PART II - STORMWATER MANAGEMENT PROGRAM

Section I - Wet Weather Sampling Procedures and Results

General

This Stormwater Management Program will address regulatory authority of the municipal stormwater system, existing stormwater flows and pollutant loads, and existing and proposed improvements to Needham's stormwater management program. An effective stormwater management program can help reduce pollutant loads to receiving waters during dry weather and wet weather conditions. Reduced pollutant loads to receiving waters results in improved water quality, which is the focus of the "Consent Order" and "Memorandum of Understanding" between Needham and the EPA.

Municipal and Regulatory Authority

The Town of Needham is a municipality as defined in Section 502(4), 33 U.S.C. section 1362(4). The municipality is the owner and operator of a stormwater drainage system which collects, conveys and discharges stormwater to receiving waters, including the Charles River.

Sanitary sewage flows from residents, businesses and industry are conveyed through a municipal sanitary sewer system, also owned and operated by the Town. Connections of sanitary sewers to the municipal stormwater system are prohibited by several local regulations of the Department of Public Works and the Health Department.

Other flows to the municipal stormwater system are regulated by federal regulations of the National Pollutant Discharge Elimination System (NPDES) program and State regulations of the State Stormwater Discharge Permit program. A list of these discharges, the type of businesses, locations and NPDES permit numbers are provided in Part I, Section III of this Report.

In Needham, enforcement and compliance with federal, state and local stormwater regulations are administered by the Environmental Protection Agency (EPA), the Department of Environmental Protection (DEP), and Needham's local government.

At the local level, the operation and management of the municipal stormwater system is conducted by the Department of Public Works (DPW). Inspections and monitoring of the municipal stormwater collection system are also conducted by the DPW. The DPW conducts maintenance of the drainage system, including catch basin cleaning, street sweeping, etc.

Where water quality constitutes nuisance conditions or public health issues, the Needham Health Department has regulatory authority. The Health Department also has authority

where water quality violations exist which impact the municipal drainage system. Examples include private drains, septic system overflows, and other sources of pollution on private property.

Stormwater Impacts to Receiving Waters

Stormwater runoff can be a significant non-point and point source of surface water pollution (FHWA, 1988). Past studies (FHWA, 1984) have shown that peak concentrations of metals and other pollutants (chloride, nutrients, oil & grease and TSS) in roadway runoff can exceed the EPA Aquatic Water Quality Criteria and/or Drinking Water Standards.

Constituent concentrations in roadway runoff are often site specific. Depending upon the type of land use adjacent to a road, roadways can be classified as being rural, suburban or urban. A rural area is typically more undeveloped with more open pervious area.

Urban development which is adjacent to a roadway reduces the pervious area and increases the impervious area (such as roof tops, streets, parking lots, and sidewalks). As detailed in Table 2.1.1, roads passing through urbanized areas typically have contaminant concentrations much higher than those passing through rural areas.

Table 2.1.1 Comparison of Road Runoff Contaminants from Urban and Rural Areas

Contaminant (mg/l)	Urban	Rural
Copper	0.054	0.022
Lead	0.40	0.08
Nitrate	0.76	0.46
Phosphate	0.40	0.16
TSS	142	41
Zinc	0.33	0.08

Source: Federal Highway Administration Publication WA/RD-88/006

Table 2.1.2 lists contaminants which were measured during wet weather sampling of this study, their impacts on receiving waters and their source(s). Nutrients and metals affect both human health and aquatic life if present in elevated levels. Fertilizers, animal feces, and decomposition of leaves during the Fall are several sources for nutrients in the environment (nitrates and phosphate). Metals are typically associated with motor vehicle traffic.

Table 2.1.2 Effects of Highway Runoff on Receiving Waters.

Constituent	EPA Guidance Critical Levels	Impact	Source(s)
Chloride	250 mg/L	Taste, domestic water supply	Deicing
Copper	<1 mg/L	Taste & odor	Engine
Iron	50 µg/L	Color, domestic water supply	Automobile rust
Lead	50 µg/L	Human health	Tire wear
Nitrate	10 mg/L	Domestic water supply	Fertilizers
Oil & Grease	Surface waters free from floating oils	Freshwater aquatic life	Oils & Greases
Phosphate	0.10 mg/L	Water quality/eutrophication	Fertilizers
TSS	Should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonably established norm for aquatic life	Freshwater fish and other aquatic life	Pavement wear, sanding
Zinc	5 mg/L	Taste & odor	Oil, grease

Source: Resource Document for Environmental Assessments, Volume III,FHWA/RD-84/064.

Four metals; copper, iron, lead and zinc; were measured during wet weather sampling. The regulatory and guidance levels of these four metals are listed in Table 2.1.3. EPA Guidance Levels are critical levels for stormwater runoff. Drinking Water Regulations are published levels for public drinking water supplies. Chronic levels indicate levels where aquatic organisms show signs of stress, and acute levels are levels at which 50 % of organisms die (LC_{50}). While chronic and acute levels vary significantly and are dependent upon the hardness of the receiving stream (3), they are shown for comparison purposes to the levels obtained during wet weather sampling.

Table 2.1.3 Regulatory and Guidance Levels of Copper, Iron, Lead and Zinc

Metal	EPA Guidance Critical Levels (mg/l)	Drinking Water Standard (mg/l)	chronic level (mg/l)	acute level(1) (mg/l)
Copper	1.0	1.3	0.0065	0.0033
Iron	0.05	0.3(2)	1.0	NA
Lead	0.05	0.05	0.0013	0.158
Zinc	5.0	5.0(2)	0.059	0.169

(1) : acute toxicity level for flathead minnow
(2) : Secondary Drinking Water Standard (cosmetic/taste)
NA: No Standard
Source: EPA Guidelines and Regulations

Wet Weather Sampling, Analysis and Evaluation

Wet weather sampling was conducted on October 19-20, 1996. Four (4) samples from seven (7) discharges were taken during the storm. The samples included a baseline sample prior to the storm, a first flush sample and two additional samples approximately one hour apart. Approximately one (1) inch of rain fell during the duration of the sampling event.

The first flush samples were taken when rainfall was observed flowing into the drainage systems, and an increase in stormwater discharge was noted. The reason for sampling during this period was to determine the peak load of the pollutants discharged for the storm event. First flush samples reflect runoff which washes materials from roadway surfaces and drainage systems deposited during a previous, or antecedent, dry period. The pollutant loads of the first flush period often reflect peak pollutant loads. For this storm, the antecedent dry period was ten (10) days.

Weather Services Corp. of Lexington, MA was retained to assist with weather prediction. Weather Services advised BETA of precipitation events which appeared to meet our criteria. These criteria included the need of a defined storm system with a potential of 1/2-inch of rain in a six hour period, and a minimum antecedent dry period of 72 hours.

Sample Collection

Several bottle types were used to collect runoff samples. All the bottles were prepared prior to sampling. Both glass and plastic (HDPE - High Density Polyethylene) bottles of different sizes were used depending upon the types of parameters to be analyzed. Table

2.1.4 lists the bottles used, their size and the type of preparation. All samples were grab samples collected at the stormwater discharges to the receiving water. The receiving waters were either the Charles River, or Alder Brook, a tributary to the Charles River.

Table 2.1.4 List of Type/Size and Preparation of Bottles Used for Sampling

Constituent(s)	Material	Size	Preparation
Metals	Plastic (HDPE)	100 ml.	HNO_3
Nutrients	Plastic (HDPE)	100 ml.	H_2SO_4
Total Petroleum Hydrocarbon	Glass	1000 ml.	H_2SO_4
TSS/TS, Chloride	Plastic (HDPE)	1000 ml.	None

To evaluate land use impacts upon stormwater quality, wet weather samples were collected from urban and residential areas. Three areas were characterized as urban, with a predominance of industrial/commercial activities and land uses within the drainage area. Four areas were characterized as residential/rural, with a predominance of residential land use and/or open space. The areas are defined in Table 2.1.5.

Table 2.1.5 Land Use of Wet Weather Sampling Areas

Subarea	Location	Land Use
N19-1	Charles Street	Rte. 95/ Commercial/ Industrial
N14-1	Highview Street	Commercial/ Industrial
N14B-1	Kendrick Street	Commercial/ Industrial
N10A-9	Webster Street	Residential
N10A-9A	Webster Street	Residential
N10A-7	Ivy Road (South)	Residential/Recreational
N10A-11	Dedham Avenue	Residential

Source: Needham Land Use and Zoning Map

Results of Wet Weather Sampling

The results of the wet weather sampling are discussed below, and are summarized in Table 2.1.6 Additionally, individual pollutant levels for all seven (7) areas are shown in Figures 2.1.1 through 2.1.10. Laboratory data sheets are provided in Appendix A.

Total Metals Results

Wet weather sampling for total metals was conducted for copper, iron, lead and zinc. The results of the wet weather sampling revealed the following:

Copper

- a first flush peak was noticed in six (6) of seven samples (see Figure 2.1.1).
- Area N14, a commercial area, revealed no first flush peak in concentration.
- there was no correlation between land use and copper concentration levels.
- all copper levels for all samples were below EPA Guidance levels and Drinking Water Regulation levels.
- all samples obtained during the storm were above chronic and acute levels (see Table 2.1.3).
- five of six copper samples had pre-rain levels below detection limits, indicating minimal dry weather levels. Area 14B was dry prior to rainfall.

Iron

- six of the seven areas showed a first flush peak for iron (See Figure 2.1.2).
- area N14B, a commercial area, revealed no first flush peak in concentration.
- residential areas revealed higher iron levels than commercial/industrial areas.
- all samples obtained during the storm were generally at or above both EPA guidance levels and Drinking Water Regulation levels.

  - **"Iron bacteria" are species of (lepotothrix and crenothrix) bacteria capable of metabolizing reduced iron into ferric oxide. The ferric oxide is precipitated either onto the stream bottom, or within the slimes that the bacteria secretes (Standard Methods, APHA, 1989). The reddish brown slimes often generate an unpleasant odor for drinking water supplies, but pose no direct threat to water quality or public health. In fact, the bacteria will often reduce the dissolved iron of water, thereby increasing water quality.**

    Iron for the bacteria may be obtained from pipes, steel re-bar of the pipes, or from flowing water. Typically, iron bacteria proliferate where conditions such as increased oxygenation occur. This occurs at numerous stormwater outfalls within our study area in Needham. BETA tested stormwater outfalls, where reddish slimes were evident, since this color may also indicate sanitary sewage. Many outfalls exhibit discoloration associated these bacteria, as detailed in the Figures of Part I, Section 3.

    Samples submitted for microscopic laboratory analysis revealed elevated levels of the iron bacteria. Generally, outfalls with iron bacteria slimes were associated with low fecal coliform bacteria. As previously mentioned, these bacteria actually reduce dissolved iron within the water, thereby improving water quality.

Lead

- Three of the seven areas (N10A-7, N10A-9 and N10A-9A) revealed a first flush peak for lead (see Figure 2.1.3). These are all residential areas.
- Lead was only detected in the three first flush samples referenced above.
- Lead was not detected in any of the commercial/industrial area samples.
- Lead exceeded the National Primary Drinking Water Regulation Standards (NPDWR), EPA Guidance, Acute and Critical levels in the three (3) residential samples.
- All three samples had elevated solids and suspended solids levels, as detailed in the following section. The "total lead" was likely within the solids of the first flush samples, and not "dissolved lead" within the stormwater. No dissolved metals analyses were conducted for this study.

Zinc

- All seven areas revealed a first flush peak concentration for zinc (see Figure 2.1.4)
- Area 10A-7 took several hours to reach a peak concentration.
- there was no correlation between land use and zinc concentrations.
- All zinc levels were below National Primary Drinking Water Regulation Standards (NPDWR) and EPA Guidance levels.
- Prior to the storm, most samples were below above acute and chronic levels. Nearly all samples were above acute and chronic levels during the storm.

Chloride, Nitrate and Phosphorus Results

Wet weather sampling was conducted for chloride, nitrate and phosphorus. The results for these parameters revealed the following, as shown in Figures 2.1.5 - 2.1.7.

- First flush peak concentrations for chloride were evident in four of the seven areas. Additionally, Area 10A-9A had a significant peak concentration later during the storm. The reason for this is unknown, but could be due to adjacent sewers surcharging, and exfiltration of sewage into the drain system, as detailed in Part I of this Report. The chloride peak is consistent with the period of time when rainfall intensified (1 inch per hour), likely resulting in surcharge conditions when the sample was taken from the outfall at 2:00 AM.
- Only two of the seven areas (N14 and N10A-11) had peak concentrations during the first flush for nitrate nitrogen. All samples met EPA guideline levels and NPDWR's.
- First flush peaks for phosphorus were evident in four of the seven areas (10A-9, 10A-9A, 10A-7 and 10A-11). These are all areas of residential land use.

Total Solids and Total Suspended Solids

Wet weather sampling results for total solids (TS) and total suspended solids (TSS) revealed the following:

- Peaks for TS and TSS were evident in N10A-7, N10A-9 and N10A-9A during the first flush period. These are three of the four residential land use areas within the

Table 4-6 Summary of Wet Weather Sampling Results

Sampling Location #	Sampling Location	Date	Time	Conductivity (uhmos)	pH	Temp (°C)	Nitrates (mg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	Total Solids (mg/L)	Chloride (mg/L)	Total Petroleum Hydrocarbons (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Zinc (mg/L)
DRAINAGE AREA - N10A																
N10A-7	South of Ivy Road	10/19/96	20:28	560	7.85	14.2	2.55	0.673	ND	305	115	ND	ND	0.06	ND	0.04
N10A-7	South of Ivy Road	10/20/96	1:28	380	7.70	14.4	2.16	1.20	2560.0	2730	72.0	ND	0.07	**14.2**	**0.56**	0.19
N10A-7	South of Ivy Road	10/20/96	2:40	340	7.40	13.6	1.91	0.439	40.0	234	72.0	ND	0.02	**0.51**	ND	0.10
N10A-7	South of Ivy Road	10/20/96	3:10	350	7.30	14.0	2.46	0.566	21.0	241	72.0	ND	0.02	**0.58**	ND	0.10
DRAINAGE AREA - N10A																
N10A-9	East of Webster Street	10/19/96	20:08	410	7.39	12.2	2.21	0.547	ND	217	49.5	ND	ND	**0.50**	ND	0.07
N10A-9	East of Webster Street	10/20/96	24:47	320	7.30	13.5	1.94	2.34	2530	2530	97.0	ND	0.06	**28.7**	**0.18**	0.35
N10A-9	East of Webster Street	10/20/96	2:25	300	7.35	13.8	0.966	0.600	23.0	223	74.5	ND	0.02	**1.79**	ND	0.22
N10A-9	East of Webster Street	10/20/96	3:10	310	7.20	13.0	0.527	0.505	16.0	204	52.0	ND	0.01	**0.72**	ND	0.16
DRAINAGE AREA - N10A																
N10A-9A	East of Webster Street	10/19/96	20:05	570	7.37	11.2	2.05	0.342	ND	386	132	ND	ND	0.05	ND	0.04
N10A-9A	East of Webster Street	10/20/96	1:00	580	7.30	12.3	1.97	2.35	2500	2630	110	ND	0.09	**55.9**	**0.29**	0.39
N10A-9A	East of Webster Street	10/20/96	2:25	900	7.10	12.3	1.16	0.581	97.0	732	**284**	ND	0.07	**4.90**	ND	0.27
N10A-9A	East of Webster Street	10/20/96	3:15	320	6.90	12.0	0.775	0.608	64.0	246	57.0	ND	0.09	**1.13**	ND	0.27
DRAINAGE AREA - N10A																
N10A-11	East of Dedham Avenue	10/19/96	20:50	360	7.59	12.8	1.06	0.153	ND	217	72.0	ND	ND	0.09	ND	0.03
N10A-11	East of Dedham Avenue	10/20/96	1:37	410	6.70	13.5	3.06	0.539	41.0	301	97.0	ND	0.02	**4.86**	ND	0.11
N10A-11	East of Dedham Avenue	10/20/96	2:10	350	7.60	13.8	2.21	0.265	13.0	5330	67.0	ND	0.01	0.29	ND	0.03
N10A-11	East of Dedham Avenue	10/20/96	3:40	300	6.90	12.9	1.98	0.0862	2.0	180	62.0	ND	0.03	**0.42**	ND	0.06
DRAINAGE AREA - N14																
N14-1	North of Second Avenue	10/19/96	19:40	880	7.65	12.4	0.102	0.687	13.0	591	92.0	ND	0.12	**0.67**	ND	0.30
N14-1	North of Second Avenue	10/20/96	1:20	480	**6.40**	12.5	0.806	0.402	96.0	438	110	ND	0.08	**1.84**	ND	0.58
N14-1	North of Second Avenue	10/20/96	2:25	180	**6.40**	14.5	0.314	0.195	11.0	120	34.0	ND	0.02	0.30	ND	0.21
N14-1	North of Second Avenue	10/20/96	3:30	200	6.50	13.4	0.379	0.107	12.0	122	44.5	ND	0.02	**0.50**	ND	0.25
DRAINAGE AREA - N14B																
N14B-1	South of Kendrick Street	10/19/96	19:50	DRY												
N14B-1	South of Kendrick Street	10/20/96	24:37	240	7.05	11.6	0.482	0.278	14.0	156	34.5	ND	0.03	**0.71**	ND	0.18
N14B-1	South of Kendrick Street	10/20/96	1:38	190	6.80	12.7	0.459	0.162	7.0	132	54.5	ND	0.04	**0.33**	ND	0.32
N14B-1	South of Kendrick Street	10/20/96	2:15	180	6.70	13.0	0.379	0.185	13.0	123	37.0	ND	0.02	0.25	ND	0.23
DRAINAGE AREA - N19																
N19-1	Northeast of Charles Street	10/19/96	20:12	800	7.50	12.2	2.45	ND	36.0	474	191	ND	ND	**1.60**	ND	0.05
N19-1	Northeast of Charles Street	10/20/96	1:28	670	6.70	12.8	2.31	0.375	162	547	157	ND	0.04	**10.8**	ND	0.21
N19-1	Northeast of Charles Street	10/20/96	2:40	510	6.50	12.7	1.71	0.470	80.0	344	119	ND	0.06	**4.85**	ND	0.22
N19-1	Northeast of Charles Street	10/20/96	3:50	640	7.20	12.4	1.83	0.187	27.0	420	160	ND	0.04	**3.79**	ND	0.19
National Primary Drinking Water Regulation Standards				None	6.5-8.5[3]	None	10	None	None	None	250[3]	None	1.3	0.3[3]	0.05	5.0[3]

Note: 1) Please refer to the drawings attached in the report for the approximate sampling locations
2) Shaded values exceed published drinking water standard
3) Secondary drinking water standard
4) ND- Not Detected

study. Area 10A-11, the fourth residential area, revealed a significant peak for TS approximately two hours into the storm, with a minimal peak for TSS.

- Peak concentrations for TS and TSS correlated with metals concentrations.
- Commercial/Industrial areas had minimal peaks for TS and TSS during first flush conditions, if any (see Figures 2.1.8 - 2.1.9).

Total Petroleum Hydrocarbons (TPH)

Wet weather sampling was conducted to evaluate whether TPH levels were elevated during first flush conditions. Additionally, a comparison of commercial/industrial land use and residential land use impacts to TPH levels was planned. However, no TPH was detected in any sample during the wet weather sampling event.

Watershed Hydrology

All ten (10) watershed areas and their sub-areas were analyzed using the Soil Conservation Service (SCS) Technical Release 55 (TR-55) method. Using TR-55 times of concentration, runoff volumes and peak discharge rates were calculated at the outfall locations for a 10-year frequency storm (see Appendix B). The peak discharge rates were evaluated to determine the land area requirements to construct various BMP's (see Table 2.1.7).

Soil data was determined from the Soil Survey of Norfolk County, MA, prepared by the US Soil Conservation Service in 1989. The hydrologic soil classification for these ten watersheds varies from Group A to Group C.

Table 2.1.7 Watershed Analysis Summary

Drainage Area	Area (acres)	Pipe Size (inches)	Calculated Flow (cfs)
N1B	23.4	18	5.7
N1	180.4	30	39.5
N6C	13.3	18	18.4
N8-1	70.7	30	27.7
N8-2	53.9	30	40.8
N10A-5	52.5	42	30.5
N10A-6	6.6	24	18.4
N10A-7	220.9	48	274.3
N10A-9	61.2	36	28.8
N10A-9A	117.9	24	97.7
N10A-11	139.5	42	44.1
N11	60.4	12	25.6
N14	87.3	54	62.89
N14B	39.3	30	75.8
N19	260.4	48	127.2
N22	47.1	24	83.4

Figure 2.1.1: Total Copper

Wet Weather Sampling Results

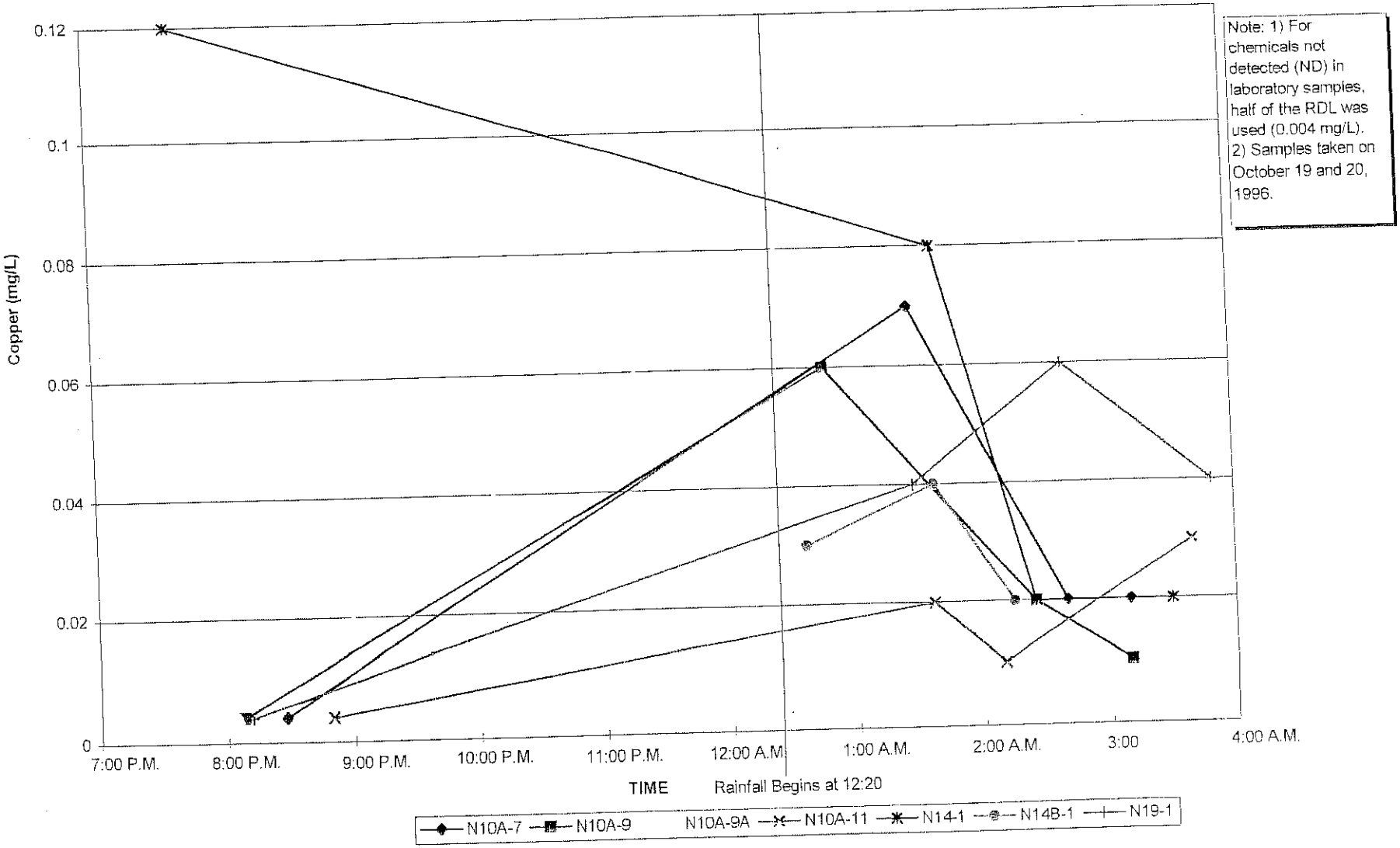


Figure 2.1.2: Total Iron

Wet Weather Sampling Results

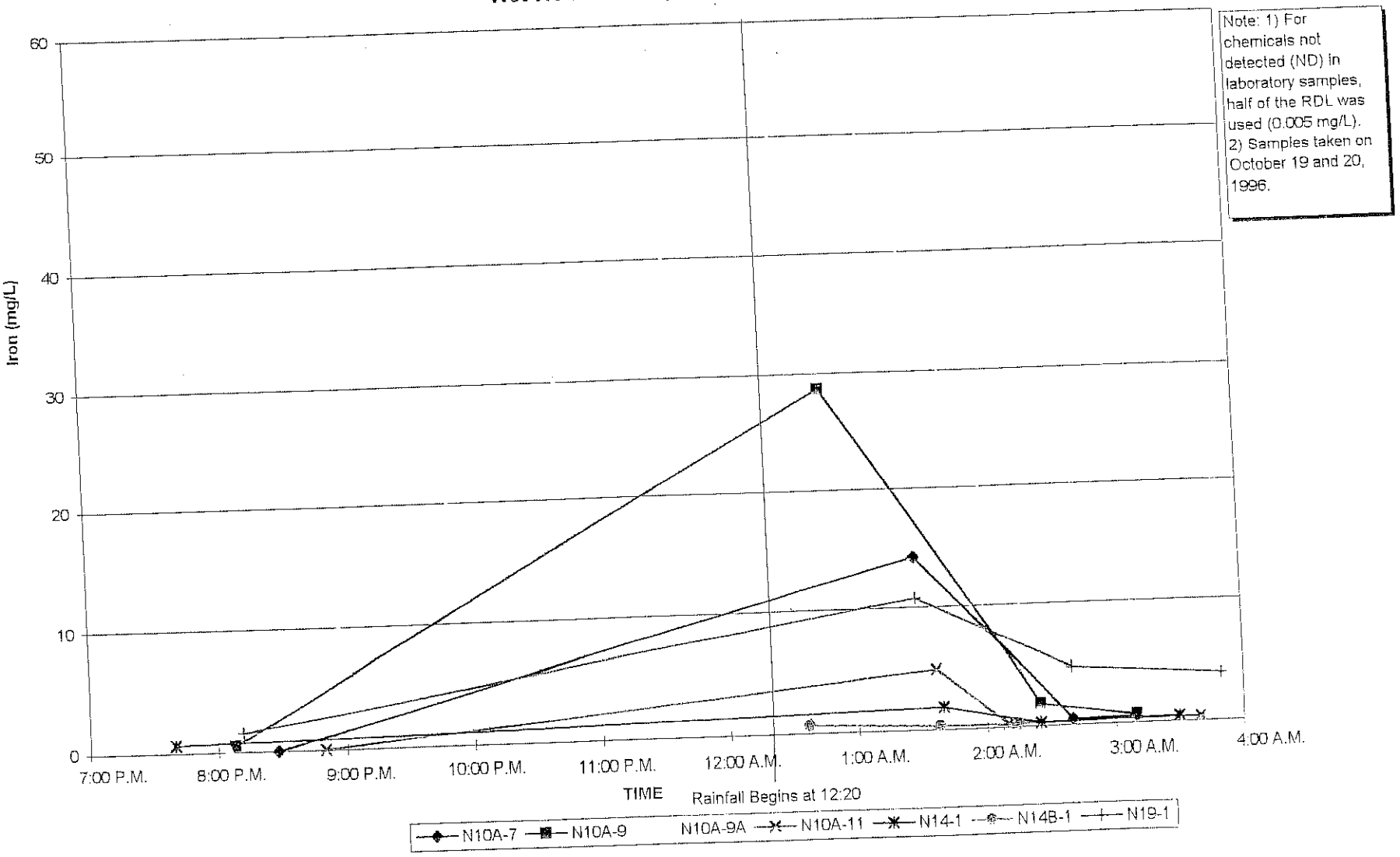


Figure 2.1.4: Total Zinc

Wet Weather Sampling Results

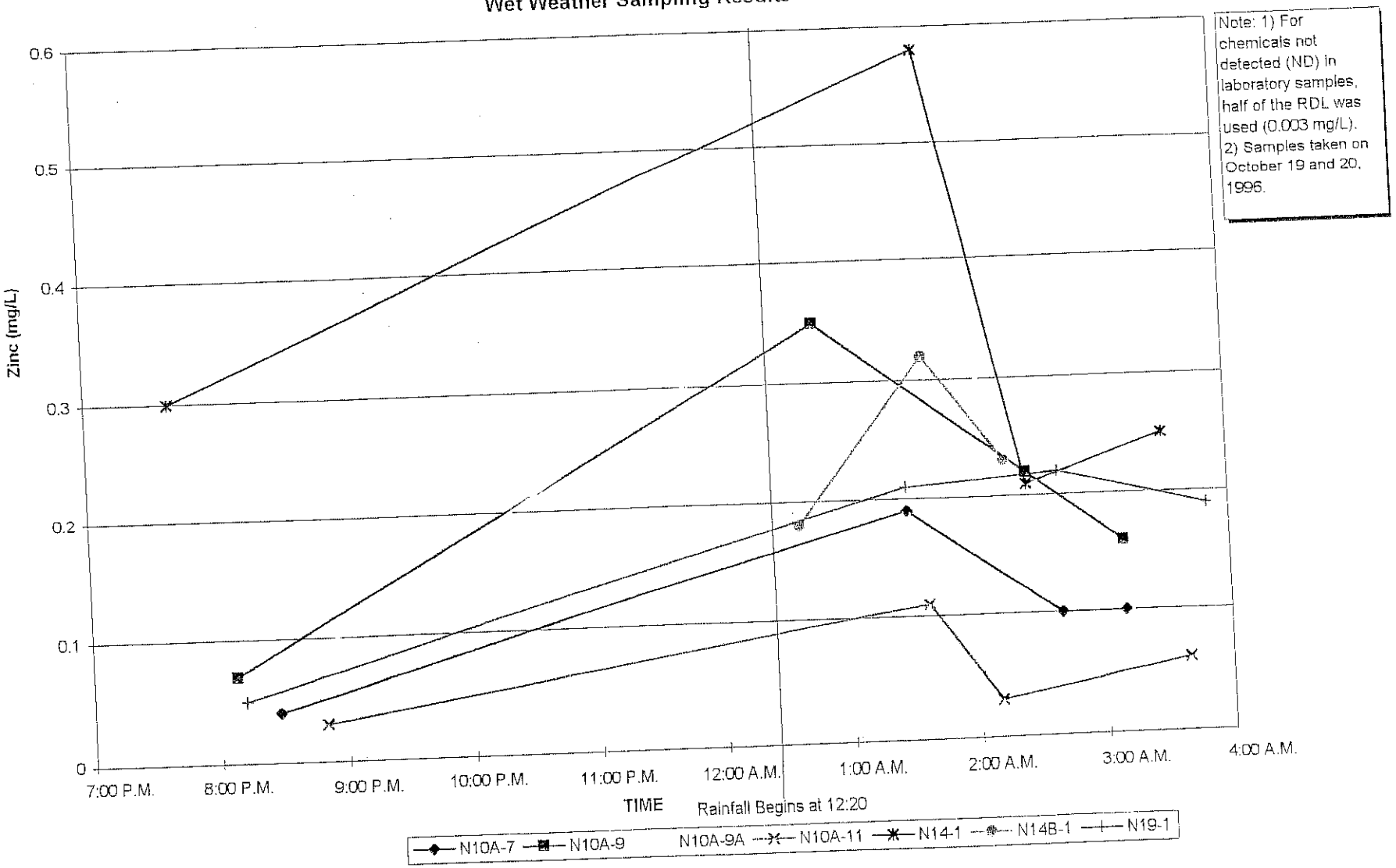


Figure 2.1.3: Total Lead

Wet Weather Sampling Results

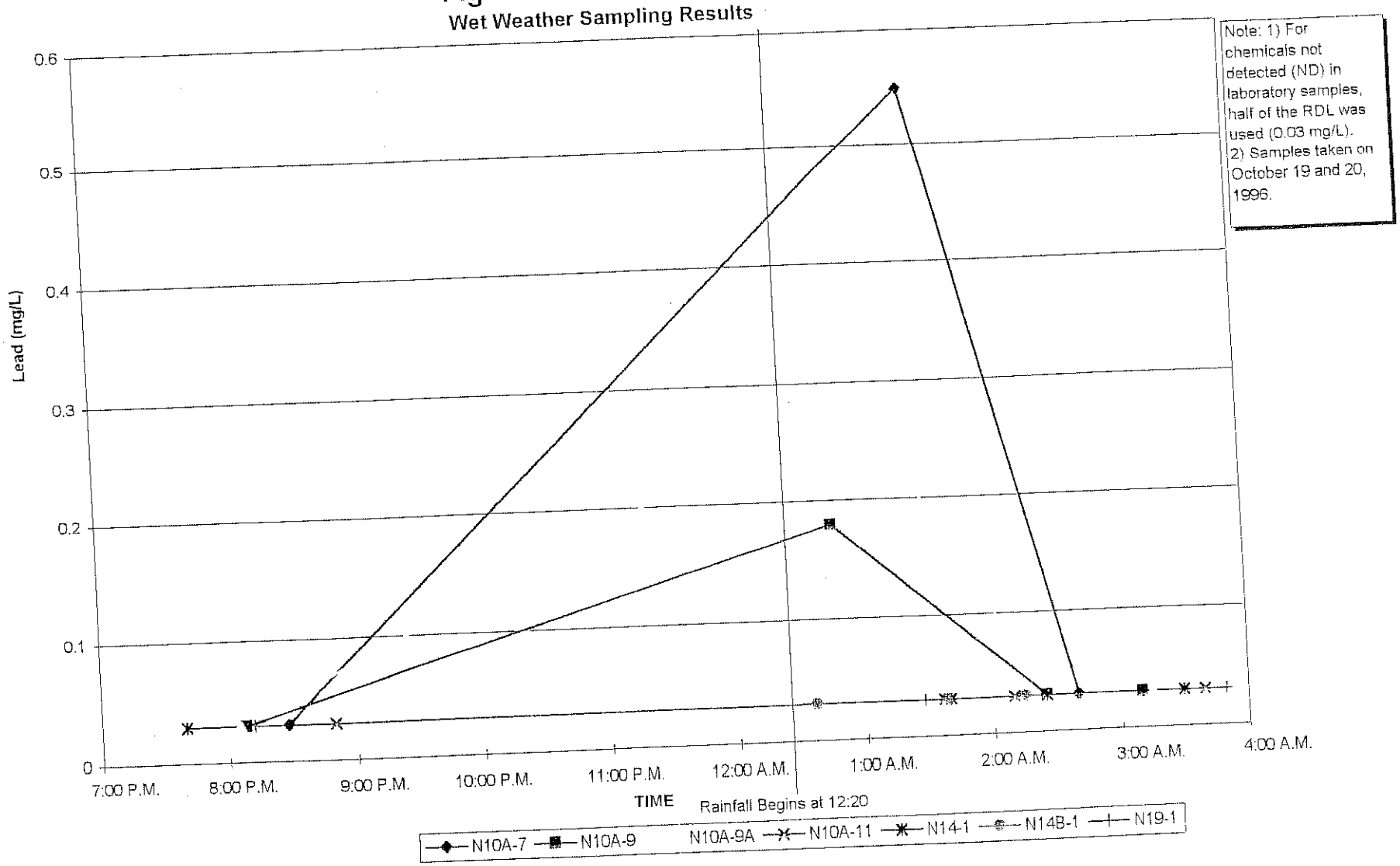


Figure 2.1.5: Chloride

Wet Weather Sampling Results

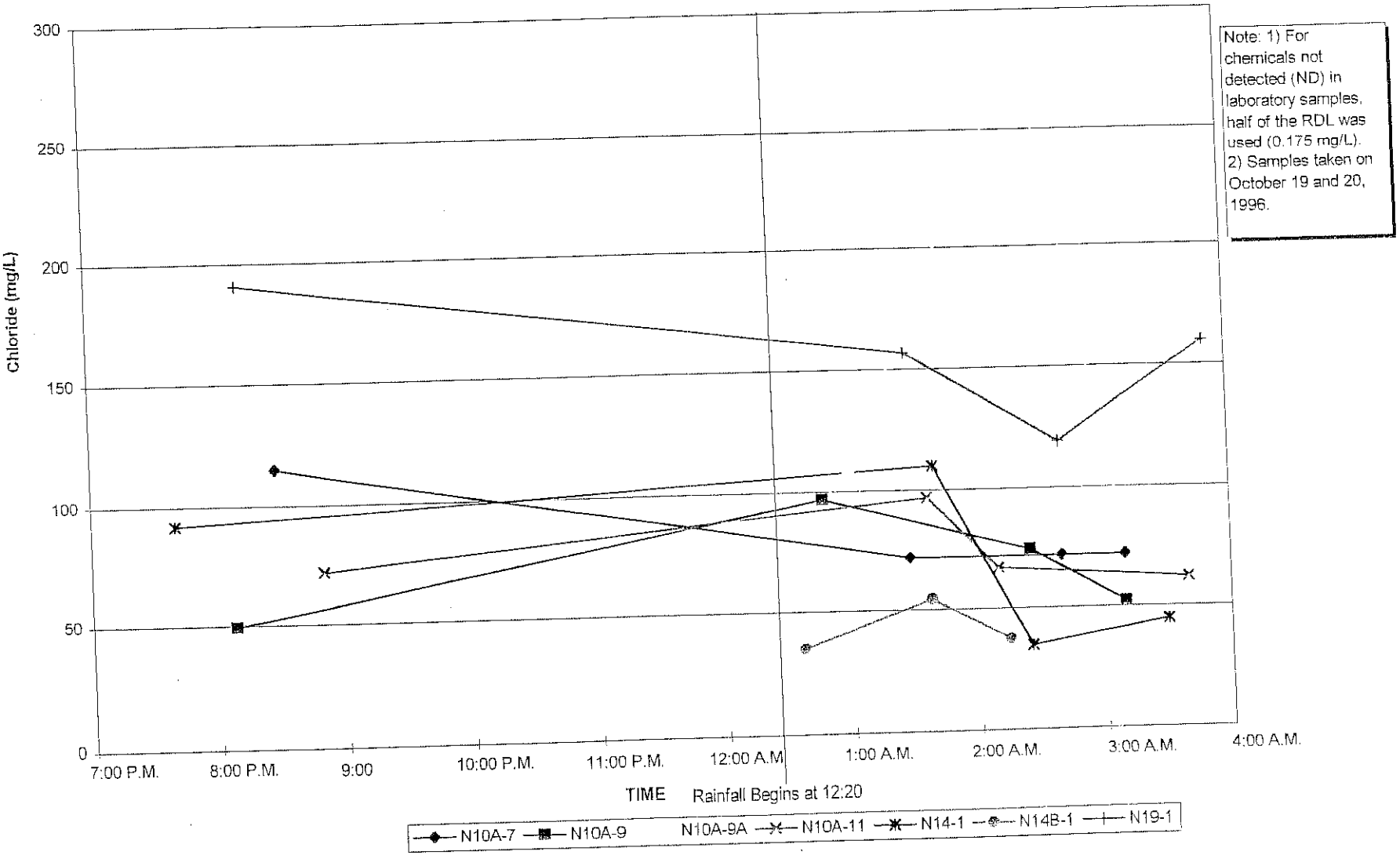
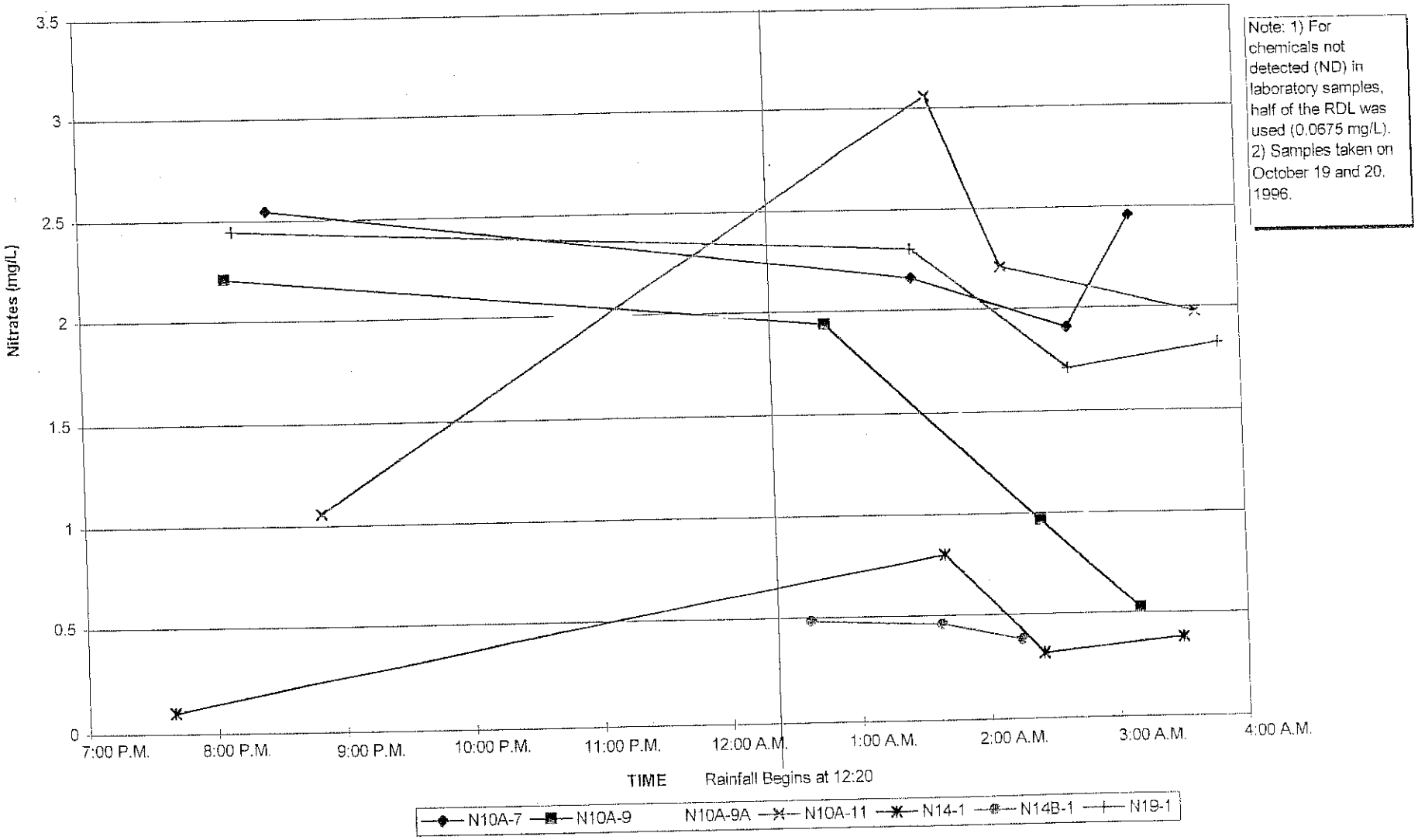


Figure 2.1.6: Nitrate Nitrogen

Wet Weather Sampling Results



Note: 1) For chemicals not detected (ND) in laboratory samples, half of the RDL was used (0.0675 mg/L). 2) Samples taken on October 19 and 20, 1996.

Figure 2.1.7: Total Phosphorus

Wet Weather Sampling Results

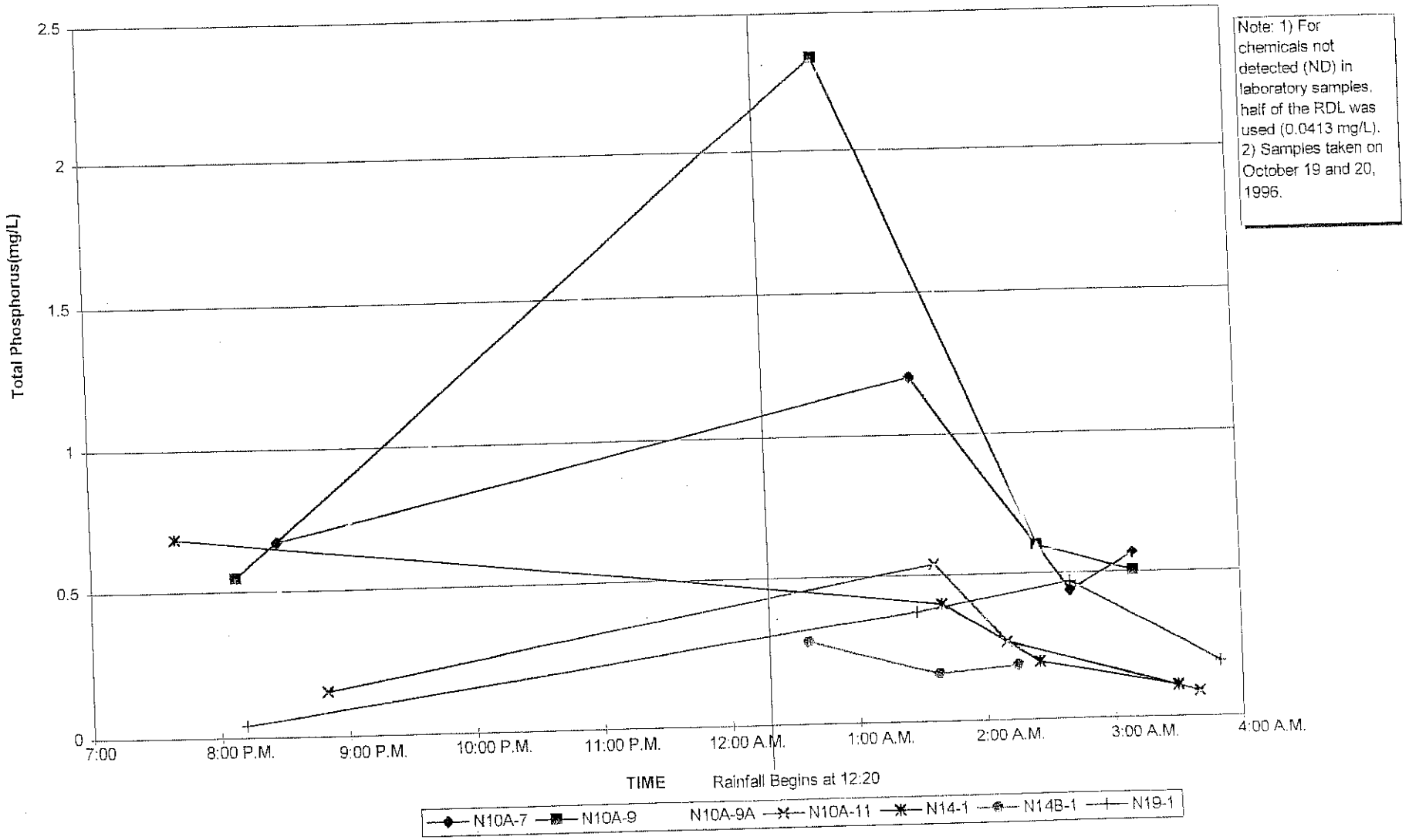


Figure 2.1.8: Total Solids

Wet Weather Sampling Results

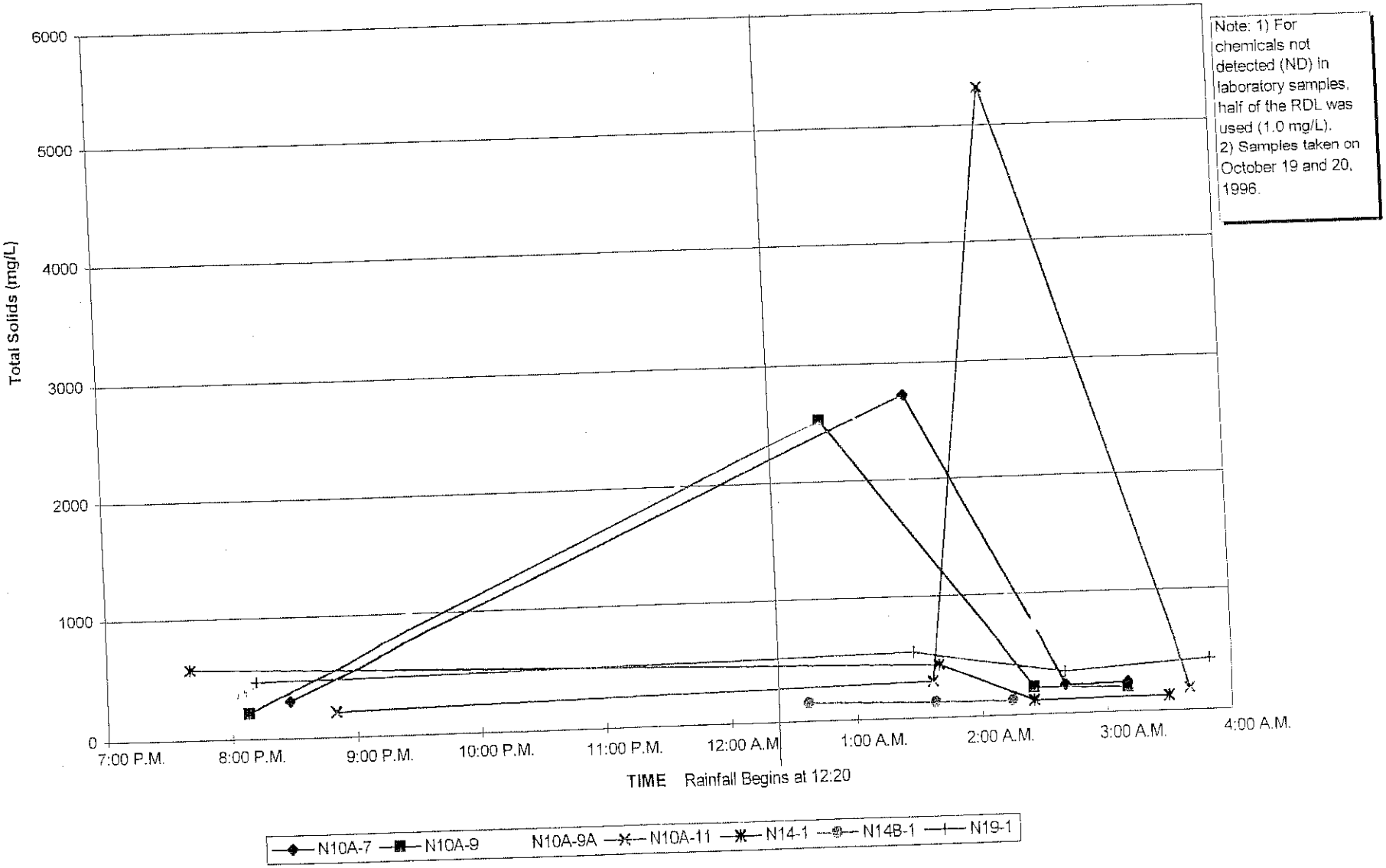


Figure 2.1.9: Total Suspended Solids (TSS)

Wet Weather Sampling Results

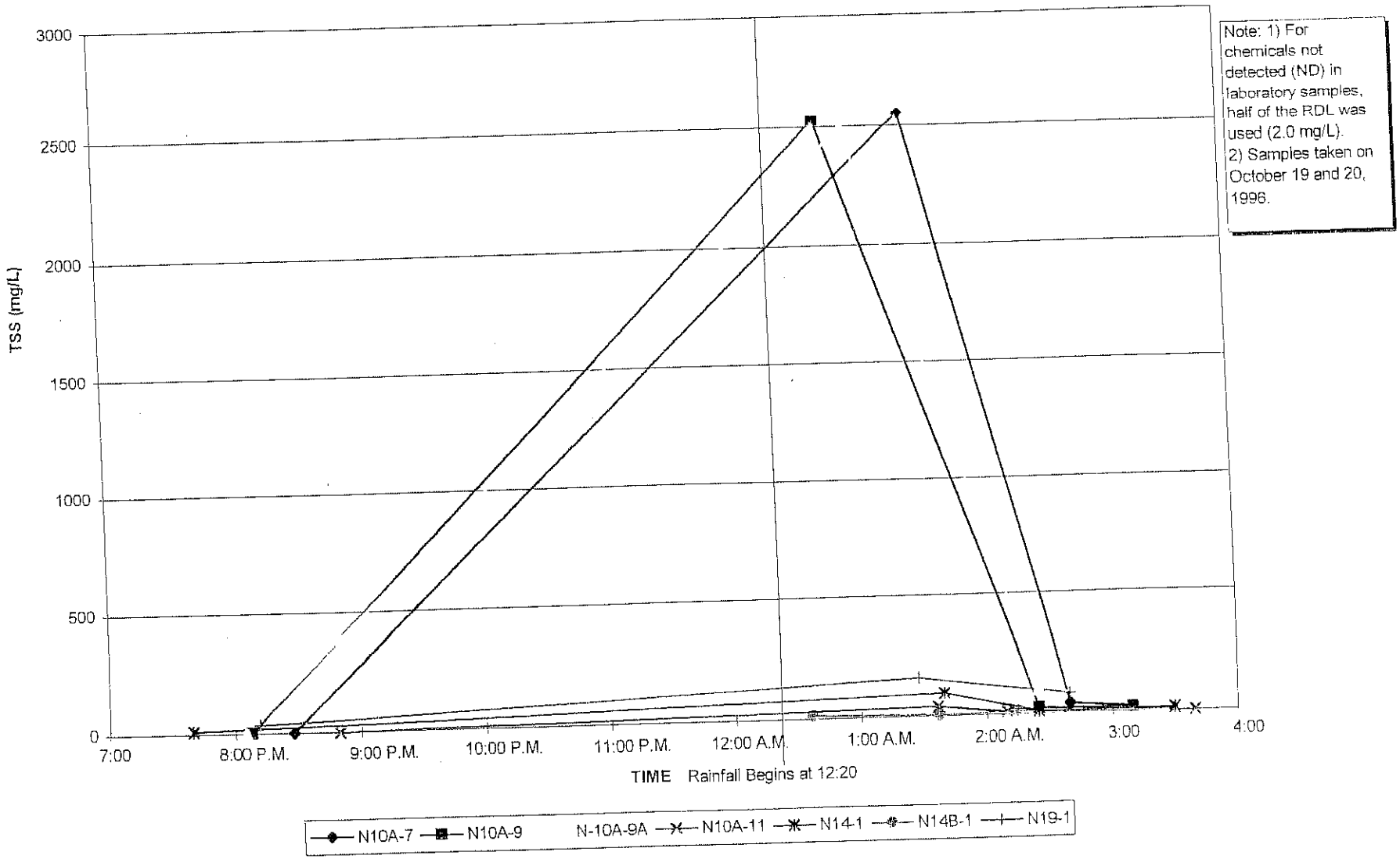
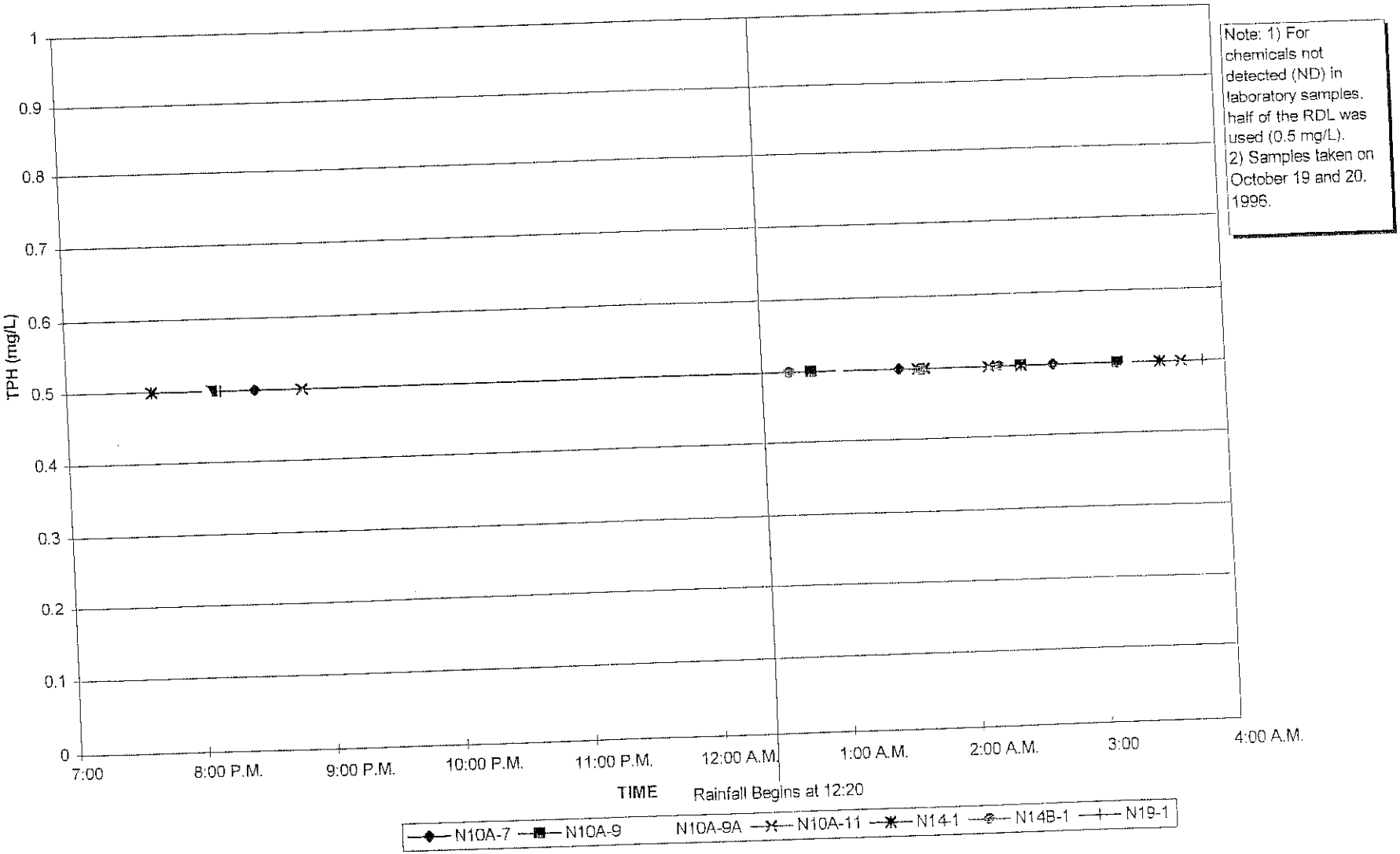


Figure 2.1.10: Total Petroleum Hydrocarbons (TPH)

Wet Weather Sampling Results



Conclusions

The total lead detected within the first flush samples of areas N10A-7, N10A-9 and N10A-9A) was likely due to solids of the first flush samples, and not "dissolved lead".

As detailed in Figures 2.1.8 and 2.1.9, the total solids and total dissolved solids levels are similar, with the exception of Area N10A-11. No dissolved metals analyses were conducted for this study. The levels of total lead exceeded EPA guidance levels, National Primary Drinking Water Regulations (NPDWR's), and acute and chronic levels. We feel this was due to silt and sediment within the samples (see Table 2.1.3).

All samples collected from residential areas all met NPDWR's, with the exception of the first flush samples discussed above.

No other NPDWR's were exceeded in any samples for parameters which were tested. Iron exceeded secondary drinking water standards in 21 of 27 samples. Secondary standards are regulated for cosmetic and taste, but pose no direct health risks.

All samples collected from the industrial/commercial areas met NPDWR's, indicating that water quality of the commercial/industrial areas of Needham are inconsistent with federal studies referenced in Tables 2.1.1 and 2.1.2. During this study, there was little correlation of pollutant levels to land use, however, total solids and total suspended solids levels were higher in residential areas.

The outfalls which were monitored generally met primary drinking water and EPA guidance levels. Additionally, many of the stormwater outfalls are not direct discharges, and flow into freshwater wetland areas, small ponds and streams. These freshwater resource areas are effective in pollutant removal, and undoubtedly improve stormwater quality.

Additionally, construction of BMP's within these freshwater wetlands and resource areas would be extremely difficult from a regulatory standpoint. Large areas of federal and state regulated wetlands would need to be altered to construct the BMP's, since these are the only open space within eight of the ten areas which were studied.

Therefor, given that most of the stormwater samples met National Primary Drinking Water Standards for the parameters tested, and the extreme difficulty constructing a BMP, structural BMP's are not recommended.

We recommend non-structural BMP's be implemented, such as improvements to the existing inspection, cleaning and monitoring components of the municipal stormwater drainage system in accordance with Part II, Section II and Section III. These improvements, along with continued stormwater management programs already in place, will reduce levels of sediment (solids), suspended solids, nutrients and metals which are discharged to the Charles River and its' tributaries. Reduced fecal coliform bacteria

pollution will also result from inspection and maintenance programs detailed in Sections II and III of Part II of this Report.

While the Town of Needham has extensive stormwater and street cleaning programs, improved inspection and prioritization of stormwater system improvement programs are needed. The Town is currently developing a standard inspection program, as discussed in the following Section. Additionally, other improvements to Needham's existing stormwater management program are addressed.

Section II - Evaluation of Stormwater Management Practices

Hazardous Materials (HAZMAT) Response Plan

General

The Town of Needham's HAZMAT program is a cooperative effort between the Needham Fire Department, the Needham Department of Public Works and the Needham Health Department. Additionally, the Town has an agreement with the Westwood Fire Department. Westwood provides assistance with significant HAZMAT situations, and is equipped to respond to unknown chemical hazards.

HAZMAT Response

Coordinating all of Needham's HAZMAT programs is the Fire Department. Any accident involving vehicles and/or chemical releases is forwarded to the Fire Department. Each fire truck is equipped with chemical absorbent materials such as petroleum/gasoline pads and "sausages". Upon arrival at the scene of any accident, the Fire Department makes an assessment of the situation and notifies the applicable regulatory and/or cleanup agencies.

Minor Releases

Upon any release of petroleum and/or hazardous materials, one of the two local fire inspectors is notified, and makes an inspection of the release scene. Upon notification, the Inspector notifies the Needham Health Department and the Department of Environmental Protection - Northeast Regional Office. If state roadways or drainage systems are involved, the Massachusetts Highway Department is notified.

The immediate response of the Fire Department includes preventing a release from entering the storm drain system, including physically placing petroleum absorbent booms, etc. between the release and the storm drain system. The Department of Public Works is immediately notified if a release is in proximity to the municipal drainage system.

The DPW is often called for minor releases to supply additional manpower, materials (including sand, etc.) and plans of the drainage and sewer systems. The sewerage and drainage plans allow contingency plans to be made to intercept a release, should one reach these systems.

Major Releases

- Upon notification of a release which could be significant, the Fire Department immediately notifies the following:
- Civil Defense Office
- Department of Public Works
- Health Department
- Department of Environmental Protection, Northeast Regional Office

The Fire Department is equipped with a specialized truck for HAZMAT response. Should a response be characterized as a potential hazard, the truck is notified to respond. The vehicle is equipped with HAZMAT materials to prevent migration of a significant release to storm drains or sanitary sewers.

Upon arrival of the vehicle, and dependent upon site specific conditions, the Fire Department notifies either the Westwood Fire Department, equipped with HAZMAT chemical suits, or Clean Harbors, Inc. Both have an agreement with the Town to respond to chemical releases.

HAZMAT Corridors/Storage Facilities

There is one landfill in Needham which is operational. The site is located on Central Avenue, several miles from the Charles River. The surface water and stormwater systems in the area flow to the north, away from the Charles River. However, several chemical storage facilities are proximate to the Charles River. The two facilities on Charles Street are located in the industrial area of northern Needham. The MWRA facility is located on Chestnut Street in southern Needham. These storage facilities include the following:

	# ASTs	NOTES	Location
Casey Petroleum, Inc.	10	10,000 gallons gasoline, oil, diesel	Charles Street
Needham Oil, Inc.	10 ASTs, 2 USTs	gasoline, oil, diesel	Chestnut Street
MWRA Water Station	5	chlorine, ammonia	Charles Street

AST: Above ground storage tank UST: underground storage tank

Each of the facilities has a spill containment plan, and the Needham Fire Department is aware of the chemicals which are stored on the sites. Numerous other facilities in Needham have underground storage tanks (UST's). However, above ground storage tanks (AST's) pose the most direct threat to stormwater, due to the possibility of a significant release from AST's within a brief period of time.

UST's are also regulated by the Needham Fire Department. Anyone who removes a UST from the ground must obtain a permit from the local fire inspector. The permit requires an observation to be made of whether the tank appears intact, or whether there is evidence of a chemical release. If there is evidence of a release, the DEP is notified, and the owner of the tank is required to retain a Licensed Site Professional (LSP) to evaluate the site.

Additionally, Route 128 is a major HAZMAT corridor through the Town. Numerous hazardous waste haulers use Route 128 daily. The Charles River is adjacent to Route 128 near Great Plain Avenue and Highland Avenue in Needham. These are two areas where the HAZMAT program is critical to the River. Coordination of HAZMAT issues involves the Needham Fire Department (and Westwood, as needed), the Massachusetts Highway Department, the Department of Environmental Protection and the Needham Health Department.

Local Land Use Issues and Regulations

Needham's current population is estimated at 29,156 (Town Clerk, 12/96). Over 80% of the Town is residentially zoned as single residence or rural residence. Most of this area is saturated with development, however, limiting space for new residential development.

Exceptions include areas such as South Street, Chestnut Street, and High Rock Avenue where new development and subdivisions are underway. Several land use controls are in effect to regulate development, and protect water resources and the environment from development impacts. These regulations include the following:

- Needham Subdivision Regulations, Needham Planning & Zoning Departments
- Needham Floodplain Regulations, Needham Zoning Department
- Wetlands Protection Act, Needham Conservation Commission

These three regulations limit development impacts, including stormwater discharges, to wetlands and waterways within Needham.

Wetlands Protection Act

Additionally, development within freshwater wetlands and within 100 feet from wetland boundaries are regulated under the Wetlands Protection Act (310 CMR 10.00). These areas are regulated by the Needham Conservation Commission and the Massachusetts Department of Environmental Protection.

Residential and commercial subdivisions and land development activities must obtain an Order of Conditions from the Conservation Commission for activities within these regulated areas. The application must detail erosion and sedimentation controls, best management practices (BMP's) and other ways to mitigate impacts to wetlands and water resources.

Rivers Protection Act

In 1996, the Rivers Protection Act was passed into law. This regulation expands the jurisdiction of the Wetlands Protection Act (310 CMR 10.00) and the Needham Conservation Commission to include a new "Riverfront" area. Rivers and streams which flow throughout the year are regulated under the Act. The Needham Conservation Commission administers the Act under the Wetlands Protection Act provisions.

The Rivers Protection Act affects all alterations within 200 feet of banks of rivers regulated under the Act. The 200 feet is measured from the mean high water mark of the waterway.

Applicants proposing development within the 200 foot area are required to evaluate feasible alternatives which may result in less impacts to the Riverfront area. Perhaps most importantly, the Conservation Commission also reviews the alternatives analysis, and may prohibit alterations to the Riverfront area which are deemed unwarranted.

This Act significantly increased the protection of Rivers in Needham, including the Charles River, Alder Brook, Rosemary Brook and numerous other tributaries to the Charles River. Stormwater impacts to rivers and streams are now evaluated up to 200 feet from the riverbank.

Charles River Corridor Plan

The "Charles River Corridor Plan" recommended additional protection mechanisms in 1982. The Town of Needham adopted several regulations recommended by the Plan, including:

- cluster zoning, including 300' setback bylaw
- scenic roads (M.G.L. Ch. 40, 5.15c)

These regulations further protected the Charles River watershed. Cluster zoning allows less land area within the River Corridor to be altered through smaller lot sizes. The Scenic Roads provisions restricts activities that aesthetically impair the roadways along the Charles River.

Stormdrain Cleaning and Maintenance Program

The Needham Department of Public Works (DPW) conducts routine cleaning and maintenance of the stormdrain system. This includes an intensive schedule of catch basin cleaning and line flushing throughout the year. The Needham DPW owns one (1) "Stetco" catch basin cleaner, which is utilized to clean debris and sediment from the Town's catch basins.

The DPW cleaning schedule includes 100% of the municipal catch basins annually, with a 30% redundancy factor. Therefore, each basin is cleaned once per year and 30% are cleaned a second time. Typically, the basins are cleaned when they are 40% full of solids. All of the materials cleaned from the catch basins are brought to Needham's municipal landfill for disposal. This results in a significant reduction in pollutants and solids discharged to waters with the Town.

Subdivision best management practices (BMP's) are designed in accordance with subdivision regulations. BMP's which are municipally owned and/or operated are maintained by the Department of Public Works.

BMP's which are privately owned and operated such as these within condominium associations, etc., are not maintained by the Town. Inspections and cleaning of private catch basins is also currently not conducted.

Problems which were noted by DPW officials included the lack of important data for many catch basins and stormwater collection pipes in Needham. Specifically, numerous catchbasins were constructed with no bottom (or invert). Traditionally, maintenance crews clean and excavate debris in these structures with no indication of the bottom of the structure. This practice has resulted in numerous catchbasins being undermined through "overcleaning". Impacts to water resources from overcleaning these catch basins have been documented, since the catchbasins collapse and offer no stormwater control.

Street Sweeping and Cleaning Program

The Town owns two street sweepers which are utilized throughout the year. Additionally, two street sweepers are "rented" through a local contractor to assist in seasonal (springtime) and major street artery sweeping programs. Street sweeping is conducted throughout the year, with exceptions in the winter months when snow plow operations are in effect. During this period, all DPW Highway personnel focus on plowing, and minimal sweeping is conducted.

De-icing of Municipal Streets

During the winter months, Needham utilizes road salt and sand to de-ice municipal roadways, and maintain access for vehicles. Road salt consists of sodium chloride, with a backup supply of calcium chloride. Sand, which is applied to the roads in winter months, is collected in the springtime through a rigorous street sweeping operation within the Town. There are no areas in Town where road salt use is not allowed, such as watershed areas, etc.

Sand and solids which enter the municipal stormwater system are also collected through the previously mentioned storm drain system cleaning program. All street sweeping and catch basin cleanings are disposed of in Needham's sanitary landfill, away from water resources.

Illicit Connection Identification and Removal Program

The Town of Needham recently conducted an investigation of illicit connections to the municipal stormwater system. The investigation included ten (10) areas identified in the Administrative Consent Order between the EPA and the Town. The results are included in Section III of Part I of this Report.

As detailed in Section III, the Town has several regulations which prohibit sanitary sewer connections to the stormwater systems. These regulations are enforced by the Department of Public Works and the Health Department.

The Town has municipal plans and records of the residences which are connected to the sanitary sewer system. The locations of the connections, and often times measurements to the connections, are shown in the Municipal Sanitary Sewer plans of the Town.

Additionally, the Needham Health Department has a listing of all septic systems and cesspools within Needham. While the list of septic systems is incomplete, it includes a large majority of the systems. Furthermore, discrepancies of the Health Department list can be compared to the sewer plans to reveal if the residence or business is connected to the sanitary sewer system.

The Town has conducted numerous investigations of illicit connections to the stormdrains in the past. The illicit connections located during previous investigations were removed from the stormdrain system.

The Stormwater Pollution Study, submitted in November, 1996, by BETA Engineering, indicated that several direct and indirect connections of the sanitary sewer system and/or residential connections to the stormdrain system may exist. These connections are currently being evaluated, and will be removed should they be determined to be illicit.

Septic System Inspection Program

The Needham Health Department conducts routine and mandatory inspections of residential septic systems in accordance with Title V of the State Sanitary Code (as revised in 1995). These inspections are conducted according to the Title V regulations and include documentation of chronic problems, such as surface discharge of systems, etc. During land sale transactions, the Title V inspections include documenting compliance with applicable setbacks to water resources and wetlands, as well as documenting evidence of surcharging of systems.

The Health Department ranks each system with either a pass or fail score. Failure indicates a chronic problem with the system, and the need for an upgrade. Systems which fail the Title V criteria must be upgraded within two (20) years of the system inspection failure. System upgrades and replacements include percolation testing, deep hole testing to determine the depth to groundwater and soil types, and design of a system in accordance with the Title V regulations. Plans of the new or upgraded systems must be submitted to and approved by the Health Department.

The Health Department also maintains records of all complaints which are made to their office. The records include the address of the property for which the complaint was filed, the date of the comp-laint, and the result of the inspection by the Health Inspector. These complaints include those associated with failing septic systems, chemical releases and storage, and odors.

Discussions with Needham's Health Inspector revealed that residences with septic systems are typically older homes with older septic systems. Many of these were installed prior to the original Title V State Sanitary Code regulations promulgated in 1976.

Typically, areas in Needham with sanitary sewers have a high rate of "tie-in". Only several homes within BETA's study area were determined to have "questionable connections" to the stormdrain system. These connections are currently being investigated.

Infiltration from Sanitary Sewers and Septic Systems

Due to the age of numerous sanitary sewers and septic systems in Needham, infiltration into the stormwater drainage system was investigated. Infiltration into stormdrains within the ten (10) areas identified in the Consent Order were the focus of the investigation.

The results of the investigation, as detailed in Part I, Section III, revealed two areas where infiltration from sanitary sewers into stormdrains occurs. Both areas have parallel sewers and drains of approximately equal depth. Additionally, both areas have older (1926-1940) sewers which had been confirmed by the Town and BETA to surcharge during peak flow periods, even during dry weather conditions. The areas included sewers in Washington Street and Webster Street.

The Town replaced the sanitary sewers in Washington Street in November of 1996. Sanitary sewers in Webster Street were inspected (television inspection), and revealed cracks in the pipes beneath the MBTA train tracks on Webster Street. The repairs of these pipes will be evaluated in early 1997.

Additional testing and television inspection of the storm drains revealed several possible impacts from septic systems. All but one were documented by BETA to be due to animals inhabiting the storm drains, as detailed in Section III.

The DPW inspects storm drains throughout the year, usually when there is a problem with the system, or when cleaning is scheduled. Additional storm water inspections are detailed in Part II, Section III.

Public Education and Outreach Programs

Twice per year, the Town conducts a household hazardous waste collection day. These events are advertised through the local newspapers, cable television and flyers which are distributed throughout the Town. Household hazardous waste includes waste oil and used petroleum products. Public advertisements for these hazardous waste collection days include information on the harmful effects of improper disposal of these materials. The collection of used motor oil on these days reduces materials which may otherwise be disposed of in municipal stormwater collection facilities, such as catch basins. Historically, storm drains have provided an easy disposal method for waste oil products.

In addition, two Needham Selectmen have a public awareness program on the local cable television network entitled "What's Up With That?". This program addresses local issues, and answers questions which residents ask over the telephone throughout the broadcast. The questions and issues deal with local infrastructure, such as sanitary sewer and storm drainage systems. Additionally, water quality, hazardous waste and other environmental

topics are discussed. This programming provides Needham residents with a forum in which to ask relevant municipal questions to the chief elected officials in the Town.

Capital Improvements Program

Existing Capital Improvements Program

Needham's public works budget, along with the budgets of all municipal departments, are part of the Town's capital plan. In Needham, a five (5) year capital plan is generated by all municipal departments, including the capital budget for the fiscal year (annual budget). The five year capital plan and the annual budget are financed through several methods, including bonding, user fees such as water and sewer rates, issuance of debt to the Town, and federal and state loans and grant monies.

The projects included in the five year capital plan, including those of the Department of Public Works, are prioritized by each Department, and the Board of Selectmen. Projects recommended for inclusion in these plans are placed on the Town Warrant, where they are voted on at the annual Town Meeting. The methods of capital financing are also voted on at Town Meeting.

In fiscal year 1996, the total authorized debt for Department of Public Works capital costs was approximately $11,400,000. Approximately $7,900,000 of this amount was issued. The remaining $4,600,000 was authorized debt which was not issued (see Appendix C).

Of the $11,400,000, a total of $5,500,000 was authorized debt for capital improvements for sewer and drainage projects (excluding landfill costs and water dept. projects). A total of $4,900,000 was debt which was issued, and the remaining $600,000 was authorized debt which was not issued.

Additional costs for Stormwater Management Improvements

The additional costs to implement improvements in Needham's stormwater management program detailed in Section VI are minimal. The Department of Public Works has the equipment and staff in place to conduct the stormwater system inventory and inspection program. Generation of a database to prioritize stormwater system improvements can also be conducted by existing staff with a computer system already owned by the Town. Costs to continue existing programs, such as television inspection under the I/I program, are already included in the Town's five year capital plan.

Section III. Proposed Stormwater Management Program Improvements

The Needham Department of Public Works (DPW) is currently developing improvements to their existing storm water management program. These improvements, as well as additional recommendations, include the following:

- Development of a standardized catch basin and storm drain inspection program, to include:
  - Continued cleaning and maintenance of stormwater system components, under the existing program.
  - a standardized inspection form, which includes information regarding the condition of the structure, construction material (brick, precast concrete, etc.) depth to invert, size, condition and type of pipes into and out of the structure, and condition of the frame and cover. The form should be completed during each catch basin, manhole or stormdrain cleaning operation (see Figure II-3-1). Evidence of illicit connections to the stormwater system, petroleum residues or chemical odors should also be included on the forms.
  - The inspection should also be conducted for sanitary sewer manholes, since evidence of surcharge, blockage and leakage may be evident in these structures (see Figure II-3-2). This is important, since the Town has documented areas where surcharging sanitary sewers impact stormwater systems, such as the recent replacement of the Washington Street sewers.

- Development of a municipal database, where the results of the stormwater and sanitary sewer inspections are documented, prioritized and programmed into the database. The database will include adequate data to identify cleaning dates, amount of debris removed, repairs required, and other appurtenant information. This allows for the municipal cleaning program to be developed that will require cleaning the most critical catch basins more frequently than other, less critical catch basins. Tailoring the catch basin cleaning program to the specific needs of the system will allow the Town to be more effective in removing sediment in the basins, thereby reducing pollutant loads to the water resources. The database would be continually updated to reflect maintenance needs.

  Additionally, the database will contain critical information regarding the stormwater system and management programs which is not readily available. Currently, much of this information is known by municipal employees, but the information is lost when the employees retire or leave the Town.

CONDITION

EXCELLENT - E
VERY GOOD - VG
GOOD - G
FAIR - F
POOR - P
DOES NOT APPLY - DNA

TYPE

RED BRICK + CEMENT - RBC
WHITE BRICK + CEMENT - WBC
CAST-IN-PLACE CONCRETE - CIP
PRECAST CONCRETE - PC
CONCRETE BLOCK - CB
FIELD STONE - FS
COBBLE STONE - CS
UNKNOWN - UK
GRANITE STONE - GS
CAST IRON - CI
CLAY PIPE - VC
TRANSITE PIPE - AC
REINFORCED CONCRETE - RC
PLASTIC - PVC

ADJUSTMENT BRICK
CONDITION _____
COMMENT _____

CONE
No of COURSES _____
TYPE _____
CONDITION _____
COMMENT _____

WALLS
TYPE : _____
CONDITION : _____
COMMENT : _____

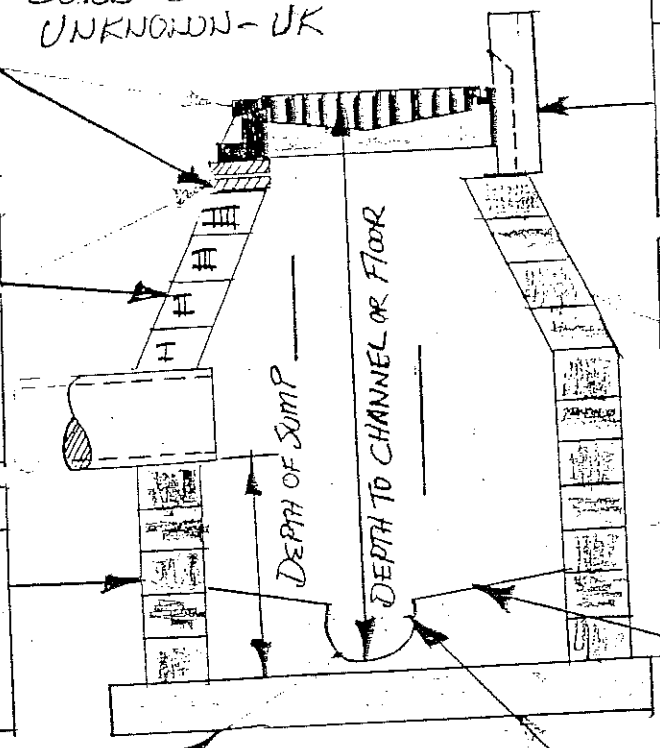
BOTTOM PLATES / FLOOR
TYPE : _____
CONDITION : _____
COMMENT : _____

CURB INLET
TYPE : _____
CONDITION : _____
COMMENT : _____

FRAME & COVER
TYPE : _____
CONDITION : _____
COMMENT : _____

TABLE
TYPE : _____
CONDITION : _____
COMMENT : _____

CHANNEL / INVERT
TYPE : _____
CONDITION : _____
COMMENT : _____



☐ MAN HOLE
☐ CATCH BASIN
☐ GREASE, OIL + GASOLINE SEPERATORS

GENERAL COMMENTS : _____

NAME : _____
DATE : _____
TIME : _____

TOWN OF NEEDHAM
DRAIN STRUCTURE INSPECTION REPORT

LOCATION _____

STRUCTURE NO.

FIGURE 2-3-1

CONDITION
EXCELLENT - E
VERY GOOD - VG
GOOD - G
FAIR - F
POOR - P

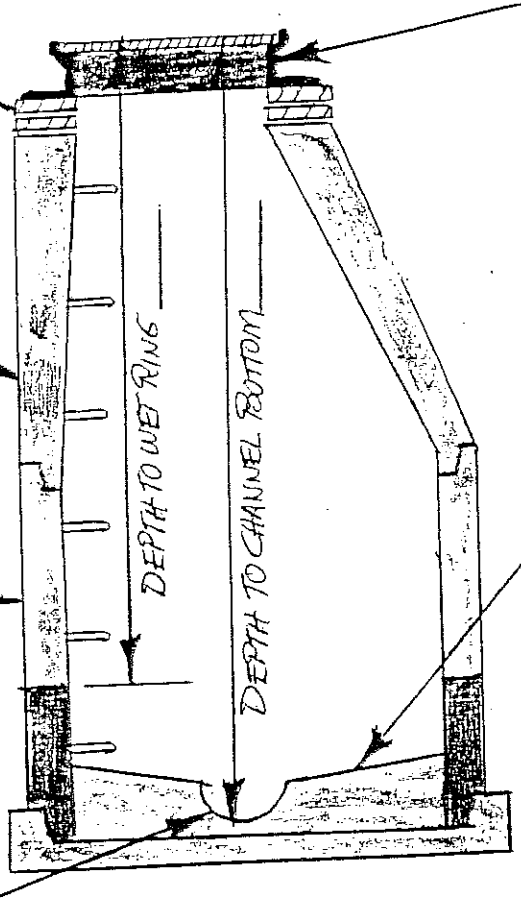
TYPE
RED BRICK & CEMENT - RBC
WHITE BRICK & CEMENT - WBC
CAST-IN-PLACE CONCRETE - CIP
PRECAST CONCRETE - PC
CLAY PIPE - VC
TRANSITE PIPE - AC
CAST IRON PIPE - CI
REINFORCED CONCRETE - RC
CAST IRON PIPE - CI
PLASTIC - PVC
STEEL - ST
ALUMINUM - AL
UNKNOWN - UK

ADJUSTMENT BRICK
No of Courses - _____
TYPE - _____
CONDITION - _____
COMMENT - _____

CONE
TYPE - _____
CONDITION - _____
COMMENT - _____

WALLS
TYPE - _____
CONDITION - _____
COMMENT - _____

CHANNEL/INVERT
TYPE - _____
CONDITION - _____
COMMENT - _____



FRAME + COVER
CONDITION - _____
COMMENT - _____

STEPS
TYPE - _____
CONDITION - _____
COMMENT - _____

TABLE
TYPE - _____
CONDITION - _____
COMMENT - _____

EVIDENCE OF LEAKAGE

COVER ____	DAMP ____
FRAME ____	SLIGHT ____
WALLS ____	LITTLE ____
TABLE ____	MODERATE ____
CHANNEL ____	HEAVY ____

GENERAL COMMENTS: _____

NAME - _____
DATE - _____
TIME - _____

TOWN OF NEEDHAM
SEWER MANHOLE INSPECTION REPORT

LOCATION: _____

MANHOLE NO.

FIGURE 2-3-2

- Continued television inspection of the sanitary sewers in Needham, under the existing Infiltration / Inflow (I / I) program. This program has revealed areas where sanitary sewers are in need of repair, and assists the Town in the prioritization of sewer and drainage improvement projects. In 1996, the Town conducted television inspection of several thousand linear feet of sanitary sewers and storm drains. Additionally, BETA plans on television inspection of 1,000 feet more of storm drains in Needham.

- Design and repairs to areas of the stormwater collection system where dry weather pollution has been documented. The sources of pollution include the following:

    - **indirect (municipal) connections to sanitary sewers on Webster Street**
    - **private (residential) drainage connections on Norfolk Street to Webster Street**
    - **direct (municipal) discharge from the sub-drain of the sanitary sewer located on Webster Street**

- Evaluate structural methods at storm water outfalls (identified in Part I) to inhibit access of animals which inhabit Needham's stormwater system. These methods may include metal grating, screening, etc. Animal populations were determined to be a major contribution to fecal coliform bacteria during dry weather sampling studies.

- The Town should consider classifying certain roadways within sensitive resource areas as "reduced salt areas". This could include areas of streets along the Charles River, and its' tributaries. Reduced salt in these sensitive areas would improve stormwater runoff quality in the winter months. Since hundreds of streets have stormwater systems which discharge to the Charles River, the reduced salt areas should focus on the streets directly adjacent to the River, and other sensitive resource areas.

- Implementation of these improvements could begin immediately, with commencement of a standardized inspection and maintenance program of the stormwater drainage system components. Throughout 1997, the Town should develop a database, which would serve as the framework for the long term maintenance program. Establishment of this database will take considerable time and effort, but once in place, it can be updated as needed to reflect maintenance needs.

- In accordance with EPA guidelines, the Town should develop an "Annual Report" which summarizes the results of the storm water management program, including enforcement, inspection and water quality issues. The Report should be submitted in December of 1997 to the EPA. Additionally, costs incurred to implement improvements to Needham's Storm Water Management Program for 1997, and predicted costs for 1998, should be included in the Report. Scheduling of stormwater management program improvements for each fiscal year should also be included in the Annual Report.

References:

1) Driscoll, E. D.; Shelly, E.P.; Streucker, E.W.; Pollutant Loadings and Impacts from Highway Stormwater, Volume I, Design Procedure, Federal Highway Administration, Office of Research and Development and Technology, FHWA-RD-88-06.

2) Dupuis, T.V.; Kobridger, N.P.; Kreutzberger, W.K.; and Trippi, V.; Effects of Highway Runoff on Receiving Waters - Volume III. Resource Document for Environmental Assessments, Federal Highway Administration, Office of Research and Development and Technology, FHWA-RD-84-064.

(3) Perry W. Langford and W. Wesley Eckenfelder, Jr., Toxicity in Industrial Effluents: (New York: Van Nostrand Reinhold, 1990), P. 99.