitation intensity and slope. For this analysis, the length of sheet flow was assumed to be on the order of 50 to 100 feet, while the slope was assumed to be 2 percent. The precipitation intensity was represented by the 2-year, 24-hour rainfall depth using the Welle and Woodward (1986) equation for sheet flow (McCuen, R.H., Hydrologic Analysis and Design, 2nd ed., 1998). The Manning's Roughness Coefficient (n) for overland flow surfaces represents surface cover effects.

The travel times of shallow concentrated flow and channel/pipe flow are computed based on the velocity of flow. The velocity of shallow concentrated flow was computed using the Manning's Equation. By applying assumed values for the hydraulic radius and Manning's n coefficient, the equation is simplified to provide a relationship between the velocity and the average slope of the surface. The hydraulic radius and Manning's n are incorporated into a factor, k, which varies with surface cover. The slope of shallow concentrated flow was assumed to be 2 percent for this analysis.

Chicopee Falls is a highly-developed area; thus, drainage is delivered to the pumping stations via a network of pipes. Therefore, the last segment of the time of concentration calculation assumes pipe flow. Flow capacities of these closed systems were not specifically computed, as that effort is beyond the scope of this analysis. The travel time is computed as the length of pipe flow divided by the velocity of flow. A velocity of 2.5 feet per second was assumed for pipe flow in Chicopee Falls. The lag times for each drainage area are included in Table 3.

Table 3. Drainage Area Characteristics

Drainage Area	Area (acres)	Curve Number	Lag Time (minutes)
Main Street	16	88	50
Oak Street	15	92	10

Appendix A includes the calculations for the composite SCS runoff curve number and lag time for each drainage area.

2.3 Other Sources of Pumping Station Inflow

As indicated in the table below, the Main Street and Oak Street pumping stations receive inflow from the toe drains, generally limited to periods of high river stage. The toe drain seepage flows applied in the model are based on information provided in the USACE design reports for the pumping stations. There are no additional sources of inflow to the pumping stations.

Table 4. Other Sources of Pumping Station Inflow

Pumping Station	Assumed Toe Drain Seepage Flow (cfs)
Main Street	6 (during high river stage only)
Oak Street	4 (during high river stage only)

3 INTERIOR HYDRAULIC ANALYSIS

HEC-HMS is used to evaluate the hydraulics of discharge from each interior area to the river through the levee. During an interior storm event, interior drainage may discharge to the river via a gravity outlet through the levee, or by being pumped through the pumping station. The method of discharge will depend on the exterior river stage during the interior storm event, identified on the river frequency curves as the Pump Activation Elevation. In HEC-HMS, the potential interior flooding area is represented by a reservoir. HEC-HMS has the capability of modeling discharge from a reservoir through gravity outlets and/or by pumping. Models were developed for each pumping station that incorporate both gravity outlets and pumping. In addition, the model includes setting a tailwater on each reservoir to represent the exterior river stage.

Reservoirs are defined in HEC-HMS by a stage-storage curve. Reservoir stage-storage data for each of the pumping stations was determined based on the Digital Elevation Model (Feb., 2005) provided by the Massachusetts Geographic Information System (MassGIS). The storage volume between elevations was computed using ESRI's ArcGIS 3D Analyst. The Main Street and Oak Street pumping stations do not have storage ponds; thus, the potential flood storage areas were defined by the topographical characteristics of each drainage area's lower elevations. The storage provided by the sump for each pumping station was incorporated into the stage-storage data. The stage-storage data for each pumping station is included in Appendix B.

The pumps are defined in HEC-HMS by pump-head discharge curves, which are based on the pump capacity information provided in the U.S. Army Corps of Engineers' "Analysis of Design" documents prepared for each of the pumping stations. The discharge varies with the head on the pump which depends on the exterior river stage. The pump-head discharge curves are included in Appendix C. The derivation of the curve for each pumping station is described below.

For simplicity in modeling, it was conservatively assumed that the efficiency of the drainage systems conveying runoff to each pumping station is 100%. That is, it was assumed that all direct runoff generated over the drainage area was able to enter the drainage system and reach the pumping stations with no delay or surcharging. In reality, inefficiencies (such as undersized pipes or clogged inlets) of the drainage system would impede the conveyance of direct runoff to the pumping stations. Modeling results indicated no interior flooding at Main Street and Oak Street pumping stations; thus, it was deemed unnecessary to further refine the models for these pumping stations by including some allowance for the inefficiency of the drainage systems.

The specific assumptions applied to the hydraulic model for each pumping station are described as follows.

3.1 Main Street Pumping Station

Pump capacity curves were not provided in the USACE Design Memorandum No. 2, General Design, Hydrology, Hydraulics & Geology (December 1962) for the Main Street Pumping Station. However, pump design capacities were provided for two values of pump head; thus, a simplified pump head-discharge curve was developed using the provided values. The two pumps at the Main Street Pumping Station were field tested on April 1, 2010, to verify pumping capacities. The Chicopee River elevation was below the pump discharge elevation during the test. Two trials were performed for each pump, in which the time to reach various stages in the wet well was recorded. The average pump rate for each pump was then computed. The pump tests indicated an overall pumping station pumping rate equivalent to about 82% of the design pumping rates provided. Pump test data is included in Appendix D. The subsequent interior drainage analysis was conducted for both full design pumping rates and at reduced pumping rates equivalent to 82% of the design pumping rates, which is representative of documented pumping rates. Full station capacity consists of two 16-inch pumps.

3.2 Oak Street Pumping Station

Pump capacity curves were not provided in the USACE Design Memorandum No. 2, General Design, Hydrology, Hydraulics & Geology (December 1962) for the Oak Street Pumping Station. However, pump design capacities were provided for two values of pump head; thus, a simplified pump head-discharge curve was developed using the provided values. The three pumps at the Oak Street Pumping Station were field tested on April 1, 2010, to verify pumping capacities. The Chicopee River elevation was below the pump discharge elevation during the test. Two trials were performed for each pump, in which the time to reach various stages in the wet well was recorded. The average pump rate for each pump was then computed. The pump tests indicated an overall pumping station pumping rate equivalent to about 65% of the design pumping rates provided. Pump test data is included in Appendix D. The subsequent interior drainage analysis was conducted for both full design pumping rates and at reduced pumping rates equivalent to 65% of the design pumping rates, which is representative of documented pumping rates. Full station capacity consists of three 16-inch pumps.

Elevations of interest for these pumping stations are listed below.

Table 5. Elevations of Interest, feet (NAVD88)

Pumping Station	**Elevation of Gravity Outlet**	**Pump Activation Elevation**	**Approximate Exterior Ground Elevation at Pumping Station Location**	**Elevation of Levee at Pumping Station Location**	**Elevation of Riverine 100-Year Flood at Pumping Station Location**
Main Street	76.3	81.8	89.0	104.4	94.6
Oak Street	75.3	78.3	85.1	99.3	91.4

4 COINCIDENT FREQUENCY ANALYSIS

The federal regulations pertaining to mapping of areas protected by levee systems indicates that the analysis of interior flooding must be based on *"the joint probability of interior and exterior flooding"* (44 CFR 65.10(b)(6)). The USACE Engineering Circular on Certification of Levee Systems (EC 1110-2-6067) states: *"The analysis of interior flooding is based on a coincident analysis of exterior and interior stages that includes the capacity of gravity and blocked gravity drainage features. Coincident analysis for interior areas is explained in Chapter 4 of EM 1110-2-1413, Hydrologic Analysis of Interior Areas. For riverine levee systems, the interior analysis considers interior rainfall events during both low river stages (gravity conditions) and high river stages when the gravity outlets are closed (blocked conditions) and the performance of pumping stations as might exist."* The U.S. Army Corps of Engineers' Engineer Manual, "Hydrologic Analysis of Interior Areas" (EM 1110-2-1413) provides guidance for a "Coincident Frequency Method" of analysis which computes the percent chance exceedance frequencies of various interior flooding elevations based on the probabilities of exceeding given exterior river stages during different interior storm events. Coincidence is the degree to which the interior and exterior events occur at the same time. The Coincident Frequency analysis provides a method to compute the joint probability of interior and exterior flooding and to determine the base flood elevation for interior areas.

The Coincident Frequency Method is a probabilistic approach that is applicable to areas where the occurrence of the exterior and interior events are independent, such that the physical and meteorologic processes of the exterior and interior events are unrelated. Relatively small interior areas located along large rivers, such as in Chicopee, are typically independent. At the confluence of the Connecticut River and the Chicopee River, the watershed to the Connecticut and Chicopee Rivers are 9,000± square miles and 722± square miles, respectively. The drainage area to the Main Street Pumping Station is 16 acres and to the Oak Street Pumping Station is 15 acres. The ratio of river watershed to interior drainage area is approximately 30,000:1. As such, the behavior of interior runoff generation is highly independent of the river's hydrologic behavior, and the Coincident Frequency Method is a valid approach in this setting.

In accordance with the Coincident Frequency Method, the probability of exceeding a given interior flooding elevation, "A", is computed as follows:

$$P(A) = \sum_{i=1}^{n} [P(A/Bi) \times P(Bi)]$$

Where:

A = given interior flooding elevation;

Bi = given exterior river stage, from i = 1 to n stages;

P(A) = total probability of attaining a given interior flooding elevation;

P(Bi) = probability that the river is at a given exterior river stage;

P(A/Bi) = probability of attaining a given interior flooding elevation if the exterior river stage is at a specific elevation.

The river stages, Bi, and probabilities of each river stage, P(Bi), were determined from the Chicopee River Stage Frequency curves developed by the local USGS gage data at Indian Orchard, Springfield, MA (USGS 01177000). The period of record spans from 1928 to the present. The Chicopee River modified stage frequency curves at Main Street and Oak Street Pumping Stations were determined by translating the Indian Orchard gage data to the locations of the pumping stations based on the stages at each location, as indicated by the flood profiles computed by the U.S. Army Corps of Engineers in the Chicopee Falls Local Protection Project Design Memorandum No. 2. The differences in stage vary with discharge; thus, the translated stages were computed depending on the recorded discharge at Indian Orchard.

Table 6. Adjustments for Stage Frequency Curves

From USACE Profiles:

Chicopee River Discharge, cuft/sec	Main St. Stage, feet (NAVD88)	Oak St. Stage, feet (NAVD88)	Indian Orchard Stage, feet (NAVD88)
10,000	85.0	82.4	136.6
70,000	96.8	94.7	142.6

Stage Adjustment, as compared to Indian Orchard gage data:

Chicopee River Discharge, cuft/sec	Main St. Stage, feet (NAVD88)	Oak St. Stage, feet (NAVD88)
10,000	- 51.6	- 54.2
70,000	- 45.8	- 47.9

Each location-specific stage frequency curve is divided into stage intervals, with each stage interval represented by an index stage, Bi. The probability of each index stage, P(Bi), is computed as the fraction of the percent of time the index stage is equaled or exceeded, in accordance with EM 1110-2-1413. The Chicopee River stage frequency curves for each pumping station are reproduced in Appendix E.

The probability of attaining a given interior flooding elevation if the exterior river stage is at a specific elevation, P(A/Bi), is considered as equivalent to the annual probability of the interior storm events evaluated in the model, as follows:

Table 7. Probability of Attaining a Given Interior Flooding Elevation, if the Exterior River Stage is at a Specific Elevation.

Interior Storm Return Period (Year)	Interior Storm Annual Probability (P(A/Bi))
1	1.000
2	0.500
5	0.200
10	0.100
25	0.040
50	0.020
100	0.010
500	0.002

Each interior storm event is analyzed at each exterior river index stage to compute each corresponding interior flooding elevation. The probabilities associated with the various combinations of interior storm events and exterior stage which produce a given interior flooding elevation are multiplied and then summed to compute the total probability of exceeding that interior flooding elevation. A plot of interior flooding stages versus the total probabilities of exceeding each interior flooding stage reveals the interior flooding stage at which the total probability is equal to 0.01 (1%). This recurrence interval is selected by the Federal Emergency Management Agency (FEMA) as the “base flood” for estimating the extent of interior flooding and the calculation of flood insurance rates under the National Flood Insurance Program (NFIP).

Appendix F reproduces the coincident frequency analysis matrices and resultant curves. Matrix One computes the values of [P(A/Bi) x P(B)] for each of the selected river index stages. Each index stage is the midpoint elevation of a selected range of river stage. Matrix Two identifies the interior flood storage elevation for each interior storm event and for each river index stage. The family of curves on Graph One illustrates the relationship of the interior flood elevation and the [P(A/Bi) x P(B)] values for each river index stage. Then, for each interior flood elevation, the intercept of each index stage curve is summed to provide a value of $\sum$ [P(A/Bi) x P(B)], which is the probability of interior flooding to that particular elevation. These values are then plotted on Graph Two and, for purposes of FEMA interior flooding mapping, P(A) was set at 0.01. The 1% change interior flood elevation is then read directly off Graph Two using linear interpolation between adjacent data points.

5 RESULTS

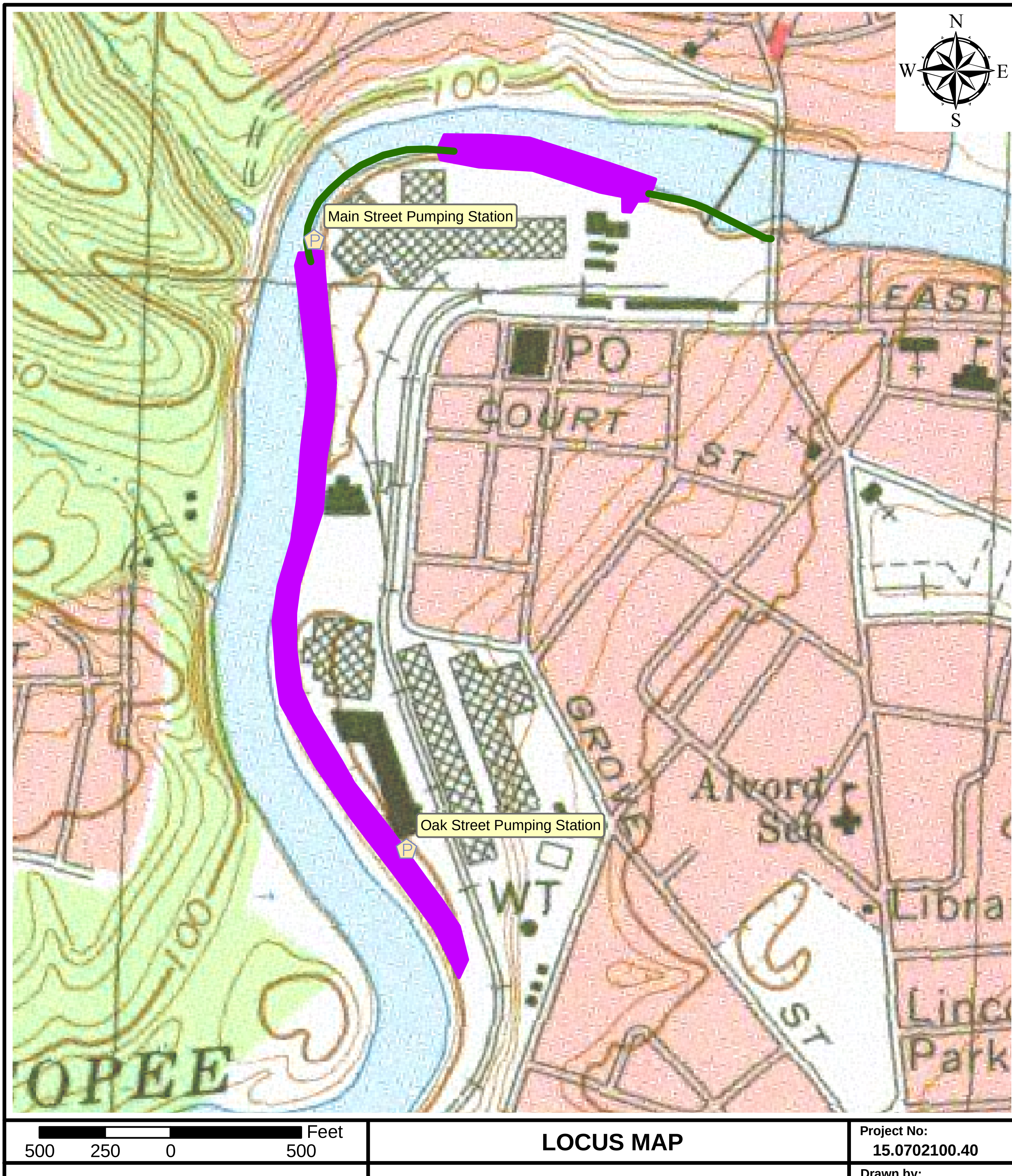
The computed interior stages resulting from the analyses of various combinations of exterior river index stage and interior storm return period for each pumping station are shown on the Coincident Frequency Analysis Matrices in Appendix F. For each pumping station, also included in Appendix F is the summation of probabilities to compute the total probability of exceeding a given interior flooding elevation and determination of the resulting 1% chance interior elevation. The 1% chance interior elevation at each pumping station is summarized in the table below. Also shown is the total area and average depth of interior flooding.

Using design pumping capacities, the computed flood elevation at the Main Street pumping station was 78.6, and at the Oak Street pumping station was 78.7. The predicted 1% chance interior flood elevations at both the Main Street and Oak Street pumping stations do not exceed the lowest ground surface elevations within their respective drainage areas, as indicated by the topographic contours generated from the MassGIS Digital Elevation Model. Therefore, there is no interior flooding associated with the 1% chance event at either of these pumping stations. Using modified pumping rates in the modeling, based on the pumping field tests as described in Sections 3.1 and 3.2, had no impact on the resulting 1% chance interior flood extent and elevations.

Table 8. 1% Chance Interior Flood Results

Pumping Station	1% Chance Interior Flood Elevation (ft, NAVD88)	Total Area of 1% Chance Interior Flood (acres)	Average Depth of 1% Chance Interior Flood (ft)
Main Street	78.6	0	0
Oak Street	78.7	0	0

Figures



LOCUS MAP

Project No:	15.0702100.40
Drawn by:	ATR
Checked by:	RTFS
Date:	May, 2010
Figure No:	1

Legend

Floodwalls

Levees

Chicopee Pumping Stations

Chicopee Falls Flood Control System Chicopee, Massachusetts

MassGIS Orthophoto (2005)

Data obtained from MASS GIS, Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA

MAIN STREET P.S. DRAINAGE AREA

Project No: 15.0702100.40

Drawn by: MTF

Checked by: RTFS

Date: May, 2010

Figure No: 2

Legend

Pumping Station (P.S.)

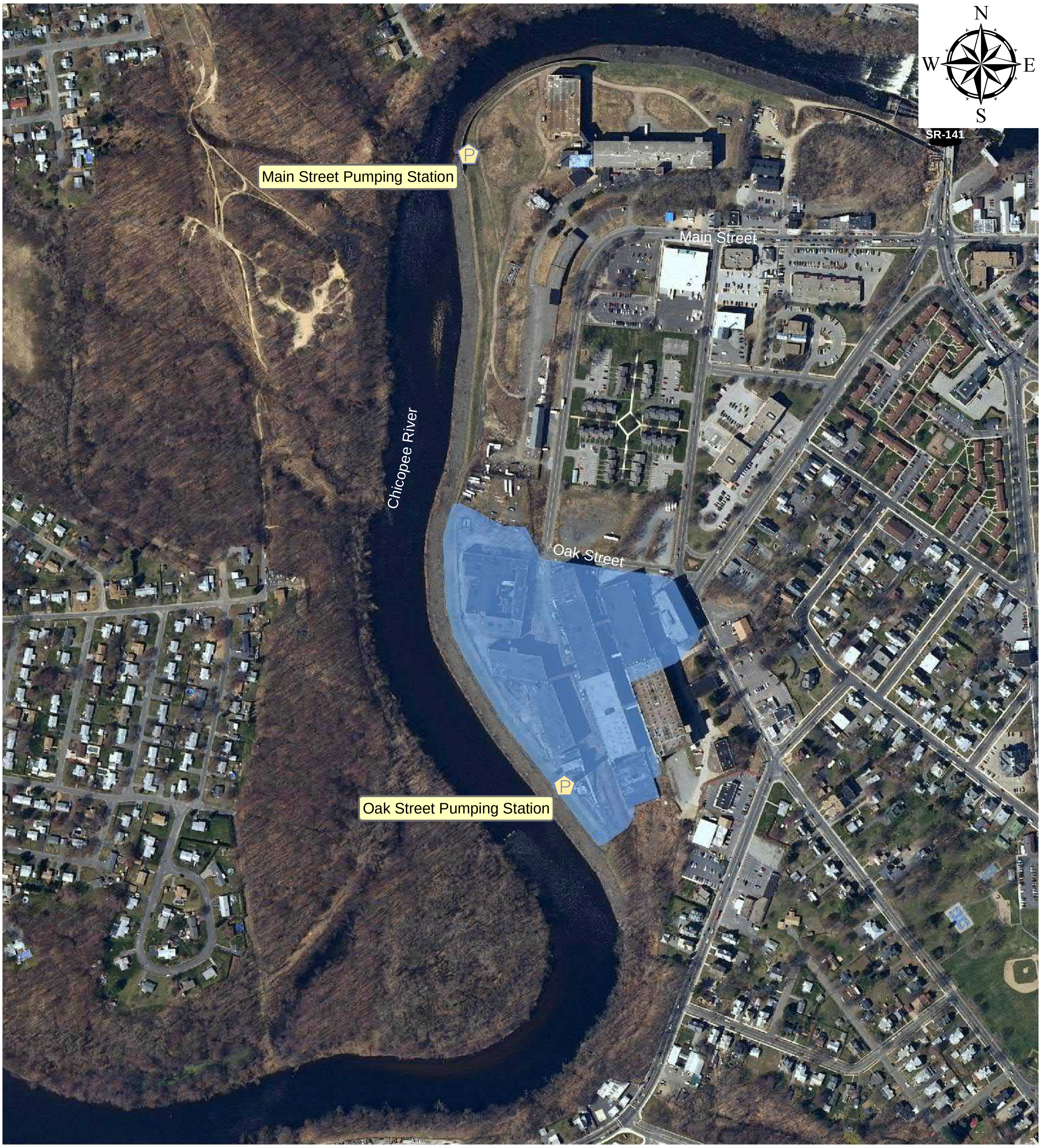
Main Street P.S. Drainage Area

Interior Drainage Analysis
Chicopee Falls Flood Control System
Chicopee, Massachusetts

MassGIS Orthophoto (2005)

Data obtained from MASS GIS, Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA



Feet
0 250 500 1,000

OAK STREET P.S. DRAINAGE AREA

Project No: 15.0702100.40

Drawn by: MTF

Checked by: RTFS

Date: May, 2010

Figure No: 3

Legend

Pumping Station (P.S.)

Oak Street P.S. Drainage Area

Interior Drainage Analysis
Chicopee Falls Flood Control System
Chicopee, Massachusetts

MassGIS Orthophoto (2005)

Data obtained from MASS GIS, Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

BEC A GZA Company

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA

Soils Map

Project No: 15.0702100.40

Soils Legend

1 Water
602 Urban Land
737 Terrace Escarpments
739C Urban Land: Hinckley-Windsor Association

Interior Drainage Analysis
Chicopee Falls Flood Control System
Chicopee, Massachusetts

Drawn by: MTF

Checked by: RTFS

Date: May, 2010

MassGIS Orthophoto (2005)

Figure No: 4

Baystate Environmental Consultants, Inc.
296 North Main Street, East Longmeadow, MA

Data obtained from MASS GIS, Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

APPENDIX A-4.7

OTHER DESIGN CRITERIA
(STRUCTURAL)

STRUCTURAL ANALYSIS

CHICOPEE FALLS FLOOD CONTROL SYSTEM

CHICOPEE FLOOD CONTROL WORKS

CITY OF CHICOPEE

HAMPDEN COUNTY, MASSACHUSETTS

October, 2010

Baystate Environmental Consultants, Inc.

A GZA Company

BACKGROUND

GZA's understanding of the project is based on our review of 44CFR65.10, our work at the site, discussions with the City of Chicopee, and the following project documents:

- A Plan set, entitled "Connecticut River Flood Control Project, Chicopee Falls, Mass., Plans for the Local Protection Project, Construction of, Chicopee River, Massachusetts, " prepared by the U.S Army Engineer Division, New England, Corp of Engineers, Waltham, Mass., dated June 1963, sheets 1- 68.

EXISTING CONDITIONS

The Chicopee Falls system is comprised of two sections of concrete flood wall, one approximately 530 feet long and the other approximately 860 feet long, installed at the top of an earthen embankment. The first wall section begins at the South abutment of the Deady Memorial Bridge, at project station 4+37.5 and extends about 530 feet to the west to Sta 9+69.8 along the southern/eastern shore of the Chicopee River. The final 20 feet at the western terminus of the floodwall, Sta 9+49.8 to Sta 9+69.8, is embedded in an earthen dike. The dike continues along the shore to the west until the second section of wall begins at project station 16+81.5. The second wall extends about 860 feet to the west along the eastern shore of the Connecticut River, to Sta 25+44.5. The final 20 feet at each end of the second wall is embedded in earthen dikes. The second length of dike, starting at Sta 25+24., extends to the southern terminus of the flood control system.

STRUCTURAL EVALUATION

Our structural engineers reviewed the original design documents in order to determine the assumed loading conditions and to review how the structural elements were designed. The results of the original analysis were compared to the current USACE guidance to verify that the structures meet current design requirements specified in the following documents:

1. USACE Manual EM 1110-2-2100 *Stability Analysis of Concrete Structures.*
2. USACE Manual EM 1110-2-2104 *Strength Design for Reinforced Concrete Hydraulic Structures.*
3. USACE Manual EM 1110-2-2502 *Retaining And Flood Walls.*

A total of eleven different wall sections between two sets of stations: 4+37.5 to 9+69.8 and 16+81.5 to 25+44.5 have been evaluated for this analysis with the methods prescribed in Reference 3. Our engineers evaluated each section for the load condition of the 1-percent-annual chance flood as required by FEMA Regulations 44 CFR 65.10. Analysis parameters and results are included in this Appendix 4.7. It is our opinion that the floodwalls will perform adequately under the 1-percent-annual-chance flood.

As prescribed by the USACE, the floodwalls were evaluated for sliding stability, overturning stability, foundation soil bearing capacity and strength and serviceability of the floodwalls. The floodwalls were analyzed as inland flood walls, critical structures with Case R1, “Usual Loading” conditions applied. Elevations and geometry data were taken from the 1963 USACE Construction Drawings referenced above, adjusted for the current survey datum. The flood wall section analysis is heavily based on Example 3 on page N-22 of Reference 3.

MATERIAL PROPERTIES

Subsurface conditions varied significantly over the length of the floodwalls. The original construction drawings indicate that much of the northern portion of the floodwall adjacent to the Deady Bridge is founded on rock and that the wall footing is secured with rock anchors. The subsurface investigations undertaken for this evaluation encountered weathered rock in the vicinity of the bottom of wall footing, east (up-station) of Sta 6+00±.

The effects of rock anchors were conservatively neglected in our analyses. In the original design documents, the floodwalls were designed for a flood elevation greater than the 1-percent-annual-chance flood upon which this current evaluation is based. The higher flood level necessitated the use of rock anchors (in the design calculations) to maintain wall stability. Confirmation of the rock anchor installation was not included in this evaluation as the current analyses indicate that they are not required for stability during the 1-percent-annual-chance flood.

Table 1 **-** Material properties for the wall sections analyzed were selected based on the original design calculations and field observations made for this report.

MATERIAL PROPERTIES		
Backfill Soil:		
Cohesion of Backfill soil un-drained	0.00	PSF
Cohesion of Backfill soil drained	0.00	PSF
Friction angle of backfill soil	26.50 – 35.00*	DEG
Developed friction angle = .0.667 x friction angle	17.67 – 23.33*	DEG
Coefficient of earth pressure at rest (Ko = 1-sin□)	0.43 – 0.55	
Unit weight of soil backfill per unit volume	100.00 – 130.00*	PCF
Unit weight of water	62.50	PCF
Saturated unit weight of soil	125.00 – 135.00*	PCF
Buoyant unit weight	62.50 – 72.50*	PCF
Buoyant unit weight on land side due to seepage	78.81 – 123.06*	PCF
Concrete:		
Unit Weight of Concrete	150.00	PCF
Unconfined Compressive Strength	4000.00	PSI

Steel Reinforcing Strength	60000.00	PSI
Depth of concrete cover for deign	3.00 – 4.50*	IN
Strength reduction factor	0.90	
Shear factor	0.85	

* Values vary along length of wall. For specific values refer to Wall Analysis Data Sheets

Lateral Soil Forces

Lateral soil forces were calculated based on methods prescribed in Reference 3. We have assumed that a vertical soil tension crack will form at the riverside (RS) edge of the footing thus minimizing any active soil forces on the RS of the wall and footing. The passive soil force on the landside (LS) of the wall is included for bearing pressure and overturning calculations but neglected for the sliding stability analysis. All wall sections analyzed meet or exceed all of the USACE recommended factors of safety. For the wall section models, the ground surface elevations on the riverside and landside vary but are considered to be level as they extend away from the wall. Since the active and passive soil pressures are neglected in the sliding analysis, the coefficient of active and passive earth pressures are not calculated. To balance the wall in the lateral direction for the calculation of bearing pressures, we have calculated a required passive soil pressure and then back-calculated a required coefficient of passive earth pressure to achieve this balanced condition. The engineer then reviewed this “back-calculated” coefficient to decide if this value is reasonable. This value is presented as “Kp required to balance horizontal forces” on the analysis summary page.

Sliding Stability

Floodwall sliding stability was evaluated based on Reference 3, Section 4-14. The friction factor for sliding was based upon either a cast-concrete/soil or cast-concrete/rock interface, depending upon location. The contribution of any potential sliding resistance of the rock anchors was neglected.

Bearing Capacity

Floodwall foundation bearing capacity was evaluated based on Reference 3, Chapter 5. Given the firm nature of the underlying rock or soils and the width of the footings, bearing capacity is not an issue of concern for the subject walls.

APPENDIX A-6

CITY OF CHICOPEE OPERATION AND MAINTENANCE MANUAL (BOUND SEPARTELY)

APPENDIX E - Slope Stability Analysis

APPENDIX F – Stormwater Management Report

Chicopee, MA

Former Uniroyal & Facemate Properties

March 2021

STORMWATER MANAGEMENT REPORT

ACOE PERMIT REVIEW ONLY

BETA
1 Springfield Street
Suite 4
Chicopee, MA 01013
413.331.5326
www.BETA-Inc.com

Table of Contents

List of Figures

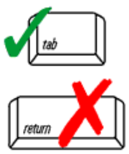
List of Appendices

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☒ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:
- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

  ☐ is within the Zone II or Interim Wellhead Protection Area

  ☐ is near or to other critical areas

  ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½” or 1” Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☒ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

1.0 OVERVIEW

1.1 PROJECT PURPOSE

Under this project, the City proposes to backfill a portion of the Chicopee Falls Local Protection Project easement and adjacent upland areas in order to facilitate future redevelopment of the former Uniroyal and Facemate properties (the "Site"). As a result of these proposed measures, existing stormwater runoff characteristics will be altered. In accordance with the Massachusetts Stormwater Handbook and best engineering practices, this Stormwater Management Report will outline the proposed modifications to the Site's stormwater management systems implemented to maintain the integrity of the Flood Control System and the Chicopee River.

1.2 CONTACT INFORMATION

City Chicopee
274 Front Street, 4th Floor City Hall Annex, Chicopee, MA 01013
Attn: Lee Pouliot, AICP, ASLA, Director of Planning & Development
Tel: (413) 594-1515

1.3 PROJECT DESCRIPTION

The project site is a portion of the former Uniroyal Site, located at 154 Grove Street, and the former Facemate Site (also known as the "Baskin Parcel") located at 75 West Main Street, both located in the City of Chicopee, MA (the "Site"). The City of Chicopee Assessor's Office identifies the properties as Lots 124-00003, 124-00012, 143-00001, 147-00006, 147-00009, 147-00010, and 202-0015A. The properties are generally zoned as Industrial with a small strip of land zoned as Residential A (Refer to Figure 1: Site Locus).

The Site is situated along the Chicopee River, bounded by the river to the west and Front Street, Grove Street, Oak Street, and West Main Street to the east. Historic use at the Site primarily included mill buildings used for various manufacturing operations since the late 1800s. Since acquisition of the lots by the City of Chicopee circa 2009, the majority of the former mill buildings have been demolished and environmental clean-up operations are currently being conducted throughout the Site. As of July 2020, seven large buildings remain at the Site, of which two (Buildings 15 and 29) are proposed to be demolished while the rest are to be retained.

This stormwater analysis has been prepared to support a fill operation along the western boundary of the Site. The fill area is a low-lying portion of the Site adjacent to an existing flood control levee. Constructed circa 1938-1942, the levee is a portion of the "Chicopee Falls Local Protection Project" and mitigates risk of flooding from the Chicopee River. The top-of-levee elevations range from 98' +/- to 100' +/- in this area. A flood control easement is present directly east of the levee, where several drainage systems are in place to control stormwater behind the levee. Catch basins, drain inlets, interceptor drains, and a toe drain collect runoff from this low-lying area and divert it to either the Main Street Pump Station (from the Facemate Property) or the Oak Street Pump Station (from the Uniroyal Property). Both pump stations discharge stormwater runoff to the Chicopee River.

1.4 ADDITIONAL DATA SOURCES

- Report entitled "Chicopee Falls Local Protection Project," Design Memoranda No. 1 through 6. Prepared by US Army Engineer Division, New England Corps of Engineers, dated December 1962.
- Letter entitled "Chicopee Levee Slope Stability" prepared by O'Reilly, Talbot, & Okun Associates (OTO), dated September 14, 2016.

2.0 EXISTING CONDITIONS DESCRIPTION

The existing Site is currently vacant, apart from Lot 124-00012 which is used as a business and “Building C” on Lot 143-0001 which is used as storage by the Chicopee Police Department. The majority of the Site’s land area beyond the vacant buildings is bare soil, grass, or limited vegetation. Former buildings have been remediated, demolished, and their footprints backfilled. Paved and unpaved driveways provide access to various portions of the Site. Miscellaneous site improvements include utility poles with overhead wire, a perimeter fence, and erosion controls.

Stormwater management is accomplished generally through several closed drainage systems throughout the Site, and include four primary discharge points:

- The Oak Street Pump Station, located on the southwestern portion of the Uniroyal Property
- The Main Street Pump Station, located approximately 570 ft. north of the Facemate Property.
- An outfall located at the southwestern corner of the Uniroyal Property which discharges to the Chicopee River (Hereafter referred to as the “South Outfall”)
- An outfall located on Lot 0202-0015A just south of the Facemate Property which discharges to the Chicopee River (Hereafter referred to as the “North Outfall”)

Stormwater runoff from the eastern (“Upper”) portions of the Uniroyal property are conveyed through a catch basin – manhole system and directed to the South Outfall. Stormwater runoff from the western (“Lower” and “Middle”) portions of the Uniroyal property is conveyed via overland flow to the area adjacent to the flood control levee. This stormwater is then collected either by catch basins associated with the “interceptor drain,” or an underground toe drain that collects groundwater. Both the toe drain and interceptor drain convey stormwater to the Oak Street Pump Station where it is discharged to the Chicopee River. Stormwater runoff from Uniroyal Buildings 26 and 27 is collected via a roof drain system and conveyed to the Oak Street Pump Station as well. Stormwater runoff in the northeastern portion of the Uniroyal property is conveyed via catch basin connections to the drainage system beneath Oak Street, but this area is outside the limit of work for this project.

Stormwater runoff from the Facemate property is conveyed via overland flow to the area adjacent to the flood control levee. This stormwater is then collected either by catch basins associated with the “interceptor drain,” or an underground toe drain that collects groundwater Both the toe drain and interceptor drain convey runoff to the Main Street Pump Station, where it is discharged to the Chicopee River. Some stormwater runoff from the eastern portions of the Facemate property may also be captured by a series of catch basins that convey flow to the North Outfall. However, the Site is generally not graded towards these drain inlets and no alterations are proposed to their catchment area.

A further description of the stormwater runoff characteristics with respect to the HydroCAD model and Watershed Plans is provided in Section 4.4 below.

Topography at the Site is generally graded to the west towards the low-lying area adjacent to the flood control levee. Due to ongoing demolition and remediation work, several areas of uneven grading are present throughout the property; however long-term grading is assumed to result in these areas being backfilled and graded westward. A portion of the Site is within the 200’ Riverfront Area associated with the Chicopee River. The area west of the levee is classified as a regulatory floodway. No wetlands or other resource areas are known to exist on the property (Refer to Figures 2 and 3).

Natural Resources Conservation Service soil maps indicate soils in the project area are considered Urban land and is not designated a Hydrologic Soil Group (HSG). As a conservative measure, HSG D has been applied to the hydrologic calculations. This ensures that proposed basins are sized to reflect a worst-case scenario. Refer to Appendix C for relevant NRCS Soil Maps.

3.0 PROPOSED CONDITIONS WITH MITIGATION

This project proposes to backfill a portion of the low-lying area behind the flood control levee in order to facilitate future redevelopment of the Site. Backfill material may include contaminated soils or other materials in accordance with the City's Fill Management Plan, to be overseen by a Licensed Site Professional (LSP). Backfill material will be "Capped" with geotextile fabric and 3' of clean fill, except where deemed unnecessary by the LSP. Clean fill material will include loam and seed to establish turf for stability and erosion control.

The Oak Street Pump Station and its associated discharge pipe are proposed to be decommissioned, partially demolished, and abandoned in place. The existing interceptor and toe drains will be abandoned in place with existing inverts plugged. The abandonment of these systems is based on the results of a geotechnical analysis by OTO indicating that levee stability will be maintained without a functioning toe drain.

To manage stormwater, the interceptor drain will be replaced with several infiltration basins proposed along the western side of the properties, generally 3' – 5' below the top of the levee. These infiltration basins will retain stormwater runoff and discharge into a new catch basin to manhole drainage system. Stormwater runoff collected within the Uniroyal Property will be conveyed to the South Outfall, while that collected within the Facemate Property will be conveyed to the Main Street Pump Station. No alterations are proposed to the upgradient portions of the Uniroyal and Facemate Properties, and the existing drainage systems in these areas will continue to function. However, stormwater runoff previously conveyed to the Oak Street Pump Station will instead be directed to the new drainage system.

Proposed perforated drain pipes connecting the catch basins and manholes will be located within crushed stone. These pipes and the crushed stone are intended to capture any groundwater that may build up behind the levee per geotechnical engineer recommendations. Note that a full evaluation of pre- and post-development levee stability is to be conducted under a separate report.

The proposed system also includes the abandonment of a 24" RCP "Bypass" drain pipe located between the Facemate and Uniroyal Sites. Per discussions with the City and record plans, this pipe was used to convey process water to the Uniroyal Site. At the time of this report, the pipe has not been during the preceding 19 years and it is anticipated that the North Outfall will be sufficient to discharge any flows in the Facemate drainage system.

4.0 Calculations and Assumptions

4.1 Objectives

The calculations presented in this report are an analysis of site hydrology and stormwater runoff, including scenarios for both Pre- and Post-Development conditions. The project is considered a redevelopment project and the objective of this analysis is to demonstrate that measures have been implemented to comply with the Massachusetts Stormwater Management Standards and City of Chicopee Stormwater requirements to the maximum extent practicable. Analysis of the Existing and Proposed Conditions is included for the one (1), two (2), ten (10), twenty-five (25), and one hundred (100) year rainfall events. A description of the project and how it relates to the ten Stormwater Management Standards is included.

4.2 Calculation Methods

Stormwater runoff is analyzed using the following:

- "HydroCAD™ Stormwater Modeling System," by Applied Microcomputer Systems based upon SCS Technical Releases No. 55 and 20 for generating hydraulic calculations including peak flows and runoff volumes

4.3 Equations and Sources of Data Used

Rainfall for the Pre-development Facemate parcel obtained via Technical Paper 40 (TP-40 Hampden County) to reflect original design calculations for the Main Street Pumping Station

1 yr. = 2.50 in, 2 yr. = 3.00 in. 10 yr. = 4.60 in. 25 yr. = 5.30 in 100 yr. = 6.50 in.

For all other calculations, rainfall data obtained via NOAA Atlas-14, Volume 10, Version 3: Chicopee, MA

1 yr. = 2.48 in, 2 yr. = 3.12 in. 10 yr. = 5.04 in. 25 yr. = 6.23 in 100 yr. = 8.07 in.

Refer to Appendix G for rainfall data.

4.4 Points of Analysis

<u>POA1L</u> – Into an existing Interceptor Drain, towards the Main St. Pump Station.

- Receives runoff from the Facemate property (Watershed 1S or 1Sa and 1Sb).
- In the pre-development conditions, runoff is collected in a low-lying area with drain inlets (Pond 1P).
- In the post-development conditions, runoff is collected in two new infiltration basins with catch basins (Ponds 1Pa and 1Pb) and directed through a new run of HDPE pipe (Reaches 1Ra, 1Rb, and 1R).

<u>POA2L</u> – Into the Chicopee River, west of the Uniroyal Property

- Receives stormwater runoff from the lower/middle Uniroyal property (Watershed 2S or 2Sa, 2Sb, and 2Sc), the Upper Uniroyal property (Watershed 3S), and Buildings 26/27 (Watershed B26, B27).
- In the pre-development conditions, stormwater from Watershed 2S is collected in a low-lying area with drain inlets (Pond 2P) then directed to the Oak Street Pump Station (POA 2La) for discharge to the Chicopee River (POA 2L). Watersheds B26 and B27 convey stormwater through roof leaders and drain pipes directly to POA 2La. Watershed 3S is collected by a closed drainage system and directed through a 30" RCP outfall (Reach 3R) to the Chicopee River (POA 2L).
- In the post-development conditions, stormwater from Watershed 2Sa, 2Sb, and 2Sc is collected in three new infiltration basins (Ponds 2Pa, 2Pb, and 2Pc) then directed through new drain pipes (Reaches 2Ra, 2Rb, 2Rc) to a new discharge pipe (Reach 2R). Stormwater runoff from B26 and B27 is also directed to Reach 2R. Stormwater from Reach 2R as well as Watershed 3S (unchanged) is directed to the existing 30" RCP outfall (Reach 3R) for discharge to the Chicopee River (POA 2L).

4.5 Calculations

Refer to Appendix D for figures showing the pre- and post- development watersheds. Refer to Appendices E and F for copies of the pre- and post-development HydroCAD calculations. Additional calculations relating to the design are provided in Appendix G.

4.6 Soil Characteristics

The proposed design will include the construction of infiltration basins atop a newly backfilled area. As such, the soil directly beneath the infiltration basins will be entirely new material and existing soil characteristics cannot be used to evaluate infiltration potential.

Volume 3, Chapter 1, Page 22 of the Massachusetts Stormwater Handbook identifies the "Rawl's Rates," standard infiltration rates associated with common soil classifications. These soil classifications are detailed in the USDA soil textural triangle, provided on Volume 3, Chapter 1, Page 14 of the Massachusetts Stormwater Handbook.

The design of the infiltration basins stipulates that the basin subbase will contain a maximum clay composition of 20% and a maximum silt concentration of 50%. Based on the textural triangle, this will result in a soil classification of Sandy Loam, Loamy Sand, or Sand with infiltration rates of 1.02 in/hr. or greater.

In addition, basin drawdown will primarily be accomplished via the catch basin inlet provided in each infiltration basin, rather than depending on soil infiltration.

4.7 Assumptions and Limitations

This stormwater analysis includes only the aforementioned backfill activities and associated alterations. It does not include any future redevelopment of the Sites which would require a separate analysis.

This analysis also includes several conservative design assumptions. Firstly, it was assumed that many upgradient areas would drain into the proposed basin areas, even though they may instead be captured by local low points or catch basins. This ensures that the design will function in the event of future, minor grading activities. Secondly, the flowpaths were considered only for the portion of the Site that will be altered, as existing grading would otherwise result in a long, sinuous flowpath that may not reflect future conditions.

5.0 Summary of Results

Peak Rate of Runoff		Flow (cubic feet per second)									
		1-Year Storm		2 Year Storm		10 Year Storm		25 Year Storm		100 Year Storm	
Outlet To:		Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
POA1	Main St. Pump Sta	5.76	3.59	6.76	4.98	9.42	7.90	10.38	9.27	11.81	11.00
POA2	Chicopee River	15.73	10.91	19.41	15.52	29.98	28.27	36.17	34.86	45.39	44.48
Project Total:		21.49	14.50	26.17	20.50	39.40	36.17	46.55	44.13	57.20	55.48

Runoff Volume		Runoff Volume (Acre-Feet)									
		1-Year Storm		2 Year Storm		10 Year Storm		25 Year Storm		100 Year Storm	
Outlet To:		Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
POA1	Main St. Pump Sta	0.606	0.420	0.792	0.626	1.413	1.313	1.692	1.766*	2.176	2.486*
POA2	Chicopee River	2.417	1.699	3.302	2.466	6.056	4.987	7.798	6.636	10.513	9.251
Project Total:		3.02	2.12	4.09	3.09	7.47	6.30	9.49	8.40	12.69	11.74

*Increase in runoff volume is the result of the increased precipitation rates used in the post-development model to better reflect actual site conditions (Refer to Section 4.3). If Atlas-14 rates are used for the pre-development model, the runoff volumes for these storm events are 2.067 acre-feet and 2.816 acre-feet for the 25- and 100-year storm events, respectively.

Supplemental Calculations:

(Refer to Appendix G)

Recharge Volume Required = 0 cu. ft. (No loss of recharge as no new impervious area proposed)
Recharge Volume Provided = 0 cu. ft. (Infiltration in basins assumed to be captured by perforated pipe)

Water Quality Volume Required:
Facemate Property: 710 cu. ft.
Uniroyal Property: 2,745 cu. ft.
Water Quality Volume Provided:
Facemate Property: 1,865 cu. ft.
Uniroyal Property: 3,235 cu. ft.

Existing TSS Removal Rate = 0 %
Proposed TSS Removal Rate = 25% (Refer to Section 7.0)

6.0 Comments and Conclusions

As a result of the proposed mitigation measures, stormwater runoff will be captured, peak flows will be controlled, and water quality volume will be provided. The provided analysis has demonstrated that there will be no adverse impacts as a result of the project. The proposed stormwater management Best Management Practices have been designed to meet the DEP's Stormwater Management Policy to the maximum extent practicable. Summaries of compliance with the ten DEP Stormwater Management Standards and City of Chicopee's Stormwater Management Rules are provided in the following sections.

7.0 Summary of Compliance with Ten Stormwater Management Standards

The City of Chicopee is proposing alterations at the Former Uniroyal and Facemate Properties in Chicopee, MA. The following summary has been prepared to illustrate the project's conformance with MassDEP's Stormwater Management Standards. Note that the project is a redevelopment project and need only meet certain standards the maximum extent practicable.

Standard 1: No New Untreated Discharges

No new stormwater conveyances (e.g., outfalls) may discharge directly untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth

No new untreated discharges to wetlands are created as part of this project. Existing site conditions currently allow runoff to flow, untreated, into the Chicopee River. The redevelopment proposes to capture and provide limited treatment of this runoff within infiltration basins and deep sump catch basins. Runoff discharged from the Uniroyal property will be conveyed to an existing outfall with outlet control protection that discharges to the Chicopee River. Runoff discharged from the Facemate property will be conveyed to the Main Street Pump Station.– project complies.

Standard 2: Peak Rate Attenuation

Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates.

The proposed design results in a net decrease to impervious area to prevent an increase in peak discharge rates, and many barren areas on the Site will be revegetated. The proposed infiltration basins are designed to capture and control the release of stormwater runoff. A net decrease in peak runoff rate and runoff volume is anticipated as part of the project – project complies.

Standard 3: Recharge

Loss of annual recharge to groundwater shall be eliminated or minimized. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type.

As no new impervious areas are proposed, there will be no loss in annual recharge from the pos-development site compared to pre-development conditions. The re-vegetation of existing impervious area will improve the Site's ability to infiltrate runoff. – project complies.

Standard 4: Water Quality

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids.

In accordance with this standard, the project is required to store a "water quality volume" equal to 0.5-inches of runoff times the total impervious area of the post-development site. The catch basins within the proposed infiltration basins have been designed to be up to 6 inches above the basin bottom to provide the required water quality volume. Appendix B includes a Long-Term Pollution Prevention Plan.

The proposed treatment train includes deep sump drainage structures to provide limited TSS removal that does not currently exist. While a TSS removal of 80% has not been achieved, the post-development project site will remain vacant, and no vehicle traffic areas will discharge to the proposed BMPs. Sedimentation potential is thus limited. Future site redevelopment activities will be required to meet the 80% TSS removal requirement. – project complies to the maximum extent practicable.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

Land use with high potential pollutant loads must have source control and pollution prevention measures implemented in accordance with the Massachusetts Stormwater Handbook.

The Site includes former mill buildings known to contain potentially hazardous substances. Ongoing remediation efforts may involve handling of these materials, and measures to prevent spills or exposure will be required of each remediation plan. Backfill operations under this project may include contaminated materials which will be handled in accordance with the Massachusetts Contingency Plan (MCP) and other local, state, and federal guidelines. These pollutant sources are anticipated only during the construction period, and in the long-term the project Site will not be classified as a LUHPPL. A basic Spill control and prevention plan is included in Appendix B. - project complies to the maximum extent practicable

Standard 6: Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of specific source control, pollution prevention measures.

The project does not propose discharges to a critical area. - project complies

Standard 7: Redevelopment

A redevelopment project is required to meet certain Stormwater Management Standards only to the maximum extent practicable.

The project is a redevelopment project under the definition of (2): "Development, rehabilitation, expansion, and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area." Certain standards have been met only to the maximum extent practicable as noted in previous sections.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

A plan to control construction related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities shall be developed and implemented.

The project will disturb greater than one acre and thus will require the development of a Stormwater Pollution Prevention Plan (SWPPP) prior to construction. Note that SWPPPs have been previously prepared and submitted for the project Sites under NDPES ID MAR1000LL and MAR1000XS. These SWPPP's may need to be updated to reflect current site conditions and proposed improvements. A Construction Period Pollution Prevention and Sediment Control Plan has been provided as Appendix A of this report.

Standard 9: Long Term Operation and Maintenance Plan

A Long-Term Operation and Maintenance Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Operations and Maintenance of Stormwater management systems will be the responsibility of the City of Chicopee. Therefore, inspection and maintenance of the stormwater management system will be in accordance with a Regulator-Approved version of the attached Operation and Maintenance Plan.

Standard 10: Prohibition of Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

There are currently no known non-stormwater illicit discharges within the project limits and new discharges are prohibited. An illicit discharge compliance statement is attached.

8.0 Summary of Compliance with Stormwater Management Rules

The following summary has been prepared to illustrate the project's conformance with the fourteen objectives detailed in Chapter 231 of the City of Chicopee bylaw.

Objective 1: Reduce the adverse water quality impacts of stormwater and combined sewer overflow discharges to rivers, lakes, reservoirs, and streams in order to attain federal water quality standards.

Existing stormwater is currently directed to the Chicopee River and the Main Street Pump Station. The proposed design will continue to discharge to these locations. A net decrease in runoff volume and peak discharge rate is anticipated. The project has been designed to maintain the required water quality volume, and TSS removal will be improved compared to existing conditions.– project complies.

Objective 2: Prevent the Discharge of Pollutants, including hazardous chemicals into stormwater runoff.

The proposed design incorporates deep sump, hooded drainage structures and infiltration basins to minimize the risk of pollution to stormwater runoff from the Site. No hazardous chemicals are anticipated to be present at the Site during normal operation. Refer to the Illicit Discharge Compliance Statement. – project complies.

Objective 3: Minimize the volume and rate of stormwater which is discharged to rivers, streams, reservoirs, lakes, and combined sewers.

The proposed design incorporates several infiltration basins to capture, store, and control runoff coupled with a decrease in impervious area. A net decrease in peak runoff rate and volume from all watersheds up to the 100-year storm is anticipated as part of the project – project complies.

Objective 4: Prevent erosion and sedimentation form improper land development, and reduce stream channel erosion caused by increased runoff.

The proposed design incorporates basic erosion controls consisting of straw wattles, stabilized construction entrance, and inlet protection minimize sedimentation and erosion from the Site. The project will disturb greater than one acre and will require the development of a detailed Stormwater Pollution Prevention Plan (SWPPP) prior to construction. – project complies.

Objective 5: Provide for recharge of groundwater aquifers and maintain the base flow of streams.

The project proposes a reduction in impervious area. As a result, an improvement in recharge potential is anticipated. – project complies.

Objective 6: Provide stormwater facilities that are attractive, maintain the natural integrity of the environment, and are designed to protect public safety.

Proposed infiltration basins are intended to blend in with proposed topography and minimize visual impact. Basin depths are typically no greater than 4' below surrounding grades to mitigate public safety concerns – project complies.

Objective 7: Maintain or reduce predevelopment runoff characteristics after development to the extent feasible.

Both pre- and post-development runoff characteristics are directed to a low-lying area behind the flood control levee. – project complies.

Objective 8: Minimize damage to public and private property from flooding.

The proposed infiltration basins have been designed to capture the 100-year storm with a 1' freeboard. A net decrease in peak runoff rate and runoff volume is anticipated from all watersheds.– project complies.

Objective 9: To prevent pollutants from entering Chicopee's municipal separate storm sewer system (MS4).

The project does not propose any alterations near to the City's MS4 system. Inlet protection is proposed at existing catch basins near the Site. – project complies.

Objective 10: To prohibit illicit connections and unauthorized discharges to the MS4 and;

Objective 11: To require the removal of all such illicit connections.

There are currently no known non-stormwater illicit discharges within the project limits and new discharges are prohibited. Refer to attached Illicit Discharge Compliance Statement. – project complies.

Objective 12: To comply with state and federal statutes and regulations relating to stormwater discharges.

The proposed stormwater management Best Management Practices have been designed to fully meet the DEP's Stormwater Management Policy as detailed in Section 6.0. – project complies.

Objective 13: To establish the legal authority to ensure compliance through inspection, monitoring, and enforcement.

The responsible party for operation and maintenance of the stormwater design is The City of Chicopee. A long-term operation and maintenance plan is provided as Appendix B. – project complies.

Objective 14: To prevent contamination to drinking water supplies

No private drinking water wells are located within 500 feet of the Site. The Site is not within an Interim Wellhead Protection Area, Zone II, or Potentially Productive Aquifer. No risk of contamination to drinking water supplies is anticipated as part of this project. – project complies.

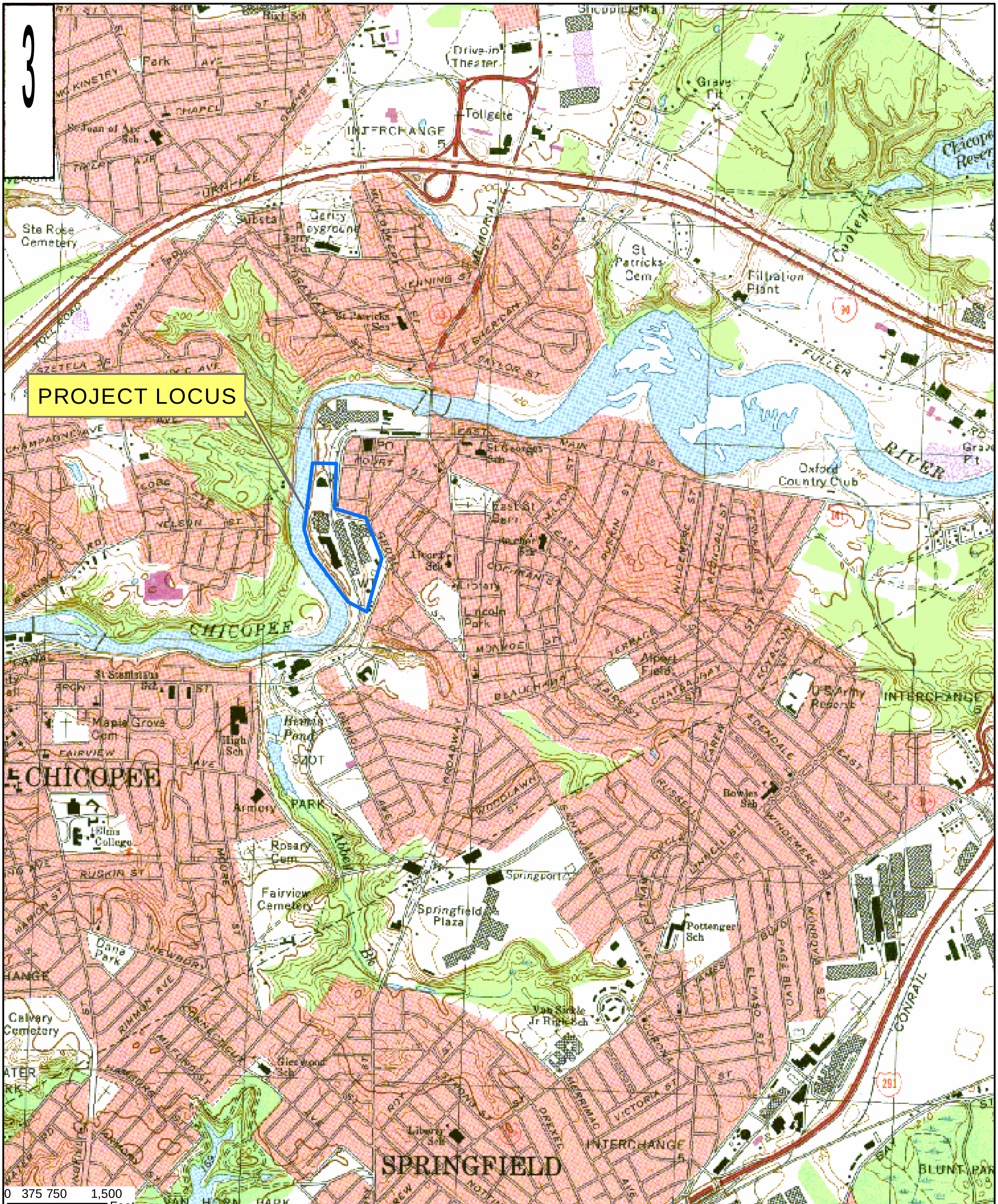
Illicit Discharge Compliance Statement

It is the intent of the Owner, the City of Chicopee to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. To the extent of my knowledge, the proposed project does not create any illicit discharges and all illicit discharges are prohibited in the future.

____

City of Chicopee

FIGURES



Former Uniroyal and Facemate Properties

Chicopee, MA

Figure 1

Site Locus Map

www.BETA-Inc.com

MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

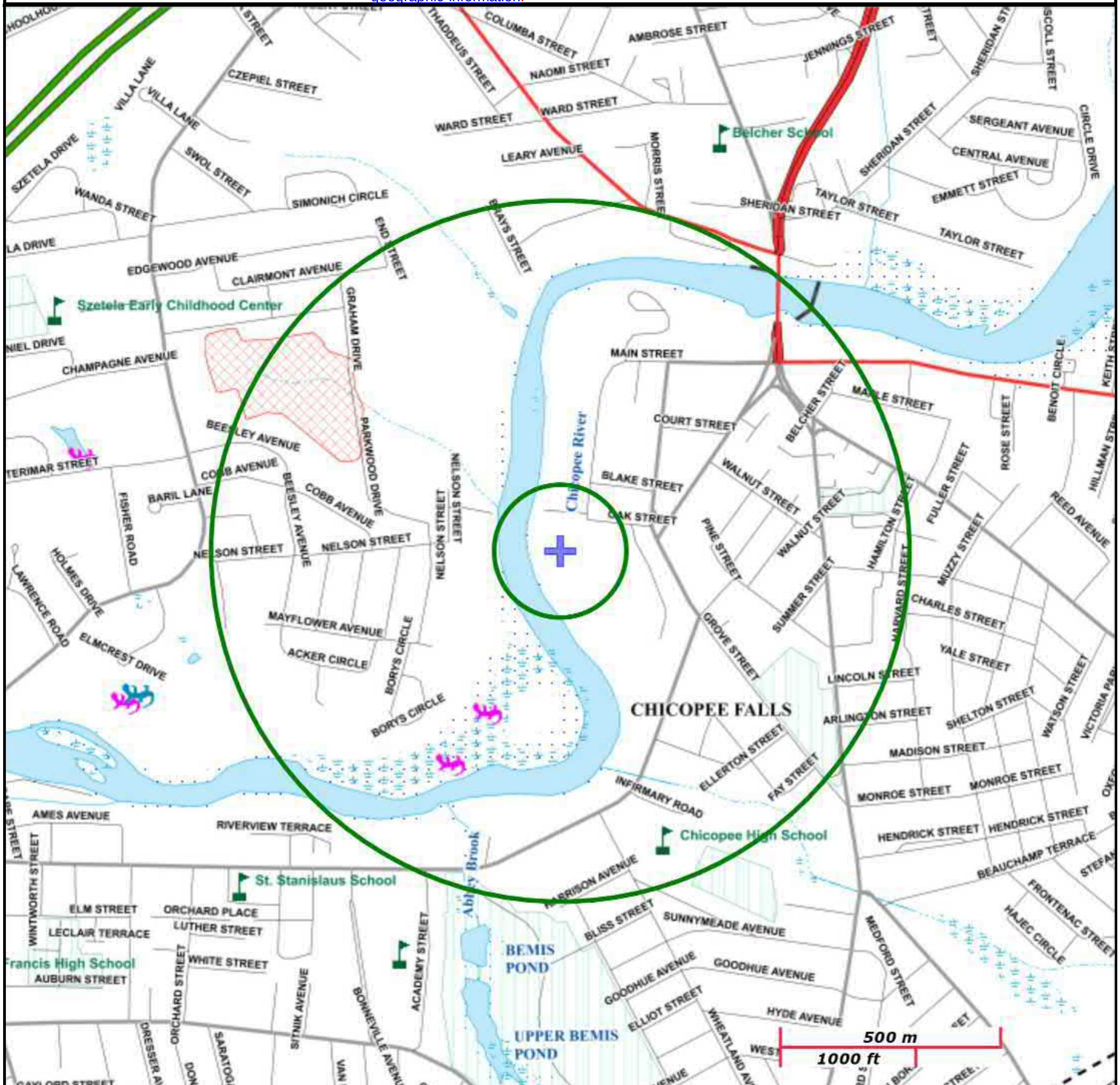
Site Information:

CHICOPEE, MA

NAD83 UTM Meters:
4669758mN , 699281mE (Zone: 18)
July 17, 2020

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at: https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail

Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct

Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam

Aquifers: Medium Yield, High Yield, EPA Sole Source

Non Potential Drinking Water Source Area: Medium, High (Yield)

PWS Protection Areas: Zone II, IWPA, Zone A

Hydrography: Open Water, PWS Reservoir, Tidal Flat

Wetlands: Freshwater, Saltwater, Cranberry Bog

FEMA 100yr Floodplain; Protected Open Space; ACEC

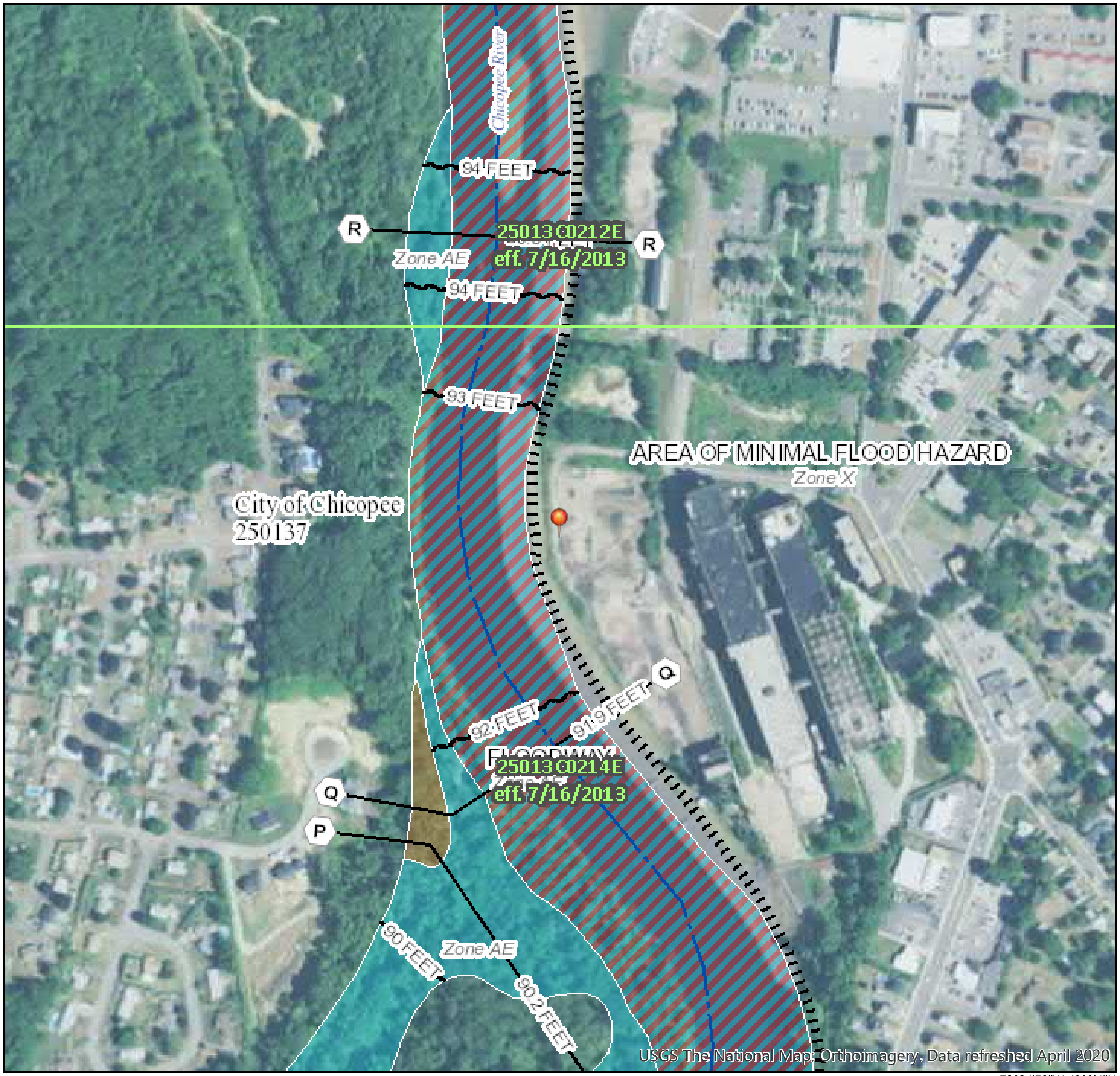
Est. Rare Wetland Wildlife Hab; Vernal Pool: Cert., Potential

Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

National Flood Hazard Layer FIRMette

FEMA

72°35'37"W 42°9'31"N



Feet

0 250 500 1,000 1,500 2,000

1:6,000

72°34'59"W 42°9'4"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/17/2020 at 12:48 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX A – CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

Construction Period Pollution Prevention and Erosion Control Plan

Former Uniroyal and Facemate Properties – Chicopee MA
ACOE Permit Review Only

Introduction

The anticipated area of disturbance during this project is greater than one acre; therefore, filing a notice of intent with EPA and development of a Stormwater Pollution Prevention Plan (SWPPP) is required. The following plan provides general guidance for the prevention of pollution and erosion and sedimentation during construction.

Potential Erosion and Sedimentation

Portions of the project involve soil disturbance; therefore, site preparation, scheduling, and construction practices need to be carefully planned to prevent construction debris and erosion from adversely impacting downstream resources. Although it is not always possible to avoid all impacts, the following guidelines shall be followed:

- Minimize land disturbance area and soil exposure to stormwater and wind erosion.
- Minimize time that area is disturbed.
- Avoid routing stormwater runoff or dewatering flows through disturbed areas.
- Inspect and maintain erosion controls until all soils are stabilized.
- Maintain good housekeeping practices.
- Stabilize disturbed soils as soon as possible to limit exposure.

Erosion and Sedimentation Plan

This Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan have been prepared in accordance with the Department of Environmental Protection's Massachusetts Erosion and Sedimentation Guidelines for Urban and Suburban Areas.

Pre-Construction and Site Preparation

- Contractor shall install all erosion control barriers in accordance with the construction documents prior to commencing any land disturbance activity.
- Inspect and maintain erosion controls until all soils are stabilized.
- Monitor weather reports daily and stabilize/prepare site if storm event in excess of the 2-year storm is expected.

Good Housekeeping

- Avoid stockpiling of soil within 100 feet of wetland resources and wellhead protection areas. If necessary, provide sufficient erosion controls to prevent migration of sediments.
- Minimize hazardous materials stored on site. All materials stored on site shall be stored in original containers and sealed.
- Refuel construction equipment off-site.
- Any spills of hazardous materials shall be reported, contained, and removed in accordance with local, State, and Federal regulations.

Construction Period Pollution Prevention and Erosion Control Plan

Former Uniroyal and Facemate Properties – Chicopee MA
ACOE Permit Review Only

Inspection and Maintenance of Erosion Controls during Construction

Inspect erosion controls weekly and after every storm event until all soils are stabilized.

- Erosion Control Barrier: Check for sedimentation accumulation, removing sediments when they reach excessive volumes (approximately 1/3 the height of the barrier). Also remove sediments when runoff ponds for 24 or more hours to prevent potential mosquito breeding habitat. Restake/replace tubes and silt fence as necessary to maintain their effectiveness.
- Stabilized Construction Entrance: Check to observe overall integrity and effectiveness of crushed stone entrance. Reshape pad as needed for drainage and runoff control, and top dress with clean stone if needed. Remove tracked-out sediment by the end of each workday.
- Catch basin Inlet Protection: Check for sedimentation accumulation, removing sediments when they reach excessive volumes.

Plans

See proposed construction drawings for locations of all proposed erosion and sedimentation controls.

Potential Construction Site Pollutants

Pollutant-Generating Activity	Pollutants or Pollutant Constituents	Location on Site
Equipment Re-fueling	Diesel Fuel, Gasoline	Staging Area*
Leaking or Broken Hydraulic Lines	Hydraulic Oil	Building Work Areas and Laydown Area
Minor Equipment Maintenance	Diesel Fuel, Gasoline, Hydraulic Oil, Motor Oil, Anti-Freeze	Staging Area*
Applying Fertilizer	Nitrogen, Phosphorous	Newly Seeded Areas
Portable Sanitary Toilets	Bacteria, Parasites and Viruses	Staging Area*
Vehicle Accident	Diesel Fuel, Gasoline	Entire Site
Trash Containers/Dumpsters	Paper, Plastic, and Food Waste	Staging Area*

*All vehicle and equipment staging to be conducted within the central and lower areas of Site.

APPENDIX B – LONG TERM OPERATION AND MAINTENANCE PLAN

Long Term Operation & Maintenance Plan
Stormwater Management Systems

Former Uniroyal and Facemate Properties – Chicopee, MA
ACOE Permit Review Only

General Information

Project Name:	Former Uniroyal and Facemate Properties
Project Type:	Site Redevelopment
Address:	164 Grove Street & 75 West Main Street, Chicopee MA
SWMS Owner:	City of Chicopee 274 Front Street, 4th Floor City Hall Annex Chicopee, MA 01013 (413) 594-1515
Responsible Party:	City of Chicopee
Contact:	Lee Pouliot, AICP, ASLA
Signature:	______________________________

This stormwater management system (SWMS) operations and maintenance plan has been prepared in accordance with the Massachusetts Department of Environmental Protection's Stormwater Management Standards.

It shall be the responsibility of the Owner to provide a revised plan indicating any change of ownership or responsible party.

Long Term Operation & Maintenance Plan
Stormwater Management Systems

Former Uniroyal and Facemate Properties – Chicopee, MA
ACOE Permit Review Only

<u>Long-Term Pollution Prevention</u>

The following measures and good housekeeping practices shall be followed at the Site to mitigate risk of pollution.

Material Storage and Handling

- Avoid stockpiling of soil or materials within 100 feet of wetland resources and wellhead protection areas. If necessary, provide sufficient erosion controls to prevent migration of sediments.
- All materials shall be stored or disposed in accordance with all local, state, and federal regulations.
- All sand piles shall be contained and stabilized to prevent the discharge of sand to wetlands or water bodies and, where feasible, covered.
- Minimize hazardous materials stored on site. All materials stored on site shall be stored in original containers and sealed.
- All solid waste, if encountered, shall be handled and disposed of in accordance with all local, state, and federal regulations.
- No snow shall be stored within waterbodies, resource areas, wellhead protection areas, or associated buffer zones.

Stormwater BMPs

- Refer to Inspection and Maintenance Procedures
- Refer to Illicit Discharge Compliance Statement

Spill Prevention and Response

- Refuel construction equipment off-site.
- Any spills of hazardous materials shall be reported, contained, and removed in accordance with local, State, and Federal regulations.
- Review on-site equipment and activities to ensure no illicit discharges are created.

Vegetation and Landscaping

- Refer to Inspection and Maintenance Procedures
- No fertilizers, pesticides, and/or herbicides shall be used at the Site.
- No road salt or sand for ice management shall be used or stored at the Site.

Long Term Operation & Maintenance Plan
Stormwater Management Systems

Former Uniroyal and Facemate Properties – Chicopee, MA
ACOE Permit Review Only

Spill Prevention Plan

Remediation activities conducted at the Uniroyal and Facemate properties may involve the handling of hazardous waste materials or other pollutant sources. The purpose of this plan is to outline the source control and pollution prevention measures to minimize the risk of pollution to stormwater runoff.

Predicted Release

Any potential spills at the Site are anticipated to be during remediation activities relating to the existing mill buildings. During these activities, materials will be handled and either re-used on-site or removed from the Site for disposal. Spills in this area could be conveyed via overland flow towards the proposed Infiltration Basins.

Oil and Pollutant Control

The proposed drainage system will include hoods at all proposed catch basins to control accidental releases of oil into the system. Regular maintenance will be required to remove and legally dispose of any captured oil.

Sorbent Materials, Spill Response Supplies, and Equipment

During the proposed work, spill response supplies shall be maintained within the staging area. These supplies shall include sorbent pads, booms, and granular material (i.e., Speedy Dry), and a shovel, all stored within a covered over-pack drum or similar container. The supplies shall be made readily available to be deployed during a fuel spill or release.

Inspections and recordkeeping of the spill response equipment supplies must be maintained as part of this plan, and training shall be conducted to inform the employees on where the equipment is located and the procedure for using the material as part of the oil spill response training curriculum.

Additional Requirements

All remediation activities conducted at the Site shall be conducted by workers licensed to do such work in the state of Massachusetts. Remediation shall be in accordance with local, state, and federal law including all required measures to prevent spread of hazardous materials.

Long Term Operation & Maintenance Plan
Stormwater Management Systems

Former Uniroyal and Facemate Properties – Chicopee, MA
ACOE Permit Review Only

BMP Inspection and Maintenance Procedures

Effectiveness of Best Management Practices (BMPs) is maximized when properly maintained. The following inspections schedule and maintenance required of BMPs for this project (see attached plan) shall be as outlined and documented below.

- Catch basins (CB) and Manholes (MH): Inspect and maintain after the first several rainfall events, after all major storms, and at least once every 3 months.
  - Check grates periodically and following heavy rainfall to verify that the inlet openings are not clogged by debris. Remove debris from grate.
  - Remove all accumulated debris.
  - Clean sump if it is greater than 50% full.
  - Note condition of frames, grates, concrete bricks, and hoods. Repair or replace damaged materials.
- Infiltration Basin: Inspect and maintain basin after the first several rainfall events, after all major storms, and at least once every 6 months.
  - Remove accumulated sediment, trash, debris, leaves, and grass clippings, particularly in area of trash racks.
  - Mow the buffer area, side slopes, and basin bottom.
  - Rake basin floor and remove tree or other plant seedlings before they become established.
  - Check for ponding within basin.
  - Check for erosion along basin slopes.
  - Inspect to ensure proper functioning.
- Vegetation: Monitor establishment and health of vegetation in fill area at least once a month for the first several months, then at least once every 6 months.
  - Check vegetation growth rate, health, and stability.
  - Note presence of any failing vegetation.
  - Reseed low-growth areas as necessary.

Approximate Maintenance Budget
Inspection and maintenance for this site is estimated as follows.

1. Inspections	$400
2. Infiltration Basins	$300
3. Deep Sump Catch Basin	$300
Annual Total	$1,000

Public Safety and Features

1. Provide police detail for extended occupation of roadway if traffic dictates.
2. All excavations and entry into closed structures will be completed in accordance with OSHA requirements.

Long Term Operation & Maintenance Plan
Stormwater Management Systems

Former Uniroyal and Facemate Properties – Chicopee, MA
ACOE Permit Review Only

BMP Inspection and Maintenance Documentation Form

Inspection No.: _ Date: ________________ Weather: ____________________

Date & Amount of Last Precipitation Event: ____

Inspector Name: _____________________ Inspection Signature: ________________________

BMP	Condition/Stability	Comment & Recommendations	Date Corrected
Catch Basins			
Manholes			
Infiltration Basins			
Vegetation			
Other			
Additional Comments			

BETA

APPENDIX C – SOILS DATA

Map Scale: 1:4,540 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hampden County, Massachusetts, Central Part
Survey Area Data: Version 14, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 25, 2013—Sep 9, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		5.0	11.7%
602	Urban land		32.8	76.2%
739C	Urban land-Hinckley-Windsor association, 0 to 15 percent slopes	D	5.2	12.2%
Totals for Area of Interest			**43.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

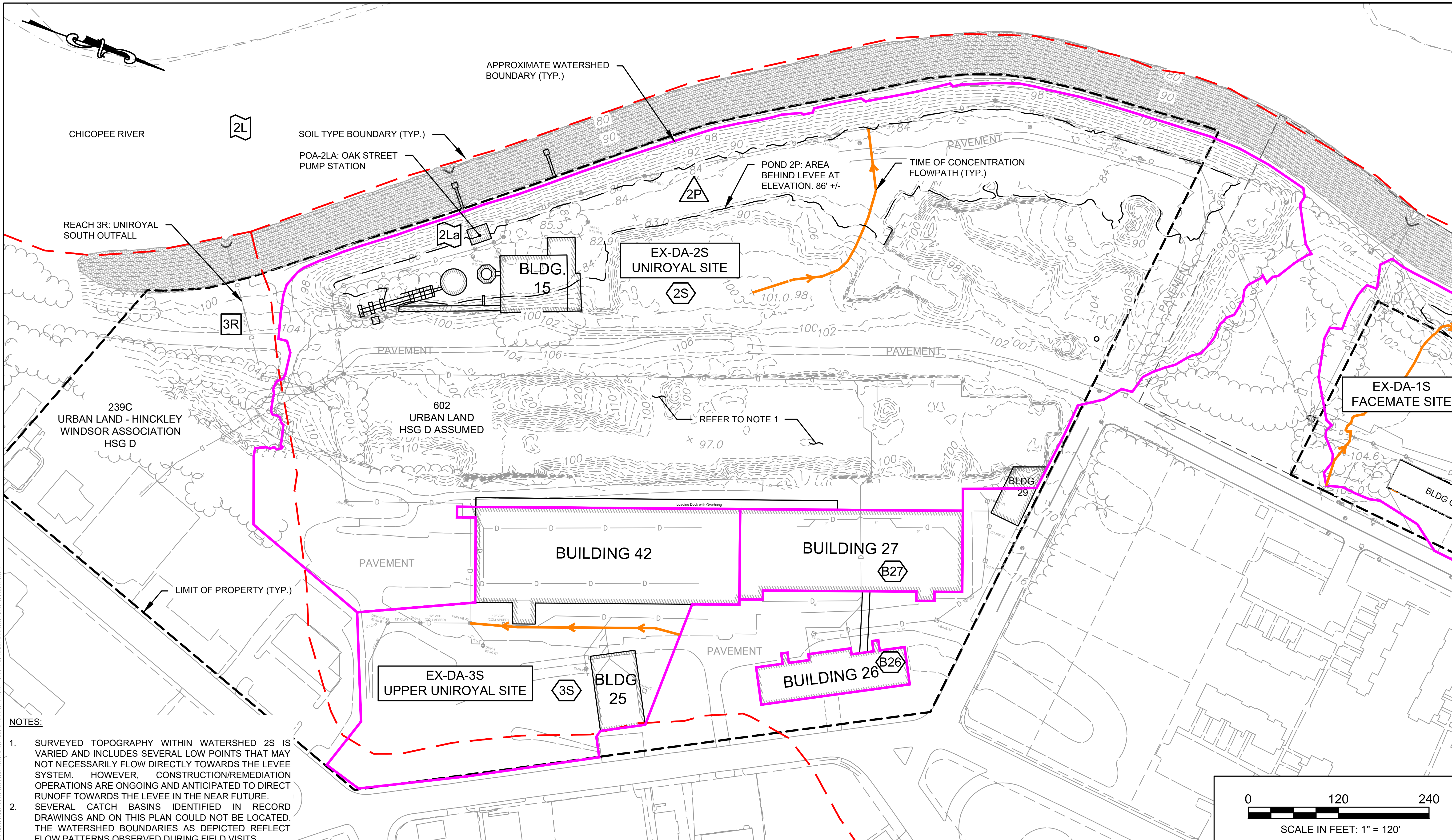
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D – WATERSHED PLANS



NOTES:

1. SURVEYED TOPOGRAPHY WITHIN WATERSHED 2S IS VARIED AND INCLUDES SEVERAL LOW POINTS THAT MAY NOT NECESSARILY FLOW DIRECTLY TOWARDS THE LEVEE SYSTEM. HOWEVER, CONSTRUCTION/REMEDIATION OPERATIONS ARE ONGOING AND ANTICIPATED TO DIRECT RUNOFF TOWARDS THE LEVEE IN THE NEAR FUTURE.
2. SEVERAL CATCH BASINS IDENTIFIED IN RECORD DRAWINGS AND ON THIS PLAN COULD NOT BE LOCATED. THE WATERSHED BOUNDARIES AS DEPICTED REFLECT FLOW PATTERNS OBSERVED DURING FIELD VISITS.

BETA
www.BETA-Inc.com

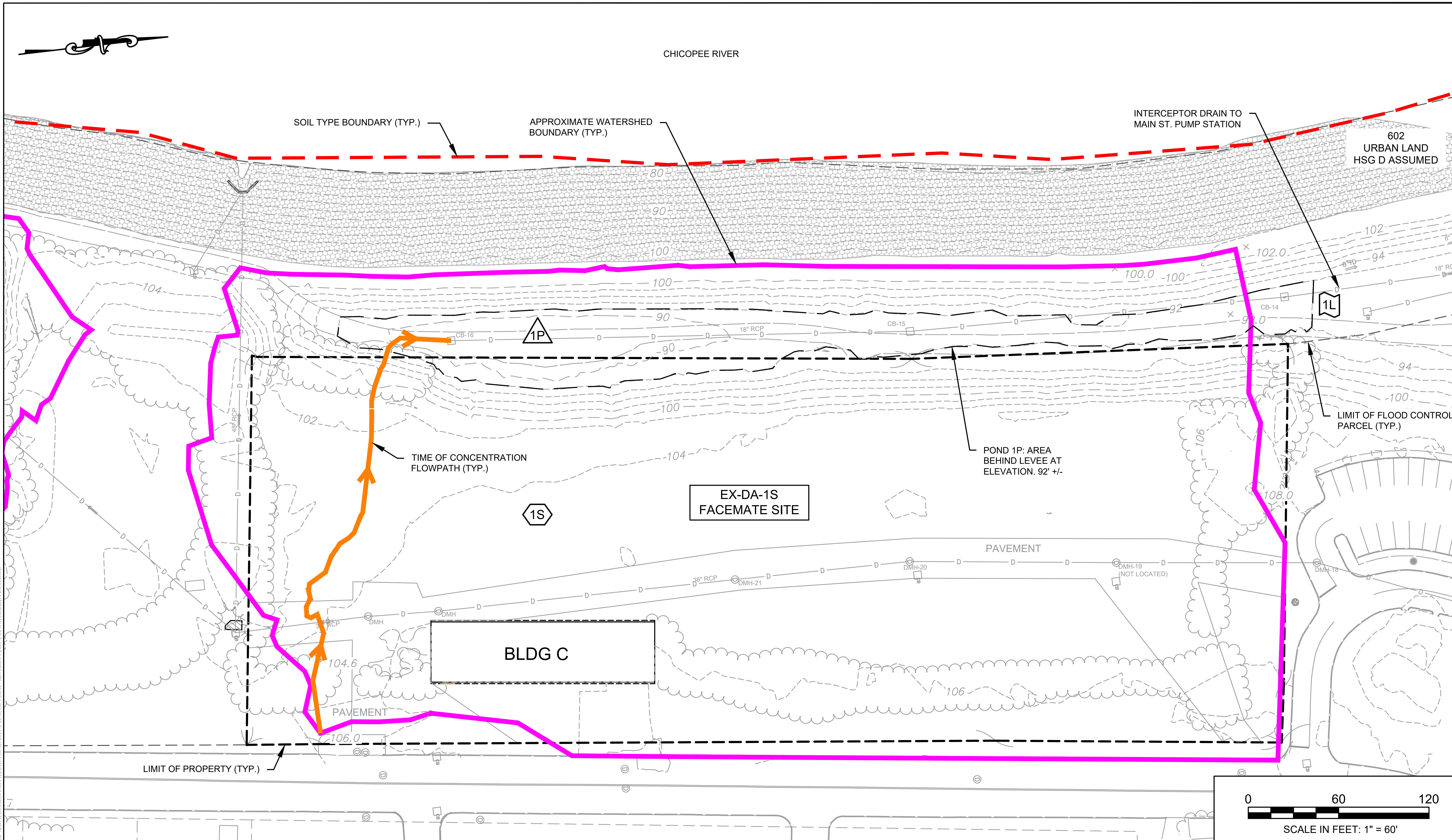
Former Uniroyal & Facemate Properties

ACOE Permit Review Only
154 Grove Street & 75 West Main Street
Chicopee, MA

Issue Date: 3-10-2021

Watershed Plan

Existing Conditions Uniroyal Property



BETA
www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

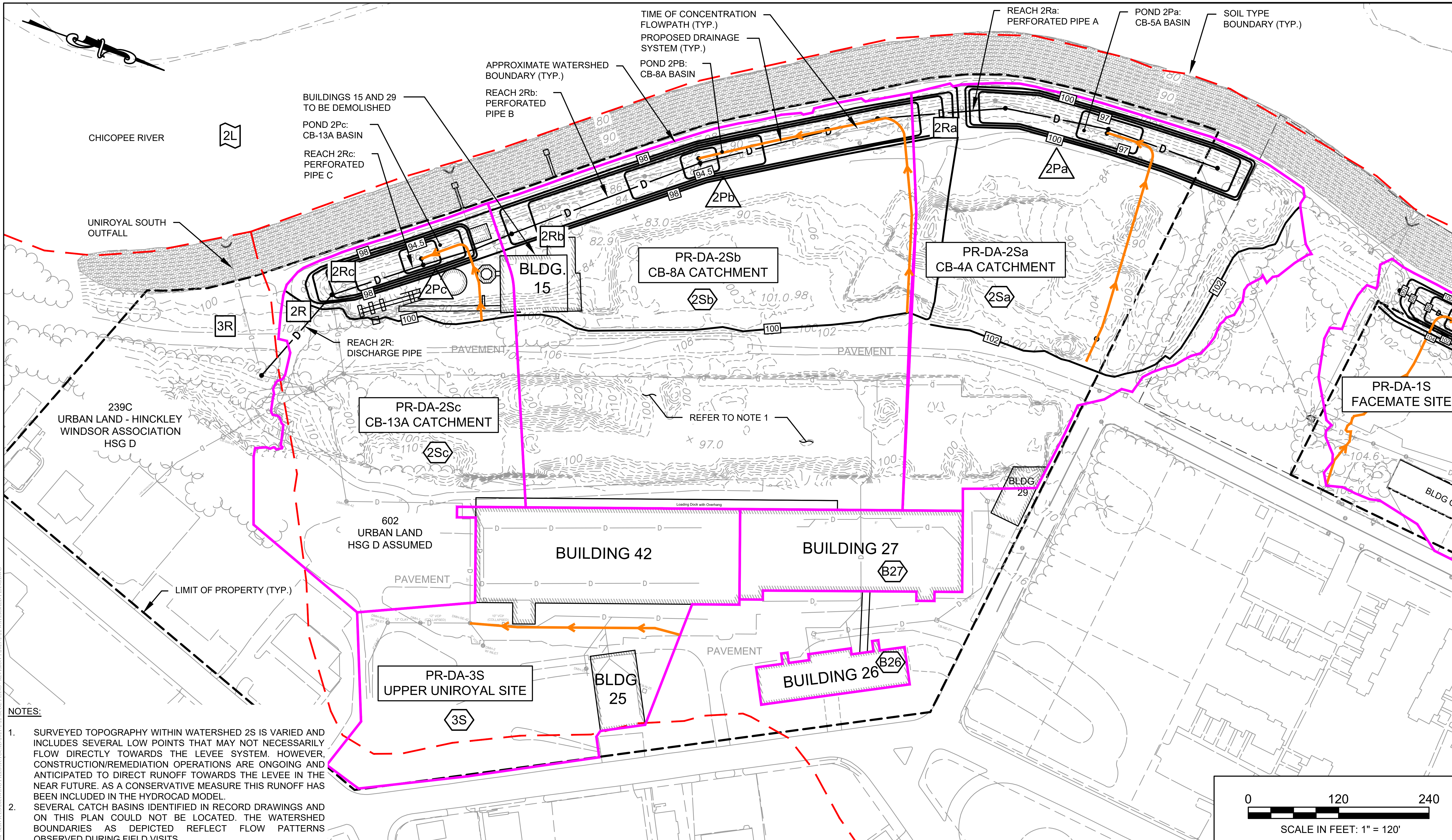
154 Grove Street & 75 West Main Street

Chicopee, MA

Issue Date: 3-10-2021

Watershed Plan

Existing Conditions
Facemate Property



NOTES:

1. SURVEYED TOPOGRAPHY WITHIN WATERSHED 2S IS VARIED AND INCLUDES SEVERAL LOW POINTS THAT MAY NOT NECESSARILY FLOW DIRECTLY TOWARDS THE LEVEE SYSTEM. HOWEVER, CONSTRUCTION/REMEDIATION OPERATIONS ARE ONGOING AND ANTICIPATED TO DIRECT RUNOFF TOWARDS THE LEVEE IN THE NEAR FUTURE. AS A CONSERVATIVE MEASURE THIS RUNOFF HAS BEEN INCLUDED IN THE HYDROCAD MODEL.
2. SEVERAL CATCH BASINS IDENTIFIED IN RECORD DRAWINGS AND ON THIS PLAN COULD NOT BE LOCATED. THE WATERSHED BOUNDARIES AS DEPICTED REFLECT FLOW PATTERNS OBSERVED DURING FIELD VISITS.

BETA
www.BETA-Inc.com

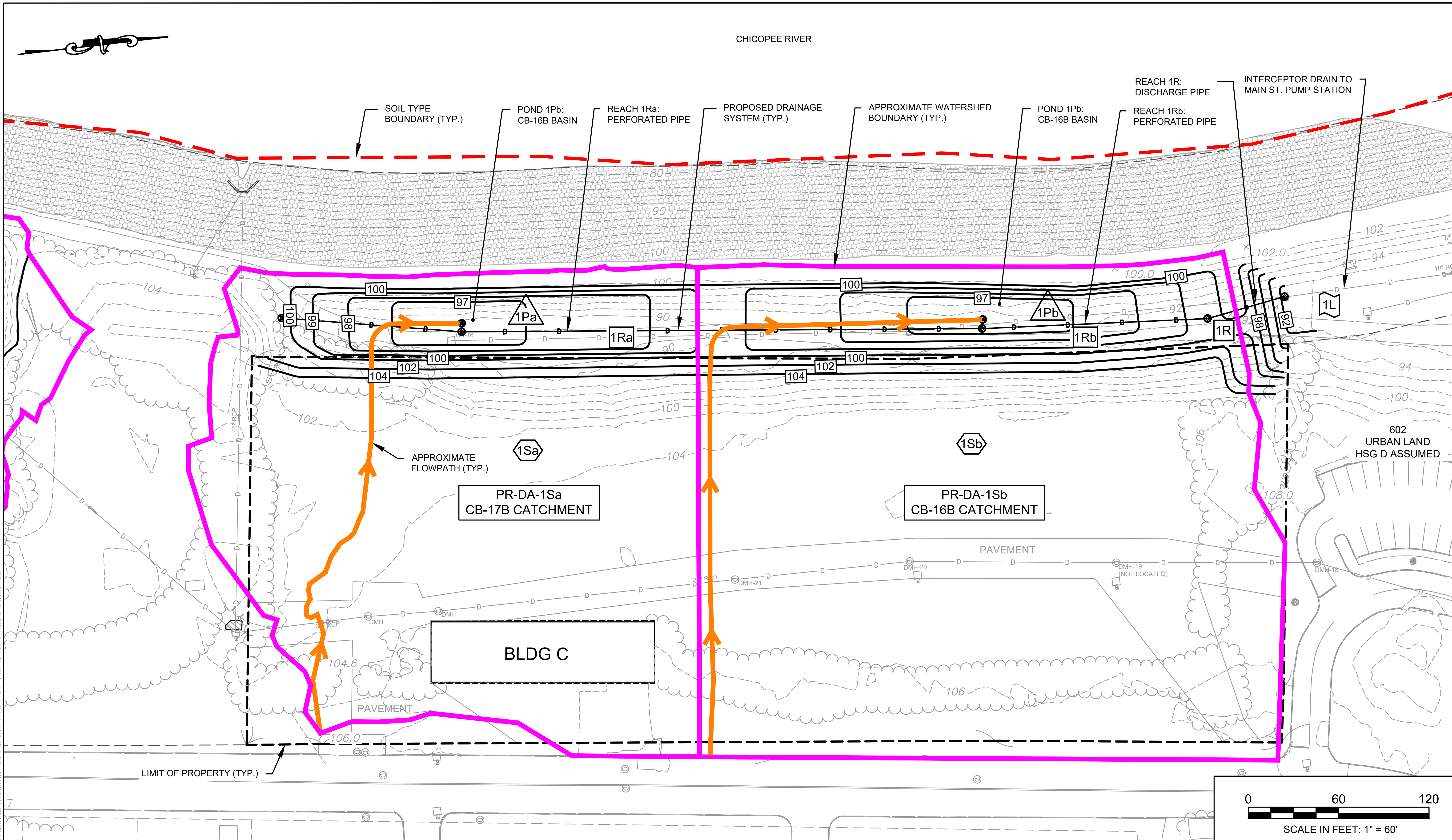
Former Uniroyal & Facemate Properties

ACOE Permit Review Only
154 Grove Street & 75 West Main Street
Chicopee, MA

Issue Date: 3-10-2021

Watershed Plan

Proposed Conditions Uniroyal Property



www.BETA-Inc.com

Former Uniroyal & Facemate Properties

ACOE Permit Review Only

154 Grove Street & 75 West Main Street

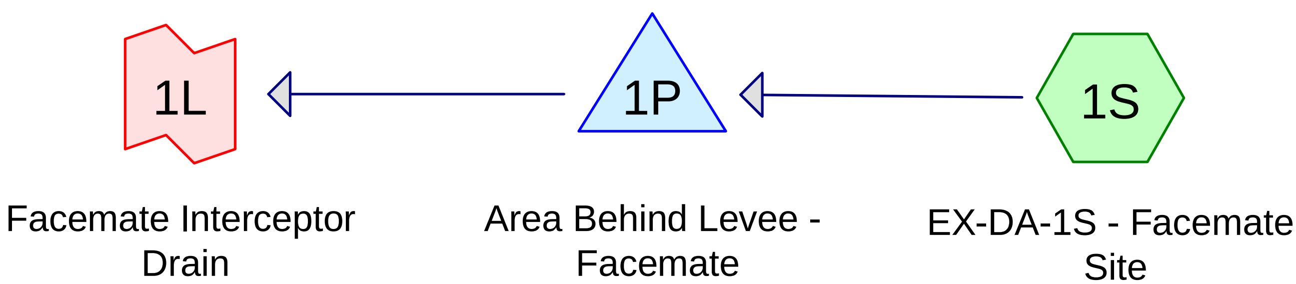
Chicopee, MA

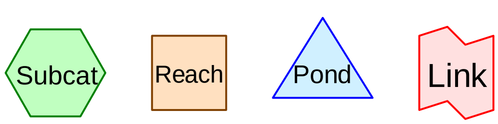
Issue Date: 3-10-2021

Watershed Plan

Proposed Conditions Facemate Property

APPENDIX E – EXISTING CONDITIONS CALCULATIONS





Routing Diagram for Existing Conditions - Facemate - TP40
Prepared by BETA Group, Inc, Printed 3/10/2021
HydroCAD® 10.00-25 s/n 10405 © 2019 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: EX-DA-1S - Facemate Site

Runoff = 8.36 cfs @ 12.09 hrs, Volume= 0.606 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.50"

Area (sf)	CN	Description
173,521	89	<50% Grass cover, Poor, HSG D
17,024	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
21,109	79	Woods, Fair, HSG D
217,891	89	Weighted Average
194,630		89.32% Pervious Area
23,261		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
3.7	190	0.0150	0.86		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
0.6	86	0.1360	2.58		**Shallow Concentrated Flow, Shallow Conc. 2** Short Grass Pasture Kv= 7.0 fps
1.1					**Direct Entry, Minimum TC**
6.0	326	Total			

Summary for Pond 1P: Area Behind Levee - Facemate

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 1.45" for 1-Year event
Inflow = 8.36 cfs @ 12.09 hrs, Volume= 0.606 af
Outflow = 5.76 cfs @ 12.18 hrs, Volume= 0.606 af, Atten= 31%, Lag= 5.4 min
Primary = 5.76 cfs @ 12.18 hrs, Volume= 0.606 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 90.36' @ 12.18 hrs Surf.Area= 8,424 sf Storage= 2,605 cf

Plug-Flow detention time= 9.9 min calculated for 0.606 af (100% of inflow)
Center-of-Mass det. time= 10.0 min (831.3 - 821.3)

Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	25,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.00	6,140	0	0
92.00	18,910	25,050	25,050

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.74 cfs @ 12.18 hrs HW=90.35' (Free Discharge)
1=Catch Basin (Orifice Controls 2.87 cfs @ 2.87 fps)
2=Catch Basin (Orifice Controls 2.87 cfs @ 2.87 fps)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 1.45" for 1-Year event
Inflow = 5.76 cfs @ 12.18 hrs, Volume= 0.606 af
Primary = 5.76 cfs @ 12.18 hrs, Volume= 0.606 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: EX-DA-1S - Facemate Site

Runoff = 10.86 cfs @ 12.09 hrs, Volume= 0.792 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
173,521	89	<50% Grass cover, Poor, HSG D
17,024	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
21,109	79	Woods, Fair, HSG D
217,891	89	Weighted Average
194,630		89.32% Pervious Area
23,261		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
3.7	190	0.0150	0.86		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
0.6	86	0.1360	2.58		**Shallow Concentrated Flow, Shallow Conc. 2** Short Grass Pasture Kv= 7.0 fps
1.1					**Direct Entry, Minimum TC**
6.0	326	Total			

Summary for Pond 1P: Area Behind Levee - Facemate

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 1.90" for 2-Year event
Inflow = 10.86 cfs @ 12.09 hrs, Volume= 0.792 af
Outflow = 6.76 cfs @ 12.20 hrs, Volume= 0.792 af, Atten= 38%, Lag= 6.7 min
Primary = 6.76 cfs @ 12.20 hrs, Volume= 0.792 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 90.49' @ 12.20 hrs Surf.Area= 9,286 sf Storage= 3,801 cf

Plug-Flow detention time= 9.8 min calculated for 0.791 af (100% of inflow)
Center-of-Mass det. time= 9.9 min (823.5 - 813.7)

Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	25,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.00	6,140	0	0
92.00	18,910	25,050	25,050

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=6.75 cfs @ 12.20 hrs HW=90.49' (Free Discharge)
1=Catch Basin (Orifice Controls 3.38 cfs @ 3.38 fps)
2=Catch Basin (Orifice Controls 3.38 cfs @ 3.38 fps)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 1.90" for 2-Year event
Inflow = 6.76 cfs @ 12.20 hrs, Volume= 0.792 af
Primary = 6.76 cfs @ 12.20 hrs, Volume= 0.792 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: EX-DA-1S - Facemate Site

Runoff = 18.98 cfs @ 12.09 hrs, Volume= 1.413 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
173,521	89	<50% Grass cover, Poor, HSG D
17,024	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
21,109	79	Woods, Fair, HSG D
217,891	89	Weighted Average
194,630		89.32% Pervious Area
23,261		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
3.7	190	0.0150	0.86		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
0.6	86	0.1360	2.58		**Shallow Concentrated Flow, Shallow Conc. 2** Short Grass Pasture Kv= 7.0 fps
1.1					**Direct Entry, Minimum TC**
6.0	326	Total			

Summary for Pond 1P: Area Behind Levee - Facemate

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 3.39" for 10-Year event
Inflow = 18.98 cfs @ 12.09 hrs, Volume= 1.413 af
Outflow = 9.42 cfs @ 12.25 hrs, Volume= 1.413 af, Atten= 50%, Lag= 9.6 min
Primary = 9.42 cfs @ 12.25 hrs, Volume= 1.413 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 90.96' @ 12.25 hrs Surf.Area= 12,250 sf Storage= 8,799 cf

Plug-Flow detention time= 10.8 min calculated for 1.412 af (100% of inflow)
Center-of-Mass det. time= 10.8 min (808.2 - 797.3)

Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	25,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.00	6,140	0	0
92.00	18,910	25,050	25,050

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=9.42 cfs @ 12.25 hrs HW=90.96' (Free Discharge)
1=Catch Basin (Orifice Controls 4.71 cfs @ 4.71 fps)
2=Catch Basin (Orifice Controls 4.71 cfs @ 4.71 fps)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 3.39" for 10-Year event
Inflow = 9.42 cfs @ 12.25 hrs, Volume= 1.413 af
Primary = 9.42 cfs @ 12.25 hrs, Volume= 1.413 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: EX-DA-1S - Facemate Site

Runoff = 22.52 cfs @ 12.09 hrs, Volume= 1.692 af, Depth= 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
173,521	89	<50% Grass cover, Poor, HSG D
17,024	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
21,109	79	Woods, Fair, HSG D
217,891	89	Weighted Average
194,630		89.32% Pervious Area
23,261		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
3.7	190	0.0150	0.86		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
0.6	86	0.1360	2.58		**Shallow Concentrated Flow, Shallow Conc. 2** Short Grass Pasture Kv= 7.0 fps
1.1					**Direct Entry, Minimum TC**
6.0	326	Total			

Summary for Pond 1P: Area Behind Levee - Facemate

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 4.06" for 25-Year event
Inflow = 22.52 cfs @ 12.09 hrs, Volume= 1.692 af
Outflow = 10.38 cfs @ 12.27 hrs, Volume= 1.692 af, Atten= 54%, Lag= 10.8 min
Primary = 10.38 cfs @ 12.27 hrs, Volume= 1.692 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 91.16' @ 12.27 hrs Surf.Area= 13,565 sf Storage= 11,457 cf

Plug-Flow detention time= 11.5 min calculated for 1.691 af (100% of inflow)
Center-of-Mass det. time= 11.5 min (803.9 - 792.4)

Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	25,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.00	6,140	0	0
92.00	18,910	25,050	25,050

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=10.37 cfs @ 12.27 hrs HW=91.16' (Free Discharge)
1=Catch Basin (Orifice Controls 5.19 cfs @ 5.19 fps)
2=Catch Basin (Orifice Controls 5.19 cfs @ 5.19 fps)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 4.06" for 25-Year event
Inflow = 10.38 cfs @ 12.27 hrs, Volume= 1.692 af
Primary = 10.38 cfs @ 12.27 hrs, Volume= 1.692 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: EX-DA-1S - Facemate Site

Runoff = 28.57 cfs @ 12.09 hrs, Volume= 2.176 af, Depth= 5.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
173,521	89	<50% Grass cover, Poor, HSG D
17,024	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
21,109	79	Woods, Fair, HSG D
217,891	89	Weighted Average
194,630		89.32% Pervious Area
23,261		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
3.7	190	0.0150	0.86		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
0.6	86	0.1360	2.58		**Shallow Concentrated Flow, Shallow Conc. 2** Short Grass Pasture Kv= 7.0 fps
1.1					**Direct Entry, Minimum TC**
6.0	326	Total			

Summary for Pond 1P: Area Behind Levee - Facemate

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 5.22" for 100-Year event
Inflow = 28.57 cfs @ 12.09 hrs, Volume= 2.176 af
Outflow = 11.81 cfs @ 12.30 hrs, Volume= 2.176 af, Atten= 59%, Lag= 12.9 min
Primary = 11.81 cfs @ 12.30 hrs, Volume= 2.176 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 91.50' @ 12.30 hrs Surf.Area= 15,747 sf Storage= 16,465 cf

Plug-Flow detention time= 12.9 min calculated for 2.175 af (100% of inflow)
Center-of-Mass det. time= 12.9 min (798.4 - 785.6)

Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	25,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.00	6,140	0	0
92.00	18,910	25,050	25,050

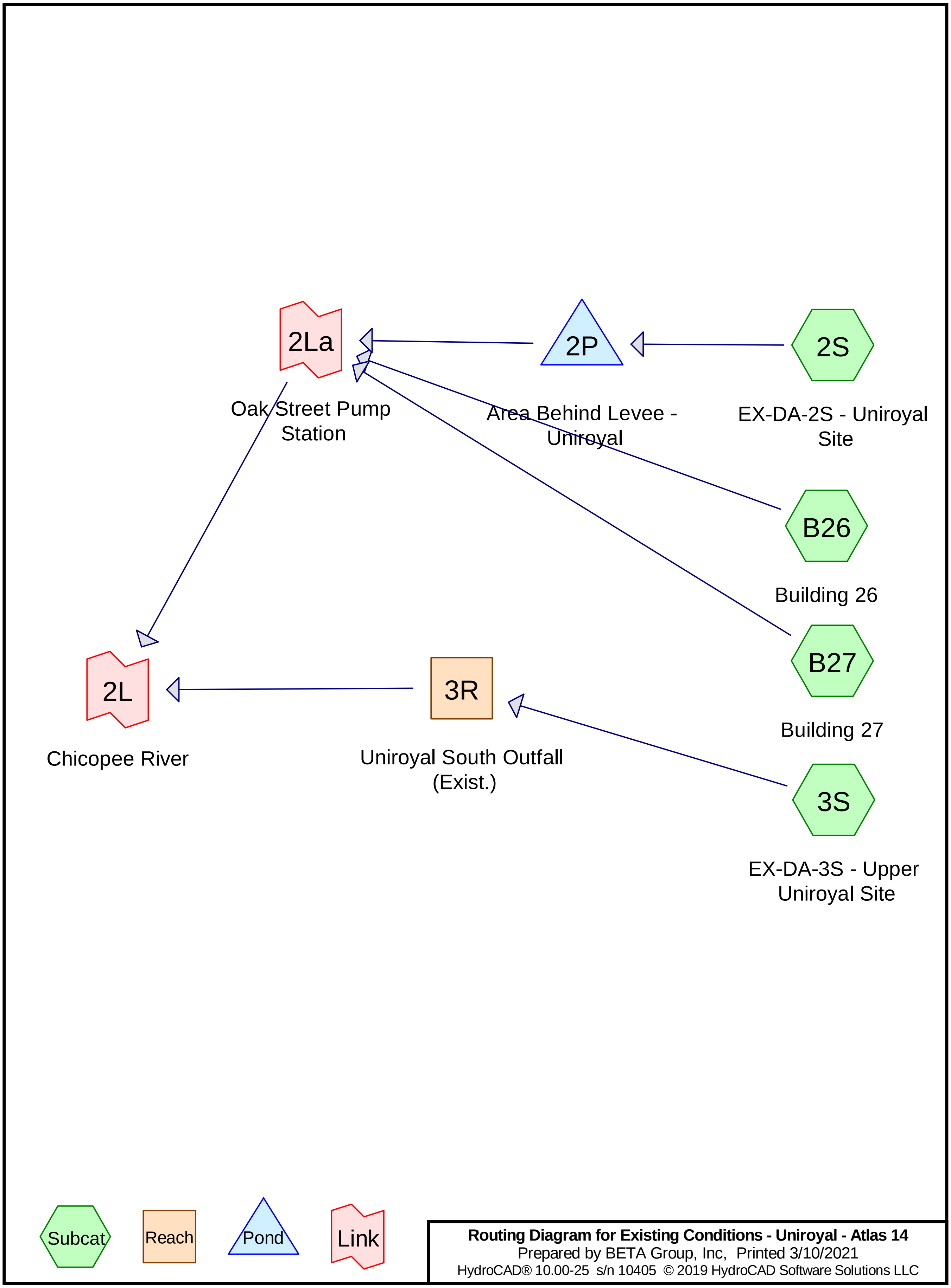
Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	90.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=11.81 cfs @ 12.30 hrs HW=91.50' (Free Discharge)
1=Catch Basin (Orifice Controls 5.90 cfs @ 5.90 fps)
2=Catch Basin (Orifice Controls 5.90 cfs @ 5.90 fps)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 5.002 ac, 10.68% Impervious, Inflow Depth = 5.22" for 100-Year event
Inflow = 11.81 cfs @ 12.30 hrs, Volume= 2.176 af
Primary = 11.81 cfs @ 12.30 hrs, Volume= 2.176 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs



Routing Diagram for Existing Conditions - Uniroyal - Atlas 14
Prepared by BETA Group, Inc, Printed 3/10/2021
HydroCAD® 10.00-25 s/n 10405 © 2019 HydroCAD Software Solutions LLC

Summary for Subcatchment 2S: EX-DA-2S - Uniroyal Site

Runoff = 24.02 cfs @ 12.10 hrs, Volume= 1.759 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
496,843	89	<50% Grass cover, Poor, HSG D
67,169	98	Paved parking, HSG D
12,351	98	Roofs, HSG D
31,364	79	Woods, Fair, HSG D
607,728	90	Weighted Average
528,208		86.92% Pervious Area
79,520		13.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0520	0.21		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.3	245	0.0650	1.78		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
6.3	295	Total			

Summary for Subcatchment 3S: EX-DA-3S - Upper Uniroyal Site

Runoff = 6.32 cfs @ 12.09 hrs, Volume= 0.472 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
64,274	89	<50% Grass cover, Poor, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	94	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.046 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 1.74 cfs @ 12.09 hrs, Volume= 0.140 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

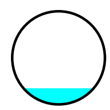
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 3.058 ac, 51.76% Impervious, Inflow Depth = 1.85" for 1-Year event
Inflow = 6.32 cfs @ 12.09 hrs, Volume= 0.472 af
Outflow = 6.26 cfs @ 12.10 hrs, Volume= 0.472 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.48 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.80 fps, Avg. Travel Time= 0.8 min

Peak Storage= 96 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 101.22 cfs

30.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 2P: Area Behind Levee - Uniroyal

Inflow Area = 13.952 ac, 13.08% Impervious, Inflow Depth = 1.51" for 1-Year event
Inflow = 24.02 cfs @ 12.10 hrs, Volume= 1.759 af
Outflow = 8.33 cfs @ 12.40 hrs, Volume= 1.759 af, Atten= 65%, Lag= 18.1 min
Primary = 8.33 cfs @ 12.40 hrs, Volume= 1.759 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 84.33' @ 12.40 hrs Surf.Area= 71,240 sf Storage= 22,614 cf

Plug-Flow detention time= 58.1 min calculated for 1.758 af (100% of inflow)
Center-of-Mass det. time= 58.4 min (875.8 - 817.4)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	168,115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
84.00	64,860	0	0
86.00	103,255	168,115	168,115

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#3	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.33 cfs @ 12.40 hrs HW=84.33' (Free Discharge)
1=Catch Basin (Orifice Controls 2.78 cfs @ 2.78 fps)
2=Catch Basin (Orifice Controls 2.78 cfs @ 2.78 fps)
3=Catch Basin (Orifice Controls 2.78 cfs @ 2.78 fps)

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 24.44% Impervious, Inflow Depth = 1.61" for 1-Year event
Inflow = 15.73 cfs @ 12.11 hrs, Volume= 2.417 af
Primary = 15.73 cfs @ 12.11 hrs, Volume= 2.417 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2La: Oak Street Pump Station

Inflow Area = 14.943 ac, 18.85% Impervious, Inflow Depth = 1.56" for 1-Year event
Inflow = 9.44 cfs @ 12.14 hrs, Volume= 1.945 af
Primary = 9.44 cfs @ 12.14 hrs, Volume= 1.945 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 2S: EX-DA-2S - Uniroyal Site

Runoff = 32.97 cfs @ 12.09 hrs, Volume= 2.435 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
496,843	89	<50% Grass cover, Poor, HSG D
67,169	98	Paved parking, HSG D
12,351	98	Roofs, HSG D
31,364	79	Woods, Fair, HSG D
607,728	90	Weighted Average
528,208		86.92% Pervious Area
79,520		13.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0520	0.21		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.3	245	0.0650	1.78		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
6.3	295	Total			

Summary for Subcatchment 3S: EX-DA-3S - Upper Uniroyal Site

Runoff = 8.29 cfs @ 12.09 hrs, Volume= 0.629 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
64,274	89	<50% Grass cover, Poor, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	94	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.059 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 2.21 cfs @ 12.09 hrs, Volume= 0.180 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

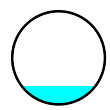
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 3.058 ac, 51.76% Impervious, Inflow Depth = 2.47" for 2-Year event
Inflow = 8.29 cfs @ 12.09 hrs, Volume= 0.629 af
Outflow = 8.23 cfs @ 12.09 hrs, Volume= 0.629 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.43 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.08 fps, Avg. Travel Time= 0.7 min

Peak Storage= 117 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 101.22 cfs

30.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 2P: Area Behind Levee - Uniroyal

Inflow Area = 13.952 ac, 13.08% Impervious, Inflow Depth = 2.09" for 2-Year event
Inflow = 32.97 cfs @ 12.09 hrs, Volume= 2.435 af
Outflow = 9.91 cfs @ 12.43 hrs, Volume= 2.435 af, Atten= 70%, Lag= 20.4 min
Primary = 9.91 cfs @ 12.43 hrs, Volume= 2.435 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 84.47' @ 12.43 hrs Surf.Area= 73,889 sf Storage= 32,626 cf

Plug-Flow detention time= 57.1 min calculated for 2.434 af (100% of inflow)
Center-of-Mass det. time= 57.4 min (865.6 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	168,115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
84.00	64,860	0	0
86.00	103,255	168,115	168,115

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#3	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=9.90 cfs @ 12.43 hrs HW=84.47' (Free Discharge)
1=Catch Basin (Orifice Controls 3.30 cfs @ 3.30 fps)
2=Catch Basin (Orifice Controls 3.30 cfs @ 3.30 fps)
3=Catch Basin (Orifice Controls 3.30 cfs @ 3.30 fps)

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 24.44% Impervious, Inflow Depth = 2.20" for 2-Year event
Inflow = 19.41 cfs @ 12.10 hrs, Volume= 3.302 af
Primary = 19.41 cfs @ 12.10 hrs, Volume= 3.302 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2La: Oak Street Pump Station

Inflow Area = 14.943 ac, 18.85% Impervious, Inflow Depth = 2.15" for 2-Year event
Inflow = 11.23 cfs @ 12.13 hrs, Volume= 2.674 af
Primary = 11.23 cfs @ 12.13 hrs, Volume= 2.674 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 2S: EX-DA-2S - Uniroyal Site

Runoff = 59.95 cfs @ 12.09 hrs, Volume= 4.552 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
496,843	89	<50% Grass cover, Poor, HSG D
67,169	98	Paved parking, HSG D
12,351	98	Roofs, HSG D
31,364	79	Woods, Fair, HSG D
607,728	90	Weighted Average
528,208		86.92% Pervious Area
79,520		13.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0520	0.21		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.3	245	0.0650	1.78		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
6.3	295	Total			

Summary for Subcatchment 3S: EX-DA-3S - Upper Uniroyal Site

Runoff = 14.15 cfs @ 12.09 hrs, Volume= 1.108 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
64,274	89	<50% Grass cover, Poor, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	94	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 3.60 cfs @ 12.09 hrs, Volume= 0.299 af, Depth= 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

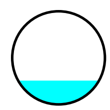
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 3.058 ac, 51.76% Impervious, Inflow Depth = 4.35" for 10-Year event
Inflow = 14.15 cfs @ 12.09 hrs, Volume= 1.108 af
Outflow = 14.06 cfs @ 12.09 hrs, Volume= 1.108 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.52 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.74 fps, Avg. Travel Time= 0.6 min

Peak Storage= 171 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 101.22 cfs

30.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 2P: Area Behind Levee - Uniroyal

Inflow Area = 13.952 ac, 13.08% Impervious, Inflow Depth = 3.91" for 10-Year event
Inflow = 59.95 cfs @ 12.09 hrs, Volume= 4.552 af
Outflow = 13.71 cfs @ 12.50 hrs, Volume= 4.552 af, Atten= 77%, Lag= 24.3 min
Primary = 13.71 cfs @ 12.50 hrs, Volume= 4.552 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 84.90' @ 12.50 hrs Surf.Area= 82,142 sf Storage= 66,166 cf

Plug-Flow detention time= 61.8 min calculated for 4.549 af (100% of inflow)
Center-of-Mass det. time= 62.1 min (852.8 - 790.7)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	168,115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
84.00	64,860	0	0
86.00	103,255	168,115	168,115

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#3	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=13.70 cfs @ 12.50 hrs HW=84.90' (Free Discharge)
1=Catch Basin (Orifice Controls 4.57 cfs @ 4.57 fps)
2=Catch Basin (Orifice Controls 4.57 cfs @ 4.57 fps)
3=Catch Basin (Orifice Controls 4.57 cfs @ 4.57 fps)

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 24.44% Impervious, Inflow Depth = 4.04" for 10-Year event
Inflow = 29.98 cfs @ 12.10 hrs, Volume= 6.056 af
Primary = 29.98 cfs @ 12.10 hrs, Volume= 6.056 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2La: Oak Street Pump Station

Inflow Area = 14.943 ac, 18.85% Impervious, Inflow Depth = 3.97" for 10-Year event
Inflow = 16.09 cfs @ 12.12 hrs, Volume= 4.948 af
Primary = 16.09 cfs @ 12.12 hrs, Volume= 4.948 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 2S: EX-DA-2S - Uniroyal Site

Runoff = 76.54 cfs @ 12.09 hrs, Volume= 5.895 af, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
496,843	89	<50% Grass cover, Poor, HSG D
67,169	98	Paved parking, HSG D
12,351	98	Roofs, HSG D
31,364	79	Woods, Fair, HSG D
607,728	90	Weighted Average
528,208		86.92% Pervious Area
79,520		13.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0520	0.21		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.3	245	0.0650	1.78		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
6.3	295	Total			

Summary for Subcatchment 3S: EX-DA-3S - Upper Uniroyal Site

Runoff = 17.74 cfs @ 12.09 hrs, Volume= 1.408 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
64,274	89	<50% Grass cover, Poor, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	94	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 1.46 cfs @ 12.09 hrs, Volume= 0.122 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 4.46 cfs @ 12.09 hrs, Volume= 0.373 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

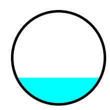
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 3.058 ac, 51.76% Impervious, Inflow Depth = 5.52" for 25-Year event
Inflow = 17.74 cfs @ 12.09 hrs, Volume= 1.408 af
Outflow = 17.64 cfs @ 12.09 hrs, Volume= 1.408 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.49 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.07 fps, Avg. Travel Time= 0.6 min

Peak Storage= 201 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 101.22 cfs

30.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 2P: Area Behind Levee - Uniroyal

Inflow Area = 13.952 ac, 13.08% Impervious, Inflow Depth = 5.07" for 25-Year event
Inflow = 76.54 cfs @ 12.09 hrs, Volume= 5.895 af
Outflow = 15.59 cfs @ 12.52 hrs, Volume= 5.895 af, Atten= 80%, Lag= 25.8 min
Primary = 15.59 cfs @ 12.52 hrs, Volume= 5.895 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 85.16' @ 12.52 hrs Surf.Area= 87,220 sf Storage= 88,569 cf

Plug-Flow detention time= 66.7 min calculated for 5.891 af (100% of inflow)
Center-of-Mass det. time= 67.0 min (850.8 - 783.8)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	168,115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
84.00	64,860	0	0
86.00	103,255	168,115	168,115

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#3	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=15.58 cfs @ 12.52 hrs HW=85.16' (Free Discharge)
1=Catch Basin (Orifice Controls 5.19 cfs @ 5.19 fps)
2=Catch Basin (Orifice Controls 5.19 cfs @ 5.19 fps)
3=Catch Basin (Orifice Controls 5.19 cfs @ 5.19 fps)

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 24.44% Impervious, Inflow Depth = 5.20" for 25-Year event
Inflow = 36.17 cfs @ 12.10 hrs, Volume= 7.798 af
Primary = 36.17 cfs @ 12.10 hrs, Volume= 7.798 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2La: Oak Street Pump Station

Inflow Area = 14.943 ac, 18.85% Impervious, Inflow Depth = 5.13" for 25-Year event
Inflow = 18.70 cfs @ 12.12 hrs, Volume= 6.390 af
Primary = 18.70 cfs @ 12.12 hrs, Volume= 6.390 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 2S: EX-DA-2S - Uniroyal Site

Runoff = 101.97 cfs @ 12.09 hrs, Volume= 7.992 af, Depth= 6.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
496,843	89	<50% Grass cover, Poor, HSG D
67,169	98	Paved parking, HSG D
12,351	98	Roofs, HSG D
31,364	79	Woods, Fair, HSG D
607,728	90	Weighted Average
528,208		86.92% Pervious Area
79,520		13.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0520	0.21		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.3	245	0.0650	1.78		**Shallow Concentrated Flow, Shallow Conc. 1** Short Grass Pasture Kv= 7.0 fps
6.3	295	Total			

Summary for Subcatchment 3S: EX-DA-3S - Upper Uniroyal Site

Runoff = 23.25 cfs @ 12.09 hrs, Volume= 1.874 af, Depth= 7.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
64,274	89	<50% Grass cover, Poor, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	94	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 1.89 cfs @ 12.09 hrs, Volume= 0.159 af, Depth= 7.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 5.78 cfs @ 12.09 hrs, Volume= 0.488 af, Depth= 7.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

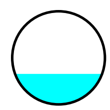
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 3.058 ac, 51.76% Impervious, Inflow Depth = 7.35" for 100-Year event
Inflow = 23.25 cfs @ 12.09 hrs, Volume= 1.874 af
Outflow = 23.12 cfs @ 12.09 hrs, Volume= 1.874 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.72 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.49 fps, Avg. Travel Time= 0.5 min

Peak Storage= 243 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 101.22 cfs

30.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 2P: Area Behind Levee - Uniroyal

Inflow Area = 13.952 ac, 13.08% Impervious, Inflow Depth = 6.87" for 100-Year event
Inflow = 101.97 cfs @ 12.09 hrs, Volume= 7.992 af
Outflow = 18.06 cfs @ 12.55 hrs, Volume= 7.992 af, Atten= 82%, Lag= 27.7 min
Primary = 18.06 cfs @ 12.55 hrs, Volume= 7.992 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 85.56' @ 12.55 hrs Surf.Area= 94,872 sf Storage= 124,854 cf

Plug-Flow detention time= 75.2 min calculated for 7.987 af (100% of inflow)
Center-of-Mass det. time= 75.4 min (851.3 - 775.9)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	168,115 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
84.00	64,860	0	0
86.00	103,255	168,115	168,115

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#2	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads
#3	Primary	84.00'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" Grate (32% open area) Limited to weir flow at low heads

Primary OutFlow Max=18.06 cfs @ 12.55 hrs HW=85.56' (Free Discharge)
—**1=Catch Basin** (Orifice Controls 6.02 cfs @ 6.02 fps)
—**2=Catch Basin** (Orifice Controls 6.02 cfs @ 6.02 fps)
—**3=Catch Basin** (Orifice Controls 6.02 cfs @ 6.02 fps)

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 24.44% Impervious, Inflow Depth = 7.01" for 100-Year event
Inflow = 45.39 cfs @ 12.10 hrs, Volume= 10.513 af
Primary = 45.39 cfs @ 12.10 hrs, Volume= 10.513 af, Atten= 0%, Lag= 0.0 min

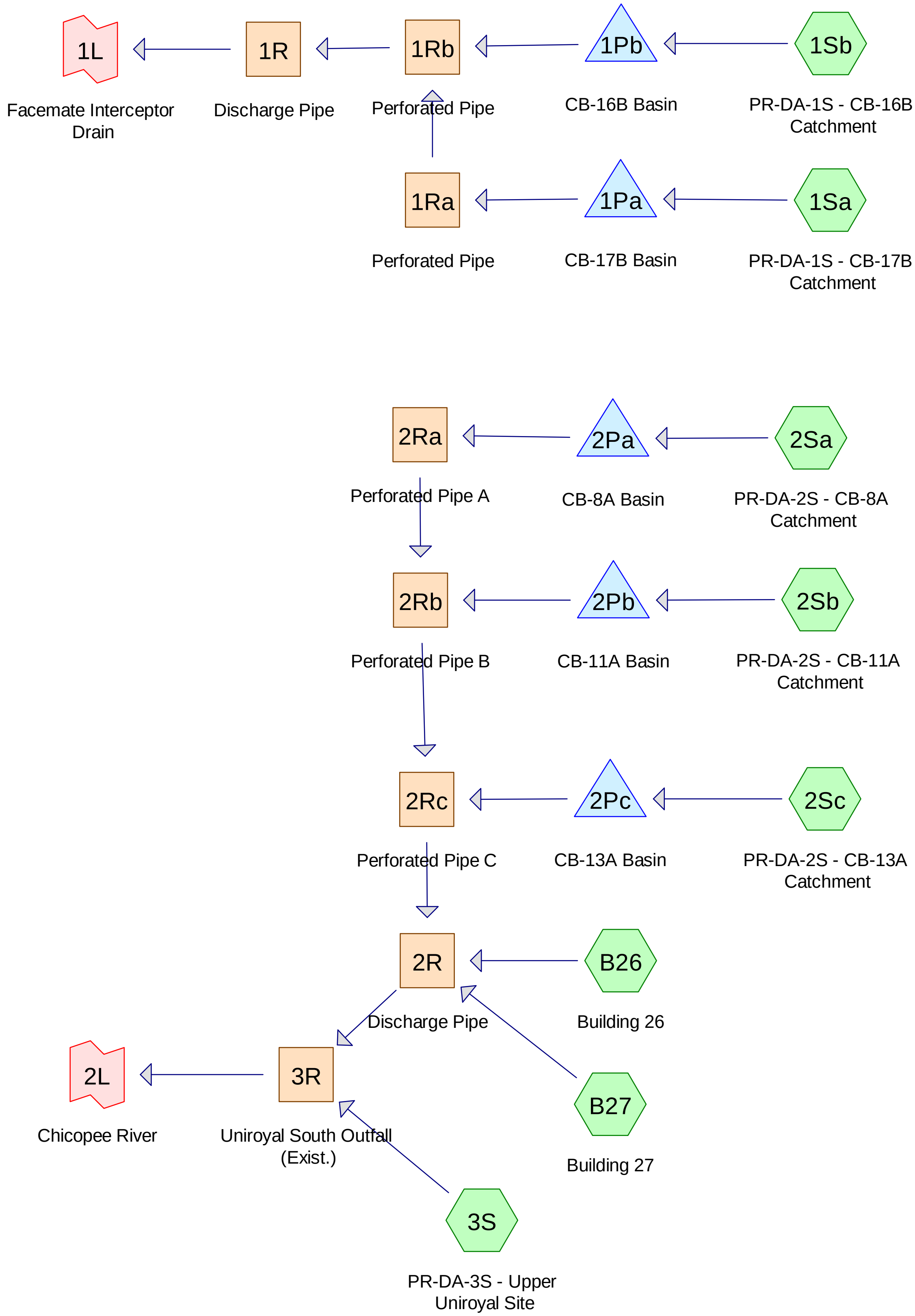
Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

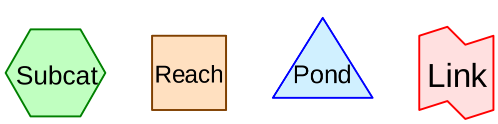
Summary for Link 2La: Oak Street Pump Station

Inflow Area = 14.943 ac, 18.85% Impervious, Inflow Depth = 6.94" for 100-Year event
Inflow = 22.43 cfs @ 12.11 hrs, Volume= 8.639 af
Primary = 22.43 cfs @ 12.11 hrs, Volume= 8.639 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

APPENDIX F – PROPOSED CONDITIONS CALCULATIONS





Routing Diagram for Proposed Conditions - Uniroyal and Facemate - Atlas 14
Prepared by BETA Group, Inc, Printed 3/10/2021
HydroCAD® 10.00-25 s/n 10405 © 2019 HydroCAD Software Solutions LLC

Summary for Subcatchment 1Sa: PR-DA-1S - CB-17B Catchment

Runoff = 2.69 cfs @ 12.10 hrs, Volume= 0.197 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
74,164	80	>75% Grass cover, Good, HSG D
6,867	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
2,569	98	Water Surface, HSG D
9,314	79	Woods, Fair, HSG D
99,151	83	Weighted Average
83,478		84.19% Pervious Area
15,674		15.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
2.6	190	0.0150	1.22		**Shallow Concentrated Flow, Shallow Conc. 1** Nearly Bare & Untilled Kv= 10.0 fps
0.7	96	0.0490	2.21		**Shallow Concentrated Flow, Shallow Conc. 2** Nearly Bare & Untilled Kv= 10.0 fps
2.1					**Direct Entry, Minimum TC**
6.0	336	Total			

Summary for Subcatchment 1Sb: PR-DA-1S - CB-16B Catchment

Runoff = 3.01 cfs @ 12.10 hrs, Volume= 0.222 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
93,694	80	>75% Grass cover, Good, HSG D
10,157	98	Paved parking, HSG D
2,498	98	Water Surface, HSG D
11,795	79	Woods, Fair, HSG D
118,144	82	Weighted Average
105,489		89.29% Pervious Area
12,655		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment 2Sa: PR-DA-2S - CB-8A Catchment

Runoff = 3.63 cfs @ 12.17 hrs, Volume= 0.326 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
165,088	80	>75% Grass cover, Good, HSG D
5,904	98	Paved parking, HSG D
1,265	98	Roofs, HSG D
3,083	98	Water Surface, HSG D
8,216	79	Woods, Fair, HSG D
183,555	81	Weighted Average
173,304		94.42% Pervious Area
10,251		5.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0070	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
3.1	235	0.0070	1.25		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
11.9	285	Total			

Summary for Subcatchment 2Sb: PR-DA-2S - CB-11A Catchment

Runoff = 5.81 cfs @ 12.15 hrs, Volume= 0.493 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
265,478	80	>75% Grass cover, Good, HSG D
10,628	98	Paved parking, HSG D
1,422	98	Water Surface, HSG D
277,528	81	Weighted Average
265,478		95.66% Pervious Area
12,050		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0090	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.0	175	0.0090	1.42		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
10.0	225	Total			

Summary for Subcatchment 2Sc: PR-DA-2S - CB-13A Catchment

Runoff = 4.22 cfs @ 12.10 hrs, Volume= 0.309 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
108,361	80	>75% Grass cover, Good, HSG D
30,845	98	Paved parking, HSG D
1,607	98	Water Surface, HSG D
5,822	79	Woods, Fair, HSG D
146,635	84	Weighted Average
114,183		77.87% Pervious Area
32,452		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0220	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
0.3	40	0.0220	2.22		**Shallow Concentrated Flow, Shallow Conc.** Grassed Waterway Kv= 15.0 fps
0.1					**Direct Entry, Minimum TC**
6.0	90	Total			

Summary for Subcatchment 3S: PR-DA-3S - Upper Uniroyal Site

Runoff = 5.30 cfs @ 12.09 hrs, Volume= 0.386 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
8,648	89	<50% Grass cover, Poor, HSG D
55,625	80	>75% Grass cover, Good, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	90	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.046 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 1.74 cfs @ 12.09 hrs, Volume= 0.140 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.48"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

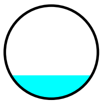
Summary for Reach 1R: Discharge Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 1.01" for 1-Year event
Inflow = 3.60 cfs @ 12.24 hrs, Volume= 0.420 af
Outflow = 3.59 cfs @ 12.24 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.39 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.15 fps, Avg. Travel Time= 0.2 min

Peak Storage= 17 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 26.20 cfs

18.0" Round Pipe
n= 0.012
Length= 50.0' Slope= 0.0530 '/'
Inlet Invert= 90.15', Outlet Invert= 87.50'



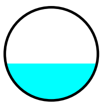
Summary for Reach 1Ra: Perforated Pipe

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 1.04" for 1-Year event
Inflow = 1.54 cfs @ 12.23 hrs, Volume= 0.197 af
Outflow = 1.54 cfs @ 12.29 hrs, Volume= 0.197 af, Atten= 0%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.45 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 4.1 min

Peak Storage= 157 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 4.73 cfs

15.0" Round Pipe
n= 0.012
Length= 350.0' Slope= 0.0046 '/'
Inlet Invert= 93.25', Outlet Invert= 91.65'



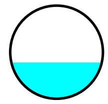
Summary for Reach 1Rb: Perforated Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 1.01" for 1-Year event
Inflow = 3.64 cfs @ 12.22 hrs, Volume= 0.420 af
Outflow = 3.60 cfs @ 12.24 hrs, Volume= 0.420 af, Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.71 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.27 fps, Avg. Travel Time= 1.1 min

Peak Storage= 95 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe
n= 0.012
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 91.65', Outlet Invert= 90.15'



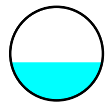
Summary for Reach 2R: Discharge Pipe

Inflow Area = 14.943 ac, 15.05% Impervious, Inflow Depth = 1.05" for 1-Year event
Inflow = 8.13 cfs @ 12.43 hrs, Volume= 1.313 af
Outflow = 8.09 cfs @ 12.44 hrs, Volume= 1.314 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.38 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 1.5 min

Peak Storage= 259 cf @ 12.43 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 23.75 cfs

30.0" Round Pipe
n= 0.012
Length= 140.0' Slope= 0.0029 '/'
Inlet Invert= 88.20', Outlet Invert= 87.80'



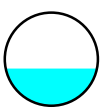
Summary for Reach 2Ra: Perforated Pipe A

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 0.93" for 1-Year event
Inflow = 2.25 cfs @ 12.38 hrs, Volume= 0.326 af
Outflow = 2.24 cfs @ 12.47 hrs, Volume= 0.326 af, Atten= 1%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.43 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 6.4 min

Peak Storage= 362 cf @ 12.43 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 6.75 cfs

18.0" Round Pipe
n= 0.012
Length= 555.0' Slope= 0.0035 '/'
Inlet Invert= 92.00', Outlet Invert= 90.05'



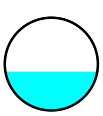
Summary for Reach 2Rb: Perforated Pipe B

Inflow Area = 10.585 ac, 4.84% Impervious, Inflow Depth = 0.93" for 1-Year event
Inflow = 5.43 cfs @ 12.45 hrs, Volume= 0.819 af
Outflow = 5.41 cfs @ 12.50 hrs, Volume= 0.819 af, Atten= 1%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.35 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 3.7 min

Peak Storage= 492 cf @ 12.47 hrs
Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 14.85 cfs

24.0" Round Pipe
n= 0.012
Length= 395.0' Slope= 0.0037 '/'
Inlet Invert= 90.05', Outlet Invert= 88.60'



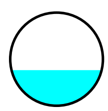
Summary for Reach 2Rc: Perforated Pipe C

Inflow Area = 13.951 ac, 9.01% Impervious, Inflow Depth = 0.97" for 1-Year event
Inflow = 7.54 cfs @ 12.43 hrs, Volume= 1.127 af
Outflow = 7.50 cfs @ 12.44 hrs, Volume= 1.128 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.41 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 1.3 min

Peak Storage= 222 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.95'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 24.65 cfs

30.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0031 '/'
Inlet Invert= 88.60', Outlet Invert= 88.20'



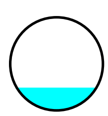
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 1.13" for 1-Year event
Inflow = 11.10 cfs @ 12.12 hrs, Volume= 1.699 af
Outflow = 10.91 cfs @ 12.12 hrs, Volume= 1.699 af, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 11.94 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.08 fps, Avg. Travel Time= 0.7 min

Peak Storage= 161 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 85.65 cfs

30.0" Round Pipe
n= 0.013
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 1.04" for 1-Year event
Inflow = 2.69 cfs @ 12.10 hrs, Volume= 0.197 af
Outflow = 1.54 cfs @ 12.23 hrs, Volume= 0.197 af, Atten= 43%, Lag= 8.3 min
Primary = 1.54 cfs @ 12.23 hrs, Volume= 0.197 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.51' @ 12.23 hrs Surf.Area= 4,853 sf Storage= 1,881 cf

Plug-Flow detention time= 80.9 min calculated for 0.197 af (100% of inflow)
Center-of-Mass det. time= 81.0 min (926.6 - 845.7)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=1.54 cfs @ 12.23 hrs HW=97.51' (Free Discharge)
1=Catch Basin (Orifice Controls 1.42 cfs @ 2.05 fps)
2=Exfiltration (Controls 0.12 cfs)

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 0.98" for 1-Year event
Inflow = 3.01 cfs @ 12.10 hrs, Volume= 0.222 af
Outflow = 2.19 cfs @ 12.18 hrs, Volume= 0.222 af, Atten= 27%, Lag= 5.0 min
Primary = 2.19 cfs @ 12.18 hrs, Volume= 0.222 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.52' @ 12.18 hrs Surf.Area= 4,379 sf Storage= 1,796 cf

Plug-Flow detention time= 77.2 min calculated for 0.222 af (100% of inflow)
Center-of-Mass det. time= 77.2 min (926.6 - 849.4)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	26,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	6,100	4,300	4,300
99.00	11,400	8,750	13,050
100.00	15,300	13,350	26,400

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=2.21 cfs @ 12.18 hrs HW=97.52' (Free Discharge)
1=Catch Basin (Orifice Controls 2.10 cfs @ 2.10 fps)
2=Exfiltration (Controls 0.11 cfs)

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 0.93" for 1-Year event
Inflow = 3.63 cfs @ 12.17 hrs, Volume= 0.326 af
Outflow = 2.25 cfs @ 12.38 hrs, Volume= 0.326 af, Atten= 38%, Lag= 12.5 min
Primary = 2.25 cfs @ 12.38 hrs, Volume= 0.326 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.51' @ 12.38 hrs Surf.Area= 9,429 sf Storage= 3,196 cf

Plug-Flow detention time= 78.3 min calculated for 0.326 af (100% of inflow)
Center-of-Mass det. time= 78.3 min (936.9 - 858.6)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	46,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	15,500	9,250	9,250
99.00	19,000	17,250	26,500
100.00	21,720	20,360	46,860

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=2.29 cfs @ 12.38 hrs HW=97.51' (Free Discharge)
1=Catch Basin (Weir Controls 2.06 cfs @ 1.40 fps)
2=Exfiltration (Controls 0.23 cfs)

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 0.93" for 1-Year event
Inflow = 5.81 cfs @ 12.15 hrs, Volume= 0.493 af
Outflow = 3.24 cfs @ 12.37 hrs, Volume= 0.493 af, Atten= 44%, Lag= 13.3 min
Primary = 3.24 cfs @ 12.37 hrs, Volume= 0.493 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 95.21' @ 12.37 hrs Surf.Area= 10,552 sf Storage= 4,023 cf

Plug-Flow detention time= 51.9 min calculated for 0.492 af (100% of inflow)
Center-of-Mass det. time= 52.0 min (908.8 - 856.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	77,063 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,500	0	0
95.00	7,050	2,138	2,138
96.00	23,400	15,225	17,363
97.00	30,000	26,700	44,063
98.00	36,000	33,000	77,063

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=3.24 cfs @ 12.37 hrs HW=95.21' (Free Discharge)
1=Catch Basin (Orifice Controls 2.98 cfs @ 2.98 fps)
2=Exfiltration (Controls 0.26 cfs)

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 1.10" for 1-Year event
Inflow = 4.22 cfs @ 12.10 hrs, Volume= 0.309 af
Outflow = 2.68 cfs @ 12.21 hrs, Volume= 0.309 af, Atten= 37%, Lag= 6.8 min
Primary = 2.68 cfs @ 12.21 hrs, Volume= 0.309 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 95.11' @ 12.21 hrs Surf.Area= 5,989 sf Storage= 2,434 cf

Plug-Flow detention time= 59.8 min calculated for 0.309 af (100% of inflow)
Center-of-Mass det. time= 59.7 min (901.6 - 841.9)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	30,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,550	0	0
95.00	5,700	1,813	1,813
96.00	8,420	7,060	8,873
97.00	10,550	9,485	18,358
98.00	14,275	12,413	30,770

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

Device	Routing	Invert	Outlet Devices
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=2.67 cfs @ 12.21 hrs HW=95.10' (Free Discharge)
1=Catch Basin (Orifice Controls 2.52 cfs @ 2.52 fps)
2=Exfiltration (Controls 0.15 cfs)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 1.01" for 1-Year event
Inflow = 3.59 cfs @ 12.24 hrs, Volume= 0.420 af
Primary = 3.59 cfs @ 12.24 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 1.13" for 1-Year event
Inflow = 10.91 cfs @ 12.12 hrs, Volume= 1.699 af
Primary = 10.91 cfs @ 12.12 hrs, Volume= 1.699 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1Sa: PR-DA-1S - CB-17B Catchment

Runoff = 4.03 cfs @ 12.09 hrs, Volume= 0.293 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
74,164	80	>75% Grass cover, Good, HSG D
6,867	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
2,569	98	Water Surface, HSG D
9,314	79	Woods, Fair, HSG D
99,151	83	Weighted Average
83,478		84.19% Pervious Area
15,674		15.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
2.6	190	0.0150	1.22		**Shallow Concentrated Flow, Shallow Conc. 1** Nearly Bare & Untilled Kv= 10.0 fps
0.7	96	0.0490	2.21		**Shallow Concentrated Flow, Shallow Conc. 2** Nearly Bare & Untilled Kv= 10.0 fps
2.1					**Direct Entry, Minimum TC**
6.0	336	Total			

Summary for Subcatchment 1Sb: PR-DA-1S - CB-16B Catchment

Runoff = 4.58 cfs @ 12.09 hrs, Volume= 0.333 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
93,694	80	>75% Grass cover, Good, HSG D
10,157	98	Paved parking, HSG D
2,498	98	Water Surface, HSG D
11,795	79	Woods, Fair, HSG D
118,144	82	Weighted Average
105,489		89.29% Pervious Area
12,655		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment 2Sa: PR-DA-2S - CB-8A Catchment

Runoff = 5.63 cfs @ 12.17 hrs, Volume= 0.494 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
165,088	80	>75% Grass cover, Good, HSG D
5,904	98	Paved parking, HSG D
1,265	98	Roofs, HSG D
3,083	98	Water Surface, HSG D
8,216	79	Woods, Fair, HSG D
183,555	81	Weighted Average
173,304		94.42% Pervious Area
10,251		5.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0070	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
3.1	235	0.0070	1.25		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
11.9	285	Total			

Summary for Subcatchment 2Sb: PR-DA-2S - CB-11A Catchment

Runoff = 8.99 cfs @ 12.15 hrs, Volume= 0.747 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
265,478	80	>75% Grass cover, Good, HSG D
10,628	98	Paved parking, HSG D
1,422	98	Water Surface, HSG D
277,528	81	Weighted Average
265,478		95.66% Pervious Area
12,050		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0090	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.0	175	0.0090	1.42		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
10.0	225	Total			

Summary for Subcatchment 2Sc: PR-DA-2S - CB-13A Catchment

Runoff = 6.25 cfs @ 12.09 hrs, Volume= 0.453 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
108,361	80	>75% Grass cover, Good, HSG D
30,845	98	Paved parking, HSG D
1,607	98	Water Surface, HSG D
5,822	79	Woods, Fair, HSG D
146,635	84	Weighted Average
114,183		77.87% Pervious Area
32,452		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0220	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
0.3	40	0.0220	2.22		**Shallow Concentrated Flow, Shallow Conc.** Grassed Waterway Kv= 15.0 fps
0.1					**Direct Entry, Minimum TC**
6.0	90	Total			

Summary for Subcatchment 3S: PR-DA-3S - Upper Uniroyal Site

Runoff = 7.28 cfs @ 12.09 hrs, Volume= 0.534 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
8,648	89	<50% Grass cover, Poor, HSG D
55,625	80	>75% Grass cover, Good, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	90	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.059 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 2.21 cfs @ 12.09 hrs, Volume= 0.180 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

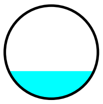
Summary for Reach 1R: Discharge Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 1.51" for 2-Year event
Inflow = 4.98 cfs @ 12.26 hrs, Volume= 0.626 af
Outflow = 4.98 cfs @ 12.26 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.41 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 22 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 26.20 cfs

18.0" Round Pipe
n= 0.012
Length= 50.0' Slope= 0.0530 '/'
Inlet Invert= 90.15', Outlet Invert= 87.50'



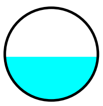
Summary for Reach 1Ra: Perforated Pipe

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 1.54" for 2-Year event
Inflow = 2.11 cfs @ 12.26 hrs, Volume= 0.293 af
Outflow = 2.11 cfs @ 12.31 hrs, Volume= 0.293 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.74 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.50 fps, Avg. Travel Time= 3.9 min

Peak Storage= 197 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 4.73 cfs

15.0" Round Pipe
n= 0.012
Length= 350.0' Slope= 0.0046 '/'
Inlet Invert= 93.25', Outlet Invert= 91.65'



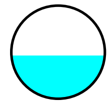
Summary for Reach 1Rb: Perforated Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 1.51" for 2-Year event
Inflow = 4.99 cfs @ 12.24 hrs, Volume= 0.626 af
Outflow = 4.98 cfs @ 12.26 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.23 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.40 fps, Avg. Travel Time= 1.0 min

Peak Storage= 120 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe
n= 0.012
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 91.65', Outlet Invert= 90.15'



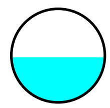
Summary for Reach 2R: Discharge Pipe

Inflow Area = 14.943 ac, 15.05% Impervious, Inflow Depth = 1.55" for 2-Year event
Inflow = 11.11 cfs @ 12.39 hrs, Volume= 1.932 af
Outflow = 11.09 cfs @ 12.40 hrs, Volume= 1.932 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.76 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 1.4 min

Peak Storage= 327 cf @ 12.39 hrs
Average Depth at Peak Storage= 1.20'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 23.75 cfs

30.0" Round Pipe
n= 0.012
Length= 140.0' Slope= 0.0029 '/'
Inlet Invert= 88.20', Outlet Invert= 87.80'



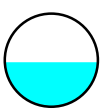
Summary for Reach 2Ra: Perforated Pipe A

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 3.09 cfs @ 12.41 hrs, Volume= 0.494 af
Outflow = 3.08 cfs @ 12.49 hrs, Volume= 0.494 af, Atten= 0%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.73 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 6.0 min

Peak Storage= 459 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 6.75 cfs

18.0" Round Pipe
n= 0.012
Length= 555.0' Slope= 0.0035 '/'
Inlet Invert= 92.00', Outlet Invert= 90.05'



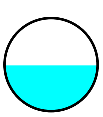
Summary for Reach 2Rb: Perforated Pipe B

Inflow Area = 10.585 ac, 4.84% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 7.20 cfs @ 12.46 hrs, Volume= 1.241 af
Outflow = 7.19 cfs @ 12.51 hrs, Volume= 1.241 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.69 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.91 fps, Avg. Travel Time= 3.5 min

Peak Storage= 606 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.98'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 14.85 cfs

24.0" Round Pipe
n= 0.012
Length= 395.0' Slope= 0.0037 '/'
Inlet Invert= 90.05', Outlet Invert= 88.60'



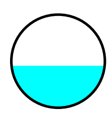
Summary for Reach 2Rc: Perforated Pipe C

Inflow Area = 13.951 ac, 9.01% Impervious, Inflow Depth = 1.46" for 2-Year event
Inflow = 10.26 cfs @ 12.42 hrs, Volume= 1.694 af
Outflow = 10.24 cfs @ 12.44 hrs, Volume= 1.694 af, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.79 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 1.2 min

Peak Storage= 278 cf @ 12.43 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 24.65 cfs

30.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0031 '/'
Inlet Invert= 88.60', Outlet Invert= 88.20'



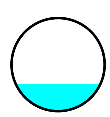
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 15.72 cfs @ 12.11 hrs, Volume= 2.466 af
Outflow = 15.52 cfs @ 12.11 hrs, Volume= 2.466 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 13.25 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.45 fps, Avg. Travel Time= 0.7 min

Peak Storage= 206 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 85.65 cfs

30.0" Round Pipe
n= 0.013
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 1.54" for 2-Year event
Inflow = 4.03 cfs @ 12.09 hrs, Volume= 0.293 af
Outflow = 2.11 cfs @ 12.26 hrs, Volume= 0.293 af, Atten= 48%, Lag= 9.7 min
Primary = 2.11 cfs @ 12.26 hrs, Volume= 0.293 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.68' @ 12.26 hrs Surf.Area= 5,624 sf Storage= 2,758 cf

Plug-Flow detention time= 69.0 min calculated for 0.293 af (100% of inflow)
Center-of-Mass det. time= 69.1 min (903.2 - 834.1)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=2.11 cfs @ 12.26 hrs HW=97.68' (Free Discharge)
1=Catch Basin (Orifice Controls 1.97 cfs @ 2.84 fps)
2=Exfiltration (Controls 0.14 cfs)

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 1.47" for 2-Year event
Inflow = 4.58 cfs @ 12.09 hrs, Volume= 0.333 af
Outflow = 2.95 cfs @ 12.20 hrs, Volume= 0.333 af, Atten= 36%, Lag= 6.5 min
Primary = 2.95 cfs @ 12.20 hrs, Volume= 0.333 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.68' @ 12.20 hrs Surf.Area= 4,931 sf Storage= 2,509 cf

Plug-Flow detention time= 63.4 min calculated for 0.333 af (100% of inflow)
Center-of-Mass det. time= 63.2 min (900.7 - 837.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	26,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	6,100	4,300	4,300
99.00	11,400	8,750	13,050
100.00	15,300	13,350	26,400

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=2.95 cfs @ 12.20 hrs HW=97.67' (Free Discharge)
1=Catch Basin (Orifice Controls 2.83 cfs @ 2.83 fps)
2=Exfiltration (Controls 0.12 cfs)

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 5.63 cfs @ 12.17 hrs, Volume= 0.494 af
Outflow = 3.09 cfs @ 12.41 hrs, Volume= 0.494 af, Atten= 45%, Lag= 14.6 min
Primary = 3.09 cfs @ 12.41 hrs, Volume= 0.494 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.67' @ 12.41 hrs Surf.Area= 11,409 sf Storage= 4,847 cf

Plug-Flow detention time= 66.7 min calculated for 0.494 af (100% of inflow)
Center-of-Mass det. time= 66.8 min (913.1 - 846.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	46,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	15,500	9,250	9,250
99.00	19,000	17,250	26,500
100.00	21,720	20,360	46,860

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=3.09 cfs @ 12.41 hrs HW=97.67' (Free Discharge)
1=Catch Basin (Orifice Controls 2.82 cfs @ 2.82 fps)
2=Exfiltration (Controls 0.28 cfs)

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 8.99 cfs @ 12.15 hrs, Volume= 0.747 af
Outflow = 4.13 cfs @ 12.43 hrs, Volume= 0.747 af, Atten= 54%, Lag= 16.9 min
Primary = 4.13 cfs @ 12.43 hrs, Volume= 0.747 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 95.45' @ 12.43 hrs Surf.Area= 14,333 sf Storage= 6,900 cf

Plug-Flow detention time= 42.8 min calculated for 0.746 af (100% of inflow)
Center-of-Mass det. time= 42.9 min (887.4 - 844.5)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	77,063 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,500	0	0
95.00	7,050	2,138	2,138
96.00	23,400	15,225	17,363
97.00	30,000	26,700	44,063
98.00	36,000	33,000	77,063

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=4.12 cfs @ 12.43 hrs HW=95.44' (Free Discharge)
1=Catch Basin (Orifice Controls 3.77 cfs @ 3.77 fps)
2=Exfiltration (Controls 0.35 cfs)

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 1.62" for 2-Year event
Inflow = 6.25 cfs @ 12.09 hrs, Volume= 0.453 af
Outflow = 3.42 cfs @ 12.24 hrs, Volume= 0.453 af, Atten= 45%, Lag= 8.7 min
Primary = 3.42 cfs @ 12.24 hrs, Volume= 0.453 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 95.29' @ 12.24 hrs Surf.Area= 6,487 sf Storage= 3,575 cf

Plug-Flow detention time= 49.9 min calculated for 0.453 af (100% of inflow)
Center-of-Mass det. time= 50.0 min (880.8 - 830.7)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	30,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,550	0	0
95.00	5,700	1,813	1,813
96.00	8,420	7,060	8,873
97.00	10,550	9,485	18,358
98.00	14,275	12,413	30,770

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

Device	Routing	Invert	Outlet Devices
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=3.42 cfs @ 12.24 hrs HW=95.29' (Free Discharge)
1=Catch Basin (Orifice Controls 3.26 cfs @ 3.26 fps)
2=Exfiltration (Controls 0.16 cfs)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 1.51" for 2-Year event
Inflow = 4.98 cfs @ 12.26 hrs, Volume= 0.626 af
Primary = 4.98 cfs @ 12.26 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 15.52 cfs @ 12.11 hrs, Volume= 2.466 af
Primary = 15.52 cfs @ 12.11 hrs, Volume= 2.466 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1Sa: PR-DA-1S - CB-17B Catchment

Runoff = 8.35 cfs @ 12.09 hrs, Volume= 0.609 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
74,164	80	>75% Grass cover, Good, HSG D
6,867	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
2,569	98	Water Surface, HSG D
9,314	79	Woods, Fair, HSG D
99,151	83	Weighted Average
83,478		84.19% Pervious Area
15,674		15.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
2.6	190	0.0150	1.22		**Shallow Concentrated Flow, Shallow Conc. 1** Nearly Bare & Untilled Kv= 10.0 fps
0.7	96	0.0490	2.21		**Shallow Concentrated Flow, Shallow Conc. 2** Nearly Bare & Untilled Kv= 10.0 fps
2.1					**Direct Entry, Minimum TC**
6.0	336	Total			

Summary for Subcatchment 1Sb: PR-DA-1S - CB-16B Catchment

Runoff = 9.67 cfs @ 12.09 hrs, Volume= 0.704 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
93,694	80	>75% Grass cover, Good, HSG D
10,157	98	Paved parking, HSG D
2,498	98	Water Surface, HSG D
11,795	79	Woods, Fair, HSG D
118,144	82	Weighted Average
105,489		89.29% Pervious Area
12,655		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment 2Sa: PR-DA-2S - CB-8A Catchment

Runoff = 12.21 cfs @ 12.17 hrs, Volume= 1.061 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
165,088	80	>75% Grass cover, Good, HSG D
5,904	98	Paved parking, HSG D
1,265	98	Roofs, HSG D
3,083	98	Water Surface, HSG D
8,216	79	Woods, Fair, HSG D
183,555	81	Weighted Average
173,304		94.42% Pervious Area
10,251		5.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0070	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
3.1	235	0.0070	1.25		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
11.9	285	Total			

Summary for Subcatchment 2Sb: PR-DA-2S - CB-11A Catchment

Runoff = 19.46 cfs @ 12.14 hrs, Volume= 1.604 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
265,478	80	>75% Grass cover, Good, HSG D
10,628	98	Paved parking, HSG D
1,422	98	Water Surface, HSG D
277,528	81	Weighted Average
265,478		95.66% Pervious Area
12,050		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0090	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.0	175	0.0090	1.42		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
10.0	225	Total			

Summary for Subcatchment 2Sc: PR-DA-2S - CB-13A Catchment

Runoff = 12.68 cfs @ 12.09 hrs, Volume= 0.928 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
108,361	80	>75% Grass cover, Good, HSG D
30,845	98	Paved parking, HSG D
1,607	98	Water Surface, HSG D
5,822	79	Woods, Fair, HSG D
146,635	84	Weighted Average
114,183		77.87% Pervious Area
32,452		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0220	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
0.3	40	0.0220	2.22		**Shallow Concentrated Flow, Shallow Conc.** Grassed Waterway Kv= 15.0 fps
0.1					**Direct Entry, Minimum TC**
6.0	90	Total			

Summary for Subcatchment 3S: PR-DA-3S - Upper Uniroyal Site

Runoff = 13.23 cfs @ 12.09 hrs, Volume= 0.998 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
8,648	89	<50% Grass cover, Poor, HSG D
55,625	80	>75% Grass cover, Good, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	90	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 3.60 cfs @ 12.09 hrs, Volume= 0.299 af, Depth= 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

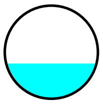
Summary for Reach 1R: Discharge Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 3.16" for 10-Year event
Inflow = 7.90 cfs @ 12.32 hrs, Volume= 1.313 af
Outflow = 7.90 cfs @ 12.32 hrs, Volume= 1.313 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.98 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.00 fps, Avg. Travel Time= 0.2 min

Peak Storage= 30 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 26.20 cfs

18.0" Round Pipe
n= 0.012
Length= 50.0' Slope= 0.0530 '/'
Inlet Invert= 90.15', Outlet Invert= 87.50'



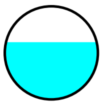
Summary for Reach 1Ra: Perforated Pipe

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 3.21" for 10-Year event
Inflow = 3.28 cfs @ 12.34 hrs, Volume= 0.609 af
Outflow = 3.28 cfs @ 12.38 hrs, Volume= 0.609 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.16 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 3.4 min

Peak Storage= 276 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 4.73 cfs

15.0" Round Pipe
n= 0.012
Length= 350.0' Slope= 0.0046 '/'
Inlet Invert= 93.25', Outlet Invert= 91.65'



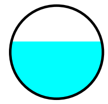
Summary for Reach 1Rb: Perforated Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 3.16" for 10-Year event
Inflow = 7.91 cfs @ 12.31 hrs, Volume= 1.313 af
Outflow = 7.90 cfs @ 12.32 hrs, Volume= 1.313 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.96 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.73 fps, Avg. Travel Time= 0.9 min

Peak Storage= 170 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe
n= 0.012
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 91.65', Outlet Invert= 90.15'



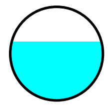
Summary for Reach 2R: Discharge Pipe

Inflow Area = 14.943 ac, 15.05% Impervious, Inflow Depth = 3.20" for 10-Year event
Inflow = 16.98 cfs @ 12.40 hrs, Volume= 3.989 af
Outflow = 16.97 cfs @ 12.41 hrs, Volume= 3.989 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 5.26 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 1.2 min

Peak Storage= 452 cf @ 12.40 hrs
Average Depth at Peak Storage= 1.56'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 23.75 cfs

30.0" Round Pipe
n= 0.012
Length= 140.0' Slope= 0.0029 '/'
Inlet Invert= 88.20', Outlet Invert= 87.80'



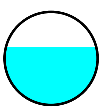
Summary for Reach 2Ra: Perforated Pipe A

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 3.02" for 10-Year event
Inflow = 4.82 cfs @ 12.50 hrs, Volume= 1.061 af
Outflow = 4.81 cfs @ 12.57 hrs, Volume= 1.061 af, Atten= 0%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.15 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 5.3 min

Peak Storage= 644 cf @ 12.53 hrs
Average Depth at Peak Storage= 0.94'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 6.75 cfs

18.0" Round Pipe
n= 0.012
Length= 555.0' Slope= 0.0035 '/'
Inlet Invert= 92.00', Outlet Invert= 90.05'



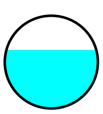
Summary for Reach 2Rb: Perforated Pipe B

Inflow Area = 10.585 ac, 4.84% Impervious, Inflow Depth = 3.02" for 10-Year event
Inflow = 10.77 cfs @ 12.55 hrs, Volume= 2.665 af
Outflow = 10.76 cfs @ 12.59 hrs, Volume= 2.665 af, Atten= 0%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.15 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 2.21 fps, Avg. Travel Time= 3.0 min

Peak Storage= 826 cf @ 12.57 hrs
Average Depth at Peak Storage= 1.26'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 14.85 cfs

24.0" Round Pipe
n= 0.012
Length= 395.0' Slope= 0.0037 '/'
Inlet Invert= 90.05', Outlet Invert= 88.60'



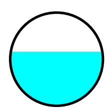
Summary for Reach 2Rc: Perforated Pipe C

Inflow Area = 13.951 ac, 9.01% Impervious, Inflow Depth = 3.09" for 10-Year event
Inflow = 15.74 cfs @ 12.49 hrs, Volume= 3.592 af
Outflow = 15.73 cfs @ 12.50 hrs, Volume= 3.592 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.32 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 1.0 min

Peak Storage= 384 cf @ 12.49 hrs
Average Depth at Peak Storage= 1.45'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 24.65 cfs

30.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0031 '/'
Inlet Invert= 88.60', Outlet Invert= 88.20'



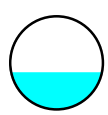
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 3.32" for 10-Year event
Inflow = 28.58 cfs @ 12.10 hrs, Volume= 4.987 af
Outflow = 28.27 cfs @ 12.11 hrs, Volume= 4.987 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 15.67 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.32 fps, Avg. Travel Time= 0.5 min

Peak Storage= 317 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.99'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 85.65 cfs

30.0" Round Pipe
n= 0.013
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 3.21" for 10-Year event
Inflow = 8.35 cfs @ 12.09 hrs, Volume= 0.609 af
Outflow = 3.28 cfs @ 12.34 hrs, Volume= 0.609 af, Atten= 61%, Lag= 14.9 min
Primary = 3.28 cfs @ 12.34 hrs, Volume= 0.609 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.19' @ 12.34 hrs Surf.Area= 7,729 sf Storage= 6,172 cf

Plug-Flow detention time= 51.1 min calculated for 0.609 af (100% of inflow)
Center-of-Mass det. time= 51.2 min (864.3 - 813.1)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=3.28 cfs @ 12.34 hrs HW=98.18' (Free Discharge)
1=Catch Basin (Orifice Controls 3.09 cfs @ 4.45 fps)
2=Exfiltration (Controls 0.19 cfs)

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 3.11" for 10-Year event
Inflow = 9.67 cfs @ 12.09 hrs, Volume= 0.704 af
Outflow = 4.67 cfs @ 12.27 hrs, Volume= 0.704 af, Atten= 52%, Lag= 10.6 min
Primary = 4.67 cfs @ 12.27 hrs, Volume= 0.704 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.20' @ 12.27 hrs Surf.Area= 7,152 sf Storage= 5,616 cf

Plug-Flow detention time= 41.0 min calculated for 0.704 af (100% of inflow)
Center-of-Mass det. time= 41.2 min (857.1 - 816.0)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	26,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	6,100	4,300	4,300
99.00	11,400	8,750	13,050
100.00	15,300	13,350	26,400

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=4.66 cfs @ 12.27 hrs HW=98.20' (Free Discharge)
1=Catch Basin (Orifice Controls 4.48 cfs @ 4.48 fps)
2=Exfiltration (Controls 0.18 cfs)

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 3.02" for 10-Year event
Inflow = 12.21 cfs @ 12.17 hrs, Volume= 1.061 af
Outflow = 4.82 cfs @ 12.50 hrs, Volume= 1.061 af, Atten= 61%, Lag= 20.3 min
Primary = 4.82 cfs @ 12.50 hrs, Volume= 1.061 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.17' @ 12.50 hrs Surf.Area= 16,109 sf Storage= 12,000 cf

Plug-Flow detention time= 52.5 min calculated for 1.060 af (100% of inflow)
Center-of-Mass det. time= 52.6 min (876.8 - 824.2)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	46,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	15,500	9,250	9,250
99.00	19,000	17,250	26,500
100.00	21,720	20,360	46,860

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=4.82 cfs @ 12.50 hrs HW=98.17' (Free Discharge)
1=Catch Basin (Orifice Controls 4.42 cfs @ 4.42 fps)
2=Exfiltration (Controls 0.40 cfs)

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 3.02" for 10-Year event
Inflow = 19.46 cfs @ 12.14 hrs, Volume= 1.604 af
Outflow = 5.97 cfs @ 12.53 hrs, Volume= 1.604 af, Atten= 69%, Lag= 23.3 min
Primary = 5.97 cfs @ 12.53 hrs, Volume= 1.604 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 96.07' @ 12.53 hrs Surf.Area= 23,892 sf Storage= 19,124 cf

Plug-Flow detention time= 40.5 min calculated for 1.604 af (100% of inflow)
Center-of-Mass det. time= 40.4 min (862.8 - 822.4)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	77,063 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,500	0	0
95.00	7,050	2,138	2,138
96.00	23,400	15,225	17,363
97.00	30,000	26,700	44,063
98.00	36,000	33,000	77,063

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=5.96 cfs @ 12.53 hrs HW=96.07' (Free Discharge)
1=Catch Basin (Orifice Controls 5.37 cfs @ 5.37 fps)
2=Exfiltration (Controls 0.59 cfs)

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 3.31" for 10-Year event
Inflow = 12.68 cfs @ 12.09 hrs, Volume= 0.928 af
Outflow = 5.27 cfs @ 12.32 hrs, Volume= 0.928 af, Atten= 58%, Lag= 13.5 min
Primary = 5.27 cfs @ 12.32 hrs, Volume= 0.928 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 95.94' @ 12.32 hrs Surf.Area= 8,244 sf Storage= 8,333 cf

Plug-Flow detention time= 36.2 min calculated for 0.927 af (100% of inflow)
Center-of-Mass det. time= 36.4 min (846.6 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	30,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,550	0	0
95.00	5,700	1,813	1,813
96.00	8,420	7,060	8,873
97.00	10,550	9,485	18,358
98.00	14,275	12,413	30,770

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

Device	Routing	Invert	Outlet Devices
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=5.27 cfs @ 12.32 hrs HW=95.93' (Free Discharge)
1=Catch Basin (Orifice Controls 5.06 cfs @ 5.06 fps)
2=Exfiltration (Controls 0.21 cfs)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 3.16" for 10-Year event
Inflow = 7.90 cfs @ 12.32 hrs, Volume= 1.313 af
Primary = 7.90 cfs @ 12.32 hrs, Volume= 1.313 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 3.32" for 10-Year event
Inflow = 28.27 cfs @ 12.11 hrs, Volume= 4.987 af
Primary = 28.27 cfs @ 12.11 hrs, Volume= 4.987 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1Sa: PR-DA-1S - CB-17B Catchment

Runoff = 11.09 cfs @ 12.09 hrs, Volume= 0.817 af, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
74,164	80	>75% Grass cover, Good, HSG D
6,867	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
2,569	98	Water Surface, HSG D
9,314	79	Woods, Fair, HSG D
99,151	83	Weighted Average
83,478		84.19% Pervious Area
15,674		15.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
2.6	190	0.0150	1.22		**Shallow Concentrated Flow, Shallow Conc. 1** Nearly Bare & Untilled Kv= 10.0 fps
0.7	96	0.0490	2.21		**Shallow Concentrated Flow, Shallow Conc. 2** Nearly Bare & Untilled Kv= 10.0 fps
2.1					**Direct Entry, Minimum TC**
6.0	336	Total			

Summary for Subcatchment 1Sb: PR-DA-1S - CB-16B Catchment

Runoff = 12.93 cfs @ 12.09 hrs, Volume= 0.949 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
93,694	80	>75% Grass cover, Good, HSG D
10,157	98	Paved parking, HSG D
2,498	98	Water Surface, HSG D
11,795	79	Woods, Fair, HSG D
118,144	82	Weighted Average
105,489		89.29% Pervious Area
12,655		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment 2Sa: PR-DA-2S - CB-8A Catchment

Runoff = 16.47 cfs @ 12.16 hrs, Volume= 1.438 af, Depth= 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
165,088	80	>75% Grass cover, Good, HSG D
5,904	98	Paved parking, HSG D
1,265	98	Roofs, HSG D
3,083	98	Water Surface, HSG D
8,216	79	Woods, Fair, HSG D
183,555	81	Weighted Average
173,304		94.42% Pervious Area
10,251		5.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0070	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
3.1	235	0.0070	1.25		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
11.9	285	Total			

Summary for Subcatchment 2Sb: PR-DA-2S - CB-11A Catchment

Runoff = 26.22 cfs @ 12.14 hrs, Volume= 2.174 af, Depth= 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
265,478	80	>75% Grass cover, Good, HSG D
10,628	98	Paved parking, HSG D
1,422	98	Water Surface, HSG D
277,528	81	Weighted Average
265,478		95.66% Pervious Area
12,050		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0090	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.0	175	0.0090	1.42		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
10.0	225	Total			

Summary for Subcatchment 2Sc: PR-DA-2S - CB-13A Catchment

Runoff = 16.74 cfs @ 12.09 hrs, Volume= 1.238 af, Depth= 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
108,361	80	>75% Grass cover, Good, HSG D
30,845	98	Paved parking, HSG D
1,607	98	Water Surface, HSG D
5,822	79	Woods, Fair, HSG D
146,635	84	Weighted Average
114,183		77.87% Pervious Area
32,452		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0220	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
0.3	40	0.0220	2.22		**Shallow Concentrated Flow, Shallow Conc.** Grassed Waterway Kv= 15.0 fps
0.1					**Direct Entry, Minimum TC**
6.0	90	Total			

Summary for Subcatchment 3S: PR-DA-3S - Upper Uniroyal Site

Runoff = 16.89 cfs @ 12.09 hrs, Volume= 1.292 af, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
8,648	89	<50% Grass cover, Poor, HSG D
55,625	80	>75% Grass cover, Good, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	90	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 1.46 cfs @ 12.09 hrs, Volume= 0.122 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 4.46 cfs @ 12.09 hrs, Volume= 0.373 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

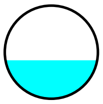
Summary for Reach 1R: Discharge Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 4.25" for 25-Year event
Inflow = 9.28 cfs @ 12.36 hrs, Volume= 1.766 af
Outflow = 9.27 cfs @ 12.36 hrs, Volume= 1.766 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.55 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.33 fps, Avg. Travel Time= 0.2 min

Peak Storage= 34 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 26.20 cfs

18.0" Round Pipe
n= 0.012
Length= 50.0' Slope= 0.0530 '/'
Inlet Invert= 90.15', Outlet Invert= 87.50'



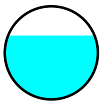
Summary for Reach 1Ra: Perforated Pipe

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 4.31" for 25-Year event
Inflow = 3.84 cfs @ 12.38 hrs, Volume= 0.817 af
Outflow = 3.84 cfs @ 12.42 hrs, Volume= 0.817 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.29 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 3.2 min

Peak Storage= 313 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 4.73 cfs

15.0" Round Pipe
n= 0.012
Length= 350.0' Slope= 0.0046 '/'
Inlet Invert= 93.25', Outlet Invert= 91.65'



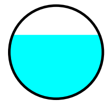
Summary for Reach 1Rb: Perforated Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 4.25" for 25-Year event
Inflow = 9.28 cfs @ 12.35 hrs, Volume= 1.766 af
Outflow = 9.28 cfs @ 12.36 hrs, Volume= 1.766 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.18 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.91 fps, Avg. Travel Time= 0.9 min

Peak Storage= 194 cf @ 12.36 hrs
Average Depth at Peak Storage= 1.03'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe
n= 0.012
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 91.65', Outlet Invert= 90.15'



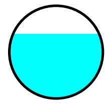
Summary for Reach 2R: Discharge Pipe

Inflow Area = 14.943 ac, 15.05% Impervious, Inflow Depth = 4.29" for 25-Year event
Inflow = 19.72 cfs @ 12.40 hrs, Volume= 5.344 af
Outflow = 19.70 cfs @ 12.42 hrs, Volume= 5.344 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 5.41 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.13 fps, Avg. Travel Time= 1.1 min

Peak Storage= 510 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.74'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 23.75 cfs

30.0" Round Pipe
n= 0.012
Length= 140.0' Slope= 0.0029 '/'
Inlet Invert= 88.20', Outlet Invert= 87.80'



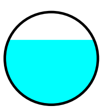
Summary for Reach 2Ra: Perforated Pipe A

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 4.09" for 25-Year event
Inflow = 5.63 cfs @ 12.54 hrs, Volume= 1.438 af
Outflow = 5.62 cfs @ 12.61 hrs, Volume= 1.438 af, Atten= 0%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.27 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.87 fps, Avg. Travel Time= 4.9 min

Peak Storage= 731 cf @ 12.57 hrs
Average Depth at Peak Storage= 1.05'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 6.75 cfs

18.0" Round Pipe
n= 0.012
Length= 555.0' Slope= 0.0035 '/'
Inlet Invert= 92.00', Outlet Invert= 90.05'



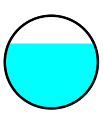
Summary for Reach 2Rb: Perforated Pipe B

Inflow Area = 10.585 ac, 4.84% Impervious, Inflow Depth = 4.09" for 25-Year event
Inflow = 12.40 cfs @ 12.59 hrs, Volume= 3.611 af
Outflow = 12.39 cfs @ 12.63 hrs, Volume= 3.611 af, Atten= 0%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.29 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 2.8 min

Peak Storage= 926 cf @ 12.61 hrs
Average Depth at Peak Storage= 1.40'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 14.85 cfs

24.0" Round Pipe
n= 0.012
Length= 395.0' Slope= 0.0037 '/'
Inlet Invert= 90.05', Outlet Invert= 88.60'



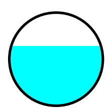
Summary for Reach 2Rc: Perforated Pipe C

Inflow Area = 13.951 ac, 9.01% Impervious, Inflow Depth = 4.17" for 25-Year event
Inflow = 18.29 cfs @ 12.52 hrs, Volume= 4.849 af
Outflow = 18.28 cfs @ 12.53 hrs, Volume= 4.849 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.50 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.31 fps, Avg. Travel Time= 0.9 min

Peak Storage= 432 cf @ 12.53 hrs
Average Depth at Peak Storage= 1.60'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 24.65 cfs

30.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0031 '/'
Inlet Invert= 88.60', Outlet Invert= 88.20'



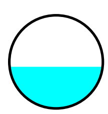
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 4.42" for 25-Year event
Inflow = 35.21 cfs @ 12.10 hrs, Volume= 6.636 af
Outflow = 34.86 cfs @ 12.10 hrs, Volume= 6.636 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 16.57 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.77 fps, Avg. Travel Time= 0.5 min

Peak Storage= 370 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.11'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 85.65 cfs

30.0" Round Pipe
n= 0.013
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 4.31" for 25-Year event
Inflow = 11.09 cfs @ 12.09 hrs, Volume= 0.817 af
Outflow = 3.84 cfs @ 12.38 hrs, Volume= 0.817 af, Atten= 65%, Lag= 17.3 min
Primary = 3.84 cfs @ 12.38 hrs, Volume= 0.817 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.50' @ 12.38 hrs Surf.Area= 8,803 sf Storage= 8,782 cf

Plug-Flow detention time= 46.2 min calculated for 0.816 af (100% of inflow)
Center-of-Mass det. time= 46.4 min (851.2 - 804.8)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=3.84 cfs @ 12.38 hrs HW=98.50' (Free Discharge)
—**1=Catch Basin** (Orifice Controls 3.62 cfs @ 5.21 fps)
—**2=Exfiltration** (Controls 0.22 cfs)

Summary for Pond 1Pb: CB-16B Basin

Inflow Area = 2.712 ac, 10.71% Impervious, Inflow Depth = 4.20" for 25-Year event
Inflow = 12.93 cfs @ 12.09 hrs, Volume= 0.949 af
Outflow = 5.47 cfs @ 12.31 hrs, Volume= 0.949 af, Atten= 58%, Lag= 13.0 min
Primary = 5.47 cfs @ 12.31 hrs, Volume= 0.949 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.52' @ 12.31 hrs Surf.Area= 8,854 sf Storage= 8,186 cf

Plug-Flow detention time= 36.4 min calculated for 0.949 af (100% of inflow)
Center-of-Mass det. time= 36.3 min (843.7 - 807.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	26,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	6,100	4,300	4,300
99.00	11,400	8,750	13,050
100.00	15,300	13,350	26,400

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=5.47 cfs @ 12.31 hrs HW=98.52' (Free Discharge)
—**1=Catch Basin** (Orifice Controls 5.25 cfs @ 5.25 fps)
—**2=Exfiltration** (Controls 0.22 cfs)

Summary for Pond 2Pa: CB-8A Basin

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 4.09" for 25-Year event
Inflow = 16.47 cfs @ 12.16 hrs, Volume= 1.438 af
Outflow = 5.63 cfs @ 12.54 hrs, Volume= 1.438 af, Atten= 66%, Lag= 22.5 min
Primary = 5.63 cfs @ 12.54 hrs, Volume= 1.438 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.50' @ 12.54 hrs Surf.Area= 17,240 sf Storage= 17,390 cf

Plug-Flow detention time= 50.2 min calculated for 1.437 af (100% of inflow)
Center-of-Mass det. time= 50.3 min (865.9 - 815.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	46,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	15,500	9,250	9,250
99.00	19,000	17,250	26,500
100.00	21,720	20,360	46,860

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=5.63 cfs @ 12.54 hrs HW=98.50' (Free Discharge)
—**1=Catch Basin** (Orifice Controls 5.20 cfs @ 5.20 fps)
—**2=Exfiltration** (Controls 0.43 cfs)

Summary for Pond 2Pb: CB-11A Basin

Inflow Area = 6.371 ac, 4.34% Impervious, Inflow Depth = 4.09" for 25-Year event
Inflow = 26.22 cfs @ 12.14 hrs, Volume= 2.174 af
Outflow = 6.78 cfs @ 12.57 hrs, Volume= 2.174 af, Atten= 74%, Lag= 25.6 min
Primary = 6.78 cfs @ 12.57 hrs, Volume= 2.174 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 96.44' @ 12.57 hrs Surf.Area= 26,327 sf Storage= 28,388 cf

Plug-Flow detention time= 44.7 min calculated for 2.172 af (100% of inflow)
Center-of-Mass det. time= 44.8 min (858.6 - 813.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	77,063 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,500	0	0
95.00	7,050	2,138	2,138
96.00	23,400	15,225	17,363
97.00	30,000	26,700	44,063
98.00	36,000	33,000	77,063

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=6.78 cfs @ 12.57 hrs HW=96.44' (Free Discharge)
—**1=Catch Basin** (Orifice Controls 6.11 cfs @ 6.11 fps)
—**2=Exfiltration** (Controls 0.67 cfs)

Summary for Pond 2Pc: CB-13A Basin

Inflow Area = 3.366 ac, 22.13% Impervious, Inflow Depth = 4.41" for 25-Year event
Inflow = 16.74 cfs @ 12.09 hrs, Volume= 1.238 af
Outflow = 6.18 cfs @ 12.35 hrs, Volume= 1.238 af, Atten= 63%, Lag= 15.9 min
Primary = 6.18 cfs @ 12.35 hrs, Volume= 1.238 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 96.36' @ 12.35 hrs Surf.Area= 9,178 sf Storage= 12,003 cf

Plug-Flow detention time= 33.9 min calculated for 1.237 af (100% of inflow)
Center-of-Mass det. time= 34.0 min (836.1 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	30,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,550	0	0
95.00	5,700	1,813	1,813
96.00	8,420	7,060	8,873
97.00	10,550	9,485	18,358
98.00	14,275	12,413	30,770

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

Device	Routing	Invert	Outlet Devices
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=6.18 cfs @ 12.35 hrs HW=96.36' (Free Discharge)
—**1=Catch Basin** (Orifice Controls 5.95 cfs @ 5.95 fps)
—**2=Exfiltration** (Controls 0.24 cfs)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 4.25" for 25-Year event
Inflow = 9.27 cfs @ 12.36 hrs, Volume= 1.766 af
Primary = 9.27 cfs @ 12.36 hrs, Volume= 1.766 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2L: Chicopee River

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 4.42" for 25-Year event
Inflow = 34.86 cfs @ 12.10 hrs, Volume= 6.636 af
Primary = 34.86 cfs @ 12.10 hrs, Volume= 6.636 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1Sa: PR-DA-1S - CB-17B Catchment

Runoff = 15.34 cfs @ 12.09 hrs, Volume= 1.146 af, Depth= 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
74,164	80	>75% Grass cover, Good, HSG D
6,867	98	Paved parking, HSG D
6,237	98	Roofs, HSG D
2,569	98	Water Surface, HSG D
9,314	79	Woods, Fair, HSG D
99,151	83	Weighted Average
83,478		84.19% Pervious Area
15,674		15.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0280	1.33		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.00"
2.6	190	0.0150	1.22		**Shallow Concentrated Flow, Shallow Conc. 1** Nearly Bare & Untilled Kv= 10.0 fps
0.7	96	0.0490	2.21		**Shallow Concentrated Flow, Shallow Conc. 2** Nearly Bare & Untilled Kv= 10.0 fps
2.1					**Direct Entry, Minimum TC**
6.0	336	Total			

Summary for Subcatchment 1Sb: PR-DA-1S - CB-16B Catchment

Runoff = 18.00 cfs @ 12.09 hrs, Volume= 1.339 af, Depth= 5.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
93,694	80	>75% Grass cover, Good, HSG D
10,157	98	Paved parking, HSG D
2,498	98	Water Surface, HSG D
11,795	79	Woods, Fair, HSG D
118,144	82	Weighted Average
105,489		89.29% Pervious Area
12,655		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment 2Sa: PR-DA-2S - CB-8A Catchment

Runoff = 23.11 cfs @ 12.16 hrs, Volume= 2.040 af, Depth= 5.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
165,088	80	>75% Grass cover, Good, HSG D
5,904	98	Paved parking, HSG D
1,265	98	Roofs, HSG D
3,083	98	Water Surface, HSG D
8,216	79	Woods, Fair, HSG D
183,555	81	Weighted Average
173,304		94.42% Pervious Area
10,251		5.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0070	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
3.1	235	0.0070	1.25		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
11.9	285	Total			

Summary for Subcatchment 2Sb: PR-DA-2S - CB-11A Catchment

Runoff = 36.75 cfs @ 12.14 hrs, Volume= 3.084 af, Depth= 5.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
265,478	80	>75% Grass cover, Good, HSG D
10,628	98	Paved parking, HSG D
1,422	98	Water Surface, HSG D
277,528	81	Weighted Average
265,478		95.66% Pervious Area
12,050		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0090	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
2.0	175	0.0090	1.42		**Shallow Concentrated Flow, Shallow Conc. 1** Grassed Waterway Kv= 15.0 fps
10.0	225	Total			

Summary for Subcatchment 2Sc: PR-DA-2S - CB-13A Catchment

Runoff = 23.02 cfs @ 12.09 hrs, Volume= 1.729 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
108,361	80	>75% Grass cover, Good, HSG D
30,845	98	Paved parking, HSG D
1,607	98	Water Surface, HSG D
5,822	79	Woods, Fair, HSG D
146,635	84	Weighted Average
114,183		77.87% Pervious Area
32,452		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0220	0.15		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.00"
0.3	40	0.0220	2.22		**Shallow Concentrated Flow, Shallow Conc.** Grassed Waterway Kv= 15.0 fps
0.1					**Direct Entry, Minimum TC**
6.0	90	Total			

Summary for Subcatchment 3S: PR-DA-3S - Upper Uniroyal Site

Runoff = 22.50 cfs @ 12.09 hrs, Volume= 1.752 af, Depth= 6.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
8,648	89	<50% Grass cover, Poor, HSG D
55,625	80	>75% Grass cover, Good, HSG D
17,187	98	Paved parking, HSG D
51,767	98	Roofs, HSG D
133,228	90	Weighted Average
64,274		48.24% Pervious Area
68,954		51.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B26: Building 26

Runoff = 1.89 cfs @ 12.09 hrs, Volume= 0.159 af, Depth= 7.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
10,635	98	Roofs, HSG D
10,635		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

Summary for Subcatchment B27: Building 27

Runoff = 5.78 cfs @ 12.09 hrs, Volume= 0.488 af, Depth= 7.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.07"

Area (sf)	CN	Description
32,552	98	Roofs, HSG D
32,552		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum TC**

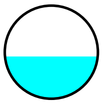
Summary for Reach 1R: Discharge Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 5.98" for 100-Year event
Inflow = 11.00 cfs @ 12.41 hrs, Volume= 2.486 af
Outflow = 11.00 cfs @ 12.42 hrs, Volume= 2.486 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.18 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.77 fps, Avg. Travel Time= 0.1 min

Peak Storage= 39 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 26.20 cfs

18.0" Round Pipe
n= 0.012
Length= 50.0' Slope= 0.0530 '/'
Inlet Invert= 90.15', Outlet Invert= 87.50'



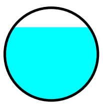
Summary for Reach 1Ra: Perforated Pipe

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 6.04" for 100-Year event
Inflow = 4.55 cfs @ 12.42 hrs, Volume= 1.146 af
Outflow = 4.55 cfs @ 12.47 hrs, Volume= 1.146 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.95 fps, Avg. Travel Time= 3.0 min

Peak Storage= 363 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.98'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 4.73 cfs

15.0" Round Pipe
n= 0.012
Length= 350.0' Slope= 0.0046 '/'
Inlet Invert= 93.25', Outlet Invert= 91.65'



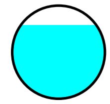
Summary for Reach 1Rb: Perforated Pipe

Inflow Area = 4.988 ac, 13.04% Impervious, Inflow Depth = 5.98" for 100-Year event
Inflow = 11.00 cfs @ 12.40 hrs, Volume= 2.486 af
Outflow = 11.00 cfs @ 12.41 hrs, Volume= 2.486 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.34 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.14 fps, Avg. Travel Time= 0.8 min

Peak Storage= 225 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.19'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe
n= 0.012
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 91.65', Outlet Invert= 90.15'



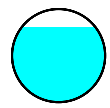
Summary for Reach 2R: Discharge Pipe

Inflow Area = 14.943 ac, 15.05% Impervious, Inflow Depth = 6.02" for 100-Year event
Inflow = 23.37 cfs @ 12.41 hrs, Volume= 7.499 af
Outflow = 23.35 cfs @ 12.42 hrs, Volume= 7.499 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 5.52 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.35 fps, Avg. Travel Time= 1.0 min

Peak Storage= 593 cf @ 12.41 hrs
Average Depth at Peak Storage= 2.01'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 23.75 cfs

30.0" Round Pipe
n= 0.012
Length= 140.0' Slope= 0.0029 '/'
Inlet Invert= 88.20', Outlet Invert= 87.80'



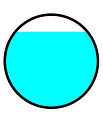
Summary for Reach 2Ra: Perforated Pipe A

Inflow Area = 4.214 ac, 5.58% Impervious, Inflow Depth = 5.81" for 100-Year event
Inflow = 6.71 cfs @ 12.58 hrs, Volume= 2.040 af
Outflow = 6.70 cfs @ 12.65 hrs, Volume= 2.040 af, Atten= 0%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.35 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 2.02 fps, Avg. Travel Time= 4.6 min

Peak Storage= 855 cf @ 12.61 hrs
Average Depth at Peak Storage= 1.22'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 6.75 cfs

18.0" Round Pipe
n= 0.012
Length= 555.0' Slope= 0.0035 '/'
Inlet Invert= 92.00', Outlet Invert= 90.05'



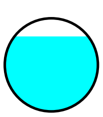
Summary for Reach 2Rb: Perforated Pipe B

Inflow Area = 10.585 ac, 4.84% Impervious, Inflow Depth = 5.81" for 100-Year event
Inflow = 14.57 cfs @ 12.63 hrs, Volume= 5.123 af
Outflow = 14.56 cfs @ 12.68 hrs, Volume= 5.123 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.39 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 2.57 fps, Avg. Travel Time= 2.6 min

Peak Storage= 1,068 cf @ 12.66 hrs
Average Depth at Peak Storage= 1.61'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 14.85 cfs

24.0" Round Pipe
n= 0.012
Length= 395.0' Slope= 0.0037 '/'
Inlet Invert= 90.05', Outlet Invert= 88.60'



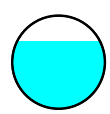
Summary for Reach 2Rc: Perforated Pipe C

Inflow Area = 13.951 ac, 9.01% Impervious, Inflow Depth = 5.89" for 100-Year event
Inflow = 21.65 cfs @ 12.57 hrs, Volume= 6.852 af
Outflow = 21.64 cfs @ 12.58 hrs, Volume= 6.852 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 5.66 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.51 fps, Avg. Travel Time= 0.9 min

Peak Storage= 497 cf @ 12.57 hrs
Average Depth at Peak Storage= 1.82'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 24.65 cfs

30.0" Round Pipe
n= 0.012
Length= 130.0' Slope= 0.0031 '/'
Inlet Invert= 88.60', Outlet Invert= 88.20'



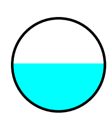
Summary for Reach 3R: Uniroyal South Outfall (Exist.)

Inflow Area = 18.001 ac, 21.28% Impervious, Inflow Depth = 6.17" for 100-Year event
Inflow = 44.92 cfs @ 12.10 hrs, Volume= 9.251 af
Outflow = 44.48 cfs @ 12.10 hrs, Volume= 9.251 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 17.63 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 6.38 fps, Avg. Travel Time= 0.5 min

Peak Storage= 444 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.28'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 85.65 cfs

30.0" Round Pipe
n= 0.013
Length= 175.0' Slope= 0.0436 '/'
Inlet Invert= 85.85', Outlet Invert= 78.22'



Summary for Pond 1Pa: CB-17B Basin

Inflow Area = 2.276 ac, 15.81% Impervious, Inflow Depth = 6.04" for 100-Year event
Inflow = 15.34 cfs @ 12.09 hrs, Volume= 1.146 af
Outflow = 4.55 cfs @ 12.42 hrs, Volume= 1.146 af, Atten= 70%, Lag= 20.0 min
Primary = 4.55 cfs @ 12.42 hrs, Volume= 1.146 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.97' @ 12.42 hrs Surf.Area= 10,404 sf Storage= 13,304 cf

Plug-Flow detention time= 44.2 min calculated for 1.146 af (100% of inflow)
Center-of-Mass det. time= 44.1 min (839.4 - 795.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	25,350 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	7,100	4,800	4,800
99.00	10,500	8,800	13,600
100.00	13,000	11,750	25,350

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=4.55 cfs @ 12.42 hrs HW=98.97' (Free Discharge)
1=Catch Basin (Orifice Controls 4.28 cfs @ 6.17 fps)
2=Exfiltration (Controls 0.27 cfs)

Summary for Pond 1Pb: CB-16B Basin

Inflow Area =	2.712 ac, 10.71% Impervious, Inflow Depth = 5.93" for 100-Year event			
Inflow	=	18.00 cfs @ 12.09 hrs, Volume=	1.339 af	
Outflow	=	6.48 cfs @ 12.36 hrs, Volume=	1.339 af, Atten= 64%, Lag= 16.3 min	
Primary	=	6.48 cfs @ 12.36 hrs, Volume=	1.339 af	

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 98.98' @ 12.36 hrs Surf.Area= 11,306 sf Storage= 12,850 cf

Plug-Flow detention time= 33.2 min calculated for 1.339 af (100% of inflow)
Center-of-Mass det. time= 33.4 min (831.2 - 797.8)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	26,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	2,500	0	0
98.00	6,100	4,300	4,300
99.00	11,400	8,750	13,050
100.00	15,300	13,350	26,400

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 82.50'

Primary OutFlow Max=6.47 cfs @ 12.36 hrs HW=98.98' (Free Discharge)
1=Catch Basin (Orifice Controls 6.19 cfs @ 6.19 fps)
2=Exfiltration (Controls 0.29 cfs)

Summary for Pond 2Pa: CB-8A Basin

Inflow Area =	4.214 ac, 5.58% Impervious, Inflow Depth = 5.81" for 100-Year event		
Inflow	=	23.11 cfs @ 12.16 hrs, Volume=	2.040 af
Outflow	=	6.71 cfs @ 12.58 hrs, Volume=	2.040 af, Atten= 71%, Lag= 24.8 min
Primary	=	6.71 cfs @ 12.58 hrs, Volume=	2.040 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 99.00' @ 12.58 hrs Surf.Area= 19,011 sf Storage= 26,575 cf

Plug-Flow detention time= 51.2 min calculated for 2.038 af (100% of inflow)
Center-of-Mass det. time= 51.3 min (857.0 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	46,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.00	3,000	0	0
98.00	15,500	9,250	9,250
99.00	19,000	17,250	26,500
100.00	21,720	20,360	46,860

Device	Routing	Invert	Outlet Devices
#1	Primary	97.33'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	97.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00'

Primary OutFlow Max=6.71 cfs @ 12.58 hrs HW=99.00' (Free Discharge)
1=Catch Basin (Orifice Controls 6.23 cfs @ 6.23 fps)
2=Exfiltration (Controls 0.48 cfs)

Summary for Pond 2Pb: CB-11A Basin

Inflow Area =	6.371 ac, 4.34% Impervious, Inflow Depth = 5.81" for 100-Year event		
Inflow	=	36.75 cfs @ 12.14 hrs, Volume=	3.084 af
Outflow	=	7.87 cfs @ 12.61 hrs, Volume=	3.084 af, Atten= 79%, Lag= 28.2 min
Primary	=	7.87 cfs @ 12.61 hrs, Volume=	3.084 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.00' @ 12.61 hrs Surf.Area= 30,011 sf Storage= 44,116 cf

Plug-Flow detention time= 54.2 min calculated for 3.082 af (100% of inflow)
Center-of-Mass det. time= 54.3 min (858.3 - 803.9)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	77,063 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,500	0	0
95.00	7,050	2,138	2,138
96.00	23,400	15,225	17,363
97.00	30,000	26,700	44,063
98.00	36,000	33,000	77,063

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=7.87 cfs @ 12.61 hrs HW=97.00' (Free Discharge)
1=Catch Basin (Orifice Controls 7.09 cfs @ 7.09 fps)
2=Exfiltration (Controls 0.78 cfs)

Summary for Pond 2Pc: CB-13A Basin

Inflow Area =	3.366 ac, 22.13% Impervious, Inflow Depth = 6.16" for 100-Year event		
Inflow	=	23.02 cfs @ 12.09 hrs, Volume=	1.729 af
Outflow	=	7.37 cfs @ 12.40 hrs, Volume=	1.729 af, Atten= 68%, Lag= 18.5 min
Primary	=	7.37 cfs @ 12.40 hrs, Volume=	1.729 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 97.00' @ 12.40 hrs Surf.Area= 10,548 sf Storage= 18,348 cf

Plug-Flow detention time= 33.3 min calculated for 1.728 af (100% of inflow)
Center-of-Mass det. time= 33.5 min (826.2 - 792.8)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	30,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.50	1,550	0	0
95.00	5,700	1,813	1,813
96.00	8,420	7,060	8,873
97.00	10,550	9,485	18,358
98.00	14,275	12,413	30,770

Device	Routing	Invert	Outlet Devices
#1	Primary	94.83'	**2.0" x 2.0" Horiz. Catch Basin X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

#2	Primary	94.50'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.50'

Primary OutFlow Max=7.37 cfs @ 12.40 hrs HW=97.00' (Free Discharge)
1=Catch Basin (Orifice Controls 7.09 cfs @ 7.09 fps)
2=Exfiltration (Controls 0.28 cfs)

Summary for Link 1L: Facemate Interceptor Drain

Inflow Area =	4.988 ac, 13.04% Impervious, Inflow Depth = 5.98" for 100-Year event		
Inflow	=	11.00 cfs @ 12.42 hrs, Volume=	2.486 af
Primary	=	11.00 cfs @ 12.42 hrs, Volume=	2.486 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Summary for Link 2L: Chicopee River

Inflow Area =	18.001 ac, 21.28% Impervious, Inflow Depth = 6.17" for 100-Year event		
Inflow	=	44.48 cfs @ 12.10 hrs, Volume=	9.251 af
Primary	=	44.48 cfs @ 12.10 hrs, Volume=	9.251 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

APPENDIX G – SUPPLEMENTAL CALCULATIONS

BETA

1 Springfield Street
Suite 4
Chicopee, MA 01013
413.331.5326
www.BETA-Inc.com

JOB Uniroyal & Facemate ACOE NO. 5100
CALC SLB DATE 03/10/21
DESC Recharge and Water Quality Volume SHEET 1 OF 2

Facemate System

Post-Development Impervious Area =	**23261**	sq. ft.
Pre-Development Impervious Area =	**23261**	sq. ft.
Net New Impervious Area =	**0**	sq. ft.
Post-Development Roof Area =	**6240**	sq. ft.

Required Recharge Volume

Recharge Volume (R_V) Required = New Impervious Area x Runoff Depth (from HSG)

R_V (Urban Land*) =	**0.00**	sf. x	**0.10**	in x	0.083	ft/in =	0	cu. ft.
R_V Required =							**0**	cu. ft.

Provided Recharge Volume

Infiltration provided within basins anticipated to be collected via underdrain
Therefore, no recharge volume provided.

Required Water Quality Volume

Water Quality Volume (WQ_V) Required = Impervious Area x Runoff Depth (Excluding roof area)

WQ_V Required =	**17,021**	sf. x	**0.5**	in x	0.083	ft/in =	709	cu. ft.
WQ_V Required =							**709**	cu. ft.

Provided Volumes

Volume Provided : Storage Volume below Lowest Invert

	Basin - CB-16B		**Basin - CB-17B**	
Invert Elev.	97.33	ft	97.33	ft
Storage Volume @ Invert	910	cu. ft.	955	cu. ft.
Bottom Surface Area (A_s)	3,565	sq. ft.	3,880	sq. ft.

Refer to HydroCAD model for determinaiton of storage volume

WQ_V Provided = **1,865** cu. ft.

Time to Empty - Drawdown Time

Time to Drawdown = Volume below outlet / Infiltration Rate x Surface Area

Basin 1: T_D =	**910**	**cf. /**	**0.0142**	ft/hr x	**3565**	sq. ft. =	**18.0 hrs**
Basin 2: T_D =	**955**	**cf. /**	**0.0142**	ft/hr x	**3,880**	sq. ft. =	**17.4 hrs**

* Hydrologic Soil Goup (HSG) D assumed for urban land
**0.34 ft/day (0.17 in/hr) inf. rate based on Mass Stormwater Handbook

BETA
1 Springfield Street
Suite 4
Chicopee, MA 01013
413.331.5326
www.BETA-Inc.com

Uniroyal System

Post-Development Impervious Area* =	160783	sq. ft.
Pre-Development Impervious Area* =	191661	
Net New Impervious Area =	-30878	sq. ft.
Post-Development Roof Area* =	94954	sq. ft.

Note: Areas do not include impervipus portions of Watershed 3S, which is beyond the limits of work

Required Recharge Volume

Recharge Volume (R_V) Required = New Impervious Area x Runoff Depth (from HSG)

R_V (Urban Land*) =	-30878	sf. x	0.10	in x	0.083	ft/in =	-257.32	cu. ft.
R_V Required =							**-257**	cu. ft.

Provided Recharge Volume

Infiltration provided within basins anticipated to be collected via underdrain
Therefore, no recharge volume provided.

Required Water Quality Volume

Water Quality Volume (WQ_V) Required = Impervious Area x Runoff Depth (Excluding roof area)

WQ_V Required =	65,829	sf. x	0.5	in x	0.083	ft/in =	2743	cu. ft.
WQ_V Required =							**2743**	cu. ft.

Provided Volumes

Volume Provided : Storage Volume below Lowest Invert

	Basin - CB-8A		**Basin - CB-11A**		**Basin - CB-13A**	
Invert Elev.	97.33	ft	94.83	ft	94.83	ft
Storage Volume @ Invert	1,460	cu. ft.	945	cu. ft.	830	cu. ft.
Bottom Surface Area (A_s)	6750	sq. ft.	4800	sq. ft.	4020	sq. ft.

Refer to HydroCAD model for determinaiton of storage volume

WQ_V Provided = 3,235 cu. ft.

Time to Empty - Drawdown Time

Time to Drawdown = Volume below outlet / Infiltration Rate x Surface Area

Basin 1: T_D =	1,460	cf. /	0.0142	ft/hr* x	6750	sq. ft. =	**15.3 hrs**
Basin 2: T_D =	945	cf. /	0.0142	ft/hr* x	4,800	sq. ft. =	**13.9 hrs**
Basin 3: T_D =	830	cf. /	0.0142	ft/hr* x	4,020	sq. ft. =	**14.6 hrs**

* Hydrologic Soil Goup (HSG) D assumed for urban land
**0.34 ft/day (0.17 in/hr) inf. rate based on Mass Stormwater Handbook

Capacties of Outlet Pipes		Date:	3/10/2021
Project:	Uniroyal & Facemate ACOE	Job No.	5100
Town:	Chicopee, MA	Calc. by:	SLB

Facemate Drainage System

Mannings Formula

$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Pipe - CB-17B to CB-16B (1RA)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$

15 in HDPE

n =	0.012		r_H	0.3125
A =	1.23 sf.		P	3.93
S =	0.0045 ft/ft			
Q_{FULL} =	4.71 cfs		V_{FULL} =	3.84
100-yr flow	4.55 cfs	OK		

Pipe - CB-16B to DM-14 (1R & 1RB)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$

18 in HDPE

n =	0.012		r_H	0.375
A =	1.77 sf.		P	4.71
S =	0.0100 ft/ft			
Q_{FULL} =	11.41 cfs		V_{FULL} =	6.46
100-yr flow	11.0 cfs	OK		

Capacties of Outlet Pipes		Date:	3/10/2021
Project:	Uniroyal & Facemate ACOE	Job No.	5100
Town:	Chicopee, MA	Calc. by:	SLB

Uniroyal Drainage System

Pipe - CB-8A Basin to CB-11A Basin (2Ra)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 18 in HDPE

n =	0.012	r_H	0.375
A =	1.77 sf.	P	4.71
S =	0.0035 ft/ft		
Q_{FULL} =	6.75 cfs	V_{FULL} =	3.82
100-yr flow =	6.70 cfs	OK	

Pipe - CB-11A Basin to CB-13A Basin (2Rb)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 24 in HDPE

n =	0.012	r_H	0.5
A =	3.14 sf.	P	6.28
S =	0.0036 ft/ft		
Q_{FULL} =	14.74 cfs	V_{FULL} =	4.69
100-yr flow =	14.56 cfs	OK	

Pipe - CB-13A Basin to DMH-14 (2Rc)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 30 in HDPE

n =	0.012	r_H	0.625
A =	4.91 sf.	P	7.85
S =	0.0030 ft/ft		
Q_{FULL} =	24.40 cfs	V_{FULL} =	4.97
100-yr flow =	21.66 cfs	OK	

Pipe - DMH-14A to DMH-17 (2R)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 30 in HDPE

n =	0.012	r_H	0.625
A =	4.91 sf.	P	7.85
S =	0.0030 ft/ft		
Q_{FULL} =	24.40 cfs	V_{FULL} =	4.97
100-yr flow =	23.4 cfs	OK	

Capacties of Outlet Pipes		Date:	3/10/2021
Project:	Uniroyal & Facemate ACOE	Job No.	5100
Town:	Chicopee, MA	Calc. by:	SLB

Find Min Slope to Provide Self Cleaning Velocities (2.0 ft/s)

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 15 in HDPE

	$n =$ 0.012		r_H	0.313
HALF FULL	$A =$ 0.61 sf.		P	1.96
	$S =$ 0.0012 ft/ft			
HALF FULL	$Q_{FULL} =$ 1.22 cfs		$V_{FULL} =$	1.98 OK

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 18 in HDPE

	$n =$ 0.012		r_H	0.375
HALF FULL	$A =$ 0.88 sf.		P	2.36
	$S =$ 0.001 ft/ft			
HALF FULL	$Q_{FULL} =$ 1.80 cfs		$V_{FULL} =$	2.04 OK

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 24 in HDPE

	$n =$ 0.012		r_H	0.500
HALF FULL	$A =$ 1.57 sf.		P	3.14
	$S =$ 0.0007 ft/ft			
HALF FULL	$Q_{FULL} =$ 3.25 cfs		$V_{FULL} =$	2.07 OK

$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$ — 30 in HDPE

	$n =$ 0.012		r_H	0.625
HALF FULL	$A =$ 2.45 sf.		P	3.93
	$S =$ 0.0005 ft/ft			
HALF FULL	$Q_{FULL} =$ 4.98 cfs		$V_{FULL} =$	2.03 OK

TSS Removal Calculations		Date:	3/10/2021
Project:	Uniroyal & Facemate ACOE	Job No.	5100
City:	Chicopee, MA	Calc. by:	SLB

Total Suspended Solids (TSS)
Removal Rate Worksheet

Best Management Practice (BMP)	BMP Removal Rate	Remaining TSS	Cumulative Removal Rate
Untreated Runoff	0%	100%	0%
Deep Sump Drainage Structure	25%	75%	25%

Note: TSS Removal Rates based on Massachusetts Stormwater Handbook, Volume 1, Chapter 1, Page 11

NOAA Atlas 14, Volume 10, Version 3
Location name: Chicopee, Massachusetts, USA*
Latitude: 42.1547°, Longitude: -72.5856°
Elevation: 130.77 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.333 (0.257-0.427)	0.400 (0.308-0.514)	0.510 (0.391-0.657)	0.601 (0.459-0.779)	0.726 (0.537-0.986)	0.821 (0.596-1.14)	0.919 (0.648-1.33)	1.03 (0.689-1.53)	1.18 (0.763-1.82)	1.30 (0.823-2.05)
10-min	0.472 (0.364-0.605)	0.567 (0.437-0.728)	0.722 (0.554-0.931)	0.851 (0.650-1.10)	1.03 (0.761-1.40)	1.16 (0.843-1.62)	1.30 (0.918-1.88)	1.46 (0.977-2.16)	1.67 (1.08-2.58)	1.84 (1.17-2.91)
15-min	0.555 (0.428-0.712)	0.667 (0.514-0.856)	0.850 (0.652-1.10)	1.00 (0.764-1.30)	1.21 (0.895-1.64)	1.37 (0.993-1.90)	1.53 (1.08-2.21)	1.71 (1.15-2.54)	1.97 (1.27-3.03)	2.17 (1.37-3.42)
30-min	0.751 (0.579-0.963)	0.903 (0.695-1.16)	1.15 (0.883-1.48)	1.36 (1.04-1.76)	1.64 (1.21-2.23)	1.85 (1.35-2.58)	2.08 (1.46-3.00)	2.32 (1.56-3.45)	2.66 (1.73-4.11)	2.94 (1.86-4.64)
60-min	0.947 (0.730-1.21)	1.14 (0.877-1.46)	1.45 (1.11-1.87)	1.71 (1.31-2.22)	2.07 (1.53-2.81)	2.34 (1.70-3.25)	2.62 (1.85-3.78)	2.93 (1.97-4.35)	3.36 (2.18-5.19)	3.71 (2.35-5.86)
2-hr	1.21 (0.940-1.54)	1.45 (1.12-1.84)	1.83 (1.42-2.34)	2.15 (1.66-2.77)	2.60 (1.94-3.51)	2.93 (2.15-4.06)	3.28 (2.34-4.74)	3.69 (2.49-5.45)	4.30 (2.79-6.60)	4.82 (3.06-7.55)
3-hr	1.38 (1.08-1.75)	1.66 (1.30-2.10)	2.11 (1.64-2.67)	2.48 (1.92-3.17)	2.99 (2.25-4.03)	3.37 (2.49-4.66)	3.78 (2.72-5.47)	4.28 (2.89-6.30)	5.04 (3.28-7.70)	5.69 (3.62-8.89)
6-hr	1.72 (1.36-2.16)	2.09 (1.65-2.62)	2.69 (2.11-3.39)	3.19 (2.49-4.04)	3.88 (2.95-5.20)	4.38 (3.27-6.05)	4.94 (3.60-7.16)	5.64 (3.83-8.25)	6.75 (4.41-10.3)	7.72 (4.93-12.0)
12-hr	2.10 (1.68-2.61)	2.61 (2.07-3.24)	3.43 (2.72-4.28)	4.11 (3.24-5.16)	5.05 (3.87-6.74)	5.73 (4.32-7.88)	6.49 (4.79-9.40)	7.48 (5.10-10.9)	9.07 (5.93-13.7)	10.5 (6.70-16.2)
24-hr	2.48 (2.00-3.05)	3.12 (2.51-3.84)	4.17 (3.34-5.15)	5.04 (4.01-6.27)	6.23 (4.82-8.27)	7.10 (5.40-9.71)	8.07 (6.01-11.6)	9.35 (6.40-13.5)	11.4 (7.51-17.2)	13.3 (8.52-20.4)
2-day	2.85 (2.31-3.47)	3.60 (2.92-4.39)	4.82 (3.89-5.91)	5.84 (4.69-7.20)	7.23 (5.65-9.53)	8.25 (6.32-11.2)	9.39 (7.05-13.5)	10.9 (7.50-15.7)	13.4 (8.84-20.0)	15.6 (10.1-23.9)
3-day	3.11 (2.54-3.77)	3.93 (3.20-4.76)	5.25 (4.27-6.40)	6.35 (5.13-7.79)	7.87 (6.17-10.3)	8.96 (6.91-12.1)	10.2 (7.69-14.6)	11.9 (8.17-17.0)	14.6 (9.63-21.7)	17.0 (11.0-25.9)
4-day	3.35 (2.74-4.04)	4.21 (3.44-5.08)	5.61 (4.58-6.81)	6.77 (5.49-8.28)	8.38 (6.59-10.9)	9.54 (7.37-12.9)	10.9 (8.20-15.5)	12.6 (8.70-18.0)	15.5 (10.2-23.0)	18.1 (11.7-27.4)
7-day	3.98 (3.29-4.76)	4.93 (4.07-5.92)	6.50 (5.34-7.83)	7.79 (6.37-9.46)	9.58 (7.58-12.4)	10.9 (8.44-14.5)	12.3 (9.33-17.4)	14.2 (9.88-20.2)	17.3 (11.5-25.6)	20.1 (13.0-30.3)
10-day	4.61 (3.83-5.49)	5.62 (4.66-6.70)	7.27 (6.00-8.71)	8.63 (7.09-10.4)	10.5 (8.35-13.5)	11.9 (9.24-15.8)	13.4 (10.1-18.8)	15.4 (10.7-21.7)	18.5 (12.3-27.2)	21.3 (13.8-32.0)
20-day	6.59 (5.53-7.79)	7.67 (6.42-9.07)	9.42 (7.86-11.2)	10.9 (9.01-13.0)	12.9 (10.3-16.3)	14.4 (11.2-18.7)	16.0 (12.0-21.8)	17.9 (12.5-25.0)	20.7 (13.9-30.2)	23.1 (15.0-34.6)
30-day	8.27 (6.98-9.72)	9.38 (7.90-11.0)	11.2 (9.38-13.2)	12.7 (10.6-15.1)	14.7 (11.8-18.4)	16.3 (12.7-20.9)	17.9 (13.4-24.0)	19.7 (13.9-27.4)	22.3 (15.0-32.3)	24.4 (15.9-36.3)
45-day	10.4 (8.80-12.1)	11.5 (9.76-13.5)	13.4 (11.3-15.7)	15.0 (12.5-17.7)	17.1 (13.7-21.2)	18.8 (14.6-23.8)	20.4 (15.3-27.0)	22.1 (15.7-30.6)	24.4 (16.4-35.2)	26.1 (17.1-38.8)
60-day	12.1 (10.3-14.1)	13.3 (11.3-15.5)	15.3 (12.9-17.9)	16.9 (14.2-19.9)	19.1 (15.4-23.6)	20.9 (16.3-26.4)	22.6 (16.9-29.6)	24.2 (17.2-33.4)	26.3 (17.8-37.9)	27.8 (18.2-41.2)

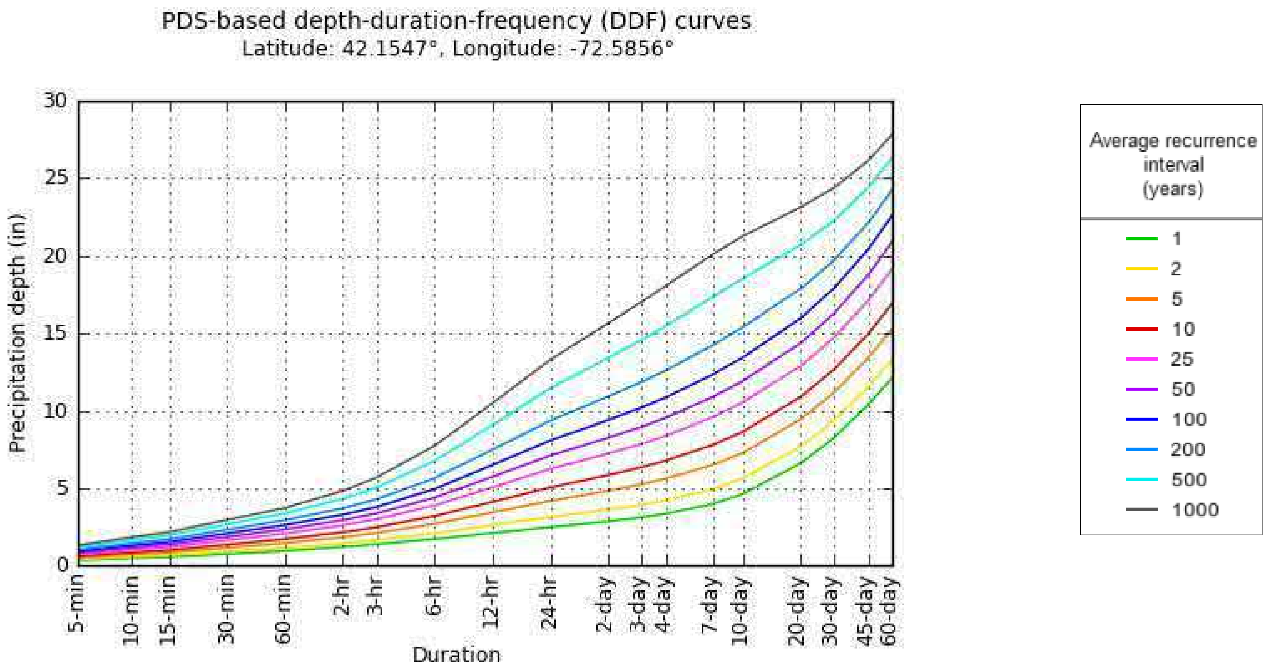
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

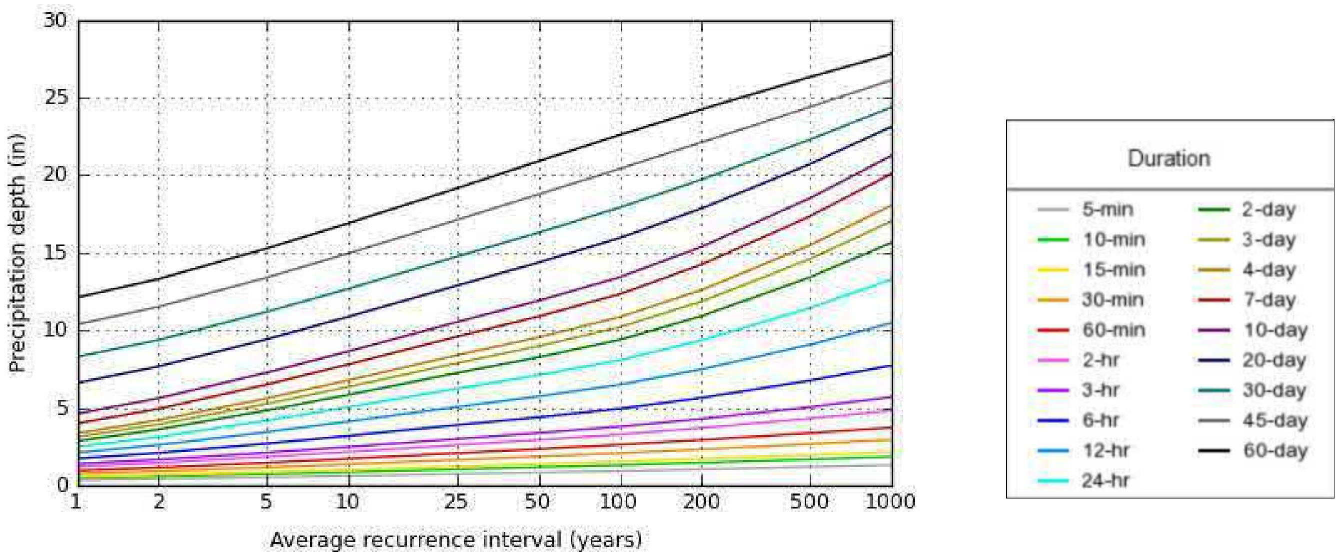
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical





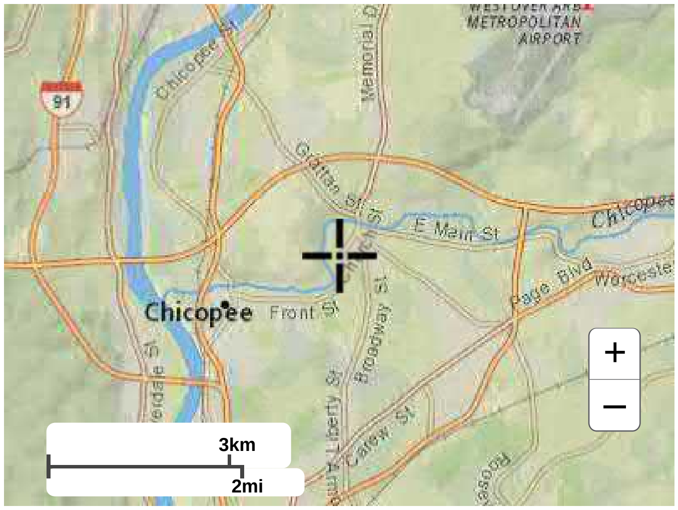
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue Mar 2 11:07:17 2021

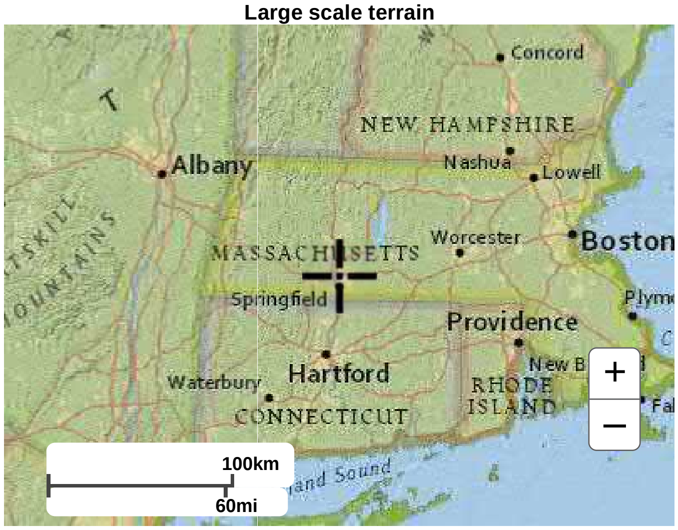
Back to Top

Maps & aerials

Small scale terrain



Large scale terrain



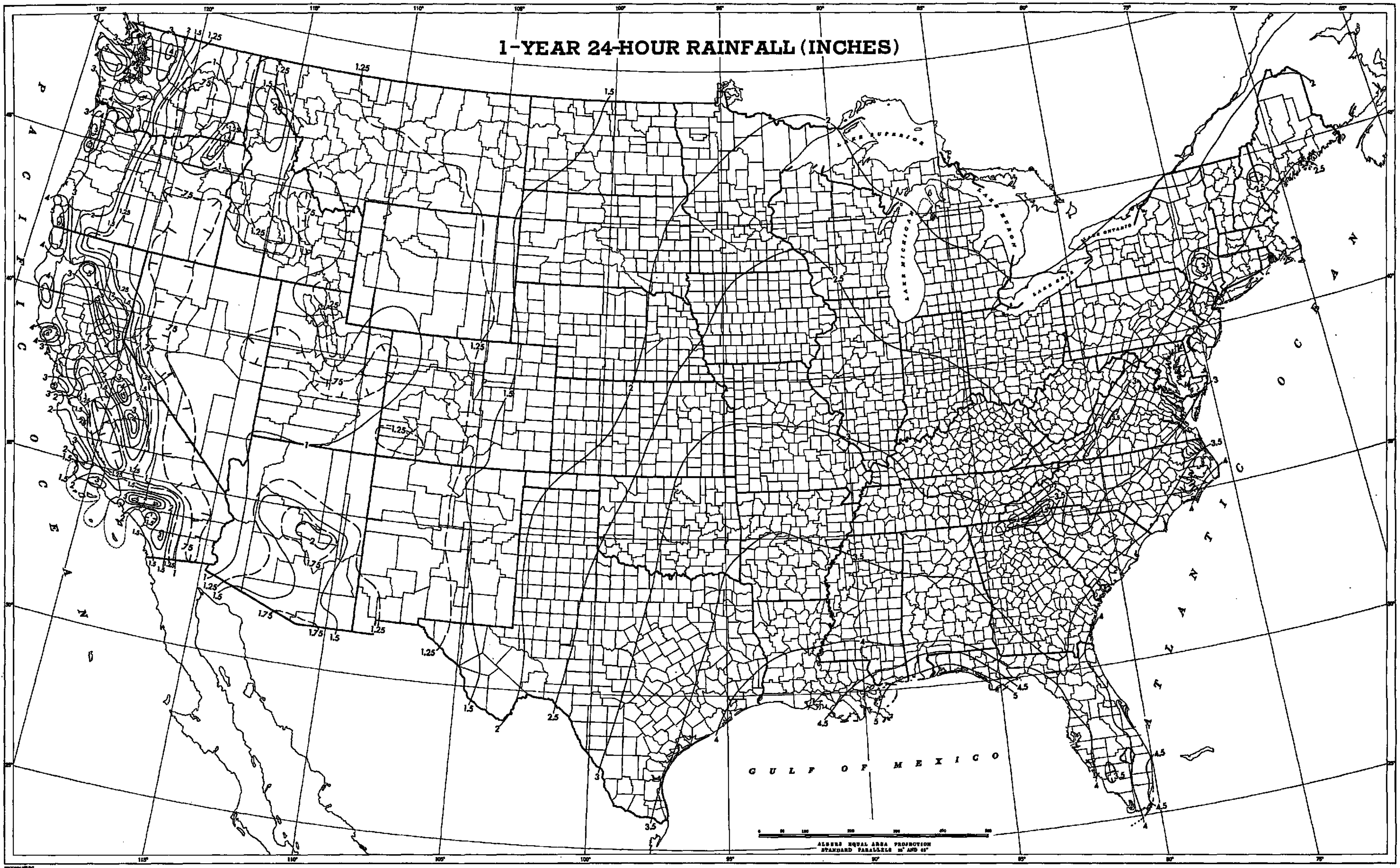
Large scale map

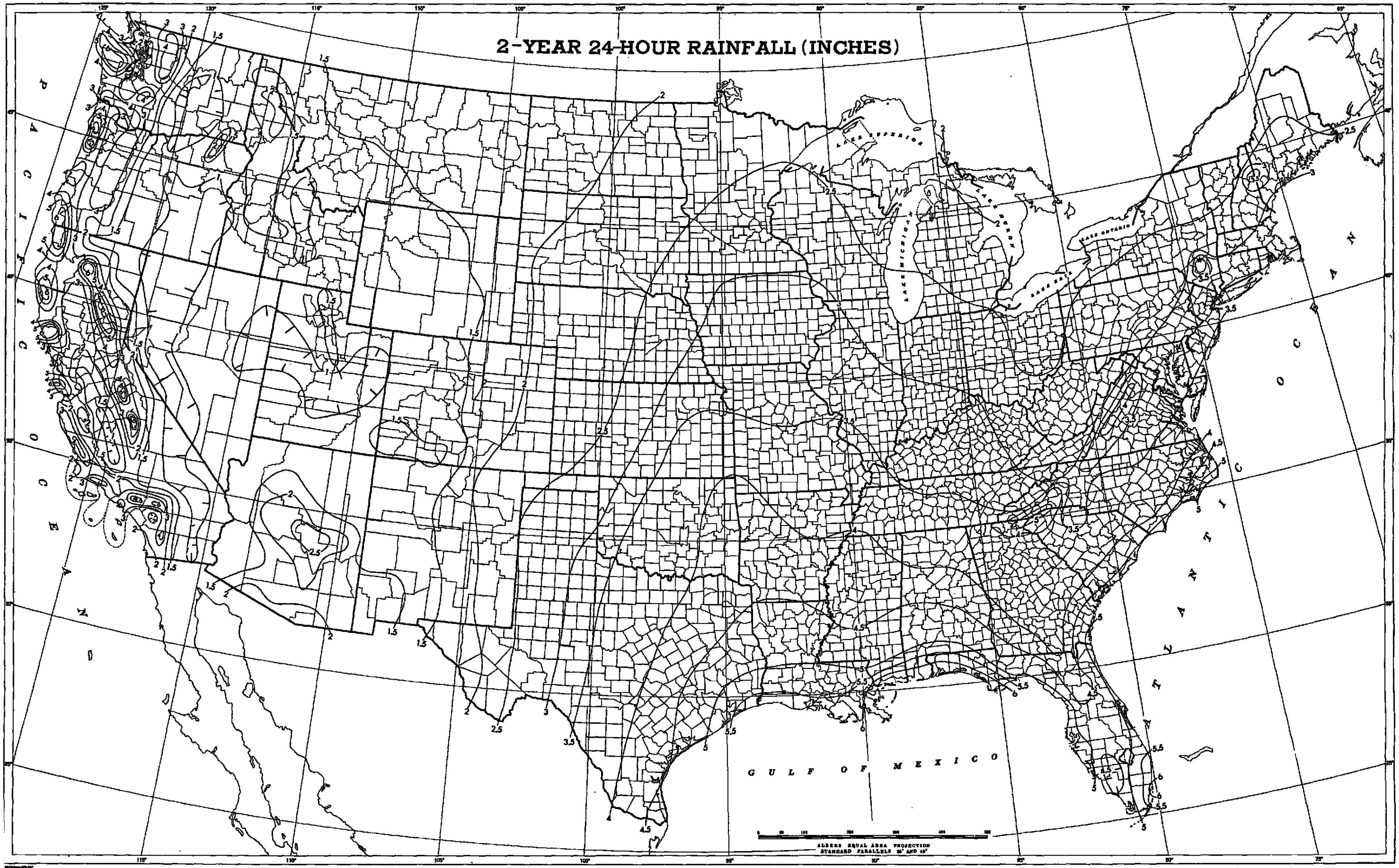
Large scale aerial

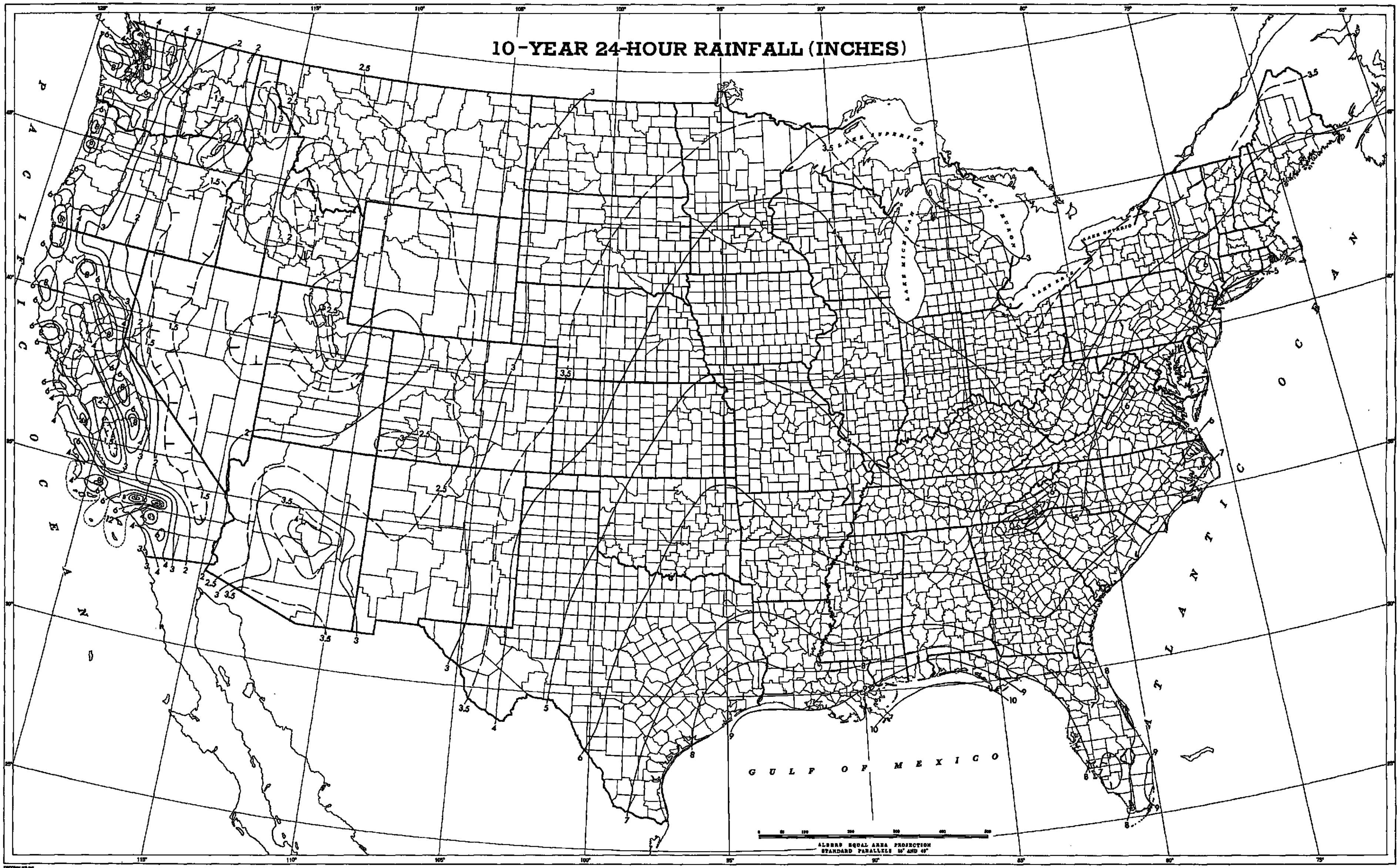
Back to Top

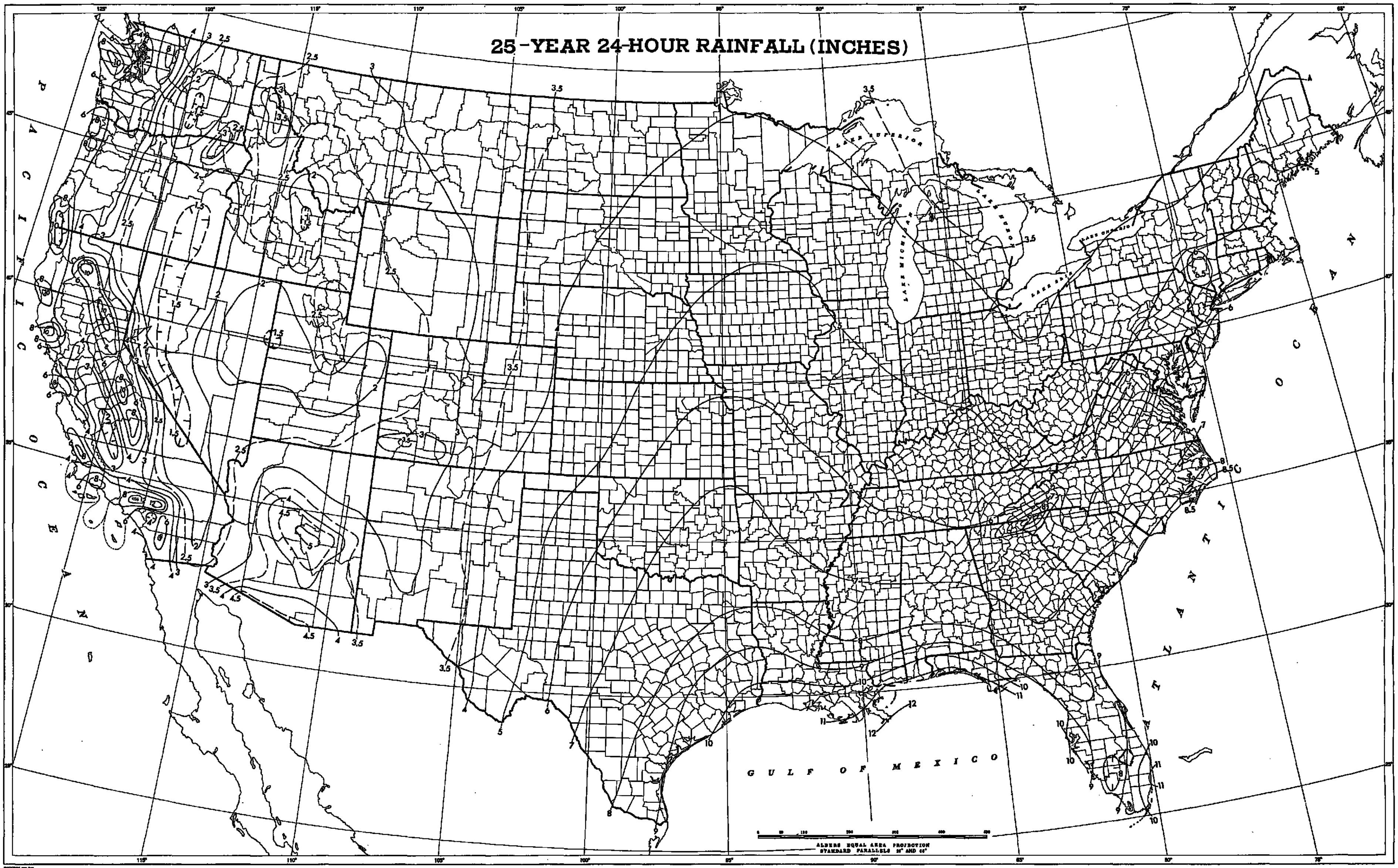
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

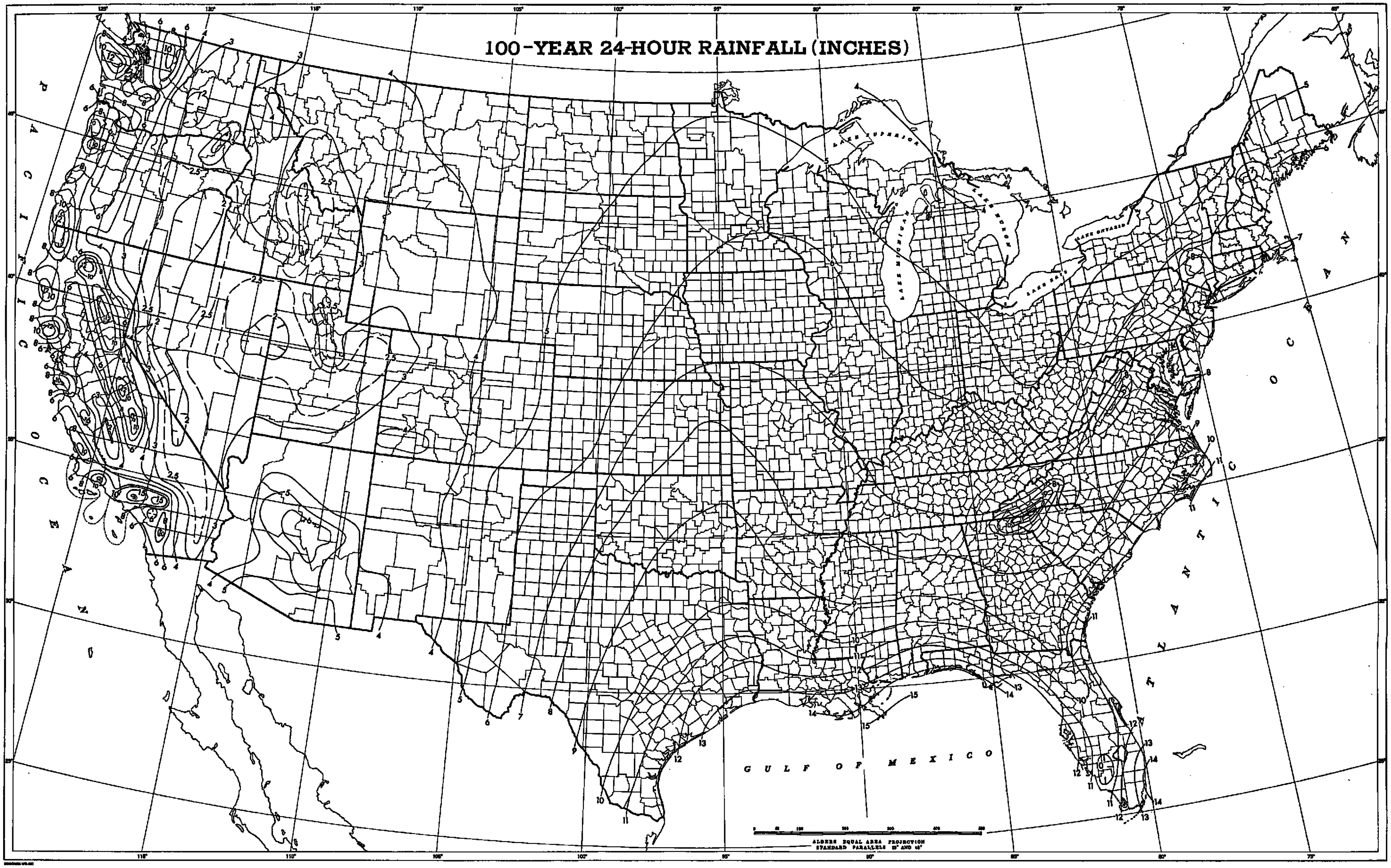

1-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 29° AND 45°


2-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 29° AND 45°


10-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 29° AND 45°



25-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 29° AND 45°


100-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ALBERS EQUAL AREA PROJECTION

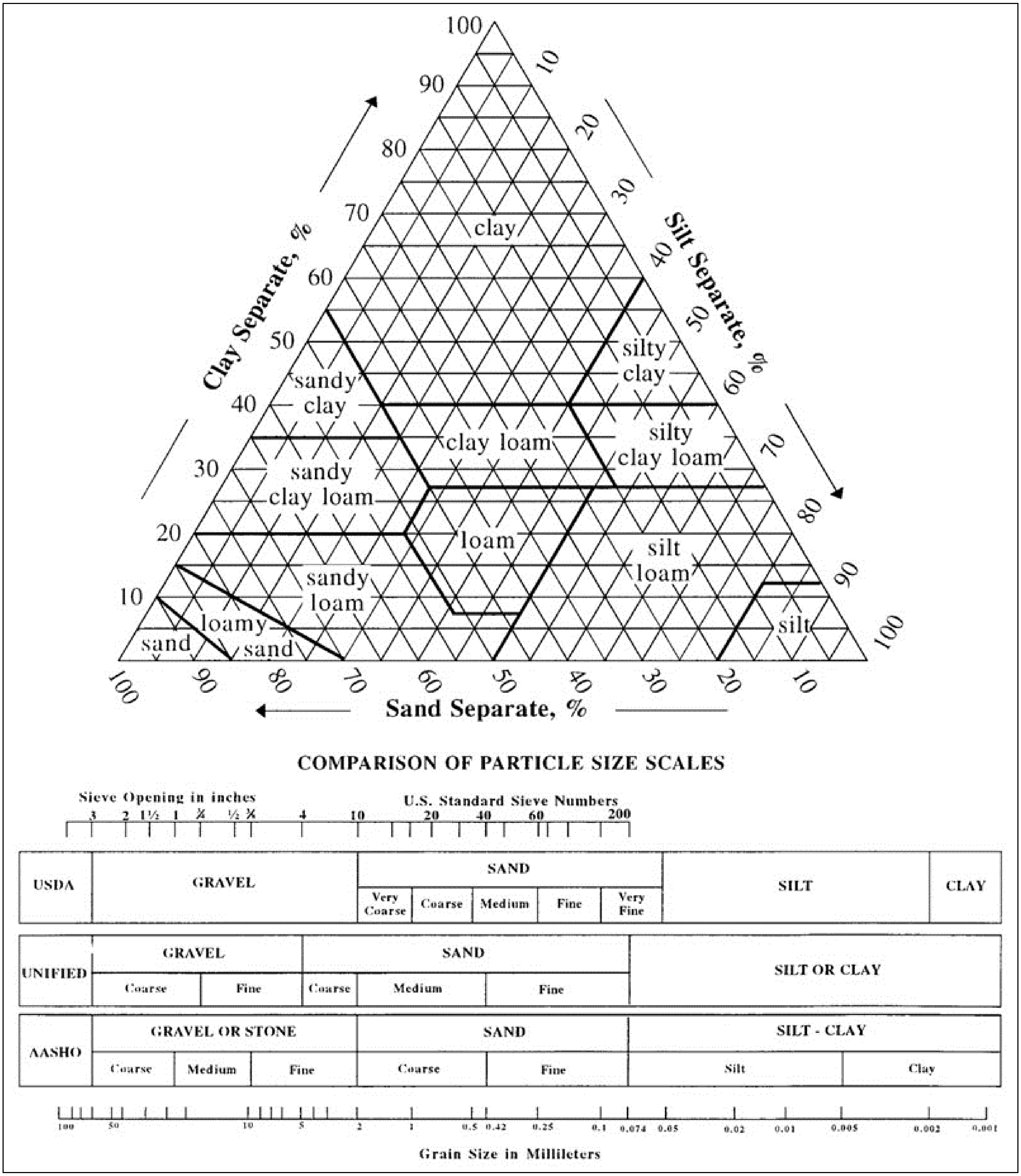


Figure 2.3.2: USDA, NRCS, 2007 National Soil Survey Handbook, Part 618, Exhibit 8,
http://soils.usda.gov/technical/handbook/contents/part618ex.html#ex8

Table 2.3.3. 1982 Rawls Rates[18]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

18 Rawls, Brakensiek and Saxton, 1982

BETA
1 Springfield Street
Suite 4
Chicopee, MA 01013
413.331.5326
www.BETA-Inc.com

APPENDIX F – Environmental Assessment, (Not included, submitted as separately bound report)