City of Nashua

Public Works Division
9 Riverside Street
Nashua, NH 03060

Division Director
(603) 589-3137
Fax (603) 589-3169

April 30, 2010

Ms. Joy Hilton (OES04-3)
Environmental Engineer
U.S. Environmental Protection Agency
5 Post Office Square
Suite 100
Boston, MA 02109-3912

Mr. Stergios Spanos
Supervisor of Permits and Compliance
New Hampshire Department of Environmental Services
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Re: **Consent Decree (Civil Action No. 05-376-PB, dated December 26, 2005) on Combined Sewer Overflows – Update to April 1, 2010 Quarterly Report on Compliance**

Dear Ms. Hilton and Mr. Spanos:

As stated in the submittal of the April 1, 2010 Quarterly Report on Compliance, enclosed please find the requested additional information (per EPA letter dated March 18, 2010) on the High Flow Management Plan and the Infiltration/Inflow Program.

The attached revised High Flow Management Plan has been updated to incorporate the Wet Weather Flow Treatment Facility (WWFTF). Per the plan, the treatment of the first 50 MGD received by the plant shall remain the same as it was previously, however the next 60 MGD received by the plant shall be diverted and treated by the WWFTF, effectively increasing the wet weather treatment capacity to 110MGD.

The following is a revised list of Infiltration/Inflow projects with an implementation schedule. These projects shall be incorporated into the City's Quarterly Report to provide updates on the progress being made in achieving the milestones.

Administration Business Office	Street Department	City Engineer	Parks-Recreation Department	Solid Waste Department	Traffic Department	Wastewater Treatment Plant
(603) 589-3140	(603) 589-4750	(603) 589-3120	(603) 589-3370	(603) 589-3410	(603) 589-4700	(603) 589-3560

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Milestone	Due Date
Resend letters to property owners who have illegal catch basin and roof drain connections. Deadlines: 30 days to respond, 90 days to disconnect. Includes 35 Progress Avenue (3 roof leaders), Coburn Woods (2 catch basins) and 5 Progress Ave (1 Catch basin) If no response/action, send second letter establishing penalties per day.	June 1, 2010
Complete 1,485 linear feet of root removal treatment shown on Table 4.3 Phase II I/I Study. Added to City's annual root treatment program. Includes Indian Rock Road easement (1,188') and Glen Drive (297')	October 31, 2010
Begin inflow removal caused by two public catch basins in Area 7-1 as shown in Table 5.1 Phase II I/I Study. Includes catch basin at 1 Forest Hills Drive and catch basin at 5/7 Progress Avenue.	October 1, 2010
Complete inflow removal caused by two public catch basins in Area 7-1 as shown in Table 5.1 Phase II I/I Study. Includes catch basin at 1 Forest Hills Drive and catch basin at 5/7 Progress Avenue.	December 31, 2010
Complete 50% of the manhole rehabilitation/replacement identified in Table 4.4 Phase II I/I Study. Includes replacing manholes, reconstructing bench and invert, sealing and lining manhole walls or resetting frame and cover for 9 manholes throughout City.	November 1, 2011
Begin design of infiltration removal project in Area 4-1, Area 7-1 and Area 8- as shown in Table 4.2 Phase II I/I Study. Includes149' on Huntington Lane, 288' on Doncaster Drive, 221' on Glen Drive, 44' on Hassel Brook Road and 982' on Indian Rock Road to University Drive.	September 1, 2011
Begin construction of infiltration removal project in Area 4-1, Area 7-1 and Area 8- as shown in Table 4.2 Phase II I/I Study. Includes149' on Huntington Lane, 288' on Doncaster Drive, 221' on Glen Drive, 44' on Hassel Brook Road and 982' on Indian Rock Road to University Drive.	May 1, 2012

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Milestone	Due Date
Complete construction of infiltration removal project in Area 4-1, Area 7-1 and Area 8- as shown in Table 4.2 Phase II I/I Study. Includes149' on Huntington Lane, 288' on Doncaster Drive, 221' on Glen Drive, 44' on Hassel Brook Road and 982' on Indian Rock Road to University Drive.	November 1, 2012
Complete remaining 50% of the manhole rehabilitation/replacement identified in Table 4.4 Phase II I/I Study. Includes replacing manholes, reconstructing bench and invert, sealing and lining manhole walls or resetting frame and cover for 9 manholes throughout City.	November 1, 2012

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Leon Kenison, P.E.
Director of Public Works

Cc: Michael Wagner, EPA
Mayor Donnalee Lozeau
Board of Aldermen
Board of Public Works
Stephen Dookran, City Engineer
Mario Leclerc, NWTF
William Keating, Nashua Engineering Department

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City of Nashua

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HIGH FLOW MANAGEMENT PLAN

Issued September 1, 2005
Updated April 30, 2010

Background

In November 1999, a high flow management plan was prepared for the City of Nashua by Camp Dresser & McKee (CDM). A copy is attached as a reference.

The high flow management plan recommended that the primary treatment capacity at the Wastewater Treatment Plant (WWTP) be utilized to the fullest to provide primary treatment and disinfection to wet weather influent flows that exceed the secondary treatment capacity of 38 mgd.

Facility Management Procedures

Pre-Storm Preparation

Monitor: Operations staff to monitor weather utilizing DTN radar in the PIC room. Watch for dark green, yellow, orange or red areas approaching.

Operators: Utilizing the call-in list and procedures to see who is available to work and schedule in advance (single person shift only).

Fill out by-pass sheet with the totalizer data for primary by-pass flow meter.

Stand by power: Generator should not be put under load until the second operator arrives on site, using the North generator electrical procedures (located in the North Generator Room). Generator should only be used in severe weather situations (electrical storms, high winds, hurricane conditions, etc.).

Chlorine analyzer: Set analyzer into high range by utilizing procedures mounted on the analyzer in the sample shed.

By-pass sampler: Set up sampler and test according to procedures posted in the sample shed. Place two to three ice packs (located in the lab freezer) to preserve sample. Sampler is to be left in stand-by until actual by-pass is initiated.

Chlorine and Bi-sulfite: Place #3 bi-sulfite pump into remote and adjust speed selector to 90%, set stroke to 90%. Check all valves to ensure that suction and discharge lines are open. Place either chlorine pump 4 or 4A, into remote and set local speed control to 80% and stroke at 100%. Check all valves to ensure that suction and discharge lines are open.

By-Pass Gate: Check for proper operation and activate to ensure that it responds remotely, also verify that it moves freely.

Raw Sewage Pumps: Verify that all idle pumps are not air bound.

Climber Screens and Wash Presses: Set climber screens and wash presses to desired cycles. (Typically 150 sec/360 sec on climbers and 2 to 4 cycles per run on wash presses).

Before Flow Arrives

One to Two Hours Prior: Simulate wet-well level and pump down collection system. Maintain wet-well level at 100". Open main influent gate to **72**".

Return Activated Sludge Pump: Place RAS pump at full speed to push all solids in secondary clarifiers back to aeration tanks to minimize the possibility of solids washout. Utilize two pumps if necessary.

Chlorine Residual: Start raising the residual to 2.5 to 4.0 mg/L. Adjust bi-sulfite accordingly.

Mix an initial batch of Ciba polymer in the sedimentation facility polymer room.

Actual By-Pass Event

As rain commences: Monitor flow closely when the wet-well level rises to a point when a second raw sewage pump will remain on in auto. You may now stop the wet-well simulation and the RSP controller and place the controller in auto.

Facility Flow: As flow reaches 30 to 32 mgd on the secondary flow meter, commence by-pass. Start hypochlorite and bi-sulfite pumps, lower bypass gate and start the by-pass sampler.

Samples: Collect samples (chlorine, de-chlor, pH and, if lab personnel are on duty, coliform). Maintain residual at 7.0 mg/L and a de-chlor residual of 0.310 mg/L. Parameters are listed on by-pass sheet for reference.

Main Influent Gate: Maintain gate at set height until wet-well reaches 7.0 to 8.0 feet and three raw sewage pumps are running and the by-pass and secondary flow are maximized.

Flow: Maintain flows through the secondary to 18 to 32 mgd based on the flow chart below. The remaining flow is to be by-passed.

By-Pass Parameters

32 MGD and bypass to	18 MGD for 6 hours.
24 MGD	26 MGD for 6-12 hours
18 MGD	32 MGD for 12+ hours.

(With either 2 or 3 clarifiers on line during bypass)

Visually inspect secondary clarifier weir overflow for possible solids carryover. In the event of washout conditions, aeration blowers are to be turned off.

*Wet Weather Treatment Facility

Monitor: Operations staff continues to monitor weather utilizing DTN radar in the PIC room. Watch for dark green, yellow, orange or red areas approaching.

Operators: Utilizing call-in list and overtime rotation procedures, add an additional staff member to operate wet weather treatment facility. <u>In the event that staff is not available, immediately notify Operations foreman and Plant Superintendent.</u>

Review (and adjust if necessary) status of North Generator.

Review the status of the chlorine contact tank configuration to ensure that both the east and west chambers are available. Each unit is capable of a maximum 55 MGD to ensure a 15 minute detention time for chlorine contact.

*Please note: The facility is already in by-pass mode and influent volumes are approaching the 50 MGD limits of the main facility.

The influent gate is set at the 72" level; this includes the main gate and the gate at the wet weather treatment facility.

SCADA parameters dictate operation and sequencing of all equipment.

*It is important to note that during the initial start-up, effluent quality may not be optimum, this is understood and expected. It is imperative that the operator continually monitors the ACTIFLO Panelview data and performs visual observations to ensure the quickest ramp-up of efficiencies.

Operator monitors the operation of the bar-rack, wash press and screw conveyor system in the pump station.
The influent flow chemical treatment is preset and should not require adjustment. The operator must ensure that the analytical probes are operating properly. The normal parameter are as follows: pH is at 6.0 SU, and effluent solids are not at the 99.9 or 0 levels. The latter indicates that the effluent probe is fouled and requires maintenance.

The ACTIFLO system is sized to treat 60 MGD, utilizing two 32 MGD trains. The CIBA polymer system is designed to support both trains.

The polymer system is designed to prepare and deliver the necessary concentration and volume. The operator is required to monitor the system to ensure that a mechanical or electrical failure has not rendered the system inoperable.

The ACTIFLO system east and west trains operate independently; the operator is required to set the lead train.

The operator ensures that all components start as required. If the system fails to start sequentially, alarms will indicate which component is in a failure mode and the operator will troubleshoot the system to return it to proper status.

The operator is required to sample and analyze the results of the cyclone de-gritter to ensure that the proper sand concentration is available. The visual test is comprised of filling an Imhoff cone with treated wastewater flows and reading the volume of settled sand in the cone. The operator is required to add additional sand when the settled sand falls below the results of the test.
The system is equipped with a sand feed system located in the polymer room.

The operator is required to visually inspect the North Generator to ensure proper operation. Several important aspects of the inspection are engine temperature levels and fuel day tank level.

As flow levels increase/decrease, the operator must ensure that the proper chemical dosing rates are met and that the electronic read-outs indicate that adequate treatment is achieved.

The operator is to collect influent and effluent samples for analysis, complete the necessary chain of custody forms and store the samples in the lab refrigerator.

Thickened sludge is removed from the settled mixture at the cyclone system. The sludge is delivered to the sludge thickening tank at the south east corner of the sedimentation building. A low dose of polymer is added to flocculate the sludge, and when the pre-set level in the tank is reached, a transfer pump transfers the volume to either the wet well at the original facility, or directly to one of five storage tanks.

At the conclusion of the storm event, the system undergoes a clean out and shutdown operation. The north generator will also undergo a cool down period and shut down.

The operator will record runtime data.

The unused, activated polymer remaining in the system has a shelf life of 48 hours. This unused polymer is to remain in the storage tanks until the shelf life has expired. At the conclusion of the shelf life, it is drained to the sump system and all lines are flushed to minimize obstructions.

The long range weather forecast is reviewed and if conditions are favorable, the chlorine contact tank is drained and cleaned to minimize potential septic conditions and odors.

Interim Limits

The Nashua Wastewater Treatment Facility has operated under NPDES discharge permit NH 0100170 issued by USEPA. A copy is attached as reference.

As outlined in the discharge permit, the facility is required to maintain monthly averages for BOD5 mg/L, TSS mg/L, pH S.U., Total Chlorine Residual mg/L and E. Coli no./100ml.

The facility has successfully met these limitations. Therefore, we propose that the limitations remain as outlined in the existing permit.

Monitoring Protocol

All flows at the Nashua Wastewater Treatment Facility are sampled and analyzed for parameters outlined in our NPDES permit. The monitoring frequency exceeds the requirements listed for all parameters.

Influent flow proportional composite samples are collected according to our normal operating procedures.

A flow proportional composite sampler is located at the by-pass chamber. The operations staff activates it once the by-pass commences. Upon ceasing the by-pass, the staff removes the sample, labels and stores it in the appropriate lab refrigerator for analysis by lab personnel. The sample is analyzed for BOD5 and TSS. The values are reported on our monthly NPDES submittal.

Effluent flow proportional samples are collected according to our normal operating procedures at the effluent weir of our chlorine contact chambers. This sample composition consists of the discharge of the secondary clarifiers and the by-pass flows. The sample is analyzed for BOD5 and TSS. These values are reported on our monthly NPDES submittal. The blended flows are chlorinated to 7.0 mg/L and are then de-chlored prior to being discharge to the receiving stream.
Grab samples are taken and analyzed for pH and Chlorine residual per permit requirements.

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Memorandum

To: *Rick Seymour, Superintendent, Nashua WWTP*

From: *Alvin Firmin*

Date: *November 30, 1999*

Subject: *High Flow Management Plan - Review and Update of the Summary of Flow Monitoring at the WWTP*

Background

In January 1992, a high flow management plan was prepared for the City of Nashua by Camp Dresser & McKee (CDM). The plan was prepared based on the observed wastewater flows into the Nashua Wastewater Treatment Plant (WWTP) and the water elevations in the sewer interceptors, monitored during a two-year rain storm in September 1991. The storm was rated as a two-year rain storm and 2.8-inches of rain were reported to have fallen in a period of 11 hours. The allowable influent flows to the treatment plant did not exceed 38 mgd, the peak flow capacity of the secondary treatment process. The additional wet weather flows generated by the storm were stored in the interceptors and/or diverted to the Nashua and Merrimack Rivers through the Nashua Combined Sewer Overflow (CSO) diversion structures.

The high flow management plan recommended that the primary treatment capacity at the WWTP (approximately 52 mgd), be utilized to the fullest to provide primary treatment and disinfection to wet weather influent flows that exceed the secondary treatment capacity of 38 mgd. This was recommended in lieu of raw CSO discharges to the rivers via the diversion structures. A copy of the 1992 high flow management plan is attached to this memorandum.

As part of the review and update of the high flow management plan, influent to the Wastewater Treatment Plant in Nashua, NH was monitored during a rain storm on Tuesday night, November 2,1999 through early Wednesday morning in order to evaluate the peak flow capacity of the influent pump station during wet weather events. The information collected is presented herein in addition to a comparison to the paper analyses of pump curves versus plant hydraulic profile. During the event, the two grit tanks, three of four primary clarifiers, and two of three secondary clarifiers were operational and on line. The plant's operation and maintenance current procedures rotates the shutting down of one primary clarifier at any one time for maintenance, and operates the third secondary clarifier during winter months when low temperatures slow down the biological processes in the secondary treatment phase.

Summary of Plant Operation During Bypass

A preset alarm notifies operators of rising level in the influent wetwell signaling the need to start lag pumps and begin bypass of flow around the secondary treatment facilities. Operators start bypassing by lowering the motor operated weir gate at the diversion chamber located after the primary clarifiers. The bypass is designed to allow the separation of primary effluent into two flow streams with a maximum of approximately 38 mgd directed to secondary treatment and the rest discharging directly to the chlorine contact tanks for disinfection.

The treatment plant has four influent pumps, each rated at approximately 20 mgd at a total dynamic head (TDH) of 45 feet. All four pumps are equipped with variable speed drives, 200 HP motors, and 22.75-inch impellers. Three duty pumps are operated automatically according to preset wetwell water surface elevations (WSE) in the following order:

- Lead Pump: up to WSE 0.40
- Lag Pump No. 1: up to WSE 1.50
- Lag Pump No. 2: up to WSE 3.00

When the water level in the wetwell rises to elevation 3.0 feet, the operators can manually switch on the fourth pump or the influent gate to the plant can be lowered to limit the flow into the wetwell.

For the purpose of this study the fourth pump was turned on and the influent gate raised to maximize flow into the treatment plant.

High Flow Operation/Monitoring Study

In anticipation of a rain event on the evening of November 2,1999, the CDM team arrived at the plant and began collecting data as the plant influent flows began to increase. The information collected during the rain event is summarized in Table 1. The following provides a description of the information in each column of the table:

- *Column A.* Time of data recording.
- *Column B.* Influent mag meter reading (maximum reading capability of 54 mgd). The flows measured by this meter, which is located downstream of the influent pumps, were recorded via the digital readers on the plant's instrumentation panel. The data was recorded through Instrumentation Channel-01.

- *Column C.* Secondary flow meter (differential meter), located on the 60-inch pipe between the secondary clarifiers and the chlorine contact tanks. Readings were recorded through Instrumentation Channel 06.

- *Column D.* Bypass flow meter (differential meter), located on the 36-inch bypass pipe between the primary sedimentation basins and the chlorine contact tanks. Readings were obtained and recorded through Instrumentation Channel 02.

- *Column E.* Total of flows recorded in Column C and Column D. Ideally, Column E should approximate the influent meter readings in Column B. However, the influent mag meter has an upper recording limit of 54 mgd. It was noticed through the monitoring period that the influent meter (Channel-01) did not provide accurate data at flows greater than 30 mgd. The straight run on the piping preceding the meter is less than recommended.

- *Column F.* Shows the discrepancy in readings between the influent meter (Column B) and the totaled flow from the secondary and bypass meters (Column E). The data in this column show how the two flow data compare and at what flow rates the influent meter loses accuracy.

- *Column G.* Reports influent wetwell water levels recorded concurrently with flow data.

- *Column H.* Shows wetwell water level data converted to WWTP datum elevations. (Note: Water levels in the wetwell are measured by a bubbler tube device which records the level of the water above the floor of the influent channel which is at elevation -6.0 feet.)

- *Column I.* Shows the calculated static head, Hs, based on the observed water levels in the wetwell and the grit tank.

- *Column J.* Reports which duty pump(s) were in operation.

Summary of the Flow Monitoring Event

- From 10:40 p.m. to 12:40 p.m., pump no. 4 was on. Flow averaged 14 mgd.

- At 12:45 a.m., water level in wet well started increasing.

- At 12:50 a.m., pump no. 2 started when the wetwell level reached elevation 0.4 feet. Maximum flow was reached at 1:13 a.m., approximating 38 mgd.

- At 1:14 a.m., the third duty pump, pump no.1, started when the wetwell level reached elevation 1.5 feet. In an attempt to limit the flow to the secondary clarifiers, the bypass weir was lowered by 12-inches and later by an additional **3-inches.** Maximum flow of approximately 52 mgd was reached at 1:36 a.m.

- At 1:36 a.m. the wetwell level reached WSE 2.60 and was approaching water surface elevation 3.0 feet, which would normally require lowering the influent gate to restrict the flow to the treatment plant. However, in order to maximize flow to the plant, the gate was kept open and pump no. 3 was turned on manually. At 1:38 a.m., the bypass weir was lowered by a total of 20-inches to increase the bypass flow and limit the flows to secondary treatment to 34 mgd. At 1:47 a.m., the bypass weir was lowered to a total of 25-inches to reduce the secondary flow from 38 mgd down to 34 mgd.

- Maximum flows observed with full operation of the 4 pumps ranged between 61 and 65 mgd.

- The grit tanks were inspected when the flow reached 54 mgd; they were not in danger of over-flowing.

Pump Performance Assessment

The flow data, summarized in Table 1, provide an indication of the peak flow that can be achieved by the influent pump station. A comparison of this field measured data to the paper analyses of the influent pumps follows.

Figure 1 shows the manufacturer's pump curves plotted against the calculated system curves. The following information was used in the assessment of pump performance:

- Depending on the wetwell level, the static head of the pump system will range from 30 feet (at low wetwell elevation) to 38 feet (at high wetwell elevation).

- The system curves shown are based on an assumed C-value of 100 in the piping between the pumps and the grit tank.

- The manufacturer's pump curve data is also plotted on the figure. The curve for a single pump is modified to allow for pump station head losses. Curves for two, three, and four pumps operating in parallel are also shown.

Figure 1 provides a comparison of the field measured pump capacities to the pump capacities estimated by paper analyses of the plant hydraulics. Based on the system curves presented and the manufacturer's pump curve (modified for station losses), the expected

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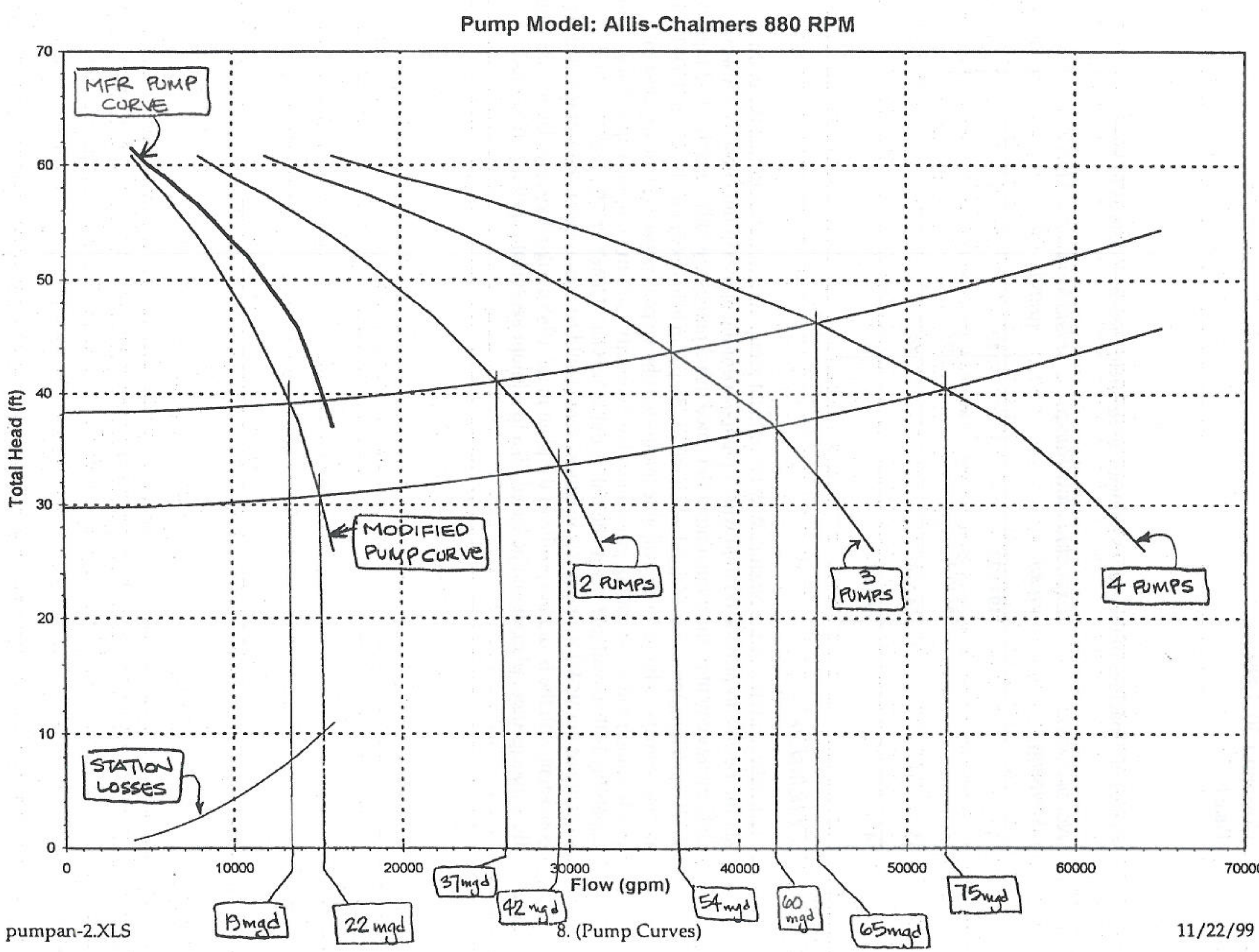
Figure 1



ranges of capacities of the pumps compare to the field measured data as follows:

No. of Pumps Operating	*Expected Flow Range (mgd)*	*Field Measured Flow (mgd)*
1	19 to 22	19
2	37 to 42	37
3	54 to 60	52
4	65 to 75	65

Conclusion

Hydraulic analyses of the Nashua WWTP influent pump system indicates that the pumps should be able to provide 60 mgd with 3 pumps operating at maximum capacity. However, field measurement of the pump output indicated that 3 pumps are only capable of 52 mgd. The peak capacity approaches 65 mgd when the fourth pump is in operation, however, CDM does not recommend relying on all available pumps to achieve peak capacity. Industry design practice and prudent operating procedures base capacity on firm pumping capabilities. Firm capability is that available when one unit is out of service. Therefore, the peak flow firm capacity of the WWTP during wet weather event should be considered to be 52 mgd. This is consistent with the hydraulic profile of the plant in the 1985 design drawings. Hence, the high flow management plan should be based on a maximum treatment capability of 52 mgd.

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CDM
environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.
Ten Cambridge Center
Cambridge, Massachusetts 02142
617 252-8000

January 17, 1992

Mr. Joseph Morrill
Deputy City Engineer
City of Nashua
City Hall
Nashua, NH 03060

City of Nashua, New Hampshire
Combined Sewer Overflow
High Flow Management Plan
CDM: 249-70-RT2-REP2

Dear Mr. Morrill:

In accordance with our contractual agreement for conducting a Phase 1 Combined Sewer Overflow Study, Camp Dresser & McKee Inc. (CDM) has prepared a draft **High Flow Management Plan**. The plan has been prepared in narrative form to include all of the individual elements identified in the scope of work for the agreement. The plan is as follows:

CITY OF NASHUA, NEW HAMPSHIRE
COMBINED SEWER OVERFLOW STUDY
HIGH FLOW MANAGEMENT PLAN
JANUARY 1992

OBJECTIVE OF THE PLAN

The objective of the High Flow Management Plan is to optimize the storage capacity of the existing wastewater collection system and to maximize the treatment capacity without producing operational upsets.

Through the work completed to date in monitoring the flows and analyzing the data resulting from the Fall, 1991 combined sewer overflow (CSO) monitoring program, it will be shown that the Nashua collection system is currently operating close to its available capacity with regard to in-system storage. It will also be shown that allowance of the operation of the enhanced primary capacity (secondary bypass), as designed and constructed, would obviously provide an increased level of treatment without operational problems.

The two elements, collection system storage and treatment capacity are directly dependent in the Nashua system.

DESCRIPTION OF EXISTING SYSTEM

COLLECTION SYSTEM. The City of Nashua's municipal sanitary sewerage system serves a metropolitan area of approximately 32 square miles. In addition to the City of Nashua, the system extends into the Towns of Merrimack and Hudson. Figure 1, attached shows the sewer service area and the main interceptor system for the Nashua system. The current residential service population approximates 80,000 people. The current service area land use delineation has been estimated as follows:

Land Use	Percent of Tributary Area
Residential	57.5 %
Commercial	4.6 %
Industrial	16.8 %
Other	21.1 %
Total	100.0 %

The collection system sewers range in size from 6 inch to 108 inch. The older pipes were constructed early in the century utilizing vitrified clay and cast iron while the newer portions of the system have been constructed of vitrified clay, asbestos cement and PVC for smaller pipe and reinforced concrete for larger interceptor pipe. With the exception of several relatively small lift stations, the collection system operates entirely by gravity. The collection system has been designed and constructed to convey both dry weather sanitary flows and limited wet weather storm flows. Although portions of the service area are completely separated, the flow is eventually mixed with sewage from combined areas in the large intercepting sewers which deliver flows to the treatment plant.

The major components of the Nashua sewerage system are the North Merrimack Interceptor, the South Merrimack Interceptor, the Nashua River Interceptor, and the Salmon Brook Interceptor. The North Merrimack Interceptor is located along the Merrimack River and is identified as (1) the North Merrimack Interceptor II, extending from a point near the Merrimack townline to the Nashua River and as (2) the North Merrimack Interceptor I from the Nashua River to the Nashua treatment plant. The South Merrimack Interceptor is located in the southeast quadrant of the City and extends along the Merrimack River from a point near the Tyngsborough townline to the Nashua treatment plant. The Salmon Brook Interceptor extends along the Salmon Brook to the Nashua treatment plant. Figure 1 illustrates the orientation of the interceptor network, treatment plant and the respective CSOs.

At the present time, 9 individual combined sewer overflow (CSO) regulator structures are operational. This represents a reduction from the 21 overflows which existed prior to the upgraded interceptor system built in the mid-1970's. A tenth overflow, Nowell Street, is listed in the current NPDES discharge permit but is expected to be eliminated in the near future with scheduled sewer separation. Table 1, attached, lists the NPDES number, location, connecting pipe sizes, and method of control for each overflow. Each CSO regulator structure has been designed and constructed to overflow wet weather flows which exceed a predetermined limit. Most of the overflows operate when the flow rate of the contributing drainage area exceeds the

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Table (1)
Description of CSO Structures

NPDES Overflow Discharge #	Location	Interceptor	Pipe Size, in In	Out	Overflow	Type of Control
'002'	Nashua WWTP	Salmon Brook South Merrimack	48 30	24	60	Elevated Weir / Reduced Outlet
'003'	Farmington Road	South Merrimack	36	10, orifice	36	Elevated Brick weir / Reduced Outlet
'004'	Burke Street	North Merrimack	24	10, w/ adjustable plate	21	Elevated Brick weir / Reduced Outlet
'005'	East Hollis Street	North Merrimack	54	24, w/ adjustable 24x24 gate	adjustable 54x54 gate	Elevated Brick weir / Reduced Outlet Outlet gate is normally open and was originally installed w/automatic controls and remote manual override from WWTP
'006'	Nashua River Siphon Structure *[Siphon]*	Nashua River	108 *60* *48* *18*	108, w/ adjustable 54x54 gate	120x72 Flap gate	Elevated Brick weir / Reduced Outlet Outlet gate is normally open and was originally installed w/automatic controls and remote manual override from WWTP
'007'	Tampa Street	Nashua River	48	10, w/ adjustable plate	48	Crown of 54" Interceptor pipe acting as an overflow weir / reduced outlet
'008'	Broad Street	Nashua River	24 10, plugged	10,w/ adjustable plate	30	Elevated Brick weir / Reduced Outlet
'009'	Lock Street	Nashua River	48	12, orifice w/ adjustable plate	36	Elevated Brick weir / Reduced Outlet
'012'	Beaucher Avenue	Nashua River	30 30	36	30	Elevated Brick Weir

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identified as Salmon Brook in permit

CAMP DRESSER & McKEE INC.

capacity of the connecting pipe. The Nashua WWTP overflow (#002) and the Nashua River Siphon overflow (#006), however, are located on the main run of the main interceptor and therefore operate differently. For these structures, an operating flow level in the main interceptor in excess of a predetermined elevation activates an overflow.

As shown in Table 1, 7 of the 9 operating overflow structures have been designed and constructed with fixed overflow elevations and/or outlet capacities. Two of the overflows, however, were designed and originally constructed with automatic, hydraulic sluice gate controls with a remote, manual override provided from the wastewater treatment plant. These are the East Hollis Street (005) and Nashua River Siphon (006) overflows. In this way, the outlet flow rate to the interceptor could be controlled in two ways, (1) regulated automatically from the hydraulic grade line of the downstream intercepting sewer and (2) regulated manually from the plant based upon influent flow rates. At the present time, the automatic and remote operated systems for the East Hollis Street and the Nashua River overflows, are not operational; the sluice gates remain in the open position. As documented in the Fall 1991 CSO flow monitoring, the current operation of these overflow structures allows maximum capture of the first flush volumes and conveyance of maximum flow to the treatment plant.

TREATMENT SYSTEM. The City of Nashua's municipal wastewater treatment plant serves the entire Nashua sewerage system. In the early 1960's, a primary treatment plant was designed and constructed to handle dry weather flows up to 10 mgd. In 1975, the primary plant was expanded in capacity to approximately 20 mgd. By 1990, the plant was further upgraded to include secondary treatment, wet weather secondary bypass and sludge dewatering. The plant capacities are as follows:

→ not the word.

Process	Flows (mgd) Avg. Day	Max. Day	Peak Hr.
Primary	21.5	38.0	50.4
Secondary	16.0	26.0	38.0

with bypass ??

As shown, the primary capacity of the plant exceeds the secondary capacity on an average daily, maximum daily and peak hourly basis. The plant has been designed and constructed intentionally to permit the operation of the full primary capacity without adversely affecting the secondary process. Figure 2, attached, represents the Liquid Process Flow Schematic of the plant which illustrates the bypass train. Figure 3, attached, shows the Primary Effluent Splitter Structure. This represents a regulating flow control structure at the discharge end of the primary tanks. As shown, flows in excess of the rated secondary capacity completely bypass the secondary process. The bypassed flow is recombined with secondary effluent at the chlorine contact tanks prior to discharge to the Merrimack River.

To date, as directed by EPA through the NPDES permit process, the operating limit of the plant has been restricted to the current discharge permit. This corresponds to the secondary plant capacity and does not account for the ability to provide additional wet weather bypass capacity.

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OPERATION OF EXISTING SYSTEM

COLLECTION SYSTEM. The Nashua municipal sanitary severage system as indicated above, is principally comprised of gravity sewers, both separate and combined. However, as the interceptor system serves the entire system, all of the separate wastewater eventually becomes combined during wet weather. As described above, the overflow structures have been designed and constructed to overflow at predetermined flow levels.

During the Fall, 1991, CDM performed a CSO flow monitoring program in accordance with a Sampling and Monitoring Plan which was reviewed and approved by the City, NHDES and EPA. The program consisted of inspecting the interceptor system, installing and operating automatic, continuous flow monitoring equipment and obtaining samples of overflow and river water.

On September 25, 1991, the City of Nashua experienced a storm of significant rain intensity and duration. In total, 2.8 inches of rain to have fallen in the Nashua area over a period of 11 hours as reported by a privately maintained Nashua raingage listed by the Department of Commerce. This reading is consistent with readings obtained from similar Department of Commerce raingage stations located in Boston, MA and Manchester, NH. For this area, this intensity and duration roughly corresponds to a storm return period approximating 2 years. CDM mobilized with the City Public Works crews to inspect the regulator structures on a frequent interval over the 24 hour period during the storm. In general, the flow monitoring records and the physical site inspections document that the main trunk of the North Merrimack Interceptor was operating in a totally surcharged condition for several hours.

Table 2, attached, contains the critical elevations of each overflow structure. The "Weir Elevation" is defined as the elevation at which an overflow would first be activated. The "Maximum Depth" is defined as the highest elevation recorded from the CSO monitoring equipment during the September 25, 1991 storm.

It is important to mention that during the storm, the influent flow rate to the wastewater treatment plant was limited to plant's secondary treatment capacity, in accordance with the EPA's current discharge permit limit. This is accomplished through the regulated influent pumping station capacity and through control of a regulating sluice gate at the influent structure at the wastewater treatment plant.

Figure 4, attached, represents a plot of the North Merrimack, South Merrimack and Nashua River Interceptors. The figure illustrates the profile of the land surface, the pipe invert, pipe crown, critical control elevations and the maximum hydraulic grade line measured during the September 25, 1991 storm. According to the flow monitoring records, this level was sustained for a period of approximately 4 hours. As shown on the profile, the hydraulic grade line appears to have reached an equilibrium level at which there was virtually no velocity in the North Merrimack Interceptor. As such, once the plant capacity was reached and the main interceptor capacity was occupied, virtually all of the combined wastewater flow tributary to the largest overflows (Nashua River and East Hollis Street) was discharged to the rivers.

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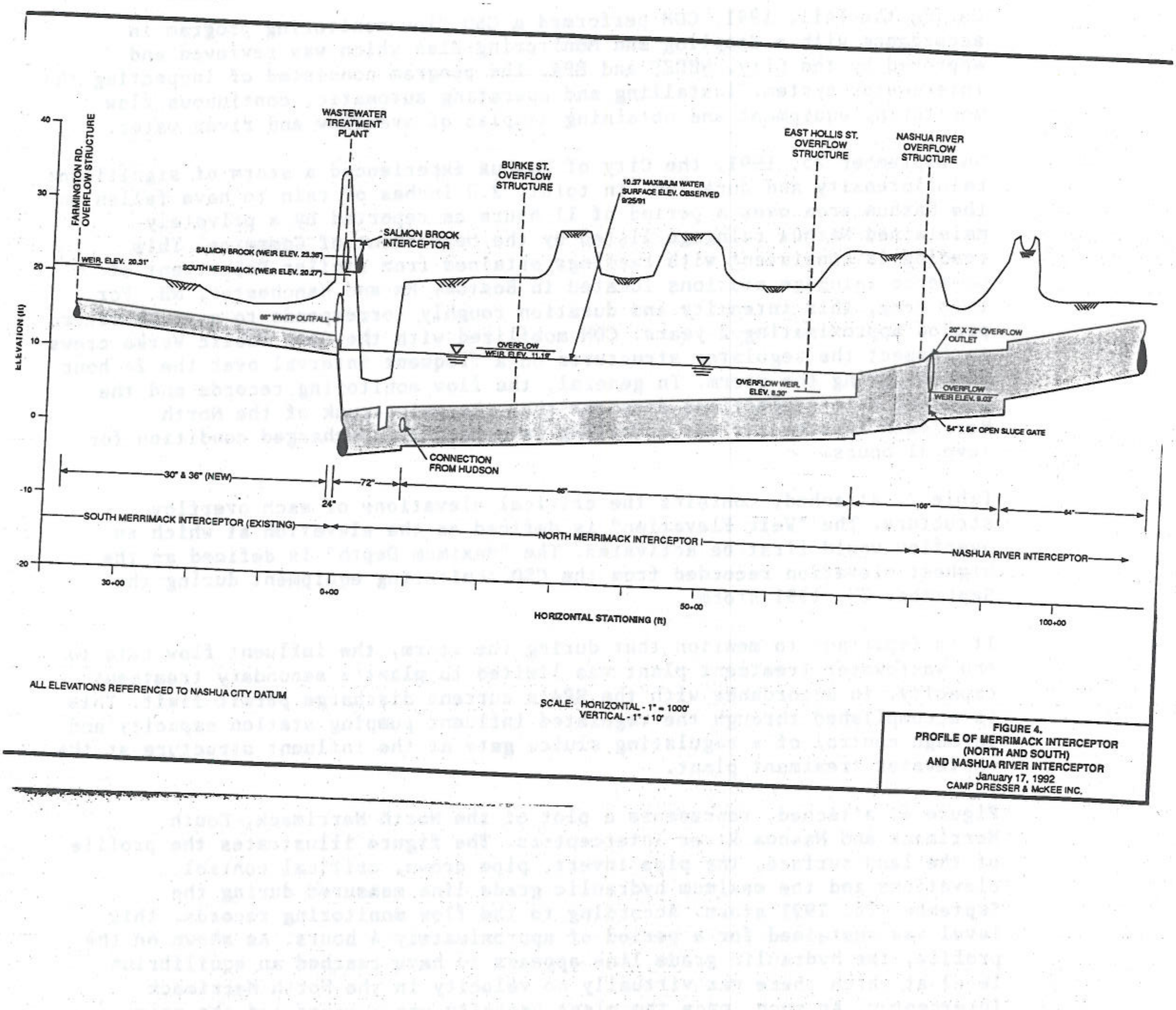

FIGURE 4.
PROFILE OF MERRIMACK INTERCEPTOR (NORTH AND SOUTH) AND NASHUA RIVER INTERCEPTOR
January 17, 1992
CAMP DRESSER & McKEE INC.

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Table (2)

CSO Structures Critical Elevations and Maximum Flow Depth on 9/25/91

NPDES Overflow Discharge #	Location	Interceptor	Inlet Pipe Size, in	Inlet Pipe Elev., ft	Outlet Pipe Size, in	Outlet Pipe Elev., ft	Weir Elev., ft	Max. Depth, ft 9/25/91
'002'	Nashua WWTP	Salmon Brook South Merrimack	48 30	11.49	24		24.37 21.11	
'003'	Farmington Road	South Merrimack	36	18.84	10, orifice	17.85	20.31	20.44
'004'	Burke Street	North Merrimack	24	9.46	10, w/ adjustable plate	8.35	11.19	11.46
'005'	East Hollis Street	North Merrimack	54	5.72	24, w/ adjustable 24x24 gate	6.17	8.3	10.82
'006'	Nashua River Siphon Structure *[Siphon]*	Nashua River	108 *60* *48* *18*	4.77 *6.23* *6.32* *5.95*	108, w/ adjustable 54x54 gate	3.38	9.03	10.37
'007'	Tampa Street	Nashua River	48	24.98	10, w/ adjustable plate	24.52	28.6	
'008'	Broad Street	Nashua River	24 10, plugged	37.84 38.57	10,w/ adjustable plate	37.49	39.07	
'009'	Lock Street	Nashua River	48	29.05	12, orifice w/ adjustable plate	28.25	29.79	29.84
'012'	Beaucher Avenue	Nashua River	30 30	17.5 17.58	36	16.9	19.97	

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Similarly, the existing South Merrimack Interceptor has been designed and constructed to operate at the highest possible hydraulic grade line before activation of the overflow. The design of the overflow weir at the Treatment Plant/Salmon Brook overflow structure causes overflows of the rims upstream of the structure before being crested. Through the ongoing construction of the South Merrimack Relief Interceptor, additional capture of first flush volume and additional in-system storage will be provided.

As a result of the field observations and monitoring records obtained during the September 25, 1991 storm, it is apparent that the Nashua sewerage system is operating in such a manner as to optimize, within existing limits, the available in-system storage capacity. As shown in the profile, the observed hydraulic grade line exceeds the crown of the interceptors for a significant length. For the maximum hydraulic grade line shown in the profile, the estimated in-system storage capacity has been calculated to represent approximately 8 million gallons. This includes the volume above average dry weather flow depth for the affected reaches of the North Merrimack, South Merrimack and Nashua River Interceptors.

TREATMENT SYSTEM. As discussed, the existing Nashua treatment plant has been upgraded and expanded to represent a higher capacity for treatment of wet weather flows than that which is currently permitted. Having reviewed the operation of the sewerage and treatment plant systems concurrently during the September 25, 1991 storm, it is apparent that the two systems are dynamically tied. As expected, the limitation on hydraulic treatment capacity directly influences the operating grade line of the interceptor system. For each incremental increase in treatment plant capacity, the aggregate interceptor flow would be increased correspondingly. This would, thereby, reduce the incidence of operation and collective discharge volume of the affected overflows.

CONCLUSIONS

COLLECTION. It has been shown that the existing sewerage system is currently operating close to its maximum potential regarding in-system storage. The hydraulic control elevations of the existing overflow structures were established to preclude adverse impacts on private properties due to excessive surcharge.

It has been shown, in the brief CSO flow monitoring performed this past Fall, that the existing system of overflow structures and interceptors is being operated in such a way as to minimize the effects of CSOs. By operating the sluice gates at the Nashua River and East Hollis Street overflow structures in a normally open mode, the North Merrimack Interceptor is being utilized to its maximum capacity to (1) capture the first flush volume of wet weather and to (2) store, in-line, the maximum capacity of the interceptor pipe.

Additionally, for the South Merrimack system, the construction of the relief interceptor will provide increased conveyance capacity to the treatment plant. The relief pipeline, however, also represents an increase in in-system storage which will reduce the incidence and duration of overflow

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operation from the South Merrimack system.

TREATMENT. As discussed above, the operation of the treatment plant, to its potential, with the expanded primary capacity as constructed would provide significant improvement to the Nashua CSO situation. Figure 5, attached, illustrates the treatment plant flow record, plant capacities and hourly precipitation during the period of the September 25, 1991 storm. As shown graphically, the plant was limited, by permit limit, to its secondary treatment capacity (approximately 38 mgd) during the maximum flow period from 7 A.M. to 1 P.M., a period approximating 6 hours. Should the plant have been permitted to operate at the design limits shown, the plant capacity could have been increased to 50.4 mgd for the same period. This increase in influent flow would not have adversely influenced the secondary treatment process. Instead, the additional flow would have received primary treatment and chlorination before discharge through the plant's outfall.

12.4 Z MGD capacity -see by-pass

The additional treatment capacity provides for an increased flow rate in the interceptor system which, for larger storms as demonstrated, would translate into a lower hydraulic grade line in the interceptor system. This impact would have a significant benefit for the more frequent small storms which result in a short term operation of the overflow. However, even for the large storm observed on September 25, 1991, the hydraulic grade line influence would be most beneficial in the upper reaches of the severage system, specifically the Nashua River and East Hollis Street overflows. This represents the area which contains relatively sensitive receiving waters. It would be expected that the increased plant throughput would result in decreased incidence of operation, decreased duration and decreased overflow rate of upstream overflows. The exact reduction of operation, rate and volume can only be predicted with the development of a model to assess the operating conditions of the collective system. It is fact, however, that for a range of smaller storms, which for the current situation produce relatively small volumes of overflows, the operation of the secondary bypass would totally eliminate the operation of overflows. Not only are these smaller storms of a frequent nature, they typically result in an initial, first flush waste strength which is as high as that of larger storms. Over a period of 24 hours, this increased capacity associated with the operation of the secondary bypass represents approximately 12 million gallons. Even for the larger storms which eventually reach a steady state with regard to influent level and overflow, the additional plant capacity results in an increased level of treatment for approximately 12 mgd of wastewater.

Therefore, in the interest of maximizing treatment capacity in the existing treatment facility for the benefit of reducing CSOs in the upstream collection system, it is recommended that the treatment facility be allowed to operate to its full potential as designed and constructed. The wet weather bypass system at the existing Nashua treatment plan is completely installed and operational, requiring no advance scheduling or investment. The allowance of the existing plant to operate with the increased primary capacity would allow the City to demonstrate the obvious benefits upon the CSO system and receiving water.

This concludes the Draft High Flow Management Plan. We trust it meets with your expectations and look forward to meeting with you on Thursday, January 23, 1992

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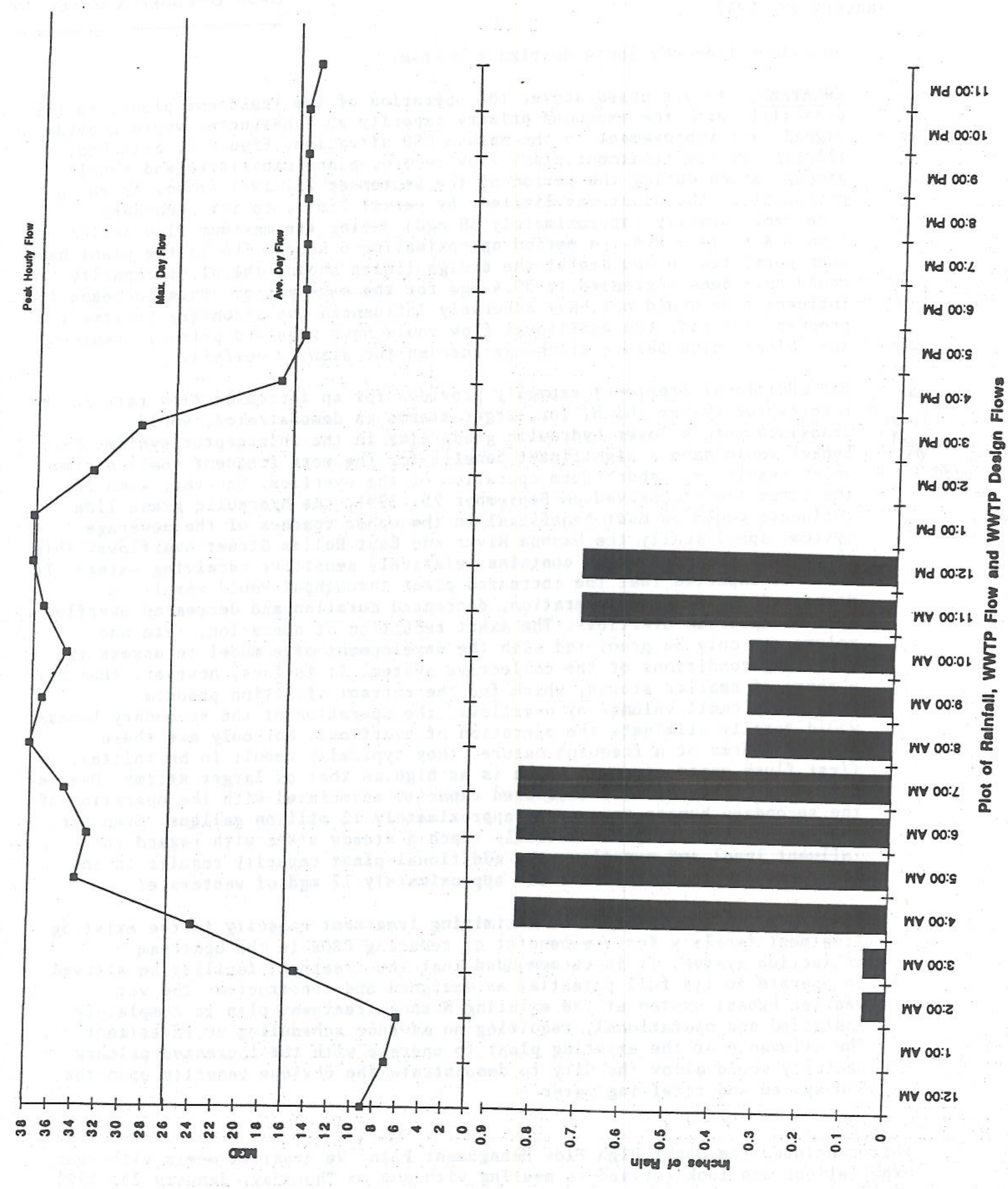

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at 9:00 A.M. at your office to discuss this plan. Should you have any questions in advance, please feel free to contact me at (617) 252-8469.

Very truly yours,
CAMP DRESSER & McKEE INC.

Patrick D. Hughes
Associate

APPROVAL:

William E. Mackey, Jr.
Senior Vice President

PDH/waf

Enclosures (2 Copies)

cc: Peter Benet, Director of Public Works, City of Nashua (w/ copy)
James Hogan, City Engineer, City of Nashua (w/ copy)
Lorraine Sander, WWTP Superintendent (w/ Copy)
Donald Levesque, Highway Superintendent (w/ Copy)
William Mackey, Alvin Firmin, Fayek Zabaneh, CDM

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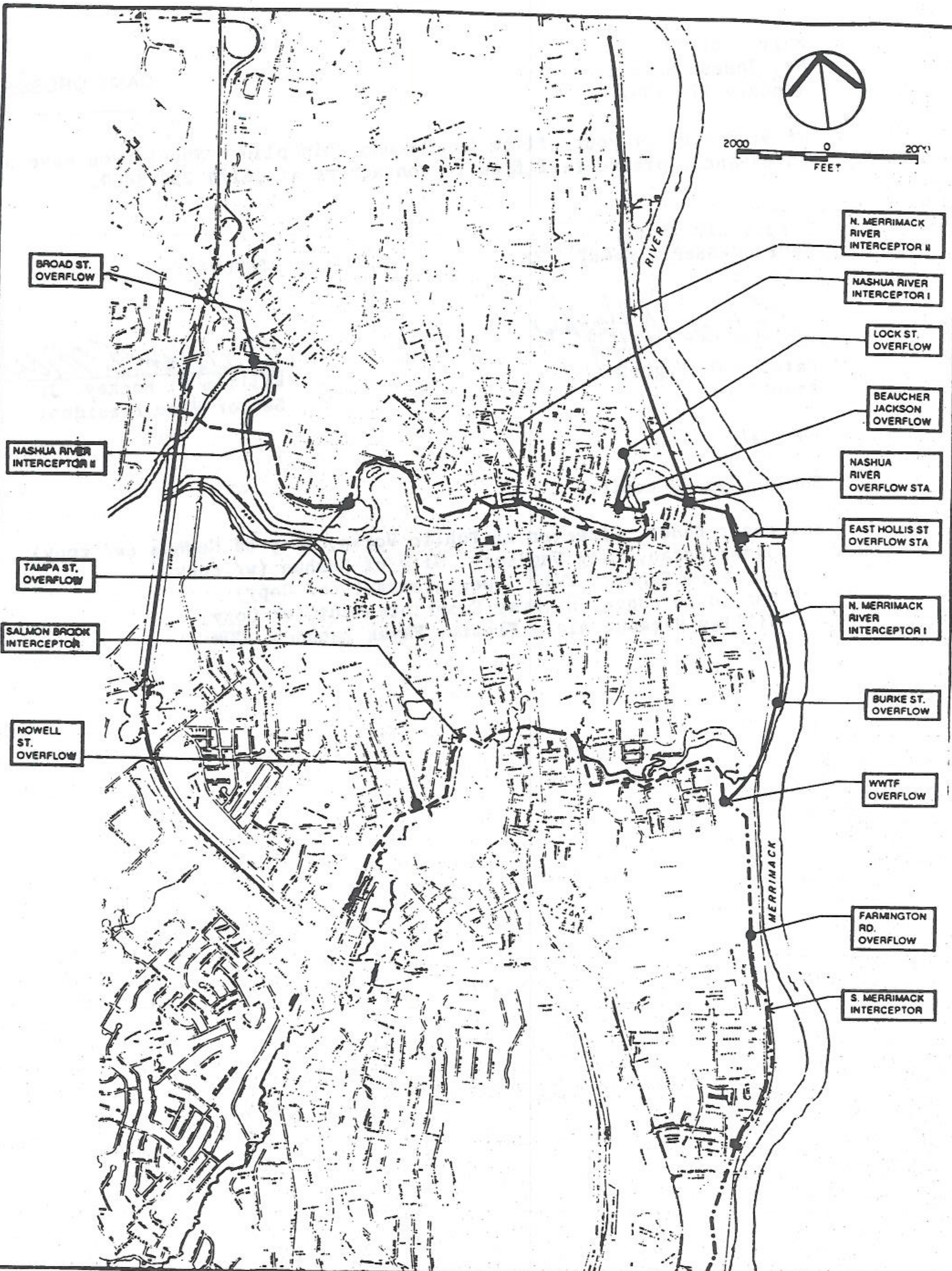

CITY OF NASHUA, NEW HAMPSHIRE

COMBINED SEWER OVERFLOW LOCATION PLAN

CDM

FIGURE

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

JUNE 1, 2000

Mr. Richard S. Seymour, Jr., Superintendent
City of Nashua
Public Works Division
229 Main Street
Nashua, NH 03060

Re: Final Issuance
NPDES Reapplication No. NH0100170
(for) City of Nashua Wastewater Treatment Facility

Dear Mr. Seymour:

Enclosed is your final National Pollutant Discharge Elimination System (NPDES) permit issued pursuant to the referenced application. The permit will become effective on the date specified in the permit, as required by 40 Code of Federal Regulations, Section 124.15. Also enclosed is the Agency's response to comments on the draft permit and information on hearing requests and stays of NPDES permits.

We appreciate your cooperation throughout the development of this permit. Should you have any questions, feel free to contact me at phone number (617) 918-1551.

Sincerely,

Edward K. McSweeney for

John F. Hackler, Chief
Maine-New Hampshire NPDES Permit Unit
Office of Ecosystem Protection

Enclosures

cc: - New Hampshire Department of Environmental Services, Water Division

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
[illegible]
BOSTON, MASSACHUSETTS [illegible]

[illegible] RETURN RECEIPT REQUESTED

[illegible]

[illegible] Code of Federal Regulations, Section 124.15 [illegible]

[illegible] Should you have any [illegible] telephone number is (617) 918-[illegible]

[illegible]

[illegible] Office of Ecosystem Protection

[illegible]