Final Draft

Preliminary Design Report
Construction of Relief Sewers
For CSO Abatement

Prepared by

The Greater New Haven Water Pollution Control Authority

Engineering Department

GNHWPCA
Protecting the Environment

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Introduction

1.1 Background

The Greater New Haven Water Pollution Control Authority (GNHWPCA) was formed as a regional sewer authority in 2005. GNHWPCA provides wastewater collection and treatment services to 200,000 customers in the city of New Haven and the towns of Hamden, East Haven and Woodbridge. GNHWPCA owns, operates and maintains an extensive sewer system that includes 555 miles of sanitary, separated and combined sewers, 30 pump stations, a 5 million gallon combined sewer overflow (CSO) storage tank, and a wastewater treatment plant.

We continue to implement the recommendations contained in our Updated CSO Long Term Control Plan (LTCP) which was approved by Connecticut DEEP in March 2011. The CSO LTCP identifies the construction of relief sewers as a viable alternative to minimize or eliminate CSOs.

GNHWPCA has 18 active CSO Regulators and 14 active CSO outfalls throughout our combined sewer system in New Haven. We have 32 flow meters deployed that continuously monitor all of our active CSO Regulators and CSO outfalls. As part of our hydraulic model update project we deployed an additional 23 flow meters between May and July 2014.

1.2 Document Overview

This report is organized as follows:

- Section 2, **Review and Analysis of the Existing System** – This section describes the existing sewer system in each of the three Study Areas including the existing Regulators and CSO Outfalls. Flow metering data and dry and wet weather calibration results from the updated hydraulic model are used to identify hydraulic bottlenecks in the existing sewer system.
- Section 3, **Alternatives Evaluation** – This section evaluates various relief sewer and sewer replacement alternatives to eliminate the hydraulic bottlenecks identified in Section 2.
- Section 4, **Recommended Plan** – This section presents the Recommended Plan for construction of relief sewer and sewer replacement projects in each of the three Study Areas including a project cost and implementation schedule.

Review and Analysis of the Existing System

2.1 Regulator 034 Study Area

2.1.1 Description of the Existing Sewer System

The Regulator 034 Study Area is shown on **Figure 1**.

A 36 inch wide by 48 inch high (nominal 42 inch diameter) brick sewer was constructed in George Street in 1861 as a combined sewer that serviced a tributary area of approximately 140 acres. A 20 inch wide by 30 inch high (nominal 24 inch diameter) brick sewer in Temple Street was constructed in 1945 to service a tributary area of approximately 20 acres. The Temple Street sewer connects to the George Street sewer and continued east on George Street via a 48 inch wide by 60 inch high (nominal 54 inch diameter) brick sewer which discharged to New Haven Harbor via a combined sewer in Meadow Street.

Construction of the Church Street Tunnel in the late 1950s and early 1960s resulted in the abandonment of the George Street sewer between Temple and Church Streets, construction of a 48 inch and 24 inch steep sewer in Temple Street south to North Frontage Road and a flat, deep 30 inch sewer in North Frontage Road to the Union Pump Station which pumped flows to the East Street wastewater treatment plant. Regulator 025 and CSO outfall 025 were also constructed at this time to carry wet weather flows in excess of the capacity of the Union Pump Station to New Haven Harbor.

The areas tributary to the George Street and Temple Street sewers were separated in the 1970s. Regulator 034 was constructed at this time to allow wet weather flows in excess of the capacity of the flat 30 inch sewer in North Frontage Road to overflow to New Haven Harbor via CSO outfall 025.

The following as-built information regarding the sewers in the Regulator 034 Study Area is included in **Appendix A1**;

- GIS pipe identification number
- Street name
- Pipe age
- Pipe material
- Pipe width (in)
- Pipe height (in)
- Pipe nominal diameter (in)
- Pipe length (ft)
- Pipe upstream invert (NAVD88)
- Pipe downstream invert (NAVD88)

- Pipe slope (ft/ft)
- Pipe upstream manhole rim (NAVD88)
- Pipe upstream depth (ft)
- Pipe downstream manhole rim (NAVD88)
- Pipe downstream depth (ft)
- Catchment type (sanitary, separated or combined)
- Pipe flowing full flow capacity (MGD)
- Pipe flowing full flow velocity (fps)
- Minimum flow (MGD) based on flow metering data
- Average flow (MGD) based on flow metering data
- Peak flow (MGD) based on flow metering data

Detailed as-built plans, sections and photographs of Regulators 025 and 034 are included in **Appendix B1**.

2.1.2 Flow Metering Data

A comprehensive flow monitoring program was completed to obtain flow data for model calibration. In addition to the 32 permanent flow monitoring locations included in GNHWPCA's CSO flow monitoring program, 23 temporary sites were selected to monitor hydraulic conditions for a 9 week period from May to July 2014. To supplement the GNHWPCA's permanent rain gauge installed at Boulevard Pump Station, two temporary rain gauges were installed within the service area to obtain rain data with more detailed spatial representation.

Detailed flow meter installation reports for the seven flow meters located in the Regulator 034 Study Area are included in **Appendix C1.** Meter installation reports include;

- Equipment installation date
- Location maps
- Photographs
- Level, velocity and meter logger sensor configuration sketches

Six dry weather periods during June 2014, each lasting 48 hours, were used to calibrate the model. The flow monitoring data and the rainfall data were analyzed using the U.S. Environmental Protection Agency (USEPA) Sanitary Sewer Overflow Analysis and Planning (SSOAP) tool. The average dry weather flows (DWFs) and diurnal flow patterns for both weekdays and weekends were analyzed using the SSOAP tool. The DWFs were divided into two flow components: base sanitary flow (BSF) and groundwater infiltration (GWI). The GWI was assumed to be 90% of the minimum nighttime flows, but adjusted to account for upstream and downstream flow balances. Diurnal patterns were applied to the BSFs and monthly patterns to the GWIs. The water billing data was used to estimate the distribution ratios of the DWFs. Model parameters were adjusted to get the best comparison of the total metered data versus the total modeled output at each of the 41 meter locations that measure flows in the sewer system.

Dry weather flow calibration results for the five flow meters located in the Regulator 034 Study Area that measure flows in the sewer lines are included in **Appendix D1.** There are three plots for each of the flow meters that show a comparison of the metered data to the model output for the following conditions;

- Total flow during each of the six dry weather periods
- Continuous flows during the June 1, 2014 dry weather period
- Continuous flows for the entire month of June 2014 (including wet weather events)

After DWF calibration, the wet weather flow (WWF) calibration was performed using the Sensitivity Radio Tuned Calibration (SRTC) tool in PCSWMM 2014 Professional 2D and the SSOAP tool. The WWF calibration processes involved eleven rainfall events that occurred between May and July 2014. Adjustments were made to the rainfall derived infiltration and inflow real time kinematic (RDII RTK) unit hydrographs parameters in each of the 767 sanitary and separate subcatchments and the hydrological parameters in each of the 675 combined subcatchments to get the best comparison of the total metered data versus the total modeled output at each of the 41 meter locations that measure flows in the sewer system and each of the 15 meters that measure flows in the CSO outfalls.

Wet weather flow calibration results for the five flow meters located in the Regulator 034 Study Area that measure flows in the sewer lines and the two flow meters that measure overflows are included in **Appendix E1.** One the first page there are four plots for each of the flow meters that show a comparison of the metered data to the model output for the following conditions;

- Total flow during each of the eleven wet weather events
- Maximum flows during each of the eleven wet weather events
- Maximum depths during each of the eleven wet weather events
- Continuous flows for the entire flow monitoring period between May and July 2014

On the second page there are six plots that compare the metered and modeled flow hydrographs for six wet weather periods between May and July 2014. On the third page there are six plots that compare the metered and modeled depths for the same six wet weather periods.

2.1.3 Identification of Hydraulic Bottlenecks

The flowing full capacities of the George Street and Temple Street sewers upstream of the sewer in North Frontage Road are 44 MGD and 8 MGD, respectively. The flowing full capacity of the North Frontage Road sewer is only 2 MGD.

Flow metering data from our CSO Flow Monitoring Program and dry and wet weather calibration results from the updated hydraulic model confirms that the 30 inch sewer in North Frontage Road is adequate to handle the dry weather flows from the George Street and Temple Street sewer tributary areas. However, during significant rain events flows in the George Street sewer can reach 15 MGD and flows in

the Temple Street sewer can reach 5 MGD. These high flows cause the 30 inch sewer in North Frontage Road to surcharge and CSOs to occur at Regulator 034. The sewer segments that form the hydraulic bottleneck are highlighted in the sewer as-built information spreadsheets contained in **Appendix A1.**

Our flow metering data also confirms the findings of a Drainage Study recently completed by Cardinal Engineering for the City of New Haven. Cardinal's SWMM model of the storm drain system in the Regulator 034 Study Area predicts that storm water will flow into the sewer system at Regulator 034 during significant rain events. Our flow meter at Regulator 034 confirms that storm water is entering the sewer system at Regulator 034. GNHWPCA added two feet of stop logs to the overflow weir in July 2014 to mitigate the storm water inflow to the sewer system.

2.2 Regulator 012 Study Area

2.2.1 Description of the Existing Sewer System

The Regulator 012 Study Area is shown on **Figure 3**.

The 48 inch diameter brick sewer in Canner Street serves tributary areas in New Haven and Hamden. At Nicoll Street the 48 inch sewer passes under an industrial building on its way to Mitchell Drive where it connects to a 35 inch wide by 52 inch high (nominal 42 inch diameter) brick sewer built in 1890 on a flat slope. Regulator 012 is located at the junction of these two sewers and allows wet weather flows in excess of the capacity of the flat 35 inch wide by 52 inch high sewer in Mitchell Drive to overflow to the Mill River via CSO outfall 012. Just downstream of this flat sewer segment, the slope of the 35 inch wide by 52 inch high sewer in Mitchell Drive becomes much steeper.

The following as-built information regarding the sewers in the Regulator 012 Study Area is included in **Appendix A2**;

- GIS pipe identification number
- Street name
- Pipe age
- Pipe material
- Pipe width (in)
- Pipe height (in)
- Pipe nominal diameter (in)
- Pipe length (ft)
- Pipe upstream invert (NAVD88)
- Pipe downstream invert (NAVD88)
- Pipe slope (ft/ft)
- Pipe upstream manhole rim (NAVD88)

- Pipe upstream depth (ft)
- Pipe downstream manhole rim (NAVD88)
- Pipe downstream depth (ft)
- Catchment type (sanitary, separated or combined)
- Pipe flowing full flow capacity (MGD)
- Pipe flowing full flow velocity (fps)
- Minimum flow (MGD) based on flow metering data
- Average flow (MGD) based on flow metering data
- Peak flow (MGD) based on flow metering data

Detailed as-built plans, sections and photographs of Regulator 012 are included in **Appendix B2**.

2.2.2 Flow Metering Data

Detailed flow meter installation reports for the three flow meters located in the Regulator 012 Study Area are included in **Appendix C2.** Meter installation reports include;

- Equipment installation date
- Location maps
- Photographs
- Level, velocity and meter logger sensor configuration sketches

Dry weather flow calibration results for the one flow meter located in the Regulator 012 Study Area that measure flows in the sewer lines is included in **Appendix D2.** There are three plots for this flow meter that show a comparison of the metered data to the model output for the following conditions;

- Total flow during each of the six dry weather periods
- Continuous flows during the June 1, 2014 dry weather period
- Continuous flows for the entire month of June 2014 (including wet weather events)

Wet weather flow calibration results for the five flow meters located in the Regulator 012 Study Area that measure flows in the sewer lines and the two flow meters that measure overflows are included in **Appendix E2.** There are four plots for each of the flow meters that show a comparison of the metered data to the model output for the following conditions;

- Total flow during each of the eleven wet weather events
- Maximum flows during each of the eleven wet weather events
- Maximum depths during each of the eleven wet weather events
- Continuous flows for the entire flow monitoring period between May and July 2014

On the second page there are six plots that compare the metered and modeled flow hydrographs for six wet weather periods between May and July 2014. On the third page there are six plots that compare the metered and modeled depths for the same six wet weather periods.

2.2.3 Identification of Hydraulic Bottlenecks

The flowing full capacity of the Canner Street sewer upstream of Regulator 012 is 29 MGD. The flowing full capacity of the steeper section of sewer in Mitchell Drive is 21 MGD. However, the flowing full capacity of the flat sewer in Mitchell Drive is only 14 MGD.

Flow metering data from our CSO Flow Monitoring Program and dry and wet weather calibration results from the updated hydraulic model confirms that the flat sewer in Mitchell Drive is adequate to handle the dry weather flows from the tributary areas. However, during significant rain events flows in the Mitchell Drive sewer can reach 16 MGD. These high flows cause the flat sewer in Mitchell Drive to surcharge and CSOs to occur at Regulator 012. The overflow elevation was raised 6 inches in May 2013 to reduce CSOs at Regulator 012. The sewer segment that forms the hydraulic bottleneck is highlighted in the sewer as-built information spreadsheets contained in **Appendix A2.**

2.3 Regulator and CSO Outfall 020 Study Area

2.3.1 Description of the Existing Sewer System

The Regulator and CSO Outfall 020 Study Area is shown on **Figure 4.**

The 24 inch diameter sewer in Quinnipiac Avenue serves tributary areas in New Haven and East Haven. The Quinnipiac Pump Station discharges to a steep section of the 24 inch sewer. Starting just northeast of the intersection of Quinnipiac Avenue and Clifton Street the 24 inch sewer was constructed on a flat slope for a distance of 1540 feet downstream. Regulator 020 is located at the intersection of Quinnipiac Avenue and Clifton Street and allows wet weather flows in excess of the capacity of the flat 24 inch sewer to overflow to the Quinnipiac River via CSO outfall 020. Both upstream and downstream of this flat section, the slope of the 24 inch sewer in Quinnipiac Avenue becomes much steeper.

The following as-built information regarding the sewers in the Regulator and CSO Outfall 020 Study Area is included in **Appendix A3**;

- GIS pipe identification number
- Street name
- Pipe age
- Pipe material

- Pipe width (in)
- Pipe height (in)
- Pipe nominal diameter (in)
- Pipe length (ft)
- Pipe upstream invert (NAVD88)
- Pipe downstream invert (NAVD88)
- Pipe slope (ft/ft)
- Pipe upstream manhole rim (NAVD88)
- Pipe upstream depth (ft)
- Pipe downstream manhole rim (NAVD88)
- Pipe downstream depth (ft)
- Catchment type (sanitary, separated or combined)
- Pipe flowing full flow capacity (MGD)
- Pipe flowing full flow velocity (fps)
- Minimum flow (MGD) based on flow metering data
- Average flow (MGD) based on flow metering data
- Peak flow (MGD) based on flow metering data

Detailed as-built plans, sections and photographs of Regulator 020 are included in **Appendix B3**.

2.3.2 Flow Metering Data

Detailed flow meter installation reports for the two flow meters located in the Regulator and CSO Outfall 020 Study Area are included in **Appendix C3.** Meter installation reports include;

- Equipment installation date
- Location maps
- Photographs
- Level, velocity and meter logger sensor configuration sketches

Dry weather flow calibration results for the one flow meter located in the Regulator and CSO Outfall 020 Study Area that measure flows in the sewer lines is included in **Appendix D3.** There are three plots for this flow meter that show a comparison of the metered data to the model output for the following conditions;

- Total flow during each of the six dry weather periods
- Continuous flows during the June 1, 2014 dry weather period
- Continuous flows for the entire month of June 2014 (including wet weather events)

Wet weather flow calibration results for the one flow meter located in the Regulator and CSO Outfall 020 Study Area that measure flows in the sewer lines and the one flow meter that measure overflows

are included in **Appendix E3.** There are four plots for each of the flow meters that show a comparison of the metered data to the model output for the following conditions;

- Total flow during each of the eleven wet weather events
- Maximum flows during each of the eleven wet weather events
- Maximum depths during each of the eleven wet weather events
- Continuous flows for the entire flow monitoring period between May and July 2014

On the second page there are six plots that compare the metered and modeled flow hydrographs for six wet weather periods between May and July 2014. On the third page there are six plots that compare the metered and modeled depths for the same six wet weather periods.

2.3.3 Identification of Hydraulic Bottlenecks

The flowing full capacity of the steep section of the 24 inch sewer in Quinnipiac Avenue downstream of the discharge from the Quinnipiac Pump Station is over 20 MGD. The flowing full capacity of the downstream steeper section of sewer in Quinnipiac Avenue south of Welcome Street is 6.5 MGD. However, the flowing full capacity of the flat sewer in Quinnipiac Avenue is only 4 MGD.

Flow metering data from our CSO Flow Monitoring Program and dry and wet weather calibration results from the updated hydraulic model confirms that the flat sewer in Quinnipiac Avenue is adequate to handle the dry weather flows from the tributary areas. However, during significant rain events flows in the Quinnipiac Avenue sewer can reach 5.3 MGD. These high flows cause the flat sewer in Quinnipiac Avenue to surcharge and CSOs to occur at Regulator and CSO outfall 020. The sewer segments that form the hydraulic bottleneck are highlighted in the sewer as-built information spreadsheets contained in **Appendix A3.**

Alternatives Evaluation

3.1 Regulator 034 Study Area

3.1.1 Alternative 1

This alternative involves construction of 1640 feet of 36 inch relief sewer, at a steeper slope of 0.0052, to replace the undersized 30 inch sewer in North Frontage Road. The proposed replacement sewer is shown on **Figure 2**. The replacement sewer will connect to the existing 36 inch deeper sewer in Union Avenue in order to create a steeper slope which will provide greater capacity and self-cleansing velocities in the replacement sewer. The flowing full capacity of the 36 inch replacement sewer is 27 MGD. The upstream 815 feet of the replacement sewer will be along the same alignment as the existing 30 inch sewer (but on a steeper slope at a deeper elevation).

Bypass pumping will be required during construction of the replacement sewer. There are significant roadway and development improvements underway in the project area. Coordination with other utility companies is required as existing and proposed underground gas, electric, telephone, traffic control devices, water and storm drains will need to be addressed during design and construction of the replacement sewer. Coordination with the public to assure that property access and utility service is maintained throughout the project will also be required. Design and construction of the downstream 825 feet of the 36 inch replacement sewer will need to be closely coordinated with the City of New Haven and its developers of the Coliseum site.

Construction of the replacement sewer described in Alternative 1 will allow Regulator 034 to be closed.

The following permits will be required for construction of the replacement sewer;

- ConnDOT Highway Permit for excavation in Route 34
- CTDEEP SWP3 Permit for discharges of groundwater to storm drains
- City of New Haven Street Opening Permit for work in local roadways
- GNHWPCA Permit for discharges of groundwater to sewers

3.1.2 Alternative 2

This alternative involves construction of 1185 feet of 42 inch relief sewer north along Temple Street, east along Crown Street and south along Church Street, at a slope of 0.0028, to relieve the upstream 815 feet of undersized 30 inch sewer in North Frontage Road. The proposed relief sewer will essentially reestablish the flow pattern that existed in the George Street sewer prior to construction of the Church Street Tunnel in the late 1950s and early 1960s. Flow will be delivered directly to Regulator 025 via the

existing sewers in George and State Streets. The flowing full capacity of the 42 inch relief sewer is 30 MGD.

Construction of the downstream 825 feet of the relief sewer (along the same alignment included in Alternative 1) will also be required to eliminate this hydraulic bottleneck. The size and capacity of the downstream 825 feet of the relief sewer can be reduced to 18 inch and 4 MGD, respectively. Coordination with the City of New Haven and its developers of the Coliseum site will be required during design and construction of the downstream 825 feet of the relief sewer.

During development of Alternative 2 it was discovered that an existing underground service tunnel in Crown Street will prohibit construction of the 42 inch relief sewer. Because of this conflict, Alternative 2 was eliminated from further consideration.

3.1.3 Alternative 3

This alternative involves construction of a 36 inch relief sewer, at a steeper slope of 0.0052, parallel to the upstream 815 feet undersized 30 inch sewer in North Frontage Road. Alternative 3 will reduce the amount of bypass pumping required during construction of the parallel sewer.

Construction of the downstream 825 feet of the 36 inch relief sewer (included in Alternative 1) will also be required to eliminate this hydraulic bottleneck. Design and construction of the downstream 825 feet of the 36 inch relief sewer will need to be closely coordinated with the City of New Haven and its developers of the Coliseum site. The proposed sewer will connect to the existing 36 inch deeper sewer in Union Avenue in order to create a steeper slope which will provide greater capacity and self-cleansing velocities. The flowing full capacity of the 36 inch parallel relief sewer is 27 MGD.

There are significant roadway and development improvements underway in the project area. During development of Alternative 3 it was discovered that existing and proposed underground gas, electric, telephone, traffic control devices, water and storm drains will prohibit construction of the parallel 36 inch relief sewer. Because of this conflict, Alternative 3 was eliminated from further consideration.

3.2 Regulator 012 Study Area

3.2.1 Alternative 1

This alternative involves construction of 1080 feet of 42 inch relief sewer in Nicoll and Willow Streets, at a slope of 0.0012, to carry wet weather flows around the hydraulic bottleneck to the steeper section of 35 inch wide by 52 inch high sewer in Mitchell Drive. The proposed relief sewer is shown on **Figure 3**. The flowing full capacity of the 36 inch relief sewer is 20 MGD.

Bypass pumping will not be required during construction of the relief sewer. Coordination with other utility companies is required as existing and proposed underground gas, electric, telephone, traffic control devices, water and storm drains will need to be addressed during design and construction of the relief sewer. Coordination with the public to assure that property access and utility service is maintained throughout the project will also be required.

Construction of the relief sewer will allow Regulator 012 to be closed.

The following permits will be required for construction of the relief sewer;

- CTDEEP SWP3 Permit for discharges of groundwater to storm drains
- City of New Haven Street Opening Permit for work in local roadways
- GNHWPCA Permit for discharges of groundwater to sewers

3.2.2 Alternative 2

This alternative involves construction of a 42 inch relief sewer, at the same slope and parallel to the 232 feet of undersized 35 inch wide by 52 inch high sewer in Mitchell Drive. Alternative 2 will reduce the amount of bypass pumping required during construction of the parallel sewer. The flowing full capacity of the 42 inch parallel relief sewer is 14 MGD.

During development of Alternative 2 it was discovered that existing underground gas, electric, telephone, traffic control devices, water and storm drains will prohibit construction of the parallel 24 inch relief sewer. Because of this conflict, Alternative 2 was eliminated from further consideration.

3.3 Regulator and CSO Outfall 020 Study Area

3.3.1 Alternative 1

This alternative involves construction of 1620 feet of 30 inch replacement sewer in Quinnipiac Avenue along the same alignment to replace the existing 24 inch sewer. The new 30 inch replacement sewer will provide increased self-cleansing velocities and will have a flowing full capacity of 7 MGD to carry wet weather flows to the steeper sections of 24 inch sewers in Quinnipiac Avenue south of Welcome Street. A drop manhole will be constructed 80 feet upstream of the flat sections of 24 inch sewers in Quinnipiac Avenue to help dissipate energy and reduce the hydraulic grade line in the sewer. The proposed replacement sewer is shown on **Figure 4**.

Bypass pumping will be required during construction of the replacement sewer. Coordination with other utility companies is required as existing and proposed underground gas, electric, telephone, traffic

control devices, water and storm drains will need to be addressed during design and construction of the relief sewer. Coordination with the public to assure that property access and utility service is maintained throughout the project will also be required.

Construction of the replacement sewer will allow Regulator and CSO outfall 020 to be closed.

The following permits will be required for construction of the replacement sewer;

- ConnDOT Highway Permit for excavation in Quinnipiac Avenue
- CTDEEP SWP3 Permit for discharges of groundwater to storm drains
- Town of East Haven Street Opening Permit for work in local roadways
- GNHWPCA Permit for discharges of groundwater to sewers

3.3.2 Alternative 2

This alternative involves construction of a 24 inch relief sewer, at the same slope and parallel to the 1620 feet of undersized 24 inch sewer in Quinnipiac Avenue. Alternative 2 will not require bypass pumping during construction of the parallel sewer. The flowing full capacity of the 24 inch parallel relief sewer is 4 MGD.

During development of Alternative 2 it was discovered that existing underground gas, electric, telephone, traffic control devices, water and storm drains will prohibit construction of the parallel 24 inch relief sewer. Because of this conflict, Alternative 2 was eliminated from further consideration.

Recommended Plan

4.1 Regulator 034 Study Area

4.1.1 Recommended Plan

The most cost effective and constructible alternative to eliminate the hydraulic bottleneck identified in Section 2 involves construction of 1640 feet of 36 inch sewer, at a steeper slope of 0.0052, to replace the undersized 30 inch sewer in North Frontage Road (Alternative 1 described in Section 3). The proposed replacement sewer is shown on **Figure 2**.

The proposed sewer segment information to eliminate the hydraulic bottleneck is highlighted in the proposed relief sewer spreadsheets contained in **Appendix F1.**

The replacement sewer will connect to the existing 36 inch deeper sewer in Union Avenue in order to create a steeper slope which will provide greater capacity and self-cleansing velocities in the replacement sewer. The flowing full capacity of the 36 inch replacement sewer is 27 MGD. The upstream 815 feet of the replacement sewer will be along the same alignment as the existing 30 inch sewer (but on a steeper slope at a deeper elevation).

Bypass pumping will be required during construction of the replacement sewer. There are significant roadway and development improvements underway in the project area. Coordination with other utility companies is required as existing and proposed underground gas, electric, telephone, traffic control devices, water and storm drains will need to be addressed during design and construction of the replacement sewer. Coordination with the public to assure that property access and utility service is maintained throughout the project will also be required. Design and construction of the downstream 825 feet of the 36 inch replacement sewer will need to be closely coordinated with the City of New Haven and its developers of the Coliseum site.

Construction of the replacement sewer will allow Regulator 034 to be closed.

4.1.2 Project Cost Estimate

The project cost to design and construct the proposed replacement sewer is estimated at $3.1 million and includes construction of the new sewers and manholes, maintenance, protection and relocation of existing utilities, pavement restoration, sedimentation and erosion control, bypass pumping, traffic control, escalation to midpoint of construction, a construction contingency, engineering design and construction services, and legal and administrative costs. A breakdown of the project cost estimate is included in **Appendix G1.**

4.2 Regulator 012 Study Area

4.2.1 Recommended Plan

The most cost effective and constructible alternative to eliminate the hydraulic bottleneck identified in Section 2 involves construction of 1080 feet of 42 inch relief sewer in Nicoll and Willow Streets, at a slope of 0.0012, to carry wet weather flows around the hydraulic bottleneck to the steeper section of 35 inch wide by 52 inch high sewer in Mitchell Drive (Alternative 1 described in Section 3). The proposed relief sewer is shown on **Figure 3**. The flowing full capacity of the 36 inch relief sewer is 20 MGD.

The proposed sewer segment information to eliminate the hydraulic bottleneck is highlighted in the proposed relief sewer spreadsheets contained in **Appendix F2.**

Bypass pumping will not be required during construction of the relief sewer. Coordination with other utility companies is required as existing and proposed underground gas, electric, telephone, traffic control devices, water and storm drains will need to be addressed during design and construction of the relief sewer. Coordination with the public to assure that property access and utility service is maintained throughout the project will also be required.

Construction of the relief sewer will allow Regulator 012 to be closed.

4.2.2 Project Cost Estimate

The project cost to design and construct the proposed relief sewer is estimated at $1.1 million and includes construction of the new sewers and manholes, maintenance, protection and relocation of existing utilities, pavement restoration, sedimentation and erosion control, bypass pumping, traffic control, escalation to midpoint of construction, a construction contingency, engineering design and construction services, and legal and administrative costsA breakdown of the project cost estimate is included in **Appendix G2.**

4.3 Regulator and CSO Outfall 020 Study Area

4.3.1 Recommended Plan

The most cost effective and constructible alternative to eliminate the hydraulic bottleneck identified in Section 2 involves construction of 1620 feet of 30 inch sewer in Quinnipiac Avenue along the same alignment to replace the existing 24 inch sewer (Alternative 1 described in Section 3). The new 30 inch replacement sewer will provide increased self-cleansing velocities and will have a flowing full capacity of 7 MGD to carry wet weather flows to the steeper sections of 24 inch sewers in Quinnipiac Avenue south

of Welcome Street. A drop manhole will be constructed 80 feet upstream of the flat sections of 24 inch sewers in Quinnipiac Avenue to help dissipate energy and reduce the hydraulic grade line in the sewer. The proposed replacement sewer is shown on **Figure 4**.

The proposed sewer segment information to eliminate the hydraulic bottleneck is highlighted in the proposed relief sewer spreadsheets contained in **Appendix F3.**

Bypass pumping will be required during construction of the replacement sewer. Coordination with other utility companies is required as existing and proposed underground gas, electric, telephone, traffic control devices, water and storm drains will need to be addressed during design and construction of the relief sewer. Coordination with the public to assure that property access and utility service is maintained throughout the project will also be required.

Construction of the replacement sewer will allow Regulator and CSO outfall 020 to be closed.

4.3.2 Project Cost Estimate

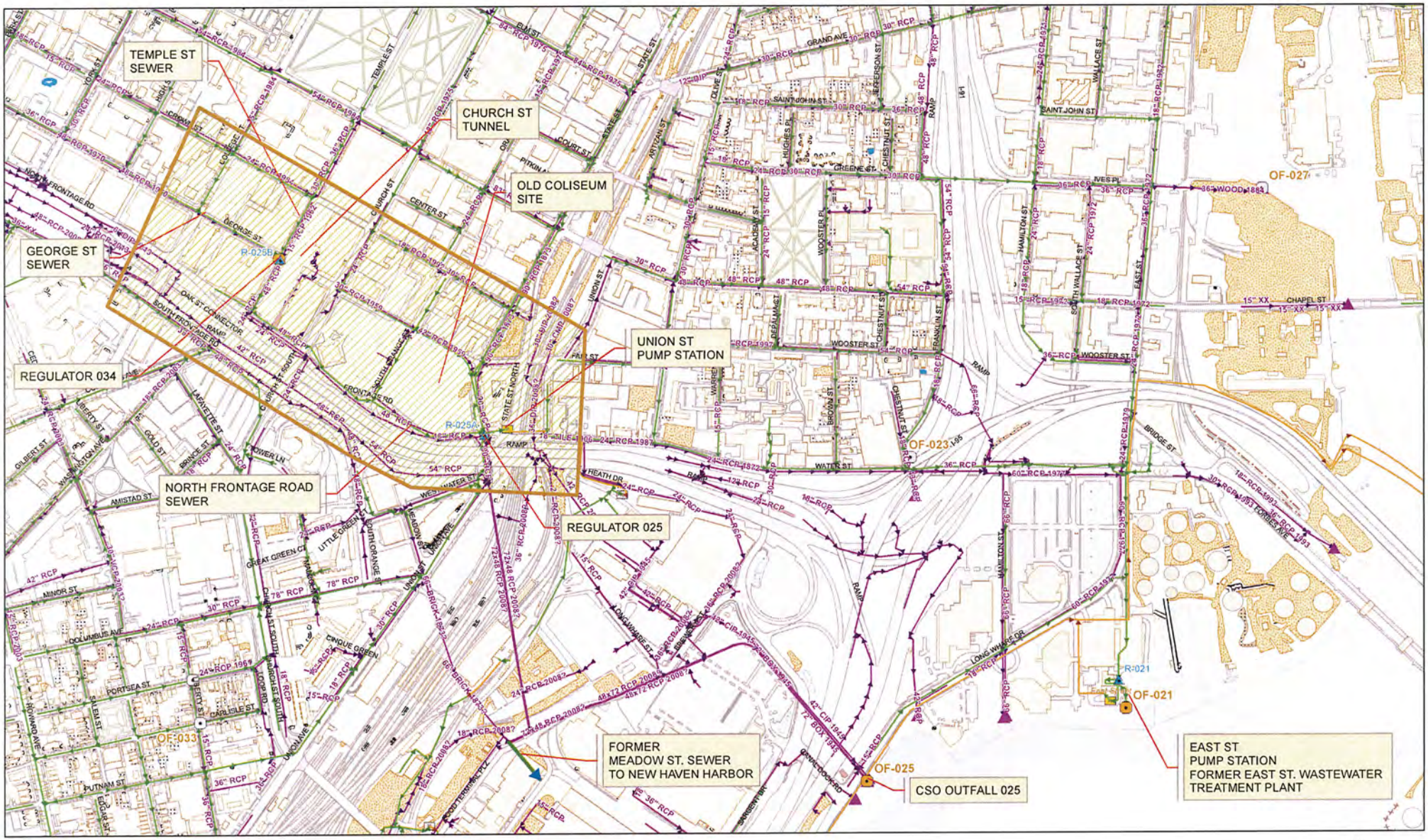
The project cost to design and construct the proposed replacement sewer is estimated at $2.3 million and includes construction of the new sewers and manholes, maintenance, protection and relocation of existing utilities, pavement restoration, sedimentation and erosion control, bypass pumping, traffic control, escalation to midpoint of construction, a construction contingency, engineering design and construction services, and legal and administrative costs. A breakdown of the project cost estimate is included in **Appendix G3.**

4.4 Project Implementation

GNHWPCA intends to combine the relief sewer projects discussed in this Report (total project cost $6.5 million) with the Regulator 003, 004, and 006 improvements and the Truman Tank modifications discussed in the West River Combined Sewer Overflow Abatement Preliminary Design Memorandum prepared by CH2M Hill in July 2014. The total project cost estimate to design and construct the Regulator improvements and CSO storage tank modifications for CSO abatement is $3.0 million.

Following incorporation of review comments from DEEP, GNHWPCA will finalize the Preliminary Design Report for the Construction of Relief Sewers and the West River Combined Sewer Overflow Abatement Preliminary Design Memorandum. GNHWPCA intends to submit one Clean Water Fund grant/loan application for $9.5 million to fund design and construction of both projects.

Design services are expected to start in April 2015. Bids are scheduled to be received in May 2016. Construction is scheduled to start in August 2016 and be completed in June 2018.



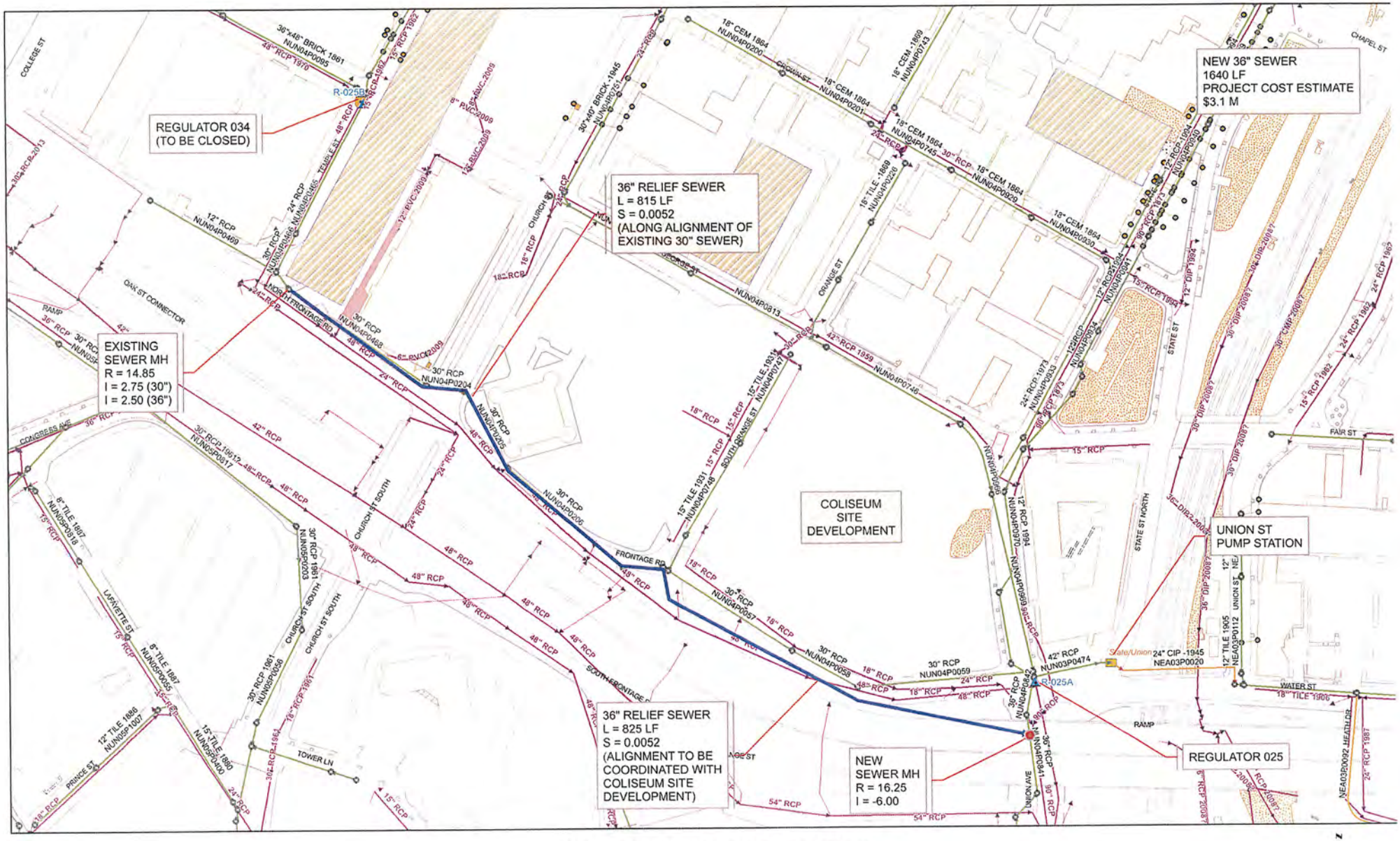
GNHWPCA

Disclaimer:
Sewer mapping data is for planning purposes only. Although compiled from record plans, there is no guarantee that this data is free from errors and omissions.

FIGURE 1. REGULATOR 034 STUDY AREA

1 inch = 500 feet

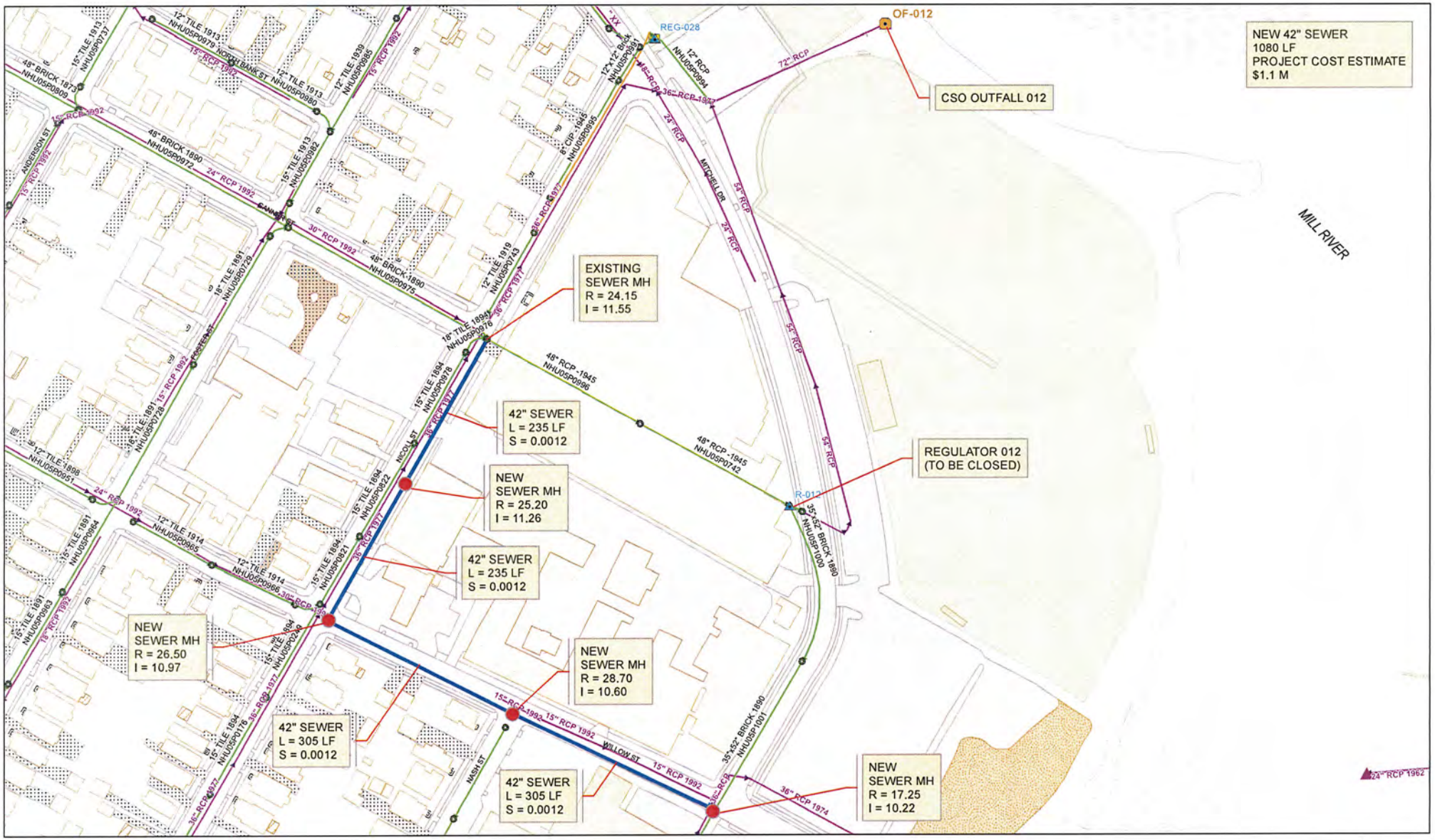
10/24/2014



GNHWPCA

Disclaimer:
Sewer mapping data is for planning purposes only. Although compiled from record plans, there is no

FIGURE 2. PROPOSED 36" RELIEF SEWER - REGULATOR 034 TO BE CLOSED



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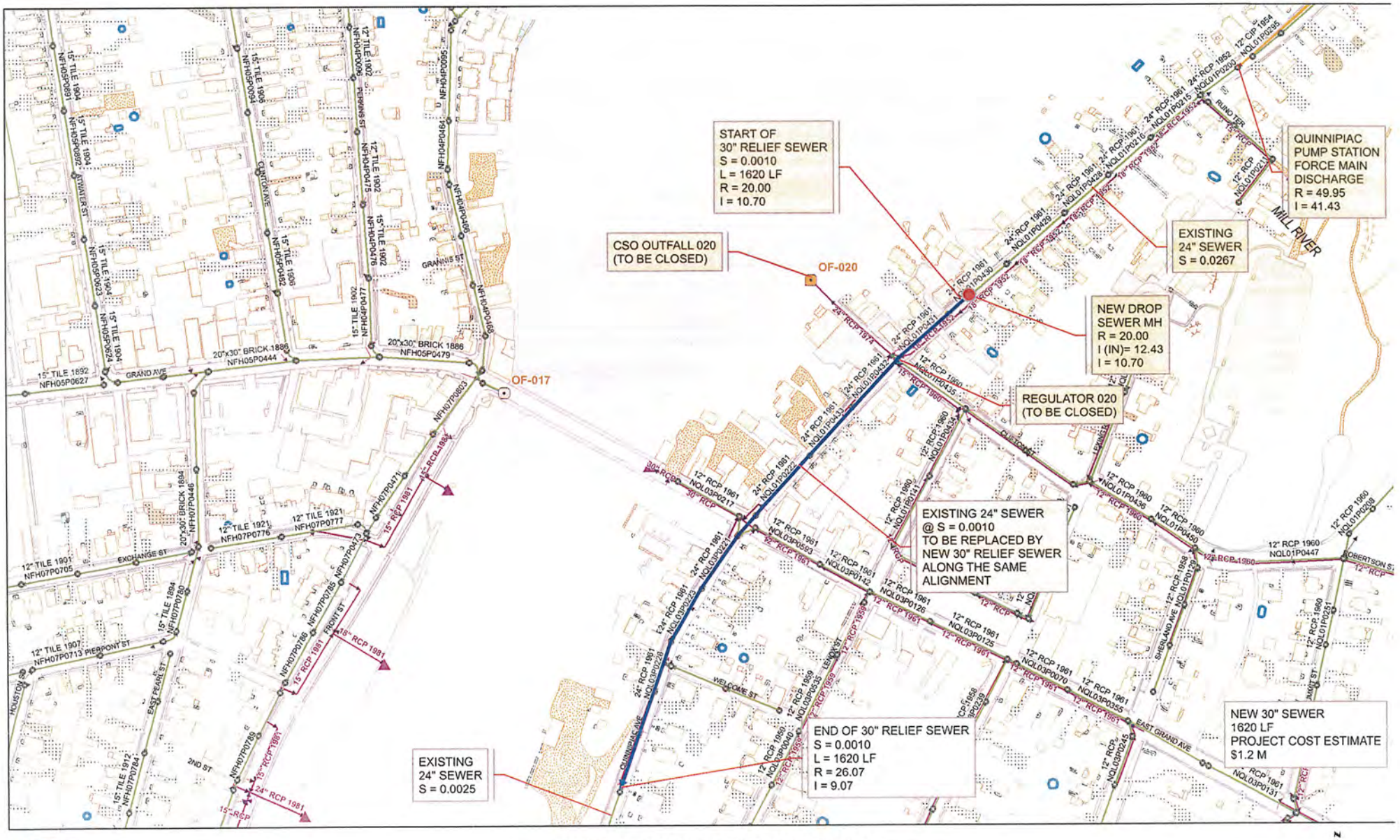
Disclaimer:
Sewer mapping data is for planning purposes only. Although compiled from record plans, there is no guarantee that this data is free from errors and omissions.

FIGURE 3. PROPOSED 42" RELIEF SEWER - REGULATOR 012 TO BE CLOSED

1 inch = 120 feet

10/24/2014



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Disclaimer:
Sewer mapping data is for planning purposes only. Although compiled from record plans, there is no

FIGURE 4. PROPOSED 30" RELIEF SEWER -
REGULATOR AND CSO OUTFALL 020 TO BE CLOSED

1 inch = 220 feet

N

10/24/201

APPENDIX A

SEWER AS-BUILT INFORMATION

REGULATOR 034 STUDY AREA

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
UNION PUMP STATION UPSTREAM TO REGULATOR 034
FLOW METER OF-025 FRONTAGE

PIPE ID	STREET	PIPE AGE	PIPE MATERIAL	PIPE WIDTH (in)	PIPE HEIGHT (in)	PIPE NOMINAL DIAMETER (in)	PIPE LENGTH (ft)	PIPE UPSTREAM INVERT (NAVD88)	PIPE DOWNSTREAM INVERT (NAVD88)	PIPE SLOPE (ft/ft)
NUN03P0074	North Frontage Road	1961	RCP			42	118	-6.07	-6.80	0.00619
NUN03P0075	North Frontage Road	1961	Brick	48	60	45	10	1.75	1.65	0.01000
NUN04P0059	North Frontage Road	1961	RCP			30	312	1.95	1.75	0.00064
NUN04P0058	North Frontage Road	1961	RCP			30	134	2.40	1.95	0.00336
NUN04P0057	North Frontage Road	1961	RCP			30	262	2.43	2.40	0.00011
NUN04P0750	North Frontage Road	1961	RCP			30	11	2.46	2.43	0.00273
NUN04P0094	North Frontage Road	1961	RCP			30	71	2.68	2.46	0.00310
NUN04P0206	North Frontage Road	1961	RCP			30	271	2.70	2.68	0.00007
NUN04P0205	North Frontage Road	1961	RCP			30	158	2.72	2.70	0.00013
NUN04P0204	North Frontage Road	1961	RCP			30	67	2.73	2.72	0.00015
NUN04P0468	North Frontage Road	1961	RCP			30	299	2.75	2.73	0.00007
NUN04P0467	North Frontage Road	1961	RCP			30	38	3.04	2.75	0.00763
NUN04P0466	Temple Street	1961	RCP			30	77	3.33	3.04	0.00377
NUN04P0465	Temple Street	1961	RCP			24	262	8.85	3.33	0.02107
NUN04P0464	Temple Street	1961	RCP			48	19	11.55	9.05	0.13158
TOTAL							2109			

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
UNION PUMP STATION UPSTREAM TO REGULATOR 034
FLOW METER OF-025 FRONTAGE

PIPE ID	PIPE UPSTREAM MH RIM (NAVD88)	PIPE UPSTREAM DEPTH (ft)	PIPE DOWNSTREAM MH RIM (NAVD88)	PIPE DOWNSTREAM DEPTH (ft)	CATCHMENT	PIPE FULL FLOW (MGD)	PIPE FULL VELOCITY (fps)	MINIMUM FLOW (MGD)	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
NUN03P0074	16.95	23.02	16.95	23.75	Separated	44.2	7.1	0.4	0.8	6.8
NUN03P0075	16.95	15.20	16.95	15.30	Separated	67.6	9.5	0.4	0.8	6.8
NUN04P0059	16.45	14.50	15.90	14.15	Separated	5.8	1.8	0.4	0.8	6.8
NUN04P0058	15.95	13.55	15.40	13.45	Separated	13.3	4.2	0.4	0.8	6.8
NUN04P0057	16.35	13.92	14.90	12.50	Separated	2.4	0.8	0.4	0.8	6.8
NUN04P0750	16.35	13.89	15.30	12.87	Separated	11.9	3.8	0.4	0.8	6.8
NUN04P0094	16.95	14.27	15.30	12.84	Separated	12.7	4.0	0.4	0.8	6.8
NUN04P0206	23.45	20.75	15.90	13.22	Separated	2.0	0.6	0.4	0.8	6.8
NUN04P0205	25.95	23.23	22.40	19.70	Separated	2.6	0.8	0.4	0.8	6.8
NUN04P0204	25.95	23.22	24.90	22.18	Separated	2.8	0.9	0.4	0.8	6.8
NUN04P0468	14.85	12.10	24.90	22.17	Separated	1.9	0.6	0.4	0.8	6.8
NUN04P0467	14.45	11.41	13.80	11.05	Separated	20.0	6.3	0.4	0.8	6.8
NUN04P0466	13.45	10.12	13.40	10.36	Separated	14.0	4.4	0.4	0.8	6.8
NUN04P0465	20.45	11.60	13.45	10.12	Separated	18.3	9.0	0.4	0.8	6.8
NUN04P0464	20.45	8.90	20.45	11.40	Separated	291.1	35.9	0.4	0.8	6.8
TOTAL										

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
UNION AVENUE SEWER UPSTREAM FROM REGULATOR 025
FLOW METER OF-025 COLUMBUS

PIPE ID	STREET	PIPE AGE	PIPE MATERIAL	PIPE WIDTH (in)	PIPE HEIGHT (in)	PIPE NOMINAL DIAMETER (in)	PIPE LENGTH (ft)	PIPE UPSTREAM INVERT (NAVD88)	PIPE DOWNSTREAM INVERT (NAVD88)	PIPE SLOPE (ft/ft)
NUN04P0842	Union Avenue	1945	RCP			36	69	-6.01	-6.07	0.00087
NUN04P0841	Union Avenue	1945	RCP			36	140	-5.87	-6.01	0.00100
NUN04P0840	Union Avenue	1945	RCP			36	57	-5.78	-5.87	0.00158
NUN04P0839	Union Avenue	1945	RCP			36	44	-5.67	-5.78	0.00250
NUN04P0838	Union Avenue	1945	RCP			36	45	-5.64	-5.67	0.00067
NUN05P0003	Union Avenue	1945	RCP			36	317	-5.35	-5.64	0.00091
NUN05P0361	Union Avenue	1945	RCP			36	263	-5.10	-5.35	0.00095
NUN05P0360	Union Avenue	1945	Cast Iron			36	23	-4.51	-5.10	0.02565
NUN05P0359	Union Avenue	1911	Brick			54	190	-0.24	-4.51	0.02247
NUN05P0358	Union Avenue	1911	Brick			54	183	-0.19	-0.24	0.00027
NUN05P0168	Union Avenue	1911	Brick	30	45	38	168	0.82	-0.19	0.00601
NUN05P0189	Union Avenue	1911	Brick	30	45	38	37	1.02	0.82	0.00541
NUN05P0174	Union Avenue	1911	Brick	30	45	38	177	1.94	1.02	0.00520
NUN05P0173	Union Avenue	1911	Brick	30	45	38	164	3.05	1.94	0.00677
NUN05P0172	Union Avenue	1911	Brick	30	45	38	245	4.68	3.05	0.00665
NUN05P0171	Putnam Street	1911	Brick	30	45	38	28	5.18	4.68	0.01786
NUN05P0170	Putnam Street	1896	Brick	20	30	25	156	5.71	5.18	0.00340
NUN05P0156	Putnam Street	1896	Brick	20	30	25	168	6.27	5.71	0.00333
NUN06P0221	Putnam Street	1896	Brick	20	30	25	170	6.82	6.27	0.00324
NUN06P0048	Liberty Street	1896	Brick	20	30	25	28	7.11	6.82	0.01036
NUN06P0176	Liberty Street	1896	Brick	20	30	25	157	7.58	7.11	0.00299
NUN06P0175	Liberty Street	1896	Brick	20	30	25	148	7.95	7.58	0.00250
NUN06P0412	Liberty Street	1896	Brick	20	30	25	153	8.33	7.95	0.00248
TOTAL							3130			

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
UNION AVENUE SEWER UPSTREAM FROM REGULATOR 025
FLOW METER OF-025 COLUMBUS

PIPE ID	PIPE UPSTREAM MH RIM (NAVD88)	PIPE UPSTREAM DEPTH (ft)	PIPE DOWNSTREAM MH RIM (NAVD88)	PIPE DOWNSTREAM DEPTH (ft)	CATCHMENT	PIPE FULL FLOW (MGD)	PIPE FULL VELOCITY (fps)	MINIMUM FLOW (MGD)	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
NUN04P0842	16.35	22.36	16.95	23.02	Separated	11.0	2.4	1.5	2.0	10.0
NUN04P0841	13.95	19.82	16.35	22.36	Separated	11.8	2.6	1.5	2.0	10.0
NUN04P0840	12.95	18.73	13.95	19.82	Separated	14.8	3.2	1.5	2.0	10.0
NUN04P0839	12.65	18.32	12.95	18.73	Separated	18.6	4.1	1.5	2.0	10.0
NUN04P0838	11.45	17.09	12.65	18.32	Separated	9.6	2.1	1.5	2.0	10.0
NUN05P0003	9.55	14.90	11.45	17.09	Separated	11.3	2.5	1.5	2.0	10.0
NUN05P0361	8.85	13.95	9.55	14.90	Separated	11.5	2.5	1.5	2.0	10.0
NUN05P0360	8.85	13.36	8.85	13.95	Separated	59.6	13.1	1.5	2.0	10.0
NUN05P0359	9.75	9.99	8.85	13.36	Separated	164.8	16.1	1.5	2.0	10.0
NUN05P0358	10.95	11.14	9.75	9.99	Separated	18.2	1.8	1.5	2.0	10.0
NUN05P0168	11.45	10.63	10.95	11.14	Separated	33.3	6.6	1.5	2.0	10.0
NUN05P0189	11.65	10.63	11.45	10.63	Separated	31.6	6.2	1.5	2.0	10.0
NUN05P0174	13.85	11.91	11.65	10.63	Separated	31.0	6.1	1.5	2.0	10.0
NUN05P0173	20.85	17.80	13.85	11.91	Combined	35.4	7.0	1.5	2.0	10.0
NUN05P0172	30.85	26.17	20.85	17.80	Combined	35.1	6.9	1.5	2.0	10.0
NUN05P0171	31.95	26.77	30.85	26.17	Combined	57.5	11.3	1.5	2.0	10.0
NUN05P0170	33.45	27.74	31.95	26.77	Combined	8.2	3.7	1.5	2.0	10.0
NUN05P0156	31.35	25.08	33.45	27.74	Separated	8.1	3.7	1.5	2.0	10.0
NUN06P0221	34.35	27.53	31.35	25.08	Separated	8.0	3.6	1.5	2.0	10.0
NUN06P0048	33.45	26.34	34.35	27.53	Separated	14.3	6.5	1.5	2.0	10.0
NUN06P0176	30.95	23.37	33.45	26.34	Separated	7.7	3.5	1.5	2.0	10.0
NUN06P0175	27.95	20.00	30.95	23.37	Separated	7.0	3.2	1.5	2.0	10.0
NUN06P0412	25.45	17.12	27.95	20.00	Separated	7.0	3.2	1.5	2.0	10.0
TOTAL										

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
GEORGE STREET SEWER UPSTREAM FROM REGULATOR 034
FLOW METER OF-034 GEORGE

PIPE ID	STREET	PIPE AGE	PIPE MATERIAL	PIPE WIDTH (in)	PIPE HEIGHT (in)	PIPE NOMINAL DIAMETER (in)	PIPE LENGTH (ft)	PIPE UPSTREAM INVERT (NAVD88)	PIPE DOWNSTREAM INVERT (NAVD88)	PIPE SLOPE (ft/ft)
NUN04P0096	George Street	1861	Brick	36	48	42	20	11.89	11.55	0.01700
NUN04P0095	George Street	1861	Brick	36	48	42	271	13.67	11.89	0.00657
NUN04P0773	George Street	1861	Brick	36	48	42	247	15.10	13.67	0.00579
NUN04P0793	George Street	1861	Brick	36	48	42	240	16.90	15.10	0.00750
NUN04P0510	George Street	1861	Brick	36	48	42	251	18.14	16.90	0.00494
NUN03P0509	George Street	1861	Brick	36	48	42	224	19.13	18.14	0.00442
NUN03P0508	George Street	1861	Brick	36	48	42	183	20.68	19.13	0.00847
NUN03P0507	George Street	1861	Brick	36	48	42	23	20.85	20.68	0.00739
NUN03P0213	George Street	1861	Brick	36	48	42	238	22.59	20.85	0.00731
NUN03P0212	George Street	1861	Brick	36	48	42	256	24.12	22.59	0.00598
NUN03P0154	George Street	1872	Brick	30	45	38	21	24.20	24.12	0.00381
NUN03P0153	George Street	1872	Brick	30	45	38	250	24.86	24.20	0.00264
NUN03P0152	George Street	1872	Brick	30	45	38	273	25.39	24.86	0.00194
TOTAL							2497			

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
GEORGE STREET SEWER UPSTREAM FROM REGULATOR 034
FLOW METER OF-034 GEORGE

PIPE ID	PIPE UPSTREAM MH RIM (NAVD88)	PIPE UPSTREAM DEPTH (ft)	PIPE DOWNSTREAM MH RIM (NAVD88)	PIPE DOWNSTREAM DEPTH (ft)	CATCHMENT	PIPE FULL FLOW (MGD)	PIPE FULL VELOCITY (fps)	MINIMUM FLOW (MGD)	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
NUN04P0096	20.45	8.56	20.45	8.90	Combined	73.3	11.8	0.2	0.4	15.5
NUN04P0095	22.15	8.48	20.45	8.56	Combined	45.5	7.3	0.2	0.4	15.5
NUN04P0773	24.85	9.75	22.15	8.48	Combined	42.8	6.9	0.2	0.4	15.5
NUN04P0793	29.85	12.95	24.85	9.75	Combined	48.7	7.8	0.2	0.4	15.5
NUN04P0510	34.65	16.51	29.85	12.95	Combined	39.5	6.4	0.2	0.4	15.5
NUN03P0509	33.85	14.72	34.65	16.51	Combined	37.4	6.0	0.2	0.4	15.5
NUN03P0508	33.75	13.07	33.85	14.72	Combined	51.7	8.3	0.2	0.4	15.5
NUN03P0507	33.45	12.60	33.75	13.07	Combined	48.3	7.8	0.2	0.4	15.5
NUN03P0213	31.05	8.46	33.45	12.60	Combined	48.0	7.7	0.2	0.4	15.5
NUN03P0212	32.85	8.73	31.05	8.46	Combined	43.4	7.0	0.2	0.4	15.5
NUN03P0154	32.95	8.75	32.85	8.73	Combined	26.5	5.2	0.2	0.4	15.5
NUN03P0153	38.75	13.89	32.95	8.75	Combined	22.1	4.4	0.2	0.4	15.5
NUN03P0152	41.45	16.06	38.75	13.89	Combined	19.0	3.7	0.2	0.4	15.5
TOTAL										

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
TEMPLE STREET SEWER UPSTREAM FROM REGULATOR 034
FLOW METER OF-034 TEMPLE

PIPE ID	STREET	PIPE AGE	PIPE MATERIAL	PIPE WIDTH (in)	PIPE HEIGHT (in)	PIPE NOMINAL DIAMETER (in)	PIPE LENGTH (ft)	PIPE UPSTREAM INVERT (NAVD88)	PIPE DOWNSTREAM INVERT (NAVD88)	PIPE SLOPE (ft/ft)
NUN04P0229	Temple Street	1945	Brick	20	30	25	33	12.52	11.55	0.02939
NUN04P0772	Temple Street	1945	Brick	20	30	25	173	13.10	12.52	0.00335
NUN04P0791	Temple Street	1877	Brick	25	37	31	173	13.68	13.10	0.00335
NUN04P0739	Temple Street	1877	Brick	25	37	31	172	14.11	13.68	0.00250
NUN04P0738	Temple Street	1877	Brick	25	37	31	174	14.54	14.11	0.00247
NUN04P0737	Temple Street	1877	Brick	25	37	31	166	14.95	14.54	0.00247
TOTAL							891			

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
TEMPLE STREET SEWER UPSTREAM FROM REGULATOR 034
FLOW METER OF-034 TEMPLE

PIPE ID	PIPE UPSTREAM MH RIM (NAVD88)	PIPE UPSTREAM DEPTH (ft)	PIPE DOWNSTREAM MH RIM (NAVD88)	PIPE DOWNSTREAM DEPTH (ft)	CATCHMENT	PIPE FULL FLOW (MGD)	PIPE FULL VELOCITY (fps)	MINIMUM FLOW (MGD)	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
NUN04P0229	20.95	8.43	20.45	8.90	Combined	24.1	11.0	0.2	0.3	4.2
NUN04P0772	24.55	11.45	20.95	8.43	Combined	8.1	3.7	0.2	0.3	4.2
NUN04P0791	27.45	13.77	24.55	11.45	Combined	14.5	4.3	0.2	0.3	4.2
NUN04P0739	26.15	12.04	27.45	13.77	Combined	12.5	3.7	0.2	0.3	4.2
NUN04P0738	25.55	11.01	26.15	12.04	Combined	12.4	3.7	0.2	0.3	4.2
NUN04P0737	24.15	9.20	25.55	11.01	Combined	12.4	3.7	0.2	0.3	4.2
TOTAL										

APPENDIX A

SEWER AS-BUILT INFORMATION

REGULATOR 012 STUDY AREA

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
REGULATOR 012 SEWER
FLOW METER FM-15

PIPE ID	STREET	PIPE AGE	PIPE MATERIAL	PIPE WIDTH (in)	PIPE HEIGHT (in)	PIPE NOMINAL DIAMETER (in)	PIPE LENGTH (ft)	PIPE UPSTREAM INVERT (NAVD88)	PIPE DOWNSTREAM INVERT (NAVD88)	PIPE SLOPE (ft/ft)
NHU05P1003	Mitchell Drive	1890	Brick	35	52	43	250	9.89	9.59	0.00120
NHU05P1002	Mitchell Drive	1890	Brick	35	52	43	252	10.22	9.89	0.00131
NHU05P1001	Mitchell Drive	1890	Brick	35	52	43	247	10.51	10.22	0.00117
NHU05P1000	Mitchell Drive	1890	Brick	35	52	43	232	10.64	10.51	0.00056
NHU05P0742	Canner Street	1945	RCP			48	237	11.24	10.64	0.00253
NHU05P0996	Canner Street	1945	RCP			48	244	11.55	11.24	0.00127
NHU05P0975	Canner Street	1890	Brick			48	318	12.02	11.55	0.00148
TOTAL							1780			

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
REGULATOR 012 SEWER
FLOW METER FM-15

PIPE ID	PIPE UPSTREAM MH RIM (NAVD88)	PIPE UPSTREAM DEPTH (ft)	PIPE DOWNSTREAM MH RIM (NAVD88)	PIPE DOWNSTREAM DEPTH (ft)	CATCHMENT	PIPE FULL FLOW (MGD)	PIPE FULL VELOCITY (fps)	MINIMUM FLOW (MGD)	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
NHU05P1003	19.95	10.06	22.55	12.96	Combined	20.7	3.2	2.5	3.5	16.0
NHU05P1002	17.25	7.03	19.95	10.06	Combined	21.7	3.3	2.5	3.5	16.0
NHU05P1001	17.65	7.14	17.25	7.03	Combined	20.5	3.2	2.5	3.5	16.0
NHU05P1000	17.04	6.40	17.65	7.14	Combined	14.2	2.2	2.5	3.5	16.0
NHU05P0742	25.15	13.91	17.04	6.40	Combined	40.4	5.0	2.5	3.5	16.0
NHU05P0996	24.15	12.60	25.15	13.91	Combined	28.6	3.5	2.5	3.5	16.0
NHU05P0975	25.05	13.03	24.15	12.60	Combined	30.9	3.8	2.5	3.5	16.0
TOTAL										

APPENDIX A

SEWER AS-BUILT INFORMATION

REGULATOR AND CSO OUTFALL

020 STUDY AREA

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
QUINNIPIAC TRUNK SEWER
FLOW METER OF-020

STREET	PIPE AGE	PIPE MATERIAL	PIPE NOMINAL DIAMETER (in)	PIPE LENGTH (ft)	PIPE UPSTREAM INVERT (NAVD88)	PIPE DOWNSTREAM INVERT (NAVD88)	PIPE SLOPE (ft/ft)	PIPE UPSTREAM MH RIM (NAVD88)	PIPE UPSTREAM DEPTH (ft)
Easement	1961	RCP	24	32	-5.55	-5.63	0.00250	5.75	11.30
Easement	1961	RCP	24	57	-5.41	-5.55	0.00246	3.55	8.96
Easement	1961	RCP	24	192	-4.95	-5.41	0.00240	3.05	8.00
Easement	1961	RCP	24	195	-4.46	-4.95	0.00251	3.45	7.91
Easement	1961	RCP	24	223	-4.19	-4.46	0.00121	3.85	8.04
Easement	1961	RCP	24	176	-3.75	-4.19	0.00250	8.05	11.80
Easement	1961	RCP	24	202	-3.23	-3.75	0.00257	11.75	14.98
Easement	1961	RCP	24	200	-2.73	-3.23	0.00250	9.75	12.48
Easement	1961	RCP	24	194	-2.24	-2.73	0.00253	7.25	9.49
Easement	1961	RCP	24	205	-1.73	-2.24	0.00249	4.65	6.38
Easement	1961	RCP	24	153	-1.35	-1.73	0.00248	6.65	8.00
Easement	1961	RCP	24	200	-0.85	-1.35	0.00250	8.15	9.00
Easement	1961	RCP	24	150	-0.49	-0.85	0.00240	9.05	9.54
Easement	1961	RCP	24	150	-0.17	-0.49	0.00213	9.85	10.02
Easement	1961	RCP	24	148	0.16	-0.17	0.00223	10.55	10.39
Easement	1961	RCP	24	150	0.63	0.16	0.00313	7.65	7.02
Easement	1961	RCP	24	67	0.74	0.63	0.00164	8.65	7.91
Easement	1961	RCP	24	207	1.25	0.74	0.00246	15.15	13.90
Easement	1961	RCP	24	148	1.30	1.25	0.00034	15.65	14.35
East Ferry Street	1961	RCP	24	96	1.65	1.30	0.00365	11.55	9.90
East Ferry Street	1961	RCP	24	235	2.80	1.65	0.00489	11.45	8.65
East Ferry Street	1961	RCP	24	114	2.95	2.80	0.00132	11.45	8.50
East Ferry Street	1961	RCP	24	155	3.65	2.95	0.00452	14.75	11.10
Quinnipiac Avenue	1961	RCP	24	49	3.91	3.65	0.00531	15.05	11.14
Quinnipiac Avenue	1961	RCP	24	198	4.01	3.91	0.00051	12.67	8.66
Quinnipiac Avenue	1961	RCP	24	183	4.22	4.01	0.00115	11.45	7.23
Quinnipiac Avenue	1961	RCP	24	222	4.81	4.22	0.00266	13.81	9.00
Quinnipiac Avenue	1961	RCP	24	204	5.57	4.81	0.00373	15.27	9.70
Quinnipiac Avenue	1961	RCP	24	203	5.73	5.57	0.00079	17.48	11.75
Quinnipiac Avenue	1961	RCP	24	196	6.33	5.73	0.00306	19.13	12.80
Quinnipiac Avenue	1961	RCP	24	192	6.83	6.33	0.00260	21.13	14.30
Quinnipiac Avenue	1961	RCP	24	207	7.32	6.83	0.00237	21.32	14.00
Quinnipiac Avenue	1961	RCP	24	153	7.77	7.32	0.00294	22.57	14.80
Quinnipiac Avenue	1961	RCP	24	154	7.96	7.77	0.00123	22.96	15.00
Quinnipiac Avenue	1961	RCP	24	147	8.33	7.96	0.00252	24.33	16.00
Quinnipiac Avenue	1961	RCP	24	146	8.69	8.33	0.00247	25.19	16.50
Quinnipiac Avenue	1961	RCP	24	153	9.07	8.69	0.00248	26.07	17.00
Quinnipiac Avenue	1961	RCP	24	154	9.22	9.07	0.00097	25.02	15.80
Quinnipiac Avenue	1961	RCP	24	120	9.37	9.22	0.00125	23.67	14.30
Quinnipiac Avenue	1961	RCP	24	79	9.44	9.37	0.00089	22.64	13.20
Quinnipiac Avenue	1961	RCP	24	60	9.51	9.44	0.00117	21.71	12.20
Quinnipiac Avenue	1961	RCP	24	160	9.67	9.51	0.00100	20.42	10.75
Quinnipiac Avenue	1961	RCP	24	167	9.82	9.67	0.00090	18.52	8.70
Quinnipiac Avenue	1961	RCP	24	71	9.89	9.82	0.00099	18.89	9.00
Quinnipiac Avenue	1961	RCP	24	211	10.10	9.89	0.00100	18.70	8.60
Quinnipiac Avenue	1961	RCP	24	168	10.27	10.10	0.00101	16.25	5.98
Quinnipiac Avenue	1961	RCP	24	172	10.45	10.27	0.00105	15.55	5.10
Quinnipiac Avenue	1961	RCP	24	178	10.62	10.45	0.00096	17.65	7.03
Quinnipiac Avenue	1961	RCP	24	202	16.70	10.62	0.03010	24.25	7.55
Quinnipiac Avenue	1961	RCP	24	200	22.72	16.70	0.03010	31.25	8.53
Quinnipiac Avenue	1961	RCP	24	152	27.32	22.72	0.03026	36.85	9.53
Quinnipiac Avenue	1961	RCP	24	146	33.22	27.32	0.04041	42.25	9.03
Quinnipiac Avenue	1961	RCP	24	171	40.22	33.22	0.04094	48.25	8.03
Quinnipiac Avenue	1961	RCP	24	123	41.43	40.22	0.00984	49.95	8.52
				8590					

GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
PRELIMINARY DESIGN REPORT - CONSTRUCTION OF RELIEF SEWERS FOR CSO ABATEMENT
SEWER AS-BUILT INFORMATION
QUINNIPIAC TRUNK SEWER
FLOW METER OF-020

STREET	PIPE DOWNSTREAM MH RIM (NAVD88)	PIPE DOWNSTREAM DEPTH (ft)	CATCHMENT	PIPE FULL FLOW (MGD)	PIPE FULL VELOCITY (fps)	MINIMUM FLOW (MGD)	AVERAGE FLOW (MGD)	PEAK FLOW (MGD)
Easement	5.95	11.58	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	5.75	11.30	Sanitary	6.2	3.1	1.3	1.6	5.2
Easement	3.55	8.96	Sanitary	6.2	3.0	1.3	1.6	5.2
Easement	3.05	8.00	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	3.45	7.91	Sanitary	4.4	2.2	1.3	1.6	5.2
Easement	3.85	8.04	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	8.05	11.80	Sanitary	6.4	3.2	1.3	1.6	5.2
Easement	11.75	14.98	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	9.75	12.48	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	7.25	9.49	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	4.65	6.38	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	6.65	8.00	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	8.15	9.00	Sanitary	6.2	3.1	1.3	1.6	5.2
Easement	9.05	9.54	Sanitary	5.8	2.9	1.3	1.6	5.2
Easement	9.85	10.02	Sanitary	6.0	2.9	1.3	1.6	5.2
Easement	10.55	10.39	Sanitary	7.1	3.5	1.3	1.6	5.2
Easement	7.65	7.02	Sanitary	5.1	2.5	1.3	1.6	5.2
Easement	8.65	7.91	Sanitary	6.3	3.1	1.3	1.6	5.2
Easement	15.15	13.90	Sanitary	2.3	1.1	1.3	1.6	5.2
East Ferry Street	15.65	14.35	Sanitary	7.6	3.8	1.3	1.6	5.2
East Ferry Street	11.55	9.90	Sanitary	8.8	4.4	1.3	1.6	5.2
East Ferry Street	11.45	8.65	Sanitary	4.6	2.3	1.3	1.6	5.2
East Ferry Street	11.45	8.50	Sanitary	8.5	4.2	1.3	1.6	5.2
Quinnipiac Avenue	14.75	11.10	Sanitary	9.2	4.5	1.3	1.6	5.2
Quinnipiac Avenue	15.05	11.14	Sanitary	2.8	1.4	1.3	1.6	5.2
Quinnipiac Avenue	12.67	8.66	Sanitary	4.3	2.1	1.3	1.6	5.2
Quinnipiac Avenue	11.45	7.23	Sanitary	6.5	3.2	1.3	1.6	5.2
Quinnipiac Avenue	13.81	9.00	Sanitary	7.7	3.8	1.3	1.6	5.2
Quinnipiac Avenue	15.27	9.70	Sanitary	3.5	1.7	1.3	1.6	5.2
Quinnipiac Avenue	17.48	11.75	Sanitary	7.0	3.4	1.3	1.6	5.2
Quinnipiac Avenue	19.13	12.80	Sanitary	6.4	3.2	1.3	1.6	5.2
Quinnipiac Avenue	21.13	14.30	Sanitary	6.1	3.0	1.3	1.6	5.2
Quinnipiac Avenue	21.32	14.00	Sanitary	6.8	3.4	1.3	1.6	5.2
Quinnipiac Avenue	22.57	14.80	Sanitary	4.4	2.2	1.3	1.6	5.2
Quinnipiac Avenue	22.96	15.00	Sanitary	6.3	3.1	1.3	1.6	5.2
Quinnipiac Avenue	24.33	16.00	Sanitary	6.3	3.1	1.3	1.6	5.2
Quinnipiac Avenue	25.19	16.50	Sanitary	6.3	3.1	1.3	1.6	5.2
Quinnipiac Avenue	26.07	17.00	Sanitary	3.9	1.9	1.3	1.6	5.2
Quinnipiac Avenue	25.02	15.80	Sanitary	4.5	2.2	1.3	1.6	5.2
Quinnipiac Avenue	23.67	14.30	Sanitary	3.8	1.9	1.3	1.6	5.2
Quinnipiac Avenue	22.64	13.20	Sanitary	4.3	2.1	1.3	1.6	5.2
Quinnipiac Avenue	21.71	12.20	Sanitary	4.0	2.0	1.3	1.6	5.2
Quinnipiac Avenue	20.42	10.75	Sanitary	3.8	1.9	1.3	1.6	5.2
Quinnipiac Avenue	18.52	8.70	Sanitary	4.0	2.0	1.3	1.6	5.2
Quinnipiac Avenue	18.89	9.00	Sanitary	4.0	2.0	1.3	1.6	5.2
Quinnipiac Avenue	18.70	8.60	Sanitary	4.0	2.0	1.3	1.6	5.2
Quinnipiac Avenue	16.25	5.98	Sanitary	4.1	2.0	1.3	1.6	5.2
Quinnipiac Avenue	15.55	5.10	Sanitary	3.9	1.9	1.3	1.6	5.2
Quinnipiac Avenue	17.65	7.03	Sanitary	21.9	10.8	1.3	1.6	5.2
Quinnipiac Avenue	24.25	7.55	Sanitary	21.9	10.8	1.3	1.6	5.2
Quinnipiac Avenue	31.25	8.53	Sanitary	21.9	10.8	1.3	1.6	5.2
Quinnipiac Avenue	36.85	9.53	Sanitary	25.3	12.5	1.3	1.6	5.2
Quinnipiac Avenue	42.25	9.03	Sanitary	25.5	12.6	1.3	1.6	5.2
Quinnipiac Avenue	48.25	8.03	Sanitary	12.5	6.2	1.3	1.6	5.2

APPENDIX B

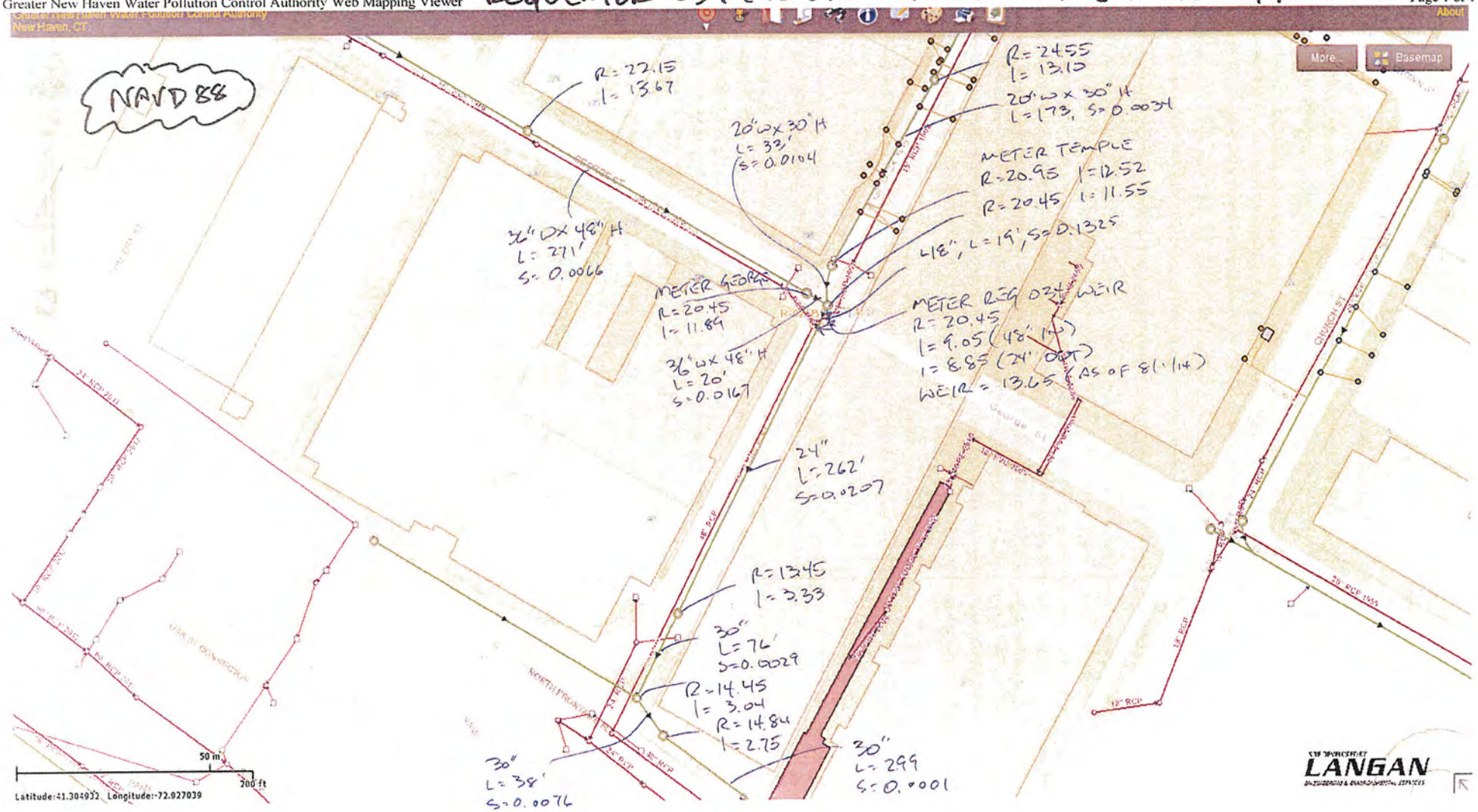
REGULATOR AS-BUILT INFORMATION

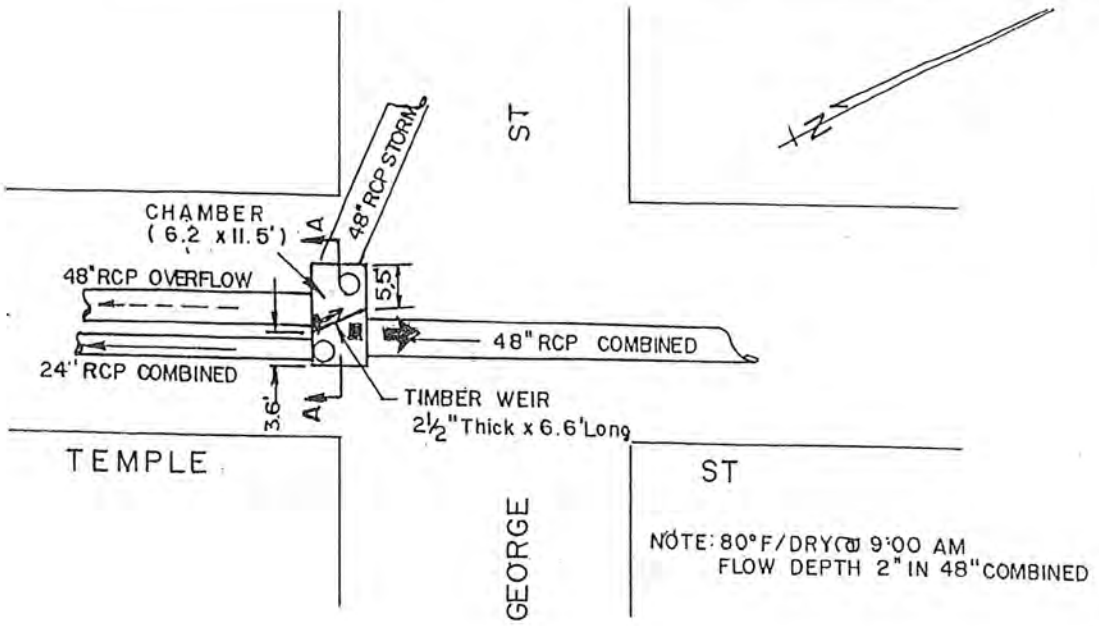
REGULATOR 034 STUDY AREA

REGULATOR 034 / TO CSO OUTFALL 025

(Updated 08-01-2014)

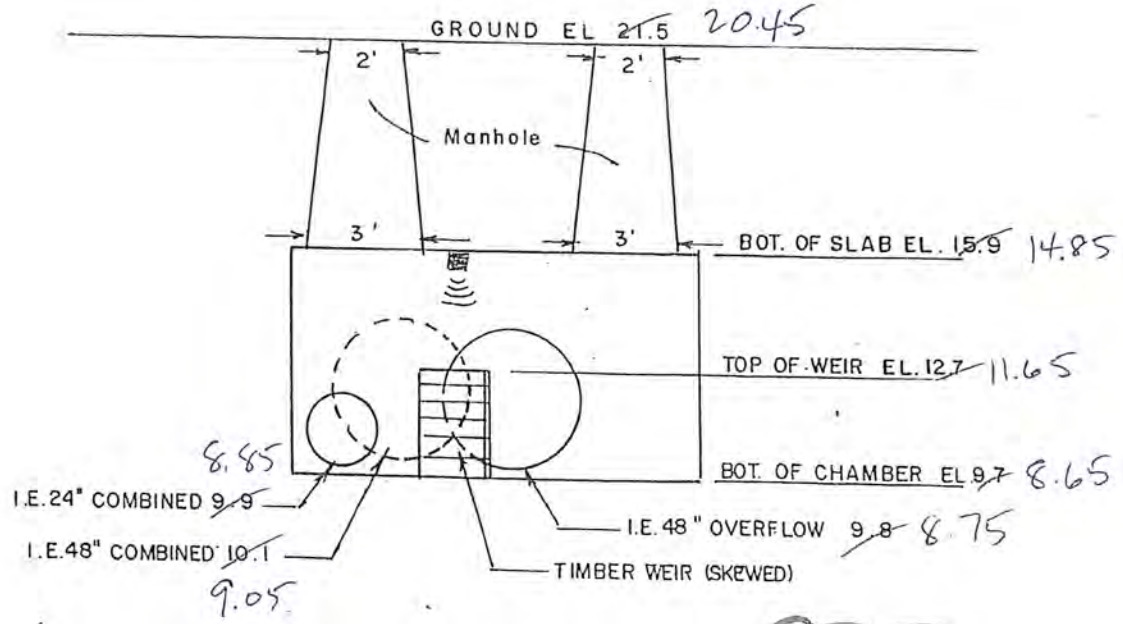
REGULATOR 034 (TO CSO OUTFALL 025) (UPDATED 8/1/14)





PLAN

N. T. S.



SECTION "A-A"

N. T. S.

NAVD88

LEGEND

WET WEATHER FLOW

DRY WEATHER FLOW

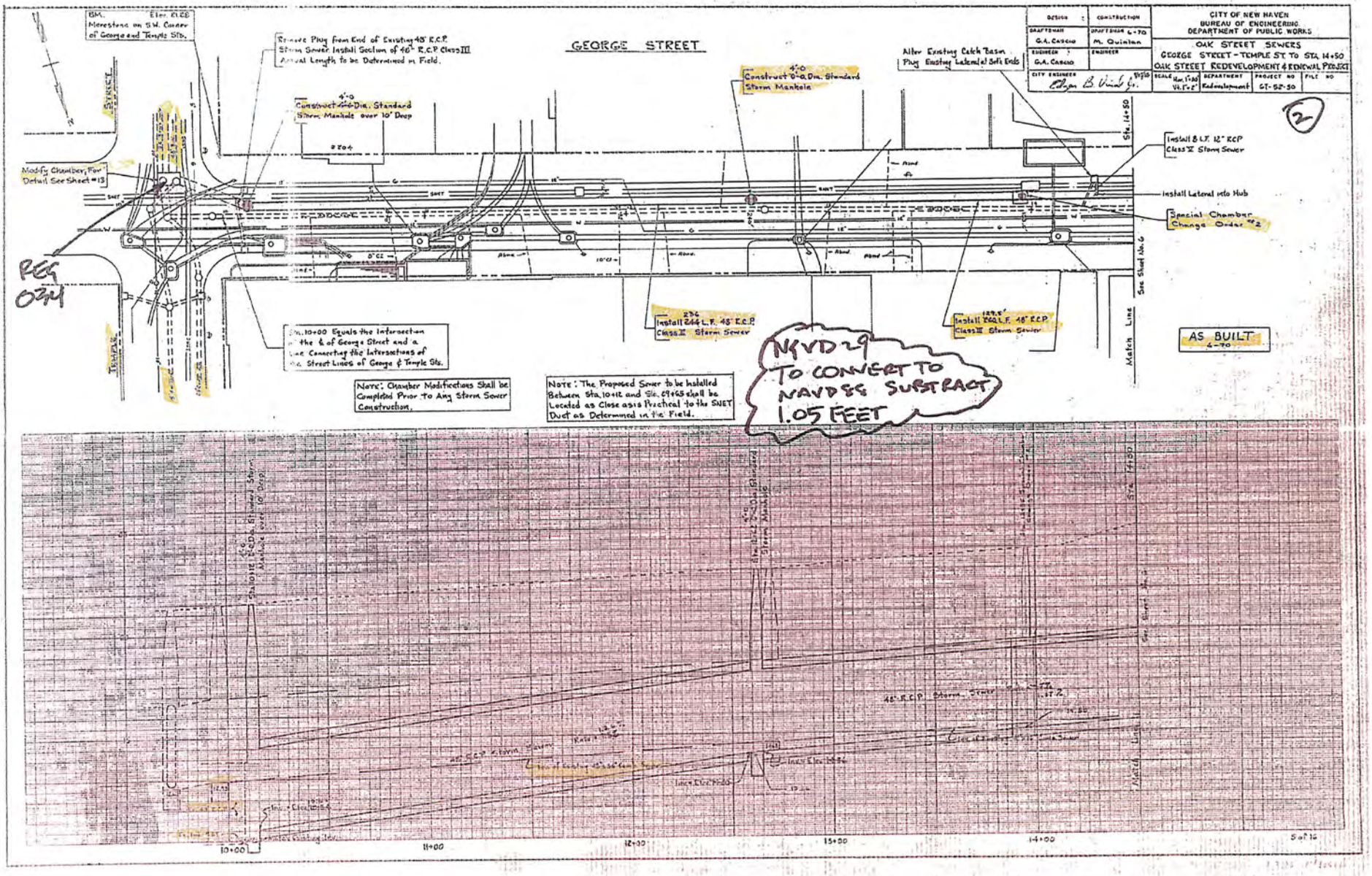
034

OVERFLOW NO. OE-9B/025
TEMPLE ST. @ GEORGE ST.
NEW HAVEN, CONNECTICUT

DATE 8-15-97

JOB NO 1146

SHT NO. 24



DESIGN	CONSTRUCTION
DRAFTSMAN	DRAFTSMAN 4-70 M. Quinlan
G.A. Cascio	
ENGINEER G.A. Cascio	ENGINEER
CITY ENGINEER Edgar B. Wood Jr. 9/30	

CITY OF NEW HAVEN
BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS

OAK STREET SEWERS
GEORGE STREET - TEMPLE ST. TO STA. 14+50
OAK STREET REDEVELOPMENT & RENEWAL PROJECT

SCALE	DEPARTMENT	PROJECT NO	FILE NO
Hor. 1"=40' Vert. 1"=5'	Redevelopment	CT-52-30	

(2)

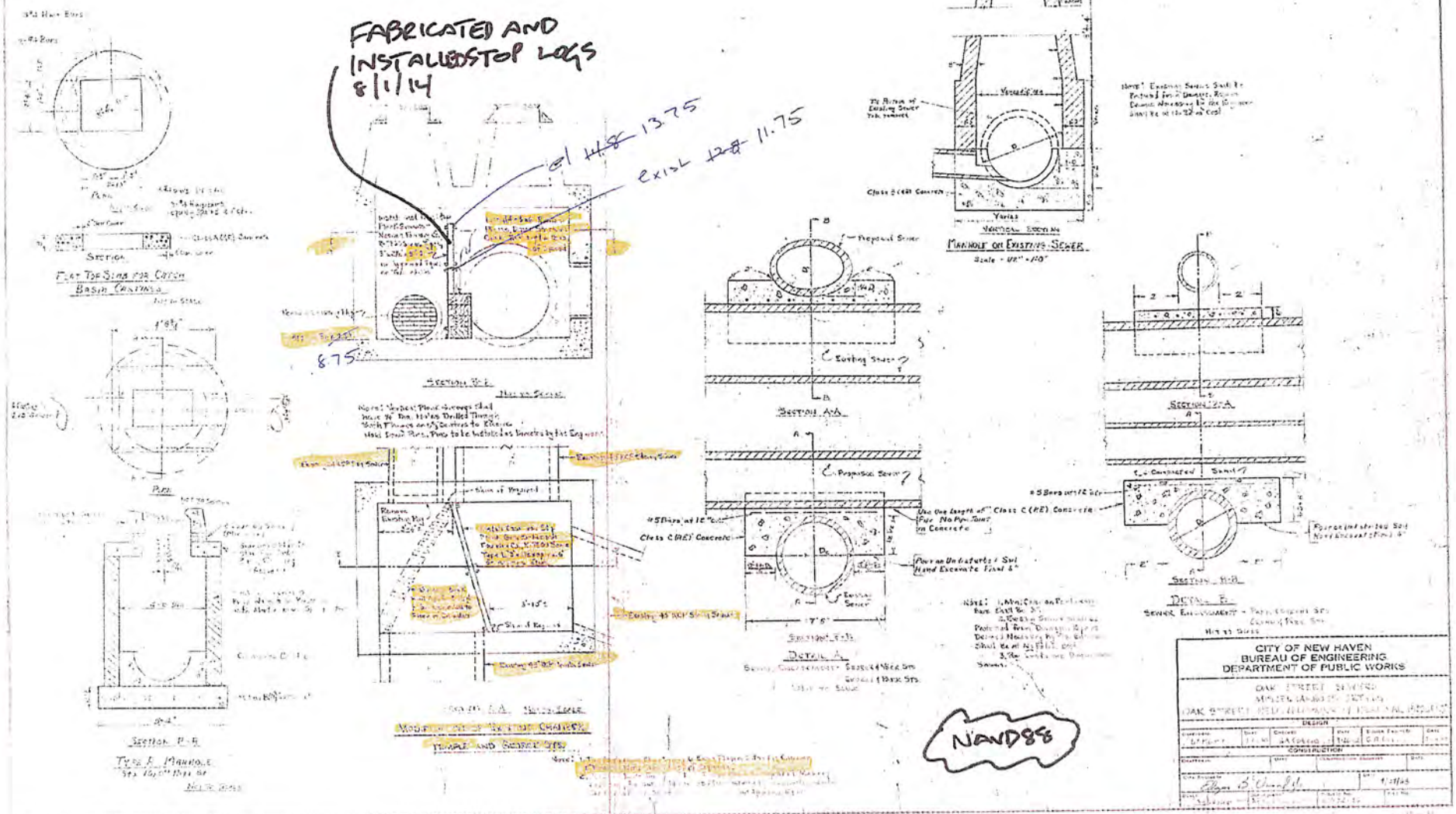
REGULATOR 034

FABRICATED AND INSTALLED STOP LOGS 8/1/14

el ~~14.5~~ 13.75

exist ~~12.5~~ 11.75

875



REGULATOR
034
BEFORE
2 FEET OF
NEW STOP
LOGS ADDED
ON 8/1/14

034 ~~025~~ CE-93

TEMPLE ST @ GEORGE

LOOKING SOUTH @ OUTLET

AND FACE OF WEIR

034 025 CE-93

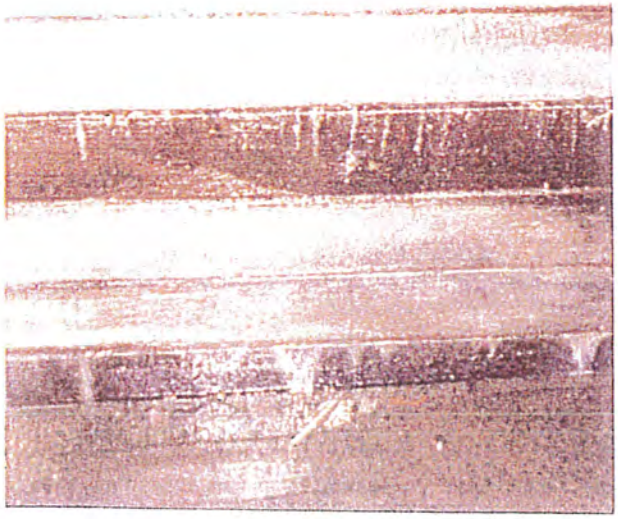
TEMPLE ST @ GEORGE

LOOKING SOUTH @ WEIR AND

OUTLET PIPE IN BACKGROUND

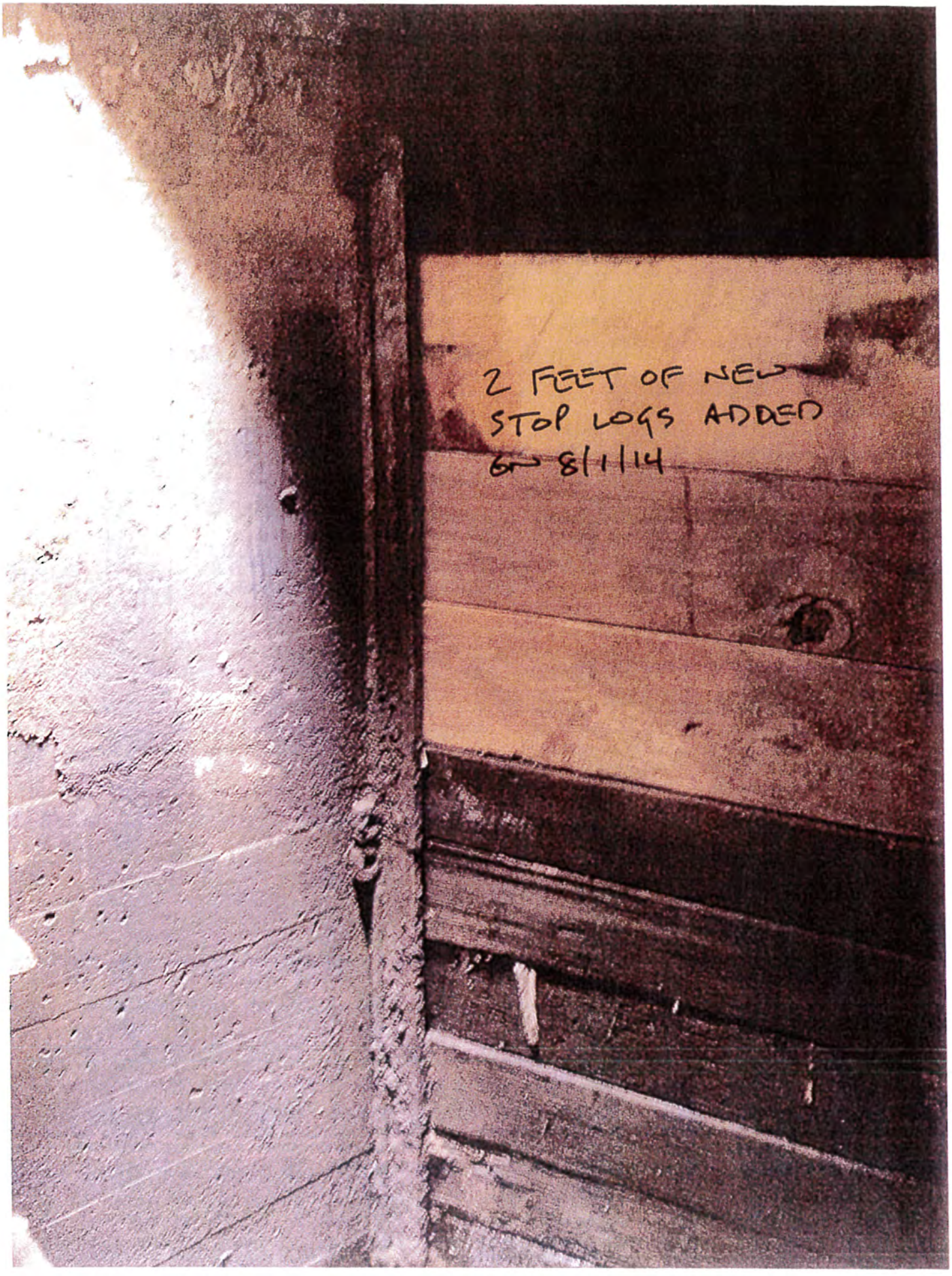
034 ~~025~~ CE-93

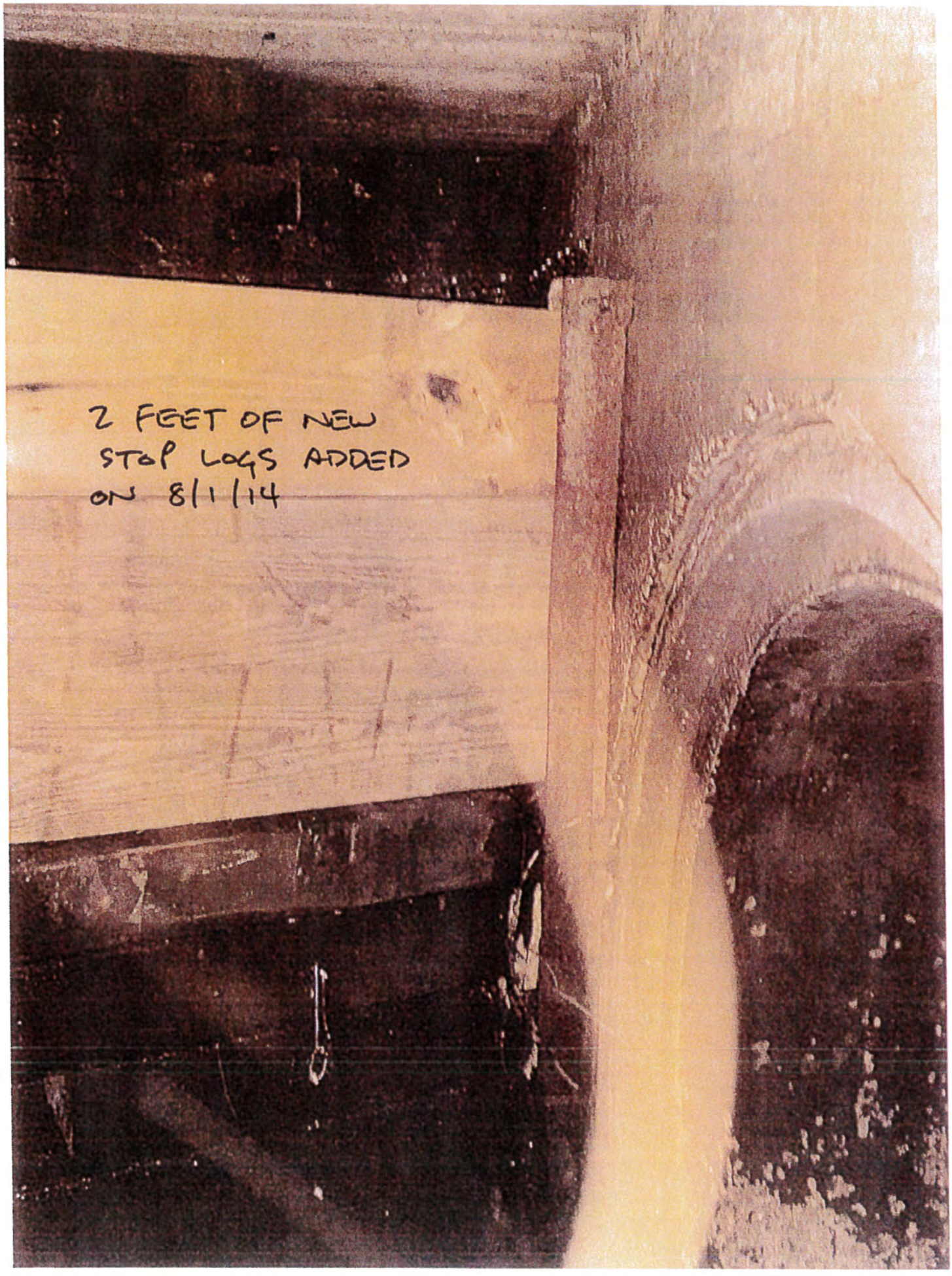
REGULATOR 034 BEFORE 2 FEET OF NEW STOP LOGS ADDED ON 8/1/14



034

034

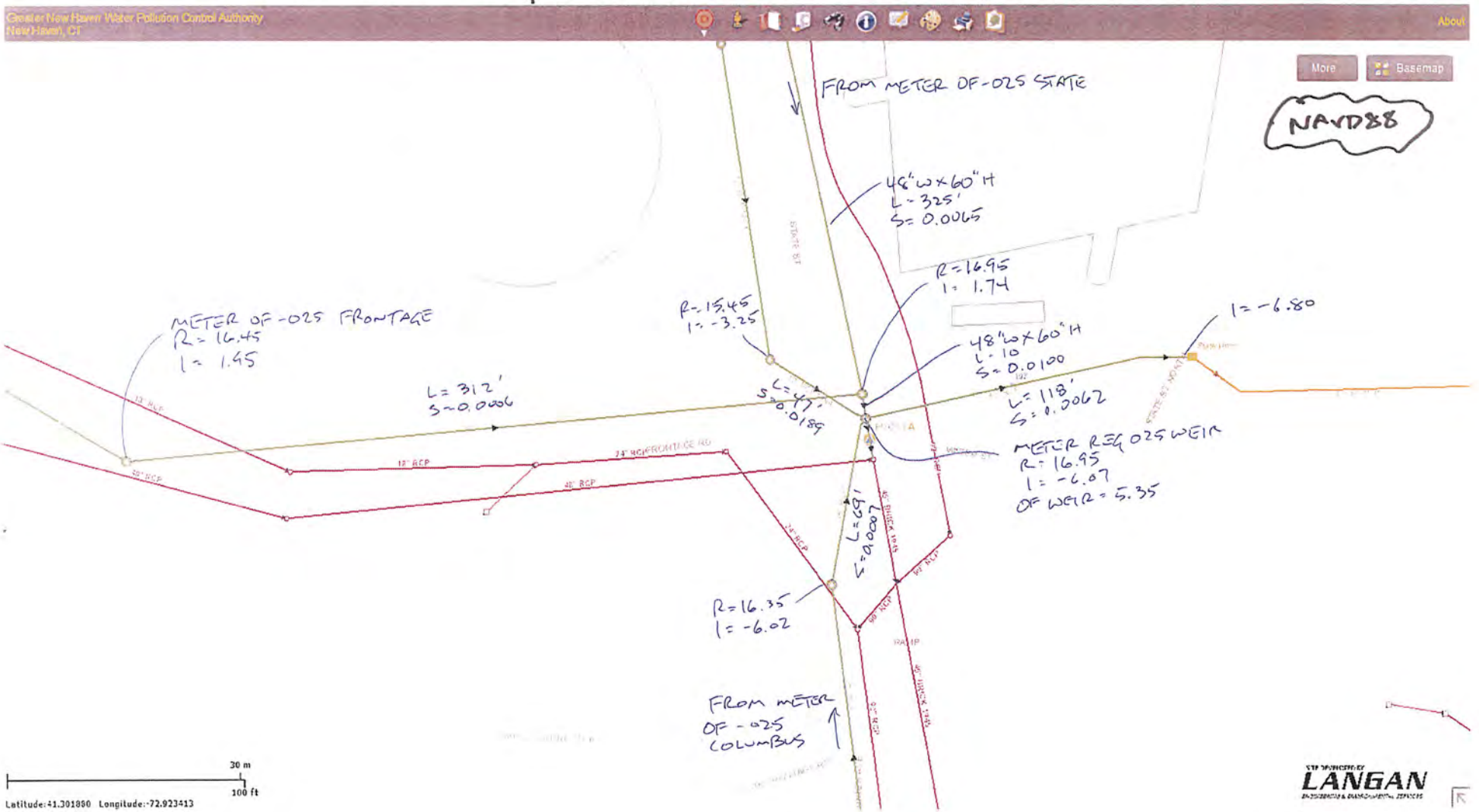

2 FEET OF NEW
STOP LOGS ADDED
8/1/14

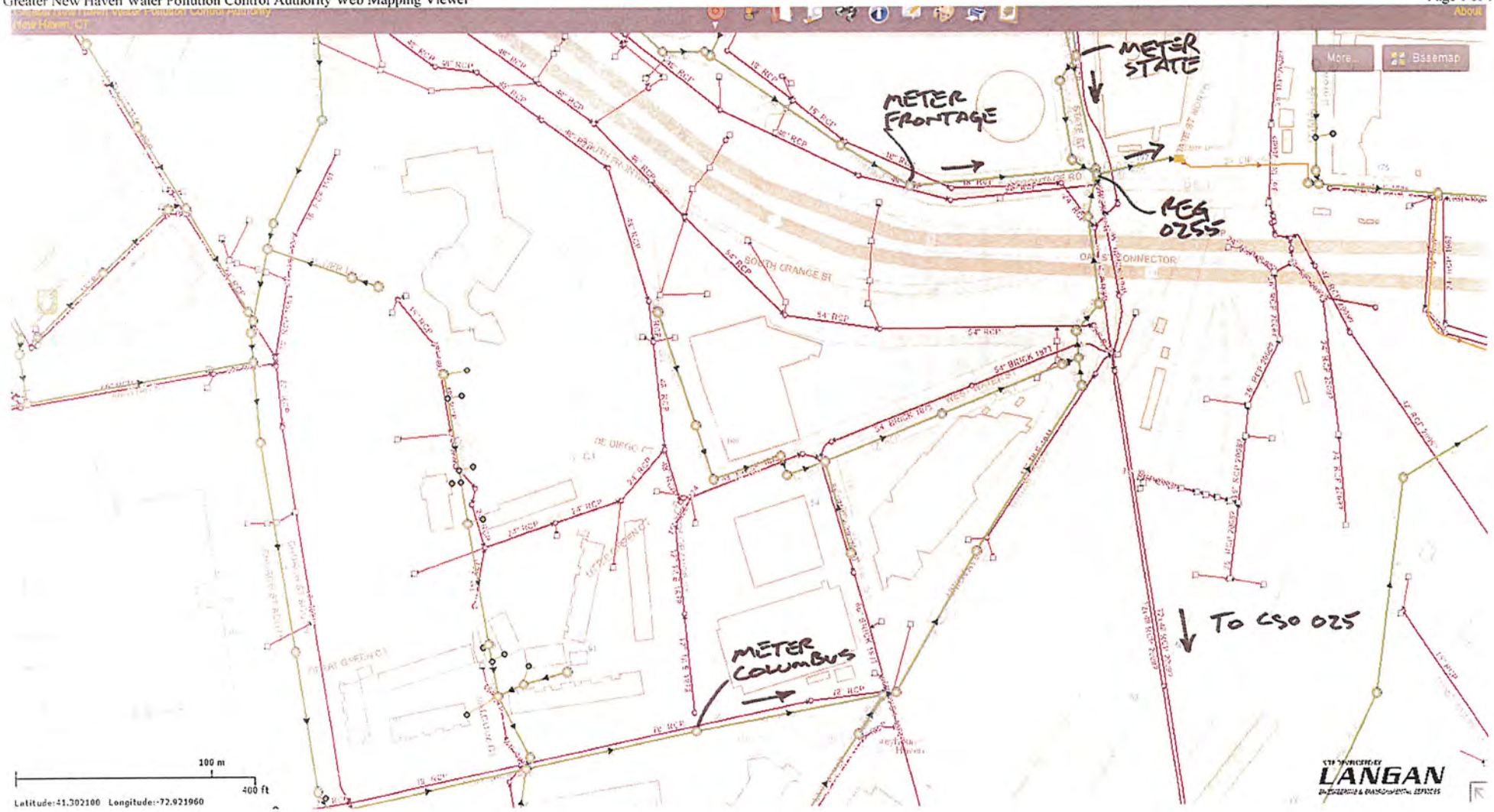

2 FEET OF NEW
STOP LOGS ADDED
ON 8/1/14

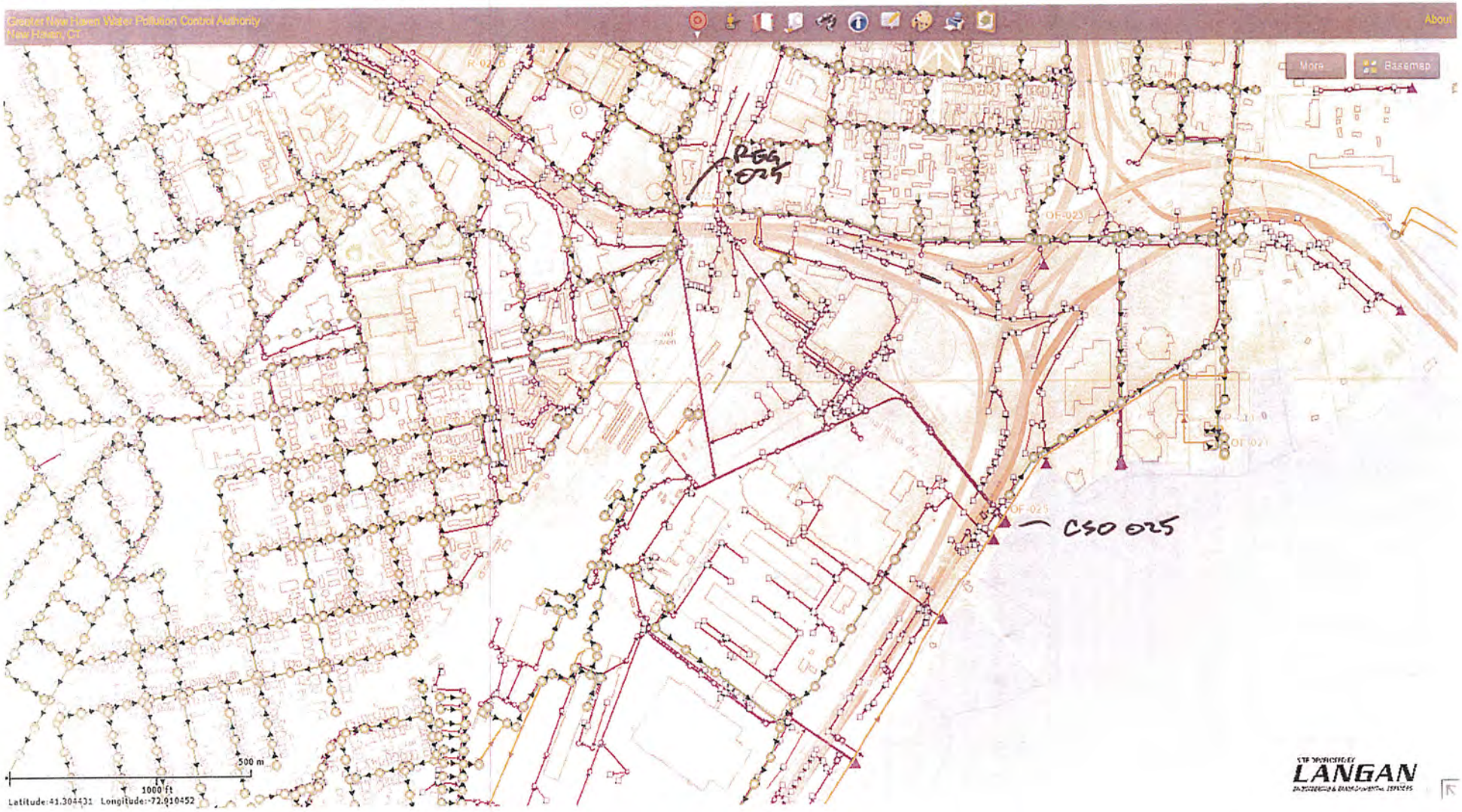
REGULATOR 025 / CSO OUTFALL 025

(Updated 08-01-2014)

 REGULATOR 025 / CSO OUTFALL 025 (UPDATED 8/1/14)




METER STATE
METER FRONTAGE
REG 025S
To CSO 025
METER COLUMBUS
100 m
400 ft
Latitude:41.302100 Longitude:-72.921960
LANGAN


Greater New Haven Water Pollution Control Authority
New Haven, CT
About
More
Basemap
CSO 025
500 m
1000 ft
Latitude:41.304431 Longitude:-72.910452
LANGAN

MH @ STATE/UNION

DIVERSIFIED TECHNOLOGY CONSULTANTS

FLOW CONTROL WEIR "AS-BUILT"

PW KIMBERLY & COLUMBUS SOUTH PROJECT NO 99-146-201 SHEET 1 OF 4

MH-506

COMPUTED BY RTC DATE 3/26/02, 3/10/03

SCALE: 1"=2' CHECKED BY DATE

REG 025

12" VCT SAN.

60" H BY 96" W BRICK COMB. SEWER

SAN/COMB.

STAINLESS STEEL PLATE (316L) 34" H BY 20" W BY 3/8" Th - 3 EA

36" RCP SAN.

SEALED TO PREVENT TIDAL INFLOW UNDER THE WEIR BY 8/11/14

42" RCP SAN/COMB. To Union Pump Station

NEW BRICK BULKHEAD

60" H BY 96" W BRICK COMB. SEWER

SAN/COMB.

S.S. ANGLE (316L) 3" BY 3" BY 1/8 - 5 EA

S.S. PLATE (316L) 27" H BY 20" W (AT TOP) BY 3/8" Th TRIANGLE PIECE - 2 EA

PLAN

DIVERSIFIED TECHNOLOGY CONSULTANTS
559 WASHINGTON AVENUE NORTH HAVEN CT 06473
(203) 239-4730 (203) 234-7376 FAX

"AS-BUILT"

PROJECT KIMBERLY & COLUMBUS SOUTH PROJECT NO. 95-146-201 SHEET 2 OF 4

MH-506 COMPUTED BY RTL DATE 10/23/01 3/10/03

SCALE: 1" = 5' CHECKED BY DATE

SOUTH ← SECTION → NORTH

695 8.01

REG 025

8.95 10.00

PROPOSED STAINLESS STEEL BULKHEAD/WEIR TOP ELEV. = 6.4 FT 5.35

SEAL TO PREVENT TIDAL INFLOW UNDER THE WEIR ON 8/1/14

30" HIGH BY 18" THICK BY 48" WIDE ICK BULKHEAD

60 H BY 45" W BRICK COMB SEWER

3.95 5.00

BRICK SHELF TO SUPPORT BASE OF SS WEIR

REMOVE WOOD PLANKS AS REQ'D

-1.05 0.00

EXISTING STEEL BEAMS, HANGERS, CHANNELS IN MH-506

36" RCP SAN. IN

42" RCP SAN. OUT

EMBEDDED BEAM (TYP.)

NAVD88

DIVERSIFIED TECHNOLOGY CONSULTANTS

"AS-BUILT"

PROJECT KIMBERLY & COLUMBUS SOUTH PROTOCOL 95-196-201 SHEET 3 OF 4

MH-506

COMPUTED BY B.TG DATE 3/26/02, 3/10/03

SCALE: 1" = 2' CHECKED BY DATE

REG 025

16.45
18.00

8.45
10.00

60" H BY 45" W BRICK ARCH

EMBEDDED I-BEAM 8" x 8" (TYP)

SS ANGLES SECURED TO SOUTH MH WALL W/ 1/2" Ø SS BOLTS ~~DRILLED & GROUTED~~ EXPANSION-TYPE

3.95
5.00

3' HIGH BY 18" THICK BY 46" WIDE BRICK BULKHEAD

SEALED TO PREVENT TIDAL INFLOW UNDER THE WEIR 8/1/14

-1.05
0.00

NAVD88

EXISTING STEEL BEAMS, HANGERS, CHANNELS IN MH-506.

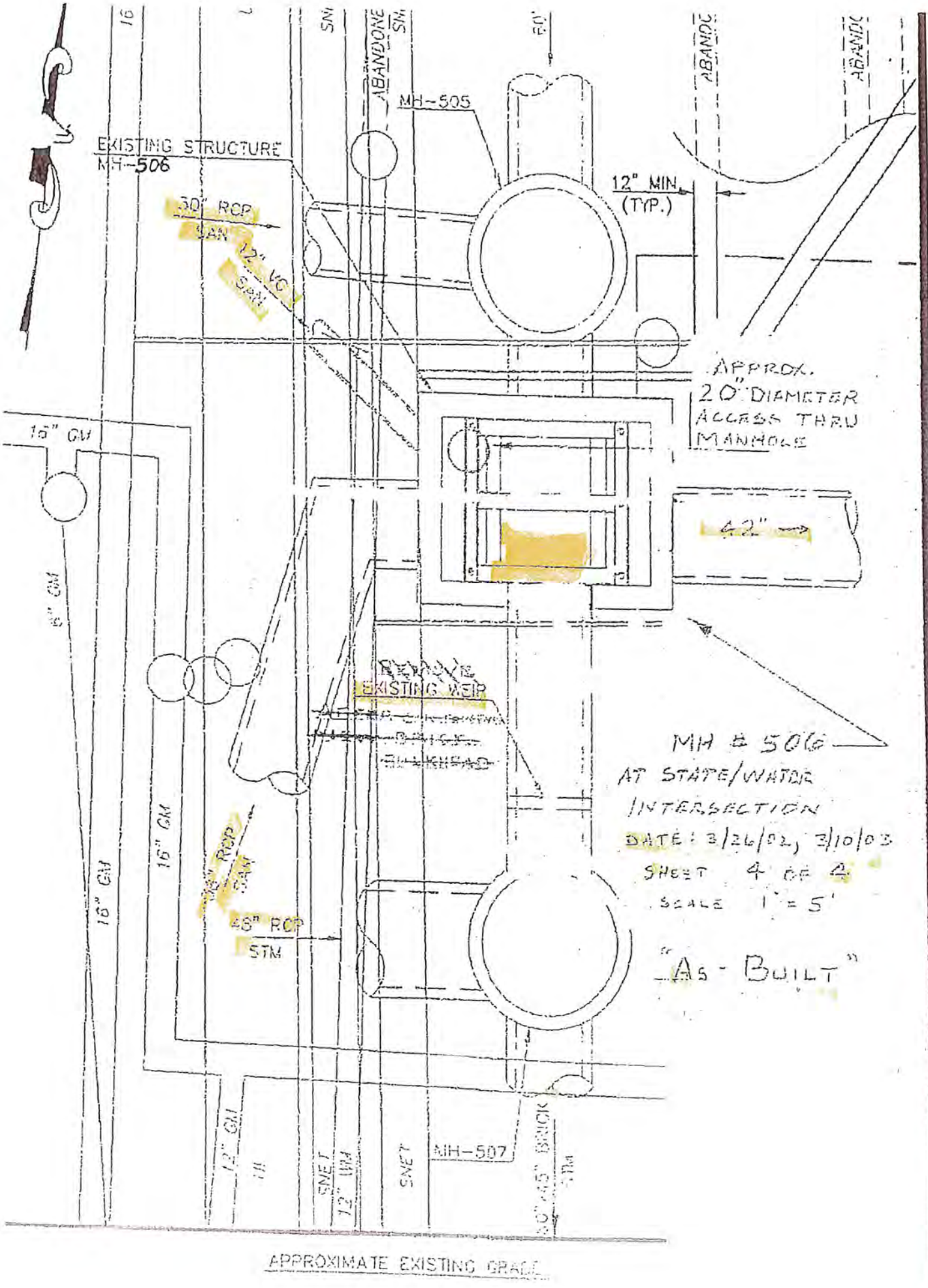
2" RCP SAN.

EAST — WEST

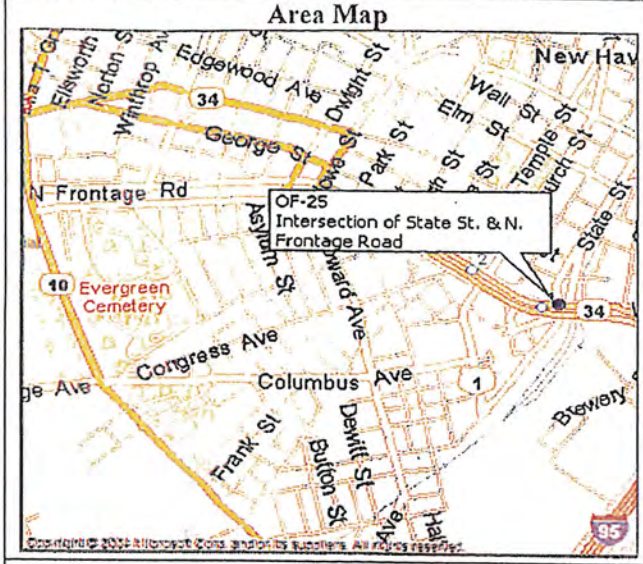
36" RCP SAN.

SECTION

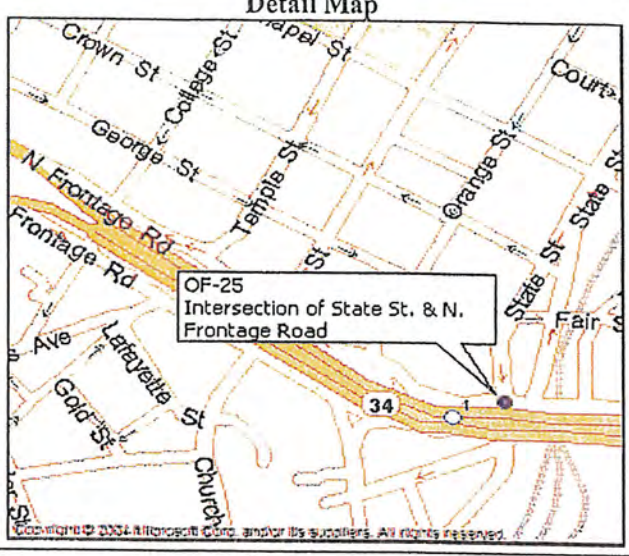
SCALE: 1" = 2'


EXISTING STRUCTURE
MH-506
MH-505
ABANDONE SM
ABANDONE
ABANDONE
12" MIN.
(TYP.)
30" RCP
SAN
12" VC
SAN
APPROX.
20" DIAMETER
ACCESS THRU
MANHOLE
42"
15" CM
8" CM
REMOVE
EXISTING WEIR
BULKHEAD
16" CM
16" CM
16" CM
36" RCP
SAN
48" RCP
STM
MH-507
SNET
12" UM
SNET
12" GM
UM
SNET
BRICK
STM
APPROXIMATE EXISTING GRADE
MH # 506
AT STATE/WATER
INTERSECTION
DATE: 3/26/02, 3/10/03
SHEET 4 OF 4
SCALE 1" = 5'
"AS-BUILT"

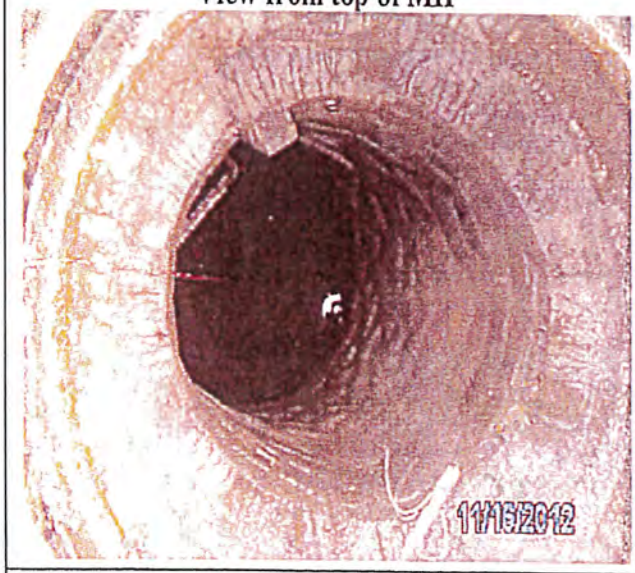
Area Map



Detail Map



View from top of MH



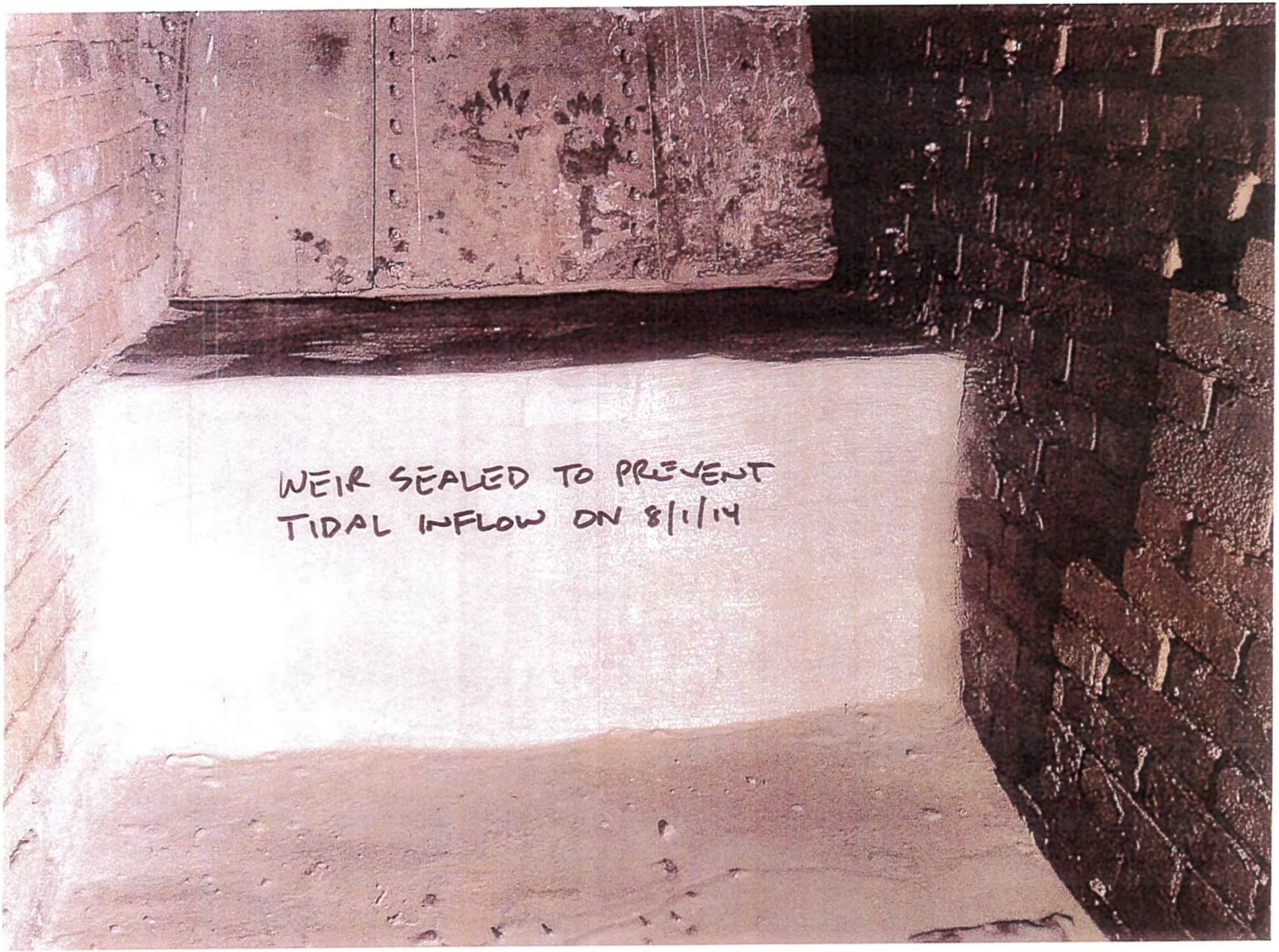
Site Overview

View of flow through influent line

View of flow through effluent line

RE 025


WEIR BEFORE BEING SEALED


WEIR SEALED TO PREVENT
TIDAL INFLOW ON 8/1/14

APPENDIX B

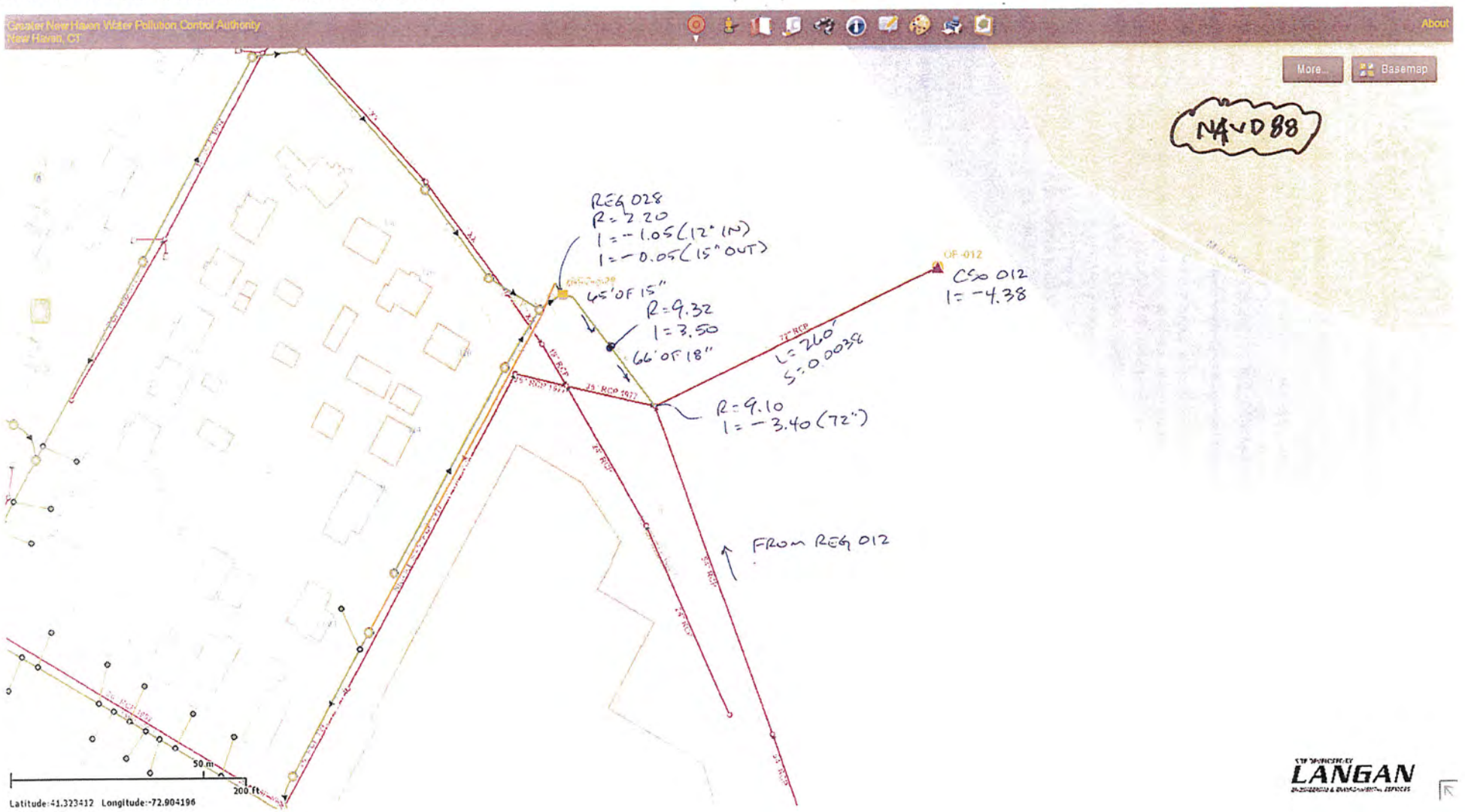
REGULATOR AS-BUILT INFORMATION

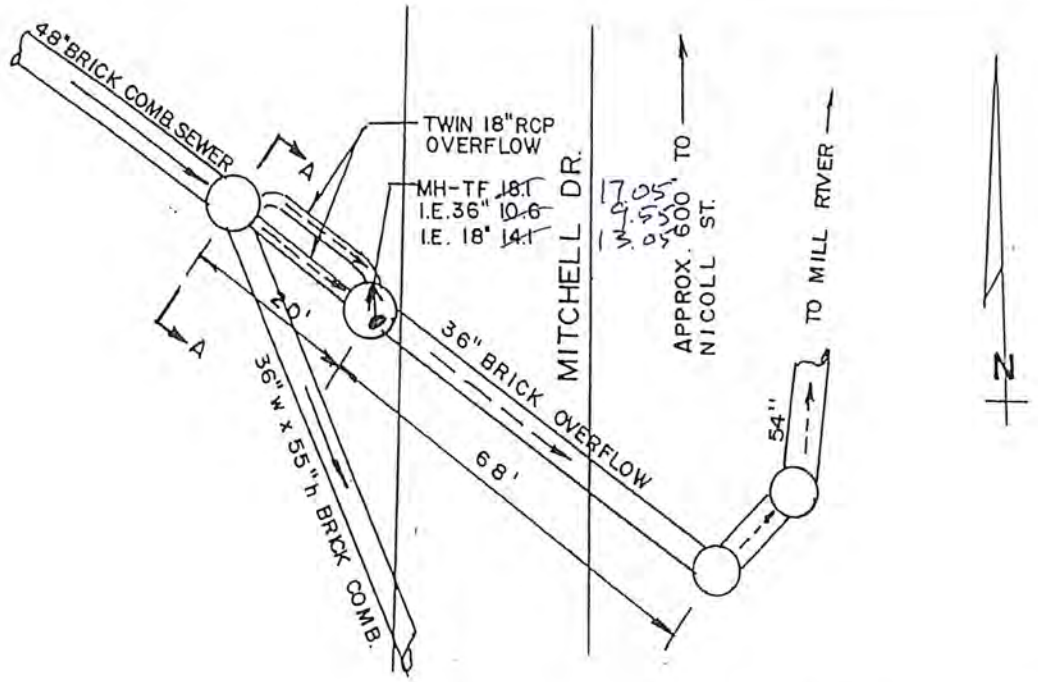
REGULATOR 012 STUDY AREA

REGULATORS 012 AND 028 / CSO OUTFALL 012

(Updated 08-01-2014)

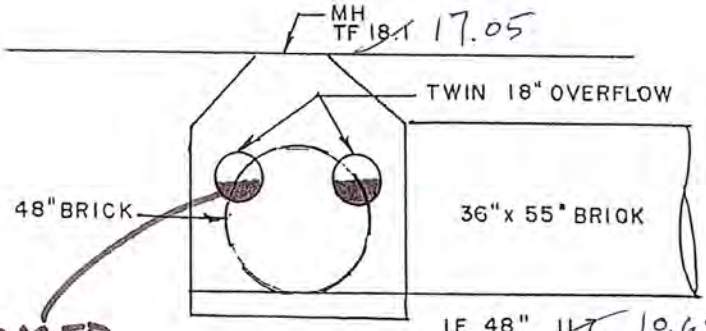
 REGULATORS 012 AND 028 / CSO OUTFALL 012 (UPDATED 8/1/14)


Greater New Haven Water Pollution Control Authority
New Haven, CT
About
More...
Basemap
NAVD 88
REG 028
R = 2.20
I = -1.05 (12" IN)
I = -0.05 (15" OUT)
45' OF 15"
R = 9.32
I = 3.50
66' OF 18"
OF-012
CSO 012
I = -4.38
21" RCP
L = 260'
S = 0.0035
R = 9.10
I = -3.40 (72")
FROM REG 012
50 m
200 ft
Latitude: 41.323412 Longitude: -72.904196



NOTE: 80°F/DRY @ 11:00 AM
FLOW DEPTH 2.2 FT IN 48"

PLAN
N.T.S.



WEIRS RAISED 6" IN 2013

SECTION A-A
N.T.S.

LEGEND

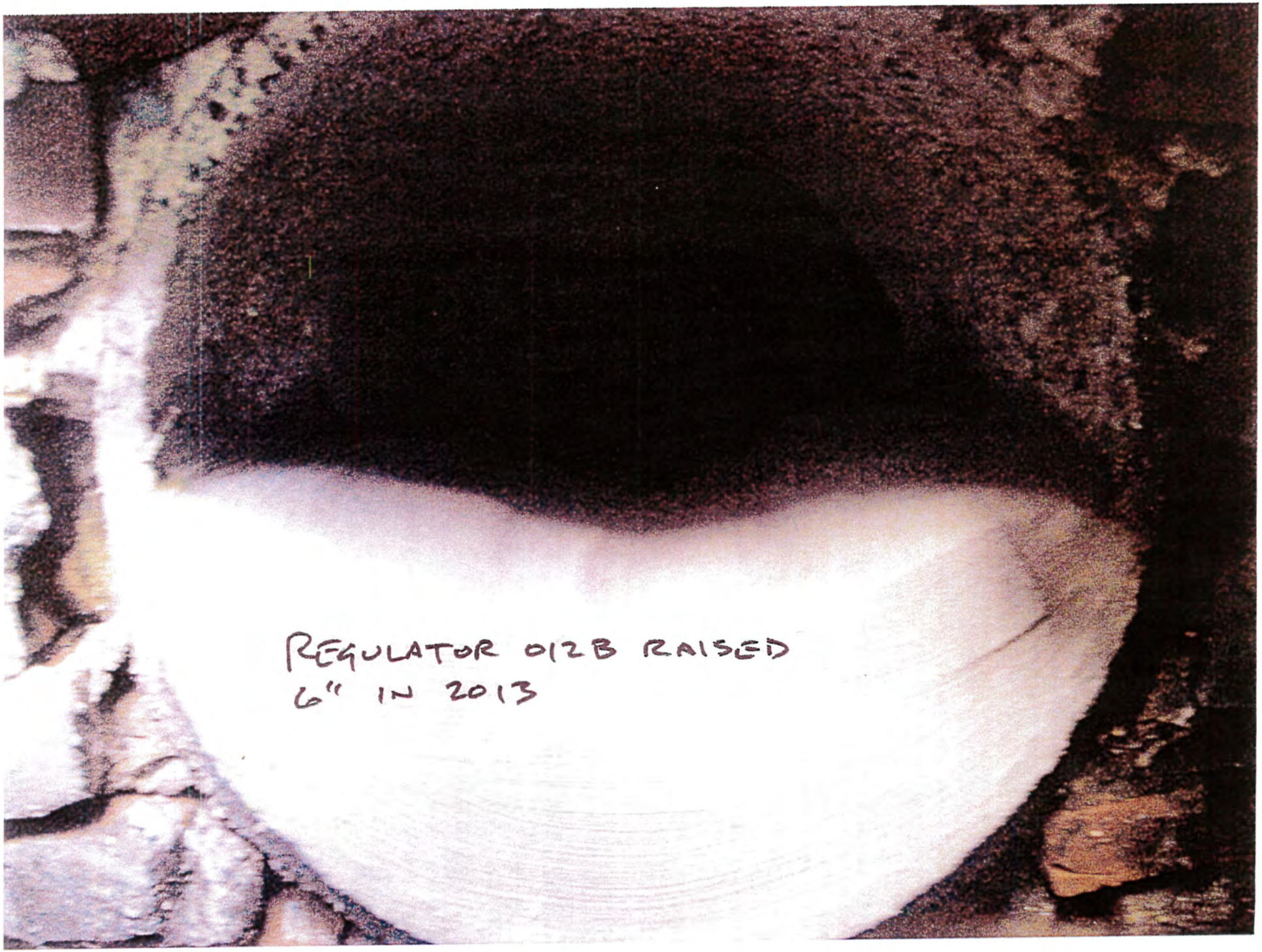
WET WEATHER FLOW

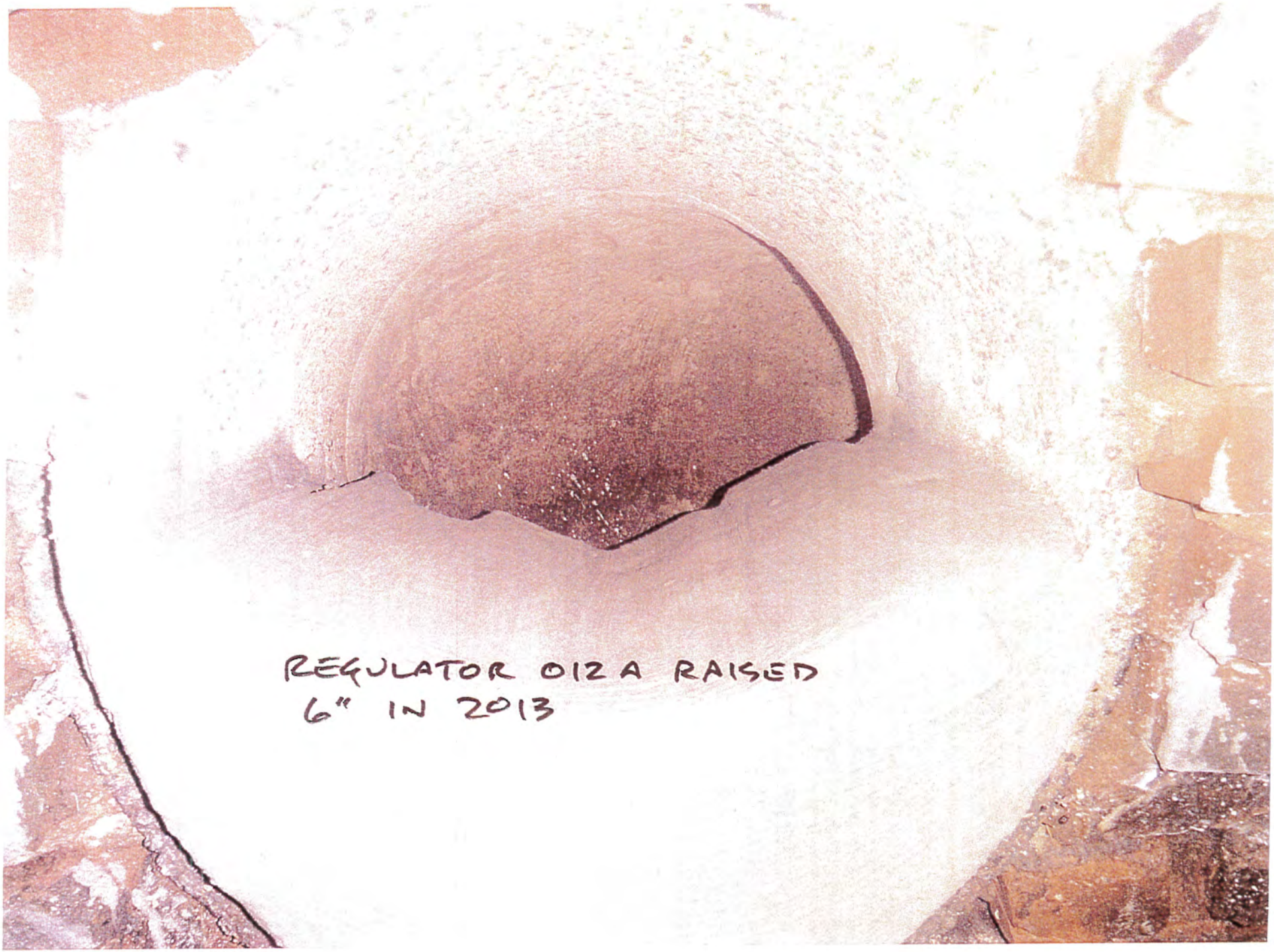
DRY WEATHER FLOW

NAVD 88

OVERFLOW NO. OE 3/012
MITCHELL DRIVE
NEW HAVEN, CONNECTICUT

DATE: 7-9-97
JOB NO. 1146
SHT. NO. 6


REGULATOR 012B RAISED
6" IN 2013


REGULATOR 012A RAISED
6" IN 2013

APPENDIX B

REGULATOR AS-BUILT INFORMATION

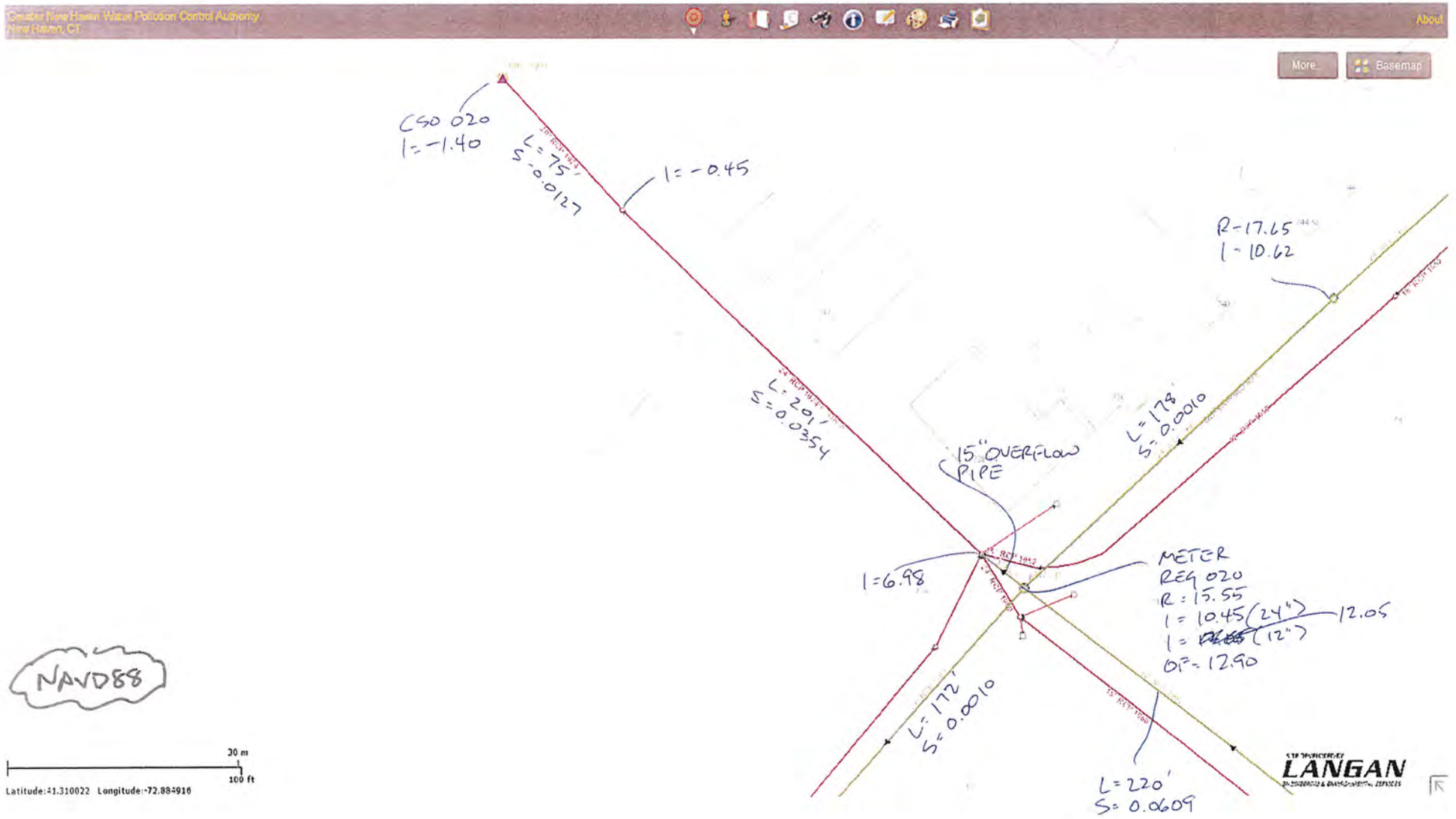
REGULATOR AND CSO OUTFALL

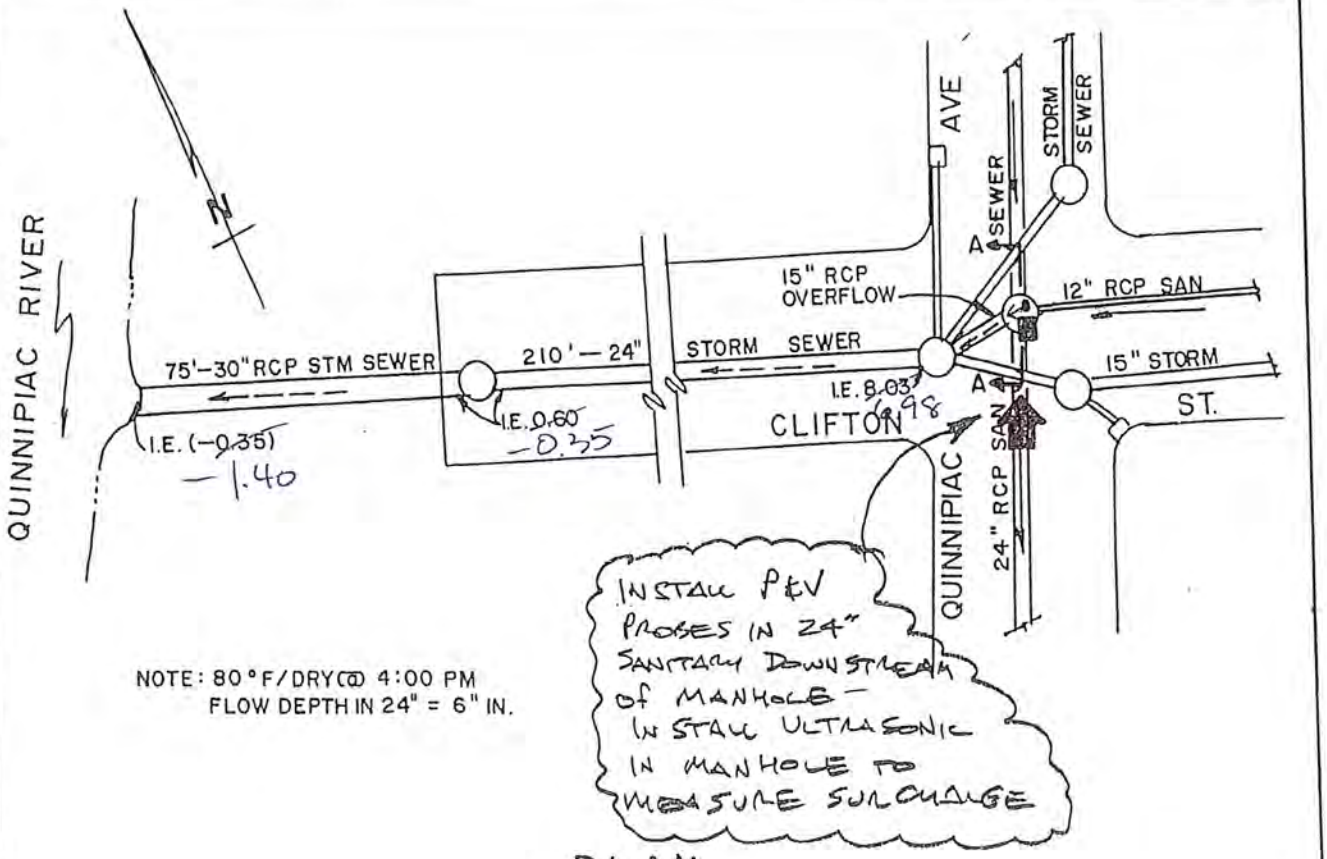
020 STUDY AREA

REGULATOR 020 / CSO OUTFALL 020

(Updated 08-01-2014)

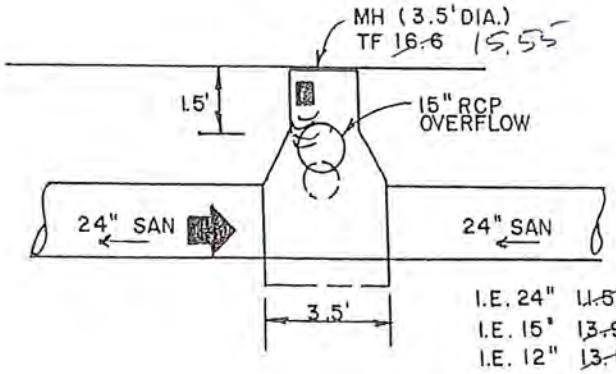
REGULATOR 020 / CSO OUTFALL 020 (UPDATED 8/1/14)





NOTE: 80°F/DRY@ 4:00 PM
FLOW DEPTH IN 24" = 6" IN.

PLAN
N. T. S.



I.E. 24" 11.50 10.45
I.E. 15" 13.95 12.90
I.E. 12" 13.10 12.05

SECTION A-A
N. T. S.

NAVD 88

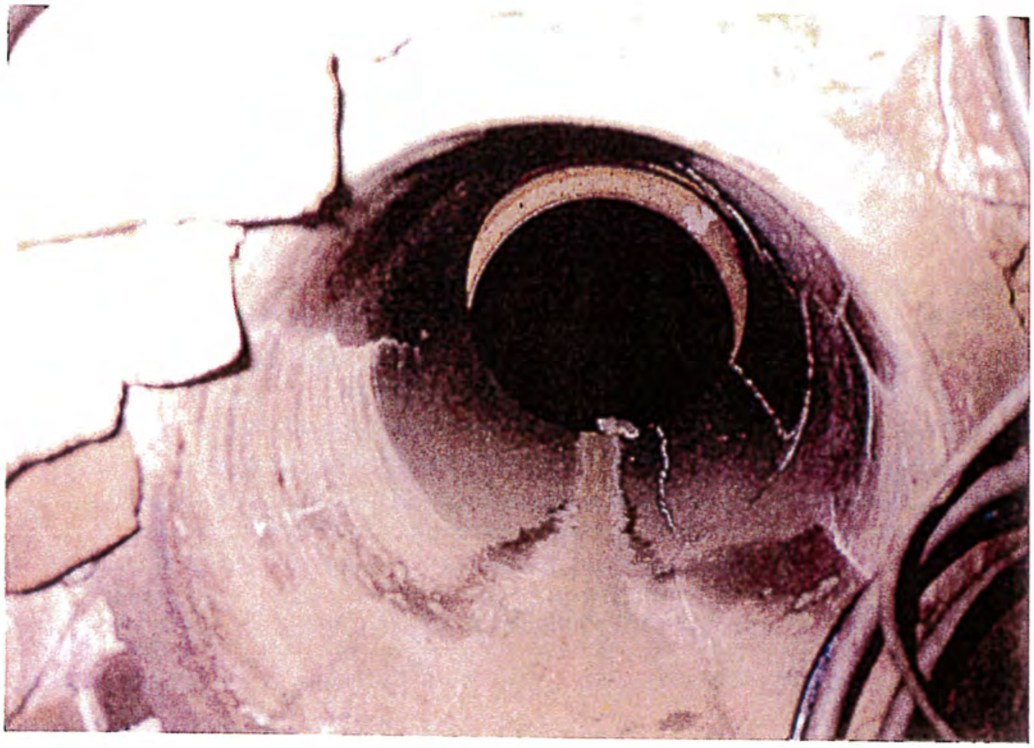
LEGEND

WET WEATHER FLOW

DRY WEATHER FLOW

OVERFLOW NO. 020
CLIFTON ST. @ QUINNIPIAC AVE
NEW HAVEN, CONNECTICUT

DATE 7-8-97
JOB NO 1146
SHT. NO 3



O2C QUINNIPIAC & CLIFTO[illegible]
LOOKING WEST INTO CULVERT [illegible]