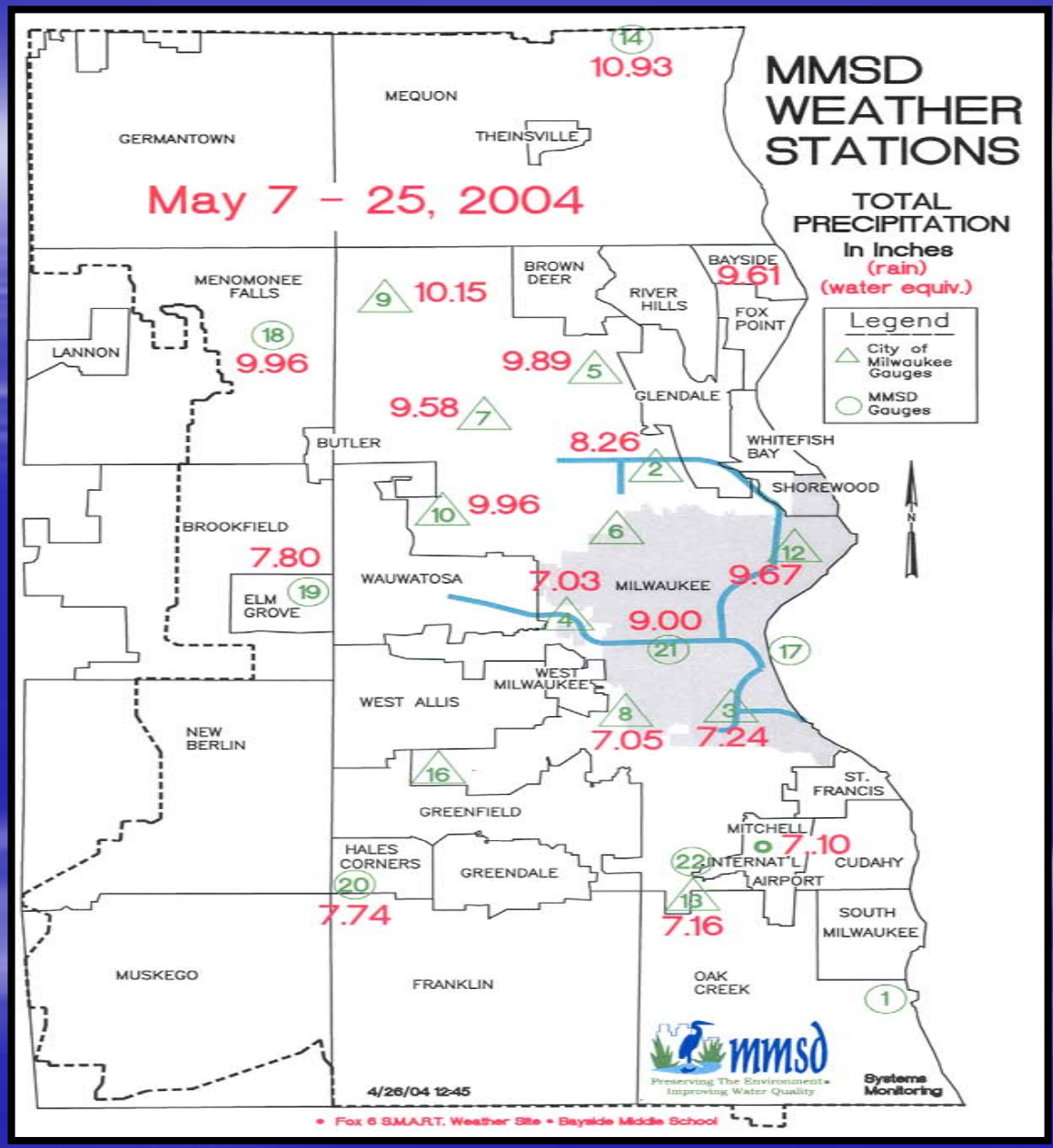
MAY 7 – 25, 2004
HYDROLOGIC EVENT


MMSD WEATHER STATIONS
May 7 – 25, 2004
TOTAL PRECIPITATION
In Inches
(rain)
(water equiv.)
Legend
City of Milwaukee Gauges
MMSD Gauges
14
10.93
MEQUON
GERMANTOWN
THEINSVILLE
MENOMONEE FALLS
9
10.15
BROWN DEER
RIVER HILLS
BAYSIDE
9.61
FOX POINT
LANNON
18
9.96
9.89
5
GLENDALE
9.58
7
BUTLER
8.26
2
WHITEFISH BAY
SHOREWOOD
10
9.96
6
12
BROOKFIELD
7.80
WAUWATOSA
7.03
MILWAUKEE
9.67
ELM GROVE
19
4
9.00
21
17
WEST MILWAUKEE
WEST ALLIS
8
7.05
3
7.24
NEW BERLIN
16
ST. FRANCIS
GREENFIELD
MITCHELL
7.10
HALES CORNERS
GREENDALE
22
INTERNAT'L AIRPORT
CUDAHY
20
7.74
13
7.16
SOUTH MILWAUKEE
MUSKEGO
FRANKLIN
OAK CREEK
1
mmsd
Preserving The Environment • Improving Water Quality
Systems Monitoring
4/26/04 12:45
• Fox 6 S.M.A.R.T. Weather Site • Bayside Middle School

Weather Forecast Resources

- Great Lakes Weather Service
  - Official weather information system for Tunnel
  - Automatic Control Driver for the Collection & Tunnel algorithm
  - Information includes real time radar and satellite imaging
  - Storm direction, intensity, duration & probability
- MMSD Conveyance System Rain Gauges
- Internet weather sites
  - NOAA, Forecasts include 24, 48 & 72-hour ranges
  - Local Media Sources & Weather.com

CONVEYANCE SYSTEM
May 7-10

PRECIPITATION

Hi: 2.77”

Lo: 1.02”

Ave: 1.82”

Cumulative Avg. = 1.82”

OVERFLOWS

May 10

Sanitary Sewer Overflows (SSOs)

(Non-Tunnel Related)

–Ravine Lane & Lake Drive

–Rangeline Road & Milwaukee River

–North 31st & West Cameron Avenue

Tunnel Volume Peaked @ 186 MG

CONVEYANCE SYSTEM
May 12-13

PRECIPITATION

Hi: 1.80”

Lo: 0.75”

Ave: 1.21”

Cumulative Avg. = 3.03”

OVERFLOWS

May 13

Combined Sewer Overflows (CSOs)

–Tunnel reserve for separate sewage was reduced to 125 million gallons

– Combined sewer gates to tunnel closed at approximately 5:30 pm causing CSO’s

Tunnel Volume Peaked @ 300 MG

CONVEYANCE SYSTEM
May 14

PRECIPITATION

Hi: 1.55”

Lo: 0.78”

Ave: 1.13”

Cumulative Avg. = 4.16”

OVERFLOWS

May 14-15

Combined Sewer Overflows (CSOs)

–CSO’s continued until May 16 @ 1:00 a.m.

Sanitary Sewer Overflows (SSOs)

Tunnel Related: Began 1:30 pm on May 14 when separate sewer tunnel gates closed

–South 6th & Oklahoma

–North 59th & Trenton

–4400 North Port Washington Road

–Green Tree & River Road

Tunnel Volume Peaked @ 392 MG

Separate sewer gates opened May 15 @ 11 PM

CONVEYANCE SYSTEM
May 14 (Continued)

PRECIPITATION

Hi: 1.55”

Lo: 0.78”

Ave: 1.13”

Cumulative Avg. = 4.16”

OVERFLOWS

May 14-15

Sanitary Sewer Overflows (SSOs)

(Non-Tunnel Related)

–Ravine Lane & Lake Drive

–Rangeline Road & Milw. River

–North 31st & Cameron

–KK & St. Francis Ave.

–North 27th & Silver Spring Ave.

–North 27th & Villard Ave.

–Basement backups reported in Milwaukee & Glendale

CONVEYANCE SYSTEM
May 17-18

PRECIPITATION

Hi: 1.06”

Lo: 0.43”

Ave: 0.61”

Cumulative Avg. = 4.77”

OVERFLOWS

May 17-18

Combined Sewer Overflow (CSOs)

–CSO’s began at 11:00 pm on May 17th when combined sewer gates were closed

–Concluded: 6:00 am on May 18th

Tunnel Volume Peaked @ 307 MG

CONVEYANCE SYSTEM
May 20-21

PRECIPITATION

Hi: 2.20”

Lo: 0.30”

Ave: 1.04”

Cumulative Avg. = 5.81”

OVERFLOWS

May 20-21

Combined Sewer Overflow (CSOs)

–CSO’s began at 8:15 PM on May 21 upon closing of combined sewer gates

Sanitary Sewer Overflows (SSOs)

(Non-Tunnel Related)

–Ravine Lane & Lake Drive (May 21)

–Rangeline Road & Milw. River (May 20&21)

Tunnel Volume Peaked @ 306 MG

CONVEYANCE SYSTEM
May 22-23

PRECIPITATION

Hi: 2.52”

Lo: 0.98”

Ave: 2.08”

Cumulative Avg. 7.89”

OVERFLOWS

May 22-23

Combined Sewer Overflow (CSOs)

–CSO’s continued

Sanitary Sewer Overflows (SSOs)

Old computer system failed at 4:30 AM on May 22, new SCADA system brought on line to operate tunnel system.

Tunnel SSO gates were closed at 12:30 PM on May 22

Tunnel Volume peaked at 401 MG

CONVEYANCE SYSTEM
May 24-25

PRECIPITATION

Hi: 0.08”

Lo: 0.00”

Ave: 0.06”

Cumulative Avg. 7.94”

OVERFLOWS

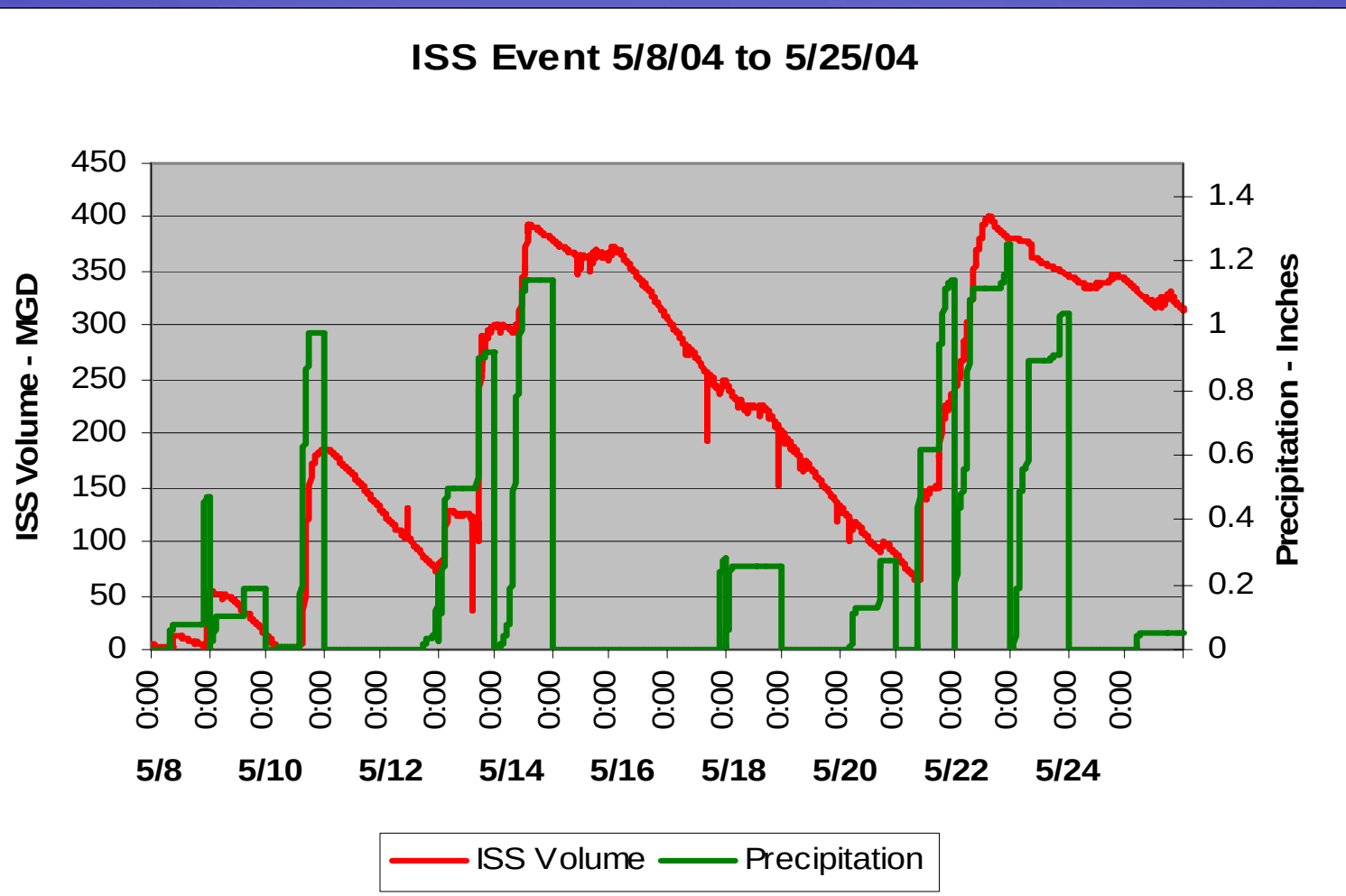
Combined Sewer Overflow (CSOs)

–CSO’s ended at 6 PM on 5/25

Sanitary Sewer Overflows (SSOs)

–SSO gates were opened by 4 PM on May 24th and tunnel related SSO’s ceased.

Tunnel Volume peaked at 345 MG


ISS Event 5/8/04 to 5/25/04
ISS Volume - MGD
Precipitation - Inches
450
400
350
300
250
200
150
100
50
0
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0:00
5/8
5/10
5/12
5/14
5/16
5/18
5/20
5/22
5/24
ISS Volume
Precipitation

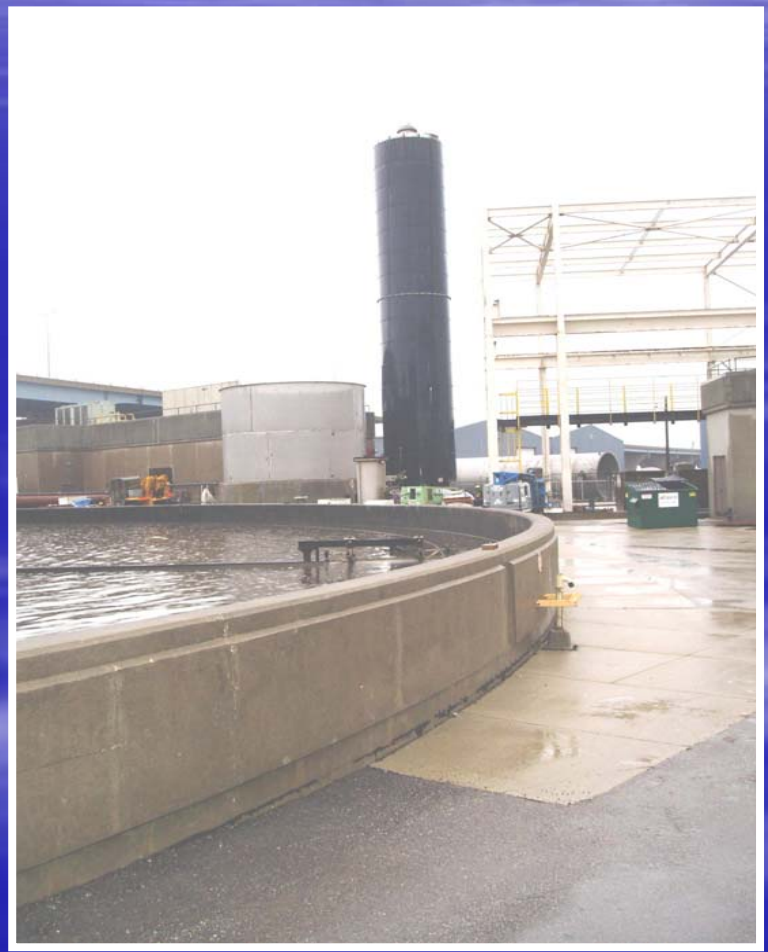
OVERFLOW SUMMARY

Date(s)	Combined Sewer Overflows *	Sanitary Sewer Overflows *	
		(Tunnel Related)	(Non-Tunnel Related)
5/10	0	0	0.5
5/13-16	1395	90.6	10.6
5/17-18	65	0	0
5/20 - 24	2681	323.9	48.4
Totals	**4141**	**414.5**	**59.5**

* All amounts in million of gallons

HEAD TANK REPLACEMENT PROJECT

- Pump Station Capacity Reduced from 140 MGD to 75 MGD

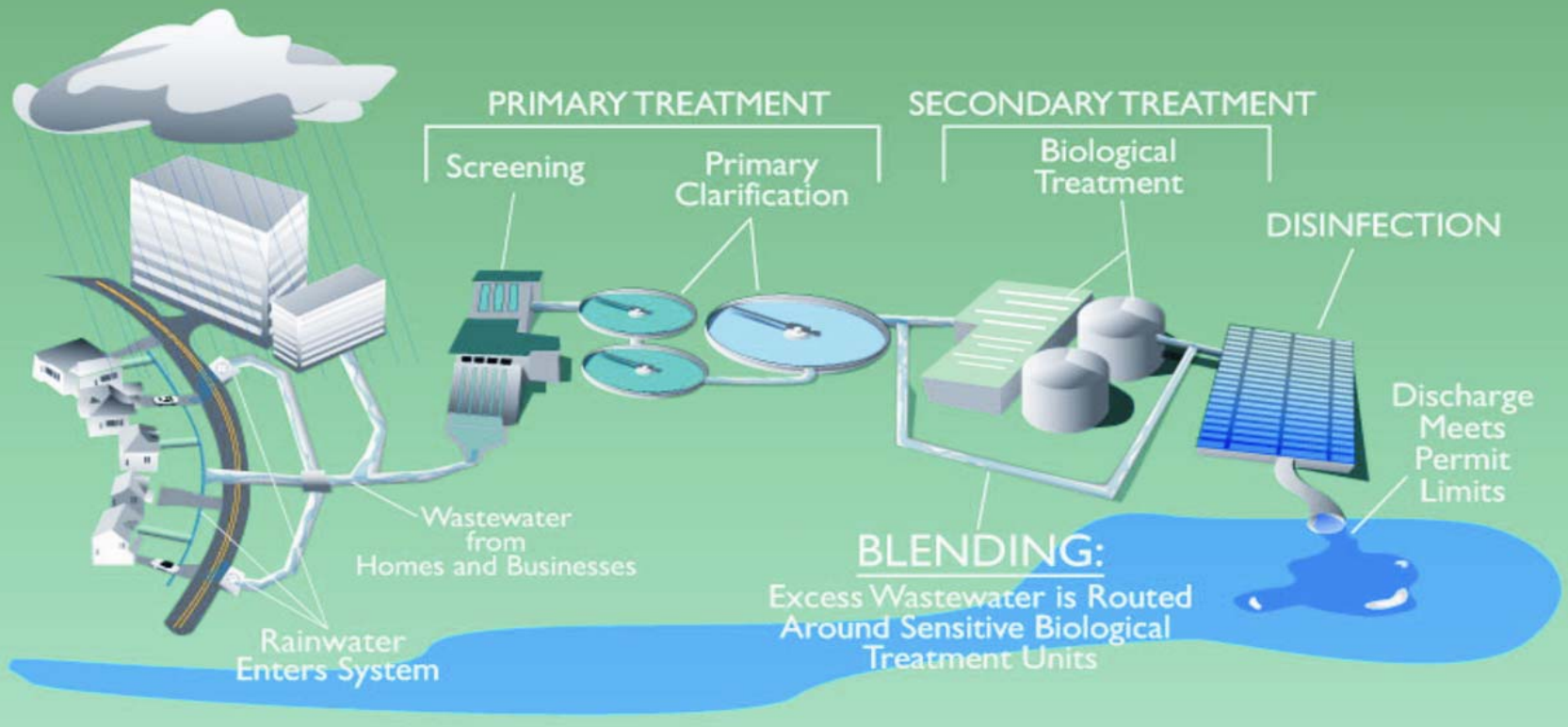


Wastewater Treatment Plant Effluent Quality

May 2004

	BOD (mg/L)	TSS (mg/L)	TP (mg/L)	Fecal Coliform (No./100mL)
Jones Island	9.4	6.6	0.32	41
South Shore	6.8	7.1	0.55	29
Contract Standard	15	15	JI: 0.5 SS:1.0	100
DNR Permit Limit	30	30	1	400

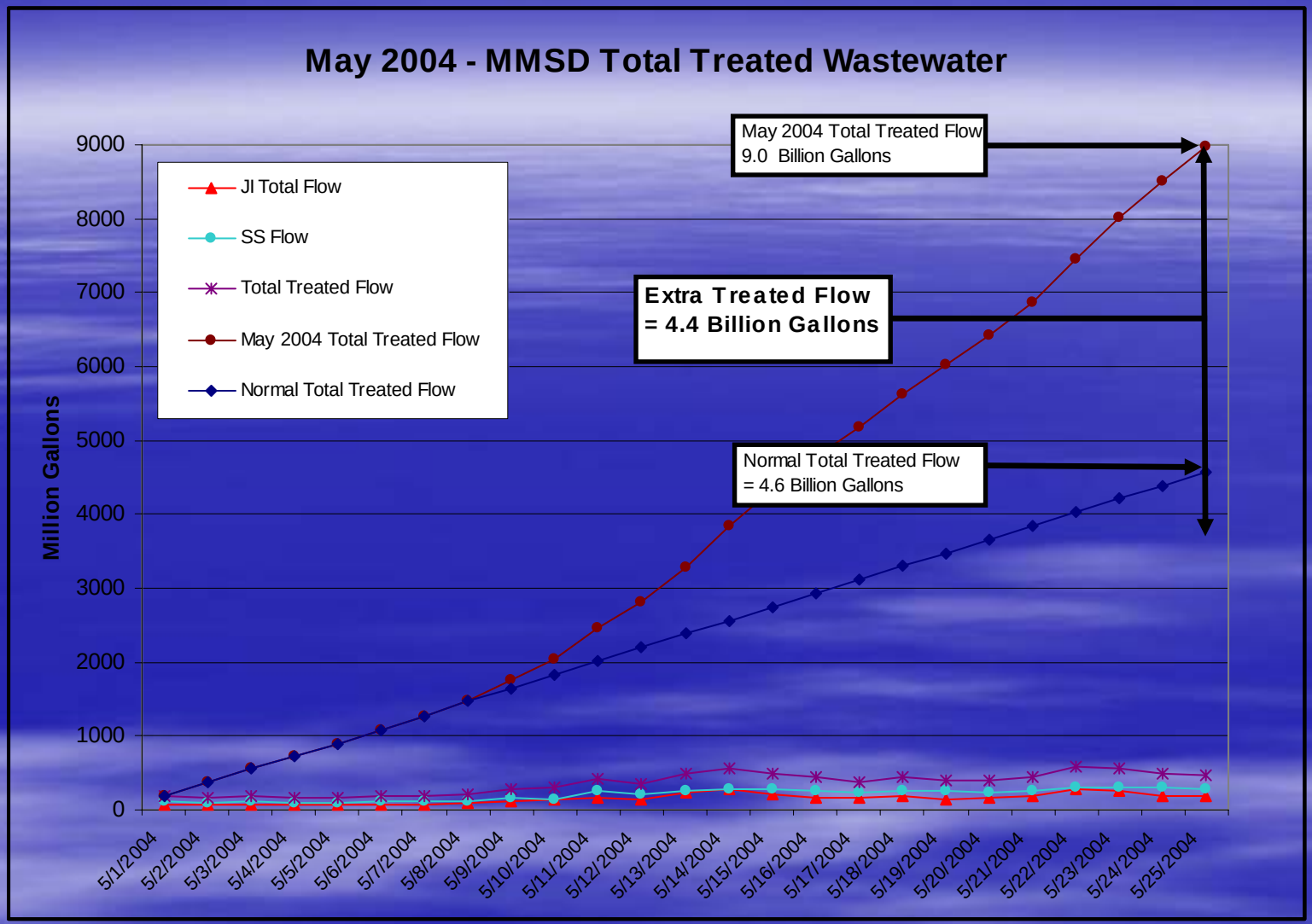
Blending at a Sewage Treatment Facility During a Storm



Source: Environmental Protection Agency 1

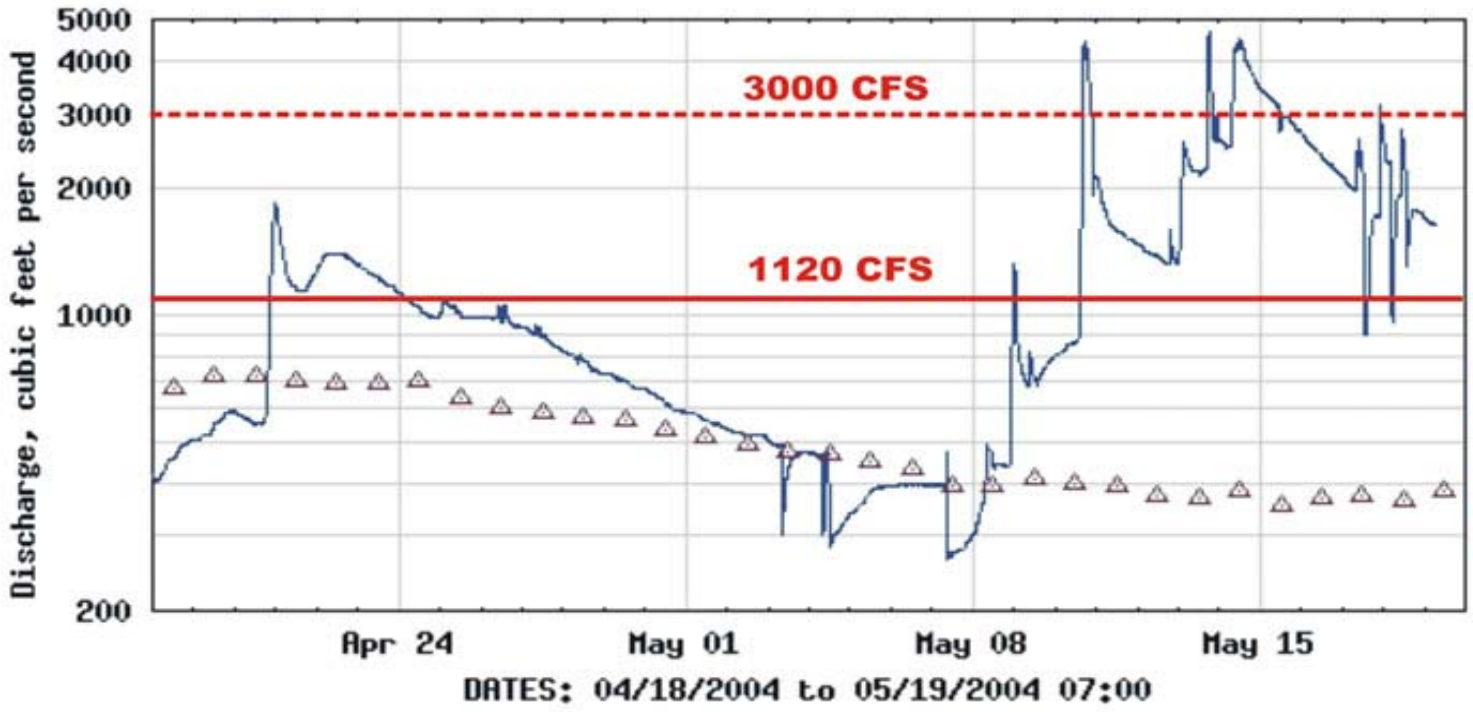
IN-PLANT DIVERSION/BLENDING

- Primary Effluent Diversion on May 14th
- 16.2 Million Gallons
- Effluent Quality
  - TSS = 26 mg/L
  - BOD = 25 mg/L
  - Fecal Coliform = 130 /100 mL
- Peak Jones Island Flow > 315 MGD


May 2004 - MMSD Total Treated Wastewater
May 2004 Total Treated Flow
9.0 Billion Gallons
Extra Treated Flow
= 4.4 Billion Gallons
Normal Total Treated Flow
= 4.6 Billion Gallons
JI Total Flow
SS Flow
Total Treated Flow
May 2004 Total Treated Flow
Normal Total Treated Flow
Million Gallons
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
5/1/2004
5/2/2004
5/3/2004
5/4/2004
5/5/2004
5/6/2004
5/7/2004
5/8/2004
5/9/2004
5/10/2004
5/11/2004
5/12/2004
5/13/2004
5/14/2004
5/15/2004
5/16/2004
5/17/2004
5/18/2004
5/19/2004
5/20/2004
5/21/2004
5/22/2004
5/23/2004
5/24/2004
5/25/2004

USGS

USGS 04087000 MILWAUKEE RIVER AT MILWAUKEE, WI



Provisional Data Subject to Revision

USGS

USGS 04087000 MILWAUKEE RIVER AT MILWAUKEE, WI

EXPLANATION

DISCHARGE

MEDIAN DAILY STREAMFLOW BASED ON 90 YEARS OF RECORD

Discharge at National Weather Service Floodstage

04-101 Milwaukee-3

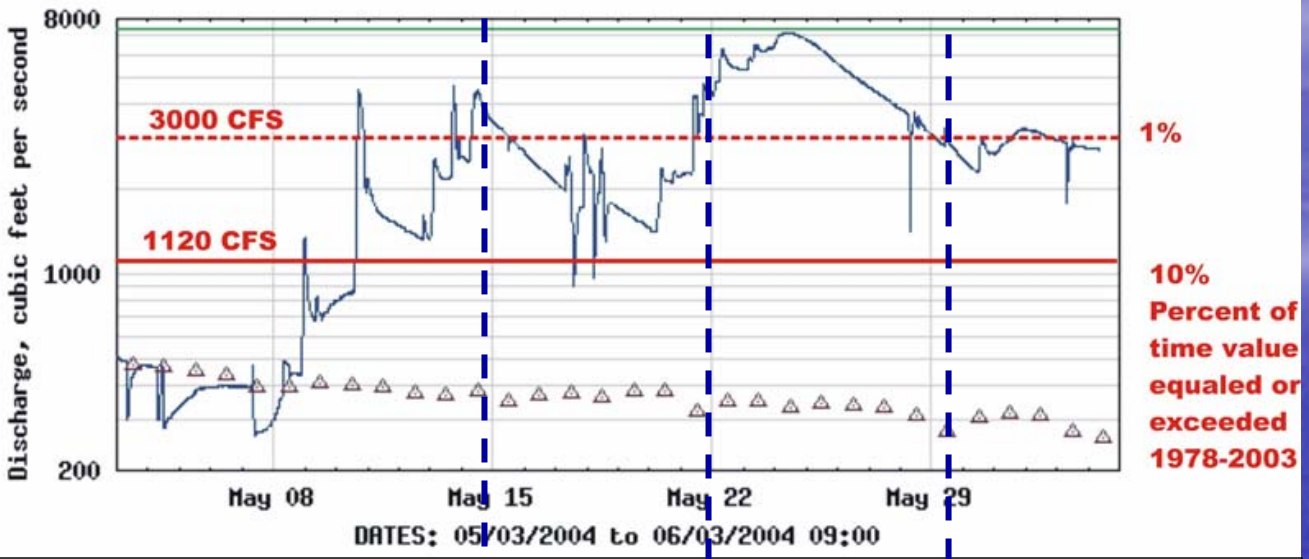
Provisional Data Subject to Revision

May 24, 2004-Milwaukee River @ Milwaukee

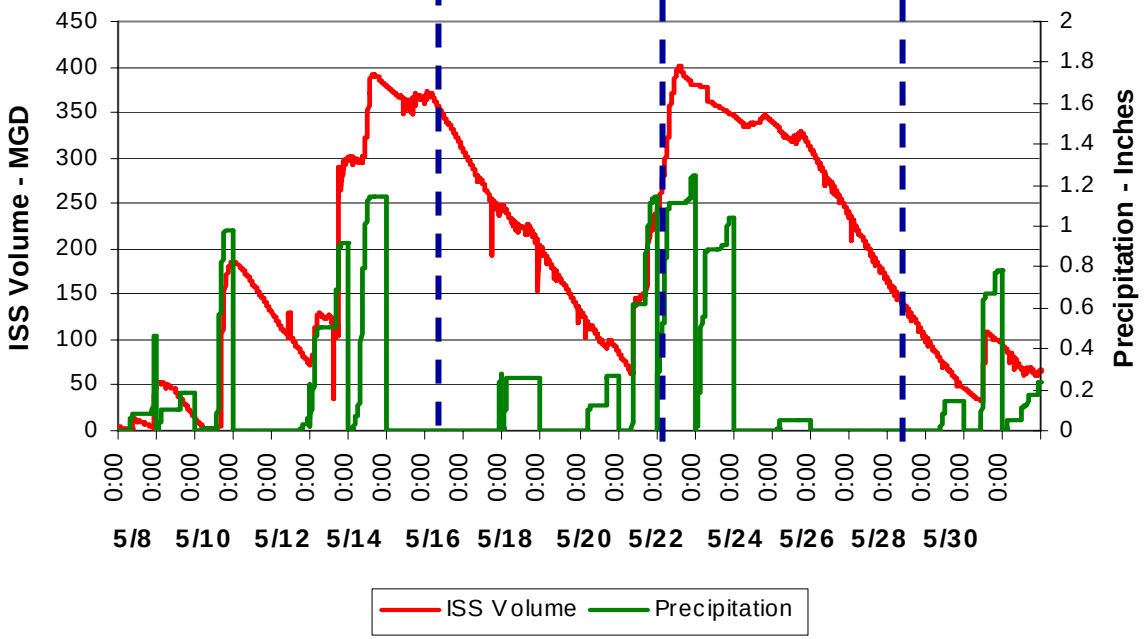
- NOAA reported:
  - 3440 cfs
  - 20% exceedance (5 year recurrence)
- USGS gauge:
  - ~7000 cfs
  - -<1% exceedance (>100 year recurrence)

USGS

USGS 04087000 MILWAUKEE RIVER AT MILWAUKEE, WI

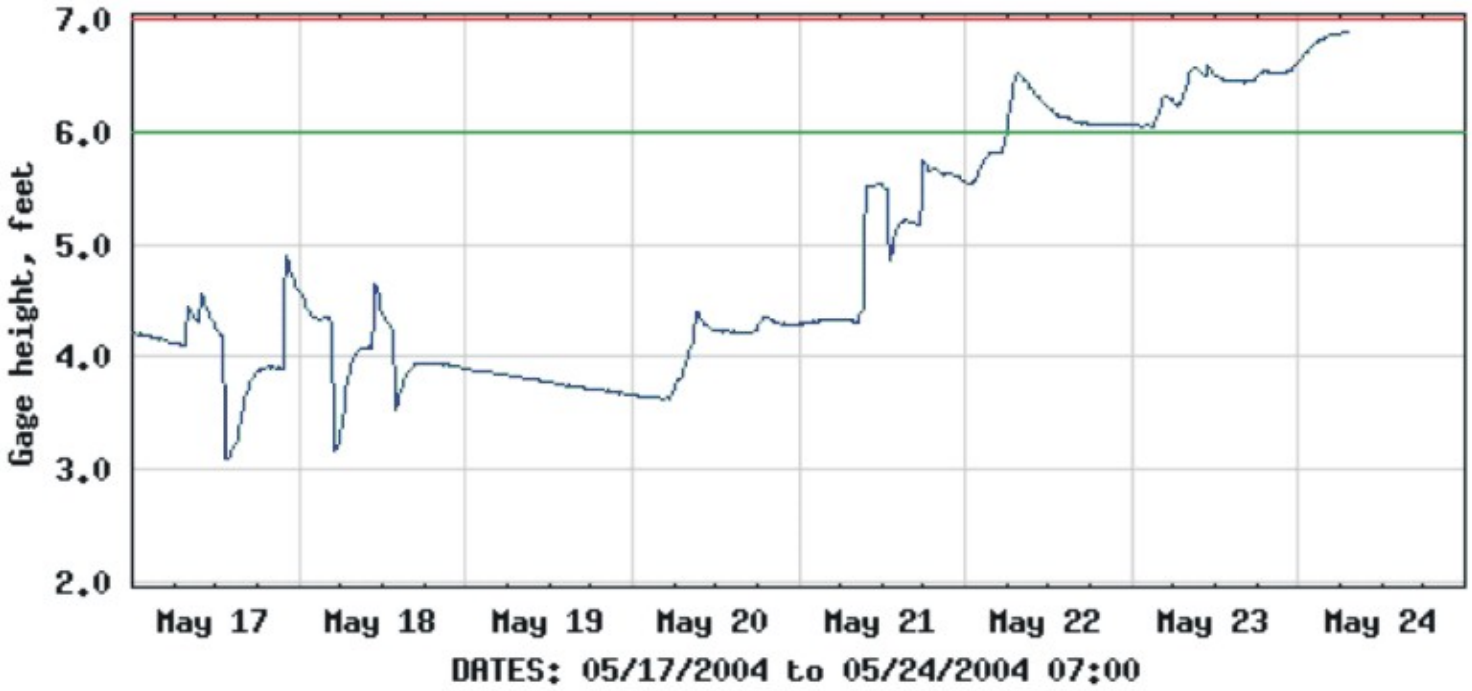


ISS Event 5/8/04 to 5/31/04



USGS

USGS 04087000 MILWAUKEE RIVER AT MILWAUKEE, WI



EXPLANATION

GAGE HEIGHT

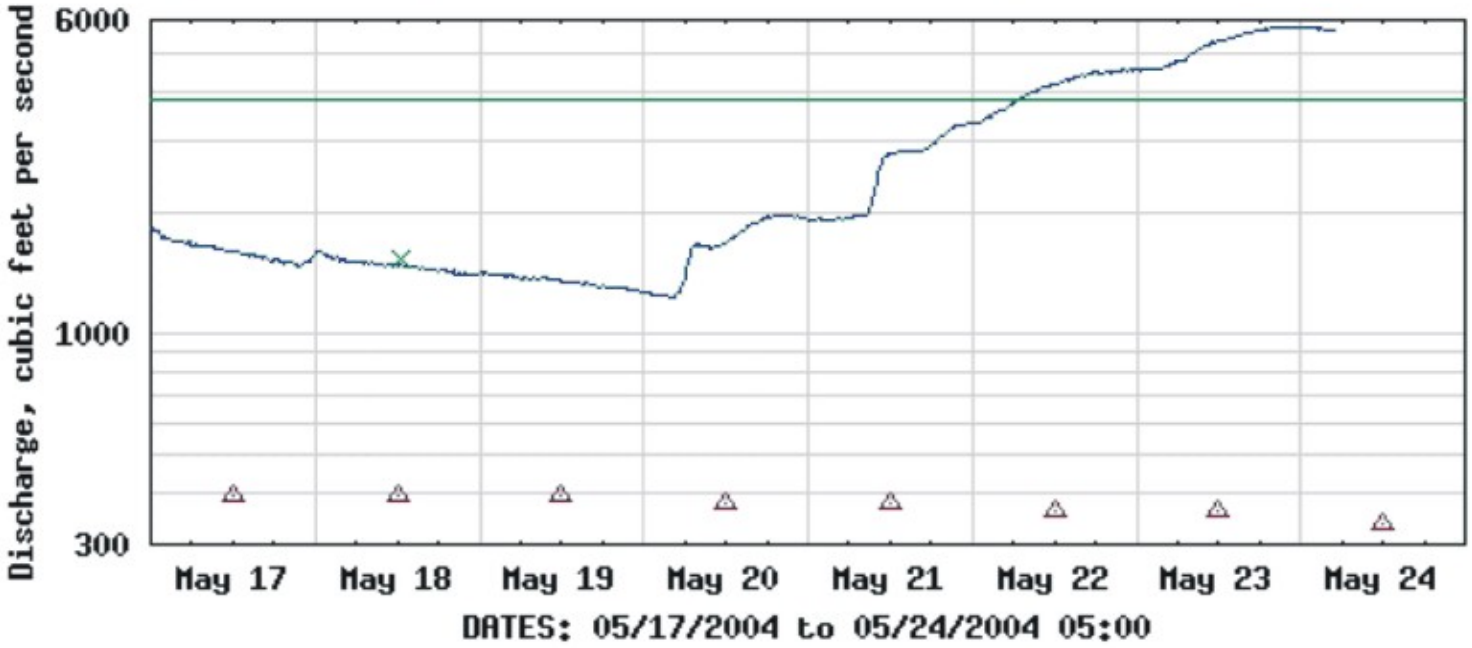
National Weather Service Floodstage

National Weather Service Bankfull Stage

Provisional Data Subject to Revision

USGS

USGS 04086600 MILWAUKEE RIVER NEAR CEDARBURG, WI



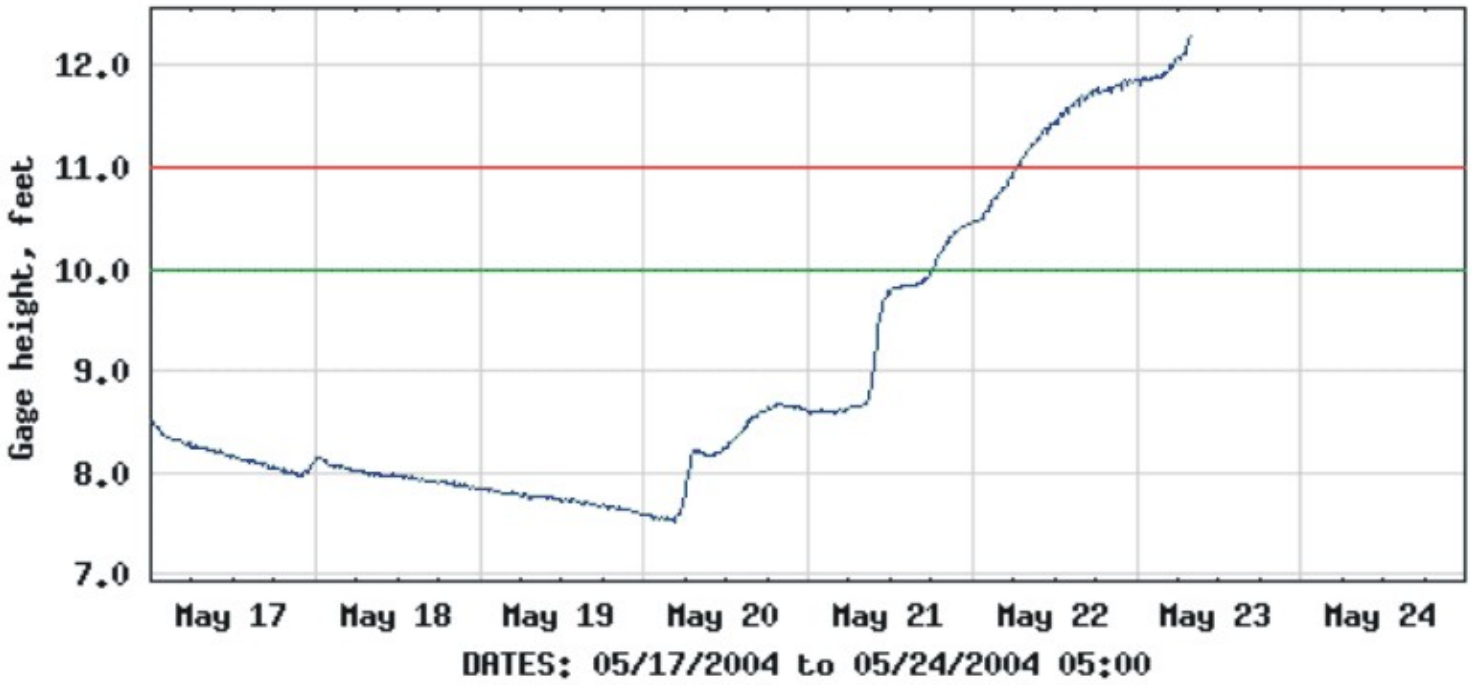
EXPLANATION

- DISCHARGE
- △ MEDIAN DAILY STREAMFLOW BASED ON 22 YEARS OF RECORD
- × MEASURED Discharge
- Discharge at National Weather Service Floodstage

Provisional Data Subject to Revision

USGS

USGS 04086600 MILWAUKEE RIVER NEAR CEDARBURG, WI



EXPLANATION

GAGE HEIGHT

National Weather Service Floodstage

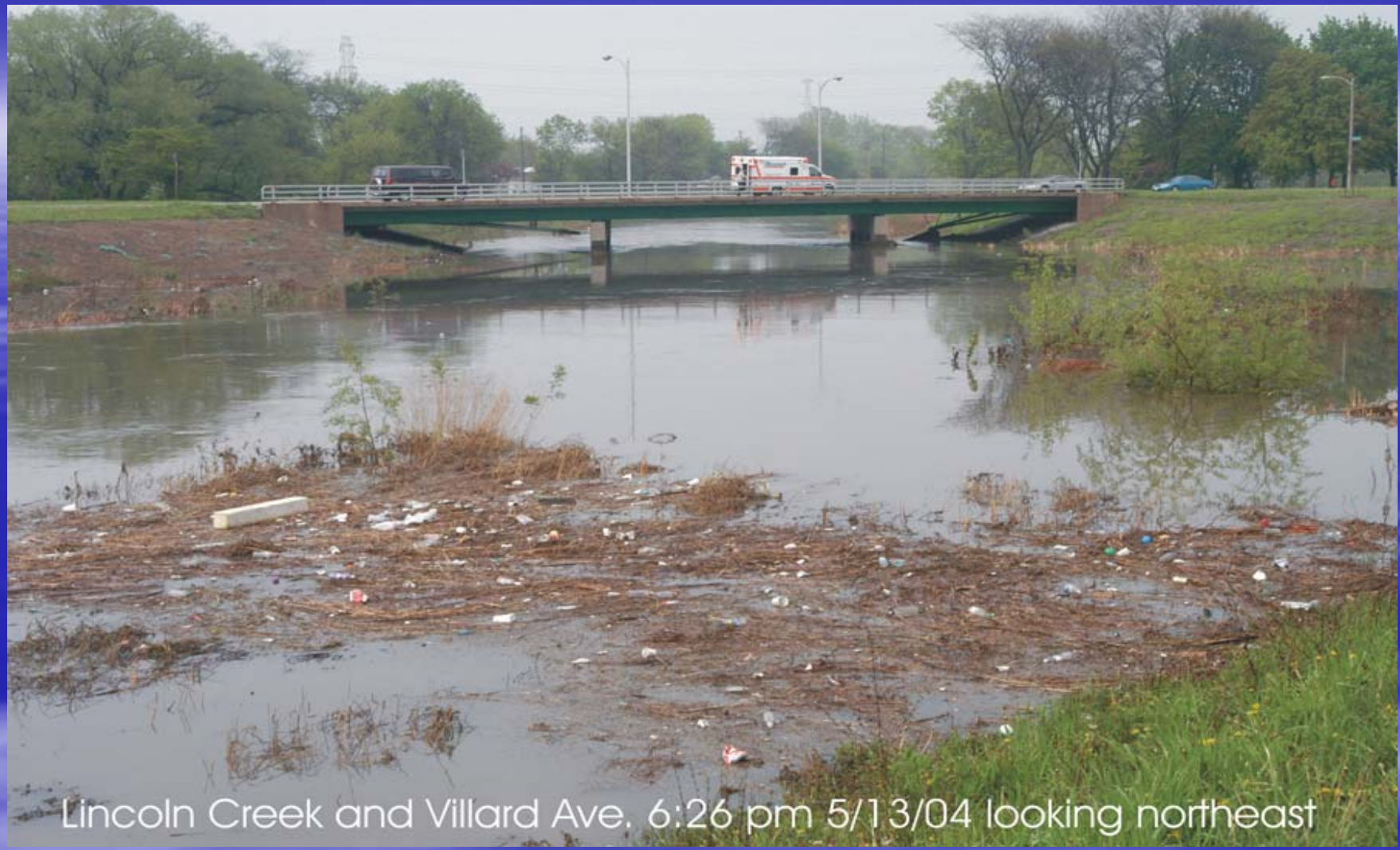
National Weather Service Bankfull Stage

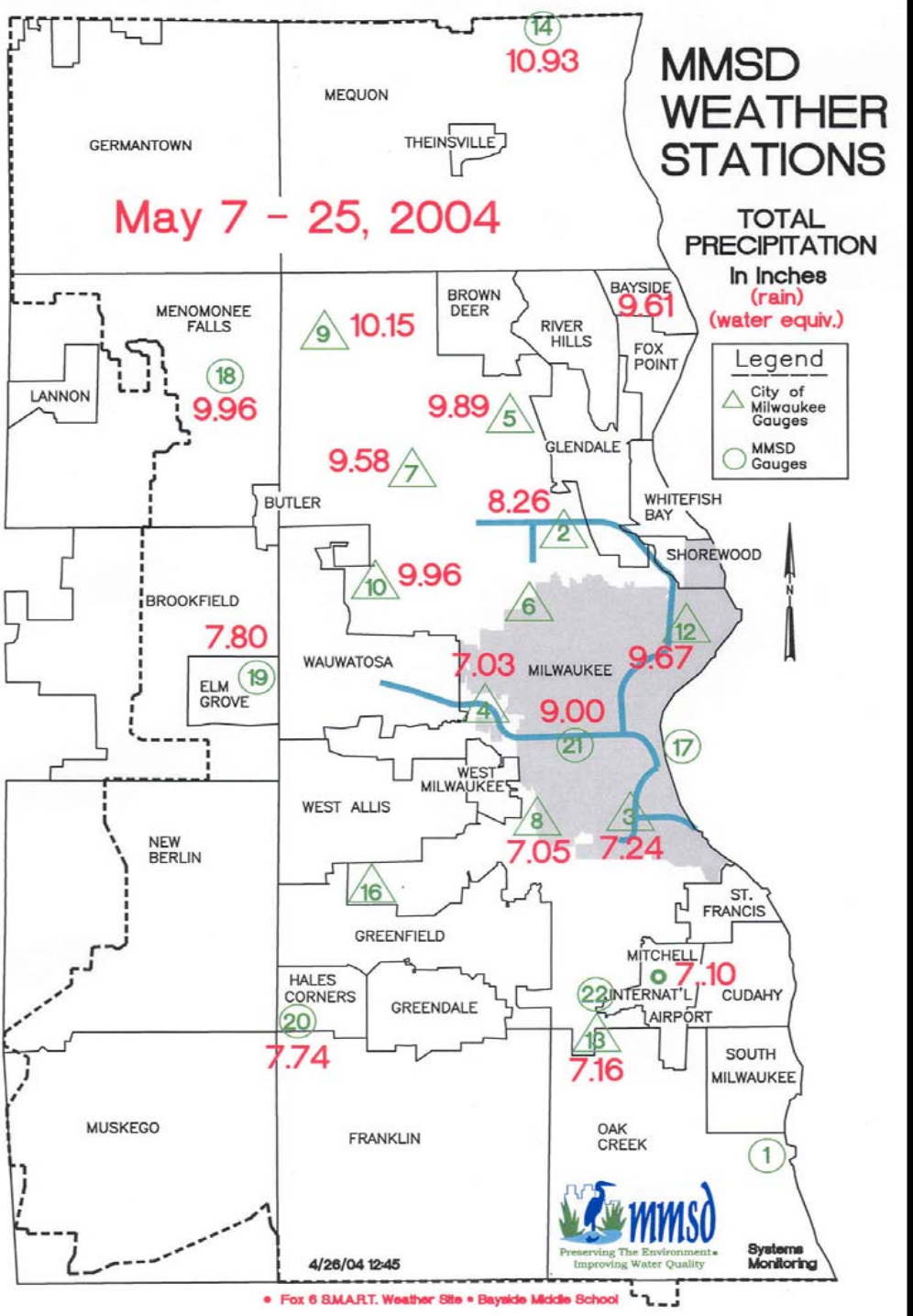
Provisional Data Subject to Revision


Skippy's
Sports
Pub
& Grub!


NO
PARKING
WEST TO
CORNER

Lincoln Creek and Cameron Ave. 6:05 pm 5/13/04 looking north

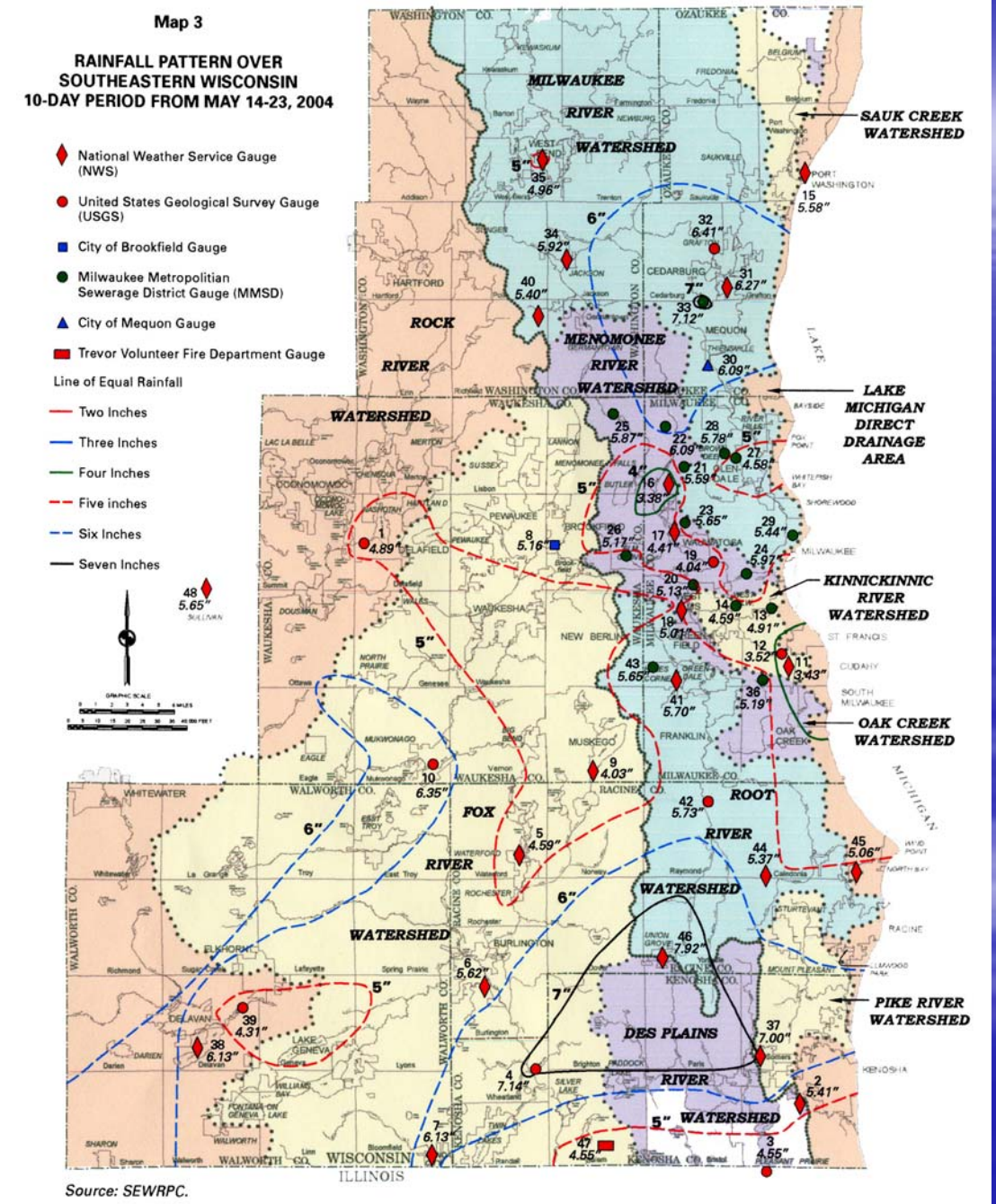

Lincoln Creek and Villard Ave. 6:26 pm 5/13/04 looking northeast



MMSD Rainfall Amounts May 7-25, 2004

Rain Gauge Network

Average of 8.9 Inches Over District Service Area In 19 Days



DRAFT SEWRPC Newsletter

"Characterization of the Rain Storms of May 2004"

Storm Event Frequency Analysis Results
May 2004

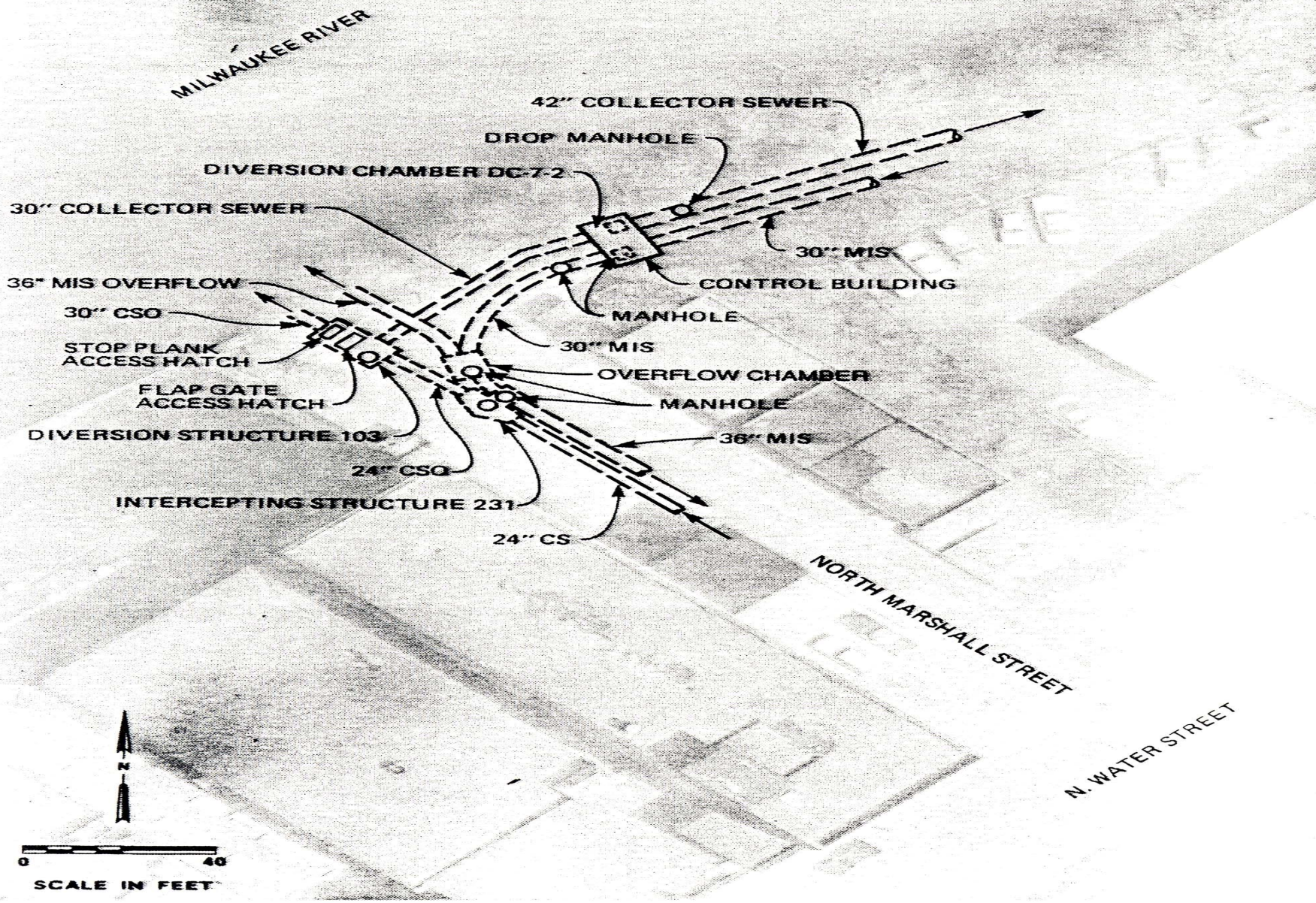
Storm Duration (days)	MMSD Rain Gauges	
	Rainfall (inches)	Recurrence Interval (years)
19 day minimum	7.03	4.6
19 day maximum	10.93	>500
19 day average	8.9	32

NOAA's Response to Extended Rainfall Analysis

"I looked over the May 2004 rainfall draft modeling analysis. I really don't have anything to add or detract from the document. It looks OK to me. I'll keep it for future reference if needed."

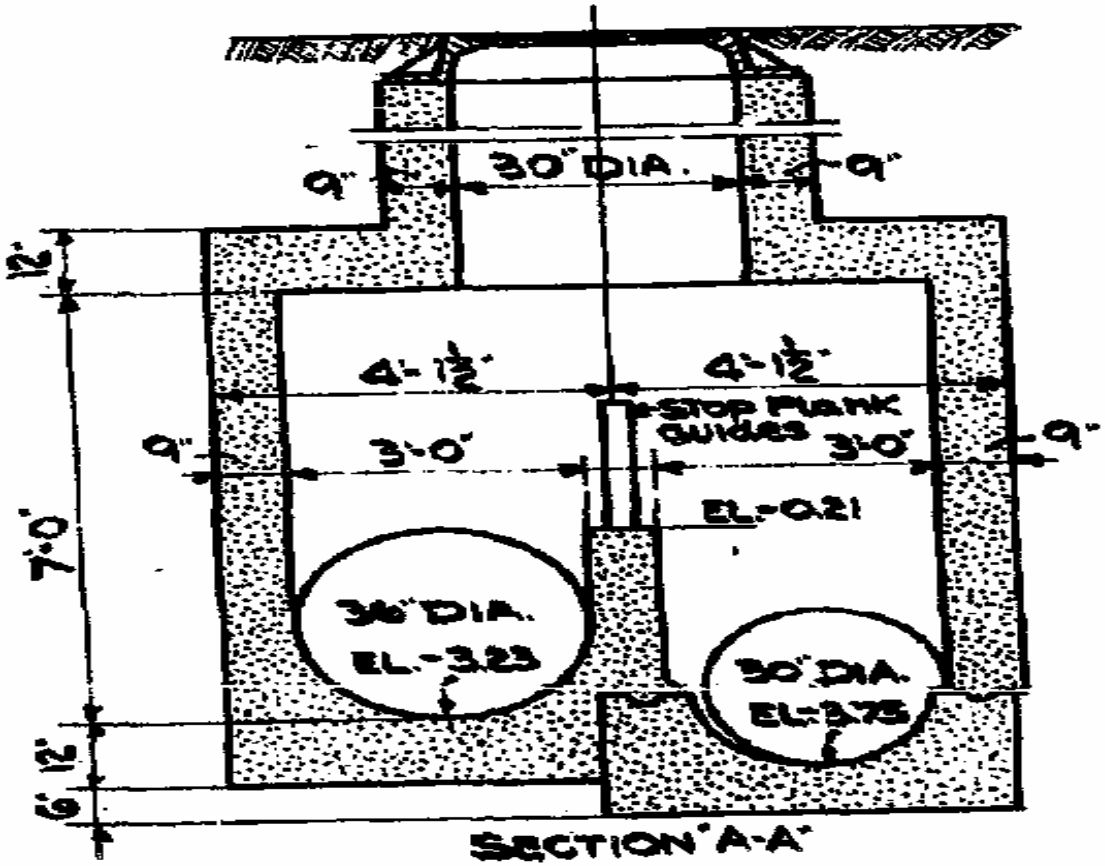
Brian Hahn - National Weather Service 8/6/04

COMBINED SEWER OVERFLOW
AUGUST 3, 2004

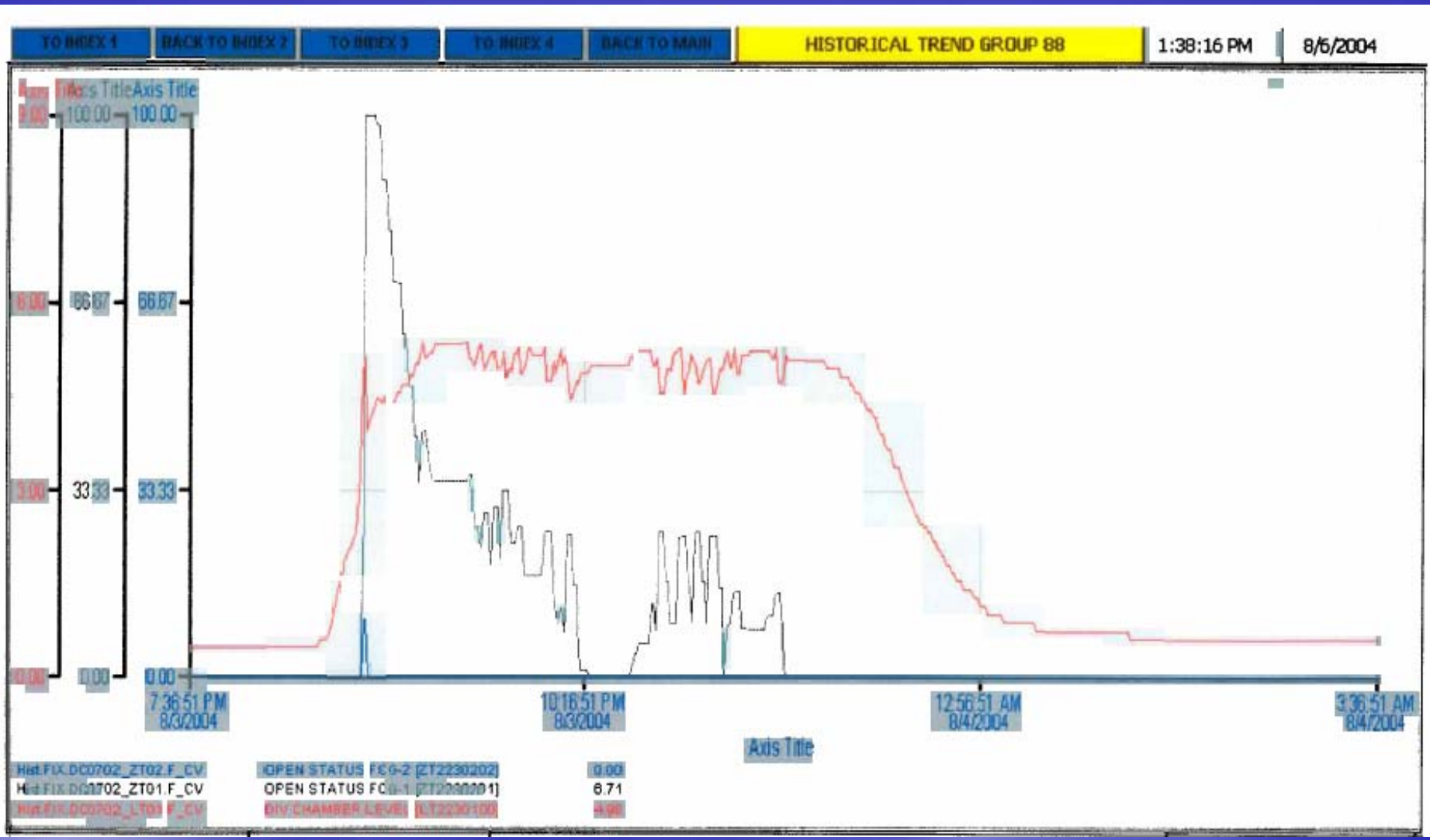


mmsd

FIGURE M-3b
DC-7-2 SITE PLAN
ISS O&M MANUALS
PART 2 DROPSHAFTS



SECTION OF OVERFLOW CHAMBER
IN MARSHALL ST. AT MILWAUKEE RIVER
Scale $\frac{1}{4}$" = 1 Foot


TO INDEX 1
BACK TO INDEX 2
TO INDEX 3
TO INDEX 4
BACK TO MAIN
HISTORICAL TREND GROUP 88
1:38:16 PM
8/6/2004
Axis Title
100.00
100.00
66.67
66.67
33.33
33.33
0.00
0.00
7:36:51 PM
8/3/2004
10:16:51 PM
8/3/2004
12:56:51 AM
8/4/2004
3:36:51 AM
8/4/2004
Axis Title
Hist.FIX.DC0702_ZT02.F_CV
OPEN STATUS FCG-2 [ZT2230202]
0.00
Hist.FIX.DC0702_ZT01.F_CV
OPEN STATUS FCG-1 [ZT2230201]
6.71
DIV CHAMBER LEVEL [LT2230103]
-4.98