EXHIBIT 1

Metropolitan Sewer District
Hamilton County Ohio

Metropolitan Sewer District
Hamilton County Ohio

EXHIBIT 2

The following is a list of the "other permitted treatment facilities operated by MSD" as referenced by Section V in the interim partial consent decree on sanitary sewer overflows.

PACKAGE TREATMENT PLANTS	
ARROW STREET	1PG00083*AD
AUDUBON WOODS	1PG00001001
MAYFLOWER	1PG00018*CD
NORTHEAST KNOLLS	1PG00037*CD
PEBBLE CREEK	1PG00072*BD
WESSELMAN WOODS	1PW00031*BD
WEST FORK	1PG00033001
WHITE OAK	1PG0034001
WILLIAMS MEADOWS	1PG00094*AD
WINDMERE	1PG00095*AD

HRTU's	
Daily Road	No Permit
Muddy Creek & Westbourne	No Permit

EXHIBIT 3

Metropolitan Sewer District
of Greater Cincinnati

Exhibit 3

PROJECTS / SCHEDULES

October 1, 2001

Project Information for:
SSOs 530, 531, 567, 577, & 634
North College Hill Group

*--6309 Betts Ave. (**530**)*
*--Goodman & Baker Aves. intersection (**531**)*
*--6936 Grace Ave. (**567**)*
*--Sterling Ave. (**577**)*
*--W. Galbraith & Parrish Aves. intersection (**634**)*

Description and Location:

The proposed North College Hill Replacement Sewers (CIP 83-07-02-C, 83-07-02-D, 83-07-03) are being sized to handle a 10 year 24 hour storm based on completed and current monitoring/modeling studies. These sewers will address the highly active SSO 530, and will provide connection for the proposed Goodman Avenue Sewer.

The proposed North College Hill Sewers begin 1000 feet west of the intersection of Compton Road and Daly Road and terminates at the intersection of North Bend Road and Witherby Avenue, approximately 13,000 linear feet of sewer. The project is within the City of North College Hill, the City of Mt Healthy, the City of Cincinnati and Springfield Township.

The Proposed Goodman Avenue Replacement Sewer (CIP 2001-25) will be sized to handle a 10 year 24 hour storm based on a current monitoring/ modeling study. Initial recommendations are to upsize the sewer. The proposed project is being modeled currently under the Sanitary Sewer No. 3 Study, (CIP 99-68) to determine capacity requirements.

The proposed Goodman Avenue Sewer is expected to connect to the North College Hill Sewer, Phase 3, at the intersection of Goodman Avenue and Hamilton Avenue and terminate at Sterling Avenue 125 feet east of Betts Avenue. The project is within the City of North College Hill. Approximately 4000 linear feet of sewer is to be constructed.

The Proposed Grace Avenue Replacement Sewer (CIP 2001-24) includes replacing and upsizing the existing 8” sanitary sewer from the intersection of Galbraith Road and Grace Avenue north along Grace Avenue approximately 360 feet. The project is located in the City of North College Hill. This project will address the highly active SSOs 531 and 577. This project will address the highly active SSO 567.

The Galbraith Road Replacement Sewer, Phase 1 (CIP 98-05-01) has been completed and has positively affected SSO 634 and 567. SSO 634 has not bypassed in two years.

Project Information for:
SSOs 530, 531, 567, 577, & 634
North College Hill Group
(CONT.)

Construction Complete Dates*:

SSO	DATE
530	**12/31/04**
531	**2/29/05**
567	**10/31/03**
577	**2/29/05**
634	**Complete 04/99**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$15,100,000.***

Project Information for:
SSOs 570 & 1017
Madeira Group

*--Euclid & Maple Aves. intersection (**570**)*
*--7907 Euclid Ave. (**1017**)*

Description and Location:
The proposed projects Camargo Road Sewer Replacement – Phase 1C (CIP 2000-17) and SSO 570 & 1017 Elimination Sewer (CIP 2001-22) begin at Camargo Road, 1500 feet SW of Miami Avenue and terminates at SSO 1017 at the intersection of Euclid Avenue and Thomas Street. Another portion of the project begins at the intersection of Miami Road and Laurel Avenue and terminates at SSO 570 at the intersection of Maple Avenue and Euclid Avenue. Approximately 5600 feet of sewer will be installed. The projects are located within the City of Madeira.

The Proposed Camargo Road Sewer projects are being modeled currently under the Madeira Drainage Area Sewer System Model, (CIP 2000-17) and will determine the required capacities to eliminate SSO #s 570 and 1017. Design may be completed prior to model completion due to scheduling, and may need to be modified prior to initiating construction.

The Maple Avenue Sewer project (CIP 97-78) was constructed and has positively affected SSO 570.

Construction Complete Dates*:

SSO	DATE
570	**7/31/04**
1017	**7/31/04**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$5,141,000.***

Project Information for:
SSOs 679A, 679B & 680
Mariemont Group

*--6501 Park Ave. (**679A**)*
*--6500 Mariemont Ave. (**679B**)*
*--Wooster Pike & Park Ave. intersection (**680**)*

Description and Location:

The proposed Mariemont Outfall Sewer (CIP 92-70) has been under evaluation to address the Highly Active SSOs 679A, 679B and 680. Multiple alignments have been considered. The final alignment will be determined with the design of the project. The project is located within the City of Mariemont.
The Proposed Mariemont Outfall Sewer is being modeled currently under the System Wide Model (CIP 99-82), and will determine the required capacities to eliminate SSO 679A, 679B, and 680. Design may be completed prior to model completion due to scheduling, and may need to be modified (as to sizing) prior to initiating construction.

Previous design alignments have not been constructible due to Native American artifacts in the area and constraints to construction within the local community park.

Construction Complete Dates*:

SSO	DATE
679A	**7/31/06**
679B	**7/31/06**
680	**7/31/06**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$9,000,000.***

Project Information for:
SSO 572

--406 Elliott Ave.

Description and Location:
The #406 Elliott Sewer (CIP 00-54) includes replacing and upsizing the existing sanitary sewer, approximately 200 feet of sewer is to be constructed, suspended under a bridge along Elliott Avenue. Approval is required by Hamilton County to suspend the sewer from a bridge. The project is located in the City of Arlington Heights.

There are numerous storm inlets connected to the sewer. MSDGC is working with the City of Arlington Heights to remove the inlets from the sanitary sewer.

The area will be monitored and modeled in 2002.

Construction Complete Dates*:

SSO	DATE
572	**9/30/02**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$50,000.***

Project Information for:
SSO 576

--Swift & Attica intersection

Description and Location:
The Attica/Swift Sewer Replacement (CIP 94-18) includes replacing and upsizing the existing sanitary sewer by pipe bursting from the intersection of Attica Ave and Swift Ave downstream approximately 315 feet to the existing manhole at the railroad. The project is located in the City of Cincinnati.

The poor condition of the existing sewer may be the cause of the SSO.

Construction Complete Dates*:

SSO	DATE
576	**9/30/02**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$130,000.***

Project Information for:
SSO 620

--9094 Eldora Dr.

Description and Location:
The Cooper Creek Sewer Replacement Contract II (CIP 83-08-02) includes replacing and upsizing the existing sanitary sewer #155 from the intersection of Hunt Road and Fuhrman Road and terminates near the intersection of East Galbraith Road and Gwilada Drive. Approximately 10,300 feet of sewer will be constructed. The project is located within the City of Reading, Sycamore Township and the City of Deer Park.

The area has been monitored and modeled.

Construction Complete Dates*:

SSO	DATE
620	**7/31/05**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$4,890,000.***

Project Information for:
SSO 628

--Pippin Rd., north of Adams Rd.

Description and Location:
The Northbrook Relief Sewer, Phase II (CIP 80-26-02) includes replacing and upsizing the existing sanitary sewer from 600 feet NW of the intersection of Adams Road and Miles Road and terminates 150 feet SE of the cul-de-sac of Elkhorn Drive. Approximately 3600 feet of sewer will be constructed. The project is located within Colerain Township.

Construction Complete Dates*:

SSO	DATE
628	**10/31/05**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$1,600,000.***

Project Information for:
SSO 706

--3933 Race Rd.

ELIMINATED
June 1998

Project Information for:
SSO 1023

--4021 Matson Ave.

Description and Location:
The Deer Park Relief Sewer (CIP 96-33) is currently under evaluation to determine the most effective design to eliminate the SSO. The project includes the construction of approximately 5000 feet of sewer from near the intersection of East Galbraith Road and Gwilada Drive and terminates at the intersection of Monticello Avenue and Matson Avenue. The project is located within the City of Deer Park.
The area has been monitored and modeled.

Construction Complete Dates*:

SSO	DATE
1023	**4/30/05**

**dates shown do not reflect potential design changes from the MSD System-Wide Model effort currently underway, nor the Capacity Assurance Plan. Impact of these components on design is unknown at present.*

Total Estimated Cost Remaining: ***$7,000,000.***

EXHIBIT 4

Model and Data Collection Work Plan

August 2001

Revised February 2002

Metropolitan Sewer District of
Greater Cincinnati

Contents

Tables

Figures

Section 1
Introduction

The System Wide Model (SWM) project has been conceived and initiated by the Metropolitan Sewer District of Greater Cincinnati (MSD) to develop and calibrate a computer model of the sewer system it manages (i.e. operates, maintains and improves). Sophisticated computer modeling tools will be developed to enable model application for evaluation of various planning scenarios, including the use of real-time controls (RTC) within the system. The project will be performed jointly with MSD and consultant staff (Camp Dresser & McKee, R.D. Zande & Associates and the Danish Hydraulic Institute) co-located in a project office. Both formal and informal training will be provided to MSD staff to ensure successful integration of the model into MSD operations.

Through the SWM, a large and long-term investment is being made in a sophisticated tool that will assist MSD in better managing the large sewer system under its control. This investment leverages MSD's previous and ongoing investment in a robust and successful geographic information system (GIS) – the Cincinnati Area Geographic Information System, or CAGIS- to manage the large body of sewer system information that resides within MSD. At its conclusion, the SWM project will provide MSD with the resources necessary to support a variety of sewer system management functions, which include sewer system overflow (both SSO and CSO) control planning, improved operations and RTC implementation. The resources that will be provided include: (1) trained staff; (2) robust model datasets; and (3) reliable modeling software tools.

The SWM project will be conducted in four sequential and individually authorized phases. The first phase will comprise the establishment of the project office and completion of this Project Work Plan (PWP). Subsequent phases will include development of the model datasets; field investigations to confirm system characteristics; a large flow, precipitation and groundwater monitoring data collection effort; model calibration and verification supported by radar-based precipitation data processing; model application, and MSD staff training.

The purpose of this PWP is to define the specific project activities that will be completed through the subsequent phases of the project (Phases 2 through 4). These activities include both technical procedures (e.g. modeling techniques, the protocol for flow monitoring, etc.) and management functions (including stakeholder participation both within and external to MSD). Additionally, the PWP documents decision processes for a variety of project elements, including the selection of the modeling tools to be applied, the specific radar-based precipitation data processing technology to be incorporated, and the computer resources that will be established for the project.

Section 2
Project Goals and Objectives

MSD's goals for the System Wide Model project can be summarized in the following five brief statements:

- Develop a tool with which to understand MSD's existing sewer system by accurately simulating the response of the system to varying groundwater and wet-weather conditions. Specific responses to be simulated - which are often inter-related - include inflow/infiltration (I/I), surface runoff, sewer flow rates and hydraulic gradients, sanitary sewer overflow (SSO), combined sewer overflow (CSO), and varying tailwater (e.g. WWTP headworks water surface, high river stage, etc.) boundary conditions.

- Fully integrate the collection system model into MSD's operations (in terms of both computer technology and human resources) to support proactive collection system management.

- Provide a reliable predictive tool for evaluation of the various planning scenarios, including the impacts of future growth/expansion of the system, various sewer system improvement alternatives and other collection system planning functions. The model produced under this project will also serve as the foundation for more detailed modeling and planning in the future, as the model is expanded to address portions of the system smaller than those included in the model network (defined as combined sewers 18-inches or larger, and sanitary sewers 12-inches or larger, within the MSD system).

- Establish the modeling foundation for real-time control (RTC) of the collection system by providing the ability to simulate the operation of gates, inflatable dams, and other facilities under various RTC scenarios.

- Integrate and enhance MSD's existing resources, especially CAGIS and project-specific collection system models, to efficiently develop a comprehensive, consistently-applied modeling technology.

Successfully achieving these goals requires that several specific objectives be satisfied during project execution. These objectives are:

- Existing information about prior modeling studies performed by/for MSD must be fully identified and inventoried. Other existing information that describes relevant characteristics of the sewer system, and information about related conditions (e.g. precipitation, WWTP influent flow rates, tributary sewershed hydrology, etc.) must also be fully identified and inventoried.

- The modeling tools that will best support MSD's modeling goals must be identified. These tools include a variety of software components that fall into the following classifications:

  – the computational "engine" (e.g. SWMM, MOUSE, HydroWorks, etc.) that will perform the numerical calculations required to produce the sewer system simulations,

  – the user interface to that computational engine (e.g. XP-SWMM, etc.),

  – the GIS that will be used to mange the large spatial and attribute datasets (e.g. ArcView, etc.)

  – support tools such as databases for time series data management (e.g. MS Access, etc.), statistical analysis software (e.g. SAS, etc.), specialized analytical programs for flow data analysis (e.g. SHAPE, etc.), and others.

- The computer hardware and operating system software that will best support MSD's model development, calibration and application (e.g. SSO management, RTC, etc.) goals must be identified. Project office support (model data management, simulations, etc.), internal and external outreach (e.g. intranet and Internet websites) and integration with MSD's organization-wide IT systems must also be considered.

- The model development procedures that will most efficiently produce models that fully meet MSD's needs for model capability, accuracy and completeness must be established and documented for the model network (defined as combined sewers 18-inches or larger, and sanitary sewers 12-inches or larger, within the MSD system). Procedures are required to ensure that reliable results are produced and can be efficiently distributed. Standardized evaluation procedures (e.g. design storm characteristics, antecedent condition assumptions, etc.) must also be determined.

- The field data required to supplement existing records (CAGIS and paper-based maps) in building the models of the sewer system must be obtained.

- A flow monitoring protocol must be developed to ensure that the data required for model calibration and verification are collected. The protocol must address the needs for both permanent and temporary flow monitors, pumping data and groundwater data.

- Precipitation data must be collected and processed in a manner that best supports model calibration. For the system-wide modeling effort being undertaken, this requires:

  – A sufficiently dense network of reliable precipitation gauges,

  - The use of advanced (*e.g.* radar-based) techniques to minimize uncertainty in the spatial variability of rainfall between the gauges.

- A plan and schedule for successful project execution and coordination among the various project team, MSD, community, regulatory and other stakeholders. This plan must support effective integration of the System Wide Model across the MSD organization to ensure its long-term effectiveness in supporting MSD's collection system operation and management.

The following sections of the Project Work Plan address each of the above objectives.

Section 3
Summary of Existing Information

The purpose of this section is to summarize the existing data sources within MSD and outside entities that were useful in preparing the PWP and will be used in developing the System Wide Model (SWM). The existing information is grouped into a number of categories and discussed in the following subsections.

3.1 Sewer Network Data

The project team investigated various sources for sewer network data. The specific data of interest were the physical layout of the sewers, sewer diameters and lengths, manhole invert and rim elevations, and special structures including drop manholes, flow diversion chambers, etc. The primary sources of information are discussed below.

3.1.1 CAGIS Data

The sewer system attribute data in CAGIS are accessible through the MSD network using the computer terminals in the project office. The sewer network data include the manhole and sewer segment ID, sewer size, length of sewer, sewer shape, and construction material. Unique information such as CSO outfall locations, crossovers between systems, and summit manholes may not be readily available at this time, but will be developed during the modeling project.

3.1.2 Paper-Based Sewer Mapping

The paper maps at 200 scale were obtained for the entire service area. In addition, a scanned version of 50-scale maps is available on MSD's wide area network for download as needed. These sewer maps provide data such as sewer layout, sewer sizes, and sewer lengths that will be useful in supplementing the CAGIS data.

3.1.3 Sewer System Studies

As part of the *Stormwater/Wastewater Integrated Management Plan* (SWIM), MSD developed a report, *Bibliographies and Report Abstracts, August 1988*. This report summarized the reports/sources related to the wastewater, stormwater, and combined sewer systems serving the City of Cincinnati and Hamilton County. In addition, the SWIM study included field investigations and development of a sewer system model for sewers greater than 30-inches. The development of CAGIS in the early 1990s included the sewer system attribute data from the paper maps, the sewer improvements conducted in the 1980s, and the data used in the SWIM study. Since initial development, CAGIS has been updated continuously to incorporate the most current sewer system information.

The project team compiled a number of sewer studies that were completed since the SWIM study. A list of the studies is provided in **Table 3-1**. The project team will collect and assess the sewer improvements actually performed and use the sewer attribute data (as built in the field) to support the model development.

Table 3-1

CIP Number	Name	Project Manager
96-79/98-04	Norwood Avenue Study	Penny Schmidt
96-12	Camargo Road Phase II	Mike Flanders
96-39	Marview (Richmond/Orchard)	Botzner/Karle
96-40	Concerto/Sharonville	Botzner/Karle
94-23	SS 87 Replacement	Lisa Schafer
83-07	North College Hill	Darcy Regal
85-14	Mill Creek Interceptor Replacement	WWE
94-31	Eastern Avenue CSO Study	Mike Flanders
95-43	Veasey Sewer Study	Penny Schmidt
95-57	St. Bernard Sewer Separation	Tom Schwiers
97-73	Daly Road CSO Facility Outfall	Mike Flanders
95-30	Polk Run /Sycamore Basin	Ali Bahar
97-25	Bold Face Pump Station Elimination	Lisa Schafer
97-23	St. Clair Separation	Penny Schmidt
	Gungadin/Paddison	Steve Jones
	Attica/Swift	Steve Jones
00-26-2	Northbrook/Pippen	Doug Peters
00-14	Cheviot Relief	Ed Kesterman
83-08	SS # 155	Steve Jones
92-86	Harper Street Pump Station	Tom Schwiers
97-94	SS 206 Replacement	Penny Schmidt
85-15	Sewer 915 Replacement	Darcy Riegal
96-68	160,160A 538	George Vila
97-09	1001/1001A	Mike Flanders
85-13	Little Miami Relief	Lisa Schafer
92-70	Mariemont Outfall	Mike Flanders
98-07	Beechmont Flood Gates	Steve Jones
98-42	Spring Grove Sewer Sep	Steve Jones
97-49	Laboiteaux and Bising	Susan Moisio
99-12	Harwinton	Mike Flanders
	Quest	Various WWE
98-91	Third Street Separation	Darcy Riegal
96-33	Matson	Steve Jones
99-69	Observatory and Monteith	Dick Carlton
98-53	Cedar Avenue Sewer	Mike Flanders
98-54	Toluca Court	Lisa Schafer
00-59	Cleves Area Sewer Study	Susan Moisio
98-84	Little Miami River Basin Plan	Ali Bahar

3.2 Sewershed Characteristics Data

Sources for the sewershed characteristic data were also investigated. The key sewershed data to assist in the SWM development include sewershed delineation and area, land use, zoning, parcels, population, ground contours, aerial photographs, and soils data.

3.2.1 CAGIS and Other Digital Data

The majority of the sewershed data required for the SWM development is available in CAGIS. In addition, sewershed data such as land use, zoning, and population statistics can also be obtained through other government agencies such as the Hamilton County Regional Planning Commission, OKI, the City of Cincinnati Planning Commission, and individual municipalities. A good portion of this information is available through agency web sites.

3.2.2 Paper-Based Sewershed Mapping

Any hard copy mapping required that is not available through CAGIS may be obtained from the sources mentioned in Section 3.2.1.

3.2.3 Studies and Reports

The SWIM project reports are a good source of sewershed data and contain information on the land use and population data. The most recent studies listed in Table 3-1, along with SWIM report, will be reviewed as necessary to supplement the existing digital data available from CAGIS and other sources.

3.3 Existing Sub-Basin Sewer System Models

The project team compiled a list of recent sewer system studies that included modeling tasks. **Table 3-2** provides a list of the studies and names of contacts to obtain information.

Table 3-2

Model Studies	Project Manager
CSO Strategy Plan	Marty Umberg
Tweed and Wakefield	George Vila / Susan Moisio
Blue Ash/Hunt and Floral	George Vila / Susan Moisio
Clearview	George Vila / Susan Moisio
Beechmont	Dick Carlton / Susan Moisio
Cleves	Susan Moisio
Matson	Susan Moisio
SS #155	Susan Moisio
Northern	George Vila / Steve Minges
Wardall and Epworth	George Vila / Susan Moisio
Richmond/Orchard	Susan Moisio
North College Hill	Susan Moisio
SS # 1001	Ali Bahar
SS # 1004	Mike Flanders
Daly Road Interceptor	Mike Flanders
Muddy Creek Interceptor	Ali Bahar
Polk Run	Ali Bahar
Montgomery Road/Schoolhouse	Gerry Krechting
SSO 700	Lou LaCortiglia

Model Studies	Project Manager
Compton Road	Susan Moisio
Schroer	Susan Moisio
Sharonville	Steve Minges
Camargo Road CSO/SSO	Mike Flanders
Linden/Sylvan Wyoming	Susan Moisio
Brill	Susan Moisio
Delhi/Rosemont (combo)	Susan Moisio
Colerain/Galbraith (Cella)	Susan Moisio
Delta Ave CSO	Dick Carlton
Toluca / Argus	Lisa Schafer
Spring Grove CSOs	Lou LaCortiglia
Bethesda – Oak St.	Susan Moisio
Nahant	Steve Minges
Covedale – to Rapid Run CSO	Lou Lacortiglia
North Bend & Harrison	Susan Moisio
Kinney Ave – Evanston	WWE
Samoht Ridge	Doug Peters

Table 3-2 (continued)

3.4 Other Existing Data

The project team identified other existing data and sources that will assist in developing the SWM.

3.4.1 Flow Monitoring

Table 3-3 includes a list of sewer studies involving sewer flow data. **Table 3-4** lists the permanent flow monitoring sites. ADS monitors were installed at these sites in 1988 to gather information for the SWIM Study. Seven sites have been removed; however, historical data, as well as current data from the remaining nine sites, are available from WWC. Note that the historical data will be used on a limited basis to evaluate the system performance for selected storm events that caused operational problems. The Project Team will perform thorough QA / QC checks prior to using any historical data for modeling analysis.

Table 3-3
Flow Monitoring Studies

Study	Duration	Contact	Study	Duration	Contact
Viscount/Delhi	1997-1998	BBS	Paddison/Berkshire	93/97	WWC
Thomas/Madiera	1997-present	Zande	Riverfront	1997-present	WWC
Harmony	1997-1998	BBS	Beechmeadow	1999	BBS
Byrneside/Blanchetta	92-93/ 97	BBS	Canyon Dr.	1997-1998	WWC
Leconte	1998-1999	BBS	Davis / Rolef	NA	BBS
SS# 155/355A	CDM/97-	BBS	Grace / Belkenton	1997-1998	BBS
North Wyoming/Vale	1990-1991	WWC	Ivyhill	1998-	Zande
Mariemont Outfall	1997-present	WWC	Kennedy / Iris	1999-	BBS
Little Miami WWTP	1995	WWC	Bridgestone / Quailhill	1993-1996	WWC
Colonial Dr	1994-1995	WWC	Taylor Creek	1994-1995	WWC
Pleasant Run PS	1999-2000	Zande	Greenhills (Various)	1993	WWC
Shady Lane	91-92/95-96	WWC	Oxley	1993	WWC

Study	Duration	Contact	Study	Duration	Contact
Northbrook/Pippen	1994-1997	WWC	Riddle Rd.	1993	WWC
River Rd / EB Muddy Crk	90-91/92-95	WWC	Globe / Norwood	1998	BBS
Jessup/ Monfort Hghts	90-92/94-96	WWC	Ruth & Ruckle	1998	BBS
Veazey	90-91/1994	WWC	Audro	1995-1996	WWC
Warren Co. Satellite sewers	1997- present	WWC	Ross/Campus	1999-na	BBS
SSO 700	1997-present	WWC	Vaquera	1997-1999	BBS
Wynneburne	1997-1998	BBS	Longview	1992	WWC
Tudor	1993-present	WWC	Anderson Ferry	1999-present	Zande

Table 3-3 (continued)

Table 3-4
Permanent Flow Meter Sites

HISTORICAL DATA	Duration
Camargo Rd.	1988-1996
Daly Road	1988-1995
Hunt / Fuhrman	1988-1996
Sharon / Mosteller	1988-1995
Wilmer	1988-1989
Kleybolte	1988-1989
Red Bank	1988-1989
CURRENT SITES	
Beechmont	1988-present
Bender	1988-present
Cleves-Warsaw	1988-present
Compton	1988-present
Exon Dr.	1988-present
Oak / Creek Rd.	1988-present
Pendry	1988-present
Springfield Pike	1988-present
Stewart Rd.	1988-present

3.4.2 TV Inspections

TV investigation reports are available from WWC. These reports include the work performed by both MSD crews and the outside contractors. All reports prior to July 1999 are available in hardcopy form. TV investigation results since July 1999 are stored electronically in a FoxPro database. The database can be accessed from the MSD desktop computers, which are connected to the WWC network in the Project Office. In the near future, an ArcView sewer shape file will be created and maintained that will provide geo-references to the sewer segments televised and the corresponding results. The TV investigation results will be used to assess the internal conditions of the sewers (sediment/silt conditions, sewer shape, sewer internal wall conditions that affect the hydraulic capacity) during the model development. In addition, results of the TV investigations will help identify the possible sewer improvements that need to be considered during model development.

3.4.3 Water Use Records

The project team will access water use (i.e., consumption) records to estimate the base wastewater flow from each catchment entering the sewer network. The water consumption records for the entire MSD service area will be collected from various water supply entities. Cincinnati Water Works (CWW) supplies water for a significant portion of the study area. Mr. Mark Menkhaus at CWW was contacted, and the winter water consumption data for the period of 1997 through 2000 were obtained. In addition to CWW, the following suppliers were contacted to obtain water consumption records, where available, for the remaining portions of the service area.

Water Supplier	Contact Name	Phone
Village of Addyston	Carol Kolb	941-1313
Village of Cleves	Bev Meyers	941-3490
Village of Indian Hill	Dixie Durbin	561-6679
Village of Lockland	Krista Proud	761-1124
Village of Loveland	Debbie Dugan	683-0150
City of Norwood	Kim Ford	458-4518
City of Reading	Nancy Stahl	733-5034
City of Wyoming	Mary Ann Engel	821-7600

The project team will complete the data collection from above suppliers during the model development process. In addition, the project team will obtain the miscellaneous water records for the service areas in Warren County from MSD staff responsible for managing those records.

3.4.4 Precipitation

The historical hourly precipitation records for the Cincinnati area are available starting in the year 1950. In addition, since 1992, MSD operated 16 mechanical rain gauges in the service area and collected the data on paper charts. Only the total daily rainfall data are available for these sites, with a written note of the times when rainfall was greater than 0.50 inch in 15 minutes. After 1992, a majority of these mechanical gauges were systematically replaced with radio gauges, and the rain gauge network was enhanced with additional radio gauges. MSD currently operates and maintains 20 radio gauges and 9 mechanical gauges throughout the service area. A majority of the existing radio gauges (i.e., 16) were in operation since 1996, providing continuous digital data at 15-minute intervals with good spatial representation, which will support continuous modeling objectives using historical data. The MSD desktop computers at the Project Office, which are connected to the WWC network, can access the radio rain gauge data.

3.4.5 WWTP Influent Flow Records

The project team compiled the influent pump station data at key wastewater treatment plants (WWTPs). **Table 3-5** summarizes the WWTP data. Additional information is listed for minor treatment plants that will be further evaluated if they prove to have a significant impact on the system model.

Table 3-5
Plant Information

NAME (Rate)	CONTACT	PHONE	INLET SIZE	PUMP/CAP	DATA
Mill Creek (130mgd)	Leroy Boone	244-5175	Aux. 96” Mill 93” Wbor 93” Ebor 96” - 3 x 8” siphon South 12”	2 – 65 mgd 3 – 30 mgd 4 – 40 mgd	Electronic 5 min avg. Venturi
Muddy Creek (15mgd)	Bill Beyer	352-4923	Wbmc 36” (24/42) Ebmc 24” (42) Bender 42”	3-7 mgd 1- 5 mgd 1-3 mgd	Chart Totalizer/mag meter
Little Miami (38mgd)	Charlie Kane	352-4921	Delta 24” (grav/FM) Newtown 72” Lit Mia 72” (60 or 48) 4 Mile 60”	5 – 40 mgd total (Note 1) 48” FM 100 mgd	Chart
Sycamore (6mgd) (See Note 2)	Jim Houchin	791-3508	42” (36 & 30)	4 @ 25mgd total	Chart/total day
Polk Run (5.5mgd) (See Note 3)	Dan Siler	683-1857	24” (24 & 8) 24” Polk Run FM	2 @ 20 mgd total	Chart/min-max avg
Taylor Creek (5.5mgd) (Effective 4 mgd)	Bob Shokler	353-9940	24” FM (east) 12” FM (east) 12” (south)	2 – 5 mgd outside plant 2 – 2.5 mgd (out)	Chart/mag meter
Indian Creek (1.5mgd)	B. Beyer	(Mud Crk)	14” (8”) Cleves FM 24”	3 @ 2.9 mgd total	Flow meter/Effluent
Minor Plants	Parent Plant				
Arrow Street (.032)	TC		8”		
Audubon Woods (.08)	TC		12”		
Mayflower Estates (.08)	TC		8” (12” us)		
Northeast Knolls (.022)	SYC		8” (12” us)		
Pebble Creek (.08)	TC		12” (8” us)		
Wesselman Woods (.03)	TC		8”		
Westfork Acres (.0368)	TC		8”		
White Oak Estates (.035)	TC		8”		
William Meadows (.045)	LM		8”		
Windmere (.0368)	TC		8”		

- Note 1 – Little Miami PS may not be effective at 40 mgd due to competing flows at common discharge
- Note 2 – 20 max. mgd through Primary, 10 mgd through Secondary, 20 mgd thru Tertiary
- Note 3 – Future upgrades – Wet weather detention, Polk Run PS moved to plant

3.4.6 Pump Station Data

The Treatment Division maintains an extensive database of various information pertaining to each Pump Station, including pump details, electrical info, and generator records. A portion of the information collected is included below:

PUMP STATION NAME	CAPACITY GPM	PUMPS	DRAINAGE AREA	PLANNED Upgrade/Elim
FRIES THIRD	255	2	CALIFORNIA	
RIVER HILLS	250	2	CALIFORNIA	
STANBERY PARK	220	2	CALIFORNIA	
TURPIN WOODS	80	2	CALIFORNIA	
BERKLEY WOODS	100	2	CLOUGH	ELIM
HIGH MEADOWS	220	2	CLOUGH	ELIM
LAWYER POINT	80	2	CLOUGH	
MOUNT WASHINGTON	300	2	CLOUGH	UPGRADE
PROSPECT WOODS	42		CLOUGH	
TURPIN LAKE	80	2	CLOUGH	
WAYSIDE	125	2	CLOUGH	
DRY RUN	1200	2	DRY RUN	
ESTATES OF FOREST HILLS	100	2	DRY RUN	
HARCOURT ESTATES	340	2	DRY RUN	
RUSTIC HILLS	315	2	DRY RUN	
WASHINGTON HILLS SOUTH	100	2	DRY RUN	ELIM
DELTA AVE	6000	3	DUCK CK	
CAMARGO CANYON	80	2	DUCK CREEK	
JOHNSON ROAD	50		DUCK CREEK	
KENWOOD ROAD	125		DUCK CREEK	ELIMINATION
CARPENTERS RUN	80	2	E. B. MCTP	
CORNELL WOODS	80	2	E. B. MCTP	
GLEN LANDING	80	2	E. B. MCTP	UPGRADE
GROOMS ROAD	260	2	E. B. MCTP	
HAGEMAN ST	200		E. B. MCTP	UPGRADE
KEMPER ROAD-INDUSTRIAL	220	2	E. B. MCTP	
LEGENDS OF CARPENTERS RUN	80	2	E. B. MCTP	
SHARON INDUSTRIAL PARK	200	2	E. B. MCTP	
TENNYSON	680	2	E. B. MCTP	
VILLAGE WOODS	200	2	E. B. MCTP	
WYNNBROOK	29	1	E. B. MCTP	
BRITNEY ACRES	132	2	EIGHT MILE	UPGRADE
ST. JAMES PARK	100	2	FIVE MILE	ELIM
WEST CHASE	350	2	HAMPTON PS	

PUMP STATION NAME	CAPACITY GPM	PUMPS	DRAINAGE AREA	PLANNED Upgrade/Elim
CLEVES	3,600	3	HOOVEN-CLEVES	UP-97
MARIEMONT PROMANADE	250	2	INDIAN HILL	
SOUTH CLIPPINGER	165	2	INDIAN HILL	
EASTERN AVE	460	2	MCTP	
ADDYSTON	480	2	MUDDY CREEK	ELIM-?
ANDERSON FERRY	700	2	MUDDY CREEK	IN PROGRESS
BARRINGTON HILLS	208	2	MUDDY CREEK	ELIM
BARRINGTON HILLS BLOCK F	167	2	MUDDY CREEK	ELIM
FONTAINE (BRIDGESTONE)	350	2	MUDDY CREEK	
GIL VOLZ	270	2	MUDDY CREEK	ELIM
GLENVIEW	200	2	MUDDY CREEK	UP-?
HENGEHOLD FOURTH	100	2	MUDDY CREEK	ELIM-?
HENGEHOLD SECOND	40	1	MUDDY CREEK	ELIM-?
KIRKRIDGE ACRES	50	1	MUDDY CREEK	ELIM
OAKVIEW	300	2	MUDDY CREEK	ELIM-?
WESTPORT VILLAGE	155	2	MUDDY CREEK	ELIM-?
COLERAIN-BEVIS	2,400	4	NEW BALT	
ANDERSON WOODS	90	2	NEWTON	
BECKMAN (SANC IVY HILLS)	320	2	NEWTON	ELIM
NEWTOWN	400	2	NEWTON	
RAVENS RUN	105	3	NEWTON	
TREETOPS	275	2	NEWTON	
DURANGO GREEN	270	2	NORTH BEND	ELIM-?
SHADY LANE	225	2	NORTH BEND	ELIM-?
SHADY LANE PARK(LOCAL)	235	2	NORTH BEND	
PLEASANT RUN CENTRAL	5,150	5	PLEAS RUN	
PLEASANT RUN EAST	2,200	3	PLEAS RUN	
PLEASANT RUN WEST	3,800	4	PLEAS RUN	
TIMBERS	100	2	PLEAS RUN	
HARPER AVE	4,450	3	POLK RUN	UP-96
HIGH POINT	675	2	POLK RUN	
HUNTINGTON	374	2	POLK RUN	
POLK RUN	5,900	3	POLK RUN	
RETWOOD ESTATES	170	2	POLK RUN	
RIVEROAKS	233.5	2	POLK RUN	
SHELDON	188	2	POLK RUN	
WELLER WOODS	350	2	POLK RUN	
HUNTERSTON	400	2	PRUN WEST	
KEMPER MILL VILLAGE	100	2	PRUN WEST	

PUMP STATION NAME	CAPACITY GPM	PUMPS	DRAINAGE AREA	PLANNED Upgrade/Elim
COUNTRY CLUB ESTATES	40		RAPID RUN	UP-?
DELLERS GLEN	80	2	RAPID RUN	
DELLWOOD ESTATES	45		RAPID RUN	ELIM-?
FOLLEY FOREST	83	2	RAPID RUN	ELIM-?
MUDDY CREEK PS	3,150	2	RAPID RUN	ELIM-?
NORTH BAY VILLAGE	175	2	RAPID RUN	ELIM-?
PLACID MEADOWS	200	2	RAPID RUN	ELIM-?
MUDDY CREEK PS	242	2	RAPID RUN	ELIM-?
FITHIAN	400	2	RIVER ROAD	IN PROGRESS
FOLEY ROAD	700	2	RIVER ROAD	IN PROGRESS
PALISADES #1	100	2	RIVER ROAD	ELIM-?
PALISADES #2	20		RIVER ROAD	ELIM-?
RAPID RUN	800	2	RIVER ROAD	IN PROGRESS
HONNERT RIDGE	80	2	SBMCTP	
LASALLE PLACE	102	3	SBMCTP	
NORTH BEND CROSSING	400	2	SBMCTP	
ORCHARD GATE	200	2	SBMCTP	DEVELOPER
PONDEROSA	150	2	SBMCTP	FUTURE CIP
PONDEROSA WOODS	28		SBMCTP	FUTURE CIP
TOWERS EAST	300	2	SBMCTP	FUTURE CIP
BOLD FACE	5,650	4	SBMMCTP	
BAHAMA GARDENS	303	2	SMCTP	95-02
ELBROOK	30		SOUTH MCTP	ELIMINATION
ROLLMAN ESTATES	185	2	SOUTH MCTP	
ACOMB	20	2	SYCAMORE	
KUGLER MILL	160	2	SYCAMORE	
ARROWOOD	50	0	TCTP	FUTURE CIP
GARDEN HILLS	1,050	2	TCTP	FUTURE CIP
GREENRIDGE FIFTH	100	2	TCTP	
HAMPTON POINTE	580	2	TCTP	
HENRIANNE COURT	55		TCTP	95-08
ORCHARD HILLS #1	87	2	TCTP	93-22
SPRING LEAF	375		TCTP	FUTURE CIP
STRAFORD LAKE	55		TCTP	
TAYLOR CREEK PS	7,000		TCTP	
WHITE OAK ESTATES	75		TCTP	
WHITE OAK TERRACE	30		TCTP	95-14
BRUESTLE	100	2	TCTP-MIAMI	UP-?
CENTURION ESTATES	400	2	TCTP-MIAMI	

PUMP STATION NAME	CAPACITY GPM	PUMPS	DRAINAGE AREA	PLANNED Upgrade/Elim
CHURCHILL DOWNS	100	2	TCTP-MIAMI	ELIM-?
DIAMOND OAKS	110	2	TCTP-MIAMI	
HOMELAWN ESTATES	35		TCTP-MIAMI	
REGENCY RIDGE	297	2	TCTP-MIAMI	
STREAMWOOD	200	2	TCTP-MIAMI	UP-?
TAYLOR ROAD	1,170	2	TCTP-MIAMI	
YATES THIRD	51		TCTP-MIAMI	ELIM-?
MARVIEW TERRACE	20		WBMCTP	95-09
ARROWHEAD	20		WBMCTP	95-01
BLANCHETTA	250	2	WBMCTP	
CAMBERLY ACRES	100	2	WBMCTP	FUTURE CIP
CENTER HILL	60	2	WBMCTP	
GREENPINE ACRES	150	2	WBMCTP	FUTURE CIP
LOCUST VIEW	140		WBMCTP	
MILLBROOK #1	100	2	WBMCTP	
MILLBROOK #2	65		WBMCTP	
RIDGEWOOD ARSENAL	2,400		WBMCTP	
SHERWOOD	78		WBMCTP	FUTURE CIP
WILLOW RIDGE	270	2	WBMCTP	
WINTON WOODS #1	100	2	WBMCTP	FUTURE CIP
WINTON WOODS #2	40		WBMCTP	FUTURE CIP
WINDMERE THIRD	110	2	WINDMERE TP	ELIM

Section 4
Model Selection

This section of the Project Work Plan documents the selection of the model and associated modeling tools to be applied in developing the System Wide Model. Model requirements are defined, and candidate models identified and evaluated, to enable the selection of the preferred modeling tools for the project.

4.1 Model Requirements

Model requirements are defined primarily by the physical processes to be modeled, the specific characteristics of the physical system to be modeled, and the time domain over which the simulations are to be performed. Each set of requirements is described individually below.

4.1.1 Modeled Physical Processes

The physical processes that must be simulated by the selected model include:

- Inflow/infiltration (I/I) responses of the sanitary sewer system to precipitation in the separate sewersheds (referred to as rainfall-dependent I/I, or RDI/I)

- Urban runoff responses of the combined sewer system in the combined sewersheds

- Base wastewater and groundwater infiltration (GWI) conditions in both the separate and combined sewersheds

- Hydraulic routing of dry- and wet-weather flows through the modeled sewer networks, defined by node/link-specific head/flow time series values

- Flow/head characteristics at hydraulic control structures (pumps, weirs, gate orifices, etc.)

- Sewer system overflows- both separate sewer overflows (SSOs) and combined sewer overflows (CSOs), defined in terms of both event hydrographs and long-term frequency/volume statistics

- Real-time control of existing and contemplated control structures within the sewer system (see Section 4.1.4)

- Hydraulic conditions (flow rate and head) for flow delivered to and within the wastewater treatment plants.

4.1.2 Modeled System Characteristics

The modeled sewersheds comprise seven individual sewer basin areas, as defined by the wastewater treatment plants (WWTP) that service the study area, listed in rank order from largest to smallest:

- Mill Creek
- Little Miami
- Muddy Creek
- Sycamore
- Polk Run
- Taylor Creek
- Indian Creek

The larger segments of the sewer networks within each of these basins will be modeled. The model networks will include all sanitary sewer conduits with diameters of 12-inches and larger, and all combined sewer conduits with diameters of 18-inches and larger. At the upper end of the size range, combined sewer trunks and outfalls in the MSD system can exceed twenty feet in width. Interceptor sewers and separate sanitary trunk sewers of sizes up to eight feet or more exist within the system. MSD sewers have been constructed of a broad variety of materials over the years- ranging from hand-placed stone to technologically-advanced plastics.

Preliminary analysis of the regional geographic information system (CAGIS) which houses the available data describing these conduits indicates that approximately 45,000 model links/nodes will be included in the modeled networks. These links/nodes are allocated among the seven basin areas defined above. The large pipe network also includes a number of unique and hydraulically complex physical structures- CSO regulators, SSO relief structures, internal diversions, weirs, tide gates, sluice gates, pumps and other structures.

The modeled networks and associated basin models will be developed and managed as individual model datasets for each of the seven WWTP service areas, with modeling capability enabled for development and testing of RTC alternatives for MSD's sewer system. The development and organization of the modeled network into sub-models is described further in Section 6.1.

4.1.3 Time Domain

The selected model must be capable of simulating the physical processes identified above for the modeled system in both single-event and continuous modes. The primary emphasis will be on single-event simulation capability for three types of events:

- calibration and verification events,

- analysis of other real events (e.g., historical rainfall events that produced flooding or SSOs) for problem evaluation and corrective action planning, and
- synthetic design storms to support various sewer system planning functions.

Continuous modeling capability is also required. The selected model should be capable of handling input data streams (i.e., precipitation records) of periods ranging from one-month to ten years. Continuous modeling applications will include:

- Hindcasting of SSO, CSO and other sewer system operational characteristics (e.g., monthly reporting, etc.)
- Frequency analysis for characterization and planning evaluations (e.g., average annual SSO frequency, etc.).

4.1.4 Real-Time Control Simulation Requirements

MSD intends to identify, evaluate and define opportunities to implement real time control (RTC) capability within the MSD sewer system during the later portions (Phase 4) of the System Wide Model project. The selected model must therefore support the simulation of RTC facilities—both limited existing facilities, such as pump stations, and future RTC facilities which may be contemplated. Future RTC strategies may include both in-system storage facilities (e.g., the existing combined sewer gate system in Seattle) and dynamic flow diversion (e.g., planned interceptor gate facilities in Philadelphia). The selected model must be capable of simulating sophisticated control scenarios under both strategies.

4.2 Candidate Models

Within the context of digital computer models for simulation of sewer systems, the term "model" has come to be used in several ways. "Model" can refer to the program code that solves the various algorithms that describe the modeled processes; this is often (and more precisely) referred to as the "model engine". "Model" can also be used to refer to the datasets that comprise the unique values for each modeled parameter associated with each modeled element (e.g., pipe, catchment, etc.). During the past few years, the term "model" has also come into use to describe software developed to take advantage of modern microcomputer advances and combine sophisticated graphical interfaces and other support tools (e.g., relational databases, etc.) with the program code. In the model selection process described below, both the model program code and the related support tools are considered.

With the above introduction as background, four "models" have been identified as viable candidates for the project. To be considered as viable, a model must meet the project requirements outlined in Section 4.1. In addition, two other basic criteria must be met:

1. The model must produce a dynamic (not steady state) characterization of sewer flow hydraulics using the full dynamic flow (St.Venant) equations. This criterion eliminates from consideration the relatively large group of steady-state models that can be applied for sewer system analysis. These models, while useful for some planning applications, cannot satisfy the analysis objectives of the System Wide Model project.

2. The model must have an established user base and application history for large sewer modeling projects, together with an established entity for user support. These criteria are essential to ensure reliability, and eliminate from consideration unsupported models, often research-oriented models with little or no practical application history and no viable user support mechanisms.

The viable candidate models that meet the defined requirements and above criteria are listed (alphabetically) in **Table 4-1**, along with an overview of the model software structure for each model.

Table 4-1
Overview of Candidate Models

Model Name/Acronym	Sponsor/Developer	Overview
Hydro Works	Wallingford Software	Complete commercial package
MOUSE	Danish Hydraulic Institute	Complete commercial package
SewerCAT	Reid Crowther Consulting, Inc.	Primarily a proprietary but non-commercial interface: limited internal "engines," but supports a variety of engine components
SWMM (U.S. EPA **S**torm**W**ater **M**anagement **M**odel)	U.S. EPA and Oregon State University	Primarily a suite of public domain "engines"; various public and commercial interfaces and other tools available.

Each of the above models meets the basic modeling requirements outlined in Section 4.1, with the exception of wastewater treatment plant hydraulics. None of the identified models includes this capability; wastewater treatment plant simulation tools (e.g.,, Plan-It STOAT, etc.) have generally been developed and applied distinct and separate from collection system models. This will require (at least in the near term) a model linkage strategy to enable comprehensive modeling of both collection system and WWTP hydraulics. The specific modeling tools to be applied and the linkages to be developed will be determined in later portions (Phase 4) of the System Wide Model project, as this technology is expected to advance significantly during the three-year duration of the project.

- All four identified models have modern, Windows -based user interfaces available. The MOUSE and HydroWorks software packages are relatively more costly to purchase than the various SWMM-based models (and SewerCAT, which is distributed at no cost), however, software cost was not considered to be a significant criterion for selection. Software cost was downplayed in the model evaluation as it is far exceeded by the other costs in developing and maintaining a reliable system-wide sewer model (e.g., data collection and maintenance, modeler labor costs, etc.). Other factors (e.g., reliability, functionality, user support, etc.) are deemed far more critical to the success of the System Wide Model. Each model is reviewed briefly in the following sections.

4.2.1 HydroWorks

HydroWorks is a complete commercial sewer modeling package, which includes the computational engine and user interface as a bundled proprietary product. The core model in HydroWorks provides sewer network flow routing with an implicit numerical solution to compute flows and heads in the system. Additional tools include:

- Wastewater Generator: computes wastewater inflow hydrographs
- Rainfall Generators: design storm hyetographs
- Runoff Generator: hydrologic simulation
- Flow Survey Converter: flow monitoring data conversion for calibration

Key Features of HydroWorks:
The primary focus of the various tools integrated into HydroWorks has historically been on support for applications to projects in the United Kingdom (U.K.); with relatively more recent focus on modifying the tools to support U.S. application requirements.

- User interface (Workbench) includes useful tools to manage project data files and simulation results files.
- Optional modules available as upgrades include:

  — Quality Module: water quality simulation

  —RTC Module: define batch mode RTC operating rules

  —Interactive Module: enables interactive RTC testing during simulation

  —Designer Module: design support tools.

- Proprietary source code; executable code distributed with license fee.

4.2.2 MOUSE

MOUSE, like HydroWorks, is a complete commercial sewer modeling package, which includes the computational engine and user interface as a bundled proprietary product. MOUSE was developed as microcomputer (DOS-based) program code, and has been exclusively used on the microcomputer platform. MOUSE is structured and marketed as a set of core components with "add-on" modules available for specialized application support. Core modules now operate within a powerful 32-bit Windows® interface; ongoing development of MOUSE includes porting the full set of individual modules from the "classic" interface to the full Windows interface.

The set of MOUSE modules available for various applications include:

- MOUSE NAM (recently reconfigured and expanded as separate Runoff and RDII modules): surface runoff and I/I computation;
- MOUSE HD: sewer network hydrodynamics with an implicit numerical solution;
- MOUSE RTC: add-on to MOUSE HD for reactive RTC simulation in batch mode;
- MOUSE T: long-term simulation statistics;
- MOUSE TRAP: various sub-modules for sediment and water quality simulation;
- MOUSE is linked to a mature and widely used and accepted graphical user interface (MIKE View) for input/output data management;

Key Features of MOUSE:

- As with HydroWorks, MOUSE is of European origin, with historical emphasis on support for combined sewer system applications over those for separate sanitary sewer systems. As noted above, however, recent MOUSE development efforts have been directed at bolstering the model's RDII simulation capability;
- MOUSE models can be linked to WWTP models with use of an ArcView extension (the Integrated Catchment Simulator);
- Proprietary source code; executable code distributed with license fee.

4.2.3 SewerCAT

SewerCAT is an object-oriented modeling package, which includes a number of simulation engines for both the hydrologic and hydraulic computational elements. Much of the SewerCAT development effort has been focused on support for RTC, and the model includes extensive support for RTC simulation. The object-oriented structure of the model enables interactive (rather than traditional batch mode) operation, which in turn allows the user to modify the system (e.g., RTC settings) during the execution. This interactive modeling can more efficiently test RTC scenarios than batch mode modeling- where the user waits for the full output file to be written, reviews the output file, then revises the input data and repeats the process.

Key Features of SewerCAT:

- Hydrologic simulation is performed with one of three methods:

—Automated import of RUNOFF-generated hydrograph

—Internally generated hydrograph with SewerCAT Overland hydrologic model

— Manual input of artificial or observed flow time series

- SewerCAT also supports three computational engines for sewer network flow routing:

—Superlink

—RUNSTDY

—SWMM/EXTRAN

The first two network routing engines employ implicit numerical solution schemes for solving the dynamic flow equations. SWMM/EXTRAN uses an explicit numerical solution (see below). SewerCAT executes hydraulic simulations with DLL versions of each engine, which allows interactive (rather than traditional batch) processing of pipe network simulations as noted above. Interactive processing enables RTC scenarios to be developed/modified during simulation, which is not possible with batch mode operation. This approach is contrasted with that of MOUSE (and HydroWorks without the Interactive Module), which uses separate (linked) input files which contain RTC operating rules that are accessed by the main program during batch execution.

- Proprietary source code (interface); model “engines” in public domain, executable code distributed at no cost.

4.2.4 SWMM

SWMM is a highly versatile and powerful model used for a variety of urban drainage modeling applications. SWMM was developed under the direction of the U.S.EPA to provide a tool to model the full range of physical processes encountered in urban drainage systems in the United States. SWMM therefore actually evolved as a set of computational “engines”, or blocks. Use of SWMM on modern microcomputers has in turn prompted the development of a number of commercial software products (and a few non-commercial programs) which provide a graphical user interface, and a wide variety of support tools (both commercial and non-commercial), for the SWMM computational engines.

- Following are the core SWMM computational blocks:

RUNOFF: surface water hydrology, groundwater infiltration and RDI/I routines are included

TRANSPORT: sewer network routing using kinematic wave solution

EXTRAN: performs sewer network routing with an explicit solution (modified Euler method) of the full dynamic flow equations

STORAGE/TREATMENT: routes flow and pollutants through storage and treatment facilities within the sewer system to simulate their performance (e.g., treated flow volumes, mass removal of specified pollutants, etc.).

Key Features of SWMM:

- SWMM was developed as, and continues to be maintained as, public domain source code. SWMM has evolved over 25 years of application, testing, enhancement and verification. SWMM has a very large user base that has grown over the model's long history. The combination of open code, large user base and long history provide a high level of reliability.

- The open source code also enables the model to be:

  —easily customized to meet application-specific requirements;

  —easily ported across multiple platforms (SWMM has been frequently migrated from mainframes to microcomputers and various other computing platforms over its history).

- Recent improvements enable better support of continuous simulation:

  —Dynamic solution switching (conditional disabling of full dynamic flow routing)

  —Parallel processor support

- Source code and executable code in the public domain. Proprietary versions of executable code and user interfaces distributed by a variety of vendors with license fee.

The computational engines in SWMM are typically applied using one of the numerous commercial user interfaces and proprietary versions of the model. (Non-commercial interfaces are also available, but not considered viable for the project due to performance and support limitations.) The following SWMM user interfaces were identified for consideration due to their recognized acceptance in the SWMM user community.

4.2.4.1 MIKE SWMM (Danish Hydraulic Institute)

Developed by DHI in collaboration with CDM to provide the state-of-the-art SWMM user interface for experienced sewer modelers. Supports public domain version of the SWMM engine code as maintained and distributed by Oregon State University (Dr. Wayne C. Huber). Best tool available for experienced SWMM modelers; not as well suited to novice users, as less user help than other SWMM interfaces. Software product backed by the largest and most stable user support resources (for sewer modeling) of the available SWMM interfaces.

4.2.4.2 Model Turbo View (MTV; 10Brooks Software)

Directed at high-end SWMM modelers with many sophisticated and useful features. The most mature of the graphical post-processor tools, and for nearly ten years recognized by experienced EXTRAN modelers as the post-processor tool of choice. Little recent development activity; limited user support resources.

4.2.4.3 PC-SWMM (Computational Hydraulics International)

Excellent SWMM interface for novice to experienced users. Excellent GIS support. Very useful specialized support tools for precipitation data analysis and sensitivity analysis and calibration support. CHI is a very small organization with limited product development and support resources. Significantly less costly license fee than the other SWMM interface products.

4.2.4.4 Visual SWMM (CAiCE Software Corp.)

Visual SWMM is a component module of Visual®Hydro. The vendor is a relative newcomer to the SWMM interface marketplace, although the product resulted from CAiCE's acquisition of rights to XP-SWMM (a very mature product; see below). The product provides excellent support for SWMM in design-oriented applications. Product supported by large software firm, but relatively small base of SWMM-related resources.

4.2.4.5 XP-SWMM (XP Software)

Support is focused on XP's proprietary version of the SWMM computational engines. Recent enhancements to GIS support through cooperative arrangement with CHI have enabled significant improvements in this area. Some advantages to the proprietary version of the model, including better support for RTC simulation. Longest user history and largest SWMM user base of the available SWMM interfaces. Recent merger and subsequent split with CAiCE has caused significant staff changes. User support history is mixed.

4.3 Model Selection Process

Key criteria for model selection include:

- Reliability of model engine (proven code)
- Model engine support for I/I and other project-specific needs
- User interface
- Support for RTC
- Customization for application-specific needs

- Support for continuous simulation
- Vendor support
- Support for WWTP model linkage

Each of the four candidate models has been evaluated against the criteria listed above. The results of the evaluation is summarized below on **Table 4-2**.

Table 4-2
Summary Evaluation of Candidate Models

Model Attribute	HydroWorks	MOUSE	SewerCAT	SWMM
Reliability of Model Engine	Proprietary source code; modest user base.	Proprietary source code; large user base.	Various model engines supported (see Section 4.2.3); small user base.	Open source code; largest user base; longest user history
Model Engine support for I/I	Moderate	Recent improvements; fairly good.	Varies with model engine (see Sec. 4.2.3)	Good
User interface	Good; useful scenario management tools	Excellent	Excellent for RTC; average for other uses.	Varies with specific interface (see Sec. 4.2.4)
Support for RTC	Excellent	Good; no interactive user control.	Excellent	RTC can be simulated but difficult to setup; no support for PID (PD version)
Customization for application-specific needs	Difficult or impossible to obtain	Possible, but requires vendor to perform	Possible, but requires code owner (RCCI) to perform (except EXTRAN engine)	Public domain source code can be readily customized as required
Support for continuous simulation	Primarily intended for single (or “multiple”) event simulations	Primarily intended for single events; MOUSE T enables improved support	Model engines provide various levels of support; model interface support is limited	Developed for single events; Version 4 (RUNOFF) and recent EXTRAN modifications enable improved support
Vendor support	Overseas vendor with U.S. agent; limited track record in U.S.	Overseas vendor with U.S. subsidiary; good support available in U.S.	Limited support since non-commercial package	Engine support by either large user base and/or vendor; vendor support variable
Support for WWTP modeling	None – linkage may be possible	GIS-based link to WWTP Model	None	Open code supports custom linkage to WWTP model

Other Factors

Execution speed: This is often cited as an advantage of implicit numerical solutions over explicit. While this advantage has been demonstrated for large river models, it has not been as clearly shown for pipe networks, where hydraulic conditions can change much more rapidly. Little rigorous testing has been performed and published for sewer networks. Limited anecdotal observation from the project team's experience has shown little or no speed advantage for the implicit (MOUSE) solution over the explicit (EXTRAN). Variable time stepping used in the implicit models may have greater benefit than the actual numerical method employed in the solution. As computer processing speed increases, the concern for execution speed steadily fades in importance. Concern is now generally limited to continuous simulation of long precipitation time series and/or larger pipe networks.

Numerical stability: Implicit models generally are more stable than explicit solution models. A principal cause of explicit model instabilities is violation of the Courant condition limitation on time step size. However, in some cases convergence problems and numeric attenuation can occur with implicit solution techniques, and these problems can be more difficult to identify than time-step induced problems with explicit models. Dry pipes (e.g., overflow conduits after an event has ended) and flow reversals (e.g., low-lying CSO regulator pipes) are particularly prone to create instability problems in implicit models. In addition to Courant condition-induced instabilities, weirs (especially in surcharge), steep pipes and other conditions can cause instability problems in explicit models.

WWTP model linkage: Since WWTP and sewer network models have historically been developed and applied as fully independent tools, some form of model linkage will likely be required for the System Wide Model project. The open code tools have an advantage in this regard, as code changes to support model linkage with proprietary models are susceptible to the plans, cooperation and schedules of the code owners.

Selected Model

The selected model is the U.S.EPA SWMM model, with the MIKE SWMM user interface. Reasons for selection of this model/interface include:

- Open (public domain) engine source code provides proven reliability from the large international user base and long and extensive application history
- Existing SWMM application base within MSD service area
- Flexible and robust I/I simulation capability
- Customizable for application-specific needs and WWTP linkage.
- Multiple-level support strategy for RTC simulation:

- ✿ Moderately comprehensive RTC support possible in native SWMM environment (variable orifices).

- ✿ More sophisticated RTC simulation can be handled by porting the SWMM models (or sub-models, as required) to either:

  - MOUSE (with RTC module): dataset conversion required, but easily accomplished through common MIKE View interface

  - SewerCAT: no dataset conversion required; EXTRAN datasets can be executed directly in the SewerCAT environment for simulation of RTC.

- User support is readily available from the large user base with active user groups for the SWMM model engine; and the large vendor organization (DHI) with a solid support history will support the model interface.

- Good continuous simulation support through recent enhancements:

  - Conditional disabling of full Q/H solution provides for significantly faster runtimes (4x in testing for Philadelphia) during continuous simulations by eliminating unnecessary computational complexity during steady state (dry) periods;

  - Parallel processing of Q/H computations on multi-processor workstations enables faster solution (roughly 30%) of the full dynamic equations required for wet periods.

It should be noted that while MIKE SWMM will be the standard model interface for the project, it is possible to use other interface products for specialized modeling capabilities that they may provide. Specifically the precipitation analysis and calibration tools available in PC-SWMM and the unique results display capabilities in MTV-EXTRAN are potentially useful. These interfaces may also be obtained for use on the project to meet specialized needs. It should also be recognized that the model interface decision is neither exclusive nor irreversible. Although maintaining and supporting multiple interfaces is not necessarily ideal, it is possible for some users of the system wide model to use another interface if they so choose. It is also possible to change interfaces with only relatively minor cost and logistical consequences.

4.4 Model Support Tools

The following tools are all identified as useful computer tools for sewer system modeling which are used in conjunction with the SWMM model engine and interfaces described above. It is anticipated that these tools will be used by the modeling team for the SWM project.

I/I Analysis: SHAPE

The rainfall and flow monitoring data will be analyzed to develop an understanding of the system RDI/I characteristics using the SHAPE computer program. The primary objective of SHAPE is to minimize the labor required to perform these analyses and allow the project resources to be focused on performing data analyses, rather than trying to organize a vast amount of flow and rainfall data. SHAPE consists of a number of utility computer programs to evaluate the complete records of flow and rainfall data, isolate typical dry- and wet-weather periods, define characteristic sanitary flows, determine seasonal dry-weather infiltration rates; and develop unit hydrographs representative of I/I. Using the SHAPE program, the project team will determine the appropriate unit I/I hydrograph parameters for input into the SWMM models. This allows the SWMM model to easily incorporate monitoring results, and facilitates the calibration of the SWMM model, as well as evaluating planning scenario alternatives.

GIS support: ArcView; AV/SWMM, MOUSE GIS

ArcView

ArcView GIS will be used to support the model development as well as to present the model results. ArcView employs several components that permit the user to visualize, tabulate, chart, and lay out geographic data, and customize the graphical user interface (GUI). This GIS tool will be used to interface with CAGIS and to perform a number tasks including extracting sewer system and sewershed attribute data, and to perform query data queries and spatial analyses. In addition, the model results (e.g.,, system dry- and wet-weather capacities) will be displayed using ArcView GIS.

AvSWMM

An ArcView GIS interface (known as AvSWMM or SWMMTools) has been created for viewing and facilitating development of SWMM RUNOFF and EXTRAN models. The interface is a group of Avenue scripts (Avenue is a programming language bundled with ArcView) that allow users to visualize a SWMM model in conjunction with existing GIS data. The scripts have been published as open code in the public domain, allowing easy access for other SWMM modelers and offering users the opportunity to make their own enhancements, similar to the communal efforts that have characterized SWMM advancements over the years. The scripts permit viewing of model input and output summary data within ArcView, allowing modelers to exploit GIS tools for analyzing model configurations and output. They do not substitute for existing commercial software interfaces for SWMM, as they do not permit viewing of conduit profiles, dynamic display of results, or editing of input data. ArcView's strengths do not lie in display of three-dimensional or dynamic data, so it would be cumbersome to develop such tools within ArcView. The scripts are designed to facilitate modeling for engineers who have access to other SWMM visualization tools. However, SWMMTools also provides a basic GIS interface for

SWMM for users who might otherwise only use the core SWMM program, provided they have access to ArcView.

MOUSE GIS

MOUSE GIS operates within ArcView to enable GIS functionality to support sewer system modeling. There are two components to MOUSE GIS: (1) the Network Editor; and (2) Results Presentation. The Network Editor enables import of the sewer network into ArcView for manipulation of the pipe network data, include sophisticated tools for automated simplification of the modeled network. Results Presentation enables display of model results in a GIS environment. This complements the pipe profile display of model results, by enabling a map-based (plan view) display of spatially-oriented information (e.g., exceedance of threshold elevations for flooding or overflow, etc.).

Data management and specialized analysis: MS Access, MS Excel, Systat/SAS

There will be relatively frequent need to analyze supporting data and model results outside the MIKE SWMM modeling environment. As noted above, other SWMM interfaces (PC-SWMM and MTV) will be used for specialized purposes, including specialized model output displays, model calibration display, precipitation data analysis and other needs. Additionally, data management and analysis will be performed using MS Access, MS Excel, and Systat and/or SAS (for advanced statistical analysis, e.g., plant inflow frequency distributions, etc.).

Section 5
Project Office Computer Resources

This section of the Project Work Plan (PWP) defines the computer resources required to support the project.

5.1 Requirements

5.1.1 GIS and Data Management

GIS use will include high-end ARC/INFO based polygon processing, specialized Avenue script development, pre-processing of model input datasets, map generation for model data and results, and screen display of various modeling information. One workstation will be equipped with ARC/INFO to provide occasional support for high-end GIS needs. The other workstations will all be equipped with ArcView for general GIS support.

5.1.2 Model Simulations

Model simulations will be performed extensively during the model development, data set debugging, calibration and application phases of the project. Simulations will generally be performed on model subsets for limited (single-event) real or synthetic hyetographs. These simulations can be performed satisfactorily with contemporary mid-range to high-end, single-processor PC (Windows® NT) workstations.

Some simulations, particularly continuous simulations, and possibly longer event simulations for large portions of the modeled network or complex RTC simulations, may impose undesirably long runtimes on conventional PC workstations. Two high-end workstations should be included in the project computer resources to handle these more demanding (especially in terms of I/O) and computationally intensive simulations. The high-end workstations can potentially be either UNIX or Windows® NT computers; both platforms are considered below (see Section 5.2). These workstations should be equipped with multiple (dual or greater) processors to take advantage of recent enhancements to the EXTRAN model to support parallel processing. High disk storage capacity should also be available to handle the output from large simulations.

5.1.3 Intranet Website Hosting

The project will establish a website on the MSD intranet, which will be hosted on the project office server. This site will enable MSD staff who are located remote to the project office to access (with password protection) the project office website to download/review documents, model results, GIS data, etc.

5.1.4 General Computing Functions

Word processing, email, spreadsheets, statistical analysis, specialized analytical software (e.g., SHAPE, etc.) must be performed on all the workstations in the project office.

5.2 Workstations

Four classes of workstations are required for the project office, defined as follows:

- Model simulation workstations
- Basic modeling workstations
- General use workstations
- Portable workstations

Each class is addressed separately below.

Model simulation workstations

Modeling workstations will be used by the modeling staff for model simulations or other computationally intensive processing tasks. Two (2) simulation-level workstations will initially be required. The modeling workstations must support the following functions and software described in **Table 5-1**.

Table 5-1
Model Simulation Workstation Requirements

Function	Software Applications
Model (attribute) Dataset Management	MIKE SWMM, Access, Oracle
Spatial Data Management	ARC/INFO, ArcView, AV SWMM, MOUSE GIS
Statistical Analysis	Systat/SAS
I/I Data Management and Analysis	SHAPE
Simulations	EXTRAN (with multi-processor parallel execution option enabled), RUNOFF
Presentations	PowerPoint
E-mail	Outlook
Web Browser	Internet Explorer

Viable options for intensive modeling use include both high-end Windows® -based microcomputer workstations and UNIX-based workstations. Review of both options has determined that the use of high-end Windows® -based microcomputer workstations is preferred for the following reasons:

- This option will facilitate more seamless integration of the selected model user interface (MIKE SWMM) and the other supporting software with the model engine software.

- Maintaining the entire network on the common Windows NT platform will also provide for more efficient networking than with integration of UNIX workstations into the network.

- Finally, the high-end workstations will be more versatile (i.e. to run other software) on a Windows platform than under UNIX.

These workstations will be assigned for use by two of the modeling staff. Assignment may vary according to project needs.

Recommended base specifications for the high-end model simulation workstations are as follows:

Processor:	Dual (2) Intel® Pentium® III Xeon™ processors at 933 MHz clock speed
Memory:	2 GB RDRAM
Disk storage:	Dual (2) 36 GB SCSI drives (72 GB total)
Monitor:	21-inch high-resolution
Network card:	3Com 10/100 Network Interface Card (NIC)
Modem:	56k
Additional storage devices:	CD-RW 8X drive, 250 MB Zip® drive

(Note: Final specification of the high-end model simulation workstations is subject to price negotiation with the selected vendor. Minor modification to the above specification is possible and may be necessary.)

Basic modeling workstations

Basic modeling workstations will be used by the modeling staff. Six (6) workstations will initially be required. (One additional workstation of this configuration will be added later for the additional MSD modeler.) The basic modeling workstations must support the functions and software described in **Table 5-2.**

Table 5-2
Basic Modeling Workstation Requirements

Function	Software Applications
GIS	ArcView, AV SWMM, MOUSE GIS
Model Dataset Management	MIKE SWMM
Data Handling/Processing	SHAPE, Oracle, SAS, etc.
Simulations	EXTRAN, RUNOFF
Presentations	PowerPoint
E-mail	Outlook
Web Browser	Internet Explorer

Recommended base specifications for the basic modeling workstations are as follows:

Processor:	Intel® Pentium® III processor at 667 MHz clock speed
Memory:	256 MB RDRAM
Disk storage:	Dual (2) 18 GB SCSI drives (36 GB total)
Monitor:	19-inch high-resolution
Network card:	3Com 10/100 Network Interface Card
Modem:	56k
Additional storage devices:	CD-RW 8X drive and 250 MB Zip drive

General use workstations

General use workstations will be used by the technical and administrative support staff. Three (3) general use workstations will initially be required. The general use workstations must support the functions and software described in **Table 5-3**.

Table 5-3
General Use Workstation Requirements

Function	Software Applications
Word Processing	Word
Model Dataset Management	MIKE SWMM
Data Handling/Processing	SHAPE, Access
Spreadsheet	Excel
Presentations	PowerPoint
E-mail	Outlook
Web Browser	Internet Explorer

Recommended base specifications for the general use workstations are as follows:

Processor:	Intel® Pentium® III processor at 600 MHz clock speed
Memory:	128 MB RDRAM
Disk storage:	30 GB hard drive
Monitor:	17-inch high-resolution
Network card:	3Com 10/100 Network Interface Card
Modem:	56k
Additional storage devices:	CD (read/write) and/or 250 MB Zip® drives

Portable workstations

Portable workstations will be used by the senior staff, to provide both office-based computer resources (Word, Excel, Outlook, etc.) for these staff and for portable use to enable presentations to be made at remote locations to MSD stakeholders and others outside the project office (PowerPoint, ArcView, etc.). Three (3) portable workstations will initially be required. The portable workstations must support the functions and software described in **Table 5-4.**

Table 5-4
Portable Workstation Requirements

Function	Software Applications
Word Processing	Word
Presentations	PowerPoint, MIKE SWMM
GIS	ArcView
Spreadsheet	Excel
E-mail	Outlook
Web Browser	Internet Explorer

Recommended base specifications for the portable workstations are as follows:

Processor:	Intel® Pentium® III processor at 650 MHz clock speed
Memory:	128 MB SDRAM
Disk storage:	12 GB hard drive
Network card:	3Com 10/100 Network Interface Card
Modem:	56k
Docking station:	With full-size (17-inch) monitor and keyboard

Server
Recommended base specifications for the project office network server are as follows:

Processor:	Single Intel® Pentium® III processor at 550 MHz clock speed
Memory:	256 MB RAM
Disk storage:	108 GB hard drive (total).
Network card:	Ethernet Network Card(s)
Backup:	35/70 GB external tape backup unit

5.3 Networking

5.3.1 Local Area Network

The office will be networked with an Ethernet-based 10/100 local area network (LAN). Ethernet CAT 5 wiring will be installed in the project office. A single 24-port hub will be installed to accommodate: wiring, computers and peripherals/printers. Windows NT 4.0 networking capability will be used to provide LAN functionality. All workstations will be equipped with Ethernet cards to enable LAN networking.

5.3.2 Wide Area Network

The Ethernet LAN installed in the project office will be connected to the City MAN. The LAN will include a new 24-port hub, which will be tied into the existing router at the project office to enable access to the City MAN, including to CAGIS.

5.4 Integration with Existing MSD IT Systems

Any existing MSD Token Ring installations that will be preserved will also be tied to the new Ethernet LAN through the new 24-port hub. CAGIS staff will provide software for both the project office server and the individual Ethernet workstations to access CAGIS.

5.5 Peripherals

Peripheral devices to be connected to the Ethernet LAN include: an E-size color plotter, a printer/copier, a color printer (11x17), a laser printer, and a scanner.

5.6 Vendor Selection

Leasing arrangements for the equipment will be established through an approved Small Business Enterprise, if possible.

5.7 Network and Workstation Installation and Support

The consultant team will provide the necessary services to install and configure the individual workstations, network the workstations into the new Ethernet LAN, and install the new 24-port network hub. The consultant team will also maintain and support the network throughout the duration of the SWM project. MSD assistance may be required to link the new project office network hub into the existing City router to provide CAGIS access, and to establish MSD staff workstation integration into the MSD network.

Section 6
Model Development Procedures

This section of the Project Work Plan defines the procedures to develop the model, including mapping, data management, determination of flow inputs, and model calibration procedures. Also, potential model applications to evaluate system-wide sewer improvement scenarios (including real-time controls, or RTC) are identified. Critical data needs (sewer data, rainfall data, flow and groundwater data, etc.) for model development are identified and described.

The model development process will apply the U.S.EPA's StormWater Management Model (SWMM; Huber, W.C. and R.E. Dickenson, SWMM Users Manual, Version 4, 1988; and Roesner, L.A. et al, SWMM Users Manual, Version 4 - Addendum 1: EXTRAN, 1988) as the modeling environment in which the sewer network and sewershed catchment data will be formulated, maintained and calibrated. The SWMM model was selected as described in Section 4 of this Project Work Plan.

6.1 Basin/Sub-Basin Model Organization and Linkage

The MSD service area is divided into drainage basins and sub-basins at several different levels. These delineations will be used to organize and manage the model datasets. The various basin delineations, and their significance to the modeling effort, are discussed individually below.

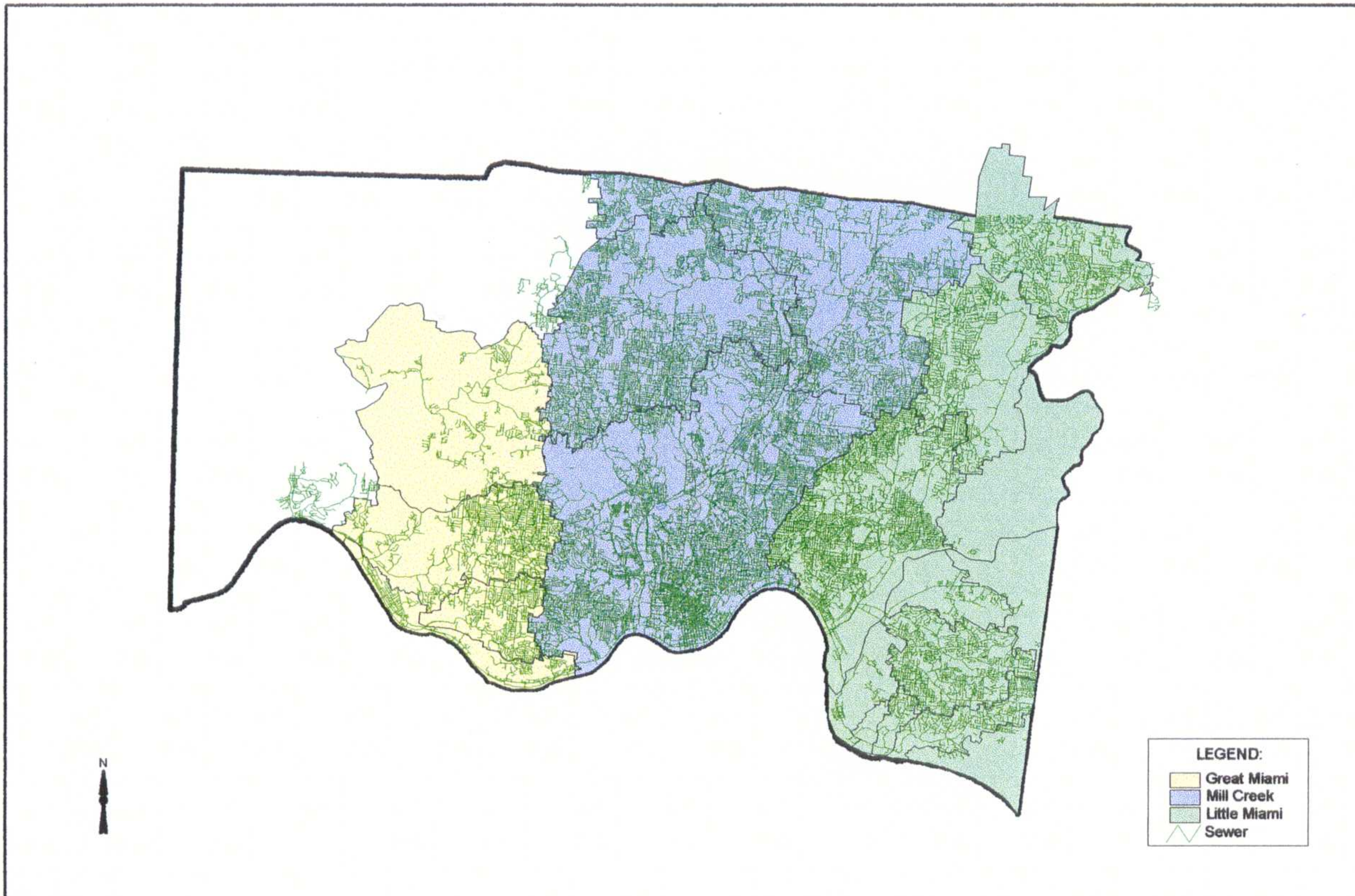
Major Drainage Basins

- Mill Creek Drainage Basin
- Little Miami Drainage Basin
- Great Miami Drainage Basin

The three major Drainage Basins define the coarsest level of basin delineation. These basins, identified in **Figure 6-1,** follow the three major river basins that divide the MSD service area.

Modeled WWTP Service Areas

- Mill Creek
- Little Miami
- Muddy Creek
- Sycamore
- Polk Run
- Taylor Creek
- Indian Creek



MSD **System Wide Model**

Major Drainage Basin

Figure 6-1

Source: CAGIS

These areas follow WWTP service boundaries, rather than river basin boundaries, and thus more closely reflect the topology of the sewer system. This delineation is directly relevant to the modeled network organization, as this delineation represents the seven distinct model networks that will be developed. However, since there exists tremendous difference in the size of the individual networks, further delineation of submodel boundaries is required.

6.1.1 Drainage Sub-Basins

The three major Drainage Basins in the MSD service area have been delineated into seventeen (17) Sub-Basins. These areas are shown on **Figure 6-2**. These areas serve to delineate sub-basin areas within the larger major drainage basins, and represent a basic level of model and sub-model organization. Modeling team assignments will be organized at the Sub-Basin level.

6.1.2 Sewershed Areas

A finer level of basin delineation is at the sewershed level. The seventeen drainage sub-basins have been subdivided into approximately 400 sewershed areas to provide a finer level of detail in supporting project execution. Flow monitoring in particular is organized at the sewershed level. Modeling work will also be organized at this level, especially during the calibration stage of the project. **Figure 6-3** identifies the individual sewersheds that have been delineated for the study area.

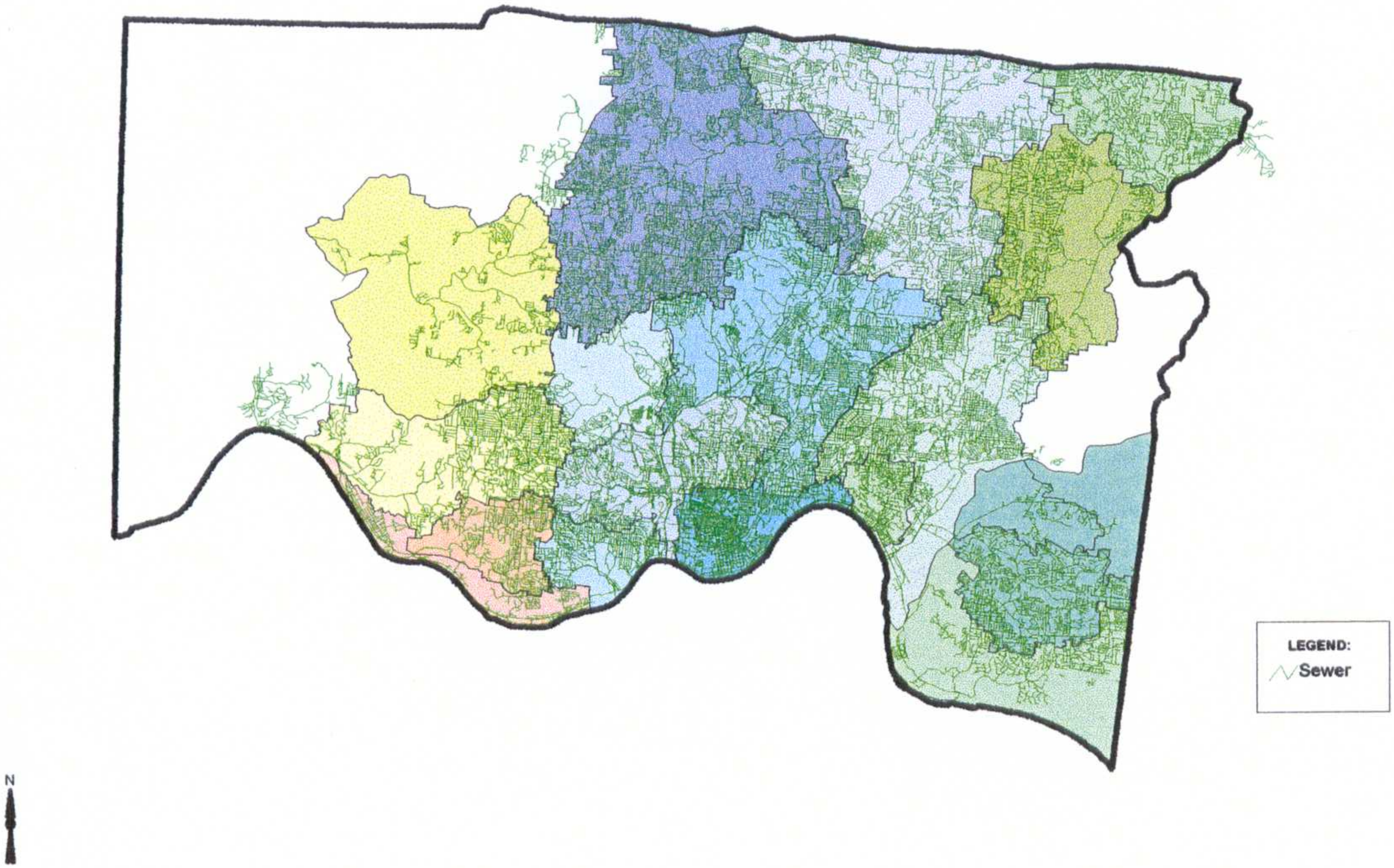
6.1.3 Catchment Areas

The finest level of basin delineation is at the catchment level. This level of delineation is the level at which individual model basin areas (i.e., RUNOFF catchments) will be delineated. These basins will be delineated during model development to represent the drainage area associated with each flow loading point on the modeled sewer network. The sewershed characteristics (i.e., I/I parameters for separate sewersheds, and runoff parameters for combined sewers) will be determined at the catchment level and used as model input.

6.2 Network Data Development

6.2.1 CAGIS Transfer

Modeled sewer network data will be derived from CAGIS as the primary data source. Direct transfer of the digital files defining the network elements (individual database records with unique identifiers), spatial data (topology, x-y grid coordinates, invert elevations, etc. for each record) and attribute data (pipe diameters, plan lengths, pipe material, etc. for each record) will be made between the project office computer network and CAGIS network (see Section 5 of this Project Work Plan for details regarding the computer networks and their connectivity).

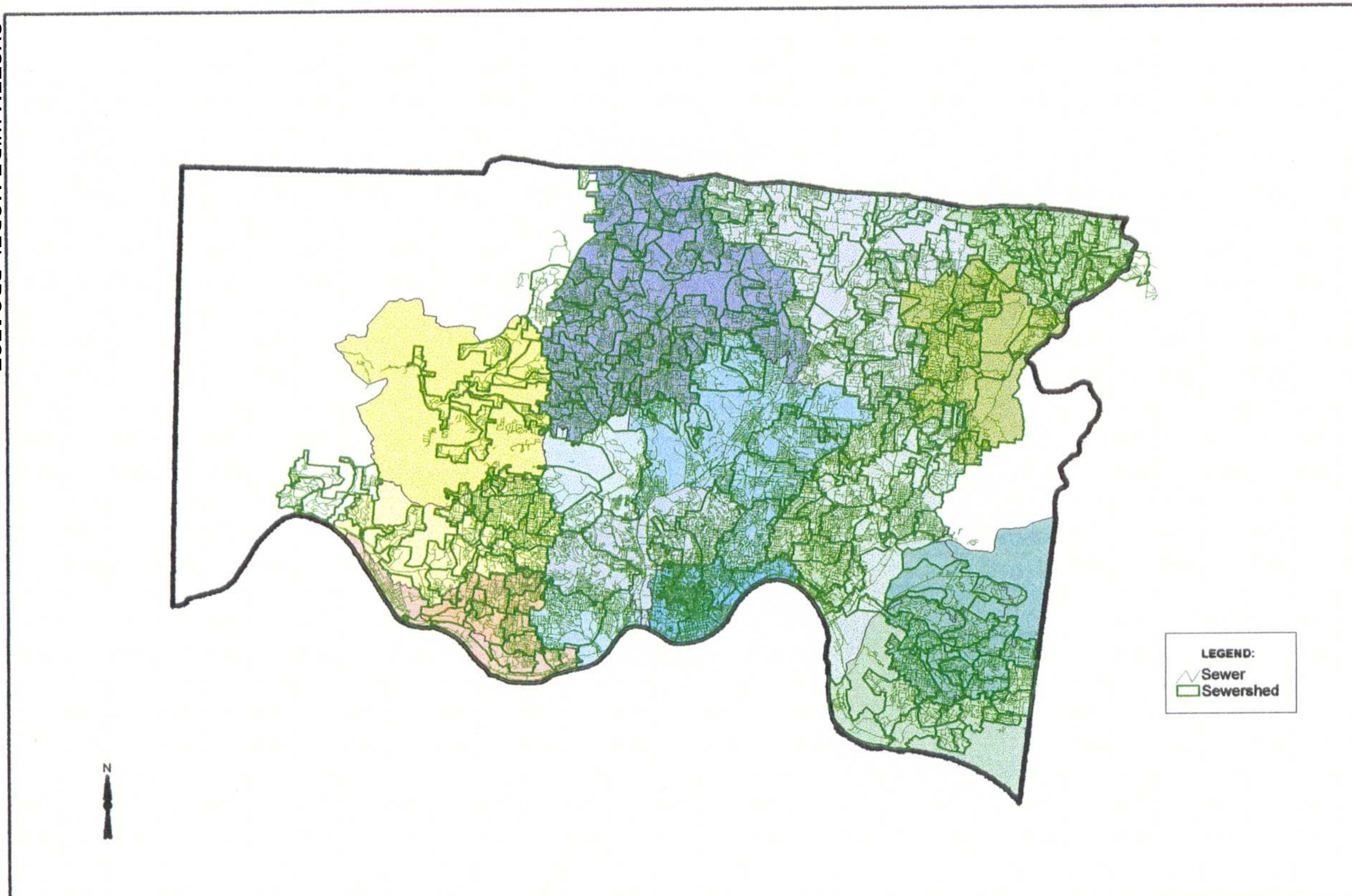


M S D
System Wide Model

Drainage Sub-Basins

Figure 6-2

Source: CAGIS



M S D **System Wide Model**

Sewersheds

Figure 6-3

Source: CAGIS

The CAGIS data files will then be queried and the combined sewers ≥18 inches in diameter and sanitary sewers ≥12 inches in diameter, along with the associated manholes, will be extracted from the CAGIS data tables. These sewers and manholes will be stored in separate ArcView shape files and Microsoft Access database files on the project office computer network. The modeled sewer network is shown on **Figure 6-4.**

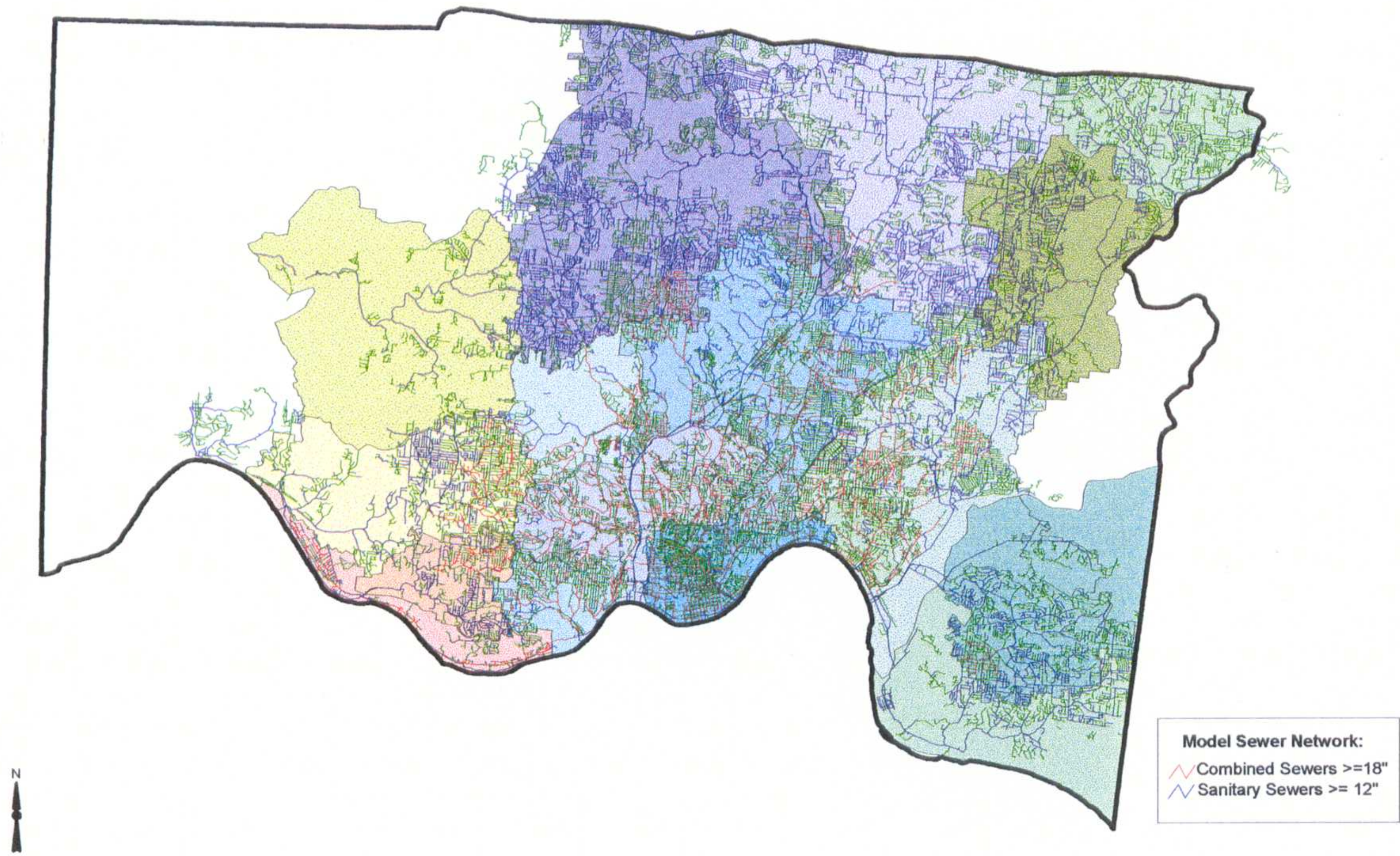
6.2.2 Dataset Development Procedure

The manhole and sewer pipe data stored in Microsoft Access will be used to develop EXTRAN model input files. Using a set of existing Access database queries written specifically for use with CAGIS data, the modeling team will pull the data needed for the SWMM/EXTRAN input files and create database tables containing the necessary model input parameters. These database tables are then exported to SWMM input data files. The database queries allow the modelers to efficiently develop the model input files and initiate a review of the model input data.

The manholes in the SWMM model will be identified using the existing 8-digit CAGIS identification number, e.g., 30402001. Pipes will be identified using the existing 17-digit CAGIS ID. The CAGIS pipe ID format is “upstream manhole-downstream manhole” (e.g., 30402001-30315007).

Currently, SWMM code will not allow a string this long as a pipe name. During the initial stages of the model development, the project team will modify the SWMM source code to be compatible with the CAGIS naming conventions. In addition, MIKE SWMM will also be updated (by DHI) to be compatible with CAGIS pipe identification numbers. These updates to the SWMM code and the MIKE SWMM interface will allow the models to be consistent with the CAGIS numbering convention and avoid having two separate IDs (i.e.,, one for System Wide Model purposes and another in the existing CAGIS system). In addition, these SWMM code changes will allow for more efficient model development processes and communication with MSD staff outside the project team.

Once the EXTRAN input file is created, the model network (i.e.,, plan and profiles) will be viewed using MIKE SWMM. The modeler will review the plan view of the model to determine any connectivity data gaps. Similarly, the modeler will review the profiles generated using MIKE SWMM to identify any questionable sewer system attribute data or data gaps. When such data problems are found, the modeler will first review the CAGIS sewer system attribute data and attempt to resolve any data transfer problem. If the problem is not related to data transformation, the project team will then use the procedures outlined in Section 7 to resolve using intense paper records search or through field investigation.



M S D System Wide Model

Modeled Sewer Network

Figure 6-4

Source: CAGIS

6.2.3 Network Data Verification Procedure

Once the data problems have been resolved by the paper records search or through field investigation, the Access database files and the ArcView shape files stored on the project office network will be updated immediately and the model input files will be revised. If appropriate, an electronic file containing the corrections will be submitted to MSD staff responsible for CAGIS data maintenance to update the CAGIS database.

6.3 Basin/Sub-Basin Data Development

Two key aspects of sewer system behavior are defined by the basin and sub-basin areas that are hydraulically connected to the system: (1) base, or dry-weather, flow conditions; and (2) wet-weather flow conditions. Each aspect is discussed individually below.

6.3.1 Base Flow Development

There are two components of base flow: (1) the sanitary wastewater component (or base wastewater flow, BWF); and (2) the groundwater infiltration (GWI) component. Each component is addressed below.

6.3.1.1 Sanitary Wastewater Component

The sanitary wastewater component of base flow (BWF) has historically been developed from several sources, often used together to define both sanitary and groundwater flows. The typical approach involves the use of population data, oftentimes derived from land use data (or census data), together with an assumed unit wastewater flow rate (gallons per day per capita) to define BWF. Flow monitoring data within the system, as well as flow data collected at the WWTP, are then used to define the composite base flow (BWF plus GWI). Finally, the difference between the observed flow and the computed BWF is attributed to GWI.

The above procedure normally requires allocating the observed WWTP flows to individual modeled basins, which introduces uncertainty as the actual BWF from a basin may be very different than the allocated amount. For this reason, water use records have recently been used in lieu of population as a basis for BWF estimates. Water use is more reliable as an basis for BWF estimates and it is generally available at a better resolution- in fact the resolution is so fine (the individual parcel level) that it has only become feasible recently with GIS that can handle the large datasets with the larger data storage / processing capability now available.

The project team has investigated the use of water consumption (use) data for the SWM project. Water use data capture and transfer procedures have been reviewed by the project team with Cincinnati Water Works staff, and the availability of water use data for other jurisdictions has also been preliminarily investigated. Detailed discussion of the transfer and integration of water use data is provided in Section 3.

6.3.1.2 Groundwater infiltration component

The system wide model will incorporate groundwater infiltration (GWI) estimates based on three sources of data. Each data source provides increasingly less precise estimates, but applies to increasingly larger areas.

1. Direct measurement of GWI- the SWM project includes a set of pieziometer installations for long-term data collection of GWI levels. Very precise estimates are provided at the relatively few direct measurement sites. Seasonal variation in GWI for the test sites will be established, and used (together with long-term WWTP flow records) to estimate seasonal variation across the entire system.

2. Inferred measurement of GWI- the dense network of flow monitors used for model calibration (see Section 8 of this Project Work Plan) will provide data that can be used to estimate GWI throughout the system. This will be accomplished in the smaller basin areas where diurnal low flows can be attributed primarily to GWI. The specific procedure is described below (see Section 6.3.2.2) in greater detail.

3. WWTP flow-based estimates- at the WWTP service area level, GWI is attributed to the difference between observed flows and the estimated BWF for the service area.

Taken together, the above sources of data will enable accurate, seasonally-adjusted GWI estimates to be made at the modeled-basin level of precision.

6.3.2 Hydrologic Response to Wet Weather Conditions

Two very different hydrologic processes are involved in the sanitary and combined sewer systems in response to wet weather. The more straightforward and well understood process is that of the combined sewer system, where surface runoff is the predominant response. Surface runoff is defined by rainfall excess and overland flow routing, both of which can be modeled with a high degree of confidence using reasonably available spatial (map-based) data (catchment imperviousness, pervious area infiltration characteristics and basin geometry, slope and roughness) with the selected model (the RUNOFF block of SWMM).

However, hydrologic processes in the sanitary sewer system are not as well understood, nor are they as accurately modeled with reasonably available data. As a result, empirical data are used to estimate the hydrologic response in the sanitary sewer system, rather than deterministically model the physical process.

Each of the approaches is described below.

6.3.2.1 Sanitary Sewer Basins

The rainfall and flow monitoring data will be analyzed to develop an understanding of the system RDI/I characteristics using the SHAPE computer program. SHAPE actually consists of a set of computer utility programs to evaluate the complete record of flow and rainfall data, isolate typical dry- and wet-weather periods, define characteristic sanitary flows, determine seasonal dry-weather infiltration rates; and develop unit hydrographs representative of I/I.

The project team using the SHAPE computer program, will divided the measured flow data into characteristic flow components appropriate for flow forecasting. As illustrated in **Figure 6-5,** these components are dry-weather flow (DWF), and rainfall dependent infiltration and inflow (RDI/I) in response to wet-weather conditions. DWF consists of base wastewater flow (BWF) from residential, commercial, and industrial users, and groundwater infiltration (GWI) that enters the collection system through defective pipes, pipe joints, and leaking manhole walls. Decomposition of the flow data into each of the major wastewater components is essential to understanding the sources of flow in the system, the relative quantities of I/I into the system, and whether I/I is excessive in the system.

Dry-Weather Flow Characterization

The characteristic flows for each catchment will be determined in the following manner:

1. Identify periods where flows are clearly not influenced by rainfall.

2. Identify the minimum flow each day (this usually occurs about 4:00 a.m.). In residential areas, about 10 percent of this flow is wastewater, with the rest representing groundwater infiltration. Subtract each day's GWI, leaving a base wastewater flow (BWF) hydrograph.

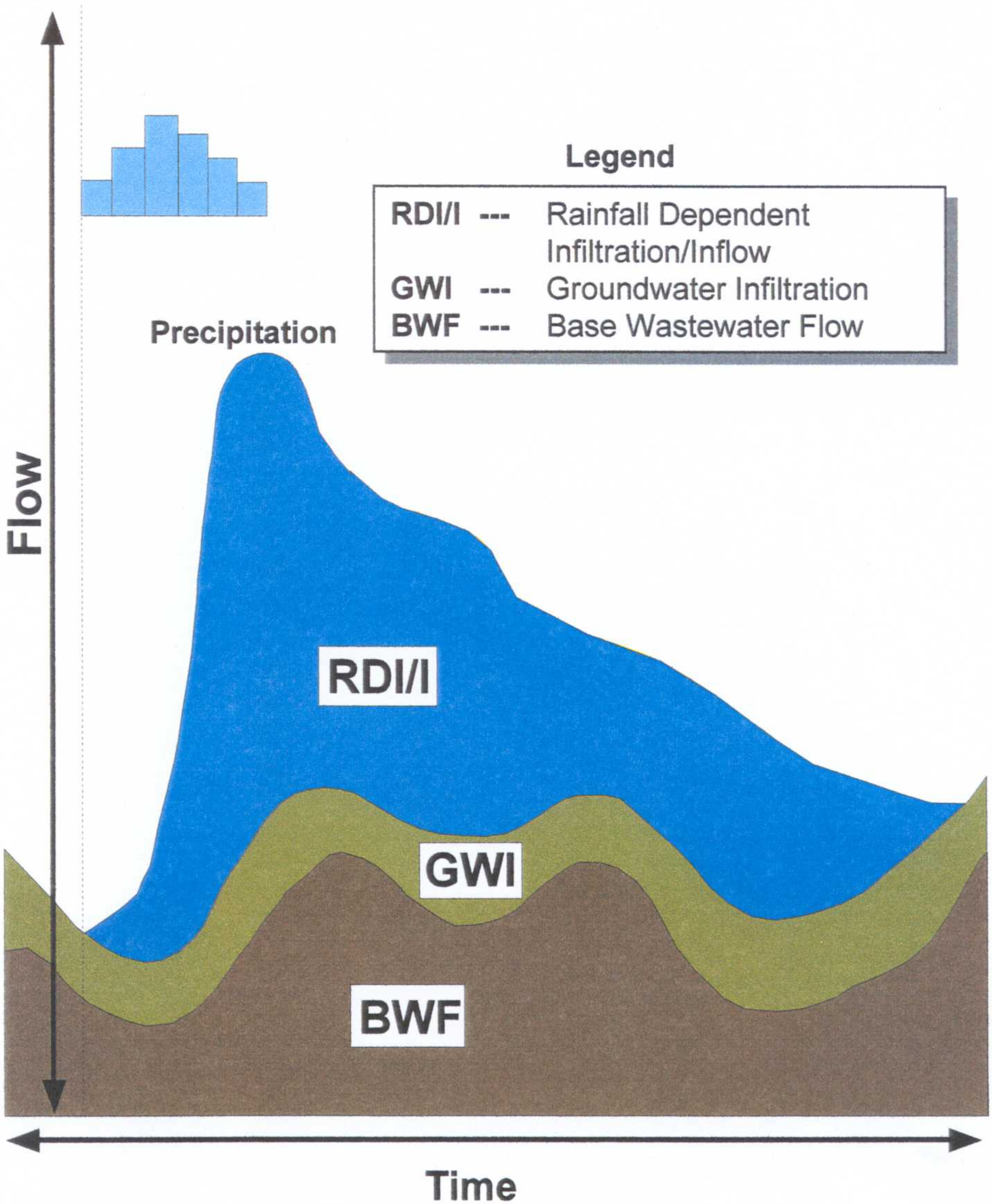
3. Divide the BWF hydrographs into weekdays and weekends. Statistically evaluate the weekday and weekend hydrographs for the period of record to determine characteristic hydrographs for the meter.

4. Allocate the meter's BWF hydrographs to each tributary catchment in proportion to the catchment's winter quarter water consumption.

5. Statistically evaluate the GWI for the period of record to determine average GWI and seasonal minimum and maximum GWI.

6. Use groundwater monitoring data to determine the percentage of each catchment's sewers lying within the groundwater table during average, minimum, and maximum GWI.

7. Allocate the meter's average, minimum, and maximum GWI to each tributary catchment according to this percentage.



Components of Wet-Weather Wastewater Flow
System Wide Model Project
Metropolitan Sewer District of Greater Cincinnati

CDM Camp Dresser & McKee

Figure 6-5

Rainfall-Dependent Infiltration/Inflow (RDI/I) Characterization

The project team will use a unit hydrograph approach to determine a characteristic relationship between rainfall and RDI/I for each meter. **Figure 6-6** Illustrates how the RDI/I from a single hour of rainfall with an intensity of I is characterized under this approach. Experience indicates that it often requires up to three unit hydrographs to adequately represent the various ways that precipitation becomes RDI/I. Each unit hydrograph is characterized by the following three parameters:

- R: The fraction of rainfall volume that enters the sanitary sewer system
- T: The time to peak in hours
- K: The ratio of time to recession to the time to peak

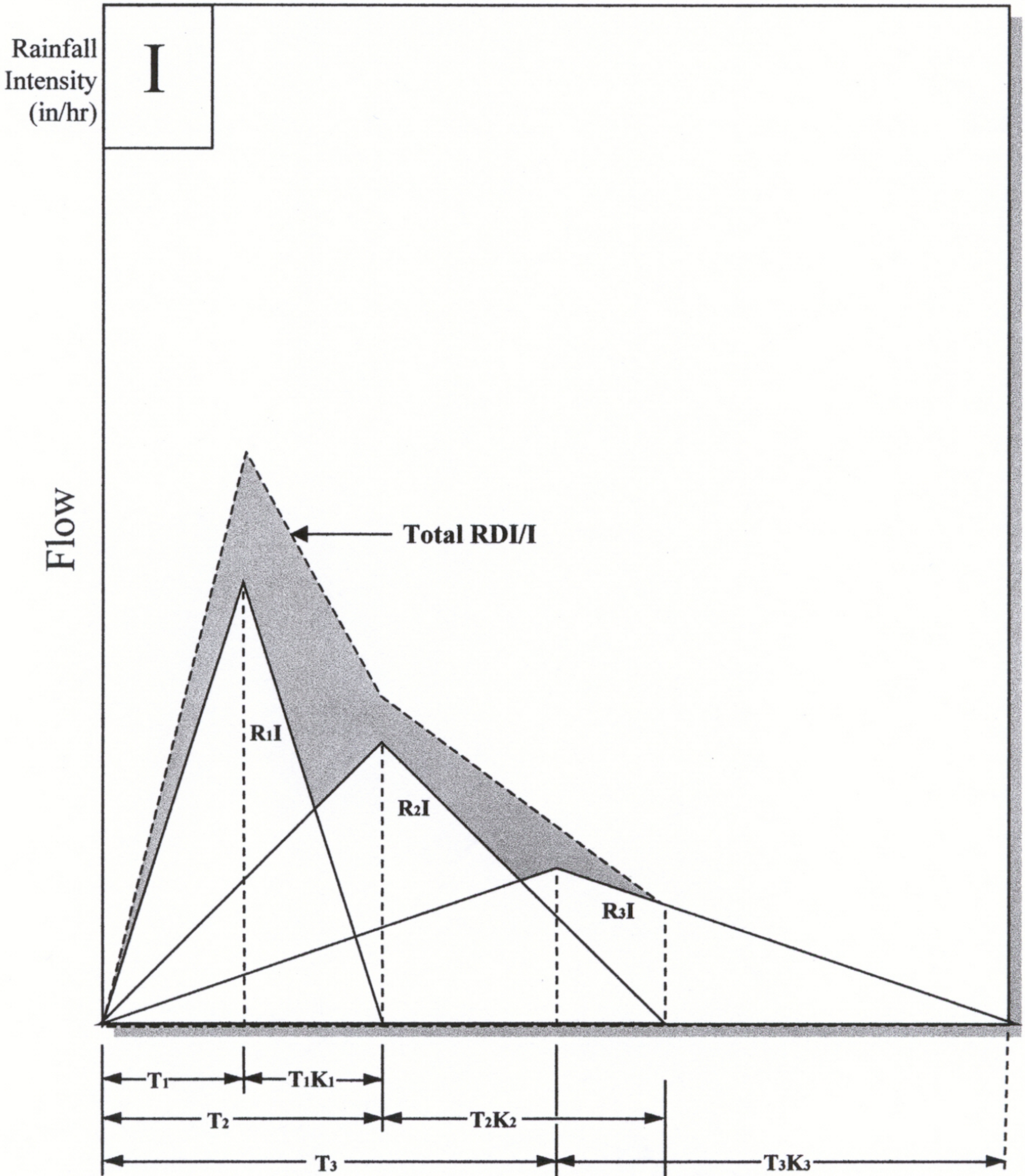
This approach allows estimating unit flow parameters appropriate for forecasting design flows. This method of hydrograph decomposition considers a range of parameters including rainfall depths, sewered area, antecedent moisture conditions (AMC), and groundwater elevations to better quantify individual wastewater flow components in the system. Unit hydrograph parameters are developed through a systematic analysis of measured flow and rainfall. Once developed, these unit hydrograph parameters and design rainfall hyetographs can be used to define RDI/I inflow hydrographs for collection system modeling/evaluation. The approach to developing RDI/I unit hydrograph parameters follows:

1. First, the project team defined RDI/I events by subtracting the characteristic dry-weather flows (BWF and GWI) from the measured flow record, as illustrated in **Figure 6-5**. For each event, the total R was calculated for the event by dividing the RDI/I volume by the rainfall volume.

2. Then, the project team will identify events where most RDI/I is due to direct inflow and/or very rapid infiltration. Typically, these are intense, short-duration thunderstorms preceded by relatively dry antecedent conditions. These events are used to determine R1, T1, and K1, characterizing the first unit hydrograph.

3. Next the project team will identify events where infiltration is maximized. These are typically long duration, low intensity events preceded by wet antecedent conditions. These events are used to determine R2, T2, and K2, characterizing the second unit hydrograph. If these events have very long recession limbs, it will be necessary to develop R3, T3, and K3, for the third unit hydrograph.

4. R, T, and K parameters for the three unit hydrographs characterizing RDI/I at the meter are assigned to all catchments tributary to the meter.



Triangular Unit Hydrograph Approach to Decomposition of the Wet-Weather Sanitary Sewer Hydrograph
Sewer Wide Model Project
Metropolitan Sewer District of Greater Cincinnati

CDM Camp Dresser & McKee

Figure 6-6

5. Finally, the project team will verify the R, T, and K parameters by using them along with catchment areas to develop inflow hydrographs for a more complex rainfall event. These hydrographs are then routed through the collection system with the model developed and compared with measured hydrographs for this event.

Using the above procedure, the project team will determine the appropriate R, T, and K values of the above-mentioned hydrographs for input into SWMM. This allows the SWMM model to easily accommodate monitored system hydrographs, and facilitates the calibration of the SWMM model, as well as evaluating rehabilitation alternatives.

6.3.2.2 Combined Sewer Basins

The system wide model will actually use two SWMM model components (or "blocks" as described in the model documentation) - the RUNOFF block, which simulates the rainfall-runoff process in each CSO basin area, and the EXtended TRANsport (EXTRAN) block, which simulates the flow and head within the interceptor sewer network, combined sewer trunks, and the CSO outfall points.

RUNOFF simulates the response of the modeled catchments to precipitation. For the system wide model, precipitation data for each catchment are generated using the network of rain gauges installed in conjunction with an advanced radar image processing system. The next section provides further discussion of the precipitation data collection and processing facilities used to support the CSO models. The catchment data consists of the drainage area ID, RUNOFF conduit ID to which the area drains, the basin acreage and representative width, average overland slope, the percent of impervious area directly connected to the drainage network, Manning's n's for overland flow on both the impervious and pervious fractions, depression storage in inches for both the impervious and pervious fractions, and infiltration parameters as required by the Horton equation. The catchment data for RUNOFF model development are managed using a relational database developed to support the modeling process.

RUNOFF simulates surface runoff from a drainage area using three "planes" of overland flow. One plane represents the directly connected impervious areas (DCIA), i.e., all impervious surfaces that are directly connected to the sewer system and possess initial abstraction or surface detention storage (puddles, cracks, etc., which do not permit immediate runoff). A second plane represents all pervious areas, including impervious areas not directly connected (NDCIA) to the sewer system. The third plane is defined as a fraction of DCIA, which provides no detention storage and thus produces runoff immediately. The flow off the drainage area is the sum of the flow off the three planes.

For each drainage area, the user inputs the percent of directly connected impervious area (DCIA), the acreage, the basin width, and the average ground slope. The three rectangular flow planes are established by RUNOFF, with the acreage of each plane determined by the total acreage, percent impervious, and the fraction of impervious area with zero detention. The kinematic wave approximation is used as the basic flow routing algorithm across the three planes of flow. This approximation assumes that the friction slope is equal to the ground slope of the plane. For this condition, the equations of continuity and uniform flow must be solved simultaneously to define the depth of flow and the outflow for each plane at each time step. This flow routing algorithm is applied sequentially to the impervious (with detention) plane, the pervious plane, and the impervious (without detention) plane. The rate of infiltration into the soil is computed by either the Horton method or the Green-Ampt method. For either method an upper limit can be imposed.

Hydrologic routing techniques that apply the kinematic wave approximation algorithms are then used to route the overland flow through the pipe, culvert, channel, and lake network as required. The RUNOFF results - runoff hydrographs, are saved in binary format for input to the EXTRAN block of SWMM to perform hydraulic routing through the network of regulators and interceptor sewers, as described below.

6.4 WWTP Flow Rates and Hydraulics

The WWTP hydraulics will be modeled at two levels: (1) initially as a boundary condition for the sewer system model; and (2) ultimately (in Phase 4 of the SWM project) as a set of linked modeled elements. Each level of modeling of WWTP hydraulics is discussed below.

6.4.1 Boundary Conditions

Data will be collected from the available WWTP influent flow records for the purpose of building boundary condition descriptions at each of the seven downstream (WWTP) individual model boundaries. The project team has investigated the available data in a series of meetings with MSD Treatment Division staff and is currently working with MSD staff to define specific data acquisition requirements, which will vary from plant to plant based on the specific data collection processes and equipment used at each plant. Initially, influent flow rates and water surface elevation at the plant headworks are the data of interest, as these data will be used to define boundary conditions. The specific representation of each boundary condition will be established after detailed review of the data and after reviewing plant headworks operating practices with each plant manager.

6.4.2 WWTP Hydraulic Simulations

During Phase 4 of the SWM project, the capability to model actual WWTP hydraulic conditions will be added to the system wide model. As this task is completed, more detailed plant data (individual flow / stage data for the various process components, to the extent that they are available) will be obtained for the purpose of building the actual linked model elements for the WWTPs. These operating data will be used in conjunction with the spatial and attribute data describing the physical characteristics of the plant facilities to build and calibrate the linked WWTP models.

6.5 Model Calibration Procedures

Model calibration involves collection of field monitoring data (rainfall and sewer flow rates/elevations) and development of an initial model input dataset, followed by successive applications of the model by adjusting calibration parameters until the model results are in agreement with the observed data. Note that the model calibration is a critical step in ensuring the model will properly simulate the prototype system over a range of storm events. Model calibration is accomplished by adjusting initial estimates of the selected variables, within a specified range, to obtain a satisfactory correlation between simulated and observed values.

The variables selected to adjust or calibrate are the parameters that cannot be observed precisely (e.g.,, percent impervious, soil infiltration parameters, etc.), and which have the greatest effect on the accuracy of the results. The calibration parameters are prioritized according to their influence on the model results, which can vary from one drainage system to other. The calibration parameters are prioritized based on knowledge of modeling case studies of similar sewer systems.

The calibration procedures for the combined and separate sewer areas are quite different, as the physical processes involved in the generation of wet-weather flow are generally (though not always) quite different. The specific procedures are described individually in this section of the project work plan for each type of sewer system.

6.5.1 Model Calibration - Combined Sewers

The calibration procedure for the combined sewer system (CSS) is described in this section. In particular, the RUNOFF model calibration parameters that are key for the success of CSS model development are described. Note that percent impervious and infiltration parameters primarily control total volume and peak magnitude of runoff. Drainage area width, and gutter/channel length parameters control the peak timing and shape effects of flow routing. The RUNOFF calibration parameters are as follows:

6.5.1.1 Impervious Area Coverage

RUNOFF simulates surface runoff from a drainage area using three planes of overland flow. Flow from the drainage area is the sum of the flow from each of the three planes (DCIA plane, pervious plane, and DCIA without detention). The three rectangular flow planes are established by RUNOFF, with the acreage of each plane determined primarily based on the total acreage, percent DCIA area, and the fraction of the DCIA area with zero detention. Therefore, percent DCIA is a key calibration parameter that will significantly affect the runoff quantity computed by the RUNOFF model. For the purpose of an initial model setup, percent DCIA estimates will be developed from CAGIS coverages of impervious area (if available), and/or from previous modeling of the combined sewer system (e.g., the SWIM Master Plan and subsequent CSO Facilities Plan), and adjusted, if necessary, during the model calibration process.

A third method may also be used to define imperviousness for the residential areas, which dominate land-use on a system wide basis. It has been demonstrated that surface imperviousness is closely correlated to population density (PD), and estimates based on correlations to PD as the independent variable are often preferred over those based on land use. This is because land use classifications often provide inadequate resolution at the higher densities, for which significant differences in imperviousness may exist. Since combined sewer areas often serve the high density residential areas, this limitation of land use classifications can be important.

Two PD-based regression equations have been used successfully for prediction of imperviousness: Stankowski and Manning. Both relate imperviousness directly to PD, although Manning is generally more accurate for the higher density urban areas. These expressions are typically applied at the census block level, for which census data are available. The results of both expressions are typically used and averaged (except at the highest densities where Manning alone is used).

6.5.1.2 Infiltration Parameters

The quantity of runoff from the pervious plane is inversely related to the amount of precipitation that can infiltrate into the soil. Infiltration parameters significantly affect the runoff estimates from the more pervious drainage areas. The rate of infiltration is a function of soil properties in the drainage area, ground slopes, and ground cover. RUNOFF computes the rate of infiltration into the soil using either the Horton method or Green-Ampt method, as selected by the user. A complete description of application of these two methods is well documented in the literature and SWMM user's manual. In each method, a set of infiltration parameters is required to represent soil properties. Initial estimates of the infiltration parameters will be based on thorough review of soil types in each drainage area, using the soil type coverage available in CAGIS. These initial values represent the average infiltration parameters for the respective soil types. During the calibration of runoff from the pervious plane, these values will be adjusted, if necessary, to ensure that infiltration losses are accurately represented.

6.5.1.3 Other Parameters

Other RUNOFF calibration parameters include: Manning's n values for overland flow on both the impervious and pervious fractions; ground slopes; characteristic drainage area width; gutter/channel length; and depression storage values for both the impervious and pervious fractions. These parameters, except drainage area width, typically have a minor effect on the estimates of volume and peak magnitude of runoff compared to percent impervious and infiltration parameters, which primarily control the ratio of rainfall to runoff in impervious and pervious areas, respectively. Sensitivity analysis will be used to confirm the sensitivity of model results for the MSD study area to the various RUNOFF parameters.

Channel characteristics that represent a drainage area's internal flow routing, if not included in the model, will have an effect on the hydrograph shape and peak timing of the runoff. The internal flow routing is accomplished in the model, without modeling in-system storage and pipe networks within the drainage area, by reducing the characteristic width, which will increase flow length and storage, resulting in effective attenuation of the runoff hydrograph. In addition, the appropriate characteristic width is a secondary parameter that can be adjusted, within limits, to calibrate the runoff volume and peak flow rate. However, this conventional approach of accounting for a drainage area's internal routing by reducing characteristic width may result in over-estimate of infiltration and under-estimate of runoff volumes from pervious areas, especially in large drainage areas. Therefore, when calibrating large drainage areas, care must be taken not to under-predict runoff volume from pervious areas during characteristic width adjustments. This can be accomplished by delineating large drainage areas into smaller areas or by using large trapezoidal channels to account for the internal routing/attenuation of drainage area's rainfall response. Note that the Manning's n values and ground slopes can also be adjusted to calibrate the shape of a runoff hydrograph.

Finally, EXTRAN parameters, especially those used to define headloss across special structures, may be calibrated as required for critical structures. Parameters typically adjusted in EXTRAN calibration include weir and orifice coefficients and Mannings "n" where significant minor losses are incorporated.

6.5.2 Model Calibration - Separate Sewers

This section presents the calibration procedures for the RUNOFF/EXTRAN linked model for the separate sewer system that includes the correlation of the simulated HGL and flow rates with the observed values at the flow monitoring sites during the calibration storm events.

6.5.2.1 Dry-Weather Flow Calibration

The dry-weather flow input for the model will be generated from actual winter month water consumption for the project area. Using the DWF analysis of the measured flow data, the diurnal flow patterns will be established. These patterns are then applied to the average DWF from each catchment that are estimated based on the average water consumption rates. The estimated DWF with appropriate diurnal patterns will be used as flow inputs to the model and then calibrated using the measured flow monitoring data during dry-periods. In addition, land use and population data may be used to support the dry-weather calibrations.

6.5.2.2 Wet-Weather Flow Calibration

The project team will use field data collected from the flow monitors to perform the wet-weather calibration of the RUNOFF/EXTRAN linked model. At least three (3) storms from the flow monitoring data will be selected for the model calibration and verification in each sub-model. Additional events will be used for further verification if required for specific sub-models. Note that the storm events selected for wet-weather calibration of the sewer-system model shall produce a sewer-system response to a range of antecedent moisture conditions. As the initial model development, sensitivity analysis testing, and flow monitoring tasks are being completed, a calibration work plan will be prepared (individually for the Group I and Group II sewersheds) that defines the specific procedures to be followed, including the number of events to be used and parameters to be adjusted for specific areas. Where appropriate these parameters will include EXTRAN parameters, as described for the combined sewer areas.

The model calibration and verification will be performed using estimates of R, T and K during selected storm events, which are derived based on the flow monitoring data. The model calibration efforts will be performed to obtain the best correlation of the simulated and observed flow data for the three events. These efforts include adjusting base flow rates to calibrate antecedent flow conditions and adjusting the R, T and K parameters to produce the sewer system response similar to the measured values for the calibration and verification events. Through the calibration and verification effort, the representation of the sewer system hydraulic characteristics and I/I response will be confirmed.

To be able to extrapolate from measured conditions to non-measured conditions, the project team will develop a statistical model, using parameters such as rainfall volume, antecedent 1-month rainfall volume and GWI. The statistical model allows the project team to extrapolate to those unknown conditions for the design storm analysis. The project team will use this statistical model, along with the sewer system model, to analyze the sewer system response to the design storm for a variety of antecedent moisture conditions.

6.6 Model Application Requirements

A variety of model applications will be developed after the calibration phase of the system wide model project. These applications include real-time control (RTC) simulations, system wide I/I scenarios, and a variety of system improvements. This section identifies the types of applications that are currently envisioned. Model applications will be defined in greater detail and developed during Phase 4 of the SWM project.

6.6.1 Real-Time Control Implementation Plan

Real-time control (RTC) of the wastewater collection system can enable increased capture of wet-weather combined sewer flow by the system in two ways: (1) in-system storage; and (2) dynamic flow diversion. In-system storage enables the storage capacity of the existing combined sewer system to be utilized during wet weather, by temporary blocking CSO outfalls and allowing flow to backup into the otherwise unoccupied pipe volume. Dynamic flow diversion enables the existing hydraulic conveyance capacity of the system to be more fully utilized during wet weather, by shifting flows from overloaded lines to those with available capacity. Both aspects of RTC will be addressed in the System Wide Model project.

The SWM will be applied to identify opportunities to implement RTC within the MSD service area. Once those opportunities are identified, an RTC implementation plan will be developed. The plan will include a description of the RTC modeling strategy to be applied, and the SWM model project focus will shift to enhancement of the system wide model to incorporate RTC simulation capability, and application of the RTC-enhanced model to test various RTC scenarios.

6.6.2 System Improvement and Rehabilitation Scenarios

Various I/I scenarios (e.g., future conditions under various rehabilitation and/or deterioration scenarios), RTC scenarios, storage/conveyance options (e.g., tunnel facilities), etc. will be evaluated with the system wide model, as directed by MSD, during Phase 4 of the project.

6.6.3 Development of Design Conditions for Scenario Evaluation

In evaluating the various system improvement and rehabilitation scenarios, it will be necessary to establish design conditions that reflect the MSD objectives for system improvement.

Initial review of these objectives with MSD has established that the current design flow will be based on the model-projected peak sewer flow rate with a recurrence interval of ten years. The design flow for sanitary sewers will be comprised of three components:

- Base wastewater flow (BWF);
- Groundwater infiltration (GWI);
- Rainfall-derived inflow/infiltration (RDII).

(The design flow for combined sewers will use the surface runoff component in place of the RDII component used for sanitary sewers.)

The project team will work with MSD to establish appropriate design conditions that reflect the various flow components in both sanitary and combined sewer systems.

6.6.4 CAGIS – Model Output Integration Plan

The model output such as sewer average and peak dry-weather capacities, the percent of sewer capacity used by dry-weather flow, peak wet-weather flow in response to selected rainfall events, etc., will be stored in Access database and exported into ArcView GIS. This will be accomplished by creating additional data fields in the sewer data tables obtained from CAGIS and importing the model output into new fields from model result database. The project team will perform a thorough QA/QC of the data accuracy after transferring into ArcView GIS. Once the QA/QC is completed, at the end of the project, the data will be forwarded to CAGIS administrator.

Section 7
Field Investigations

This section describes the requirements and protocol for field investigations that will be necessary in the course of the model development. The primary objective of the field investigation protocol is to develop a focused approach that will result in optimal effort and expenditure in conducting the field investigations. In addition, this protocol will enable MSD to systematically identify and correct the deficiencies in CAGIS data, and eventually update the CAGIS sewer system database.

7.1 Field Investigation Requirements

The field investigations will primarily include verification of the sewer attribute data from CAGIS that are in question and filling missing values. In general, the requirements include verification of manhole invert and rim elevations, sewer sizes, pipe material, and attributes of special structures (drop manholes, flow diversion chambers, flow control gates, etc.). Other activities are expected to include verification of sewershed delineations, confirmation of land use data, and other miscellaneous data that affect estimation of the model input parameters.

7.2 Field Investigation Protocol

The modeling team will initially generate the model sewer networks and profiles using the selected modeling software and the sewer system attribute data that resides within CAGIS. After a thorough review of these plan and profile views, the modeling team will assess the completeness and reliability of the sewer system data from CAGIS. Subsequently, the modeling team will prepare a list of sewer system data deficiencies and discrepancies that require verification. As a next step, the modeling team will review the paper based sewer maps and recent sewer system studies obtained during data collection task to resolve the data issues. In addition, the modeling team will request MSD WWE staff to review their records to address data problems. Finally, if the data verification can not be achieved by review of the paper maps and sewer system studies, the modeling team will prepare a Request for Field Investigation (RFI) for each data discrepancy and or data gap.

The modeling team will document in a spreadsheet the process to determine the need for field investigation. This spreadsheet will include, at minimum, the following fields:

		Step 1		Step 2		Step 3		
Item No.	Description of CAGIS Data Problem	Paper Maps/ Records Review (yes or no)	Problem Resolved? (yes or no)	WWE Review (yes or no)	Problem Resolved (yes or no)	Need Field Investigation (yes or no)	RFI No.	Comments

Each RFI will be assigned a unique tracking number and include detailed information such as manhole and/or pipe ID, a map indicating the location of the manhole/pipe that need to be investigated, and a list of sewer attribute data to be verified or recorded. The modeling team will also indicate the any specific directions for field crew for observing and measuring special features during field investigation (e.g., sewer connections in a drop manhole, flow regulator configuration in a SSO or CSO diversion structure). A blank RFI is depicted in **Figure 7-1**.

The modeling team will provide the RFI to the field investigation team on as needed basis during the model development. The field investigation team will then schedule the work and perform the field investigations according to the RFI. The field investigation team consists of experienced staff who will document the results in a Field Investigation Report (FIR). This team will sometimes be accompanied by the modeling team that initiated the request, as required (e.g., especially critical, unusual, or otherwise key features of the system).

A unique tracking number (with reference to RFI) will be assigned to each FIR. **Figure 7-2** includes a blank FIR to show the key results that will be recorded. The field team, as an attachment to the FIR, will prepare a detailed sketch that depict the location of the subject manholes and pipes and specific locations where the field measurements are obtained. In addition, digital photographs will be obtained and attached to the FIR. Note that **Figures 7-1** and **7-2**, if necessary, will be finalized during the initial stage of model development, prior to commencing any field investigations.

In addition to verifying sewer attribute data, the field investigations during model development may require confirmation of the sewershed delineations, land use data, and other miscellaneous data that affect estimation of the model input parameters. The modeling team will include a detailed description of the request in the RFI and necessary maps to enable the field team to perform the investigations. The field observations will be documented in the FIR.

The field investigation team will comply with OSHA requirements for confined space entry and other safety procedures during entering/investigating manholes and similar structures. In addition, the field team will coordinate the investigations with MSD staff. The coordination involves advance notification of the field activities, scheduling the field work to avoid conflict with other MSD operations, and requesting the presence of MSD staff to perform investigations, if required.

The modeling team will use the field investigation results to supplement the CAGIS data to develop sewer networks and forward that information to MSD if the CAGIS data require an update.

Request for Field Investigation (RFI)
System Wide Model
Metropolitan Sewer District of Greater Cincinnati

Tracking number: ______________ Requested by: ______________ Date requested: ______________

Drainage Basin: ______________ District Name: ______________ (e.g. Hyde Park, Wyoming, etc.)

Pipe ID: ______________ Upstream MH ID: ______________ Downstream MH ID: ______________

Street Location Description: ______________________________ (e.g. 1000' north of the intersection of Madison Rd. and Observatory Rd.)

Map Attached: Y ☐ N ☐

Problem Description: ______________________________

Specific Instructions: Please complete a Field Investigation Results (FIR) Form for the information checked below. Please include a field sketch and a disk with digital photo(s) labeled with the RFFI tracking number.

- ☐ Pipe Diameter
- ☐ Manhole Rim Elevation
- ☐ Manhole Depth
- ☐ Manhole Invert Elevation
- ☐ Pipe Material
- ☐ Sediment Depth
- ☐ Drop Manhole
  - ☐ Incoming Pipe Diameter
  - ☐ Incoming Pipe Invert

For Flow Diversion Manholes:

- ☐ Weir Length
- ☐ Weir Height
- ☐ Outfall Pipe Diameter
- ☐ Outfall Pipe Offset from MH Invert

Other Instructions: ______________________________

Field Investigation Results (FIR)
System Wide Model
Metropolitan Sewer District of Greater Cincinnati

Tracking number (from RFI): ________________ Investigated by: ________________ Date Investigated: ________________

Pipe Diameter: ________ (inches) Manhole Invert Elevation: ________ (ft) Drop Manhole: Y ☐ N ☐

Manhole Rim Elevation: ________ (ft) Pipe Material: ________ Incoming Pipe Diameter: ________ (inches)

Manhole Depth: ________ (ft) Sediment Depth: ________ (inches) Incoming Pipe Invert: ________ (ft)

For Flow Diversion Manholes:

Weir Length: ________ (ft) Outfall Pipe Offset from MH Invert: ________ (ft)

Weir Height: ________ (ft)

Outfall Pipe Diameter: ________ (ft)

Field sketches attached?: Y ☐ N ☐

Digital photograph(s) included: Y* ☐ N ☐ *(Disk attached with digital photos labeled with the RFFI tracking number.)

Comments: ____

____

____

____

____

____

Additional comments attached?: Y* ☐ N ☐ *(Additional sheets attached and labeled with the RFFI tracking number.)

Section 8
Flow Monitoring Protocol

8.1 Flow Monitoring Objectives

The primary goal for the flow monitoring program is to measure flow in separate sanitary and combined sewers in response to a range of storm events, which will provide an accurate basis for calibrating and verifying the System Wide Model. The number and magnitude of the events monitored and the location of the monitoring sites affects the reliability of the calibrated model results. This section provides the protocol for systematically monitoring the flow across the County wide sewer system during the 3-year period of the project.

The components of the flow monitoring plan are:

1. General criteria for flow monitoring.
2. Preliminary locations for flow monitoring (Group 1 and Group 2 major drainage basins).
3. High-end monitoring (i.e., locations with complex hydraulics that require high-end technology equipment) and permanent sites.
4. Site selection criteria.
5. Equipment selection appropriate for the project.
6. Flow monitoring procedures and documentation for all activities.
7. QA / QC for flow data obtained.
8. Data format and access for project office use.
9. Groundwater monitoring.

8.2 General Criteria for Flow Monitoring

The Group 1 and Group 2 major drainage basins will be monitored separately for four (4) months' duration: Group 1 will be monitored from February 1, 2001 through June 1, 2001; Group 2 from February 1, 2002 through June 1, 2002. Group 1 efforts will monitor the Mill Creek Drainage Basin as a single unit, and Group 2 will monitor the Little Miami Drainage Basin and the Great Miami Drainage Basin, each as single units. Because of the necessity to understand the functioning of the entire sewer network, all monitors in a given phase must be operational by the beginning of that phase. If within the 4-month monitoring period for either group, the storm events monitored do not provide sufficient data for the calibration requirements as originally intended, an assessment will be made regarding additional monitoring requirements in relation to the project objective

8.3 Preliminary Locations

The entire MSD service area was divided into three major drainage basins: the Little Miami Drainage Basin, the Great Miami Drainage Basin, and the Mill Creek Drainage Basin. A thorough review of the sewer system maps for each major drainage basin further delineated contributing sewersheds, with each representing a significant portion of the flow in that drainage basin.

The preliminary location of the flow monitors focuses on isolating the flow in each sewershed. This requires detailed monitoring of the inflows from other sewersheds and the outflows to the trunk sewers and outflow through CSOs, SSOs, and PSOs. The elements essential for the determination of the preliminary locations include:

1. ***Thorough understanding of the system layout***—Certain system features have flow characteristics, which define system performance. The understanding of these features is critical to properly representing the system with a hydraulic model, and often, therefore, require flow monitoring. These features include active SSOs, CSOs, pump stations, pump station overflows (PSOs), treatment plants, and outfalls.

2. ***Determination of subbasin discharge points to the trunk sewers***—The confluence of major tributary subbasins with trunk sewers provides the primary locations for the flow monitors. This is especially true when a subbasin comprised of sanitary sewers flows into a combined sewer.

3. ***Upstream of key SSOs, CSOs, and PSOs***—Monitors are located upstream of active SSOs or PSOs tributary to major sanitary subbasins. Some SSOs, CSOs, and PSOs have tributary areas sufficiently small to have no significant impact on the sewer system hydraulics; these require no monitors.

4. ***Pump Stations***—System wide, there are 134 pump stations ranging in capacity from 20 gpm to 7000 gpm. Selected pump stations will be monitored if the pump station records, at the desired resolution, are not available. Each pump station will be reviewed to determine the degree to which the flows affect the system performance; and consequently, whether additional flow monitoring is required. **Figure 8-1** shows the decision flow chart. The following questions will be asked of each pump station:

   a. Does the pump station have an elapsed time meter (ETM), a flow totalizer, or other monitoring device at necessary resolution?
   b. Is the pump station an influent lift station for a treatment plant?
   c. Is the peak capacity less than 200 gpm?
   d. Does the pump station have an associated PSO?
   e. Does the pump station have significant hydraulic impact on the system?

5. ***Trunk sewer or interceptor***—Flow meters will be located at critical points along the trunk sewer, including points of major confluence and upstream of crossover points between parallel trunk sewers.

6. ***Treatment plants***—Locate flow monitors on all influent lines to the treatment plants.

7. ***Priority areas for CIPs***—Locate flow monitors for high priority CIP projects, such as Richmond / Orchard and Madeira.

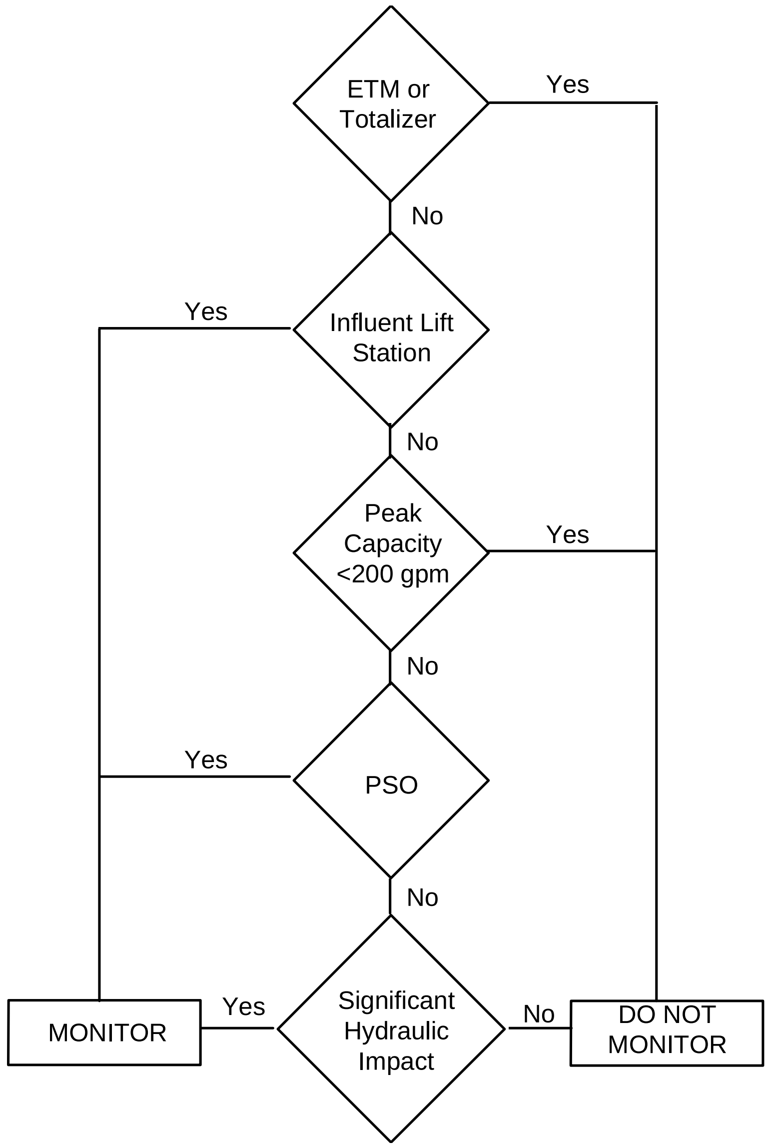
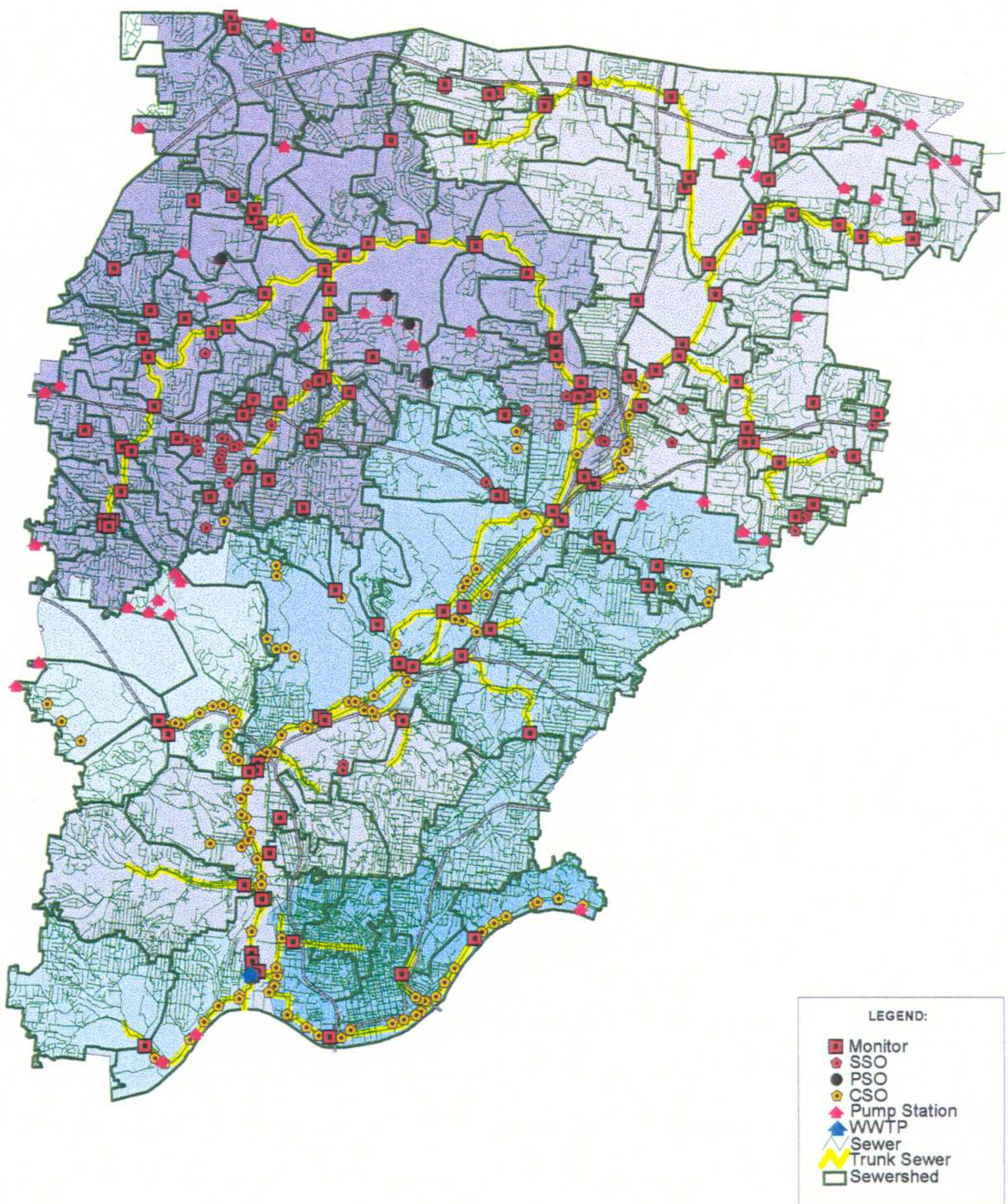


Figure 8-1
Pump Station Flow Monitoring Decision Flow Chart

The project team, using the criteria above, identified 294 preliminary locations for flow monitoring covering all the major drainage basins. **Figures 8-2** through **8-4** depict these preliminary locations. A budget reserve of 20 percent will be maintained to provide for additional months of flow data, should prolonged dry weather occur, or if additional monitoring sites are identified during project execution. This will allow for up to two additional months of data as needed from either Group 1 or Group 2 major drainage basins. **Figure 8-5** shows how the monitors will be supplied for each phase of the project. Monitors for permanent locations in Group 2 will be temporarily used in Group 1.



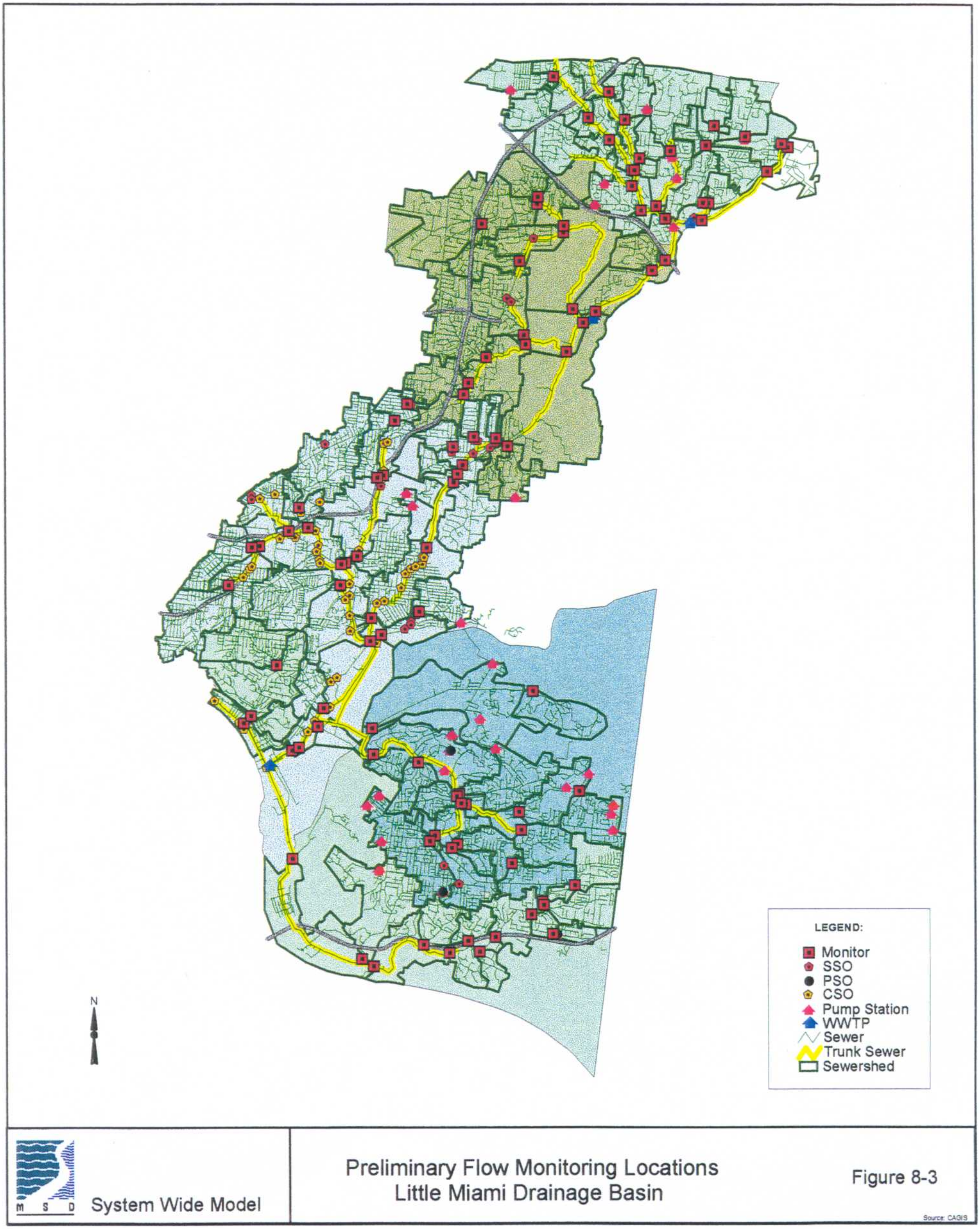
M S D

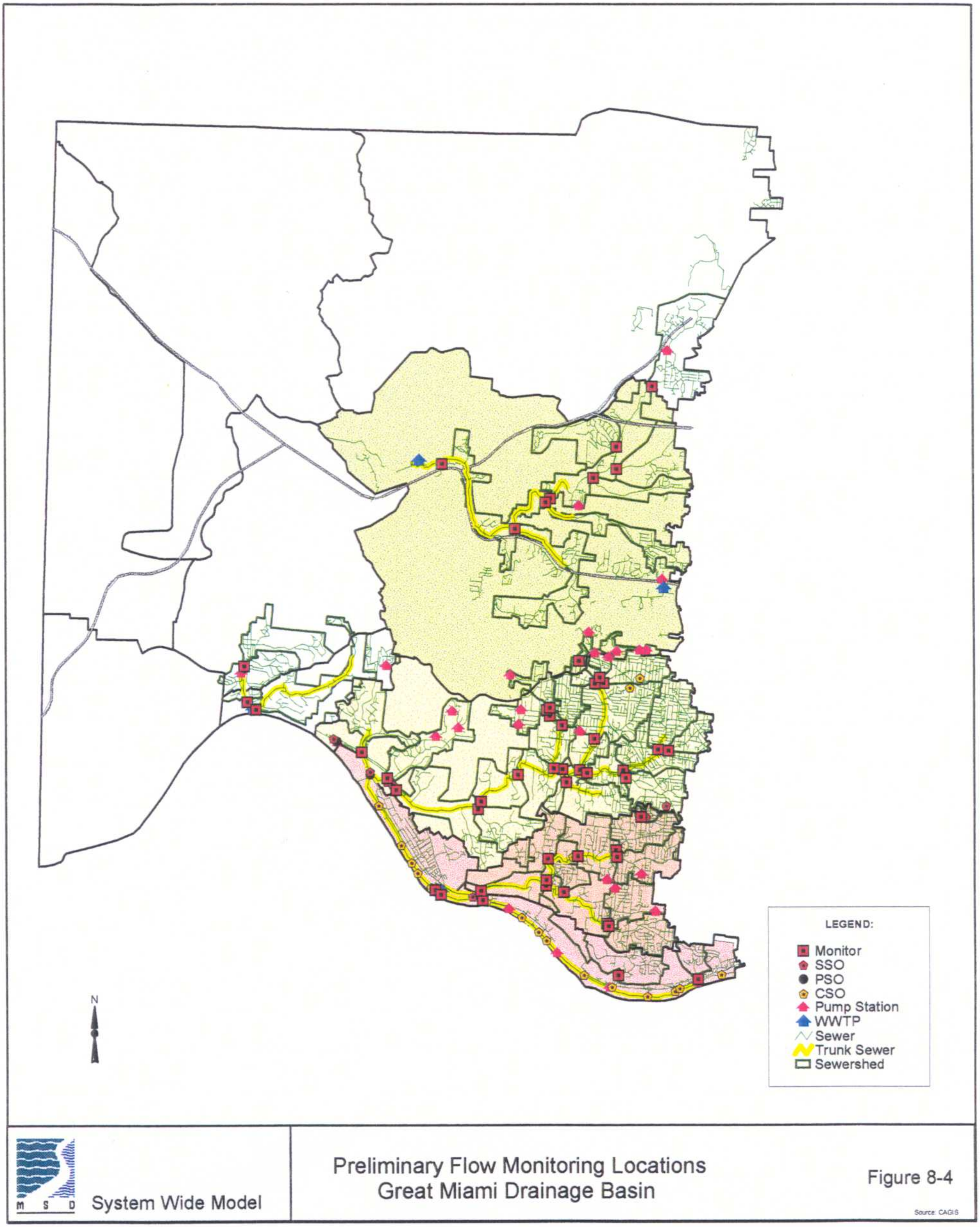
System Wide Model

Preliminary Flow Monitoring Locations
Mill Creek Drainage Basin

Figure 8-2

Source: CAGIS


LEGEND:
Monitor
SSO
PSO
CSO
Pump Station
WWTP
Sewer
Trunk Sewer
Sewershed
N
M S D
System Wide Model
Preliminary Flow Monitoring Locations
Little Miami Drainage Basin
Figure 8-3
Source: CAGIS


N
LEGEND:
Monitor
SSO
PSO
CSO
Pump Station
WWTP
Sewer
Trunk Sewer
Sewershed
M S D
System Wide Model
Preliminary Flow Monitoring Locations
Great Miami Drainage Basin
Figure 8-4
Source: CAGIS

A number of sites within the county wide system have been selected as potential sites for permanent monitoring. The permanent sites broadly represent the county wide sewer system, and will provide long-term flow records to recalibrate the model following improvement projects. In addition, the long-term flow data will provide an excellent management tool for MSD to support its system operation. The actual sites will be selected based on the maintenance requirements of the individual monitors during the project monitoring. Other considerations for permanent installations include major tributaries, treatment plant influent lines, downstream location from major replacement/repair projects, and key trunk sewers.

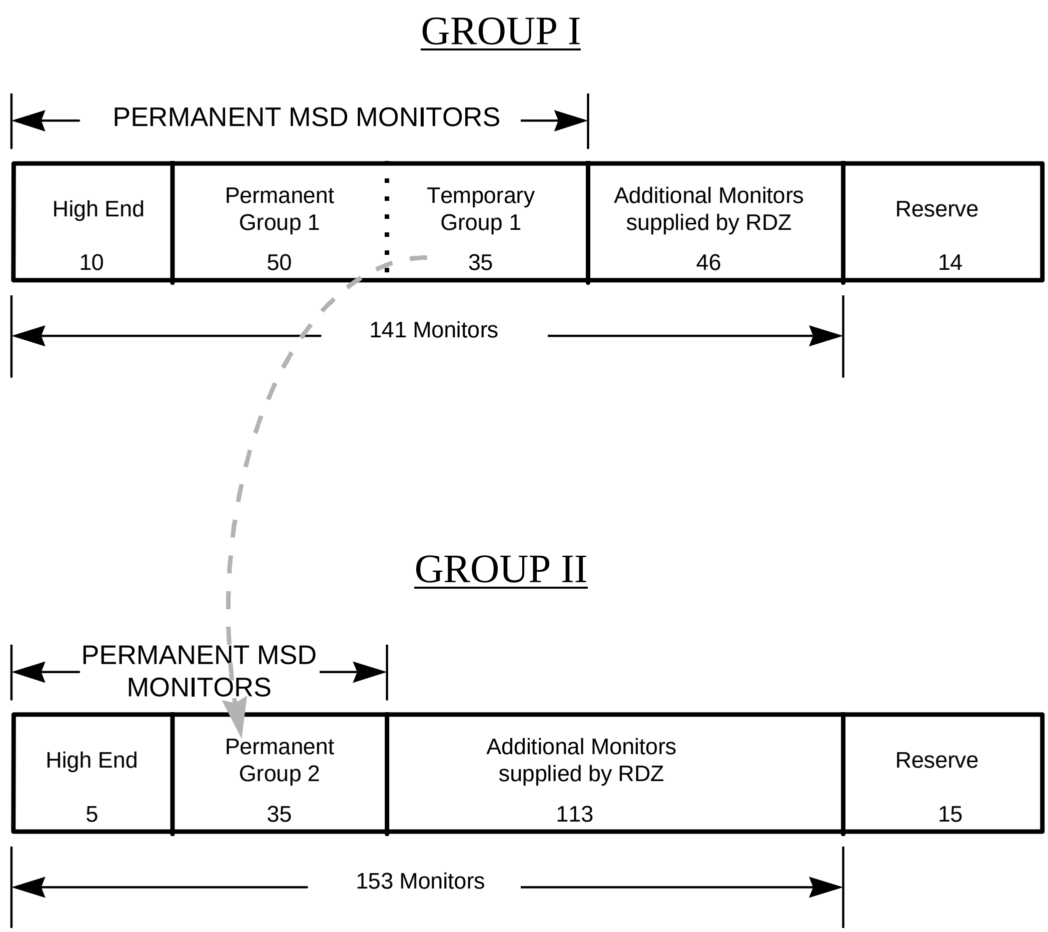


Figure 8-5
Utilization of MSD Permanent Monitors

8.4 High-End Equipment

While the majority of sites in the system will be monitored with small portable flow monitoring equipment, a number of sites have large size pipes or complicated hydraulic conditions. These conditions cannot be adequately monitored by the portable equipment. The term high end will be used to refer to the variety of equipment that is available for these conditions. This equipment includes Accusonic, Badger 5000, Quantum, OCM Pro, OCM, and MGD. To be considered for application as high-end equipment for this project, the equipment must make measurements of the flow at a variety of points across the pipe in two or three dimensions, and from this develop a three dimensional profile of the flow in the pipe. Averaging of the results of multiple sensors, which do not define a profile, will not be considered.

8.5 Site Selection

Prior to field investigations, the detailed sewer maps will be reviewed with MSD staff. In the proximity of each preliminary location, several candidate manholes will be identified. From these candidates a primary manhole will be selected. Detailed field investigation of the primary manhole and the other candidates will yield a single site for each preliminary location. These investigations will include verification of existing flow boundaries, physical inspection of manholes, pump station operation, and any other pertinent items that influence the selection of a specific flow monitoring site. The full site report resulting from the inspection will include various factors discussed below:

Sewer Hydraulics

The flow characteristics in the selected sites must be suitable for accurate flow measurement. The flow patterns in the proximity of the selected manholes must show no evidence of non-uniform flow, which is normally caused by the existence of bends, flow diversions, junction manholes, etc., close to the selected site. In addition, the monitoring sites will avoid areas with sediment or debris, which negatively impacts the flow characteristics. Based on these assessments, the suitability of each flow monitoring location and a recommendation of an appropriate flow monitoring device (from the list included in Section 8.6) to match the site conditions will be made. In some cases, the site's hydraulic suitability will be determined after reviewing the first week's data, and an alternate site will be used for better hydraulic conditions. On a case-by-case basis, MSD field crew will clean sewer segments both upstream and downstream of the candidate sites to provide suitable hydraulic conditions.

Pump Stations

Locating the flow monitors sufficiently upstream of the pump stations will minimize the influence of the backwater from the pump station on the monitors. While modern velocity-area monitors will account for surcharging and backwaters in the flow measurements, their accuracy diminishes under these conditions. Therefore, it is preferable, to the degree possible, to place the monitors several pipe reaches upstream of the pump station, as long as this does not exclude key suspected sources of I/I.

Structural Condition of the Manhole

A selected manhole site must be structurally sound. Visual inspection will confirm the suitability of each site for flow monitor installation.

Access to the Site

The selected manhole location must be easily accessible, for efficient installation of the monitors. Poor access can significantly affect routine maintenance of the flow monitors. Some of the factors to be considered are the amount of traffic, and ease of transporting equipment, if the manhole is located off the street. Each site report will include specific notes on the accessibility of the site.

Other Safety Considerations

The project team realizes the importance of safety issues related to the flow monitoring program. The field investigation will thoroughly evaluate the safety related factors such as presence of hazardous gases, wastewater with high amounts of industrial flow, etc., which may potentially affect the field crew. Of particular concern and note will be whether traffic at a site is suitable for download by a one man crew. The site reports will provide recommendations for every site, with necessary precautions to be taken to avoid potential safety problems.

In some cases, the primary monitoring manhole may not meet the requirements of the selection criteria; consequently, the investigations will continue to check upstream and downstream manholes. The manhole inspection process will be documented in a standard site inspection report. Once the suitable location for each monitoring site is identified, a final site report will be generated that includes the location of the manhole, pipe sizes, flow direction, hydraulic conditions, depth of sediment, traffic conditions, and special notes on the access to the manhole, etc. For some flow monitoring locations that do not meet all the selection criteria and have no substitute manholes, a special monitoring plan will be prepared that includes best access to the manhole, special equipment required to open the manhole for data collection, best time for data collection, whether the manhole is in a busy street, and special safety equipment required.

8.6 Equipment Selection

Portable wastewater flow monitors will be totally self-contained, microprocessor controlled units that measure and record both depth and velocity of flow in the sewer at 5-minute intervals. Each flow measuring site is to be equipped with its own local data logger. The data logger will record depth and velocity (unless level only) readings in order to compute flow and measure surcharge levels. The data logger housing should be made of corrosion resistant materials and must be suitable for installation in a sanitary sewer. The data logger's programs must be non-volatile in case of power disruption. Other features will include: water tight pressurized housing, non-rechargeable alkaline battery power supply with a minimum life of 1 month under normal usage, and capable of storing a minimum 1 month of 5-minute data before overwrite occurs. Field personnel should be able to view collected data and perform diagnostic tests while at the monitoring site. The data logger must meet the following criteria:

1. Activate the transducers in the sensors to make measurements of velocity and level.

2. Store the level and velocity data for 1 month at 5-minute sample intervals.

3. Provide for manual collection with a battery-powered IBM compatible laptop computer.

Software is to be furnished for data collection, storage, flow quantification, capacity analysis, statistical accuracy, and net flow.

The conditions at each site will be evaluated prior to selection of individual monitors. The following models will be considered for use on the System Wide Model.

Portable

1.) ADS 1600
2.) MARSH McBIRNEY 260
3.) NIVUS PCM3
4.) SIGMA 910-970

ADS 1600

Depth is measured by a quad redundant ultrasonic sensor installed at the top of the pipe facing down toward the water surface. The monitor measures the time of travel of a 40 kHz signal from the face of the sensor to the water and back to the sensor. The time of travel is converted to distance by applying the speed of sound in air. The speed of sound in air is adjusted for temperature by one of two temperature sensors located in the ultrasonic sensor head. The dead zone is usually less than 1 inch. Depths down to zero can be measured.

Up to 4 of the 12 sensor pairs are in operation at any moment and the operator can remotely diagnose the operating pairs for strength and quality of signal. The operator can remotely add and remove sensor pairs from operation. When activated for a reading, each pair in turn measures distance 32 successive times for a total of 128 readings. Errant readings from each sensor pair are discarded and 4 depth readings are recorded. The sensors have zero drift but performance is affected by sites with turbulence or waves.

Doppler velocity measurements are made by transmitting an ultrasonic signal upstream and measuring particle velocity, similar to police radar. The sensor receives echoes from the particles and records the frequency shift (velocity) and the strength of each echo. The signal strength from the echo depends on the sixth power of the particle size. Thus, larger particles will provide the majority of the echo received back by the sensor.

The wafer velocity probe (only 0.5 inch high) contains paired transmitting and receiving crystals in a PVC casing. A 250 kHz signal is transmitted from the face of the sensor at an angle of 45 degrees. To convert the received signal to an average velocity uses ADS' third generation velocity technology (V3). V3 technology assumes that the fastest particle in sewage remains constant from moment to moment, regardless of its size. V3 technology measures the velocity of the fastest particle in sewage and converts it to average velocity. The ratio of average to peak velocity is around 0.9 in most sewers, and velocity profiles are used to determine the ratio in unusual flow. A minimum energy is required to separate high frequency noise from the peak velocity. The determination of this minimum affects the value selected as the peak velocity.

MARSH McBIRNEY 260

Depth measurement uses a submerged pressure transducer. One side of the stainless steel diaphragm is exposed to the atmosphere; the other side, submerged beneath the flow, measures both the liquid head and atmospheric pressure. A piezoelectric crystal converts the pressure difference to a voltage that is transmitted to the data logger. Atmospheric pressure is brought to the stainless steel membrane by a plastic tube vented inside the data logger. Moisture is prevented from entering the data logger by a replaceable desiccant. The depth measurement is corrected for velocity-induced depth errors. The depth can be measured down to about one inch.

The electromagnetic velocity transducer operates on the Faraday principle, which states that a conductor moving through a magnetic field produces a voltage that is directly proportional to the velocity of that conductor. A magnetic field is created by the velocity transducer. The voltage produced from the moving fluid is converted to a velocity by the flow monitor electronics. No particles are required in the moving fluid; therefore, this monitor is acceptable in clear water. A 30 hertz signal is used to pulse the electromagnetic field; therefore, 30 velocity measurements are taken each second. Because the strength of the magnetic field and the resulting current response decreases with distance from the surface of the probe, confidence in the raw velocity measurement decreases with flow depth. For deeper flows, it is necessary to determine the relationship between the point velocity measured by the probe and the average velocity. This is accomplished by profiling the flow under both low and high flow conditions.

NIVUS PCM3

Depth measurement uses a ceramic pressure transducer housed within the data logger. A plastic tube brings the submerged pressure to one side of the stainless steel diaphragm; the other side, submerged beneath the flow, measures both the liquid head and atmospheric pressure. A piezoelectric crystal converts the pressure difference to a voltage read by the data logger. Moisture is prevented from entering the data logger by a water repellent membrane. The depth measurement is corrected for temperature-related drift errors. Because the submerged pressure is brought into the data logger, the NIVUS PCM3 clears the tube with compressed air prior to each depth reading. The probe requires no calibration when it is received from the factory. It can be immediately installed in the field. Depth can be measured down to about one inch.

Doppler velocity measurements are made by transmitting an ultrasonic signal upstream and measuring particle velocity, similar to police radar. The sensor receives echoes from the particles and records the frequency shift (velocity) and the strength of each echo. The signal strength from the echo depends on the sixth power of the particle size. Thus, larger particles will provide the majority of the echo received back by the sensor.

The velocity sensor has a hydrodynamic shape and contains paired transmitting and receiving crystals, which transmit the signal at 750 kHz, at an angle of 45 degrees. The PCM3 is a continuous wave Doppler. The returning signal is sampled at different times to provide a measurement of the velocity at different depths. If a portion of the resulting profile of the pipe velocity is not consistent with the remainder of the profile, it is discarded and estimated from a normal profile.

The datalogger comes with onboard display and keypad programming.

SIGMA 910

Depth measurement uses a submerged pressure transducer. One side of the stainless steel diaphragm is exposed to atmospheric pressure; the other side submerged beneath the flow is exposed to both the liquid head and atmospheric pressure. A piezoelectric crystal converts the pressure to a voltage, which is transmitted to the data logger. Atmospheric pressure is brought to the stainless steel membrane by a plastic tube vented near the data logger. Moisture is prevented from entering the tube by a combination of a water repellent membrane and a replaceable desiccant. The depth measurement is corrected for velocity-induced depth errors. Depths can be measured down to about one inch.

Doppler velocity measurements are made by transmitting an ultrasonic signal upstream and measuring particle velocity, similar to police radar. The sensor receives echoes from the particles and records the frequency shift (velocity) and the strength of each echo. The signal strength from the echo depends on the sixth power of the particle size. Thus, larger particles will provide the majority of the echo received back by the sensor.

The velocity sensor contains paired transmitting and receiving crystals utilizing a 1 megahertz ultrasonic Doppler sensor for measurement of average stream velocity. The sensor is approximately 1 inch high. The Doppler signal is directed at 20 degrees upward from the channel bottom. The energy spectrum received back by the sensor is shaped before calculation of the first moment of the distribution, which is recorded as the average velocity. Flow direction is separately obtained by detecting the relative phase difference between the actual transmitted wave and the return signal. Only

Doppler waves exactly 90 degrees out of phase are used to determine flow direction. The 911 is an intrinsically safe version of the 910.

SIGMA 920

This monitor utilizes the same basic technology as the 910, and with upgrades can support two area velocity sensors, an ultrasonic probe, a modem, and AC power.

SIGMA 930

This monitor utilizes the same basic technology as the 910, and with upgrades can support three area velocity sensors, multiple ultrasonic probes, a modem, and AC power. The 940 is an intrinsically safe version of the 930.

SIGMA 950

This monitor utilizes the same basic technology as the 910, and with upgrades can support a modem, AC power, and an onboard display.

High-End Equipment

1. ACCUSONIC
2. BADGER
3. MGD
4. OCM
5. OCM PRO
6. QUANTUM

ACCUSONIC

The water velocity is determined using the multi-path ultrasonic time-of-flight method. The elevation of the water surface above the site datum is called the "Level," and the variable component of this value is input to the flow computer in analog form from one or two sensors, (typically downlooker ultrasonic units or pressure transmitters). A single arbitrated value for Level is obtained from the two inputs. The wetted cross section area is computed from the Level and parameters stored in the computer defining the shape of the conduit. The integration technique for computing the flow from the velocity data is determined automatically from the water level and from the quality of the velocity data.

When the Level is too low for any acoustic paths to operate (or if they are submerged and have failed), flow will be computed using Manning's equation. When the level is higher and ultrasonic paths are operating, a trapezoidal integration method is used. When the conduit is surcharged, either the same integration alogorithum may be used (modified to allow for the friction effect of the top of the conduit), or alternatively the "Pipe" mode may be used. The flow monitor may be configured to provide determinations of flow in up to four separate and dissimilar conduits or "Sections," each with one or two analog Level inputs and a number of acoustic paths. The total number of Level inputs allocated among the Section is limited to 4, and the total number of paths allocated among the Sections is limited to 8.

BADGER 5000

The Badger 5000 measures depth with redundant level detectors. The first is a submerged pressure transducer, the second a non-contact reflective ultrasonic sensor. Velocity is measured by a single acoustic transit time path and a redundant Doppler acoustic velocity sensor.

MGD

A transducer assembly is mounted on the invert of a pipe or channel. Piezoelectric ceramics emit short pulses along narrow acoustic beams pointing in different directions. Echoes of these pulses are backscattered from material suspended in the flow. As this material has motion relative to the transducers, the echoes are Doppler shifted in frequency. Measurement of this frequency enables the calculation of the flow speed. A fifth ceramic mounted in the center of the transducer assembly, and aimed vertically, is used to measure the depth. Depths down to zero cannot be measured.

The ADFM divides the return signal into discrete regular intervals that correspond to different depths in the flow. Velocity is calculated from the frequency shift measured in each interval. The result is a profile, or linear distribution of velocities, along the direction of the beam.

OCM

Depth is measured by an ultrasonic sensor installed at the top of the pipe facing down toward the water surface. The monitor measures the time of travel of an ultrasonic signal from the face of the sensor to the water and back to the sensor. The time of travel is converted to distance by knowing the speed of sound in air. The speed of sound in air is adjusted for temperature sensors located in the ultrasonic sensor head.

Doppler velocity measurements are made by transmitting an ultrasonic signal upstream and measuring particle velocity, similar to police radar. The sensor receives echoes from the particles and records the frequency shift (velocity) and the strength of each echo. The signal strength from the echo depends on the sixth power of the particle size. Thus, larger particles will provide the majority of the echo received back by the sensor.

The velocity sensor has a hydrodynamic shape and contains paired transmitting and receiving crystals, which transmit the signal at either 750 KHz or 2 MHz, depending on the probe model selected, at an angle of 45 degrees. The OCM is a range gated Doppler. The returning signal is sampled at different times to provide a measurement of the velocity at different depths. If a portion of the resulting profile of the pipe velocity is not consistent with the remainder of the profile, it is discarded and estimated from a normal profile.

OCM PRO

The OCM Pro measures depth by a submerged ultrasonic transducer directed vertically upward. The monitor measures the time of travel of an ultrasonic signal from the face of the sensor to the water and back to the sensor. The time of travel is converted to distance by knowing the speed of sound in water. The speed of sound in water is adjusted for temperature. Depths down to zero cannot be measured.

The OCM Pro sends pulsed ultrasonic signals into the liquid that are reflected from the particles in the flow. These reflected signals are then digitized and stored as a pattern. Every point in the flow cross-section is characterized by its own individual reflection pattern. This pattern moves with the flow. The changes in flow velocity between the reception time of the two patterns and the two transmitting pulses is very small, but significant for the small time interval.

This time difference is the measurement for the velocity of flow. With a mathematical correlation method, the velocity of flow can be computed for every point in the vertical profile. With the signal velocity information and the corresponding flow profile, the OCM Pro calculates the velocity profile. A 3-d profile is inferred from the 2-d profile calculated from the average velocity.

QUANTUM

The principles of operation of the Quantum multipath flow monitor are identical to the Accusonic, with the following improvements. The signal from the receiver to the data logger/integrator is transmitted digitally, the frequency of the transmitted signal is adjustable, and the unit has an onboard display.

All level monitors will be ultrasonic. Depth is measured by an ultrasonic sensor installed at the top of the pipe facing down toward the water surface. The monitor measures the time of travel of an ultrasonic signal from the face of the sensor to the water and back to the sensor. The time of travel is converted to distance by applying the speed of sound in air. The speed of sound in air is adjusted for temperature by sensors located in the ultrasonic sensor head.

8.7 Flow Monitoring Procedures and Documentation

Safety Plan

A written field Safety Plan specific to the System Wide Model will be prepared during Phase 2 of the SWM project and submitted to MSD by September 30, 2000. This will include at a minimum a confined space entry (CSE) program, and a site safety program. The Safety Plan will be consistent with all applicable Federal, state, and local regulations for manhole work and CSE.

Site Inspection

Prior to installation of a monitor, the site will be visited and inspected as detailed in Section 8.5. A copy of the Site Inspection Form is provided at the end of Section 8. The essential elements of the site inspection will include:

1. Document traffic conditions and site access;
2. Measure and record level and velocity of normal flow;
3. Inspect pipe and manhole including:
   a. If necessary, measure pipe size in two directions if circular, or detailed measurements of irregular pipes,
   b. Document conditions that affect installation (i.e., grout, roots, condition of bench wall), and
   c. Report evidence of manhole surcharge;
4. Sketch manhole and bench walls;
5. Photograph site, manhole, and pipe.

The site will not be considered approved for installation until the information has been reviewed with the project manager.

Site Record of Calibration and Installation

The flow monitor will be calibrated and installed under the direct supervision of MSD-approved personnel. The monitor will be calibrated according to the manufacturer's recommendations. Proper calibration of the monitors is critical for the success of the flow monitoring program. All details of the calibration will be recorded. All cabling between the probe/band and the data loggers is to be secured tightly to the sewer or manhole walls. The data logger's housing and cabling in the sewer manholes should be installed to minimize restrictions for access to the manholes.

The documentation of the installation process will include:

1. Both the measured level and monitor reported level of flow;
2. Adjustment to level setting of monitor as necessary per manufacturer's recommendations;
3. Location and method of level of flow measurement;
4. Clock position of probe installation;
5. Depth of sediment;
6. Distance upstream of back of probe from butt of pipe;
7. Photograph of completed installation.

The installation will not be considered complete until the written information on the site record and the photographs have been reviewed with the project manager. A copy of the Site Record Form is included at the end of this section.

Maintenance

Comprehensive maintenance procedures will be provided for the flow monitors, sensors, and software. These procedures are designed to minimize monitor downtime and produce reliable data to support the calibration needs of the model. Acquired data will be furnished to MSD in an approved format. Duplicate records will be kept in separate, secure locations to avoid data loss.

The flow monitors will be visited twice weekly. During the first site visit of the week, the flow data will be recovered, the operation of the monitor checked, and the installation inspected. Site visits will include the following activities:

1. Flow data collection.

2. Operation of Monitor—The real time operating status of the monitor will be checked. Level, velocity, signal strength, temperature, and battery voltage (as applicable to the model) will be recorded at the site. Desiccant and batteries will be replaced as required.

3. Installation inspection—The probe and all portions of the band will be visually inspected by descending the manhole or with a remote inspection camera. Prior to any adjustments, the probe / pipe will be photographed. Any misalignment of the probe or attached debris will be corrected. After any work, the probe / pipe will be again photographed.

During the second site visit during the week, the same procedure will be followed, except the data collection will not be performed.

If required by the manufacturer, the permanent flow monitors will be removed and recalibrated annually. Additional maintenance services will consist of scheduled preventative maintenance and repair services, including all parts and labor required to keep the hardware, software and system performance in compliance with this protocol. A copy of the maintenance record forms, including Flowmonitor Download, Detailed Field Record, Flow Monitor Replacement, and Temporary Flow Monitor Removal, are provided at the end of this section. Note that the field forms will be further refined to address all the specific needs during the initial stages of the flow monitoring program.

Removal

At the time of removal, the level will be measured in accordance with the manufacturer's recommendations. The monitor will be cleaned and disinfected prior to storage. A copy of the Removal Form is provided at the end of this section.

8.8 QA/QC

After collection of the first round of data, a depth versus velocity scatter plot will be developed. Based upon a review of the data, it will be determined whether the site has hydraulic characteristics conducive to meeting the objectives of the study. If appropriate, a recommendation will be made to change the monitoring configuration, equipment, or location.

The data obtained weekly will be promptly reviewed. The scattergraph of the data obtained since the last download will be plotted and overlaid on the scattergraph of the previous data. Data problems associated with sensor fouling or drift will be identified and the field maintenance crew alerted for appropriate action. Upon any changes in system hydraulics indicating a need for pipeline maintenance, MSD will be alerted.

8.9 Data Format and Access

Data Processing

The data processing services will consist of the following activities:

1. Submission of two copies of a monthly report, including the maintenance results. The monthly report will identify preventive maintenance and repair services conducted during the month.

2. Weekly meetings with MSD to review previously collected data and system performance.

3. Provision of flow data and maintenance records on a database to facilitate project office use.

The monthly report will include raw data, and total flows plotted and reported using the Continuity Equation. The report will also include depth and velocity scattergraphs, depth and velocity hydrographs, and calibration reports.

Final Report

At the conclusion of the monitoring period, a final report will be prepared with the following information:

1. Executive Summary.
2. Map showing flow monitoring locations.
3. Site Directory and flow schematic.
4. Technical summary including descriptions of equipment, field procedures, calibration procedures, and method of flow quantification.
5. Calibration and field maintenance records

6. Hydrographs of 5-minute flows and rainfall for the entire monitoring period. In addition, daily, weekly, and monthly summaries will be developed.
7. Depth-velocity scattergraphs of all data collected on a monthly basis.
8. Data loss and limitations

Final data will be delivered in hard copy and electronic format.

8.10 Groundwater Data Collection

Groundwater levels will be monitored at up to11 locations throughout the County to provide a sampling of the groundwater levels. The levels will be measured either by a piezometer located adjacent to the bedding of the pipe at the level of the invert, or by surface water elevations during ground water discharge. The sites will be monitored during the same period as the flow monitoring in that area.

These sites will be used to establish the seasonal variation of the groundwater table on a system wide basis. These system wide results can be correlated to monitored infiltration patterns. If the flow monitoring indicates that in certain areas the infiltration pattern varies significantly from the expected seasonal variation, additional groundwater monitoring sites may be selected as necessary.

In addition, a long-term groundwater infiltration study initiated prior to the System Wide Model is being continued under this project. This study will provide useful long-term sewer infiltration data for a four-site pilot study area. These results will be integrated with those of the 11 supplemental sites to characterize groundwater infiltration within the MSD Sewer System.

Site Name: ____________________

Site Inspection Form

Metropolitan Sewer District

of Greater Cincinnati

R.D. Zande & Associates

10560 Ashview Place
Suite 110
Cincinnati, Ohio 45242
(513) 769-5009
(514)

Street Address or Description of Location: ____________________

CAGIS Manhole Number: ____________________

For Field Use

Time: ____________________ Field Supervisor: ____________________

Date: ____/____/____

Manhole Sketch

Site Description

MH Structural Condition:

☐Good ☐Fair ☐Poor

Safety Conditions(hazardous gases,etc):

☐Good ☐Fair ☐Poor

Flow Condition:

☐Suitable ☐Not suitable

Pipe Size:

Horizontal________in

Vertical ________in

Water Velocity: __________ ft\sec

Water Depth:__________ inches

☐ Sediment / Silt Present

Site Access: ☐ Good ☐ Adequate ☐ Inaccessible

Traffic Control required: ☐ **Yes** ☐ **No** Crew Size(People): ☐ One ☐ Two ☐ Three

Site Accepted: ☐ **Yes** ☐ **No**

Comments: ____________________

☐ Site Picture taken ☐ MH Picture taken ☐ Pipe Picture taken

Site Name: ______________________

Site Record of Installation

Metropolitan Sewer District

of Greater Cincinnati

MSD

R.D. Zande & Associates

10560 Ashview Place
Suite 110
Cincinnati, Ohio 45242
(513) 769-5009

Authorized by: ______________________ Date: ____/____/____

Recorder ID Number: ______________________ Probe ID Number: ______________________

Type of Recorder: ______________________

CAGIS Manhole Number: ______________________

Street Address or Description of Location: ______________________

For Field Use

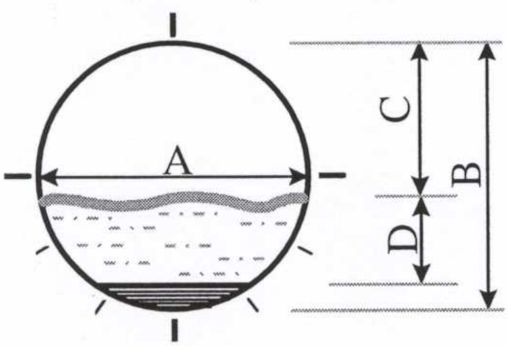
Time: ______________________ Field Supervisor: ______________________

Date: ____/____/____

Measured Depth: __________in.

Monitor reported Depth: __________in.

☐ Depth was adjusted per manufacturer's recommendation.



A	in.
B	in.
C	in.
D	in.

Clock position of probe: __________

Distance upstream of back of probe from butt of pipe: __________in.

Comments: ____

____

____

☐ Pipe picture post installation taken

Site Name: ____________________

Flow Monitor Replacement

Metropolitan Sewer District
of Greater Cincinnati

R.D. Zande & Associates
10560 Ashview Place
Suite 110
Cincinnati, Ohio 45242
(513) 769-5009

Equipment to be Removed

Recorder ID Number: ____________________ Probe ID Number: ____________________

Type of Recorder: ____________________

Equipment to be Installed

Recorder ID Number: ____________________ Probe ID Number: ____________________

Type of Recorder: ____________________

For Field Use

Time: ____________________ Field Supervisor: ____________________

Date: _____/_____/_____

Level Measured: ____________________ in.

Comments: ____________________

Site Name: ______________________

Flow Monitor Removal

Metropolitan Sewer District
of Greater Cincinnati

R.D. Zande & Associates

10560 Ashview Place
Suite 110
Cincinnati, Ohio 45242
(513) 769-5009

Authorized by: ______________________ Date: ____/____/____

Recorder ID Number: ______________________ Probe ID Number: ______________________

Type of Recorder: ______________________

CAGIS Manhole Number: ______________________

Street Address or Description of Location: ______________________

____

For Field Use

Removed

Time: ______________________ Field Supervisor: ______________________

Date: ____/____/____

Comments: ______________________

____

____

____

____

____

☐ Monitor cleaned

☐ Monitor disinfected

Site Name: ____________________

Temporary Flow Monitor Removal

MSD

Metropolitan Sewer District

of Greater Cincinnati

R.D. Zande & Associates

10560 Ashview Place
Suite 110
Cincinnati, Ohio 45242
(513) 769-5009

Authorized by: ____________________ Date: ____/____/____

Recorder ID Number: ____________________ Probe ID Number: ____________________

Type of Recorder: ____________________

Comments: ____

____

For Field Use

Removed

Time: ____________________ Field Supervisor: ____________________

Date: ____/____/____

Comments: ____

____

____

____

____

____

Reinstalled

Time: ____________________ Field Supervisor: ____________________

Date: ____/____/____

Comments: ____

____

____

____

____

____

Biweekly Flow Monitoring Log Sheet

Field Supervisor____________________

Site	Date	Time	Purpose of the Visit	Level Reading Appears OK Y/N - Level	Velocity Reading Appears OK Y/N - ft/sec	Battery OK or Replaced OK/Y - Voltage	Desiccant Replaced	Signal Strength	Measured Level in.	Depth Adjusted Y/N	Photo Taken Y/N
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
				Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										
			Yes / No	Y / N in.	Y / N ft/sec	OK / Y V.	Yes / No			Y / N	Y / N
	Comments:										

Section 9
Precipitation Data Collection and Processing

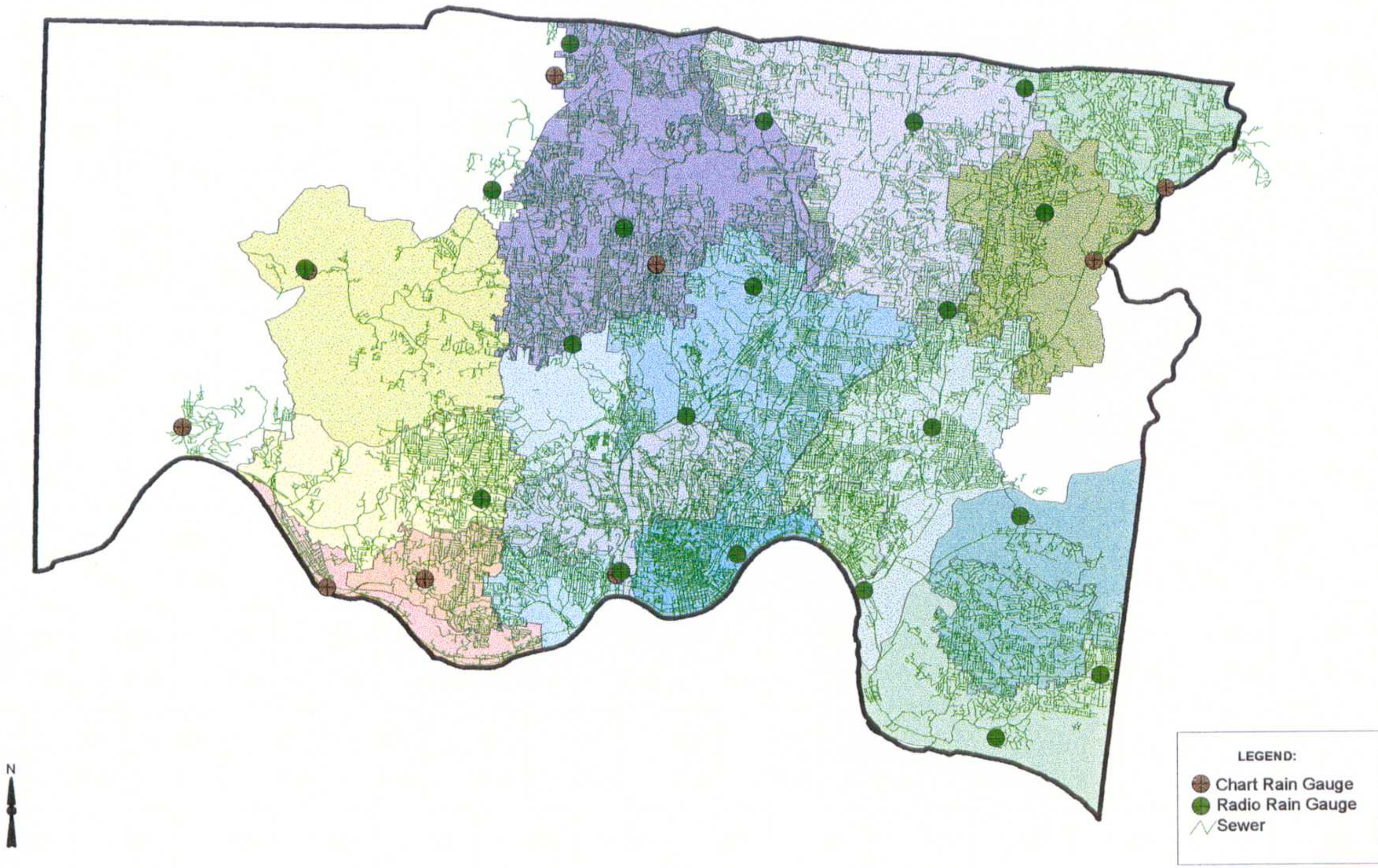
9.1 Precipitation Data Requirements

Precipitation data provide the basic time-variable input to the System Wide Model, and therefore the precision, accuracy, and resolution of these data are of critical importance to the project. Inadequate precipitation data introduce calibration errors, or misrepresent model input, which in turn reduce model accuracy and reliability for simulation of the sewer system.

Precipitation data have historically been provided for sewer modeling by precipitation gauges distributed throughout the many sewer systems that have applied computer models over the past several decades. The accuracy of the precipitation data is typically a function of the equipment, its location, and maintenance. Precision is a function of the type of equipment used. Accuracy and precision are, however, typically much less problematic than resolution when working with precipitation data. It has become widely recognized in recent years that the calibration and application of our ever-more precise sewer models is significantly compromised by limitations on precipitation data resolution. Since it is impractical, if not impossible, to achieve the desired resolution by simply adding additional precipitation gauges, radar technology has recently emerged as a viable means to enhance the spatial coverage of precipitation gauge data.

MSD currently operates 29 rain gauges throughout its service area. **Figure 9-1** depicts the location of existing rain gauges. The rainfall data collected at these locations provide good measurement of rainfall at the point of collection. These measurements, however, do not define the actual rainfall characteristics between the rain gauge locations due to the spatial variability of the rainfall. Accounting for the rainfall spatial variability is important to develop accurate models necessary for identifying proper solutions for issues related to SSOs, CSOs, and flooding. Therefore, the project team will apply the state-of-the-art radar-rainfall technologies to derive rainfall data between gages and obtain catchment-specific rainfall data to support the model calibration.

The radar measurements collected using the National Weather Service's (NWS) NEXRAD (NEXt generation RADar) will provide reliable aerial templates of rainfall at the desired resolution; however, they may not provide data that represent actual ground capture rates. The rain gauges, if installed and maintained properly, provide reliable point estimates of the rainfall reaching the ground surface (i.e., ground capture rates). Combining these two types of rainfall measurement techniques will provide reliable aerial distribution of the rainfall, which is accomplished by calibrating (or ground truthing) radar data using rain gauge measurements.



System Wide Model

Existing Rain Gauge Network

Figure 9-1

Source: CAGIS

Radar-rainfall data application to urban hydrologic modeling is rapidly growing and currently used in a small number of major cities (e.g., Indianapolis, Pittsburgh, Seattle, etc.). Currently, several companies specialize in value-added radar-rainfall services. Note that the raw radar data from NWS can be directly purchased through their authorized vendors. The radar-rainfall companies, however, will obtain this raw data from NWS vendors and provide value-added services such as QA/QC the radar data, obtain and QA/QC the rain gauge data, calibrate the radar data, and deliver the gauge adjusted radar data in desired format. In general, the data will be provided with a spatial resolution of 4kmx4km pixels or finer with a time interval of 1 hour or less. Graphical images and pixel- and/or catchment- specific time series of radar rainfall are the typical data formats.

Two distinct radar-rainfall data requirements must be considered in selecting a specific vendor to support the project:

1. Rainfall data for selected events to develop and calibrate the System Wide Model (SWM) and subsequent model applications

2. Real-time data to support MSD operations

It is essential to identify the appropriate radar-rainfall technology that will provide adequate data (i.e., temporal and spatial variation, ground truthing, etc.) for model calibration as well as the capability to deliver real-time data in a format that MSD operations staff can efficiently use. While the requirements for SWM calibration and application are different than those for MSD collection system operation, it is impractical and inefficient to establish and maintain two different radar-rainfall technologies and vendor service arrangements. Therefore, both needs have been considered together to select a single vendor.

Sections 9.2 and 9.3 provide a detailed description of the evaluation of the radar-rainfall technologies and the selected radar-rainfall service provider.

9.2 Evaluation of Candidate Radar/Rainfall Technologies

The project team, using prior experience with radar-rainfall technology and detailed information provided by the candidate vendors, evaluated four companies that provide value-added radar-rainfall services. These are:

- NexRain Corporation;
- RadHyps;
- RHEA; and
- Vieux and Associates

All the above radar-rainfall data providers obtain data through NWS authorized vendors, process the radar data with site-specific rain gauge data, and deliver the gauge-adjusted radar-rainfall data in one or more desired formats. In addition, these companies also provide raw radar data in near real-time data (i.e., with 5 to 7 minute delays) in several formats.

The fundamental approach used by all four radar-rainfall companies are similar, however, the actual radar and rain gauge data processing, and the end products (spatial and temporal resolution, data accuracy and data formats) varies considerably.

All four radar-rainfall companies provided detailed information on their radar-rainfall services to evaluate their qualifications and capabilities, and to assess how they would meet MSD requirements for both the SWM project and operational support.

The request for information included the following specific tasks to be addressed:

> **Task 1, Review the adequacy of the existing rain gauge network -** This task will require the radar-rainfall provider (Provider) to determine the adequacy of the existing rain gauge network, provide recommendations on any additional rain gauge requirements, and modify or relocate the existing rain gauges to support accurate radar-rainfall data calibration.
>
> **Task 2, Review of NEXRAD facilities and data pertaining to MSD's service area –** In this task the Provider will determine the appropriate NEXRAD site(s) to be used to support the project. A detailed evaluation will be performed to identify the limitation of each radar site and recommendations will be made.
>
> **Task 3, Develop Data Processing Protocol -** The Provider will prepare a detailed data processing protocol detailing the specific procedures to collect the radar-rainfall data and rain gauge data. This protocol will address the specific processes involved in data collection, data QA/QC, specific procedures for calibrating the radar-rainfall data, and data delivery.
>
> **Task 4, Project Setup -** The Provider will perform the initial setup, which will include the geo-referencing between the NEXRAD pixel grid system and the MSD GIS mapping for the service area. In addition, procedures will be developed for deriving the radar-rainfall data for pre-defined drainage areas within the MSD service areas. The Provider will prepare a report on the setup efforts and provide the GIS maps and products developed as part of this task.
>
> **Task 5, Post Processing Data -** The Provider is required to provide the processed radar-rainfall data for selected rainfall events during 2001 through 2003. The number of selected rainfall events will be in the range of 6-20 for this period. The data will be provided for 1-km x 1-km or 2-km x 2-km pixel size at 5 to 15 minute intervals. The Provider should delineate the issues and

describe advantages and disadvantages in using specific pixel and time resolution with respect to the MSD needs for radar-rainfall data. The Provider will obtain the NEXRAD data and the local rain gauge data and perform data processing. In addition, for each data processing effort, the Provider will document the data QA/QC, and any limitation of the source data and ultimately the final radar-rainfall data. Comparison of rain gauge, radar data, and calibrated data (e.g., scatter plots, tables, etc.) will be included in the documentation. The Provider will provide the processed data within 4 weeks of the request. The data will be delivered in both time series (ASCII or spreadsheet) and image format. The images will be provided in ArcView GIS shape file format.

Task 6, Real-time Data - The Provider will provide the uncalibrated radar-rainfall data in real-time at 15 minutes to hourly intervals with a pixel resolution of 4-km x 4-km or less. The data will be delivered in real-time in both time series and image format. The images will be provided in ArcView GIS shape file format. In addition, if not previously performed, on a monthly basis the Provider will calibrate the radar data using the ground rain gauge network and replace the real time data previously provided. The Provider, each data processing month, will document the data QA/QC, and any limitation of the source data and ultimately the final radar-rainfall data. Comparison of rain gauge and radar data (e.g., scatter plots, tables, etc.) will be included in the documentation.

Task 7, As-Needed NEXRAD Data - The Provider, on an as-needed basis, will provide the radar images and rainfall estimates for storm events of interest within one week of the request. The data should be at 15 minute to hourly intervals with a pixel resolution of 4-km x 4- km or less. In addition, the Provider will provide calibrated radar-rainfall data within the month of the request date. Documentation related to data processing is required as described in Task 6.

The project team received information from all four radar-rainfall providers in response to the above specific tasks. These responses were used to assess their ability to adequately address the radar-rainfall requirements outlined in Section 9.1. Note that Tasks 1 through 4 are related to both the radar-rainfall requirements (i.e., model calibration and operations). Task 5 is required for the System Wide Model. Finally, Tasks 6 and 7 are related to MSD operations

The following criteria were used to assess the capabilities of the radar-rainfall providers:

Technical Aspects

1. NEXRAD data products proposed for the project.

2. Knowledge of rain gauge network setup.

3. Techniques that will be applied to calibrate the radar data using the ground gauge data.

4. Spatial and temporal resolution of the radar-rainfall data both in real-time and post processed.

5. Delivery of real time data in both time series and images in GIS format.

6. Deliverable format for post -processed data (ASCII, spreadsheets, GIS shape files, etc.).

7. Overall data quality in relation to the project goals.

Other Aspects

1. The experience and quality of the Contractor will be assessed based on the experience and knowledge gained working with NEXRAD data, rain gauges, and hydrologic and hydraulic modeling.

2. Proposed key project personnel and their experience in the areas of project management and customer service, technical analysis, and data processing.

3. Experience with hydrological and hydraulic modeling applications and related client references.

4. Cost of services for the defined tasks.

9.3 Selected Radar-Rainfall Technology

The project team reviewed the information provided by the radar-rainfall companies using the criteria listed in Section 9.2. Based on this review, the project team selected Vieux and Associates (VAI) to provide radar-rainfall data for model development, as well as to support MSD operations. The project team determined the overall services offered by VAI would best meet MSD requirements. This selection was based on the following factors:

- VAI demonstrated exceptional knowledge of the NEXRAD system and its operation, which is critical for developing accurate radar rainfall data for the project. One of the key project team members proposed by VAI was involved in a number of research projects related to NEXRAD and is thoroughly familiar with NEXRAD current and future operations, and radar data products. In addition, VAI demonstrated their ability to provide more reliable radar rainfall data to calibrate MSD rain gauges.

- VAI demonstrated their understanding of the rain gauge data requirements for accurate radar-rainfall processing. They proposed experienced field personnel to perform detailed investigation of MSD rain gauge network, and to recommend improvements. Accurate rain gauge data is critical to properly calibrate radar-rainfall data.

- VAI services provide radar-rainfall data with adequate spatial and temporal resolution to calibrate the model (1kmx1km at 5-minute time interval) as well as support MSD operations (4kmx4km at 1-hr time step in real-time).

- VAI provides the radar-rainfall images and data in ArcView GIS shape file format. This will allow a cross-section of MSD staff to use this data efficiently without learning a new data management system

- VAI's proposed services and cost would result in maximum benefits (products and services) to MSD in return for funds expended.

9.4 Assessment of Existing Rain Gauge Network

The location and performance of the individual rain gauges, depicted in **Figure 9-1**, will be thoroughly reviewed by VAI using qualified personnel under the direction of CDM. As part of this review, VAI will evaluate items such as rain gauge spatial distribution, number of gauges, gauge siting, and other relevant factors that impact the radar-rainfall data processing. VAI will also have qualified professionals visit each existing rain gauge site to assess and document site conditions (possible obstructions from trees and buildings, wind effects created by surrounding buildings, etc.) that may adversely affect accurate rainfall measurements. Detailed performance testing will be conducted for each rain gauge. A technical memorandum will be prepared that will include an assessment of the existing rain gauge network and will discuss further any refinement/enhancement necessary to the existing rain gauge network with respect to gauge siting; spatial coverage and number of gauges; and other relevant changes that will support accurate processing of the radar-rainfall data. The project team will coordinate the rain gauge evaluation efforts with MSD staff who maintain and operate the rain gauges.

9.5 GIS Integration

The radar-rainfall data will be fully integrated into the MSD GIS system. As part of the radar-rainfall services, VAI will geo-process the radar-rainfall pixels to derive rainfall data for catchment-specific rainfall data to support model development and calibration. In addition, VAI will provide the radar data, in near real-time, in the GIS shape file format to support MSD operations.

9.6 Website Data Deployment

The radar rainfall data used for the model simulations will be stored on the project office intranet site. In addition, this data can be made available for access from MSD intranet and internet sites for distribution to support other MSD projects and operations.

Section 10
Project Coordination and Schedule

This section of the Project Work Plan defines the guidelines for project coordination between MSD and consultant staff members and various external entities that are involved. Routine project coordination procedures—including communication, documentation, project status meetings, etc.—are described.

10.1 Project Team Organization and Communication

The key project team members are identified below on **Table 10-1** (MSD) and **Table 10-2** (Consultant Team).

Table 10-1
MSD Project Staff

Person	Role
Susan Moisio	Project Manager
Steve Donovan	Technical Manager
Lori Lang	Project office information technology support

Other MSD staff with whom communication will occasionally be required, but who are not directly part of the project team include:

Patrick Karney	Director
Robert Campbell	Deputy Director
Steve Minges	Superintendent, Wastewater Collection
Tony Huang	Chief Sewers Engineer
Pete Schneider	Superintendent, Wastewater Treatment
Barbara George	Information technology (IT) manager
Dale Oppenheimer	Mapping and CAGIS data manager

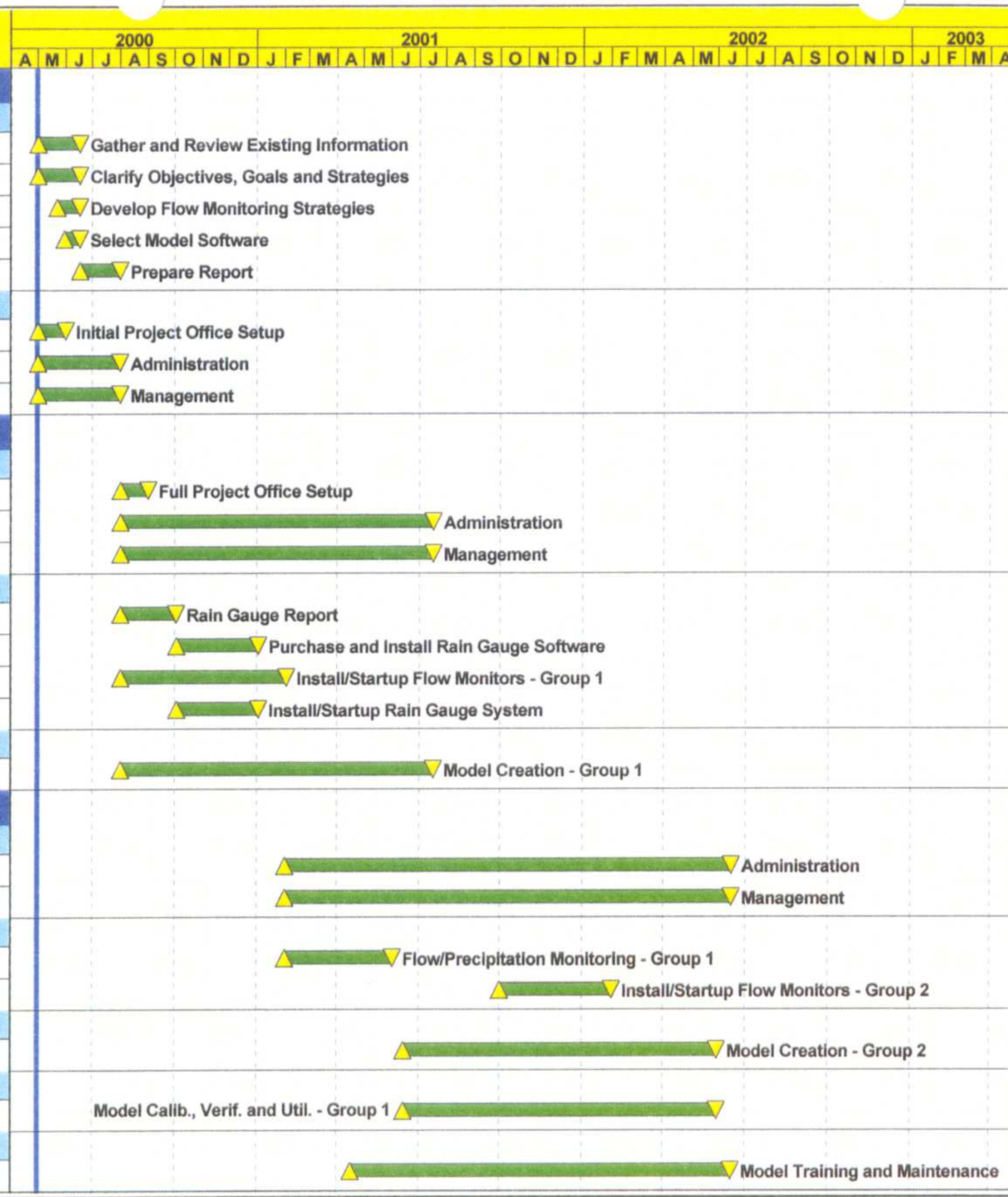
In many cases, the above individuals may designate staff who will be involved with the project team on their behalf.

Table 10-2
Consultant Team Project Staff

Person (Firm)	Role
Ted Burgess (CDM)	Project Manager
Srini Vallabhaneni (CDM)	Modeling Task Leader
John Barton (RDZ)	Flow Monitoring Task Leader
Jesper Kjelds (DHI)	Model Enhancement/Support Task Leader
Harry McCullum	Contract Administration (invoicing)

All communication between MSD and the consulting team regarding project direction, technical matters, financial matters, staffing, office administration or other issues will be directed through the Project Managers (Ms. Moisio and Mr. Burgess).

Task	Activity Description	Early Start	Early Finish
Phase 1			
Project Work Plan			
A-1	Gather and Review Existing Information	01MAY00	16JUN00
A-2	Clarify Objectives, Goals and Strategies	01MAY00	16JUN00
A-3	Develop Flow Monitoring Strategies	22MAY00	16JUN00
A-4	Select Model Software	29MAY00	16JUN00
A-5	Prepare Report	16JUN00	31JUL00
Project Administration and Management			
B-1	Initial Project Office Setup	01MAY00	31MAY00
B-2	Administration	01MAY00	31JUL00
B-3	Management	01MAY00	31JUL00
Phase 2			
Project Administration and Management			
B-1	Full Project Office Setup	01AUG00	31AUG00
B-2	Administration	01AUG00	16JUL01
B-3	Management	01AUG00	16JUL01
Flow, Rainfall and Groundwater Data Collection			
C-1	Rain Gauge Report	01AUG00	02OCT00
C-2	Purchase and Install Rain Gauge Software	02OCT00	01JAN01
C-5	Install/Startup Flow Monitors - Group 1	01AUG00	01FEB01
C-6	Install/Startup Rain Gauge System	02OCT00	01JAN01
Model Creation			
D	Model Creation - Group 1	01AUG00	16JUL01
Phase 3			
Project Administration and Management			
B-2	Administration	01FEB01	14JUN02
B-3	Management	01FEB01	14JUN02
Flow, Rainfall and Groundwater Data Collection			
C-4	Flow/Precipitation Monitoring - Group 1	01FEB01	01JUN01
C-5	Install/Startup Flow Monitors - Group 2	01OCT01	01FEB02
Model Creation			
D	Model Creation - Group 2	15JUN01	31MAY02
Model Calibration, Verification and Utilization			
E	Model Calib., Verif. and Util. - Group 1	15JUN01	31MAY02
Model Training and Maintenance			
F	Model Training and Maintenance	16APR01	14JUN02



Start Date	01MAY00
Finish Date	01APR03
Data Date	01MAY00
Run Date	12JUN00 17:27

Early Bar
Progress Bar

MSD2

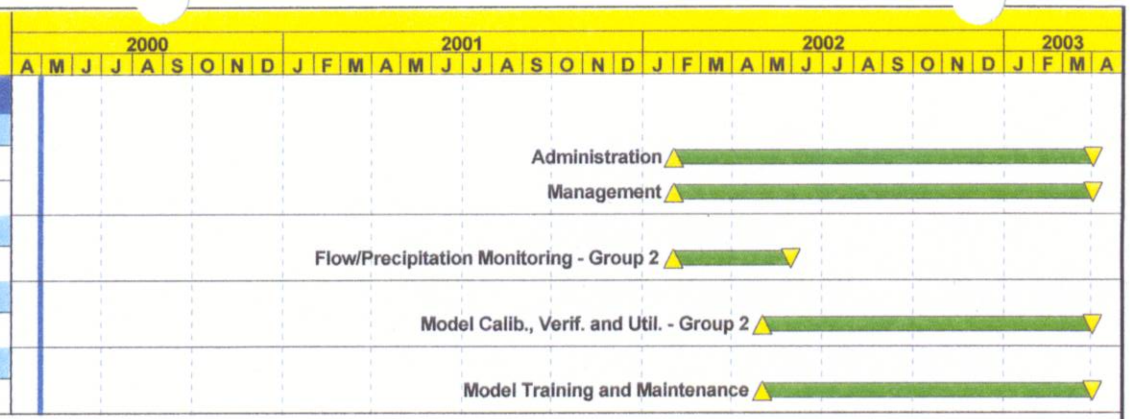
Sheet 1 of 2

Cincinnati MSD System Wide Model Project Schedule

Figure 10-1

CDM Camp Dresser & McKee

Task	Activity Description	Early Start	Early Finish
Phase 4			
Project Administration and Management			
B-2	Administration	01FEB02	01APR03
B-3	Management	01FEB02	01APR03
Flow, Rainfall and Groundwater Data Collection			
	Flow/Precipitation Monitoring - Group 2	01FEB02	31MAY02
Model Calibration, Verification and Utilization			
	Model Calib., Verif. and Util. - Group 2	01MAY02	01APR03
Model Training and Maintenance			
	Model Training and Maintenance	01MAY02	01APR03



Coordination of routine project activities will be addressed at weekly status meetings. These meetings are currently conducted each week on Monday morning; a weekly project status meeting schedule will be maintained throughout the project. These meetings include all project staff (both MSD and consultant team) and enable coordination between the project managers and staff.

Copies of all written correspondence generated during the project, including technical memoranda, correspondence, invoices and meeting minutes will be placed in the project files maintained at the project office. Digital copies of all material generated by the project staff will also be maintained on the project office computer network (to be installed during Phase 2).

10.2 Project Schedule

The following schedule has been developed for the project.

Phase 1	**Scheduled Completion Date**
Establishment of Project Office	Completed May 26, 2000
Project Work Plan - Draft Report	Completed July 5, 2000
Project Work Plan - Final Report	July 31, 2000
Phase 2	
Procure/Install computer hardware/software	August 31, 2000
Rain Gauge System Report	October 2, 2000
Rain Gauge System Operable	January 1, 2001
Flow Monitoring Task Order(s) issued	August 15, 2000
Model Development for Group I Sewersheds	July 16, 2001
Flow Monitoring Set up Group I Sewer Sheds	February 1, 2001
Phase 3	
Model Development for Group II	May 31, 2002
Flow Monitoring Time Frames for Group I	February 1 through June 1, 2001
Flow Monitoring Set up for Group II Sewer Sheds	February 1, 2002
Model Calibration, Validation, MSD Acceptance and Training for Group I Sewer Sheds	May 31, 2002
Phase 4	
Model Calibration, Validation, MSD Acceptance and Training for Group II Sewer Sheds	April 1, 2003
Flow Monitoring Time Frames for Group II	February 1 through June 1, 2002
Draft Final Report	March 1, 2003
Final Report	April 1, 2003

Group I sewersheds are those sewersheds within the Mill Creek WWTP service area. Group II sewersheds are all other sewersheds within the project area for the System Wide Model.

The project schedule is depicted in Gantt chart format on **Figure 10-1**.

10.3 Coordination with External Stakeholders

10.3.1 Organization-Wide Model Integration at MSD

Project workshops will be conducted on a regular basis with MSD staff, to include representatives from the Wastewater Engineering, Collection, Industrial Waste and Treatment divisions of MSD. The purpose of these workshops is to help foster integration of the SWM across the MSD organization. In addition to an initial kickoff workshop, routine progress workshops with MSD staff will be convened on a quarterly basis throughout the project to review and discuss SWM project objectives, progress and current status. Additional workshops toward the conclusion of the project may be used to ensure comprehensive understanding of the model throughout the MSD organization. These workshops will supplement monthly workshops with the core MSD SWM user group.

The project will develop and maintain an intranet site which key MSD staff (with password-protected authorization) can access to review working documents, GIS maps, model results and other information during the project. Additionally, a project internet site (with open access) is currently being developed and will be maintained for general distribution of information about the project.

10.3.2 Kickoff Workshop with MSD Stakeholders

A kickoff workshop for the project has been scheduled for August 1, 2000. This workshop will provide an opportunity for MSD staff across the organization to understand the project objectives, scope, schedule and work plan.

10.3.3 Public Advisory Committee

Hamilton County's Public Advisory Committee (PAC) will serve as an outside review group for the SWM. The project team will review and discuss project objectives, progress and current status with this group on a regular basis. Meeting schedules and agendas will be developed with the PAC as the project proceeds.

10.3.4 Technical Review Committee

A Technical Review Committee (TRC) has been established for the project. The TRC is composed of three of CDM's most senior sewer modeling experts. This TRC team is scheduled to meet during the week of July 17, 2000 to review this draft Work Plan. Foremost among the review will be model development strategy. During the project, the TRC will be consulted on an ad-hoc basis to address project issues- especially unique model development situations- and provide feedback on the project. Formal TRC meetings will also be convened during the Group I and Group II model calibration periods to review interim calibration results and assist the project team in finalizing the calibrations.

10.3.5 Regulatory Agency Interaction

It is expected that the project team will meet with representatives of interested and appropriate regulatory agencies (i.e. OEPA, US EPA Region 5) occasionally during the project to brief these agencies on the progress of the project. An initial meeting or meetings during the early stages of the project, to brief these agencies on project startup, is planned. Depending on the level of interest at these agencies, regular briefings on progress may be scheduled by MSD management during the project.

10.3.6 Community Outreach

A number of entities within the community may be interested in the project and its progress and results. These entities include: other City departments, Hamilton County officials, other local agencies (e.g. the cities of Madeira, Wyoming, etc.), ORSANCO, and the news media. CDM staff will work with MSD public relations staff to develop brochures, internet site content, press releases, special presentations and other forms of outreach and information dissemination to the community. MSD management may also elect to establish formal presentations of the project to other City departments, Hamilton County officials, and other local agencies.

Model and Data Collection Work Plan Addendum.

This Addendum was prepared in response to comments raised by USEPA/Ohio EPA, is incorporated as part of the Model and Data Collection Work Plan and is enforceable as part of the Interim Partial Consent Decree on Sanitary Sewer Overflows.

1. The MSDGC is fully committed to the development of all four phases of the System Wide Model Project and intends to meet the following schedule as long as the necessary rainfall is received:

   Phase One – May 1, 2000 – July 28, 2000
   Phase Two – August 9, 2000 – August 4, 2001
   Phase Three – February 1, 2001 – January 31, 2002
   Phase Four – February 1, 2002 – April 1, 2003

2. The MSDGC will address SSOs on sewers smaller than 12” in diameter through local sewer models. These local sewer models will be incorporated into the SWM.

3. MSDGC will site 15 additional rain gauges, four of which have been sited and are listed below:
   - 11864 Chesterdale Rd.
   - 5923 Wintonridge
   - 2126 Madison @ Grandin Springer School
   - Polk Run WWTP

   Four additional sites are planned to be located in the Little Miami watershed and seven additional sites are planned to be located in the Great Miami watershed.

4. The descriptions of the four groundwater monitoring instrumented manholes on Sewer No. 3 that were used to directly monitor groundwater are:

   - Manhole Number 30208013 Catalpa and Sundale
   - Manhole Number 30201005 Catalpa and Emerson
   - Manhole Number 27913006 Betts and Innes
   - Manhole Number 27913011 Betts and Innes

5. Groundwater infiltration (GWI) flow is established using water consumption data obtained for the winter months flow. The assumption is made that 90% of the water used is returned to the sewer. This information is then compared to the flow monitoring data and a Groundwater Infiltration rate is obtained.

6. The primary goal for the flow monitoring program is to measure flow in separate and combined sewers in response to a range of storm events, in a manner that will provide an accurate basis for calibrating and verifying the System Wide Model and adequately support the development of a Capacity Assessment Plan, Capacity Assessment Report and Capacity Assurance Program Plan.

7. Adequate numbers of independent storms will be used for calibration and verification. The exact number will be established as the project proceeds, to account for event-specific characteristics (e.g. spatial variability, intensity, duration, magnitude of sewer response, etc.). Each of the roughly 300 monitored locations will serve as a calibration point in the model. Calibrations to observed data at these locations will be tailored to specific needs of both the combined and separate sewershed models, as these sewer systems function very differently (even if the response appears similar) and the model representation of the respective areas is consequently very different.

   Factors considered during selection of appropriate storms for calibration and verification include the spatial variability relative to storm volume/duration/intensity, antecedent moisture conditions, nature and magnitude of the sewer response, quality of flow/precipitation/radar data available, specific parameters of concern and modeling objectives.

   The models will be regarded as successfully calibrated when the verification results show observed-simulated agreement to within generally accepted standards for sewer network models. The model performance characteristics of interest that will be evaluated for observed-simulated agreement in assessing model calibration include: average dry-weather flow rate, peak dry-weather flow rate, and a range of wet-weather characteristics. Wet-weather characteristics to be evaluated for the selected events include: total event volume, peak flow rate, time to peak flow rate, peak hydraulic grade line elevation and general hydrograph shape.

8. The MSDGC will extend the data collection period as necessary to acquire adequate data if rainfall in the initial four month data collection period is not sufficient.

9. MSDGC follows the manufacturer's recommendations on proper maintenance and calibration of the flow monitoring equipment as weather permits. During the SWM Project (Model Building, Data Collection and Model Calibration/Verification) some monitor site conditions have required MSDGC to adopt more intensive maintenance activities, which go beyond the manufacturer's recommendations. For example:

   - Twice weekly inspections are conducted at sites observed to have potential sensor fouling or drifting problems. Weekly inspections are conducted for the sites with a history of reliable meter performance.
   - Regular site checks involve a number of activities, including real time depth and velocity checks, photographs documenting meter installation, battery checks, etc. This work is accomplished above ground.
   - Twice-monthly depth measurements/checks are being made. This work includes diving the manhole and measuring the depth.

   Weekly inspections would not include the depth measurements only the depth checks. A depth check is made by looking at the data above ground either with a laptop computer or at the meter itself. A depth measurement is made by entering the manhole.

10. Calibration, routine maintenance and Q/A field checks of rain gauges and GW monitoring equipment are as follows:

    a. Rain Gauges will be maintained according to manufacturer's recommendations.

    b. Groundwater monitoring equipment is calibrated prior to shipment by the manufacturer. The monitoring equipment is checked to make sure there is enough voltage in the batteries and to check the condition of the desiccant before each reading.

11. Q/A review procedures for flow, rainfall and GW data are as follow:

    a. Flow Q/A
    During data download in the field, the current readings are checked to ensure there are readings for all meter channels, e.g. level, velocity, etc. and verified to be within a range of measurements that would be valid for that site.

    The battery voltage is checked to ensure sufficient life exists to power the meter until the next scheduled download visit.

    The data is loaded into a spreadsheet where monthly "flow hydrographs", "level and velocity hydrographs", and "level vs. velocity scatter graphs" are generated. From these graphs it is observed, on a weekly basis, whether there are data gaps, channel loss, or reading drift. Additionally, it can be observed whether a possible obstruction exists in the system near the meter. If potential problems are observed, the field crew is alerted and a site check is performed to clean the probe, clean the sewer, adjust the meter depth to match the observed depth, or in the worst case, replace the meter.

    b. Rainfall Q/A
    Because most of the gauges are radio reporting, communication problems will be observed immediately if the receiving system does not receive a daily transmission, even in dry weather. In addition to inputting the rainfall data into the hydraulic model, which may alert us to potential problems due to inconsistent calibration parameters, daily totals for a month are input into a spreadsheet for easy access and Q/A checks.

    It is observed whether a gauge underreports or doesn't report any rainfall relative to other gauges in the proximity. When potential problems are observed, the field crew is alerted to perform a service visit to the gauge site.

    c. Groundwater Monitoring
    The piezometers are installed in the ground and cannot be checked once they are installed.

12. The Model and Data Collection Project will result in the collection of all necessary additional data, and the development of models that, together, will allow for the development of a Capacity Assessment Plan, Capacity Assessment Report and Capacity Assurance Program Plan in accordance with Paragraphs VII.[C] - [E] of the Interim Partial Consent Decree on Sanitary Sewer Overflows entered into between the United States, the State of Ohio, the Board of County Commissioners of Hamilton County, Ohio and the City of Cincinnati.

13. A flow monitoring protocol must be developed and implemented to ensure that adequate data are collected to allow for model calibration and verification. The data also must be adequate to allow for development of a Capacity Assessment Plan, Capacity Assessment Report and Capacity Assurance Program Plan in accordance with Paragraphs VII.[C] - [E] of the Interim Partial Consent Decree on Sanitary Sewer Overflows entered into between the United States, the State of Ohio, the Board of County Commissioners of Hamilton County, Ohio and the City of Cincinnati.

14. Precipitation data must be collected and processed in a manner that best supports model calibration and verification. The data also will be used in developing a Capacity Assessment Plan, Capacity Assessment Report and Capacity Assurance Program Plan in accordance with Paragraphs VII.[C] - [E] of the Interim Partial Consent Decree on Sanitary Sewer Overflows entered into between the United States, the State of Ohio, the Board of County Commissioners of Hamilton County, Ohio and the City of Cincinnati.

15. Frequency and volume analysis for characterization and planning evaluations (e.g., average annual SSO frequency, SSO discharge volumes, etc.) as needed to support the development of a Capacity Assessment Plan, Capacity Assessment Report and Capacity Assurance Program Plan will be developed.

16. Hydraulic routing refers to the computation of time varying flow rates and depths through the modeled sewer network in response to the input hydrographs.

17. An assessment of the adequacy of the collected data for calibrating and verifying the System Wide Model and for supporting the development of a Capacity Assessment Plan, Capacity Assessment Report and Capacity Assurance Program Plan will be included in the final report.

18. The final report will be delivered in hard copy to U.S. EPA and OEPA February 29, 2004.

19. MSDGC will provide USEPA and OEPA the locations of the temporary flow monitoring sites and the existing and proposed permanent flow monitoring, groundwater, and rain gauges 30 days after the lodging of the Consent Decree.

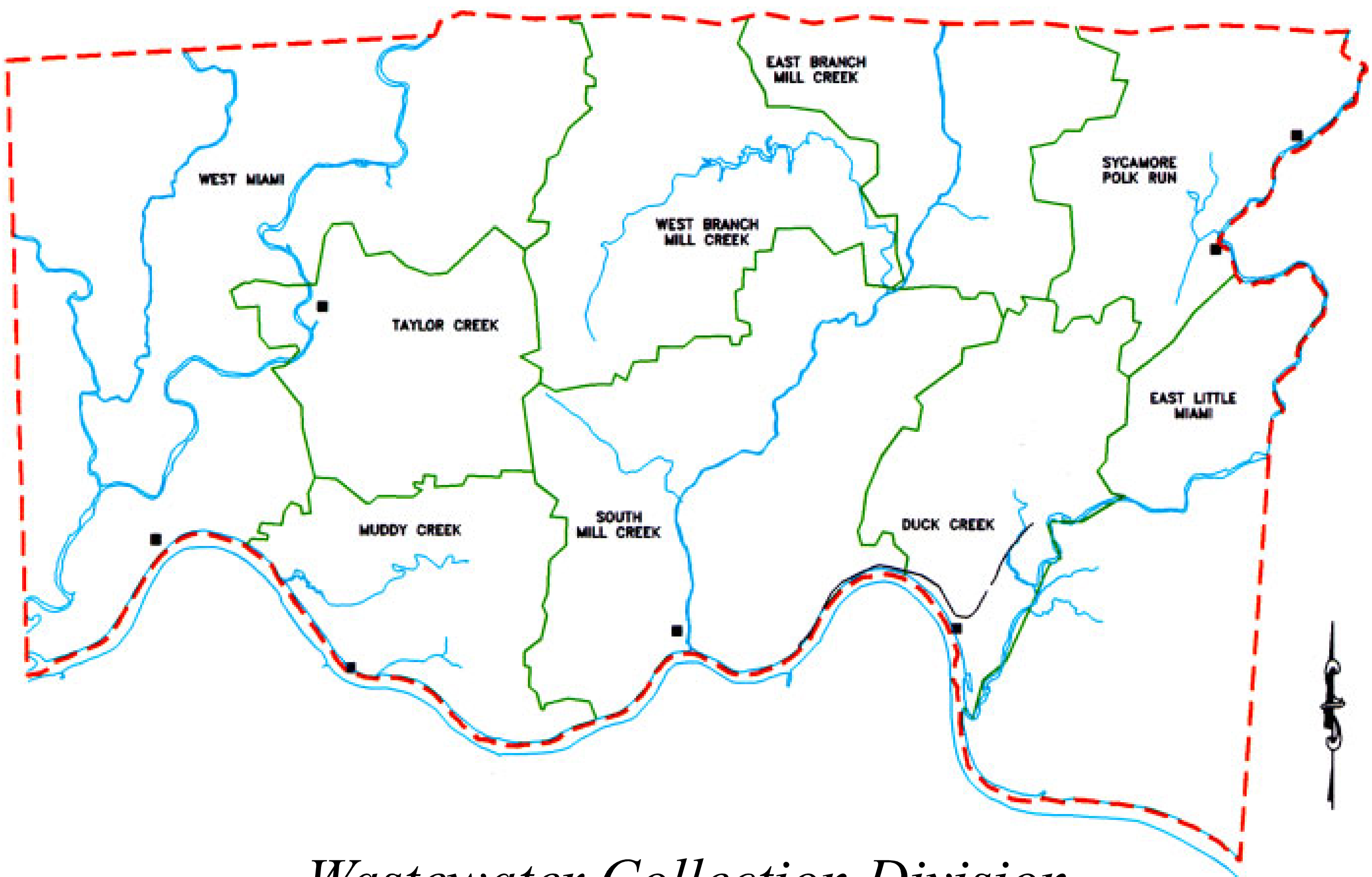
    The detailed maps and schematics showing all major Sewer System components (effectively the portion of the system modeled) will be submitted on February 29, 2004.

    MSDGC will notify U.S. EPA and Ohio EPA on an annual basis of any changes in locations of any permanent monitoring locations that MSDGC has made and describe the reasons for the changes in a report submitted pursuant to Paragraph IX.C of the consent decree.

EXHIBIT 5

Metropolitan Sewer District
of
Greater Cincinnati

SSO MONITORING & REPORTING PLAN



Wastewater Collection Division

R.D. Zande & Associates

DECEMBER 1999

REVISED FEBRUARY 2002

MSD

SSO MONITORING AND REPORTING PLAN

DECEMBER 1999
(REVISED February 2002)

Prepared for

The Metropolitan Sewer District

of

Greater Cincinnati

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1.0 Introduction

The Sanitary Sewer Overflow (SSO) Monitoring and Reporting Plan is an operational document that describes the procedures taken by the Metropolitan Sewer District of Greater Cincinnati (MSD) in reporting of all field-verified SSOs and the monitoring of wet weather "Enumerated SSO Locations." The monitoring of "Enumerated SSO Locations was initiated in compliance with the Ohio Environmental Protection Agency (OEPA) Director's Final Findings and Orders (DFFO's), issued September 22, 1992. Monitoring and reporting of SSO activity was described in the Findings and Orders as follows:

> Until discharges from all overflow points in MSD's separate sanitary sewers and interceptors are eliminated, the Board of County Commissioners shall comply with the monitoring and reporting requirements given in the attachment to the DFFO's.

The attachment to the DFFO's included a list of 34 known SSO locations and the requirement that any additional overflow points subsequently identified in MSD's separate sanitary sewers and interceptors shall be monitored. Monitoring was to be conducted in accordance with the following table and reported as required below.

CHARACTERISTIC			MONITORING REQUIREMENTS	
Reporting Code	Units	Parameter	Measurement Frequency	Sample Types
80990	No./Mo.	Occurrences	When Discharging	Estimate

For days when there are no overflow discharges, an explanation of "No Discharge" shall be entered in the additional remarks section. Also, on such days Zero should be reported for occurrences, duration and flow.

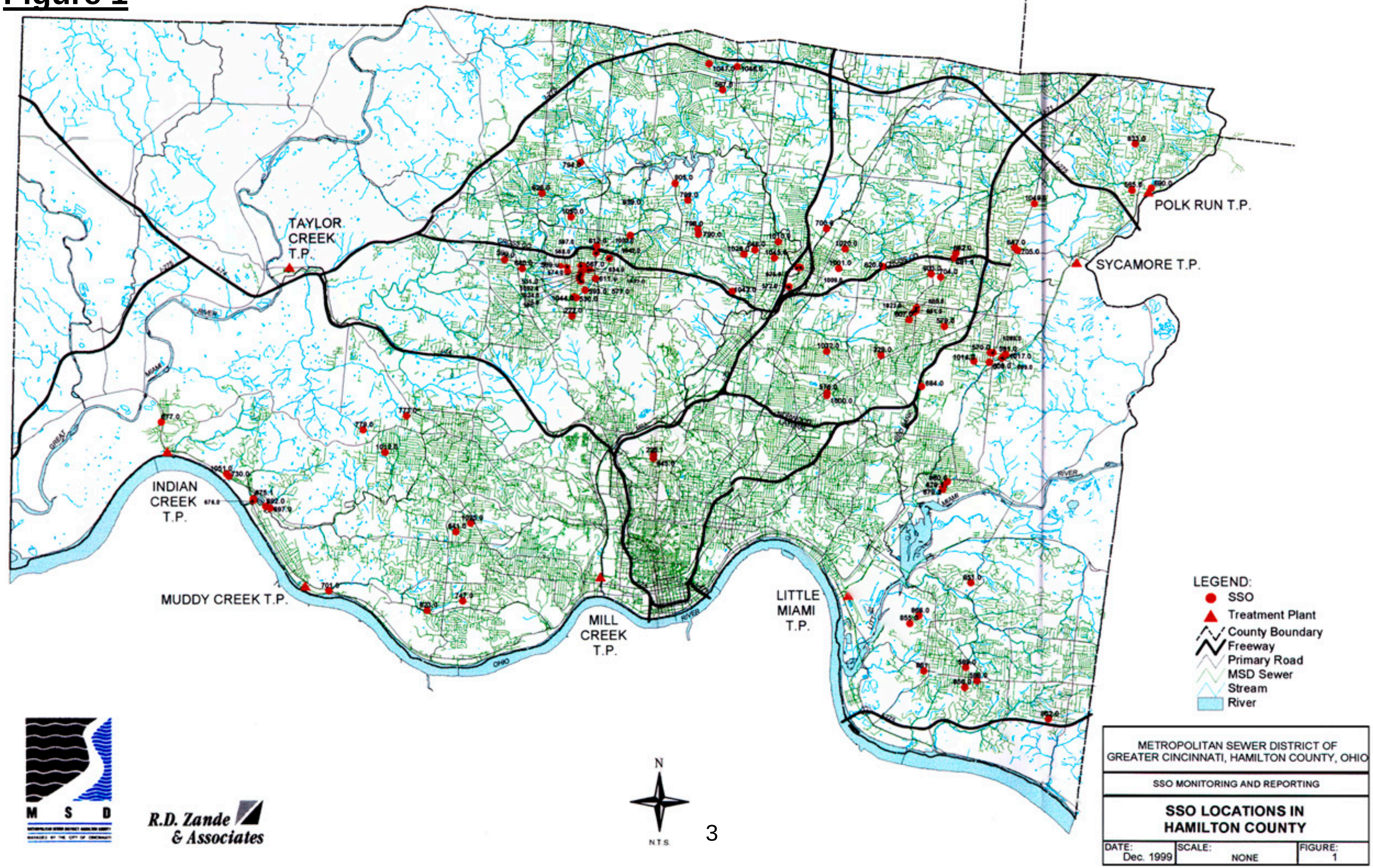
Notification and reporting of SSOs to USEPA, OEPA and the Hamilton County and/or local health department will be described in Section 4.0 of this document.

The SSO monitoring and reporting program has been in operation since the issuance of the Findings and Orders and is managed by the Wastewater Collection Division of MSD.

This plan will be subject to modification by the Director of MSD to account for changes in circumstances such as changes in the configuration of MSD facilities, the purchase of new equipment, changes in regulatory requirements, the development of new technologies, or changes in industry standards/best management practices.

Since inception of the monitoring program, the list of known SSO locations has been updated to include all known SSO points in the MSD service area. These revisions have included removal of SSO points eliminated from the system and the addition of new SSO locations that have been identified. The current list of known SSO locations included in the monitoring plan are identified in Table 1 (see pp. 7-9) and shown in Figure 1.

Figure 1


TAYLOR CREEK T.P.
POLK RUN T.P.
SYCAMORE T.P.
INDIAN CREEK T.P.
MUDDY CREEK T.P.
MILL CREEK T.P.
LITTLE MIAMI T.P.
LEGEND:
SSO
Treatment Plant
County Boundary
Freeway
Primary Road
MSD Sewer
Stream
River
METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI, HAMILTON COUNTY, OHIO
SSO MONITORING AND REPORTING
SSO LOCATIONS IN HAMILTON COUNTY
DATE: Dec. 1999
SCALE: NONE
FIGURE: 1
M S D
R.D. Zande & Associates
N
N.T.S.

2.0 Background and Monitoring Methodology

With few changes, the monitoring program employed at the onset of the program is still utilized. Although the monitoring methods only provide ”yes/no” information on discharge occurrences, MSD continues this approach for two primary reasons.

1. Current methodology is relatively reliable and can be performed at a reasonable cost to the District.

2. Most sites do not warrant a more complicated monitoring approach. With current methods MSD knows which locations are problem areas and which are not. Many capital improvements program and maintenance and rehabilitation projects already require flow monitoring to gather “design quality” information to quantify flows, surcharging, and discharges through SSOs.

The original list of sanitary sewer overflow stations was identified in Attachment 1 to the Ohio EPA Director’s Final Findings and Orders. Additional work conducted for the program included the collection and review of all available existing information pertaining to sanitary sewer overflows, field inspection of all known sites, and the positive identification of the by-pass structures. This work resulted in identification of additional sites which were added to the original list.

Two specific categories of sanitary sewer overflows were encountered during field inspection of the facilities: (1) sanitary sewer overflows having a bypass pipe present to discharge wastewater to storm facilities or waters of the state; (2) “flip lid” manholes or locations where the manhole lid is hinged to allow for discharge to waters of the state and prevent removal of the lid by overload conditions. Figure 2 shows two examples of Case No. 1 where a bypass pipe exists. In some instances an overflow dam separates the overflow pipe from the sanitary sewer channel.

Included in the study were a number of pumping station locations which lack a back-up power source. This group of pumping stations is believed to be representative of pump stations within the MSD service area. The complete list of sanitary sewer overflow locations, including the group of pump stations, can be found in Table 1.

Figure 2

Two Types of Overflow Manholes

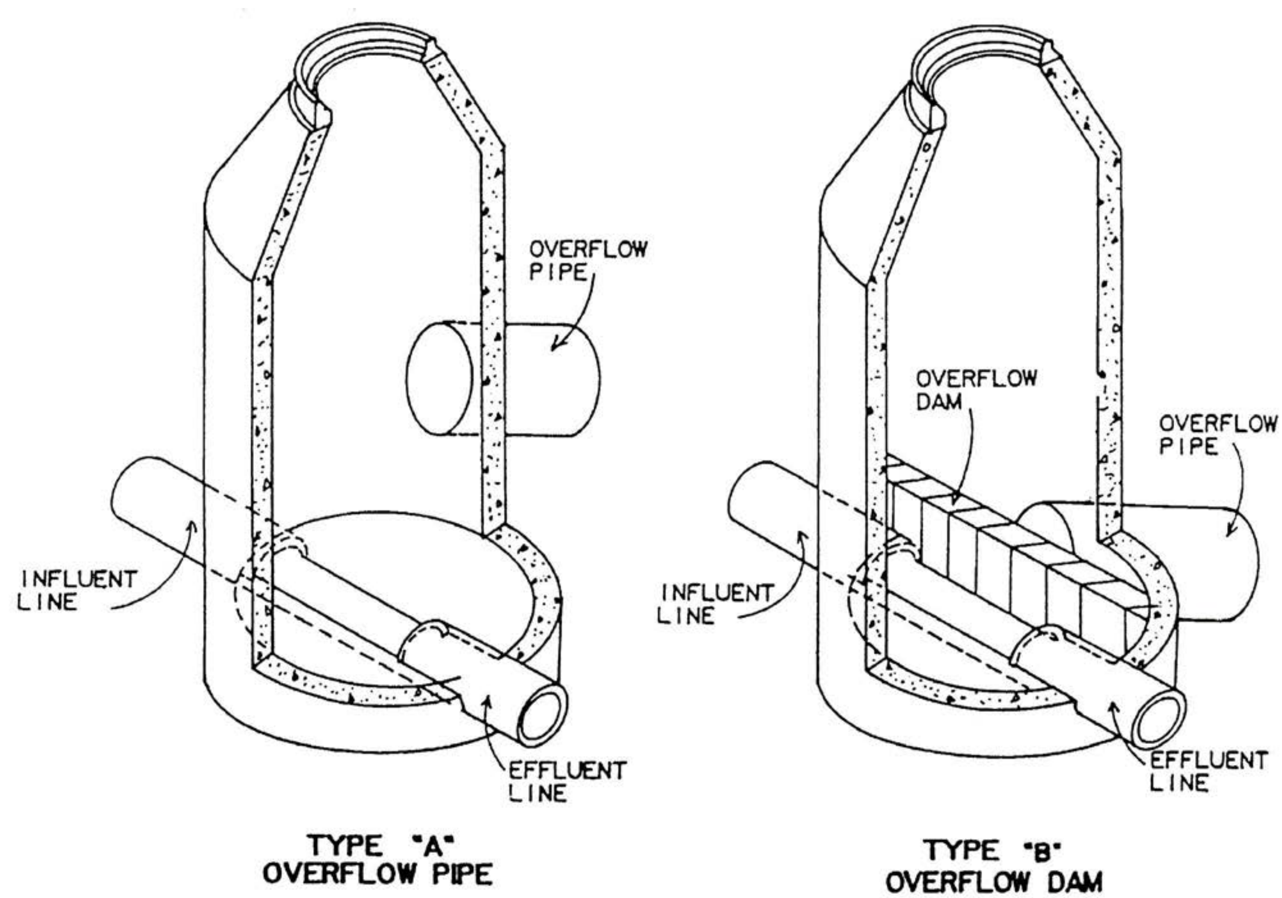


Table 1
KNOWN SANITARY SEWER OVERFLOW LOCATIONS

SSO Number	Description
222	Intersection of Connecticut Court and Connecticut Avenue
225 A	Intersection of Middleton Avenue and Rawson Woods Lane
228	Intersection of Kennedy , Iris and Dante Avenues
530	6309 Betts Avenue
531	Intersection of Goodman and Bake Avenues
565	9590 Kemper Road, across Polk Run Creek
567	6936 Grace Avenue
568	Intersection of W. Galbraith and Gloria Avenue
569	Intersection of W. Galbraith and Rob Vern Avenue
570	Intersection of Euclid and Maple Avenues
572	406 Elliott Avenue
574	2014 Carpenter Avenue
576	Intersection of Swift and Attica Avenues
577	Sterling Avenue
579	Intersection of Richmond and Orchard Avenues
585	1273-79 Norman Avenue
587	11460 Rose Lane
588	6963 Salem Avenue
589	6778 LeConte Avenue
590	3332 W. Galbraith, west of Cella Avenue
591	Intersection of Euclid and Laurel Avenues
593	Intersection of Savannah and Catalpa Avenues
597	6929-33 Leboiteaux Avenue
600	Intersection of Plainfield Road and Schenck Avenue
601	Intersection of Plainfield Road and Hoffman Avenue
603	8879 Plainfield Road
607	O'Leary Avenue, east of May Street
608	Intersection of Southside and Dawson Avenues
611	Intersection of Hamilton and Catalpa Avenues
612	Hamilton Avenue, south of the Lakeknoll Apartments
620	9094 Eldora Drive, down the hill behind the house near Cooper Creek
623	East of intersection of Viscount and Delhi Pike
625	Intersection of Davis and Rolef Avenues
628	Pippen Road, north of Adams
634	intersection of W. Galbraith and Parrish Avenues
639	1276 Compton Road, near the creek

SSO Number		Description
640		3001 Shadycrest Court, behind house near the creek
641		Intersection of Beechmeadow Lane and Ralph Avenue, near creek
645		Intersection of Middleton and McAlpin Avenues
646		Intersection of Linden and Larchmont Avenues
647		Behind 9600 Ross Avenue, near the creek
675	A	Muddy Creek at Anchor Cove Marina, west side
676	P	Muddy Creek Pump Station Outlet Chamber, south of Rte 50
677	P	Rte 50, opposite Martha Avenue, under railway overpass
679	A	6501 Park Avenue, behind the house
679	B	6500 Mariemont Avenue, behind house down the hill
680		Southeast of the intersection of Wooster Pike and Park Avenue
681		9201 Blue Ash Road
682		9304 Blue Ash Road
684		6101 Stewart Road, near the bridge
690		First MH east of Polk Run WWTP
692		Lowland Road, near Anchor Cove Marina
697		Hillside Road Ballfields, near western edge of the fields
699		Railroad Avenue, in parking lot of the Arthritis Foundation
700		Behind the Ohio Asphalt Company, near Mill Creek
701		Intersection of River and Bender Roads, in Rapid Run Creek
704		8811 Tudor Avenue
705		9512 Main Street
730	P	Addyston @ Mistletoe Avenue, 50' north of Rte 50
747	P	Placid Meadows @ 529 Covedale
773	P	Glenview @ 3999 Virginia Court
790	P	Arrowhead Court @ 9096 Arrowhead Court
794	P	Greenpine Acres @ 2068 Persimmon Court
798	P	Marview Terrace @ 611 Marview Terrace
799	P	Millbrook #1 @ 736 Woodfield Road
805	P	Winton Road #1 @ Winton Road, 150' south of Corbett Road
851	P	Berkely Woods @ 6291 Stirrup Road
852	P	Brittney Acres @ 8100 Woodruff Road
856	P	High Meadows @ 6805 High Meadows Drive
861	P	Prospect Woods @ 1189 Hawkstone Drive
1000		South of the intersection of Attica and Grover Hill Avenues
1001		Intersection of East Benson and Hill Street
1002		Intersection of Bake and DeArmand Avenues
1003		7131 Hamilton Avenue
1005		1834 Sundale Avenue

SSO Number	Description
1008	Intersection of Euclid and Miami Avenues
1009	Intersection of Davis and Williams Avenues
1010	Intersection of Elm and Mulberry Avenues
1012	5988 Lawrence Avenue
1014	Chase Creek, south of Juniperview Avenue
1017	7907 Euclid Avenue
1020	Intersection of Heile Drive and Hunt Road
1022	8345 Greismer Avenue
1023	4021 Matson Avenue
1024	1835 Dallas Avenue
1025	West High Street, in the woods near the creek
1029	#5 Sylvan Drive, behind the house near the creek
1032	Intersection of Losantiville and Cedarbrook Avenues
1042	1483 Balfour Avenue, behind the house near creek
1043	225 W. Galbraith, south of employee parking lot
1044	6280-82 Witherby Avenue
1045	Intersection of Cooper and Crescent Avenues
1046	McGrew Avenue, at end of street
1047	Intersection of Park and Harmony Avenues
1048	Intersection of Glensprings and Springfield pike
1049	10290 Montgomery Road
1050	9169 Tag Avenue
1051	3312 Main Street, Addyston
1052	First MH outside Sycamore WWTP
1053	Temporary outfall, Camargo Road Phase 1
1054	Mariemont Swim Club

Monitoring Schedule

Due to the widespread nature of the overflow locations, the monitoring list for each month was divided into two routes. One route covered the eastern portion of the county while the second covered the western portion of the county. Each route requires approximately one day to complete.

Table 2 presents the monitoring rotation. It should be noted that only a representative sample of the pumping stations which lack standby power are being monitored. The Wastewater Treatment Division maintains a telemetry system to monitor the pump station activity. The reporting of sanitary sewer overflows at the pump station is addressed in the Wastewater Treatment Division O&M Plan.

TABLE 2

MONITORING LIST
(DFFO LIST AND ADDITIONAL SITES)

ROUTE 1 (West Route)		ROUTE 2 (East Route)	
639	567	603	625
612	597	* 579	1009
634	531	565	1043
577	1002	* 591	1000
530	1024	* 620	1032
641	1005	* 700#	607
623	593	572	1023
* 701	611	699	601
677P	222	645	600
1045	1044	225-A	1001
1029	574	* 608	1020
646	568	* 570	704
1010	569	* 228	682
1048	640	* 576	681
1047	590	684	705
587	773P	679-B	647
805P	1012	680	1049
799P	1025	679-A	690
798P	747P	* 851P	1052
790P	697	* 861P	1008
794P	692	* 589	1014
628	675-A	* 856P	1017
1050	676P	* 588	1053
1003	730P	* 852P	1054
1042	1051		
585	* 700#		
1022			

NOTES: * - Denotes location identified by OEPA DFFO's
- Site monitored on both East and West route
P - Denotes pump station locations

3.0 Monitoring Methods

Five methods are currently used in monitoring the overflow stations. These methods include: (1) fluorescent powdered chalk; (2) wooden floats with rope; (3) surcharge indicators; (4) specialized monitoring devices; and (5) visual observations. Of these methods, visual observation is the only method which affords 100% reliability in determination of a overflow occurrence. A detailed explanation of each method and situations in which they are utilized follows.

Fluorescent Chalk Method

This method involves the use of dry, powdered chalk commonly used for chalk lines. For purposes of reliability, fluorescent orange chalk is used due to its high visibility under poor lighting conditions. The chalk is used in locations where the manhole involved experiences no significant problems with inflow or infiltration through the manhole lid or within the manhole structure which could prove detrimental to the accuracy of this method. Most instances involving the use of chalk occur where a bypass pipe is present and easily accessible or where an overflow dam is present. A liberal portion of chalk is spread over as large an area as possible either within the bypass pipe or atop the overflow dam. Positive discharge is noted when the chalk was either partially or entirely erased.

Wooden Float Discharge Indicators

A second method of monitoring utilized is wooden floats. These discharge indicators consists of small sections of 2 inch by 4 inch wood cut into approximately four (4) inch lengths with a medium sized eye bolt screwed into the wood. An attachment line is tied to the bolt and is attached within the manhole to prevent loss of the float device. These floats are very sturdy and are not easily moved by animals. In some instances the floats are placed in the same areas as the fluorescent chalk to confirm results from the chalk. The monitoring floats are attached to an adequate length of rope or line to allow for significant movement of the float and for retrieval and reuse. The monitoring floats are periodically replaced depending on the conditions in each SSO location. Positive discharge is noted when float movement or removal indicated a positive overflow occurrence. Also, the presence of debris or evidence of discharge on the float or attachment line is used as a positive indicator in making an accurate determination.

Manhole Surcharge Indicators

This method is used in locations where previously discussed methods were found to be inadequate in providing data for accurate discharge determination. It is also used in combination with other monitoring methods. The surcharge indicators are placed in manholes where a bypass pipe is present and of sufficient height to allow for their use. The indicator is placed in the manhole such that positive identification of any surcharge may be obtained and the elevation of the surcharge can be estimated to determine potential for an overflow event. The bottle gauges are effective in obtaining additional monitoring data.

Specialized Monitoring Devices

This method of monitoring utilizes devices which are customized to a particular site to ensure the accuracy of discharge determination. These devices are used in SSOs which are a combination of Type "A" and Type "B" overflow manhole (see Figure 2), and cannot be monitored with the use of conventional monitoring devices. These devices are engineered specifically to optimize the collection of data and not to interfere with the operation of the site. Examples of such devices include float mechanisms which indicate the level of manhole surcharge and can be reset after each use.

These types of monitoring devices are also used if there is an abundance of animal movement or other conditions, such as excessive dampness in particular manholes. These conditions may adversely affect the accuracy of other monitoring methods. These devices are constructed for the unique sites and are upgraded periodically to ensure appropriate monitoring data.

Visual Observation

Visual observation is used in combination with all monitoring methods and is valuable in aiding the monitoring crew while assessing each location. The site inspection includes determination of the manhole condition, presence of debris in the manhole, evidence of surcharge, and estimated flow in the sewer system. These items are taken into consideration along with the monitoring indicator when determination of a discharge occurrence is made. On occasion, the monitoring crew may visually observe discharges as they occur. These visual confirmations may occur while monitoring either during extremely heavy rain events or immediately following such rain events.

4.0 Communications and Reporting

Daily Communications

The monitoring crew conducts site inspections daily and provides ongoing communications to various MSD staff. When the monitoring crew observes a site to be discharging, WWC staff are contacted immediately. When inspections are performed during extended wet weather conditions, calls are placed periodically after groups of sites are inspected. This communication allows prompt response to address problems if necessary.

At the completion of the monitoring route, monitoring results for all locations are reported to the WWC staff and results for the pump station locations are reported to the Wastewater Treatment Division. The information communicated includes a synopsis of discharge activity observed during the site inspections.

Notification and Reporting of All Field-Verified SSOs Except SSOs at "Enumerated Locations" Due to Capacity-Related Wet Weather Events; and Reporting of Basement Backups

MSD will provide timely notice to OEPA for all field-verified SSOs, except those from "Enumerated Locations" due to capacity-related wet-weather events. Except during wet weather events, timely notice to OEPA shall be electronic, within 24 hours of when MSD becomes aware of an SSO. During wet weather events, timely notice to OEPA shall be electronic, within 48 hours of when MSD becomes aware of an SSO, unless the SSO presents an imminent risk to public health, in which case MSD shall provide notice within 24 hours.

For all field-verified SSOs, except those from "Enumerated Locations" due to capacity-related wet weather events, MSD will provide written notice to OEPA within 5 days. For any such SSO not halted in 48 hours, MSD will provide a verbal update to the Ohio EPA using the 24-hour hotline and shall provide OEPA a separate status report every 5 days. Notice will include: known or suspected cause of the SSO; whether the SSO was caused by any failure to follow the O&M Program; whether any failure to comply with the O&M Program contributed to the volume or the duration of the SSO; whether MSD followed its SSO Response Plan in responding to and mitigating the impact of the discharge; best estimate of volume released; description of source/point of overflow; location; date(s) and estimated duration of overflow; ultimate destination of overflow; any applicable corrective actions to prevent future overflows; weather condition, and identity of person(s) making the report.

For SSOs from enumerated locations due to capacity-related wet weather events, MSD shall report the SSO [including best estimate of volume released; description of source/point of overflow; location; date(s) and duration of overflow; ultimate destination of overflow; any applicable corrective actions to prevent future overflows; and identity of person(s) making the report], if: 1) the SSO was caused by MSD’s failure to comply with the O&M Program or if MSD’s failure to comply with the O&M Program contributed to the volume or duration of the SSO, or 2) MSD failed to follow its SSO Response Plan in responding to and mitigating the impact of the discharge. MSD shall also provide to USEPA on a quarterly basis a copy of the monthly summary report in accordance with 1992 Ohio EPA's DFFO, which is currently in place.

In addition, for known releases to or wastewater backups into buildings, MSD will summarize all known information and submit it to OEPA in a monthly report.

MSD will provide both OEPA and the County Health Department with monthly reports which summarize all of the above reporting.

Two sample forms are provided illustrating External (OEPA) and Internal (MSD) reporting.

SAMPLE
SEWER OVERFLOW REPORT (EXTERNAL)

1. Spill Location/Address: ____

   ____

   Spill Location/MH#: ____

2. Spill source/point of overflow description: ______________________________

   ____

3. Known or Suspected cause of spill:______________________________

   ____

   ____

(describe conditions surrounding spill , e.g., power failures, equipment breakdown, broken line, etc.)

4. Spill destination (stream name): ______________________________

5. Weather conditions: ______________________________

6. Spill date(s)/estimated duration/estimated volume (if known):

FROM (M/D/Y)				
TIME:				
TO (M/D/Y)				
TIME:				
ESTIMATED DURATION				
ESTIMATED VOLUME				

7. Any corrective actions to prevent future overflows: ______________________________

   ____

8. Spill due to failure to follow "MSD WWC Operations and Maintenance Program"?

   ☐ Yes ☐ No

If **YES**, state reason:

____

SAMPLE
SEWER OVERFLOW REPORT (EXTERNAL) (continued)

9. Spill volume/duration due to failure to follow “MSD WWC Operations and Maintenance Program”?
☐ Yes ☐ No

If **YES**, state reason:

____

10. “MSD WWC Sewer Overflow Response Plan” followed for:

SPILL RESPONSE ☐ Yes ☐ No
SPILL MITIGATION ☐ Yes ☐ No

If **NO**, state reason:

____

11. Person making this report: ______________________________DATE: __________________

SAMPLE
SEWER OVERFLOW REPORT (INTERNAL)

1. Request for Service No. ____
2. Location/Address ____
   ____
   ____
3. Phone Number ____________________________
4. Has spill entered waters of the State ☐ Yes ☐ No
5. If yes, list receiving stream ____
6. Has Superintendent been notified? ☐ Yes ☐ No
7. Ohio EPA - Spill Hotline notified ☐ Yes ☐ No
8. If yes, state time and date ____
9. Is problem the responsibility of MSD ☐ Yes ☐ No
10. If no, list jurisdiction of responsibility.
    ☐ Private Property Owner ____________________
    ☐ Private Sewer ________________________
    ☐ Other ____________________________
11. Is signage necessary? ☐ Yes ☐ No
12. Has Health Department been contacted? ☐ Yes ☐ No
13. If yes, state which Health Department.
    ☐ City/Cities ________________________
    ☐ County ____________________________
14. Is a follow-up visit recommended? ☐ Yes ☐ No
15. If the problem resulted in a water-in-basement incident, did MSD provide courtesy information to property owners? ☐ Yes ☐ No
16. Describe maintenance actions taken to prevent reoccurrence

____

____

Enumerated SSO Weekly Health Department Reporting

In compliance with the Ohio EPA Director's Final Findings and Orders, the appropriate Hamilton County and/or local health department shall be notified of SSO activity. The Hamilton County Health Department is notified of discharge activity from all known SSO locations within Hamilton County. If an SSO is located within the jurisdiction of a local and/or city health agency, that entity is also notified of discharge activity within its respective jurisdiction. The health departments are notified through a weekly summary letter listing the SSO locations within their respective jurisdiction that exhibited evidence of discharge during the previous week. Correspondence is addressed to a specific contact person(s) of each Agency of Record. An example of the notification letter is included as Exhibit A on the following page.

EXHIBIT A

Date

Mr. _______________
Health Commissioner
Hamilton County Health Department
250 William Howard Taft Road, 2nd Floor
Cincinnati, Ohio 45219

Re: Sanitary Sewer Overflows
Ohio EPA Director's Final Findings and Orders
Notification to Local Health Department

Dear Mr. _____________:

In reference to the letter dated September 14, 1992, regarding notification of sanitary sewer overflows to the Hamilton County Health Department, this letter is in accordance with the Ohio EPA Directors Final Findings and Orders issued by the Ohio EPA to the Board of Hamilton County Commissioners.

Location was found to have had a positive discharge occurrence during the period of

_________________________ to ___________________________.

SSO NO. LOCATION

If you have any questions regarding this matter, please contact

____ at
____________________.

Very Truly Yours,

Signature

Enumerated SSO Monthly Reporting

In accordance with the Ohio EPA Director's Final Findings and Orders, discharge data is reported to Ohio EPA in a monthly report. The monthly report is issued to Ohio EPA-SWDO for the preceding month and contains a synopsis of the daily monitoring information for the month. The report also includes a summary of rainfall information for rain gages in the vicinity of each group of SSO locations. The report is formatted to include a group of rain gage locations with the corresponding SSO locations. This allows the reader to compare SSO activity with rainfall data in the immediate vicinity of the respective locations. A reproduction of the report format is included as Exhibit B on the following page.

Exhibit B

MSD of GREATER CINCINNATI
SANITARY SEWER OVERFLOW REPORT : DATE
PRIMARY RAIN GAGE : # - LOCATION
SECONDARY RAIN GAGES : # - LOCATION, # - LOCATION

DAY	R.G. #	R.G. #	R.G. #		SSO NO.	SSO NO.								
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
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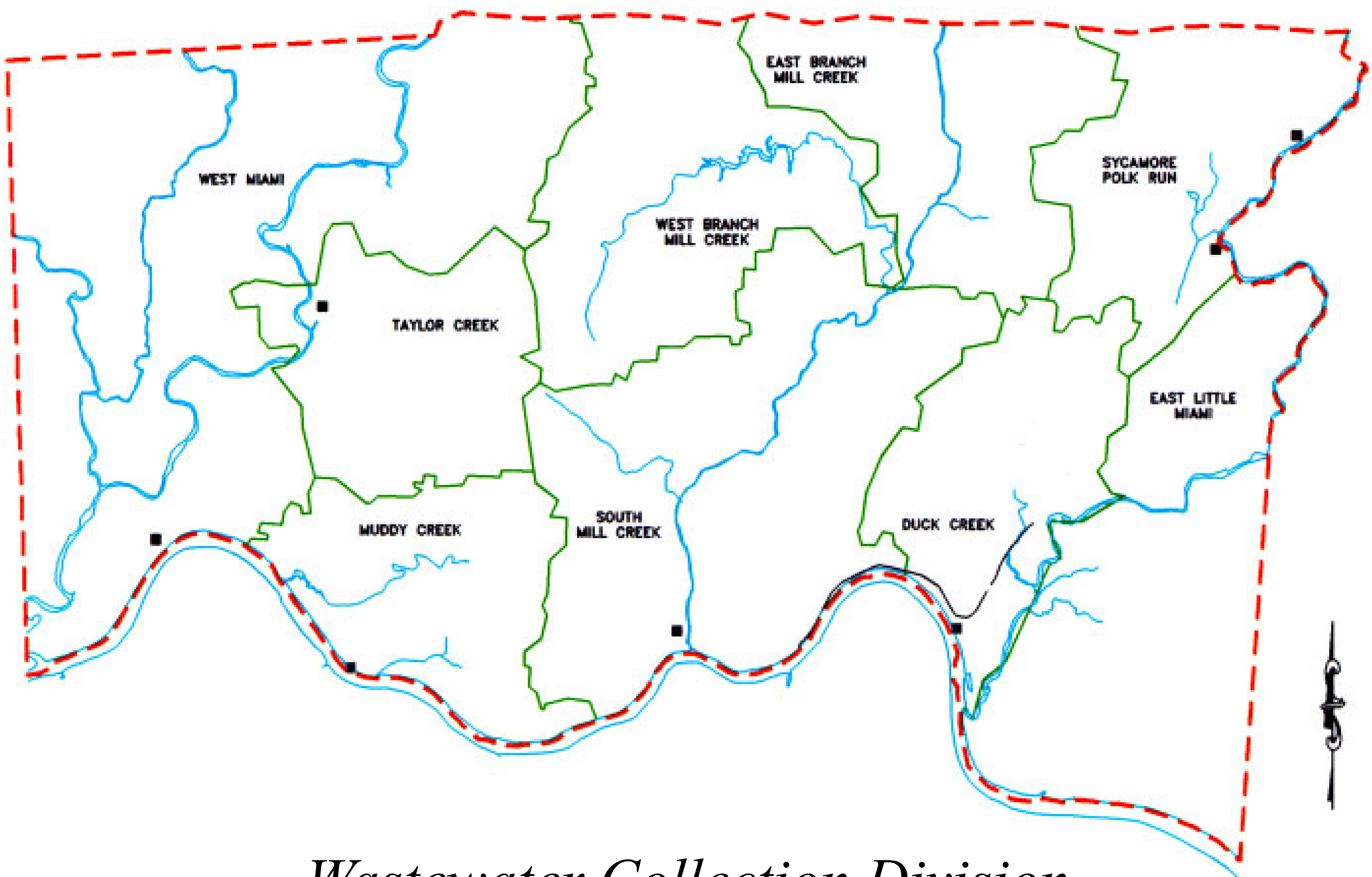
27														
28														
29														
30														
31														

ADDITIONAL REMARKS :
0 - NO DISCHARGE
0* - DISCHARGE ESTIMATED NOT TO HAVE OCCURRED ON THIS DAY
AH - EVIDENCE OF DISCHARGE EXISTS, HOWEVER EXACT DATE UNKNOWN
POS. - DISCHARGE OBSERVED DURING SITE INSPECTION
X - MONITORING DEVICE DISTURBED, NO INDICATION OF OVERFLOW
- DATE SITE WAS MONITORED

EXHIBIT 6

Metropolitan Sewer District of Greater Cincinnati

SEWER OVERFLOW RESPONSE PLAN



Wastewater Collection Division

R.D. Zande & Associates

DECEMBER 1999
REVISED FEBUARY 2002

MSD

SEWER OVERFLOW RESPONSE PLAN

DECEMBER 1999
(REVISED February 2002)

Prepared for

The Metropolitan Sewer District

of

Greater Cincinnati

SEWER OVERFLOW RESPONSE PLAN
TABLE OF CONTENTS

December 1999
(Revised February 2002)

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1.0 INTRODUCTION

Purpose, Objectives And Goals

A Sewer Overflow Response Plan (SORP) is an operational document that describes procedures to be taken by the Metropolitan Sewer District of Greater Cincinnati (MSD) in response to sewer overflows within its separate or combined sanitary sewer systems. It is designed to ensure that every report of a sewer overflow is dispatched to the appropriate crews for response, and that appropriate response actions are taken to address each overflow. This plan is primarily intended to address response to dry-weather sewer overflows from any point in either the combined or separate sewer system, and to address wet weather sewer overflows from any point in either the combined or separate sewer system, except at "Enumerated SSO Locations" and permitted CSO discharge points.. ***NO*** WIB SSOs are included in this Plan.

There are two types of wet weather and/or capacity-related SSO discharges: 1) SSO discharges from "Enumerated SSO Locations" ("Enumerated SSO Locations" have been identified to Ohio EPA as chronic Capacity-Related SSO discharges, which are monitored and reported in accordance with the 1992 Ohio EPA DFFO), 2) SSO discharges from a "Non-Enumerated SSO Location." The latter are generally caused by higher than normal rainfall and/or higher than normal ground water condition, or a flow restriction due to an isolated sewer pipe failure. During a wet weather and/or capacity-related discharge, the sewer system may be surcharged and therefore may not have capacity to return the overflow to the sewer system. In many cases the SSO discharge point is a rain-swollen creek or a direct-connection to a storm sewer.

A wet weather, capacity related SSO discharge response may be different than a dry weather SSO discharge response, or the response to a wet weather SSO caused by a localized pipe failure or blockage. The SORP response to a wet weather, capacity-related SSO discharge from a "Non-Enumerated SSO Location" would be generally limited to: 1) field verifying the initial report of a SSO discharge; 2) determination that the SSO is the result of a sewer system overload from storm water entry, and/or high ground water; 3) make field inspections of the location at 24 hour intervals until the SSO ceases; 4) cleanup discharge debris from locations of normal public access after the storm water runoff flow has receded; 5) any identified pipe repairs will be initiated as soon as site and sewer conditions allow reasonable work conditions; and 6) the site will be referred to Engineering for further investigation and possible capital improvements to address the capacity limitation.

Where not precluded by surcharge, high flow or drainage course flooding conditions, the response to wet weather capacity related and localized blockage caused SSOs will be the same as to that for dry weather SSOs.

A Sewer Overflow Response Plan (SORP) emphasizes emergency response activities to contain, mitigate and clean-up residuals from the sewer overflow. In addition, the SORP emphasizes procedures to accurately report and document overflows, notify agencies and take other actions as appropriate.

The primary objectives of the SORP are to:

- Protect public health and the environment,
- Satisfy regulatory agencies and discharge permit conditions which address procedures for managing sewer overflows, and
- Minimize risk of enforcement actions against MSD.

Other objectives of the SORP include:

- Protecting private and public property,
- Protecting MSD personnel;
- Protecting all MSD owned facilities, and
- Providing good customer service.

The SORP is intended to supplement and be consistent with existing emergency plans and standard operating procedures. Many of the procedures followed by the WWC Division are outlined in the Wastewater Collection Division Training Manual, which was prepared in 1992.

In order to achieve this objective, the following goals were identified:

- Necessary communications including who will be notified in what order,
- A means to gauge the level of potential impact promptly so as to dispatch the proper resources without delay, and
- Actions to be taken by MSD and what actions will be undertaken by emergency contractors.

It should be stated at the outset that the WWC Division response to sewer problems received as “Request for Service” calls is very quick. Each problem is diagnosed within several hours and the resolution is determined on a case-by-case basis. It is difficult to document each possible response that will be or has been undertaken by the WWC Division. Overall, they will “do whatever it takes” to resolve a problem which is under their domain. Many of the statements outlined in this report are taken from experienced individuals who exercise energy, creativity and skill on a daily basis to resolve “Request for Service” calls.

Updating and Maintenance of the SORP

It is recommended that MSD update the SORP on an as-needed basis to reflect revisions to the NPDES permit and new initiatives that are being undertaken by the WWC Division.

This plan will be subject to modification by the Director of MSD to account for changes in circumstances such as changes in the configuration of MSD facilities, the purchase of new equipment, changes in regulatory requirements, the development of new technologies, or changes in industry standards/best management practices. MSD shall report any such modifications to this Plan in the annual report required by Paragraph IX.C of the Consent Decree.

2.0 FACTORS THAT INFLUENCE OVERFLOW RESPONSE

The sewer system covers approximately 414 square miles and serves a residential population in excess of 800,000 including industries. MSD operates and maintains over 3,150 miles of sanitary and combined sewers, 6 major wastewater treatment plants, numerous package treatment plants, package lift stations, and major pumping stations.

Figure 1 depicts the MSD service area.

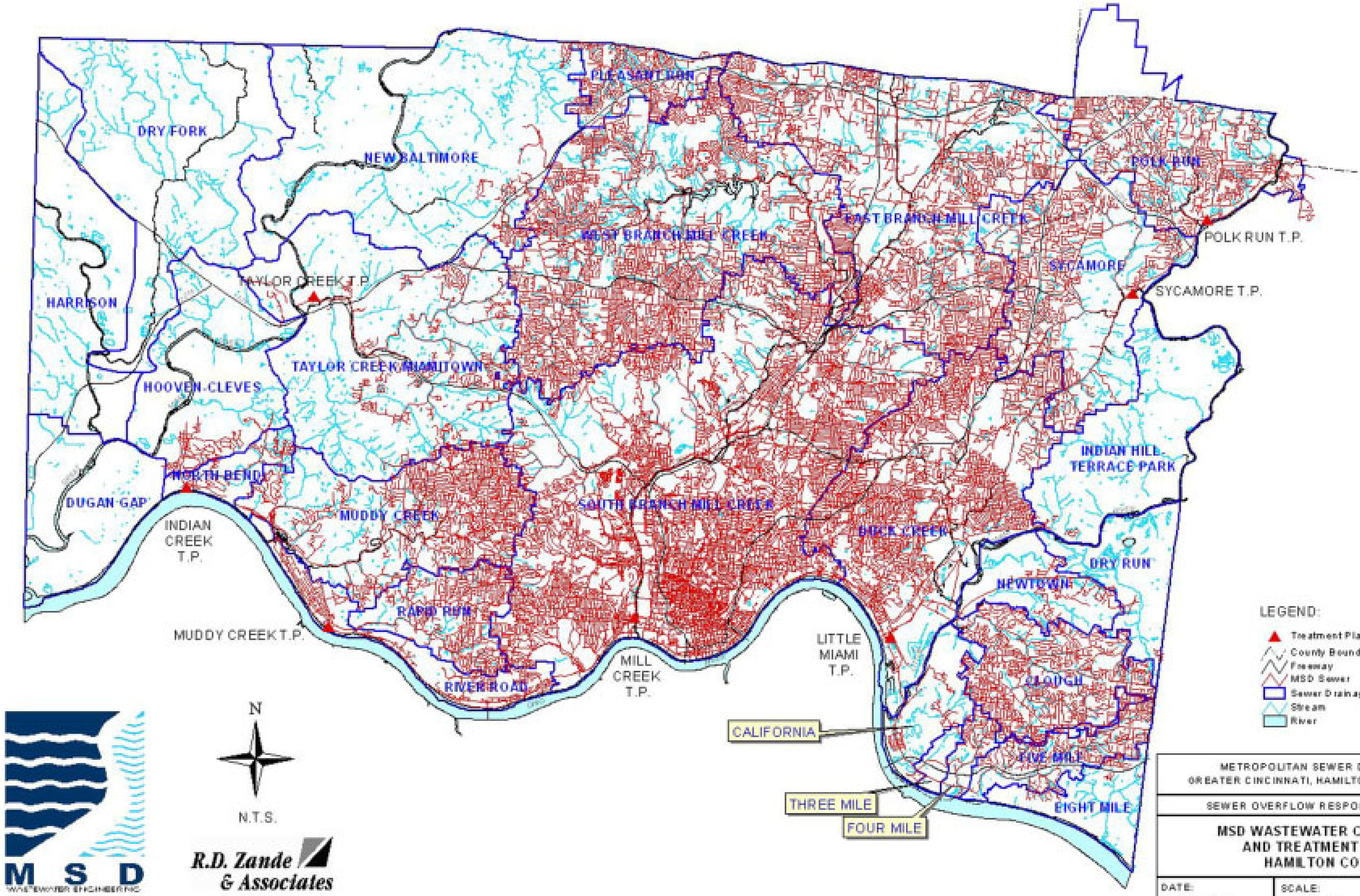
The MSD service area is served by sanitary and combined sewers. In general, sanitary sewers serve the newer and more outlying portions of the service area. Combined sewers exist primarily in the older and downtown areas and serve portions of the Duck Creek, Mill Creek, Muddy Creek, Rapid Run, and River Road drainage areas.

Overflow Locations

Sewer overflows will typically occur more frequently at or near the following locations:

- Sanitary Sewer Overflow (SSO) structures,
- Combined Sewer Overflow (CSO) structures,
- Pump stations,

Figure 1



METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI, HAMILTON COUNTY, OHIO		
SEWER OVERFLOW RESPONSE PLAN		
MSD WASTEWATER COLLECTION AND TREATMENT SYSTEM HAMILTON COUNTY		
DATE: DEC. 1999	SCALE: NONE	FIGURE: 1

P:\2596.8\ARCVIEW\8874County Sewer.apr

- Through tops of manholes, and
- Basements.

Lists of SSO structures and CSO control structure are provided in Appendices A and B respectively.

<u>Types of Overflows</u>

The location and situations under which sewer overflows occur dictates the type of response taken. Table 1 summarizes types of overflows and the required response.

TABLE 1

SEWER OVERFLOW TYPE AND THE REQUIRED RESPONSE

Type of Sewer	Weather Condition	Overflow Response Required	Overflow Monitoring	Comments
Separate Sanitary (non-enumerated)	Dry	Yes	No	Although no specific overflow monitoring would be performed, MSD will monitor these areas for chronic problems.
Separate Sanitary (non-enumerated)	Wet	Yes	No	Although no specific overflow monitoring would be performed, MSD will monitor these areas for chronic problems.
Separate Sanitary (enumerated)	Dry	Yes	No	Although no specific overflow monitoring would be performed, MSD will monitor these areas for chronic problems.
Separate Sanitary (enumerated)	Wet	No	Yes	MSD monitors all wet weather SSOs and reports to the Ohio EPA on a monthly basis.
Combined (all)	Dry	Yes	No	Although no specific overflow monitoring would be performed, MSD will monitor these areas for chronic problems.
Combined (EXCEPT Permitted)	Wet	Yes	No	Although no specific overflow monitoring would be performed, MSD will monitor these areas for chronic problems.
Combined (Permitted)	Wet	No	Yes	MSD is monitoring all CSOs under a NPDES permit-OEPA Permit No. 1PX00022*AD.
Pump Stations	The Metropolitan Sewer District Wastewater Treatment Division's "Pump/Lift Station Operation and Maintenance Procedures" as revised February 2002 is herein incorporated by reference.			

Overflow Destination

The “destination” is the ultimate point where a sewer overflow enters the environment once it leaves the collection system. An understanding of this is necessary to ensure the proper execution of an overflow response.

Typically, sewer overflows will end up in one or more of the following destinations:

- Pooled in low areas adjacent to an overflow,
- Surface streams,
- Storm sewers and then ultimately a surface stream or ditch
- Basements.

The destination of sewer overflows depends in part if they occur at “design SSO or CSO” locations, rather than arbitrary points in the collection system. “Design SSO or CSO” locations are those which are configured to provide hydraulic relief to the system during wet-weather conditions and are generally equipped with overflow pipes or weirs set at a level to minimize the potential for water-in-basement incidents and still convey the maximum possible flow downstream for treatment.

Size of Tributary Area

By knowing the size of the area upstream, the crew has an idea in knowing flow rate and volume discharged. Second, if industries are upstream, crews can determine if special industrial pollutants may be encountered. This will assist in determining whether special safeguards must be taken. In the CAGIS Mapping system there is a Sewer Trace Tool that identifies the sewers upstream or downstream from a given point or SSO location. The length of sewer found in the trace is provided along with a graphical display of the sewer locations. This information is available in the field laptop computers and the office desktop computers.

MSD maintains a database of permitted industrial users, the company address is used to graphically display the location in the CAGIS Mapping system. The Sewer Trace Tool can also identify industrial users upstream or downstream from a given point or SSO location.

Site Accessibility

Site accessibility is an important factor in determining the response to a sewer overflow. To address limited access site conditions, MSD has track mounted loaders, bulldozers and backhoes to repair sewer failures, and four wheel drive farm tractors for flush cleaning and CCTV inspection. If truck mounted equipment is required to address an overflow, a temporary road will be constructed. The response to a sewer overflow in areas of limited accessibility is determined on a case-by-case basis.

Weather Conditions

Since portions of the sewer systems are either combined or subject to infiltration and inflow, the sewer overflow response strategy will depend on recent precipitation in the upstream sewershed. This is particularly important if bypass pumping is necessary or if the repair is being performed in a combined sewer.

Sanitary Sewer Overflow Classification

As a part of the General Compliance Plan to Eliminate Sanitary Sewer Overflows, prepared in 1993 and supplemental update reports in 1994 and 1996, SSO locations were classified on the basis of activity. In order to provide clarity of understanding among all parties, a classification system was created to describe SSO activity in “common” terms. As a result, SSOs were placed into 7 categories:

- Highly active,
- Generally active,
- Generally Inactive,
- Inactive,
- Unclassified,
- Removed, and
- Reclassified.

This classification methodology is empirical. Divisions between classifications are non-distinct and a matter of judgment. Nevertheless, most SSOs maintain a generally constant behavior pattern consistent with their classification which is discussed further below.

“Highly active” is the leading category for SSO activity. Highly active SSOs may be triggered by minimum amounts of rainfall, typically higher than 0.25-0.5 inches over the entire sewershed.

“Generally active” is the second leading category for SSO activity. These locations overflow less often than those in the highly active category. Discharges are generally triggered by rainfall events greater than 0.5-1.5 inches over the entire sewershed. Unlike the highly active locations, discharge frequency appear to be more impacted by in-situ ground soil moisture.

The “generally inactive” category applies to locations that typically discharge only from large precipitation events. This can generally be interpreted as events exceeding 1.5 inches of rainfall.

The “inactive” category applied to locations that have not discharged, or do not appear to be prone to do so. Some inactive locations are in “problem” areas where a cluster of SSOs exist. Sometimes an inactive location is in close proximity to a more active location; however, it does not discharge because it is at a higher elevation.

For other “inactive” locations, it is not clear why a relief structure was provided. It is believed that some locations may have been diversion points ahead of small subdivision wastewater treatment plants. When the plant was decommissioned and brought into a regionalized system, the outfall was never closed.

The “unclassified” category is used for newly discovered SSO locations, for which there is not enough data to make a classification. For most sites, a 6 month period is the minimum time necessary to reasonably forecast SSO activity. For sites that are “inactive” a longer time is necessary to confirm activity.

The “removed” category applies to SSOs that have been de-registered from the master list. In most instances, CIP projects were responsible for removing SSOs; in others, MSD subjected the location to a “graduation” procedure to ensure that it would not pose a risk if it was eliminated.

“Reclassified” is a category used to relabel a SSO as a CSO. In some instances, when the original classification was made, the structure was near the border between separate areas and combined areas. Other times, small pockets of combined sewers existed in areas that were originally considered “separate”.

3.0 MSD'S APPROACH TO SEWER OVERFLOW RESPONSE

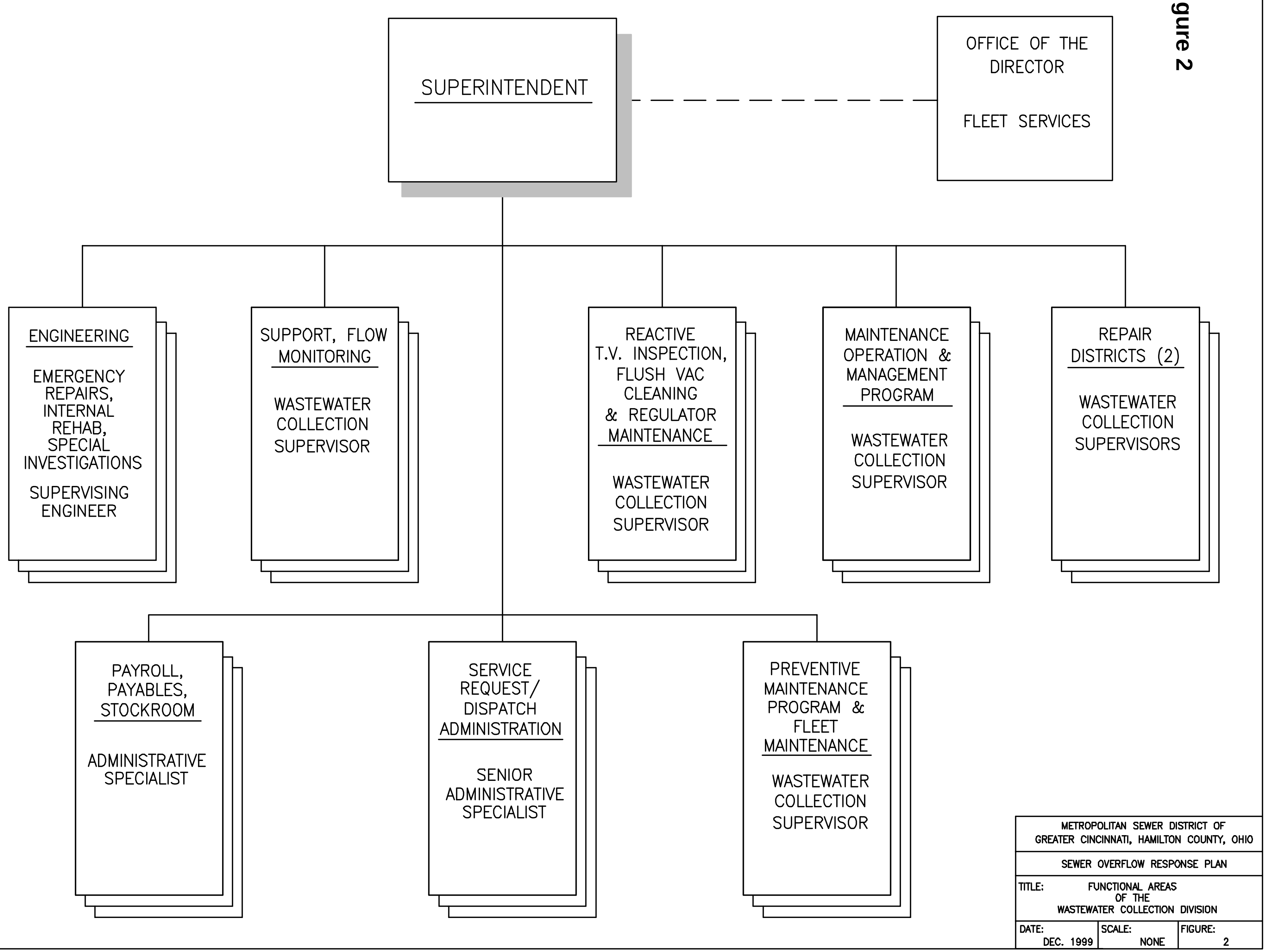
The Wastewater Collection (WWC) Division is responsible for the inspection, maintenance, and repair and rehabilitation of the wastewater collection system, which includes all combined sewers, separate sanitary sewers, combined sewer regulators and appurtenances.

As such, it is the WWC Division that is primarily responsible for the successful resolution of sewer problems including "overflow response."

Table of Organization

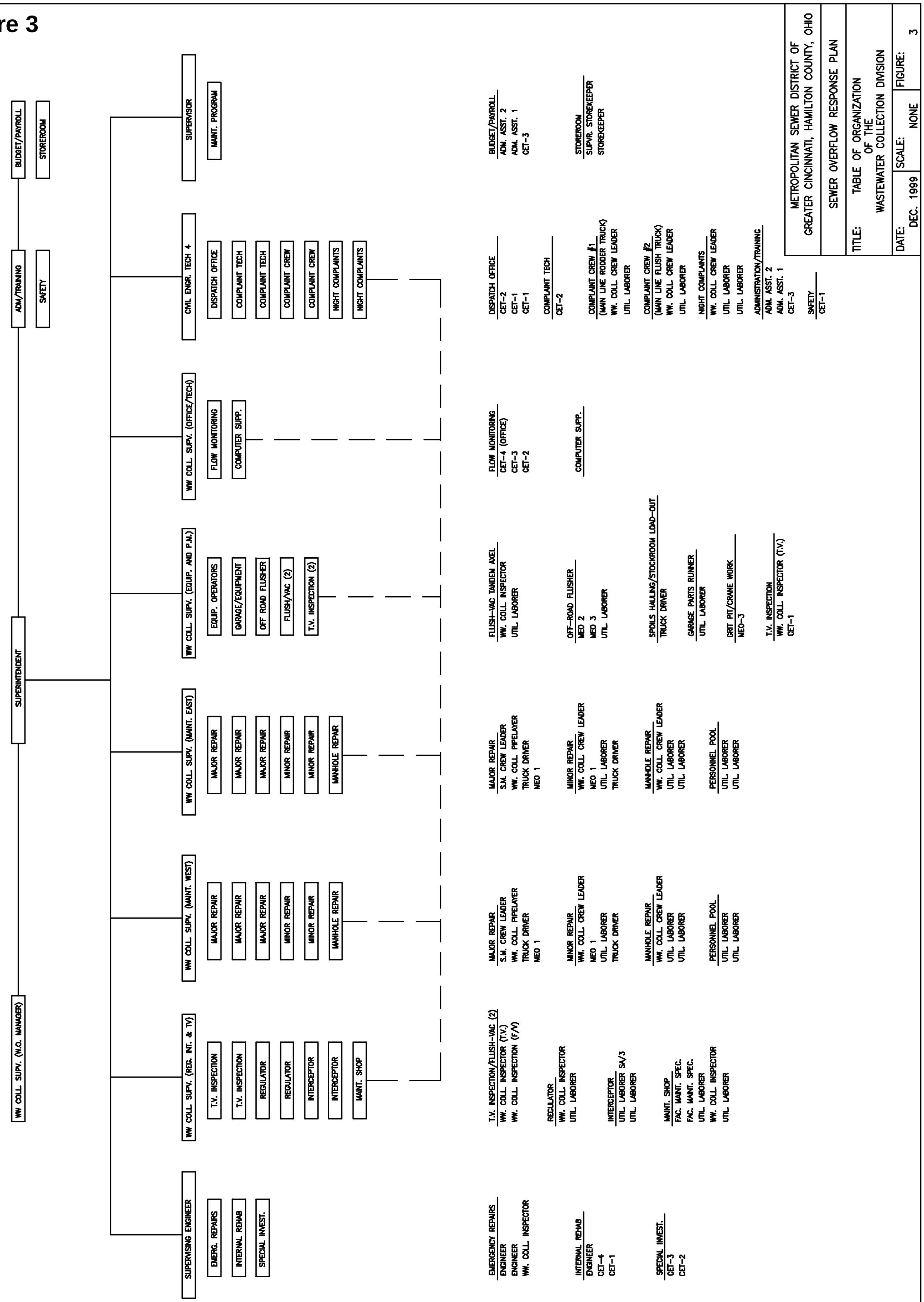
Figure 2 shows "Functional Areas of the Wastewater Collection Division" and Figure 3 is a "Table of Organization of the Wastewater Collection Division." The functional relationship of these positions as related to dry-weather sewer overflow response is described in the following chapter; however, several warrant introduction at this time - the Dispatcher, the Supervisor, the Response Teams, the Superintendent and the Director.

Figure 2



P:\2595.8\8874 Response Plan & CMOM\SORPFIG2.DWG

Figure 3



P:\2595.8\8874 Response Plan & CMOM\SORPFIG3.DWG

The Dispatchers are the first line of contact with the public. The Dispatch Office is used to keep reports once the response teams are done with a call. All records are maintained in an organized manner and available to MSD personnel.

Dispatchers collect information over the telephone in a calm, friendly and professional manner. This task may be complicated by the fact that the person calling may be upset, confused or unknowledgeable about the problem being experienced. During normal working hours, the Dispatchers work out of the WWC Division at 225 W. Galbraith Road. During evenings and weekends, calls are received by the dispatcher at the “after hours” desk of MSD at 1600 Gest Street, who in turn dispatch first response teams or contact “on-call” supervisors if the reported problem warrants additional evaluation or supervision. The Dispatchers have the authority to cross over MSD Division lines to obtain the assistance of any supervisor or secure any equipment that may be necessary to resolve the problem.

The second key positions are the “Supervisors”. These persons hold positions of supervisory authority under the Superintendent and are senior operations staff and Division engineers. Supervisors work with the crews to resolve sewer maintenance problems and serve as a liaison between the crews and the Superintendent. During normal working hours, there are a number of supervisors who can handle problems as they arise.

During evenings and weekends, problems are referred to the “Supervisor on Call” or the first or second backup “Supervisor on Call.” Supervisors on Call are changed on a rotating basis once every month. Industry standard communications technology is used to contact “on call” supervisors. Assuming 3rd shift is 12:00 p.m. to 7:30 am – the 24 hour dispatcher contacts the “on call” supervisors with any requests for service. The “on call” supervisor calls out the appropriate crew. Past history of 3rd shift requests for service does not justify a full time 3rd shift crew.

The third group is the Response Teams. They are responsible for finding the location of the problem, communicating with the affected public, accurately evaluating the problem, communicating their findings to the Supervisor, and then taking necessary steps to resolve the problem. MSD shall maintain adequate staffing to meet these responsibilities. The WWC Division currently has 4 response teams available during the day shift (7:30 a.m. to 4:00 p.m.), and 1 team during the evening shift (4:00-midnight). If these staffing levels change, notice shall be provided to EPA and OEPA in the annual report required by Paragraph IX.C of the Consent Decree.

Response Team activities may include, rodding or flushing the sewer line. For more serious problems, teams work with the supervisors to plan and execute an acceptable remediation strategy. This may include the mobilization of construction equipment to “dam-up” an area of sewer overflow and then recover it by pumping. As a final step, the impacted area may be flush/pumped and deodorized. There may be instances where it is deemed that the resources needed to adequately address a problem require effort beyond MSD forces. This is particularly true of main line breaks where there is a risk of a significant sewer overflow. In these situations, MSD may enlist the aid of an emergency contractor. MSD maintains a general services agreement with several companies for situations that require the prompt reconstruction of sewer lines. The Emergency Sewer Repair Contractors (ESRCs) are normally managed by the Wastewater Collection Division Engineering Section, however the six Wastewater Collection Supervisors have full authority to call out any of the ERSCs if a sewer failure requires additional resources.

These companies are capable of mobilizing construction equipment and personnel quickly to handle emergency assignments. Typical projects may include the reconstruction of sewers damaged in hill slides and those with severe structural failure. The MSD contracts for emergency sewer repairs typically require the contractor to respond to the site within 4 hours of notification to mobilize. This response time and the level of response will vary because of several factors, some are identified below:

- Location of the sewer repair in relation to the contractor's equipment yard.
- Scope of the repair, size of sewer, depth of sewer and volume of flow.
- The size, type and availability of equipment and number of workers.
- The time of day, day of the week and the proximity to a holiday
- Weather conditions, clear, rain, snow, extreme cold or heat

MSD will commit to implement, in the most expeditious manner possible, the non-emergency procurement provisions of applicable City of Cincinnati and County of Hamilton purchasing regulations, the former herein referenced as Appendix E-1 - 10. Emergency procurement provisions are subject to the Hamilton County Administrator's authority delegation, dated April 10, 2001 (Appendix E-12) (which superceded the "Policy for Management of Public Sewer System Emergencies by the Metropolitan Sewer District" [page 172]) and Article 24, Section 2402, "Administrative Rule No. 2," of the ***MSD Rules and Regulations***, effective March 1, 2001 (Appendix E-11).

The Superintendent is in charge of the WWC Division and reports to the Director. Although the Superintendent will normally not be personally involved in most service calls, he/she is administratively responsible for activities performed by the Division, including all fiscal and budgetary matters and coordination with the Director's office. The Superintendent also is a valuable technical resource who is knowledgeable in the design, construction and maintenance of collection systems and is therefore, frequently involved in devising strategies and directing actions to solve the most complicated problems.

The Director is the administrative head of the MSD and is responsible for the activities of all operating divisions. Although the Director will not be involved in the day-to-day activities of the WWC Division, he/she must be apprised of situations that may gain the attention of the public-at-large, the media or the Ohio EPA. In this manner, the Director can inform the Hamilton County Commissioners and the City Manager, if warranted.

Available Resources

The WWC Division is fully equipped with personnel, equipment and supplies to perform most maintenance and repair projects that may arise due to malfunctions in the collection systems; however, there are times that the WWC Division finds it to be more expedient to utilize emergency contractors.

Typical tasks for the WWC Division include cleaning lines and performing maintenance and repairs on various elements of the collection systems including CSO regulator structures. With their in-house machine shop, the WWC Division has the capabilities to fabricate parts for CSO regulators that are no longer commercially available.

Extensive information on the WWC Division is provided in the Wastewater Collection Division Training Manual, prepared in 1992. Additional information on the inspection and maintenance of the combined sewer systems may be found in CSO operational manuals such as the Greater Cincinnati Combined Sewer Overflow Operational Manual for the Little Miami Service Area, which was originally prepared in 1994 and updated in 1997. It should be noted that companion manuals are also available for the Mill Creek Service area and the Muddy Creek Service Area. These manuals were prepared in accordance with a requirement in the NPDES permit for the combined sewer systems - Ohio EPA Permit No. 1PX00022*AD.

Training

The Division conducts regular training programs for new and existing employees for all key job functions. The SORP will be included in these training programs beginning in the year 2002.

4.0 **"REQUEST FOR SERVICE" PROCEDURES**

The process utilized by MSD to respond to "Request for Service (RFS)" calls is defined in the Process Flowchart shown in Figure 4. This procedure includes all calls received at MSD, regardless of whether a sewer overflow has occurred.

Each step of the flowchart is described below.

Step 1 - Dispatcher Receives Telephone Call

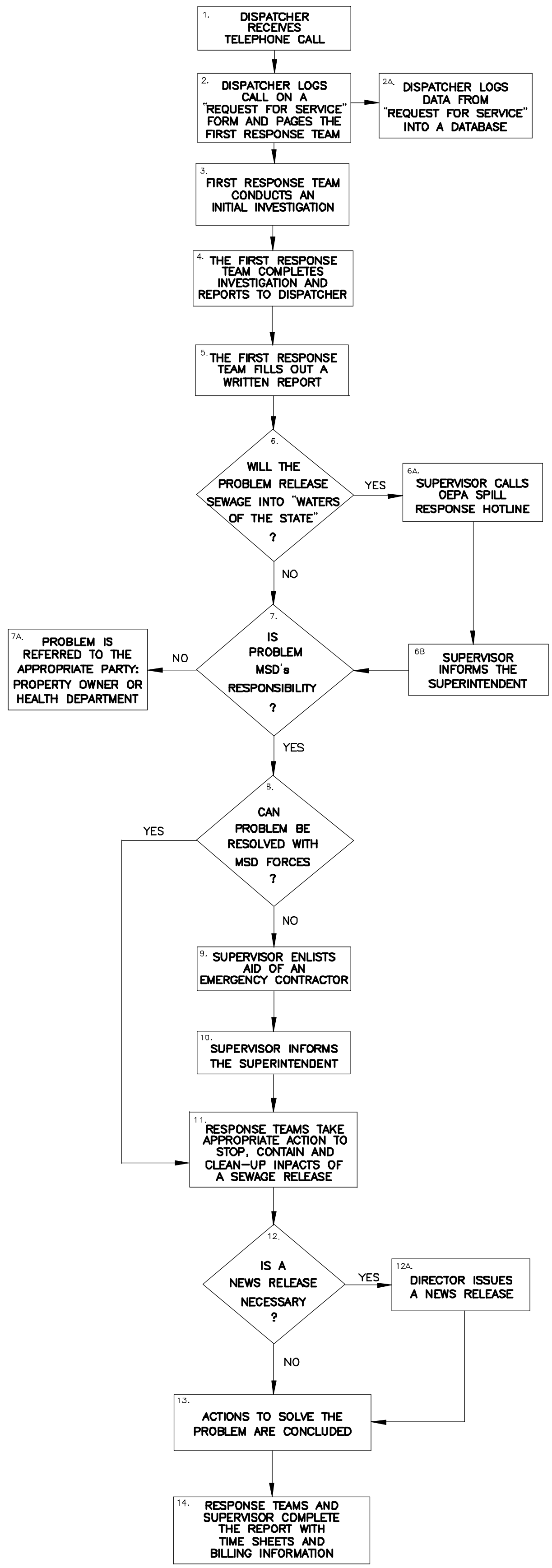
Request for service calls are received by the Dispatch Office at the following telephone numbers:

Monday-Friday...............................352-4900
7:30 a.m. - 4:00 p.m.

After Hours....................................244-5500

Calls received during normal working hours are taken by the Dispatch Office at 225 W. Galbraith Road, the WWC Division. Calls received after hours are taken by the after-hours Dispatcher at the MSD Main Office at 1600 Gest Street.

Figure 4



METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI, HAMILTON COUNTY, OHIO		
SEWER OVERFLOW RESPONSE PLAN		
TITLE: "REQUEST FOR SERVICE" PROCESS FLOWCHART		
DATE: DEC. 1999	SCALE: NONE	FIGURE: 4

Step 2 - Dispatcher Logs Call on a "Request for Service" Form and Pages the First Response Team

At this time, the Dispatcher manually logs key information onto the "Request for Service" form and then enters it into a Foxpro database. Information to be obtained is as follows:

- Name of the person calling,
- Address and phone number of the person calling,
- Time and date the call was received,
- Location, and,
- Details of the problem.

A reproduction of the "Request for Service" form is provided in Chapter 5.0.

Dispatchers are trained to elicit information on the exact nature and magnitude of the problem, including whether the sewer problem is on private property or in the MSD owned main-line sewer.

Also, during this step the Dispatcher pages crews by radio to respond to the service call. Depending upon the location and nature of the problem, one of three types of crews may respond:

- Technician in van,
- 2 person crew in rodder truck, and
- 3 persons in a complaint/rodder truck (after hours crew).

Below is a list of equipment carried by the various first response crews.

STANDARD EQUIPMENT FOR COMPLAINT CREWS

(April 18, 2000)

PERSONAL EQUIPMENT

- MSD Uniform
- MSD I.D. Badge
- Hard Hat
- Safety Glasses
- Safety Traffic Vest
- Safety Boots
- Gloves: Leather palm, Leather driving gloves, rubber gloves

GENERAL EQUIPMENT FOR ASSIGNMENTS

- Pager
- Cell phone
- Hand-held radio
- Computer/ Arcview & Complaint Tracking
- Location Sheet Pad
- WIB Sheet Pad
- Odors Sheet Pad
- Blue Cards
- White Cards
- Complaint forms
- Street guide
- Traffic Cones
- Atmosphere Meter
- Manhole Hook
- Flash light
- Mirror
- 100’ Tape
- Tripod and accompanying equipment
- MH lids
- Rope w/hook
- Grabber Poles
- Probing poles
- MH wrenches for unlocking MHs
- Wrenches, for bolts on some MHs
- Paint (Green)
- Survey Orange tape
- Spike, to go through pavement

Sledge hammer
Dye tablets
Hydrant Water hoses (50' lengths, 5' each)
Hydrant wrench
Hydrant fittings, for adapting hoses to hydrant
Hydrant pump

***Electric Mole machine/200' cable (requires a 2 person crew)*
***Various cable tools (1" spear, 3" spear, 1" pigtail, 3" root saw, etc.)*
***Gasoline Rodder Machine/300' of rods (requires a 3 person crew)*

<u>Step 2A - Dispatcher Logs Data from "Request for Service" into a Database</u>

Information from the telephone call is entered into a FoxPro database. This database is made available to all MSD divisions; however other divisions cannot change information entered by the WWC Division.

<u>Step 3 - First Response Team Conducts an Initial Investigation</u>

During this step, the crew arrives on site and locates the problem. Each First Response Team is provided with a laptop computer. Using ArcView, they can access Cincinnati Area Geographic Information System (CAGIS) mapping of the area. This will provide information on features including sanitary sewers, combined sewers, waterlines, gas lines, properties, roadways and rivers/streams. This information is particularly valuable to track the ultimate destination of a sewer overflow and in the event that bypass pumping is to be set-up.

At this time, the first response team is responsible for assessing the cause of the problem and making an initial determination of the level of effort required to correct the problem. First Response Teams try to "plan for the worst and hope for the best." In this manner, they can avoid unnecessary delays and difficulties that can occur by underestimating the situation initially.

Step 4 - The First Response Team Completes Investigation and Reports to Dispatcher

At this point, the First Response Team has evaluated the situation and made a report to the Dispatcher. The Dispatcher in turn notifies the appropriate Supervisor, if field conditions warrant their direct involvement.

Step 5 - The First Response Team Fills Out a Written Report

This is a continuation of the previous step. Findings of the investigation are logged in a written report, which is a continuation of the original "Request for Service" document. This information is then returned to the Dispatch Office for proper logging.

Step 6 - Will the Problem Release Sewage into "Waters of the State"?

At this point the First Response Team has evaluated the situation and reported to the Dispatcher if sewage will be released to the Waters of the State. The Dispatcher, in turn, notifies the Supervisor. The Supervisor, or his designee, places the call to the OEPA.

Step 6A - Supervisor Calls OEPA Spill Response Hotline

The spill response hotline for the Ohio EPA, Southwest District Office is 1-800-282-9378.

Step 6B - Supervisor Informs the Superintendent

The preceding steps may all occur within a timeframe of several hours. The problem may be resolved or well under control before the Superintendent can be made aware of the particular situation. The need to inform the Superintendent at this time should be determined on a case-by-case basis utilizing the judgment and experience of those persons involved. The Superintendent must be made aware of a problem in the event of the following situations:

- Releases of sewage into the environment,
- Events that may gain the attention of the media or the public-at-large, and
- Problems that cannot be resolved quickly or where an emergency contractor is needed.

Step 7 - Is Problem MSD's Responsibility?

From this step forward, the initial determination has been made as to the likely cause of the problem and the Supervisor assists with an appropriate course of action. The first question pertains to ownership of the sewer line. If the problem is on private property, then Step 7A is undertaken. If the problem is in the building service line in the public right-of-way, MSD will assist the homeowner with bypass pumping. If the problem is in the main-line sewer owned by MSD, then one proceeds to Step 8.

Step 7A - Problem is Referred to Appropriate Party: Property Owner or Health Department

In some instances, service calls may be received for private sewers. MSD has no jurisdiction over these lines. Accordingly, these service calls are referred to City or County Boards of Health, whichever is appropriate. Telephone numbers are provided in Chapter 5.0.

Step 8 - Can Problem be Solved with MSD Forces?

During this step, the team and Supervisor decide whether the problem can be handled with MSD forces alone or if emergency contract assistance is needed. In many instances, the First Response Team on-site is fully capable of resolving the problem. In other instances, additional MSD maintenance teams may be paged.

Step 9 - Supervisor Enlists Aid of an Emergency Contractor

Occasionally, a problem will be encountered, such as a main-line sewer break, when an emergency contractor is brought in to solve the problem. This generally occurs when problems are large and beyond the resources of the MSD staff and crews.

Step 10 - Supervisor Informs the Superintendent

This step is essentially a repeat of Step 6B. In this situation, it is customary to inform the Superintendent.

Step 11 - Response - Take Appropriate Action to Stop, Contain and Clean-up Impacts of a Sewage Release

The previous steps describe the decision-making process to assess the impact of a problem, to assess the degree of MSD responsibility and to mobilize the appropriate resources. During this step the First Response Team, in house maintenance crews and emergency contractors take appropriate action to stop, contain and clean-up impacts of a sewage release. *These procedures are described in Section 4.2.* All of the actions described below may be undertaken sequentially or concurrently.

Step 12 - Is a News Release Necessary?

In general, the Division's response to problems is so fast that problems are solved before the public can even become aware. However, there are other instances, due to magnitude, location and time of the problem that the Superintendent and Director may decide to issue a news release.

Step 12A - Director Issues a News Release

Under this step, the Director's office issues a news release of the problem, its cause and actions being taken to resolve it.

Step 13 - Actions to Solve the Problem are Concluded

At this point, all work to correct and remediate the problem is completed.

Step 14 - Response Teams and Supervisor Complete the Report with Time Sheets and Billing Information

This is the final step in the response flowchart where all paperwork on the incident is completed and returned to the Dispatch Office. The report is a continuation of the original "Request for Service". The report is also used as a repository for billing and cost information.

4.2 MSD Formulates a Division - Wide Response to Stop, Contain and Clean-Up Impacts of a Sewage Release

MSD will formulate a response that is site specific and considers the following situations:

- time of day and day of week (holidays)
- location and accessibility of equipment
- time of year

- current and projected weather forecasts
- receiving stream
- size and type of sewer
- estimated volume of bypass
- in some cases the river stage
- availability of necessary equipment
- employee availability

The remainder of this section describes general practices employed by the WWC Division to stop, contain and clean up the impacts of a sewage release.

It should be noted that every response is site specific and may include, but not limited to any combination of the following activities:

- Probing
- Rodding
- Machine Cleaning
- Flush/Vaccing
- CCTV Inspection

- Excavate/Reconstruction

Measures to Contain the Overflow

The purpose of containment is to minimize the affected area of impact until further action can be taken.

Containment of Overflow

Containment is site specific and may include, but not limited to:

- Using natural creek depressions
- Constructing earthen dams
- Constructing sand bag dams (roadways and creeks)

Convey Contained Flow Back to System

- The WWC Division will make a concerted effort to return the contained flow back to the collection system by means of pumping or gravity conveyance.

Maintenance of Flow

In the event of a prolonged sewer line blockage or a sewer line collapse, the crew may set up a portable bypass pumping operation to maintain existing flow. The WWC engineering staff may assist to determine the proper size and number of pumps required to effectively handle the sewage flow and the crew may periodically monitor the bypass pumping. Depending upon site conditions centrifugal pumps or hydraulic submersible pumps may be utilized along with overland piping systems.

Measures to Clean up the Impacts of an Overflow

Once measures to stop, contain and maintain flow have been established, the WWC Division will undertake actions to clean up the effects of a sewer overflow in the following manner:

- Where sewage and residual materials have resulted in ponding, the sewer overflow is recovered through flushing and/or pumping

- Next, the overflow path upstream of the containment area is flushed with water, if available, and recovered to the sewer system

- If appropriate, the overflow area is deodorized with a nontoxic, odor masking agent

Prevention

The WWC Division places a premium on preventive maintenance activities. Following the completion of sewage release containment and clean up, the causes of the discharge are evaluated to determine possible improvements to prevent future problems. Causes of discharge have included:

- Vandalism
- Pipe collapse
- Debris build-up

Where possible, MSD will take appropriate actions to reduce the potential of a reoccurring sewage release and has found the following activities to be particularly helpful.

- Secure manhole lids/limit access to structures
- Repair the sewer system as problems are discovered
- Perform scheduled maintenance activities such as root removal and cleaning

If maintenance activities cannot resolve the sewage release, then the SSO will be referred to the Engineering Division for further investigation and possible capital improvement.

5.0 COMMUNICATIONS

This chapter provides an overview of communications practices followed by MSD to document findings of service calls and sewer overflows. This includes special forms used by the WWC Division and information disseminated to the public.

All notification and reporting of SSOs to regulatory agencies shall be consistent with MSD's ***SSO Monitoring and Reporting Plan*** (January 2002).

Important Phone Numbers

City of Cincinnati Board of Health:

East Side 352-2908

West Side 564-1750

Hamilton County Board of Health 326-4500

Ohio EPA Spill Hotline (OEPA-SWDO) 1-800-282-9378

The "Request for Service" Form

The "Request for Service" form is the primary method utilized by the WWC Division to record a sewer related problem. This form follows all activity revolving around the problem from the initial call to final disposition. The "Request for Service" is assigned a number, which follows the call. In this manner, MSD maintains a chronological record of all calls. This record becomes useful to the District in scheduling maintenance, repair project and special projects and Capital Improvement Program projects.

News Release

The Director or Superintendent, following consultation with local Health officials, may issue a news release for any sanitary sewer overflow due to magnitude of discharge, location or time of discharge or an unusual threat to the public. The news release will identify the problem, the cause and actions being taken to solve it.

Metropolitan Sewer District
Wastewater Collection

Date:____________

Request for Service

Time:____________

Caller Info

Received by:____________

First Name__________________________ Last Name________________________________

Agency________________________________ Phone: Business__________________

Address______________________________________ Home_________________

Location

Address____

Near Intersection____

City/Township_________________ Sub Area____________Zip Code____________

Details____

Comments	**Job Order**
	Address____ Foreman_______________________________________ Repair____ ST_______SW ______SOD_____R/W______ Est. Days______________________________________ Size of Cut_____________________________________ Number____ UT#__________________WW___________________

On Site

Date:____________ Unit Responding:__________________________

Time Received:__________ Arrived:__________ Finish:______________

Condition Found and Temporary Action Taken (Make All Referrals by Name - Do Not Use Radio Numbers)

Pump#	P/U Pump	EIB	Office Use

Final Disposition

Signage

MSD will erect signage (where practical) to inform the public that a “rain” related sewer overflow has occurred at one of the locations identified in APPENDIX “A”. APPENDIX “A” is based on the “rain related” SSOs reported to OEPA. Future signage will be added or deleted to conform to the “rain related” SSOs reported to OEPA.

In certain instances, MSD may wish to erect temporary signage to inform the public that a “non-rain” related sewer overflow has occurred. An example of such a circumstance may be if the sewer overflow is prolonged and the chance for public contact is high. The decision to erect signage should be based largely upon judgment of those involved and done on a case-by-case basis. Figure 5 presents an example sign that could be erected by crews if needed.

Figure 5

WARNING

SEWER OVERFLOW

Water in this area may contain sanitary sewage.
Contact with sewage
poses a potential health risk.

For more information, call:

METROPOLITAN SEWER DISTRICT

(513) 352-4900

Public Education

MSD undertakes a significant effort to educate the public through formal presentations in schools and tours of treatment facilities. The purpose of this effort is to enlighten the public about MSD's role as a leading steward of the environment and provide information on activities undertaken by MSD.

6.0 APPENDICES

A SSO Locations

B CSO Locations

C Information Given to the Public by the WWC Division

D Other Forms

E Referenced Codes & Policies:

- City of Cincinnati Purchasing Regulations
- Hamilton County Administrative Rule #2
- Board of Hamilton County Commissioners Emergency Policy for Sewers

APPENDIX A

SSO LOCATIONS

LIST OF SANITARY SEWER OVERFLOW LOCATIONS

MSD FACILITY	LOCATION	CLASS
0.0	End of Sultana Drive Cul-De-Sac	Removed
70.0	Plainville Road north of Little Duck Creek	Removed
77.0	Intersection of Murray Avenue and Simpson Avenue	Removed
103.0	Avon Drive cul-de-sac	Removed
216.0	Intersection of Muddy Creek Road and Westbourne Road	Removed
219.0	South of Intersection of Burns and Ferndale Avenues	Removed
222.0	Intersection of Connecticut Court and Connecticut Avenue	Generally Inactive
225.1A	Intersection of Middleton Avenue and Rawson Woods Lane	Generally Inactive
227.0	Intersection of Kennedy and Iris Avenues	Removed
228.0	Intersection of Kennedy, Iris, and Dante Avenues	Highly Active
477.0	Vibet Court	Removed
508.0	245 Clark Avenue, near bridge	Removed
519.0	5110 Froome Avenue	Removed
530.0	6309 Betts Avenue	Highly Active
531.0	Intersection of Goodman and Bake Avenues	Highly Active
531.0	Intersection of Goodman and Bake Avenues	Highly Active
565.0	9590 Kemper Road, Across Polk Run Creek	Generally Inactive
566.0	Hosbrook Drive at Hosbrook Manor Apartments	Removed
567.0	6936 Grace Avenue	Highly Active
568.0	Intersection of W. Galbraith and Gloria Avenues	Generally Active
569.0	Intersection of W. Galbraith and Rob Vern Avenue	Generally Active
570.0	Intersection of Euclid and Maple Avenues	Highly Active
571.0	435 Elliott Avenue	Removed
572.0	406 Elliott Avenue	Highly Active

MSD FACILITY	LOCATION	CLASS
573.0	1801 Carpenter Avenue	Removed
574.0	2014 Carpenter Avenue	Generally Removed
575.0	6849 Beechmont Avenue, near Anderson Township Lane	Removed
576.0	Intersection of Swift and Attica Avenues	Highly Active
577.0	Sterling Avenue	Highly Active
578.0	Royal Glen Avenue, east of Blanchetta Avenue	Removed
579.0	Intersection of Richmond and Orchard Avenues	Generally Inactive
581.0	At Intersection of Montgomery and Quatman Avenues	Removed
581.1A	Quatman Avenue, West of Montgomery Avenue	Removed
583.0	Located at intersection of Osceola Avenue and Camargo Road	Removed
584.0	North Bend Road, near Bridge over Mill Creek	Removed
585.0	1273-1279 Norman Avenue	Generally Inactive
586.0	Intersection of Vale and North Park Avenue	Removed
587.0	11460 Rose Lane	Generally Inactive
588.0	6963 Salem Avenue	Generally Inactive
589.0	6778 Leconte Avenue	Generally Inactive
590.0	3332 W. Galbraith, west of Cella Avenue	Generally Inactive
591.0	Intersection of Euclid and Maple	Generally Inactive
592.0	Hamilton at Sundale Avenue	Removed
593.0	Intersection of Savannah and Catalpa Avenues	Generally Active
597.0	6929-6933 Leboiteaux Avenue	Generally Active
599.0	Intersection of Hamilton and Claretta Avenues	Removed
600.0	Intersection of Plainfield and Schenck Avenues	Generally Inactive
601.0	Intersection of Plainfield and Hoffman Avenues	Generally Active
602.0	Intersection of Matson and Monticello Avenues	Removed
603.0	8879 Plainfield Avenue	Generally Active

MSD FACILITY	LOCATION	CLASS
604.0	Intersection of State and Miami Avenues	Removed
606.0	1519 Kenova Avenue	Removed
607.0	O'Leary Avenue, east of May Street	Inactive
608.0	Intersection of Southside and Dawson Avenues	Generally Inactive
609.0	4001 Oak Avenue	Removed
610.0	Frondorf Road south of Bridgetown Road	Removed
611.0	Intersection of Hamilton and Catalpa Avenues	Inactive
612.0	Hamilton Avenue, south of Lakeknoll Apartments	Generally Inactive
615.0	Intersection of Eastern and Deering Avenues	Removed
619.0	3950 Landsdowne Avenue, west of May Street	Removed
620.0	9094 Eldora Drive, behind house near Cooper Creek	Highly Active
623.0	Intersection of Viscount and Delhi Pike	Generally Active
624.0	613 Stewart Avenue, west of Anthony Wayne	Removed
625.0	Intersection of Davis and Rolef Avenues	Inactive
627.0	3763 Thornton Avenue	Removed
628.0	Pippen Road, north of Adams Road	Highly Active
631.0	3717 North Berkely Circle	Removed
632.0	Race Road, north of Raceview Road	Removed
634.0	Intersection of W. Galbraith and Parrish Avenue	Highly Active
635.0	Intersection of Linden and Lake Avenues	Removed
639.0	1276 Compton Road, near creek	Generally Inactive
640.0	3001 Shadycrest Avenue, behind house near creek	Generally Inactive
641.0	Intersection of Beechmeadow Lane and Ralph Avenue, near the creek	Inactive
645.0	Intersection of Middletown and McAlphin Avenues	Generally Active
646.0	Intersection of Linden and Larchmont Avenues	Inactive

MSD FACILITY	LOCATION	CLASS
647.0	Behind 9600 Ross Avenue, near the creek	Inactive
675.1A	Muddy Creek at Anchor Cove Marina, west side	Generally Inactive
675.2B	Muddy Creek at Anchor Cove Marina, east side	Removed
676.0	Muddy Creek Pump Station Outlet Chamber	Pump Station
678.0	Park Avenue	Removed
679.1A	6501 Park Avenue, behind the house	Highly Active
679.2B	6500 Mariemont Avenue, behind the house	Highly Active
680.0	Near the intersection of Wooster Pike and Park Avenues	Highly Active
681.0	9201 Blue Ash Road	Inactive
682.0	9304 Blue Ash Road	Inactive
684.0	6101 Stewart Road, near the bridge	Generally Inactive
685.0	Cross County Highway	Removed
687.0	Intersection of Smiley and Valleyview Avenues	Removed
688.0	North of Indian Creek WWTP	Removed
689.0	Intersection of Anshcutz and Broadway Avenues	Removed
690.0	First Manhole east of Polk Run WWTP	Generally Active
691.0	First Manhole south of Harper Street Pump Station	Removed
692.0	Lowland Road, near Anchor Cove Marina	Inactive
693.0	Sycamore Creek, west of Loveland-Madeira Road	Removed
695.0	Sycamore Creek, 5 MH west of SSO 693	Removed
696.0	Banning Road, east of Colerain, under the bridge	Removed
697.0	Hillside Road Ballfields, near west edge of fields	Generally Inactive
698.0	Route 32, behind SuperAmerica Station	Removed
699.0	Railroad Avenue, in parking lots of Arthritis Foundation	Generally Active
700.0	Behind the Ohio Asphalt Company, near Mill Creek	Highly Active

MSD FACILITY	LOCATION	CLASS
701.0	Intersection of River and Bender Roads, in Rapid Run	Removed
703.0	East of Intersection of Quaillhil and Werk Avenues	Removed
704.0	8811 Tudor Avenue	Generally Active
705.0	9512 Main Street	Generally Inactive
706.0	3933 Race Road	Removed
1000.0	South of the Intersection of Attica and Groverhill	Generally Active
1001.0	Intersection of East Benson and Hill Street	Generally Inactive
1002.0	Intersection of Bake and DeArmand Avenues	Generally Active
1003.0	7131 Hamilton Avenue	Generally Inactive
1004.0	1418 St. Clair Avenue	Removed
1005.0	1834 Sundale Avenue	Generally Active
1005.0	1834 Sundale Avenue	Generally Active
1006.0	At the north terminus of Franklin Avenue	Removed
1007.0	1701-1704 Lincoln Avenue	Removed
1008.0	Intersection of Euclid and Miami Avenues	Generally Active
1009.0	Intersection of Davis and Williams Avenues	Generally Inactive
1010.0	Intersection of Elm and Mulberry Avenues	Generally Inactive
1011.0	Intersection of Rolef and Wilson Avenues	Removed
1012.0	5988 Lawrence Avenue	Inactive
1013.0	One MH west of SSO 625	Removed
1014.0	Chase Creek, south of Juniperview Avenue	Generally Inactive
1015.0	Behind Nathional Guard Armory, off Vine Street	Removed
1016.0	Intersection of Sagamore and Lansdowne Avenues	Removed
1017.0	7907 Euclid Avenue	Highly Active
1018.0	Carmargo Road, south of Shawnee Run Road	Removed
1019.0	MacArthur Park Apartments entrance	Removed

MSD FACILITY	LOCATION	CLASS
1020.0	Intersection of Heile Drive and Hunt Road	Generally Inactive
1021.0	Bernard Avenue	Removed
1022.0	8345 Greismer Avenue	Generally Inactive
1023.0	4021 Matson Avenue	Highly Active
1024.0	1835 Dallas Avenue	Highly Active
1025.0	West High Street, in the woods	Generally Inactive
1026.0	3830 Spencer Avenue	Removed
1027.0	Intersection of Linden and MacGregor Avenues	Removed
1028.0	4334 Runninfawn Drive	Removed
1029.0	#5 Sylvan Drive, behind the house in the creek	Generally Active
1030.0	Intersection of Elsmere and Ashland Avenues	Removed
1032.0	Intersection of Losantiville and Cedarbrook Drive	----
1036.0	Intersection of Camargo Road and Shawnee Run Road, near	Removed
1041.0	Intersection of Elm and Burns Avenue	Removed
1042.0	1483 Balfour Avenue, behind the house in the creek	----
1043.0	225 W. Galbraith Avenue, near the employee parking lot	----
1044.0	6280-6282 Witherby Avenue	----
1045.0	Intersection of Cooper and Crescent Avenues	----
677.0P	Route 50, opposite Martha Avenue, under railroad bridge	Active
730.0P	Addyston @ 38 Mistletoe Avenue, 30’ north of Route 50	Active
747.0P	Placid Meadows @ 529 Covedale	Active
748.0P	Poinsettia @ east curb of Delhi Park Road	Removed
773.0P	Glenview @ 3999 Virginia Court	Active
779.0P	Taylor Road @ 630 Taylor Road	Active
790.0P	Arrowhead Court @ 9096 Arrowhead Court	Active

MSD FACILITY	LOCATION	CLASS
794.0P	Greenpine Acres @ 2068 Persimmon Court	Active
798.0P	Marview Terrace @ 611 Marview Terrace	Active
799.0P	Mill Brook #1 @ 736 Woodfield Road	Active
805.0P	Winton Road #1 @ Winton Road, 150' south of Corbett	Active
833.0P	Glen Lakes @ 9536 McKinney Road	Removed
851.0P	Berkely Woods @ 5291 Sirrup Road	Active
852.0P	Britney Acres @ 8100 Woodruff Road	Active
855.0P	Fries Third @ 5980 Bagdad Drive	Active
856.0P	High Meadows @ 6805 High Meadows Drive	----
858.0P	8575 Clough Pike	Removed
859.0P	6009 Virbet Court	Removed
861.0P	Prospect Woods @ 6805 High Meadows Drive	----
866.0P	Stanberry Park @ 6069 Tridale Court	----
1046	McGraw Avenue, at end of street	----
1047	Intersection of Park and Harmony Avenues	----
1048	Intersection of Glensprings and Springfield pike	----
1049	10290 Montgomery Road	----
1050	9169 Tag Avenue	----
1051	3312 Main Street, Addyston	----
1052	First MH outside Sycamore WWTP	----
1053	Temporary outfall, Camargo Road Phase 1	----
1054	Mariemont Swim Club	----

APPENDIX B

CSO LOCATIONS

CSO List Sorted by Drainage Basin and CSO Number

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
043	1PX00022326	5249 CHARLOE ST. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
054	1PX00022328	LAWNDALE GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
061	1PX00022329	4730 MADISON AVE. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
064	1PX00022330	END OF HARROW ST. DIV. DAM	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
066	1PX00022331	MADISON AND REDBANK GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
068	1PX00022332	NU-TONE PARKING LOT GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
069	1PX00022333	CAMARGO AND EAST FORK GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
071	1PX00022262	PLAINVILLE AND INDIAN HILL GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
072	1PX00022334	4800 JAMESON GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
073	1PX00022335	4713 SETTLE GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
074	1PX00022336	6402 ROE ST. GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
075	1PX00022263	6333 ROE ST. GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
076	1PX00022337	BRAMBLE AND HOMER GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
078	1PX00022338	3980 SOUTH WHETSEL GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
079	1PX00022339	SOUTHERN AVE. GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
080	1PX00022340	BROTHERTON RD. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
083	1PX00022341	3675 FOREST HILLS GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
084	1PX00022269	"OLD RED BANK" RD. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
085	1PX00022342	5150 WOOSTER PIKE GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
086	1PX00022264	ARCHER ST. DIV. DAM	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
135	1PX00022___	1351 KENNEDY AVE. GRATING	LITTLE MIAMI	DUCK CREEK	
136	1PX00022343	3979 ROASSLYN DR. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
	1PX00022344	NORWOOD INCINERATOR GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
182	1PX00022251	BERKSHIRE REGULATOR	LITTLE MIAMI	CLOUGH	TRIB TO CLOUGH CREEK
187	1PX00022345	5637 LESTER RD. GRATING	LITTLE MIAMI	DUCK CREEK	TRIB. TO DUCK CREEK
188	1PX00022265	3646 MADISON RD. DIV. DAM	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
199	1PX00022346	FORD GATE GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
200	1PX00022347	EAST FORK AVE. GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE DUCK CREEK
205	1PX00022348	CAMBERWELL AVE. DIV. DAM	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
214	1PX00022270	YONONTE CR. GRATING	LITTLE MIAMI	DUCK CREEK	TRIB. TO DUCK CREEK
467	1PX00022252	DELTA AVE. WEST REGULATOR	LITTLE MIAMI	DUCK CREEK	OHIO RIVER
467A	1PX00022317	DELTA AND HUMBERT DIV. DAM	LITTLE MIAMI	DUCK CREEK	OHIO RIVER
468	1PX00022253	DELTA AVE. EAST REGULATOR	LITTLE MIAMI	DUCK CREEK	OHIO RIVER
469	1PX00022254	DELTA @ EASTERN DIV. DAM	LITTLE MIAMI	DUCK CREEK	OHIO RIVER
470	1PX00022318	EASTERN AVE. GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE MIAMI
471	1PX00022319	GRANDIN ROAD GRATING	LITTLE MIAMI	DUCK CREEK	LITTLE MIAMI
472	1PX00022320	TURPIN ST. DIV. DAM	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
473	1PX00022321	PENNSYLVANIA AVE. DIV. DAM	LITTLE MIAMI	DUCK CREEK	DUCK CREEK

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
476	1PX00022256	CLOUGH CR. DIV. DAM	LITTLE MIAMI	CLOUGH	CLOUGH CREEK
500	1PX00022266	ROBERTSON SOUTH OF 1-71 GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
501	1PX00022350	4326 28TH ST. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
503	1PX00022351	ZAEH RD. GRATING	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
549	1PX00022258	WILLIAMS AND DUCK CR. REGULATOR	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
550	1PX00022259	NORTH TERM. EDWARDS RD. REGULATOR	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
551	1PX00022322	I-71 OPP. LESTER RD. REGULATOR	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
552	1PX00022323	I-71 WEST OF MARBURG REGULATOR	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
553	1PX00022324	NORTH TERM. MARBURG REGULATOR	LITTLE MIAMI	DUCK CREEK	DUCK CREEK
554	1PX00022325	STEWART AND KEN ARBRE GRATING	LITTLE MIAMI	DUCK CREEK	TRIB. TO DUCK CREEK
555	1PX00022260	OPP. 6735 KEN ARBRE GRATING	LITTLE MIAMI	DUCK CREEK	TRIB. TO DUCK CREEK
556	1PX00022268	STEWART RD. WEST REGULATOR	LITTLE MIAMI	DUCK CREEK	TRIB. TO DUCK CREEK
557	1PX00022261	STEWART RD. EAST REGULATOR	LITTLE MIAMI	DUCK CREEK	TRIB. TO DUCK CREEK
656	1PX00022354	WOOSTER @ RED BANK DIV. DAM	LITTLE MIAMI	DUCK CREEK	LITTLE MIAMI
657	1PX00022355	CORBIN ST. DIV. DAM	LITTLE MIAMI	DUCK CREEK	OHIO RIVER
002	1PX00022394	LIBERTY ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
003	1PX00022395	HARRISON AND STATE WEST REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
004	1PX00022396	HARRISON AND STATE EAST REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
005	1PX00022279	LICK RUN REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
006	1PX00022397	QUEEN CITY EAST REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
007	1PX00022280	DRAPER ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
008	1PX00022398	VINTON ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
009	IPX00022281	MARSHALL AVE. REGULA TOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
010	1PX00022282	DENHAM ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
011	1PX00022399	HOPPLE ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
012	1PX00022283	BATES RN REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
013	1PX00022284	YONKERS ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
014	1PX00022285	STATION 15 REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
015	1PX00022286	ARLINGTON ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
017B	1PX00022287	DREMAN AVE. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
018	1PX00022310	COLERAIN AVE. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
019	1PX00022400	GERINGER ST. GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
021	1PX00022288	STRENG ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
022	1PX00022289	LUDLOW AVE. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
023	1PX00022290	ALIBONE ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
024	1PX00022291	LUDLOW RUN REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
025A	1PX00022401	WINTON RD. A REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
026A	1PX00022374	STATION AVE. A DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
028	1PX00022276	CLIFTON AVE. EAST GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
029	1PX00022376	DONNELL ST. GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
030	1PX00022377	LAFAYETTE CIR. GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
033	1PX00022277	BANK AVE. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
037	1PX00022379	MAPLE ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
039	1PX00022380	64TH ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
053	1PX00022327	HARVEST AND KINCAID GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	DUCK CREEK
089	1PX00022381	MONTANA GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
109	1PX00022382	HILLCREST NORTH GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	LUDLOW RUN
110	1PX00022383	4710 HOWARD GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	LUDLOW RUN
112	1PX00022384	1547 SPRINGLAWN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	LUDLOW RUN
117	1PX00022278	DREMAN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
123	1PX00022387	HOFFNER GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
125	1PX00022388	BADGELEY RUN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
126	1PX00022389	TODD #1 GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
127	1PX00022390	HAYS GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
128	1PX00022391	TODD #2 GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
130	1PX00022392	BUTTE GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
151	1PX00022403	GROESBECK GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	LUDLOW RUN
152	1PX00022292	FITZPATRICK ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
162	1PX00022404	THOMPSON HEIGHTS GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	LUDLOW RUN
165	1PX00022405	SPRINGLAWN @ BRIDGE GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	LUDLOW RUN
171	1PX00022406	VINE AND DECAMP DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
179	1PX00022408	SCARLET OAKS REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
180	1PX00022293	BLUE ROCK REGULATOR	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
181	1PX00022311	BLOODY RUN REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	BLOODY RUN
191	1PX00022409	7601 PRODUCTION DR. GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	TRIB. TO MILL CREEK
194	1PX00022410	HIGHPOINT GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	TRIB. TO WEST FORK
195	1PX00022411	WESTWOOD NORTHERN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	TRIB. TO WEST FORK
203	1PX00022412	TWIN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
217A	1PX00022414	WOODEN SHOE REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	KINGS RUN
226	1PX00022415	OXLEY GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST BRANCH MILL

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
					CREEK
419	1PX00022294	BOLD FACE SR. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
420	1PX00022418	DELHI AVE. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
421	1PX00022419	REIVER ROAD @ DELHI DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
422	1PX00022295	MT. ECHO RD. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
423	1PX00022420	MT. HOPE AVE. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
424	1PX00022421	RIVER RD. @ STATE DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
425B	1PX00022423	STATE AVE. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
426A	1PX00022424	EVANS AND RIVER RD. #1 DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
426B	1PX00022425	EVANS AND RIVER RD. #2 DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
427	1PX00022426	PERIN AND EVANS DIV. DAM SLUICE	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
428	1PX00022312	SOUTH ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
429	1PX00022427	GEST ST. EAST DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
430	1PX00022296	GEST ST. WEST-2-DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
431A	1PX00022429	BLACKFORD ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER AND MILL CREEK
432	1PX00022297	9TH AND MCLEAN DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
433	1PX00022298	CARR ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
434	1PX00022430	CARR AND FRONT DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
435	1PX00022431	BAYMILLER ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
436	1PX00022299	GEST AND FRONT REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
437	1PX00022432	SMITH ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
438	1PX00022300	CENTRAL AVE. GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
442	1PX00022433	VINE ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
445	1PX00022301	RIVERFRONT STADIUM REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
447	1PX00022434	RIVERFRONT COLISEUM REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
449	1PX00022435	PIKE ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
450	1PX00022436	BUTLER ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
451	1PX00022302	SAWYER POINT EAST DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
452	1PX00022437	PARSONS ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
453A	1PX00022303	COLLARD ST. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
454A	1PX00022439	LITHERBURY ST. NORTH DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
454B	1PX00022440	LITHERBURY ST. SOUTH DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
455	1PX00022441	WALDEN ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
456	1PX00022442	HAZEN ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
457	1PX00022443	COLLINS ST. WEST DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
457A	1PX00022444	COLLINS ST. WEST REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
458	1PX00022304	COLLINS ST. EAST DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
459	1PX00022445	BAYOU ST. 120 WEST REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
460	1PX00022446	BAYOU ST. 100 WEST DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
461	1PX00022447	EGGLESTON AND 4TH DIV. DAM SLUICE	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
464	1PX00022448	EGGLESTON AND 3RD F. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
465	1PX00022449	EGGLESTON AND 3RD E. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
466E	1PX00022450	EGGLESTON AND PETE ROSE WAY DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
466W	1PX00022___	EGGLESTON AND PETE ROSE WAY DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	
481	1PX00022313	MITCHELL AND SPRING GROVE DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
482	1PX00022306	MITCHELL AVE. REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
483	1PX00022307	KINGS RUN REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
485	1PX00022451	ROSS RUN REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
486	1PX00022314	KINGS RUN AND SPRING GROVE DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
487	1PX00022315	ROSS RUN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	ROSS RUN
488	1PX00022452	68TH ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
489	1PX00022453	7TH AND MCLEAN DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
490	1PX00022454	LOCKLAND HIGHWAY GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
505	1PX00022267	BEREDITH AND KINCAID GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	DUCK CREEK
506	1PX00022352	6536 CLIFFRIDGE GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	TRIB. TO MILL CREEK
507	1PX00022456	214 CLARK ST. GRATING	MILL CREEK	EAST BRANCH MILL CREEK	MILL CREEK
508	1PX00022457	245 CLARK ST. OVERFLOW	MILL CREEK	EAST BRANCH MILL CREEK	MILL CREEK
509	1PX00022455	GERBERT STREET. GRATING	MILL CREEK		MILL CREEK
510A	1PX00022458	SOUTHERN AVE. GRATING	MILL CREEK	EAST BRANCH MILL CREEK	MILL CREEK
511	1PX00022460	531 DAVIS GRATING	MILL CREEK	WEST BRANCH MILL CREEK	MILL CREEK
512	1PX00022461	MILL AND VINE GRATING	MILL CREEK	EAST BRANCH MILL CREEK	MILL CREEK
513	1PX00022462	BERNARD AND REISENBERG GRATING	MILL CREEK	EAST BRANCH MILL CREEK	MILL CREEK
514	1PX00022463	150' NORTH OF SMALLEY GRATING	MILL CREEK	EAST BRANCH MILL CREEK	MILL CREEK
515	1PX00022308	200' WEST OF BACOON ST. GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
516	1PX00022464	BACON ST. GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
517	1PX00022465	510 SOUTH COOPER GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
525	1PX00022466	MT. AIRY GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	TRIB. TO WEST FORK
527A	1PX00022467	POWERS #1 GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
528A	1PX00022470	BEEKMAN NORTH GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
528B	1PX00022471	BEEKMAN SOUTH GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL CREEK
529B	1PX00022472	LIEWELLEN GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	WEST FORK MILL

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
					CREEK
532	1PX00022309	DALY RD. VORTEX SEPARATOR	MILL CREEK	WEST BRANCH MILL CREEK	COMPTON CREEK
535	1PX00022473	146 RIDGEWAY GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	CILLEY CREEK
536	1PX00022474	6246 MARIE GRATING	MILL CREEK	WEST BRANCH MILL CREEK	COMPTON CREEK
537	1PX00022475	#41 SHERRY GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	CILLEY CREEK
538	1PX00022476	#96 NORTH PARK GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
539	1PX00022477	117 E. CHARLOTTE GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
544	1PX00022479	VINE ST. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	BLOODY RUN
558C	1PX00022483	P & G #3 REGULATOR	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
559	1PX00022485	914 OAK ST. GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
560	1PX00022486	60 ST. CLAIR GRATING	MILL CREEK	SOUTH BRANCH MILL CREEK	CILLEY CREEK
562	1PX00022488	428 SOUTH COOPER GRATING	MILL CREEK	WEST BRANCH MILL CREEK	WEST BRANCH MILL CREEK
651	1PX00022489	RIDGE @ LAKEVIEW DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	TRIB. TO MILL CREEK
653	1PX00022490	MURRAY RD. DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	BLOODY RUN
655	1PX00022491	25 SPRUCE DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
658	1PX00022492	HAZEN ST. @ GLEN ALLEY DIV. DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	OHIO RIVER
666	1PX00022428	MCLEAN AND LIBERTY ST. DIVERSION DAM	MILL CREEK	SOUTH BRANCH MILL CREEK	MILL CREEK
198	1PX00022316	MUDDY CREEK @ WESTBOURNE GRATING	MUDDY CREEK	MUDDY CREEK	MUDDY CREEK
223	1PX00022356	FOLEY RD. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
402	1PX00022357	TOPINABEE RD. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
403	1PX00022358	ELCO ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
404	1PX00022271	IVANHOE ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
405	1PX00022272	REVERE ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
406	1PX00022359	KENNEBEC ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
408	1PX00022360	WOCHER ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
410	1PX00022362	FENIMORE ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
411	1PX00022363	ANDERSON FERRY RD. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
412	1PX00022364	COLAFAX ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
413	1PX00022365	TYLER ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
414	1PX00022366	McGINNIS ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
415	1PX00022367	FITHIAN ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
416	1PX00022368	IDAHO ST. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
518	1PX00022370	MUDDY CR. (WEST OF SIDNEY) GRATING	MUDDY CREEK	MUDDY CREEK	MUDDY CREEK
520	1PX00022371	ROBB AND WEST ST. GRATING	MUDDY CREEK	MUDDY CREEK	MUDDY CREEK

CSO NO	EPA STATION	NAME	DRAINAGE_B	AREA	RECEIVING
522	1PX00022274	WERK AND WESTBOURNE GRATING	MUDDY CREEK	MUDDY CREEK	MUDDY CREEK
523	1PX00022275	RAPID RUN AND DEVILS BACKBONE GRATING	MUDDY CREEK	RAPID RUN	RAPID RUN
541	1PX00022369	5678 RIVER RD. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER
637	1PX00022373	CARRIE @ McFARREN GRATING	MUDDY CREEK	MUDDY CREEK	MUDDY CREEK
654	1PX00022372	STILLE DR. DIV. DAM	MUDDY CREEK	RIVER ROAD	OHIO RIVER

APPENDIX C

INFORMATION GIVEN TO THE PUBLIC BY THE WWC DIVISION

INFORMATION ON

HEALTH CONCERNS AND CLEANING A BASEMENT

AFTER A SEWER BACKUP

Heavy storms, blockages or breakdowns in sewer pipes and other events can cause the sewer system to back up into basements. The water contains sewage, even when diluted by storm water. Children and pets should be kept out of the flooded areas until the areas have been cleaned.

Please note that cleanup is not the responsibility of the Metropolitan Sewer District; it is the responsibility of the property owner or resident. The Cincinnati Health Department offers the following information on cleanup if water from the sewer system has entered your basement.

1.) Protect yourself while removing the water and cleaning your basement by wearing rubber boots and gloves.
2.) Wash clothes and other items which come into contact with the backup water with soap and water.
3.) Wash your hands with soap and water.
4.) Remove odors and disinfect flooded areas with a solution of bleach (one part bleach in 10 parts water) or other household disinfectants. Do not use ammonia.

Sewage has the potential of carrying microorganisms which cause diarrhea and other diseases, such as Hepatitis A, Salmonella and Giardia, all of which can be killed readily with household disinfectants. The odors may be unpleasant but are not harmful.

If you have any questions or need more information on cleanup, you may call Cincinnati Health Department staff at 357-7392 during office hours; call 357-7435 after 5:00 p.m. or on a weekend.

If you have questions about the sewer system, you may contact the Wastewater Collection Division at 352-4900 between 7:30 a.m. and 4:00 p.m., Monday through Friday. If you have an emergency situation after hours or on a holiday or weekend, call 244-5500.

Wastewater Collection Division
Metropolitan Sewer District

GSM/LSF 8/11/93/WIBhandout

Excerpt form
"RULES AND REGULATIONS"
The Metropolitan Sewer District
of
Greater Cincinnati, Hamilton County, Ohio

ARTICLE XII
SECTION 1207

The owner of the premises served by a sewer shall be responsible for the maintenance and cleaning of the building sewer from the building to the point of connection with the public local sewer and for the maintenance, operation, cleaning, repair, and reconstruction of the building sewer from the building to the property line or point of connection in a public easement. Repair and reconstruction of the building sewer in a public right-of-way shall be the responsibility of the Department. If shall be the responsibility of the owner or his agent to establish, by means of a valid sewer cleaner contractor receipt, that such repair or reconstruction is the responsibility of the Department. The Department shall have the right to verify the sewer cleaner's finding prior to beginning repair or reconstruction. A proper cleanout must be in place prior to such operation by the Department.

INFORMATION SHEET

SEWER ODORS INSIDE BUILDINGS

Dear Resident:

You have expressed concern about the presence of "sewer odors" inside your building. Properly installed sewer lines with water seal traps on all plumbing fixtures will prevent sewer gases or vapors from entering buildings from main sewer lines. Building sewer lines and traps must be properly maintained to prevent serious injury from sewer gases or vapors. Dangerous gases such as hydrogen sulfide and carbon monoxide or vapors from household or industrial sources can be present in main sewers. Explosions in sewers can occur from methane gas produced by decaying vegetation, leaks from natural gas lines or underground gasoline storage tanks.

Often odors are detected inside a building even when the building's sewer lines are not broken. The most frequent cause of this is a dry trap. A trap that has a 2-inch water seal will prevent vapors or sewer gases from entering a building through the sewer lines. Occasionally, a slight smell of sewer odors can be detected from a floor drain, even when the trap is full of water and in proper working order.

The first step to take is to check your indoor plumbing. The drawing on the reverse side details how this plumbing is normally installed. If any of your traps are dry, pour about a gallon of water into them.

Board of Health Regulations and State Building Codes contain sections regulating sewage and plumbing in buildings. The owners of all properties are responsible for maintenance, repair and operation of all sewers and plumbing fixtures on private property.

If you need further information concerning this matter please contact the Metropolitan Sewer District at 352-4900.

Sincerely,

G. Stephen Minges, P.E., Superintendent
MSD/Wastewater Collection Division
225 West Galbraith Road
Cincinnati, Ohio 45215

GSM: bkw

APPENDIX D

OTHER FORMS

Metropolitan Sewer District
Wastewater Collection Division

Date:

Time:

COMPLAINT FORM

Received:

CALLER INFORMATION

Name:

Agency: **Business Phone:**

Address: **Home Phone:**

PROBLEM LOCATION

Address: **City/Township:**

Nearest Intersection:

Detailed Location Information:

Condition Reported:

Comments:

ON SITE INSPECTION

Date: **Unit Number:**

Dispatch Time: **Arrival Time:** **Completion Time:**

Condition Found:

Action Taken:

Comments:

Job Order:

Last Referral: **Last Referral Date:**

For:

FINAL DISPOSITON

By: **Date: / /** **Responsibility of:**

ABBREVIATIONS USED ON COMPLAINT FORMS

A	ADVISED
A/C	ADVISED COMPLAINANT
BOH	BOARD OF HEALTH
CH’D CKED	CHECKED
COMP. COMPL	COMPLAINT OR COMPLAINANT
CWW	CINCINNATI WATER WORKS
DS	DOWNSTREAM
DSP	DISPATCHERS AT STATION 4
F/V	FLUSH/VACUUM
FM	FORCE MAIN
FV’ED	FLUSHED/VACUUMED
HAM CO, HAM CTY	HAMILTON COUNTY
I/O	INTERSECTION OF
MH	MANHOLE
ML	MAINLINE
NBUIMH(S)	NO BACKUP IN MANHOLE(S)
NMST	NO MAIN SEWER TROUBLE
OPP	OPPOSITE
R/O	REAR OF
STA4, STA10	DISPATCHERS AT STATION 4 OR STATION 10
T&B	TAP AND BOLT
TV	CLOSED CIRCUIT TELEVISION
US	UPSTREAM

EPA CALLS

Date	Time	Address	Person	Situation

APPENDIX E

REFERENCED CODES & POLICIES

Cincinnati Municipal Code Title III

CHAPTER 321:

PROCUREMENT AND DISPOSAL OF SUPPLIES, SERVICES AND CONSTRUCTION

321-13. Procurement; Supplies, Services and Construction in Excess of $5,000 But Not Greater Than $25,000.

The city purchasing agent may make any contract for supplies, services or construction involving an expenditure in excess of $5,000 but not in excess of $25,000 without additional approval by the city manager or board or commission in whose behalf the procurement is made.

In the case of any contract involving an expenditure not in excess of $25,000 for the procurement of supplies, services or construction, the city manager or the city purchasing agent may invite competitive bidding by announcement without advertisement and may waive the requirement for a bid or performance surety.

(Ordained by Ord. No. 426-1992, eff. 10-23-92; a. Ord. No. 110-1994, eff. 5-6-94)

321-15. Procurement; Supplies, Services and Construction in Excess of $25,000 But Not Greater Than $100,000.

The city purchasing agent may make any contract for supplies, services or construction involving an expenditure in excess of $25,000 but not in excess of $100,000 without additional approval by the city manager or board or commission in whose behalf the procurement is made.

In the case of any contract involving an expenditure not in excess of $100,000 for the procurement of supplies, services or construction, the city manager or the city purchasing agent may invite competitive bidding by advertisement and may waive the requirement for a bid or performance surety. Performance surety for construction contracts over $50,000 shall not be waived.

(Ordained by Ord. No. 426-1992, eff. 10-23-92; a. Ord. No. 110-1994, eff. 5-6-94)

321-17. Procurement; Supplies, Services and Construction in Excess of $100,000.

The city purchasing agent may make any contract to purchase supplies, services, or construction without additional approval of the city manager, or the board or commission in whose behalf the contract is made, if the contract involves an expenditure in excess of $100,000.

In the case of any contract involving an expenditure in excess of $100,000 within a 12-month period for the procurement of supplies or services, the city purchasing agent shall invite competitive bidding by advertising and may waive the bid or performance surety, if deemed by the city purchasing agent to be in the best interest of the city. In the case of any contract involving an expenditure in excess of $100,000 for the length of the contract, for construction, the city purchasing agent shall invite competitive bidding by advertising, may waive the posting of bid surety if deemed by the city purchasing agent to be in the best interest of the city and shall require performance surety of 100% of the contract amount.

The following minimal procedure shall be used for procurements set forth above:

(a) Each week a listing of such items to be procured shall be inserted in the City Bulletin under the heading "Notice - Bids Wanted" indicating the item, reference number and bid closing date.

(b) The notice in the City Bulletin shall also indicate for each item:

(1) That sealed bids will be received at the office of the city purchasing agent until 12:00 noon (local time) on the date specified.

(2) That copies of the inquiry are available at the office of the city purchasing agent.

(3) That performance surety may be required for supplies and service and shall be required for all construction contracts over $50,000.

The city manager or the city purchasing agent may at any time require advertisement, bid surety or performance surety on any procurement, when such procedure is deemed desirable to protect the best interests of the city. Such procurement shall be awarded on the approval of the city manager or the board or commission on whose behalf the contract is being awarded.

(Ordained by Ord. No. 426-1992, eff. 10-23-92; a. Ord. No. 110-1994, eff. 5-6-94)

321-19. Procurement; Professional Services.

Professional service contracts shall be the responsibility of the city manager or appropriate board or commission. Any department, board, commission may contract for such services without competitive procedures and without requiring a performance surety. The city purchasing agent shall promulgate procedures for the procurement of professional services.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-21. Bid; Competitive.

Competitive bidding shall be used to procure all supplies, services and construction in excess of $5,000 except as provided in Section 321-17, Procurement; Professional Services; Section 321-51, Proposal; Competitive; Section 321-85, Contract; Sole Source; and Section 321-89, Contract; Emergency Procurement; or other similar provisions of this chapter.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-22. Bid; Specifications.

(a) Specifications are any description of the physical or functional characteristics or of the nature of supplies, services or construction.

(b) All city departments, boards and commissions shall specify environmentally preferable supplies, services or construction when appropriate.

All city departments, boards and commissions shall conduct a review of supplies, services or construction specifications to determine whether the specifications either require the use of products manufactured from virgin materials or exclude the use of recycled products, reusable products, or products designed to be recycled. In the event that such specifications do exclude the use of recycled products or require the use of virgin materials, then such exclusions or requirements may be eliminated unless the department, board or commission can demonstrate to the satisfaction of the city purchasing agent that the recycled products would not achieve a necessary requirement or performance standard.

All city departments, boards and commissions shall recommend changes to the city purchasing agent to ensure that performance standards for particular supplies, services or construction can be met and that the specifications are not overly stringent, and to recommend changes to ensure that the specifications will incorporate a requirement for the use of recycled materials, reusable products, and products designed to be recycled to the maximum extent possible, subject to an alternative showing that either the performance of the product will be jeopardized or that the product will negatively impact health, safety, or operational efficiency.

The city purchasing agent may request the bidder to affirmatively demonstrate that recycled material will not jeopardize the performance of the product and will not negatively impact health, safety, or operational efficiency.

(Ordained by Ord. No. 141-1994, eff. 6-3-94)

321-23. Bid; Form of Invitation for Bids.

The city purchasing agent shall state the time and place when and where invitations for bids will be received. The form approved by the city purchasing agent shall be used, and an invitation for bid shall be involved and not considered unless such form is used without change, alteration or addition by the bidder. Bidders may be permitted by the city purchasing agent to bid upon all work and materials to be furnished or upon any part of the work or materials.

Copies of any plans, details, bills of materials or specifications shall be open to public inspection at all business hours between the day of the notice and the day for opening the bids, at the office of the purchasing department where the bids are received, or such other place as may be designated in such notice.

Any bid or performance surety requirements shall be stated in the invitation for bid.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-25. Bid; Surety.

The conditions and form of bid surety shall be in accordance with Section 321-133, Surety; Bid, and Section 321-139(a), Form of Bid Surety.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-27. Bid; Correction, Withdrawal or Cancellation of an Invitation For Bid.

The city purchasing agent is authorized to make written corrections to invitation for bids. The city purchasing agent may withdraw or cancel at any time any invitation for bid, if the city purchasing agent deems such action is in the best interest of the city.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-29. Bid; Time Extension for Bid Opening.

The time, date and place of bid openings may be extended to a later time or date by the city purchasing agent, provided that written or oral notice of a change of time, date or place is given.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-31. Bid; Opening of Bids.

Bids invited by the city purchasing agent by advertisement if the bid is expected to be in excess of $100,000 shall be opened at the time, date and place specified in the invitation for bid and shall be publicly read in accordance with procedures promulgated by the city purchasing agent.

Bids invited by the city purchasing agent by announcement or by advertisement if the bid is expected to be in excess of $25,000 but not greater than $100,000 shall be received and recorded by the city purchasing agent or a designee. No public opening or reading of bids is required.

(Ordained by Ord. No. 426-1992, eff. 10-23-92; a. Ord. No. 357-1994, eff. 10-28-94)

321-33. Bid; Waiver of Defects.

In awarding a contract, the city purchasing agent may waive any variation from the bid requirements or defect in a bid which does not materially affect the competitive nature of the bid, is not in violation of any ordinance, statute or law and does not prejudice the right of the public.

A variance or defect does not materially affect the bid if the terms of the bid are clear and unambiguous, the bid contains all essential elements of the contract, if the amount or competitive nature of the bid is not affected and if the bidder has not received an unfair advantage from having seen the competitor's bid documents.

In considering any waiver, the city purchasing agent shall attempt to secure the best work or materials at the lowest price practicable and shall make such determination in a manner as to fairly and reasonably accomplish such purpose with sole reference to the public interest.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-35. Bid; Clarification.

The city purchasing agent may request clarification of a bid or any part thereof. Clarification shall mean the communication between the city and the bidder regarding the bid. Such communication shall not change the bid, the competitive nature of all bids or violate any ordinance, statute or law and shall not prejudice the right of the public.

In considering any clarification the city purchasing agent shall attempt to procure the best supply, service or construction at the lowest practicable price and shall make such clarifications in such a manner as to fairly and reasonably accomplish such purpose with the sole reference to the public interest.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-37. Bid; Award to Lowest and Best.

Except where otherwise provided by ordinance, the city purchasing agent shall award a contract to the lowest and best bidder or in the case of multiple awarded bidders who has the capability in all respects to perform fully the contract requirements and the integrity and reliability which will assure good-faith performance. The city purchasing agent may consider the bidder's performance on prior and current contracts with the city in determining to whom the award shall be made.

Factors which may be considered in determining the lowest and best bid include, but are not limited to, the following factors which may indicate a bidder's potential for effectively providing equal opportunity for minority group members and women in its contract with the city; information concerning the bidder's current, past and proposed payment of prevailing wages, utilization of minority group members and minority business enterprises, including employment and subcontracts, in the event the selection of the lowest and best bidder is based in large part upon factors indicating the bidder's potential for effectively providing equal opportunity for minority group members and women in a city contract, the contract award may be made only if the bid does not exceed by more than three percent to a maximum of $10,000 any other lowest and otherwise qualified bidder and if in the opinion of the city purchasing agent the selection of such bidder as the lowest and best bidder will have the greatest potential among the bidders for providing equal opportunity to local minority group members and women to participate in city contracts. "Minority group member" shall mean a person belonging to one of the following racial or ethnic groups: Blacks, Hispanics, American Indians, Alaskan natives, and Asian and Pacific Islanders.

In invitations to bid designated by the city purchasing agent as an environmentally preferable comparison bid, the city purchasing agent, in determining the lowest and best bid, shall deem as favorable the fact that the bidding company offers supplies that contain recycled material, and shall select such bidder as the lowest and best bidder if its bid does not exceed by more than three percent to a maximum of $10,000 any other lowest and otherwise qualified non-recycled bidder.

In such circumstances where more than one bidder offers supplies with recycled material that do not exceed by more than three percent to a maximum of $10,000 any other lowest and otherwise qualified non-recycled bidder, the following factors, listed in descending order of preference, shall be considered in determining the lowest and best bid.

(a) The highest percentage of post-consumer material content.

(b) The highest percentage of pre-consumer material content.

In addition, the following factors may be considered in determining the lowest and best bid.

(c) The ability of the product and package to be reused or recycled.

(d) The volume and toxicity of waste and by-products that a given product generates in its manufacture, use and disposal.

The decision of the city purchasing agent or designee, including whether the environmentally preferable product satisfies the bid requirements, shall be final in the determination of the award.

The total accumulation of all preference percentages from all preference programs now in existence or hereafter established shall not exceed ten percent.

(Ordained by Ord. No. 426-1992, eff. 10-23-92; a. Ord. No. 11-1994, eff. 2-11-94; a. Ord. No. 141-1994, eff. 6-3-94)

321-39. Bid; Award on Equal Bids.

Whenever bids shall be received for supplies, services or construction and two or more bids shall, in the opinion of the city purchasing agent, be equally entitled to be considered the lowest and best bids, the city purchasing agent shall be authorized to award such contract by lot to any one of such lowest or best bidders, or, if the number of such lowest and best bidders is not in excess of three, to divide the award and contract as the city purchasing agent deems best among them or among such of them as shall consent to such apportionment.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-83. Contract; Multi-Term.

Unless otherwise provided by law, a contract for supplies or services may be entered into for any period of time deemed to be in the best interests of the city. The term of the contract and conditions of renewal extension, if any, are included in the solicitation and funds shall be available for the first period at the time of contracting. Payment and performance obligations for succeeding periods shall be subject to the availability and appropriation of funds.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-85. Contract; Sole Source.

A contract may be awarded for supplies, services or construction without competition when the city purchasing agent determines in writing that there is only one source for the required supply, service or construction. A requirement for a particular supply, service or construction does not justify a sole source procurement if there is more than one potential bidder or offeror.

The determination of a sole source procurement shall be made in writing and shall include the basis therefor and the duration of its effectiveness. In cases of reasonable doubt, competition shall be solicited.

The city purchasing agent may conduct negotiations, as appropriate, for price, delivery and terms.

The city purchasing agent shall maintain a record of sole source procurements including the contractor's name, the amount and type of each contract, a listing of the supplies, services, or construction procured under each contract and the identification number of the contract.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-87. Contract; Direct Award.

A contract may be awarded for supplies, services or construction without competition when the city purchasing agent determines in writing that it is in the best interest of the city to procure compatible equipment accessories or replacement parts, original manufacturer for supplies, or public utility services or to procure supplies for trial use or testing.

The determination of direct award procurement shall be made in writing and shall include the basis therefor and the duration of its effectiveness. In cases of reasonable doubt, competition shall be solicited. Any request to the city purchasing agent that a procurement be restricted to one contractor shall be accompanied by an explanation as to why no other will be suitable or acceptable to meet the need.The city purchasing agent may conduct negotiations, as appropriate, for price, delivery and terms.

The city purchasing agent shall maintain a record of direct award procurements in excess of $5,000, including the contractor's name, the amount and type of each contract, a listing of the supplies, services, or construction procured under each contract and the identification number of the contract.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

321-89. Contract; Emergency Procurement.

(a) Emergency.

Notwithstanding any other provision of this chapter, when there exists a threat to public health, welfare or safety under emergency conditions defined in procedures promulgated by the city purchasing agent requiring the immediate procurement of services, supplies, materials, construction, demolition or equipment, the city manager, upon recommendation of the city purchasing agent and the head of the department involved, may waive any advertising, contract, and surety requirements prescribed by statute or ordinance and the pre-award requirements of the equal employment opportunity program of the city of Cincinnati prescribed by ordinance and authorize the purchase, by purchase order, of the needed services, supplies, materials, construction, demolition or equipment from the lowest and best bidder as disclosed by competitive bids which may be either oral or written. A record of all emergency purchases of supplies, services and construction in excess of $100,000 shall be reported to city council semi-annually. Furthermore, the city purchasing agent may authorize emergency purchases of $100,000 and less without additional approval of the city manager being required to approve the nature of the emergency.

When normal procurement requirements are waived, all possible steps shall be taken to secure maximum competition in the procurement of the needed supplies, services, or construction; and any warranted follow-up in regard to the equal employment opportunity program shall be made.

A written determination of the basis for the emergency and for the selection of a particular contractor shall be included in the contract file and in the recommendation to the city manager or board or commission on purchases in excess of $100,000.

(b) Imminent Danger.

Notwithstanding any other provision of this chapter, when there exists a disaster, or an imminent threat or danger to public health, welfare or safety requiring the direct action of a director or the commissioner of health, such director or commissioner of health may waive any advertising, formal contract, and surety requirements prescribed by statute or ordinance and the pre-award requirements of the equal employment opportunity program of the city of Cincinnati prescribed by ordinance and authorize the purchase of the needed services, supplies, materials, construction, demolition or equipment from the best bidder as disclosed by informal competitive bids which may be oral or written. If the cost is expected to exceed $100,000, the director or the commissioner of health shall obtain the verbal approval of the city manager or the deputy city manager, or if the cost is expected to be $100,000 or less, obtain the verbal approval of the city purchasing agent or the city purchasing agent's designee. The city purchasing agent may promulgate procedures for such emergency purchases involving imminent danger. A record of all imminent danger emergency purchases shall be reported to city council semi-annually.

(Ordained by Ord. No. 426-1992, eff. 10-23-92)

ARTICLE XXIV
[MSD ***Rules and Regulations*** (Eff. March 1, 2001)]

ADMINISTRATIVE RULES

Section 2402 Administrative Rule No. 2

The City of Cincinnati will follow the Hamilton County adopted Purchasing Policy without exception when purchasing goods and services and in entering into any contracts. Any exception in following the county purchasing policy must be authorized by the Board of County Commissioners by resolution.

In the performance of sewer repair work, the District shall follow the guidelines of Section 307.86 of the Ohio Revised Code, which delineates competitive bidding requirements. In addressing those circumstances falling under paragraph (A), which outlines certain exceptions to competitive bidding requirements, the County Administrator may make a determination that a real and present emergency exists, thereby precluding the requirement for a competitive bid. The County Administrator may delegate some or all of this authority to the Director of MSD.

County of Hamilton

OFFICE OF THE

COUNTY ADMINISTRATOR
COUNTY ADMINISTRATION BUILDING

138 E. COURT STREET, ROOM 603
CINCINNATI, OHIO 45202

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BOARD OF COMMISSIONERS
JOHN S. DOWLIN
TOM NEYER, JR.
TODD PORTUNE

DAVID J. KRINGS
Administrator

The Hamilton County Administrator hereby delegates to the Director of the Metropolitan Sewer District of Greater Cincinnati authority to authorize the expenditure of funds, up to $50,000, to stabilize emergency situations under any of the following conditions:

- Where system failure would cause sewer overflows in violation of applicable federal, state and local law or rule;
- Where the health and welfare of the public would be placed in jeopardy if the time involved in the competitive bidding procedures were to be followed; and
- Where a natural disaster occurs that would require immediate action.

MSD will immediately take all action necessary to stabilize the situation, to resolve any dangers to the public or properties and to restore any loss of service.

Whenever action is taken under the delegation of authority and a contract of purchase, lease, or construction is exempted from competitive bidding because the estimated cost is fifteen thousand dollars or more, but less than fifty thousand dollars, MSD shall, in compliance with section 307.86 of the Ohio Revised Code, assign the work to a contractor previously selected through a unit basis competitive bid (time-and-materials bid.) MSD shall maintain pertinent records for the longer of at least one year after the contract is awarded or the amount of time the federal government requires.

The MSD Director shall notify the office of the County Administrator no later than the close of the following business day that action has been taken under the delegation of authority, and shall specify the nature of the action. The MSD Director shall submit to the County Administrator a monthly report summarizing actions taken in any month when the MSD Director exercised the emergency provisions outlined above.

At no time shall the MSD Director exceed the authority outlined under Section 307.86 (A) of the ORC.

Signed,

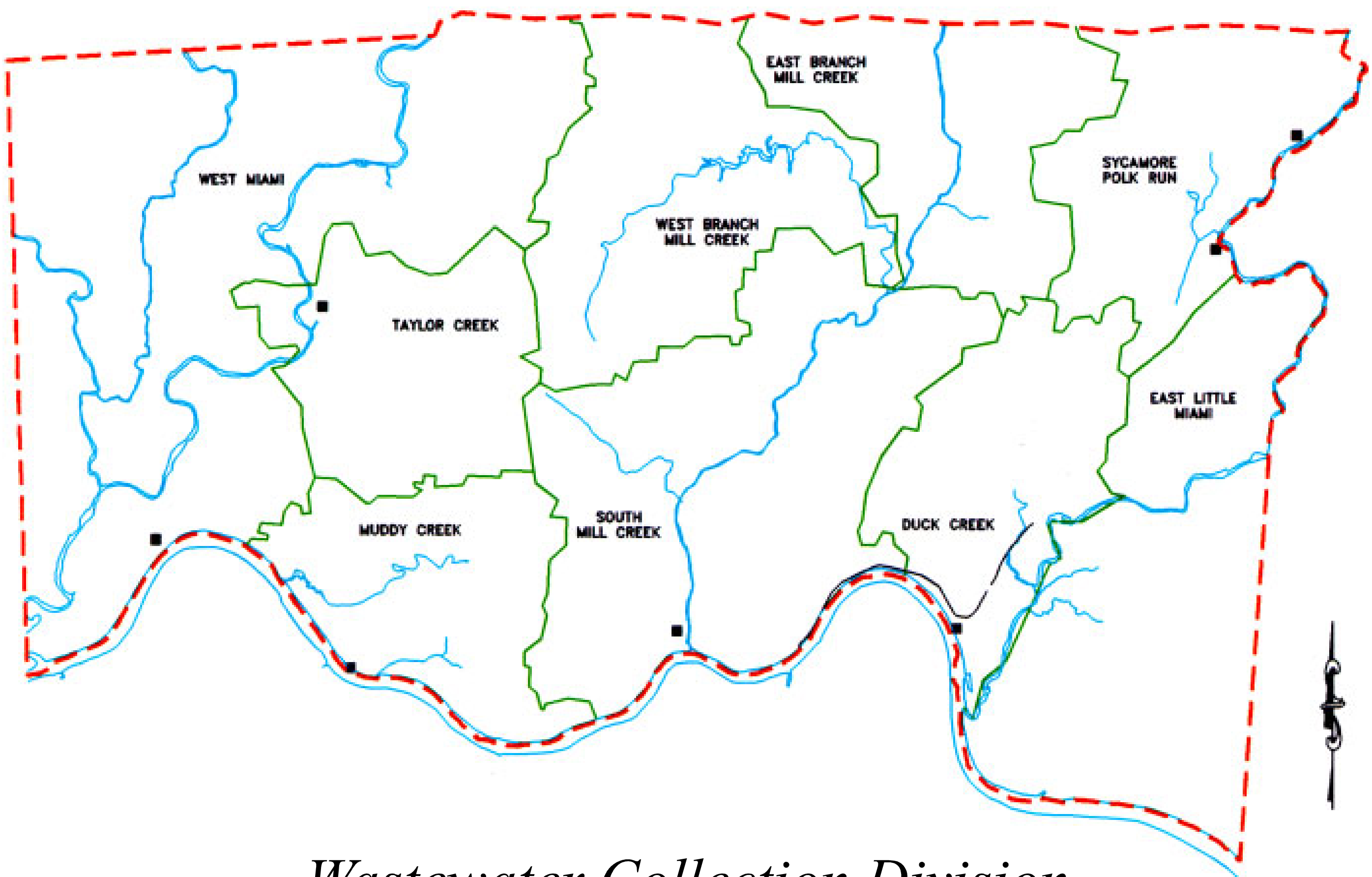
David J. Krings

4-10-01
Date

EXHIBIT 7

Metropolitan Sewer District
of
Greater Cincinnati

OPERATION AND MAINTENANCE PROGRAM



Wastewater Collection Division

R.D. Zande & Associates

DECEMBER 1999

REVISED FEBRUARY 2002

MSD

OPERATION AND MAINTENANCE PROGRAM

DECEMBER 1999

(REVISED February 2002)

Prepared for

The Metropolitan Sewer District

of

Greater Cincinnati

OPERATION AND MAINTENANCE PROGRAM

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1.0 INTRODUCTION

1.1 Purpose, Objectives and Goals

This report is entitled an “Operation and Maintenance Plan.” It describes programs and procedures currently undertaken by the Metropolitan Sewer District of Greater Cincinnati (MSD) in the management of its operation and maintenance programs for the wastewater collection systems.

This report is not an operation and maintenance manual. It does not provide detailed descriptions of specific operation and maintenance functions or system components. These descriptions are provided elsewhere. Rather, this report presents a functional overview of programs, equipment and personnel in place to manage sewer operations on a daily basis for MSD.

The Wastewater Collection (WWC) Division is responsible for all sewer related maintenance and repair functions at MSD. In addition the WWC Division is involved in a host of other activities including but not limited to preventive maintenance, emergency maintenance, information gathering, system monitoring scheduling, data and project tracking, contract administration, design and construction administration, and vehicle, building and equipment maintenance.

Although many of these tasks can be considered routine, others are “emergencies” and can not be anticipated. The WWC Division is aware that the reputation of MSD in the eyes of the public depends on how it responds to these “emergencies.” It should be stated that the majority of “routine” work done by the WWC Division is to address potential problem areas in the collection systems before they become “emergencies.” The Division expends a significant effort in the following work areas:

- Root and debris removal,
- Internal inspection by TV to detect pipe failures before they occur and locate sources of inflow and infiltration,
- Internal/re-lining sewers to restore their structural integrity to pipelines and reduce the risk of failures.

Although it is impossible to detail every function performed by the WWC Division, Chapter 5.0 of this report emphasizes 5 principal areas of responsibility:

Area	**Section**
• “Request for Service” Procedures	5.1
• Preventive Maintenance	5.2
• Emergency / Reactive Maintenance	5.3
• Maintenance Management System	5.4
• Monitoring/Information Gathering	5.5

These topics emphasize the WWC Division’s response capabilities to preventive and emergency maintenance in addition to other areas such as maintenance management.

This report is intended to supplement and be consistent with existing emergency plans and standard operating procedures. Many of the procedures followed by the WWC Division are outlined in the Wastewater Collection Division Training Manual, which was prepared in 1992.

It is hoped that the reader will gain an appreciation of the level of commitment provided by MSD through its WWC Division to protect human health and the environment by its programs and activities.

1.2 Updating and Maintenance of the Plan

It is recommended that MSD update the Plan on an as-needed basis to reflect revisions to the NPDES permit and new initiatives that are being undertaken by the WWC Division. MSD shall report any such modifications to this Plan in the annual report required by Paragraph IX.C of the Consent Decree.

2.0 THE MSD ORGANIZATION

The Department of Sewers of the City is responsible for the management and operation of MSD. The head of the Department of Sewers is the Director who is primarily responsible for the administration of the entire sewer system, including design, construction, repair, maintenance and operation of all sewers and sewage treatment facilities. The Director manages five operating divisions: the Administration Division, the Engineering Division, the Wastewater Treatment Division, the Industrial Waste Division, and the Wastewater Collection (WWC) Division.

The Director is primarily responsible for coordinating the overall operation of MSD. The Administration Division is responsible for all personnel, accounting, budgeting, safety and training.

The Engineering Division is responsible for the planning and administration of capital projects, the extension of service permits, rules, regulations and legislation, and maintaining all sewer records.

The Engineering Division is also responsible for planning, evaluating, and development of projects; development, management, and implementation of the capital improvement program; acquisition of easements and property; preparation and presentation of all legislation required to complete a project; and project management from conception through design, construction, completion, and acceptance of the project with the goal of project completion on time and within budget.

The Wastewater Treatment Division has the responsibility for operating and maintaining all wastewater treatment plants, package treatment plants, pumping stations and performing all actual treatment of sewage.

The Industrial Waste Division is responsible for regulating industrial waste discharges, pretreatment and surcharge programs, sampling and analytical laboratory operations.

The Wastewater Collection (WWC) Division is responsible for inspection, maintenance, repair and rehabilitation of the wastewater collection system including all combined sewers, sanitary sewers, combined sewer outlets and appurtenances.

3.0 THE WASTEWATER COLLECTION DIVISION

3.1 Organizational Description

The WWC Division is responsible for the inspection, maintenance, and repair and rehabilitation of the wastewater collection system, which includes all combined sewers, separate sanitary sewers, combined sewer regulators and appurtenances. A table of organization is presented in Figure 1. The WWC Division is organized into 8 functional areas illustrated in Figure 2 and introduced below.

Area	**Primary Function(s)**
1. Engineering	• Emergency Repair • Internal Rehabilitation • Special Investigations
2. Reactive Sewer Maintenance and Regulator Maintenance	• Reactive TV inspection and flush/vac cleaning • Combined Sewer maintenance
3. Repair Districts (West and East)	• General sewer repair and maintenance for east and west parts of the District
4. Support and Flow Monitoring	• Flow Monitoring Program • Rain Gauge Network
5. Preventive Sewer Maintenance and Equipment Maintenance	• Preventive TV inspection and flush/vac cleaning • Equipment Maintenance and Purchasing • Fleet Maintenance
6. Maintenance Planning and Scheduling	• Scheduling of work orders based on priority

7. Dispatch Office
   - Request for Service Calls
   - Maintains Records

8. Payroll, Stockroom and Human Resources
   - Internal Support functions for the Division

The purpose of the above listing is to highlight primary functions of the 8 groups. These designations reflect normal day-to-day operations. As can be seen, much of the work done by the WWC Division relates to information gathering, scheduling, coordination and preventive maintenance. A brief description of each area is below.

1. Engineering: The Engineering Group oversees traditional engineering work undertaken in the WWC Division including planning, design and construction. The WWC Division undertakes a substantial amount of work each year to repair and replace failed elements of the collection system in need of emergency attention. In addition, the Division administers a substantial and well established program to internally line sewer pipes with cured-in-place-pipe (CIPP). This program has been pivotal in restoring the structural integrity of many systems considered to be either partially or fully deteriorated. It is believed that this program has substantially reduced emergency or reactive maintenance work throughout the District.

   The Engineering Group also performs and oversees projects called "Special Investigations." These projects entail an evaluation of a study area to determine the cause and potential solutions for problems such as frequent water-in-basement complaints.

2. Reactive Sewer Maintenance and Regulator Maintenance:

This group performs reactive TV inspection and flush/vac cleaning as requested by the First Response Team, other sections within the Division or work requested by other divisions of MSD.

Much of MSD is served by combined sewers, particularly the older parts of the city and downtown. As such, the WWC Division spends a substantial effort to inspect, clean and maintain combined sewers, interceptors and control structures. Details on operation and maintenance of these sewers may be found in the documents entitled:

Greater Cincinnati Combined Sewer Overflow Operational Manual for the Little Miami Service Area, 1994, updated 1997.

Greater Cincinnati Combined Sewer Overflow Operational Manual for the Mill Creek Service Area, 1994, updated 1997.

Greater Cincinnati Combined Sewer Overflow Operational Manual for the Muddy Creek Service Area, 1994, updated 1997.

Although the teams in this group are assigned to perform work in the combined sewer systems, they are available for special assignments or emergencies as they arise.

3. Repair Districts (West and East):

The Repair District Teams perform minor repairs on various elements of the collection systems. Although their work is generally divided into east and west areas, they are available for special assignments.

4. Support and Flow Monitoring:

   This group helps other functional groups including Engineering with the collection of flow and rain data from flow meters and the rain gage network. In addition, this group installs flow meters and helps maintain equipment.

5. Preventive Sewer Maintenance and Equipment Maintenance:

   This group is principally responsible for work related to scheduled preventive maintenance TV inspection and flush/vac sewer cleaning operations including "on road" and "off road" locations. WWC has built TV inspection and flush clean functionality into four-wheel drive tractors to service the remote "off road" sewer locations. This group also oversees equipment purchasing and maintenance scheduling for the Division, including coordination with the Municipal Garage.

6. Maintenance Planning and Scheduling:

   This group is important to the Division in that it schedules and coordinates "work order" projects based on information collected from response teams. This group provides an important interface with recommendations made from a "complaint" or "Request for Service" response calls once the immediate problem has been addressed. For example, if the recommendation from a "complaint" or "Request for Service" response call is to clean or TV inspect sections of sewer line, this group creates a work order and schedules the project.

7. Dispatch Office:

   The Dispatchers are the first line of contact with the public. The Dispatch Office is used to keep reports once the Response Teams are done with a call. All records are maintained in an organized manner and available to MSD personnel.

   Dispatchers collect information over the telephone in a calm, friendly and professional manner. This task may be complicated by the fact that the person calling may be upset, confused or unknowledgeable about the problem being experienced. During normal working hours, the Dispatchers work out of the WWC Division at 225 W. Galbraith Road. During evenings and weekends, calls are received by the dispatcher at the “after hours” desk of MSD at 1600 Gest Street, who in turn dispatch First Response Teams or contact “on-call” supervisors if the reported problem warrants additional evaluation or supervision. The Dispatchers have the authority to cross over MSD division lines to obtain the assistance of any supervisor to secure any equipment that may be necessary to resolve the problem.

8. Payroll, Stockroom and Human Resources:

   This group provides administrative support to the WWC Division.

   Each of these functional areas include a Supervisor to report to the Superintendent.

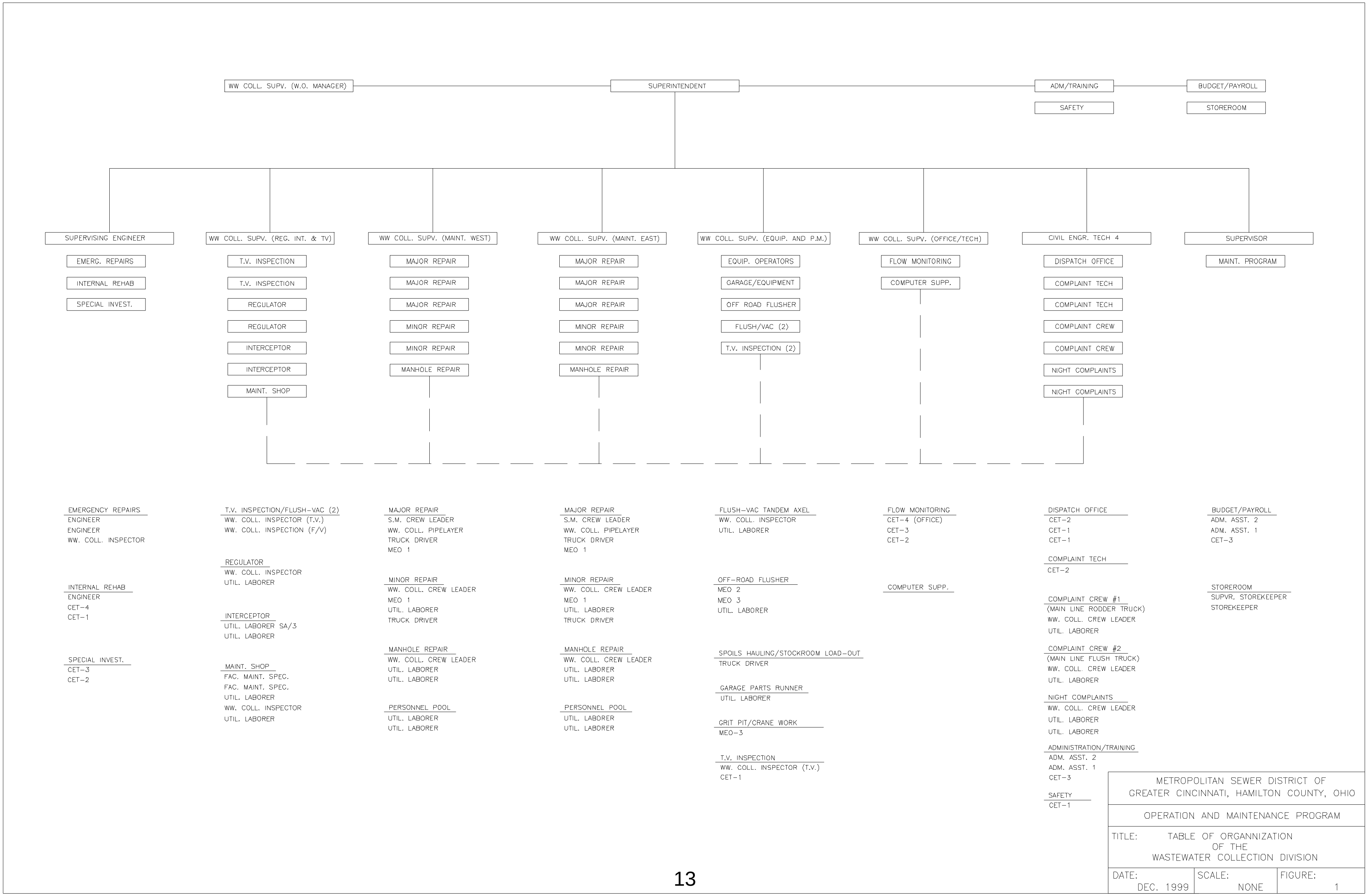
Supervisors hold positions of supervisory authority under the Superintendent and are senior operations staff and Division engineers. Supervisors work with the crews to resolve sewer maintenance problems and serve as a liaison between the crews and the Superintendent. During normal working hours, there are a number of supervisors who can handle problems as they arise. During evenings and weekends, problems are referred to the “Supervisor on Call” or the second backup “Supervisor on Call.” Supervisors on Call are changed on a rotating basis once every month.

The Superintendent is in charge of the WWC Division and reports to the Director. Although the Superintendent will normally not be personally involved in most service calls, he/she is administratively responsible for activities performed by the Division, including all fiscal and budgetary matters and coordination with the Director’s office. The Superintendent also is a valuable technical resource who is knowledgeable in the design, construction and maintenance of collection systems and is therefore, frequently involved in devising strategies and directing actions to solve the most complicated problems.

In no way does this completely describe all work done by these groups nor reveal how they interact with each other. As will be seen in Chapter 5.0 under the “Request for Service” procedures, all groups interact and coordinate to resolve sewer related problems that arise. Although personnel assigned to each group generally perform functions of that particular group, there is a substantial overlap that occurs in solving sewer problems. Most personnel are trained to perform multiple tasks and can be assigned to other groups on a temporary or permanent basis, if necessary.

Figure 1

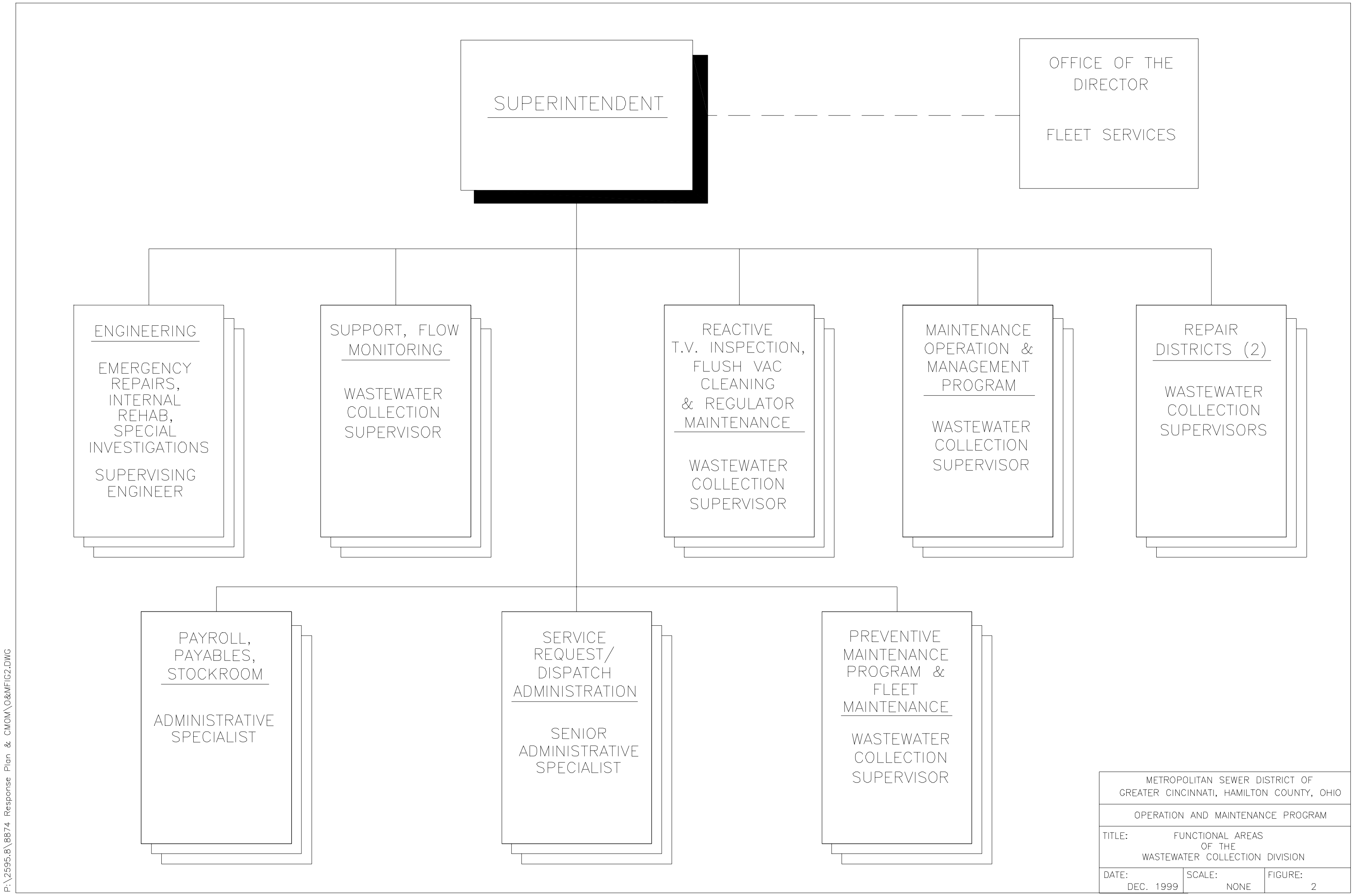
Table of Organization



P:\2595.8\8874 Response Plan & CMOM\FIG1.DWG

Figure 2

Functional Diagram



3.2 Facility and Equipment Description

3.2A Physical Facility

WWC Division operates from a complex at 225 West Galbraith Road and is the headquarters for all sewer maintenance activities undertaken by the District. The facility is centrally located within the county which provides crews timely response to collection system problems.

Besides providing offices and conference space for technical and support personnel, the complex also features large enclosed vehicle and equipment parking, vehicle repair, storage areas and well stocked and organized material storage areas both under roof and in a yard areas behind the complex.

3.2B Equipment

The WWC Division owns and has ready access to a sizable arsenal of equipment to perform sewer maintenance and repair work for nearly every foreseeable situation. Equipment was purchased based on the needs of the MSD collection systems including difficult to access areas. As such, the WWC Division owns a wide array of equipment in the following categories:

APV 4x4 Pickup Trucks
APV Suburban 4x4
Air Blowers
Arrow Board Trailer
Inflatable Boat
Boom Trucks
Chipping Hammers
Clay Spades
Cleaning Machines
Cleaning Machine/Truck
Compactors
Complaint Trucks
Complaint Flusher
Compressor
Concrete Vibrator
Cranes
Dump Trucks
Dump Operator Vehicles
Dump Seal Tight Trucks
Dump Tandem Axle Trucks
Excavator Trackhoe
Extendahoe Loaders
Flusher
Flusher Vacuum Trucks
Forklifts
Fuel Tank Truck
Gang Trucks
Hydraulic Alternator
Hydraulic Drill
Hydraulic Power Source
Hydraulic Power Truck
Hydraulic Wrench
Light Plant
Light Truck Loader
Loader Rubber Tire
Loader Truck
Riding Mower
Off-Road Flusher
Outboard Motor
Paving Breakers
Pickup Trucks
Pickup/4x4 Trucks
Portable Flushers
2 Inch Trash Pumps

6 Inch Trash Pumps
Hydraulic Pumps
Sump Pumps
Rock Drills
Electric Rodders
Gas Rodders
Rodder Trucks
Saws
Salt Spreaders
Circular Saws
Pneumatic Saws
Walk Behind Saws
Scooter
Smoke Generators
Sweeper
Trucks
TV Vans
Tampers
Truck Carrier
Truck Dozer
Tractor
Beaver Tail Trailers
Boat Trailer
Drag Trailers
Tilt Trailers
Utility Tool Box Trailers
Utility Trailers
Trench Digger
Utility Pickup/4x4/Plow
Extended Vans
Mini Vans
Win. Vans
Welder
Hydraulic Winch

MSD shall maintain adequate equipment to appropriately operate, repair and maintain its wastewater collection system. MSD currently owns the equipment set forth in Appendix A. If there is any change to this Appendix, MSD shall provide a revised appendix to EPA and OEPA in the annual report required by Paragraph IX.C of the Consent Decree.

3.3 CAGIS

The Cincinnati Area Geographic Information System (CAGIS) is a countywide computerized mapping system which includes physical features (roadways, pavement, buildings), natural features (rivers, topography, land use), utility information (sewers, manholes, water, gas, electric), and property information (property lines, address, property owner). MSD operates and maintains sewer system data in CAGIS, including manhole location, manhole numbering, sewer line information, pump station location, and treatment plant location. This system integrates database information in a graphical interface to view mapped information such as sewers, property lines, roadways, buildings, etc. on a single map. MSD has expanded the use of the system to include tracking of all "Request for Service" calls, tracking of various completed maintenance activities, proposed improvements projects, new development, etc.

All complaint (First Response) teams, special investigation teams, and TV crews are equipped with laptop computers loaded with ArcView 3.1 and CAGIS data. This enables them to be able to quickly respond to sewer problems in the field without having to call back in the office for prints to be pulled from microfiche film and then have this information relayed to them over the radio.

If a sewer segment is found to be in need of maintenance the exact segment is identified and sent to the Division's Maintenance Planning and Scheduling group. The maintenance work identified is entered into the database and scheduled.

The various databases in use at the WWC Division are linked together using the sewer segment ID. So it is very important that the field crews are identifying the sewer segment the same way as the databases.

4.0 SEWER SYSTEM DESCRIPTION

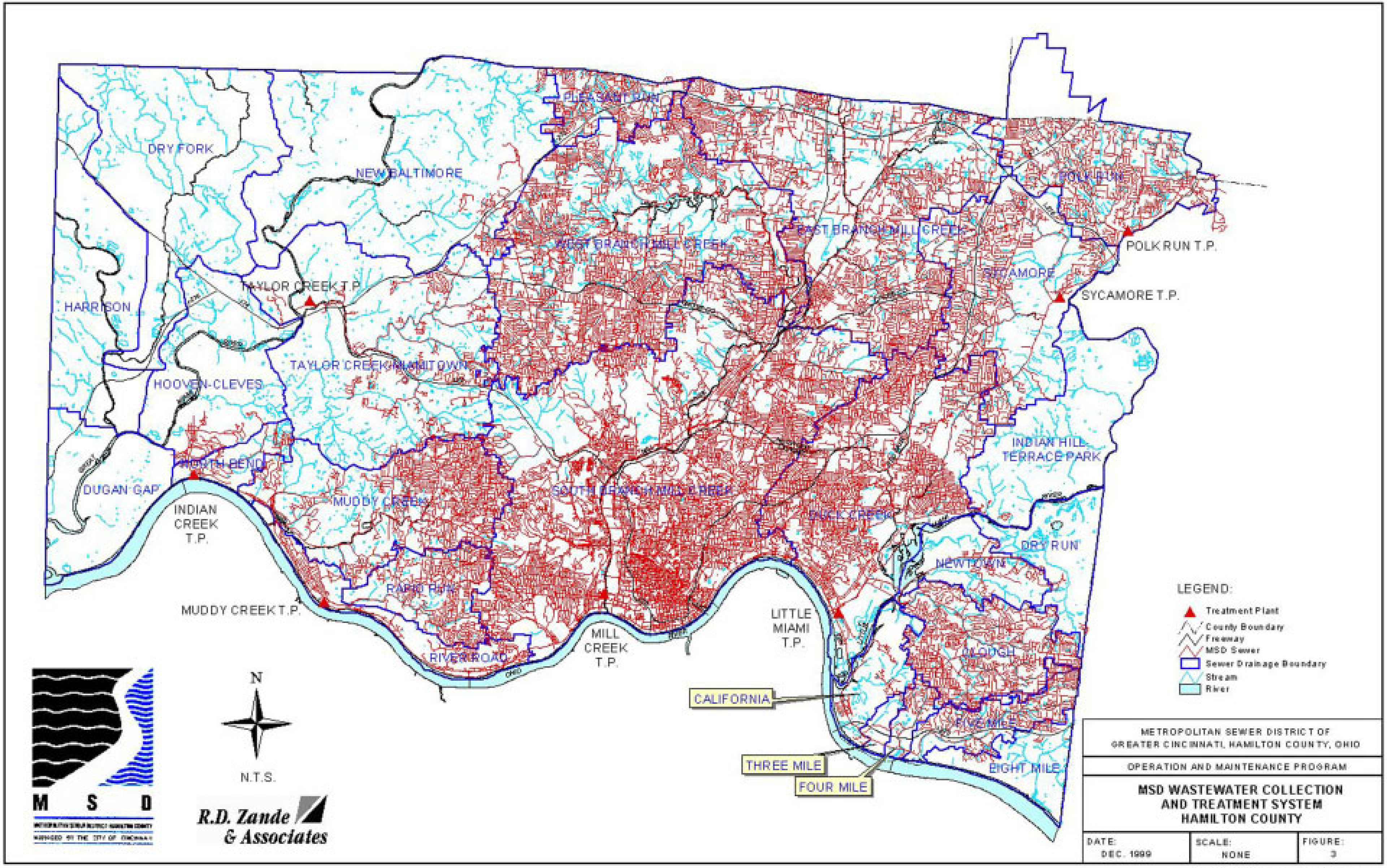
MSD is a county sewer district established on April 10, 1968, in accordance with resolutions of the Board of County Commissioners of Hamilton County and Ordinances of the City of Cincinnati. Prior to 1968, the County and the City maintained separate sewage operations. As part of this agreement, the City gave the County the right to use all of the City's existing sanitary sewers and sewage disposal facilities, while the County assumed the obligation to provide sewage treatment to 23 separate municipalities located within Hamilton County.

MSD services all of the unincorporated areas of the County, minor sections of Warren and Clermont Counties and all of the cities and villages within the County which have sanitary or combined sewers, except the Villages of Glendale and Terrace Park and the City of Harrison. All households which have sanitary sewers available must be connected to such sanitary sewers. There are large portions of the County that are not sewered.

Figure 3 is a large scale map of the collection system for MSD.

Figure 3

MSD Sewer System Map



P:\2595.8\ARCVIEW\8874CountySewer.apr

The area served by MSD encompasses over 400 square miles and includes 33 municipalities and unincorporated areas of Hamilton County. The collection systems operated and maintained by MSD provide service to approximately 800,000 Hamilton County residents with more than 200,000 sewer connections. The system includes over 3,150 miles of sanitary and combined sewers, 7 major wastewater treatment plants, numerous package treatment plants and package lift stations, and 8 major pumping stations.

5.0 OPERATION AND MAINTENANCE PROGRAM

As is seen from the discussion in Chapter 3.0, the WWC Division is involved in a number of wide-ranging activities including but not limited to preventive maintenance, emergency maintenance, information gathering, system monitoring scheduling, data and project tracking, contract administration, design and construction administration, and vehicle, building and equipment maintenance.

For the purpose of clarity, it should be stated that the discussion presented in Chapter 3.0 emphasizes activities generally considered to be routine or "non-emergency." The following topics emphasize other aspects of the WWC Division's response capabilities for preventive and emergency maintenance, the Division's maintenance management system, and other monitoring and information gathering activities.

Area	Section
• "Request for Service" Procedures	5.1
• Preventive / Reactive Maintenance	5.2
• Emergency Maintenance	5.3
• Maintenance Management System	5.4
• Monitoring/Information Gathering	5.5

This plan will be subject to modification by the Director of MSD to account for changes in circumstances such as changes in the configuration of MSD facilities, the purchase of new equipment, changes in regulatory requirements, the development of new technologies, or changes in industry standards/best management practices. MSD shall report any such modifications to this report in the annual report required by Paragraph IX.C of the Consent Decree.

5.1 **"Request for Service" Procedures**

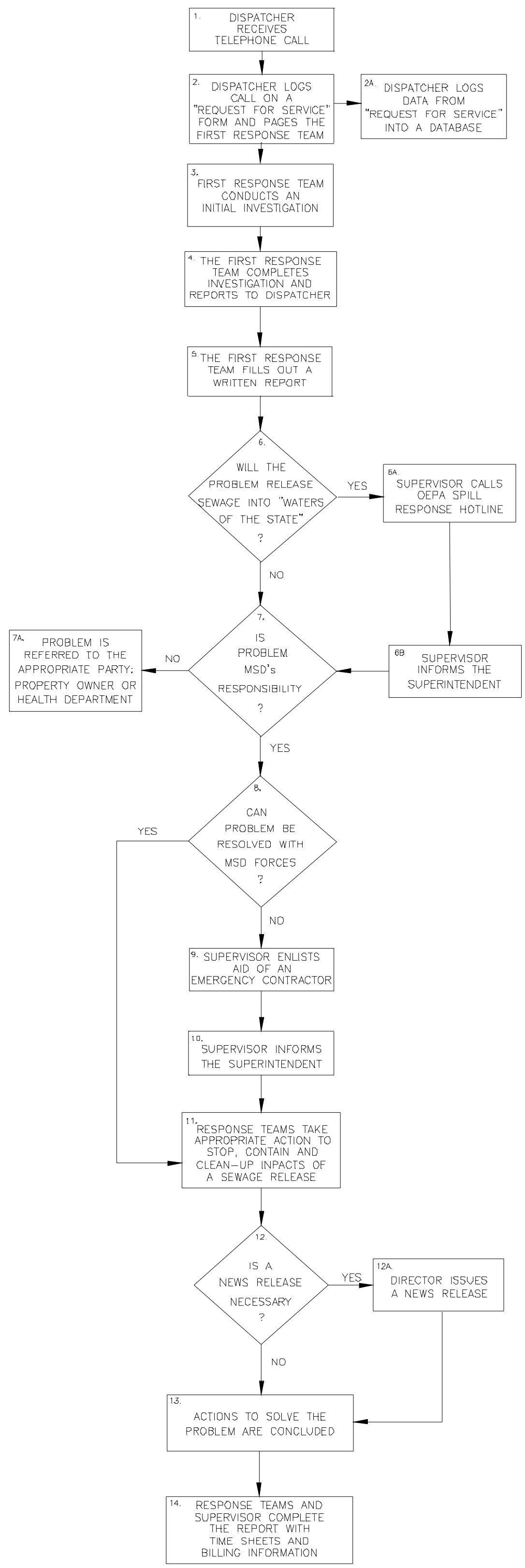
"Request for Service" or "Complaint" calls are those initialed by the public in response to sewer related problems. Typically those may include water-in-basement complaints, or reports of sewage in creeks. In many instances these calls end up being false alarms in that no real problem is occurring and the caller only perceived that a problem was occurring. In other instances, MSD finds that the "problem" is due to problems with building service lines (e.g. building service laterals) on private property or a sewer line owned by a homeowners association.

Although not all "Request for Service" or "complaint" calls are bonafide emergencies, all require a prompt response. The "Request for Service" procedures outlined here provide insight into the coordinated efforts of all members of the WWC Division and how they work together as an integrated team.

"Request for Service" calls also provide the WWC Division with valuable information. For example, a sewer line may need frequent root removal. In this manner, this particular line may be added to the pool of root removal project sites and scheduled in the future as "preventive maintenance" rather than "emergency or reactive maintenance."

The process utilized by MSD to respond to "Request for Service" or "complaint" calls is defined in the Process Flowchart shown in Figure 4. This procedure includes all calls received at MSD, regardless of whether a sewer overflow has occurred.

Figure 4



METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI, HAMILTON COUNTY, OHIO

OPERATION AND MAINTENANCE PROGRAM

TITLE: "REQUEST FOR SERVICE" PROCESS FLOWCHART

DATE:	SCALE:	FIGURE:
DEC. 1999	NONE	4

Each step of the flowchart is described below.

Step 1 - Dispatcher Receives Telephone Call

Request for service calls are received by the Dispatch Office at the following telephone numbers:

Monday-Friday...............................352-4900
7:30 a.m. - 4:00 p.m.
After Hours....................................244-5500

Calls received during normal working hours are taken by the Dispatch Office at 225 W. Galbraith Road, the WWC Division. Calls received after hours are taken by the after-hours Dispatcher at the MSD Main Office at 1600 Gest Street.

Step 2 - Dispatcher Logs Call on a "Request for Service" Form and Pages the First Response Team

At this time, the Dispatcher manually logs key information onto the "Request for Service" form and then enters it into a Foxpro database. Information to be obtained is as follows:

- Name of the person calling,
- Address and phone number of the person calling,
- Time and date the call was received,
- Location, and,
- Details of the problem.

A reproduction of the "Request for Service" form is attached as Appendix "B".

Dispatchers are trained to elicit information on the exact nature and magnitude of the problem, including whether the sewer problem is on private property or in the MSD owned main-line sewer.

Also, during this step the Dispatcher pages crews by radio to respond to the service call. Depending upon the location and nature of the problem, one of three types of crews may respond:

- Technician in van,
- 2 person crew in rodder truck, and
- 3 persons in a complaint/rodder truck (after hours crew).

Step 2A - Dispatcher Logs Data from "Request for Service" into a Database

Information from the telephone call is entered into a Foxpro database. This database is made available to all MSD divisions; however other divisions cannot change information entered by the WWC Division.

Step 3 - First Response Team Conducts an Initial Investigation

During this step, the crew arrives on site and locates the problem. Each First Response Team is provided with a laptop computer. Using ArcView, they can access Cincinnati Area Geographic Information System (CAGIS) mapping of the area. This will provide information on features including sanitary sewers, combined sewers, waterlines, gas lines, properties, roadways and rivers/streams. This information is particularly valuable to track the ultimate destination of a sewer overflow and in the event that bypass pumping is to be set-up.

At this time, the First Response Team is responsible for assessing the cause of the problem and making an initial determination of the level of effort required to correct the problem. First Response Teams try to "plan for the worst and hope for the best." In this manner, they can avoid unnecessary delays and difficulties that can occur by underestimating the situation initially.

Step 4 - The First Response Team Completes Investigation and Reports to Dispatcher

At this point, the First Response Team has evaluated the situation and made a report to the Dispatcher. The Dispatcher in turn notifies the appropriate Supervisor, if field conditions warrant their direct involvement.

Step 5 - The First Response Team Fills Out a Written Report

This is a continuation of the previous step. Findings of the investigation are logged in a written report, which is a continuation of the original "Request for Service" document. This information is then returned to the Dispatch Office for proper logging.

Step 6 - Will the Problem Release Sewage into "Waters of the State"?

At this point the First Response Team has evaluated the situation and reported to the Dispatcher if sewage will be released to the Waters of the State. The Dispatcher, in turn, notifies the Supervisor. The Supervisor, or his designee, places the call to the OEPA.

Step 6A - Supervisor Calls OEPA Spill Response Hotline

The spill response hotline for the Ohio EPA, Southwest District Office is 1-800-282-9378.

Step 6B - Supervisor Informs the Superintendent

The preceding steps may all occur within a timeframe of several hours. The problem may be resolved or well under control before the Superintendent can be made aware of the particular situation. The need to inform the Superintendent at this time should be determined on a case-by-case basis utilizing the judgment and experience of those persons involved. The Superintendent must be made aware of a problem in the event of the following situations:

- Releases of sewage into the environment,
- Events that may gain the attention of the media or the public-at-large, and
- Problems that cannot be resolved quickly or where an emergency contractor is needed.

Step 7 - Is Problem MSD's Responsibility?

From this step forward, the initial determination has been made as to the likely cause of the problem and the Supervisor assists with an appropriate course of action. The first question pertains to ownership of the sewer line. If the problem is on private property, then Step 7A is undertaken. If the problem is in the building service line in the public right-of-way, MSD will assist the homeowner with bypass pumping. If the problem is in the main-line sewer owned by MSD, then one proceeds to Step 8.

Step 7A - Problem is Referred to Appropriate Party: Property Owner or Health Department

In some instances, service calls may be received for private sewers. MSD has no jurisdiction over these lines. Accordingly, these service calls are referred to City or County Boards of Health, whichever is appropriate. Telephone numbers are provided in Chapter 5.0.

Step 8 - Can Problem be Solved with MSD Forces?

During this step, the team and Supervisor decide whether the problem can be handled with MSD forces alone or if emergency contract assistance is needed. In many instances, the First Response Team on-site is fully capable of resolving the problem. In other instances, additional MSD maintenance teams may be paged.

Step 9 - Supervisor Enlists Aid of an Emergency Contractor

Occasionally, a problem will be encountered, such as a main-line sewer break, when an emergency contractor is brought in to solve the problem. This generally occurs when problems are large and beyond the resources of the MSD staff and crews.

Step 10 - Supervisor Informs the Superintendent

This step is essentially a repeat of Step 6B. In this situation, it is customary to inform the Superintendent.

Step 11 - Response - Take Appropriate Action to Stop, Contain and Clean-up Impacts of a Sewage Release

The previous steps describe the decision-making process to assess the impact of a problem, to assess the degree of MSD responsibility and to mobilize the appropriate resources. During this step the First Response Team, in house maintenance crews and emergency contractors take appropriate action to stop, contain and clean-up impacts of a sewage release. *These procedures are described in Section 4.2 of the Metropolitan Sewer District of Greater Cincinnati's "Sewer Overflow Response Plan."* All of the actions therein described may be undertaken sequentially or concurrently.

Step 12 - Is a News Release Necessary?

In general, the Division's response to problems is so fast that problems are solved before the public can even become aware. However, there are other instances, due to magnitude, location and time of the problem that the Superintendent and Director may decide to issue a news release.

Step 12A - Director Issues a News Release

Under this step, the Director's office issues a news release of the problem, its cause and actions being taken to resolve it.

Step 13 - Actions to Solve the Problem are Concluded

At this point, all work to correct and remediate the problem is completed.

Step 14 - Response Teams and Supervisor Complete the Report with Time Sheets and Billing Information

This is the final step in the response flowchart where all paperwork on the incident is completed and returned to the Dispatch Office. The report is a continuation of the original "Request for Service". The report is also used as a repository for billing and cost information.

Once the "complaint" file is closed, the Division will review the file to determine if a "work order" is necessary. This is discussed in Section 5.4

5.2 Preventive Maintenance

The previous section outlines "Request for Service" procedures utilized by the WWC Division. Although the WWC Division recognizes that some emergencies are inevitable, the Division places a premium on preventive maintenance to minimize the occurrence of future "emergencies."

Many of the programs administered by the WWC Division were introduced in Chapter 3.0 along with a discussion as to which functional group was in principal charge. Although many of the Division's specific procedures relating to preventive maintenance are outlined in the Wastewater Collection Division Training Manual, 1992, the Division relies on the use of CCTV to provide information to MSD that feeds the subsequent maintenance activities. In part, information obtained from CCTV is entered into the database described in Section 5.4.

For the purpose of preventive maintenance the WWC Division generally selects lines to be CCTV inspected on the following basis:

- Sewers tributary to known SSO locations
- Sewers located in areas of reported basement flooding
- Sewers located in areas of repeated requests for service
- Sewers located in areas of planned public improvement

Information gained from CCTV work is entered into the database described in Section 5.4. This tool allows the WWC Division to decide which lines need additional maintenance and repair, what type of action is appropriate; and when this work may be required.

Based on the findings obtained from CCTV, the WWC Division may perform one or more of the following activities:

- Perform additional line cleaning/root removal
- Perform minor repairs
- Perform special investigation and/or flow monitoring
- Re-line fully or partially deteriorated lines using CIPP pipe
- Recommend a Capital Improvement Project

Each of these activities is described further below:

Perform Additional Root Removal and Sewer Cleaning

In many instances the WWC Division will discover that the available capacity in a sewer line may be reduced by the presence of roots, grit material and other debris. By removing these obstructions, the available capacity in a line can be effectively restored.

Perform Minor Repairs

In other instances, CCTV inspection work will reveal situations where a minor repair is warranted. Typical minor repairs performed by the WWC Division include point repairs on main line sewers, manholes, building service laterals or force mains.

Perform Special Investigations and/or Flow Monitoring

Special investigation projects entail an evaluation of a study area to determine the cause and potential solutions for problems such as frequent water-in-basement complaints. These investigations typically include flow monitoring and engineering evaluations.

Re-line Fully or Partially Deteriorated Lines Using CIPP Pipe

The WWC Division has found this program pivotal in restoring the structural integrity of many systems considered to be either partially or fully deteriorated. It is believed that this program has substantially reduced emergency or reactive maintenance work throughout the District.

Recommend a Capital Improvement Project

In other instances the WWC Division will work with other divisions in MSD to formulate a capital improvement project.

Annual Preventive Maintenance Target Goals

Wastewater Collection System gravity sewer information:

- 2,900 miles (total) of combined and sanitary sewers
- 612 miles of sewer off-road (524 miles between 8” & 42” high pressure cleaning possible)
- 2,288 miles accessible by truck

The Wastewater Collection Division is presently implementing a Preventive Maintenance Program for Sewer Cleaning, CCTV Inspection and Sewer Rehabilitation.

Targeted yearly production rates for this program are:

● CCTV or sonar sewer inspection on-road	150 miles
● CCTV or sonar sewer inspection off-road	40 miles
● High pressure cleaning of sewers on-road	150 miles
● High pressure cleaning of sewers off-road	35 miles
● Root cutting and/or chemical treatment of roots (mileage will be measured from MH to MH for this specific operation) (the target goals are based on work identified by CCTV or inspection)	10 miles
● Sewer rehabilitation and/or lining (the target goals are based on work identified by CCTV or inspection)	10 miles
● Manhole rehabilitation (the target goals are based on work identified by CCTV or inspection)	150 MH/year

The actual performance output of various maintenance tasks will vary from year to year. In order to meet the minimum annual performance standards, MSD may average the two previous years with the present reporting year to establish an annual performance value for Consent Decree reporting purposes.

5.3 Emergency / Reactive Maintenance

The WWC Division understands that while emergencies are unavoidable and cannot be always anticipated, it is imperative to know how to respond when an “emergency” does occur. The “Request for Service” procedures in the earlier part of this chapter provide an introduction to the types of actions typically undertaken by First Response Teams when encountering a problem.

The WWC Division has the philosophy: "plan for the worst and hope for the best." In this manner the Division avoids the potential problem initially of under mobilizing its forces to address a sewer problem. This helps them avoid losing valuable time, which could make a bad situation even worse. Overall, the Division's First Response Teams have developed the skill through experience and training to report problems accurately and initiate bypass pumping and spill containment without delay.

Emergency contractors are used to assist the WWC Division with larger maintenance and repair projects. Currently, 6 firms are under contract with MSD. The conditions may vary to a degree as to when emergency contractors are mobilized; however emergency contractor are generally used for larger maintenance and repair projects, or to repair problems that may tend to release large amounts of sewage into "waters of the state."

5.4 Maintenance Management System

The Metropolitan Sewer District of Greater Cincinnati (MSD) has developed a program with the goal of creating a comprehensive database that tracks pending and completed work as well as aids in the cost estimating and invoicing of work orders that are received. In addition to this the District wanted the information made easily available for everyday use.

The tracking system is a linking of graphical and attribute data displayed through ArcView and FoxPro software respectively for this system. The graphical data consists of manhole and sewer segment identification from the CAGIS system. The attribute data consists of data entered directly from work orders issued for maintenance or inspection.

5.4A The Maintenance Process

Request for Maintenance Work

The request can come from other MSD departments, other Wastewater Collection Sections, MSD contractors, Municipalities, city departments as well as from homeowners. The "Request for Service" is entered into the complaint tracking database and referred to the Maintenance and Inspection Supervisor. The information entered is:

Who requested the work,
What type of work is to be done,
Where is the work to be performed (address),
When the request was made, and
Why the work is being requested.

Graphically Assigning the Work

The ArcView mapping system utilities CAGIS database information. Once ArcView is accessed the Maintenance and Inspection Supervisor can see buildings, streets, manholes, sewers (with flow directional arrows), along with various other shape files. From the sewer shape file we can find out the sewer size, length, upstream and downstream manhole numbers (e.g. sewer segment). At this point the Maintenance and Inspection Supervisor can see if any work has been done to this sewer segment or is pending. A map is then generated of the project area.

Databases

The WWC Division utilizes a computerized management system to handle work orders.

Information from each complaint or work order is entered into the maintenance database. Maintenance database fields are as follows:

Complaint/work order date	Pipe size
Upstream manhole	Maintenance number
Type of work	Pipe length
Downstream manhole	Estimated cost
Complaint/work order address	Sewer segment
Who is performing maintenance work	

This information is saved as a pending job. Maintenance work can then be assigned by type of work, municipality, and/or other considerations.

Once the maintenance work order is completed the data from the work sheets is entered into a database. This database is able to compare MSD job cost to that of contractors performing the same types of work.

The Division has found these databases to be very useful in scheduling preventive maintenance such as root removal. Root removal from sewer lines is a continuous maintenance problem that needs to be performed on a regular basis for some sewer segments. By searching the database MSD is able to determine what sewer segments need periodic maintenance and how often.

Sections 5.4B through 5.4E discuss the databases in more detail.

5.4B **Maintenance Tracking Database**

All collection system maintenance activities are recorded and tracked in a computerized Maintenance Tracking Database. This work includes TV inspection, flushing, root cutting, flush vac, TV inspection of tap, grouting, etc. Work orders are generated from the "Request for Service" process, the preventative maintenance program, or other sources. The work request is entered into the system and assigned by the WWC Supervisor to an MSD maintenance crew or an emergency contractor. As work is completed, information from the field crew is entered into the database. The system tracks the status of the work (assigned, complete, not complete), the type of work (flush, flush vac, TV, root cut, etc.), and any findings from the field crew (debris, grease, pipe condition, etc.).

This system is also utilized to schedule preventative maintenance work and automatically generate work orders for various tasks (root cut, flush vac, etc.). All maintenance activities are included in this system to provide a comprehensive record of all maintenance work completed throughout the system. A reproduction of the Maintenance Tracking form is included in the Appendix.

5.4C <u>TV Inspection Database</u>

A TV Inspection database is also utilized to monitor the condition of the system and automatically generate work orders for preventative maintenance. As the TV investigation of a section of sewer is conducted, the crew enters the findings of the inspection into the database on the laptop computer. This includes structural and maintenance ratings of “1” to “4” to indicate the condition of the pipe. A rating of “1” indicates no further action required, “2” indicates a slight concern and that the section of pipe should be re-inspected in the future, “3” indicates a problem that should be scheduled for repair, and “4” indicates a significant problem that should result in immediate repair. Data collected on the laptop computer in the field is transferred into the main computer system in the WWC Division office. The system automatically generates reports of the daily inspections and sections ranked “4” are immediately assigned to a repair crew. Any segments ranked “3” are reviewed to determine the extent of the repair required and are scheduled for repair, rehabilitation, or replacement. The system will also automatically generate work orders at the prescribed interval for preventative maintenance work. A reproduction of the TV Inspection Report form is included in the Appendix.

5.4D <u>Project Tracking Database</u>

Repair projects, such as main line repair, joint repair, building lateral repair, force main repair, pipe collapse, etc. are tracked in a Project Tracking database system. As repair projects are generated, they are added to the system to be scheduled and tracked through completion. The project is assigned a project number, the type and description of work, location, site conditions, and any other essential information is included in the database and utilized to schedule the necessary crew and equipment. The project is assigned to a MSD repair team or contracted to an emergency contractors. Upon completion of the project, information from the repair team is added to the system, including length of pipe repaired or replaced, supplies used to complete the project, and any other comments. A reproduction of the Project Tracking form is included in the Appendix.

All of the TV, “Request for Service,” Project Tracking and the Maintenance Tracking Database information can be linked to CAGIS and can be mapped or compared to the data and any other data in the system. They can also be cross referenced through the Project Number, Maintenance Number, address, or manhole number.

5.4E Inventory Management System

Collection system maintenance equipment and replacement parts are maintained at the WWC Division. Supplies and equipment used for collection system repair and maintenance include pipe, manhole castings, fittings, clamps, gaskets, precast manhole components, grout, specialty tools, compressors, hydraulic pumps hand tools, bypass pumps, hose, etc. The WWC Division maintains an inventory of replacement parts presently valued at approximately $764,000. The supply is monitored and maintained through the use of a computerized inventory control system. Inventory is maintained at “set levels” based on consumption and delivery schedules of the various supplies. The computer system automatically generates orders for supplies when the inventory drops to the “set level” to optimize the use of available storage space. Materials that require longer delivery are generally ordered in larger quantities at less frequent intervals, while materials that can be provided on a short delivery time are ordered more often.

5.5 Monitoring/Information Gathering

The WWC Division is involved with the collection of primary data through the flow monitoring program contracts with professional services firms. Three examples are these are the SSO monitoring program, the CSO monitoring program, and the in-stream program. Each is introduced below.

SSO Monitoring

This program is discussed in the report entitled Sanitary Sewer Overflow Monitoring and Reporting Plan, as revised January 2002. This program has been in place since 1992 and originated with the Ohio EPA Director's Final Findings and Orders issued September 22, 1992.

CSO Monitoring

The current CSO Monitoring Program originated in 1991 with the issuance of a new NPDES Permit 1PX00022*AD for all CSOs in the MSD service area. Previously CSOs were coupled with NPDES permits for the 3 wastewater treatment plants which are served, in part, by a combined sewer system.

Instream Monitoring

The NPDES Permit 1PX00022*AD for all CSOs in the MSD service area requires that water quality and biological studies are conducted for all the receiving streams to document impacts from CSOs, on a rotating basis. Instream monitoring for the three receiving streams has been ongoing since 1994.

6.0 APPENDICES

DECEMBER 1999

(REVISED February 2002)

APPENDIX	TITLE
A	Wastewater Collection Division Equipment List
B	"Request for Service" Forms
C	Maintenance Tracking Database Form
D	TV Inspection Database Form
E	Project Tracking Database Form

APPENDIX “A”

Wastewater Collection Division Equipment List

Equipment Number	Description	Equipment Type
30682	Chev. S-10 Blazer 4 Dr. 4X4	APV
40603	Chev. S-10 Blazer 2 Dr. 4X4	APV
40604	Chev. S-10 Blazer 2 Dr. 4X4	APV
50601	Chev. S-10 Blazer 2 Dr. 4X4	APV
50602	Chev. S-10 Blazer 2 Dr. 4X4	APV
60600	Ford Explorer XL 2Dr. 4X4	APV
60601	Ford Explorer XL 2Dr. 4X4	APV
60681	Ford Explorer XL 4Dr. 4X4	APV
60682	Ford Explorer XL 4Dr. 4X4	APV
70604	Chev. S-10 Blazer 2 Dr. 4X4	APV
70605	Chev. S-10 Blazer 2 Dr. 4X4	APV
70609	Chev. S-10 Blazer 4 Dr. 4X4	APV
70610	Chev. S-10 Blazer 4 Dr. 4X4	APV
90681	Ford Explorer XL 4Dr. 4X4	APV
30690	Chev. K2500 Suburban 4X4	APV Suburban
00690	Chev. K2500 Suburban 4X4/Diesel	APV Suburban
70865	Chev. K2500 Suburban 4X4/Diesel	APV Suburban
66900	Air System Ventilating Blower	Air Blower
66901	Air System Ventilating Blower	Air Blower
66902	Air System Ventilating Blower	Air Blower
53900	Power Flash Arrow Board	Arrow Board Trailer - Mounted
86535	Hand Held Blower	Blower
38550	Achilles Inflatable Boat	Boat Inflatable
11810	Chev. Truck/Diesel w/ 4 Ton Crane	Boom Truck
91810	Chev. Flat Bed/Diesel w/ Stinger Crane	Boom Truck
41810	Chev. Rear Mtd. Boom Truck	Boom Truck
61811	Chev. C60 Utility Boom Truck w/Compressor	Boom Truck
09483	Kent Chipping Hammer	Chipping Hammer
09504	Sullair Chipping Hammer	Chipping Hammer
26540	Pneumatic Chipping Hammer	Chipping Hammer
26541	Pneumatic Chipping Hammer	Chipping Hammer
26542	Pneumatic Chipping Hammer	Chipping Hammer
05325	Kent Clay Spade	Clay Spade
26622	Kent Clay Spade	Clay Spade
26623	Kent Clay Spade	Clay Spade
26624	Kent Clay Spade	Clay Spade
76621	Hatco Clay Spade	Clay Spade
76622	Hatco Clay Spade	Clay Spade
76623	Hatco Clay Spade	Clay Spade
76624	Hatco Clay Spade	Clay Spade
03465	Sreco Flexible Bucket Machine	Cleaning Machine
03466	Sreco Flexible Bucket Machine	Cleaning Machine
03467	Sreco Flexible Bucket Machine	Cleaning Machine
03468	Sreco Flexible Bucket Machine	Cleaning Machine
04423	Flexible Bucket Machine	Cleaning Machine
23465	Sreco Truck-Loading Sewer Cleaning Machine	Cleaning Machine/Truck Loader
66675	Stone Vibratory Compactor	Compactor
66676	Stone Vibratory Compactor	Compactor

Equipment Number	Description	Equipment Type
76677	Wacker Flat Plate Compactor	Compactor
01924	Int'l. Util./Complaint/Diesel	Complaint
01928	Int'l. Util./Complaint/Diesel	Complaint
11917	Int'l. Util./Complaint/Diesel	Complaint
11918	Int'l. Util./Complaint/Diesel	Complaint
11922	Int'l. Util./Complaint/Diesel	Complaint
11923	Int'l. Util./Complaint/Diesel	Complaint
91920	Chev. Util./Complaint/Diesel ('98T)	Complaint
41917	Chev. Complaint Truck/Diesel	Complaint
91921	Chev. Util./Complaint Flusher/Diesel	Complaint Flusher
13555	Grimmer Schmidt 175 CFM Compressor	Compressor
13556	Grimmer Schmidt 175 CFM Compressor	Compressor
23555	Grimmer Schmidt 175 CFM Compressor	Compressor
23556	Grimmer Schmidt 175 CFM Compressor	Compressor
53557	Grimmer Schmidt 175 CFM Compressor ('99T)	Compressor
73560	Grimmer Schmidt 175 CFM Compressor	Compressor
83555	Grimmer Schmidt 175 CFM Compressor ('99T)	Compressor
93556	Grimmer Schmidt 175 CFM Compressor	Compressor
33558	Grimmer Schmidt 175 CFM Compressor	Compressor
33559	Grimmer Schmidt 175 CFM Compressor	Compressor
53560	Grimmer Schmidt 175 Compressor	Compressor
53561	Grimmer Schmidt 175 Compressor	Compressor
63555	Smith 160 GP Compressor	Compressor
73555	Smith 160 GP Compressor	Compressor
73556	Smith 160 GP Compressor	Compressor
26660	Minnich Pneu. Concrete Vibrator	Concrete Vibrator
36670	Wyco Electric Concrete Vibrator	Concrete Vibrator
05104	Grove Hydraulic Crane 15 ton/Diesel	Crane
25850	Little Giant Crane	Crane
55850	Little Giant Truck-Mounted Crane	Crane
30950	Chev. Dump/Diesel	Dump
30951	Chev. Dump/Diesel	Dump
40953	Chev. Kodiak Dump/Diesel	Dump
40954	Chev. Kodiak Dump/Diesel	Dump
50953	Chev. Kodiak Dump	Dump
50952	Chev. Kodiak Dump	Dump
50956	Chev. Kodiak Dump	Dump
50957	Chev. Kodiak Dump	Dump
10945	Chev. Dump/Oper./Diesel	Dump Operator's
10946	Chev. Dump/Oper./Diesel	Dump Operator's
10947	Chev. Dump/Oper./Diesel	Dump Operator's
10948	Chev. Dump/Oper./Diesel	Dump Operator's
40951	Chev. Kodiak Oper. Dump/Diesel	Dump Operator's
40952	Chev. Kodiak Oper. Dump/Diesel	Dump Operator's
50950	Chev. Kodiak Oper. Dump	Dump Operator's
50951	Chev. Kodiak Oper. Dump	Dump Operator's
50954	Chev. Kodiak Oper. Dump	Dump Operator's
50955	Chev. Kodiak Oper. Dump	Dump Operator's
80953	Int'l 4900 4X2 Operator's Dump/Diesel	Dump Operator's
80954	Int'l 4900 4X2 Operator's Dump/Diesel	Dump Operator's

Equipment Number	Description	Equipment Type
80955	Int'l 4900 4X2 Operator's Dump/Diesel	Dump Operator's
80951	Int'l 4900 4X2 Operator's Dump/Diesel	Dump Operator's
80952	Int'l 4900 4X2 Operator's Dump/Diesel	Dump Operator's
70950	Ford Dump/Diesel w/ Seal Tight Body	Dump Seal Tight
90950	Chev. Dump/Diesel w/ Seal Tight Body	Dump Seal Tight
50990	Chev. Tandem-Axle Dump Truck	Dump Tandem-Axle
70980	Int'l 4900 Tandem-Axle Dump/Diesel	Dump Tandem-Axle
05495	John Deere 690B Track Backhoe/Diesel	Excavator Track
15832	Case 580SK 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
35830	John Deere 310D 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
45830	John Deere 310D 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
55831	Case 580SL 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
65831	John Deere 310D 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
65832	John Deere 310D 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
75831	Case 580SL 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
75832	Case 580SL 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
85833	Case 580SL 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
85834	Case 580SL 4X4 Extendahoe Loader/Diesel	Extendahoe Loader
11530	Chev. Vactor/Diesel	Flusher
71890	Ford L8501 Vactor 2103 Flusher/Vac Truck	Flusher Vacuum Truck
81892	Sterling L8501 Vactor 2103 Flusher/Vac Truck	Flusher Vacuum Truck
91891	VACTAINER TRUCK	Flusher Vacuum Truck
91892	VACTAINER TRUCK	Flusher Vacuum Truck
92670	Toyota Forklift/Diesel	Forklift
92671	Toyota Forklift/Diesel	Forklift
51750	Ford F700 Fuel Tank Truck	Fuel Truck
11916	Int'l. Util./Gang/Diesel	Gang
11919	Int'l. Util./Gang/Diesel	Gang
41923	Chev. Gang Truck	Gang
61917	Chev. C3500HD Gang Truck	Gang
71925	Chev. C3500HD Gang Truck	Gang
71926	Chev. C3500HD Gang Truck	Gang
71927	Chev. C3500HD Gang Truck	Gang
71928	Chev. C3500HD Gang Truck	Gang
81915	Chev. C3500HD Gang Truck	Gang
06796	Honda Portable Generator	Generator
06797	Honda Portable Generator	Generator
06798	Honda Portable Generator	Generator
06799	Honda Portable Generator	Generator
16792	Gillette Brushless Generator	Generator
46793	Pow'r Gard 3000W Generator	Generator
56790	Pow'r Gard 3000W Generator	Generator
56791	Pow'r Gard 3000W Generator	Generator
66791	Pow'r Gard OHV3000 Generator	Generator
66792	Pow'r Gard OHV3000 Generator	Generator
66793	Pow'r Gard OHV3000 Generator	Generator
96495	Stanley Hyd. Alternator 3000 Watts	Hydraulic Alternator
07875	Stanley Hyd. Drill	Hydraulic Drill
06831	Stanley Hyd. Pwr Source (mtd on 5467 trl)	Hydraulic Power Source
53870	Stanley Hyd. Power Source/Diesel	Hydraulic Power Source

Equipment Number	Description	Equipment Type
73780	Thompson Hyd. Power Source/Diesel	Hydraulic Power Source
73781	Thompson Hyd. Power Source/Diesel	Hydraulic Power Source
01800	Chev. Util./Hyd. Pump Truck/Diesel	Hydraulic Power Truck
21800	Chev. Util./Hydraulic Truck/Diesel	Hydraulic Power Truck
07850	Stanley Hyd. Wrench	Hydraulic Wrench
53840	Over Lowe Portable Light Plant	Light Plant
45871	Mustang 940 Loader with backhoe,auger,and sweeper	Light Track Loader
06147	Case W18 Wheel Loader/Diesel	Loader Rubber Tire
25812	John Deere 444E Wheel Loader/Diesel	Loader Rubber Tire
05815	John Deere 445G Track Loader/Diesel	Loader Track
05816	John Deere 655B Track Loader/Diesel	Loader Track
92831	Kut Kwick Slopemaster 60" Mower	Mower Riding
55810	John Deere 7800 Tractor Loader/Flusher	Off-Road Flusher
07414	Mariner Outboard Motor	Outboard Motor
09545	Sullair Paving Breaker	Paving Breaker
09560	Chicago Pneumatic Paving Breaker	Paving Breaker
09561	Chicago Pneumatic Paving Breaker	Paving Breaker
09564	Jaeger Paving Breaker	Paving Breaker
09587	Chicago Pneumatic Paving Breaker	Paving Breaker
26561	Kent Paving Breaker	Paving Breaker
26562	Kent Paving Breaker	Paving Breaker
26563	Kent Paving Breaker	Paving Breaker
76562	Hatco Paving Breaker	Paving Breaker
76563	Hatco Paving Breaker	Paving Breaker
76564	Hatco Paving Breaker	Paving Breaker
40816	Chev. C3500 Pickup w/PG	Pickup
60888	Ford F350 Pickup w/Dual Rear Wheels	Pickup
70805	Chev. C3500 Pickup w/PG	Pickup
70829	Chev. K3500 4X4 P.U. w/PG	Pickup/4X4
66923	Ridgid Kollman Portable Water Flusher	Portable Flusher
66924	Ridgid Kollman Portable Water Flusher	Portable Flusher
86692	Gorman-Rupp Model 12A1-13 2" Trash Pump	Pump 2 in. Trash
86693	Gorman-Rupp Model 12A1-13 2" Trash Pump	Pump 2 in. Trash
23630	Gorman Rupp 6" Trash Pump	Pump 6 in. Trash
23631	Gorman Rupp 6" Trash Pump	Pump 6 in. Trash
93630	Gorman-Rupp Model 16C20-F5L	Pump 6 in. Trash
93631	Gorman-Rupp Model 16C20-F5L	Pump 6 in. Trash
93632	Gorman-Rupp Model 16C20-F5L	Pump 6 in. Trash
09757	Stanley Hydraulic Pump 450 GPM	Pump Hydraulic
09765	Stanley Hydraulic Pump 450 GPM	Pump Hydraulic
56750	Stanley 2-1/2 in. Hydraulic Pump	Pump Hydraulic
56751	Stanley 2-1/2 in. Hydraulic Pump	Pump Hydraulic
76750	Thompson 6 in. Hydraulic Pump	Pump Hydraulic
76751	Thompson 6 in. Hydraulic Pump	Pump Hydraulic
76752	Thompson 4 in. Hyd. Pump	Pump Hydraulic
76753	Thompson 4 in. Hyd. Pump	Pump Hydraulic
76754	Stanley 4 in. Hydraulic Pump	Pump Hydraulic
76755	Thompson 6 in. Hyd. Pump	Pump Hydraulic
76756	Thompson 6 in. Hyd. Pump	Pump Hydraulic

Equipment Number	Description	Equipment Type
86750	Stanley 4 in. Hyd. Pump	Pump Hydraulic
86751	Thompson 4 in. Hyd. Pump	Pump Hydraulic
86752	Thompson 4 in. Hyd. Pump	Pump Hydraulic
96750	Stanley 4 in. Hyd. Pump for EQ#93870	Pump Hydraulic
96751	Stanley 4 in. Hyd. Pump	Pump Hydraulic
96752	Stanley 4 in. Hyd. Pump	Pump Hydraulic
96753	Stanley 4 in. Hyd. Pump	Pump Hydraulic
96755	Stanley 2-1/2 in. Hyd. Pump	Pump Hydraulic
96756	Thompson 4 in. Hyd. Pump	Pump Hydraulic
96757	Thompson 4 in. Hyd. Pump	Pump Hydraulic
96758	Stanley 2-1/2 in. Hyd. Pump	Pump Hydraulic
36941	Thor Pneu. Sump Pump	Pump Sump
96940	Jersamatic Pneu. Sump Pump	Pump Sump
96941	Jersamatic Pneu. Sump Pump	Pump Sump
96942	Jersamatic Pneu. Sump Pump	Pump Sump
46941	Thor 2-1/2" Sump Pump	Pump Sump
66940	Chicago Pneumatic 2 1/2" Sump Pump	Pump Sump
66941	Chicago Pneumatic 2 1/2" Sump Pump	Pump Sump
09631	Chicago Rock Drill	Rock Drill
09634	Grander Denver Rock Drill	Rock Drill
16929	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
46920	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
46921	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
46922	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
56920	Ridgid Kollmann K-1500 BSP Electric Mole	Rodder Electric
56921	Ridgid Kollmann K-1500 BSP Electric Mole	Rodder Electric
56922	Ridgid Kollmann K-1500 BSP Electric Mole	Rodder Electric
66920	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
66921	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
66922	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
76927	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
76928	Ridgid Kollmann K-1500SP Electric Mole	Rodder Electric
23487	Sreco Sewer Rodder/Gasoline	Rodder Gas
23489	Sreco Sewer Rodder/Gasoline	Rodder Gas
46924	Sreco Sewer Rodder	Rodder Gas
56924	Sreco Sewer Rodder/Gasoline	Rodder Gas
56925	Sreco Sewer Rodder/Gasoline	Rodder Gas
01830	Int'l. Truck w/ Hyd. Rodder/Diesel	Rodder Truck
21830	Int'l. Power Rodder	Rodder Truck
71830	Ford F350 Rodder Truck ('98T)	Rodder Truck
86459	CHAIN SAW	SAW
86460	CHAIN SAW	SAW
86461	CHAIN SAW	SAW
47575	Meyer Salt Spreader	Salt Spreader
97575	Meyers Salt Spreader	Salt Spreader
56480	Stihl Circular Saw	Saw Circular
56504	Stihl Circular Saw	Saw Circular
56505	Stihl Circular Saw	Saw Circular
56507	Stihl Circular Saw	Saw Circular
56508	Stihl Circular Saw	Saw Circular

Equipment Number	Description	Equipment Type
56509	Stihl Circular Saw	Saw Circular
76481	Stihl Circular Saw	Saw Circular
76483	Stihl Circular Saw	Saw Circular
46485	Thor Pneu. Hand Circular Saw	Saw Pneumatic
67850	Saw-Tec Pneumatic Concrete Saw	Saw Pneumatic
67851	Saw-Tec Pneumatic Concrete Saw	Saw Pneumatic
94471	Norton Concrete Saw	Saw Walk Behind
94472	Norton Concrete Saw	Saw Walk Behind
09049	Cushman Elec. Motor Scooter	Scooter
86950	Turbo Smoke Generator	Smoke Generator
86951	Turbo Smoke Generator	Smoke Generator
62570	Tennant Sweeper 275 LP ('99T)	Sweeper
91916	UTILITY TRUCK	TRUCK
92692	Off Road Tractor w/ TV Equipment	TV Tractor
81465	Chev. TV Van/Diesel	TV Van
91465	Chev. TV Van/Diesel	TV Van
81466	Ford E Super Duty Iner-City Van w/ Cues TV System	TV Van
00870	Chev. TV Van/Diesel	TV Van
09000	Kent Tamper	Tamper
09001	Kent Tamper	Tamper
09651	Kent Tamper	Tamper
09652	Ingersoll-Rand Tamper	Tamper
06760	Bombardier J-5F Crawler Tractor	Track Carrier
45670	Case 850E Track Dozer/Diesel	Track Dozer
90980	Int'l. Tractor/Diesel	Tractor
40981	Int'l. Tractor/Diesel	Tractor
37478	Trail King TK24 12 ton Beaver Tail Trailer	Trailer Beaver
77477	Trail King TK24 12 ton Beaver Tail Trailer	Trailer Beaver
87476	Trail King TK24 Beaver Tail Trailer	Trailer Beaver Tail
97454	Tee Nee Boat Trailer	Trailer Boat
47477	Trail King 40 Ton Trailer	Trailer Drag
87477	Trail King TK50 Drag Trailer	Trailer Drag
07475	Eager Beaver Trailer/tandem tilt	Trailer Tilt
17475	Eager Beaver Tilt Top Trailer	Trailer Tilt
27475	Eager Beaver Tilt Top Trailer	Trailer Tilt
27476	Eager Beaver Tilt Top Trailer	Trailer Tilt
27477	Eager Beaver Tilt Top Trailer	Trailer Tilt
37477	Eager Beaver Tandem Axle Trailer	Trailer Tilt
09406	Utility Tool Box Trailer	Trailer Tool Box
09407	Utility Tool Box Trailer	Trailer Tool Box
09408	Utility Tool Box Trailer	Trailer Tool Box
09410	Utility Tool Box Trailer	Trailer Tool Box
09413	Utility Tool Box Trailer	Trailer Tool Box
05467	Trailer only/Hyd. Pwr. Source EQ# 6831	Trailer Utility
34030	Queen City Mfg. Cargo Trailer	Trailer Utility
57453	Trail King 5 Ton Utility Trailer	Trailer Utility
04801	Ditch Witch Trench Digger 2'x 6'	Trench Digger
71920	Dodge Ram 3500 Utility P.U. 4X4 w/Plow & PG	Utility Pickup/4X4/Plow
40862	Chev. Sport Van Ext. S.W. Van	Van Extended

Equipment Number	Description	Equipment Type
40863	Chev. Sport Van Ext. S.W. Van	Van Extended
50856	Dodge Ram Wagon 3500 Ext. S.W. Van	Van Extended
50857	Dodge Ram Wagon 3500 Ext. S.W. Van	Van Extended
60849	Chev. G30 Ext. S.W. Van	Van Extended
60847	Chev. G30 Ext. S.W. Van	Van Extended
70860	Ford E250 HD Ext. S.W. Van	Van Extended
70670	Chev. Venture S.W. Van w/AC	Van Mini
70847	Ford E250 HD Win. Van	Van Win
70848	Ford E250 HD Win. Van	Van Win
70853	Ford E250 HD Win. Van	Van Win
90843	Ford E250 HD Win. Van	Van Win
90844	Ford E250 HD Win. Van	Van Win
90845	Ford E250 HD Win. Van	Van Win
96880	Miller cart mounted welder	Welder
27850	Ramsey Hydraulic Winch	Winch

APPENDIX “B”

“Request for Service” Forms

Metropolitan Sewer District
Wastewater Collection

Date:____________

Request for Service

Time:____________

Caller Info

Received by:_____________

First Name________________________ Last Name_________________________________

Agency______________________________ Phone: Business___________________

Address____ Home__________________

Location

Address____

Near Intersection____

City/Township_________________________ Sub Area____________Zip Code____________

Details____

Comments

Job Order

Address____

Foreman_______________________________________

Repair____

ST________SW _______SOD______R/W_______

Est. Days______________________________________

Size of Cut_____________________________________

Number____

UT#____________________WW____________________

On Site

Date:_____________ Unit Responding:__________________________

Time Received:___________ Arrived:__________ Finish:______________

Condition Found and Temporary Action Taken (Make All Referrals by Name - Do Not Use Radio Numbers)

Pump#	P/U Pump	EIB	Office Use

Final Disposition

Metropolitan Sewer District
Wastewater Collection Division

Date:

Time:

COMPLAINT FORM

Received:

CALLER INFORMATION

Name:

Agency: Business Phone:

Address: Home Phone

PROBLEM LOCATION

Address: City/Township:

Nearest Intersection:

Detailed Location Information:

Condition Reported:

Comments:

ON SITE INSPECTION

Date: Unit Number:

Dispatch Time: Arrival Time: Completion Time:

Condition Found:

Action Taken:

Comments:

Job Order:

Last Referral: Last Referral Date:

For:

FINAL DISPOSITION

By: Date: / / Responsibility of:

APPENDIX “C”

Maintenance Tracking Database Form

Assigned To: | **Maintenance #** | **Work Date:**

Date Assigned: | **Project Name:** | **Work Type Completed:**

Section Completed:

Contact Person: | **Phone#:** | **Job Completed:**

Complaint Information:

Sewer Segment: | **Type of Work:** | **Pipe Dia:** | **Length:** | **Off Road:** | **Emergency:**

Remarks:

Hydrant Location:

Meter#: | **Pumped:** | **Weather:** | **Temp:** | **Traffic Control:**

Equipment / Personnel	Number / Name	Hours: Regular:	Overtime:

Field Notes:

								Quantity:
DEBRIS	GREASE	ROOTS	OTHER..	Cleaned	Root Cut	TVed	Sonar	Jts Grouted, Taps Cut, MH Baited, ETC.....

APPENDIX "D"

TV Inspection Database Form

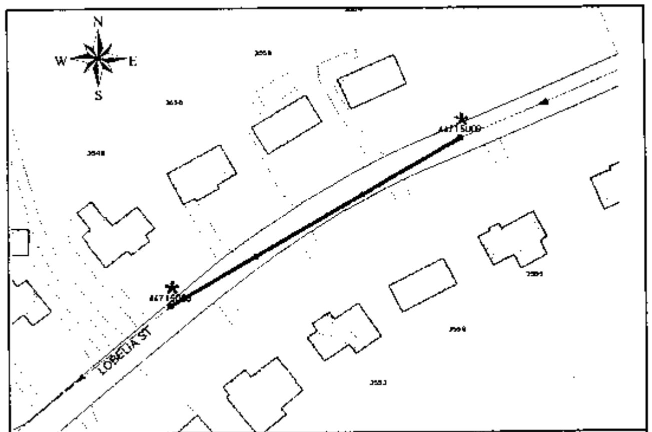
S830J6MLB

TV INSPECTION REPORT

Metropolitan Sewer District
Wastewater Collection Division

Sewer Segment: 44715009-44715008

M S D Maintenance Number: 00944-99



Sewer Segment: **44715009-44715008**
Type of Pipe: **CONCRETE** Length: **300.21'**
Pipe Size: **12"** US MH Depth: **10.40'**
Section Length: **3'** DS MH Depth: **7.90'**

TV Date: **September 03, 1999**

Municipality: **BLASH**

US Address: **3565 LOBELIA**

DS Address: **3547 LOBELIA**

Video Tape No: **4428**
Start: 00:24.27
Stop: 00:33.11

Start Manhole: 44715009
Type of TV: MAINLINE
Direction: DS

12 9 3 6

Crewleader: WUEST
Work Location: STREET PAVEMENT
Surface Cover:
Weather: SUNNY WARM

Structural Rating: **4**
Maintenance Rating: **1**

1-ok 2-future eval
3-need work
4-emergency

Footage	Condition	Degree	Clock	Comments
0.0	START INSPECTION			
3.1	TAP		9	
24.5	TAP		3	
75.8	TAP		9	
93.0	PIPE W/ PONDING	HEAVY		
93.0	PIPE W/ PONDING	BEGIN		
102.0	PIPE W/ PONDING	END		
102.0	PIPE W/ DEBRIS	BEGIN		CHOKE
102.1	PIPE W/ DEBRIS	END		
123.8	TAP		3	
165.0	TAP BREAK IN		9	
200.5	TAP W/ DEBRIS	LIGHT	3	
⚐ 224.0	PIPE W/ HOLE	HEAVY	3	ABOUT 6" X 6"
224.7	TAP W/ BROKEN PIPE	MEDIUM	9	1ST JOINT OFFSET 1" MUD EXPOSED
⚐ 259.2	PIPE W/ HOLE	HEAVY		HALF PIPE MISSING, OBSTRUCTING FLOW
259.5	REVERSE INSPECTION			

Inspector's Comments:

[illegible] of pipe missing 6" x 6" hole at 224' and half pipe missing at 259.2' with piece of pipe obstructing flow, tved from ds end, heavy cracks with 30% shape loss, from 15' to 40.8'

⚐ has image

Video Tape No: **4428**

Start: 00:49.13

Stop: 00:51.34

Structural Rating: **4** *1-ok 2-future eval 3-need work 4-emergency*

Maintenance Rating: **1**

Start Manhole: 44715008

Type of TV: MAINLINE

Direction: US

12 9 3 6

Crewleader: WUEST

Work Location: STREET PAVEMENT

Surface Cover:

Weather: SUNNY WARM

Footage	Condition	Degree	Clock	Comments
0.0	START INSPECTION			
4.0	TAP		9	
15.0	CRACK - QUADRANT	BEGIN		
15.0	CRACK - QUADRANT	HEAVY		
19.1	PIPE COLLAPSED (PARTIAL)			17% SHAPE LOSS
37.2	TAP BREAK IN		9	
40.8	PIPE W/ HOLE	HEAVY		PIECE OF PIPE BLOCKING FLOW
40.8	COMPLETE INSPECTION			

Inspector's Comments:

has image

APPENDIX “E”

Project Tracking Database Form

Metropolitan Sewer District of Greater Cincinnati
Wastewater Collection Division
Project Tracking Form

Project No. 00681-99 Enter Date: 07/20/1999

Complaint Tracking Information

Date: 07/14/1999 Address: 687 W KEMPER RD

Address: 687 W KEMPER RD

Intersection:

Mun_twnshp FORPK Sub_area

Location BETWEEN SIDEWALK AND STREET

Manhole From: 35205002

Manhole To: 35204020

Condition Reported (Max of 50 Char.)
WIB

Charge_to:

Contractor: SCHWEITZER CONSTRUCTION CO

Contract No. / Cost Center:

Project Engineer: PETE CALDWELL

Project Inspector: DAN DUNCAN

Crew Leader/ eman: MIKE MOORE

Project Classification
Contractor - Open Trench Excavation

- [ ] Main Line New Installation
- [ ] Main Line Replacement
- [x] Main Line Repair
- [ ] Main Line Bulk Head
- [ ] Main Line Fill, Seal and Abandon
- [ ] Force Main Replacement
- [ ] Force Main Repair
- [ ] Force Main Valve Replacement
- [ ] Force Main Valve Repair
- [ ] Low Pressure Force Main Replacement
- [ ] Low Pressure Force Main Repair
- [ ] Low Pressure Force Main Valve Replacement
- [ ] Low Pressure Force Main Valve Repair
- [ ] Building Lateral New Installation
- [ ] Building Lateral Replacement
- [ ] Building Lateral Repair
- [ ] Building Lateral Relocate
- [ ] Manhole New Installation
- [ ] Manhole Replacement
- [ ] Manhole Repair
- [ ] Manhole Rehabilitation
- [ ] Manhole Raise
- [ ] Encasement Installation
- [ ] Encasement Repair

Other

Start: 07/15/1999 Finish: 07/19/1999

Estimated Days to Complete: 3.0

Cut Size: Length 12 Width 5

Avg_depth 14.0

Street Opening Permit:

Utilities: 715-025-011

Water Works: CWW

OVERALL PROJECT DIFFICULTY: EASY (Easy,Moderate,Difficult)

Printed on 08/13/1999

Project No. 00681-99 **Enter Date:** 07/20/1999

Soil Conditions: [ ] Rock [X] Clay [ ] Silt / Sand Other

Surface Conditions: [ ] Asphalt [ ] Concrete [ ] Sidewalk [ ] Driveways [ ] Unimproved
[ ] Off Road/Creek Other sod

Utilities: NONE (Light, Medium, Heavy) [ ] Water [ ] Electric [ ] Sewer [ ] Gas [ ] Telephone/Cable
Other

Pumping Required: [ ] Dewatering [ ] Bypass Pumping

Excavation: [ ] No Shoring [X] Trench Box [ ] Open Sheeting [ ] Closed Sheeting [ ] Tunnel Liner
[ ] Soldier Pile/Lagging [ ] Horizontal Tunneling [ ] Horizontal Boring
[ ] Sheet Piling Other

Backfill: [X] Excavated Soil [ ] Controlled Density [ ] Compacted Granular [ ] Flash Fill

Other

Pipe Materials

Item	Material	Type sdr35,etc.	Size	Length	Quantity
pe, PVC, SDR-35 12"	PVC		12	10.00	1

Concrete Encasement

Height (feet)	Length (feet)	Width (feet)

Fill, Seal, and Abandon

Pipe Diameter (inches)	Pipe Length (feet)

Tunneling / Boring

Casing/Liner Plate Diameter (inches)	Length (feet)

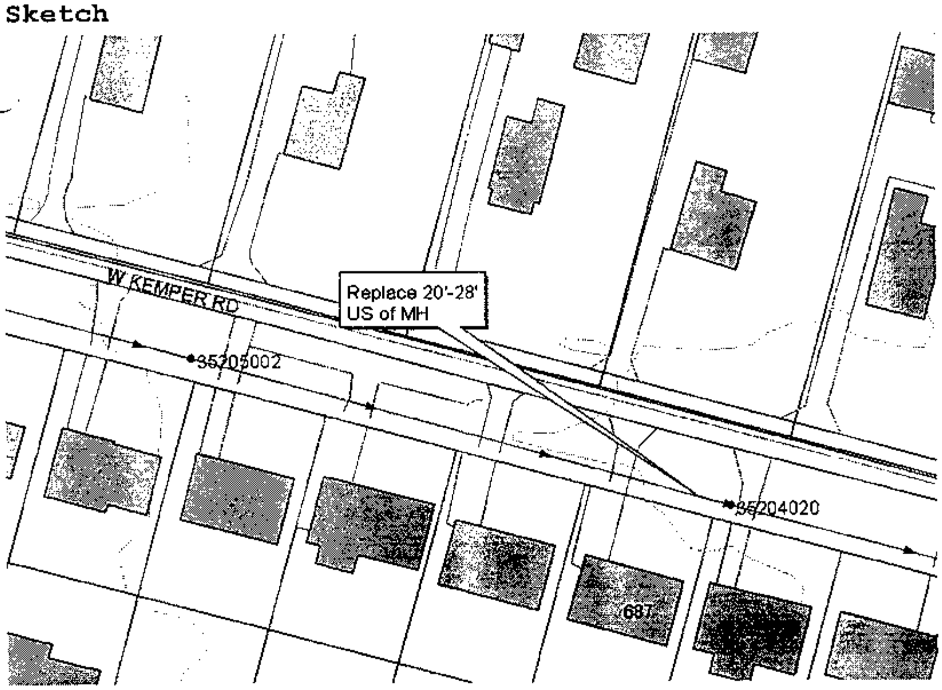
Project No. 00681-99

Enter Date: 07/20/1999

Restoration

Material	Type	Address	Qty	Unit

Sketch



Comments

REPLACED 10' OF 12" BROKEN SEWER ALONG ROAD. RESODDED SITE.

Printed on 08/13/1999 Submit By: PETE CALDWELL Submit Date:08/03/1999

EXHIBIT 8

Metropolitan Sewer District of Greater Cincinnati

INDUSTRIAL WASTE SSO/CSO DISCHARGE MANAGEMENT AND MINIMIZATION PLAN

Division of Industrial Waste

DECEMBER 1999
REVISED FEBRUARY 2002

Metropolitan Sewer District
Division of Industrial Waste

Industrial Waste SSO/CSO Discharge Management and Minimization Plan

December 1999
Revised February 2002

Metropolitan Sewer District
Division of Industrial Waste
Industrial Waste SSO/CSO Discharge Management and Minimization Plan

OBJECTIVE

Using elements of the National Pretreatment Program, to minimize the impact of the discharges from industrial/commercial users during overflow conditions in the Metropolitan Sewer District's sewerage system; to provide additional collection and treatment capacity in the system; and to monitor the effectiveness of the procedures implemented. This is an ongoing procedure that is focused on examining all wet weather/clean water discharges for reuse, detainment, or curtailment.

Description of the Division of Industrial Waste

The Metropolitan Sewer District, Division of the Industrial Waste is responsible for the implementation of the National Pretreatment and Surcharge programs for the District. The Division also provides technical and analytical assistance for the District as well as other local agencies. The Division is composed of four sections. Organizational charts are found in Appendix A.

1) Sampling and Surveillance

- Conducts sampling events used to determine compliance for the pretreatment program and surcharge determinations;
- Collects surface water, treatment plant, sludge samples;
- Conducts field investigations;
- Responds to spill, odor and other citizens' complaints;
- Participates in and conducts surveillance of activities impacting the District's sewer system and assists local, state, and Federal agencies with a variety of investigations;
- Evaluates data and determines surcharge factors;
- Inspects the collection system as necessary when troubleshooting or identifying discharges impacting overflows

2) Laboratory

- Analyzes samples from industrial discharges, surface water sites, spills, wastewater treatment plants for NPDES compliance, investigations, and septic tanks (for Health Departments) using a variety of instrumentation and methods approved by USEPA (40 CFR 136).

3) Permits and Compliance

- Evaluates all data generated for compliance with the conditions of the Pretreatment Program;
- Conducts a variety of inspections of industrial/commercial sites and activities;
- Responsible for all enforcement response activities of the District (Pretreatment Program and MSD Rules and Regulations violations as they pertain to non-domestic users);
- Generates and issues all Wastewater Discharge Permits;
- Evaluates sampling locations;
- Provides direction for the use of pollution prevention principles for compliance; and
- Reviews and approves discharges to the sewer system from industrial and commercial sources

4) Office of the Superintendent

- Provides clerical support;
- Information management;
- Generates and maintains Divisional budget;
- Maintains and processes personnel/payroll information;

- Performs other administrative activities and technical/analytical support to the Department and other agencies.

Authority

The Division of Industrial Waste is responsible for implementing the District's approved Pretreatment Program. The program is under the oversight of the Ohio Environmental Protection Agency (OEPA) and is audited annually for compliance with the National Pretreatment Program. The Division also enforces the Rules and Regulations of the Metropolitan Sewer District as they pertain to non-domestic sources.

Wastewater Discharge Permits are issued to the industrial users of the District. At present, there are 145 Significant Industrial Users and 45 non-Industrial Users holding permits. Monitoring requirements are established according to the flow discharged to the sewer. Classifications used to determine the monitoring requirements are found in Appendix B.

Activities

I. Discharge Prohibitions

A. Groundwater Remediation Projects

Groundwater remediation projects discharging to the Metropolitan Sewer District's system are required to cease all discharges to the sewer during and/or forty-eight hours after a precipitation/overflow event. Wastewater discharge permits issued to these projects include this prohibition. In some cases, the permitee is required to install a system to automatically monitor and interrupt the discharge. Depending on the location, the permitted entity may physically observe the point of overflow; use weather forecasts; or install telemetry systems as a basis upon which to determine when flow to the sewer system should cease. This requirement is explained at the time the request to discharge is made, allowing the permitee to plan for the need to construct and or design a system that would insure compliance with the prohibition conditions. Systems are inspected randomly during precipitation events to evaluate compliance with the requirements of the permits to discharge.

B. Batch Discharges

Significant Industrial Users who have been allowed to convert continuous discharges to batch processes, are limited to discharging to the system under the same conditions as described above. Examples of the documents issued are included in Appendix C.

II. Discharge Restrictions

A. Areas of Concern

All industries contributing wastewater to an SSO are of concern to the Division of Industrial Waste. All industries regulated by the Division's activities are evaluated for the impact on the SSO. The Division's activities are prioritized according to the classification of the SSOs.

Highly active SSOs as defined by the Capital Improvement Projects identified in Exhibit 3 of this consent decree are areas of primary concern for the Division of Industrial Waste. Where industrial contributions to these SSOs exist, all actions described in this plan may be implemented in these areas, requiring the industrial users to take the actions necessary to minimize the impact of the industrial discharge on the SSO. This may include pollution prevention, limiting production and/or wastewater discharge during precipitation events, recycling, and rerouting of storm water.

The highly active SSOs that also receive a contribution from industrial discharges are 1053, 701, 700, 628, 620, and 572 and are on the Master List included in Appendix F. The Division will implement actions to eliminate/minimize the contribution from any existing and future industry in these areas as a first priority.

"Areas of Concern" also include the geographical area immediately upstream of a CSO. Industries in these areas are subject to the same evaluation criteria as those contributing to the highly active SSOs identified above. Contributory industries are regulated according to the impact of the wastewater discharge on the overflow. A list of the contributory industries and the CSOs are included in Appendix F.

Industries contributing to other SSOs on the Master List in Appendix F are evaluated using the criteria specified in this plan. Control mechanisms for the regulation of the discharge are generated based on the activity (frequency, volume, duration, characteristic, and impact) of the overflow. These requirements may or may not be as stringent those currently issued to the industrial users located upstream of SSOs 700, 572, 628, & 620.

B. Existing Industrial Users

The District's approved Pretreatment Program includes a classification of the Industrial Users by flow to assist in the determination of monitoring frequencies in excess of the National Pretreatment Program's requirements. During sampling events, the Division of Industrial Waste monitors the flows of all industrial users. This information, combined with flow monitoring data of the collection system, and system capacity calculations (from Wastewater Engineering) is used to evaluate requests or notifications of any changes (especially increases) in the amount of flow discharged to the system. An evaluation of the industrial user's discharge for the potential for reuse, recycling, retention, or curtailment during wet weather events is performed at the annual inspection and/or permit renewal. Current users whose facilities are located in an area of concern are now being advised of the potential need for extra storage capacity onsite. Implementation of measures to prevent discharges during wet weather conditions may be required by inclusion in the Wastewater Discharge Permit or by Administrative Order.

C. New Industrial Users

As required by the National Pretreatment Program, upon receipt of a Wastewater Discharge Permit Application, the discharges from new Industrial Users are evaluated by determining wastewater characteristics such as: flow volumes, pollutant types, and pollutant concentrations. This determination is initially made from design and process plans submitted by the industry and later verified by inspection, sampling, and analysis of the wastewater discharge stream. The Industrial User's process is carefully evaluated to determine whether or not a federal categorical standard is applicable. Local limits are applied to the discharge. The location of the discharge in reference to any known overflows is also determined. The need for restricting the discharge during wet weather events is evaluated in accordance with the guidelines outlined in Section A above. If necessary, the discharge may be subject to restrictions during wet weather.

III. Removal of "Clean Water" from the Sewer System

A. Existing Users

In 1997, the Division added to its inspection process an evaluation of the discharge of "clean water" (non-contact cooling water, uncontaminated storm water, etc.) into the sewer system. All facilities are notified of the necessity to remove this flow from the sewer system. Users are also advised of options for eliminating contaminated storm water where possible, by covering production or storage areas exposed to precipitation events. Permitee's are advised of options such as treatment and reuse; discharge through the NPDES permitting process, etc. Users are evaluated for compliance with this request. As the Division is notified of the removal of this flow, the facility is inspected and the estimates are passed on to the Wastewater Engineering Division.

B. New Users

The discharge of "clean water" into the separate sewer system from new discharges is prohibited. These users are assisted with the elimination of the potential of the discharge of "clean water" to the system before the permit is issued.

C. Incentive to Remove "Clean Water" from the System

Prior to March 2001, the Metropolitan Sewer District's Rules and Regulations allowed a maximum deduction of eighty percent in sewer charges when non-contact cooling water, etc (clean water) was discharged to the sewer in areas serviced by separate sewers. The revised Rules and Regulations phases out this deduction over the next five years, with complete elimination of the deduction by 2005.

IV. Pretreatment Program Elements

A. Pretreatment Systems

In order to reduce the concentrations of pollutants discharged during overflow conditions, an Industrial User may be required to install a pretreatment system to address pollutant(s) that if discharged during an overflow, will negatively impact the quality of the receiving stream. Data from monitoring activities by MSD and OEPA, water quality standards, local limits, and categorical standards of the industry (where applicable) contributory to the basin are used to determine whether or not the system will be required. Once the evaluation is completed, a new or modified Wastewater Discharge Permit will be issued specifying all pretreatment requirements for the discharge such as monitoring, reporting, installation of the pretreatment system, and any additional measures necessary to address the minimization of the impact of the discharge during overflow events. These actions may also be ordered by issuance of an Administrative Order to the industry.

B. Pollution Prevention

Since 1992, pollution prevention has played an integral part in the Pretreatment Program of the Division. The first phase of the initiative identifies Pollution Prevention as a "tool" by which to attain compliance. Programs and internal resources have been developed and Industrial Users are informed of opportunities for compliance using pollution prevention. As a result of this activity, users are encouraged and/or required to implement principles of pollution prevention in order to comply with the requirements of the pretreatment program. Industries are also being advised to use pollution prevention measures to minimize the impact of their discharges on overflows during wet weather events. These actions may include but are not limited to recycling, reuse and reduction of the discharge. Pollution Prevention actions will be documented and evaluated during annual inspections performed by Industrial Investigators.

C. Spill, Slug, and Containment Plans

In accordance with the National Pretreatment Program, all significant industrial users and industrial users with reasonable potential to discharge a slug or spill that will have an impact on the collection system, wastewater treatment plants, or worker health and safety, to have a Slug, Spill, and Containment Plan. Each plan must contain all of the four elements in the federal pretreatment regulations, 40 CFR 403.8(f)(2)(v). They are reviewed annually for the ability to contain spills from the facility and also to retain flow, if necessary, in an overflow situation. As new plans are developed, industries may be required to provide for additional storage capacity during overflows if necessary. Copies of the criteria used are included in Appendix D.

D. Permitting Process

As described in Section II B&C the permitting process, in conjunction with inspections, is used extensively to determine the actions that should be taken to minimize discharges during overflow events. At the time of permit renewal or issuance of a new permit, all industries having the potential to contribute to an overflow in an area of concern, will be evaluated to identify actions that should be taken to minimize the contribution to the overflow during wet weather. These actions may include but are not limited to retention, curtailment, and rerouting. Implementation of any measure may be required by issuance of a permit containing a compliance schedule or Administrative Order.

Short-term remediation projects are regulated through the use of the “One Time Discharge” (OTD) permit. Holders of this permit are required to cease any and all discharges to the sewer system during and forty-eight hours after any wet weather event. Projects requiring extensive remediation processes are issued the “Long Term Discharge” (LTD) permit. These users are also required to cease discharging during wet weather events or if an overflow is observed. Examples of the types of control documents issued are included in Appendix C.

E. Oil and Grease Control

The Division has developed a limit for the discharge of non-biodegradable Oil and Grease into the sewer system from non-domestic sources as defined by USEPA Method 1664. The Division is also responsible for taking enforcement actions for violations of the section of the MSD Rules and Regulations pertaining to grease and blockages of the sewer system by industrial and/or commercial sources. The actions taken are in conjunction with the activities of the Wastewater Collection Division of the Department, City of Cincinnati Health Department, Hamilton County Health District, Plumbing and Inspections agencies, and other public licensing agencies.

The Wastewater Collections Division identifies blockages in the sewer lines during cleaning and/or responses to complaints. Information concerning the extent of the problem, and generator of the grease is sent to the Division of Industrial Waste. The generator is notified by the Division of Industrial Waste, by letter, of the requirement to clean and televise the private sewer servicing the property. Within forty days, the Wastewater Collection Division (WWC) cleans and televises the public sewer. Within four to six months, WWC will reinspect the public sewer. If grease is found to be originating from the same source, the public sewer will be cleaned and televised by WWC. All applicable information necessary to recover the costs of the investigation and cleaning of the line is sent to the Division of Industrial Waste. The source is then tracked according to the conditions of the Enforcement Response Plan. Enforcement actions may consist of the recovery of the costs of cleaning the lines and fines and penalties for repeat occurrences. Additionally, the source may be required to increase the frequency of cleaning of the grease traps and maintain documentation of said actions. To evaluate compliance with this requirement, the Division conducts random inspections of the facilities. A list of violators is sent to the Health Departments regulating the sources for further action if necessary. Examples of letters used in this process are included in Appendix F.

F. Enforcement Response

The District's Enforcement Response Plan (ERP) allows for the use of a portion of the fines and penalties for Environmental Enhancement Activities (EEAs). This is the Division's version of Supplemental Environmental Projects. In addition to addressing the condition that caused the violation(s), the user's location is evaluated to determine whether or not a portion of the fine should also be used to reduce and/or eliminate the discharge of pollutants; minimize flow to the sewer system; implement pollution prevention principles; or address wet weather conditions that may contribute to CSOs or SSOs.

V. Voluntary Activities

A. Identification of Industrial Users Contributory to SSOs and CSOs

All industrial Users contributory to SSOs and CSOs are identified at the time of inclusion in the Industrial Waste Program. This information is maintained in the Cincinnati Area Geographical Information System. The data is updated frequently. The information is used in the Division of Industrial Waste's activities as they pertain to minimizing discharges during wet weather events as well as other pretreatment activities. Maps identifying these locations are included in Appendix F.

B. CSO Long Term Control Plan

The MSD has developed a CSO Long Term Control Plan. As the CSO controls are implemented, industries impacting the proposed work are notified and informed of their impacts on the CSO and potential future requirements of them, as well as any timelines of the District. At this point, any actions of the users are considered voluntary. Activities are monitored. As the District's activities progress, actions identified to the industries may become requirements through a compliance schedules in the Wastewater Discharge Permit or Administrative Orders.

C. Rerouting of Discharges

If the potential exists for the rerouting of a user's discharge to an area with little or no potential for contributing to a CSO or SSO, the User is encouraged to reroute its discharge to that location. Where and when necessary, the rerouting may be included in the permit as a requirement.

VI. Characterization of Discharges from CSOs and SSOs

A. Surface Water Monitoring Program

The Division of Industrial Waste has a surface water-monitoring program. The data generated from this program is used to evaluate the impact of discharges from the CSOs and SSOs. Sampling locations have been identified that bracket the SSOs and CSOs of concern. Sampling is conducted routinely in both wet and dry weather conditions. The samples are analyzed for all regulated pollutants, fecal coliform, BOD, Total Kjeldhal Nitrogen, and Total Suspended Solids. Current sampling locations and a summary of the program are found in Appendix G.

B. Data Evaluation

The Division reviews data generated by other departments to fulfill the NPDES requirements of the CSO program for the Department. The data is used to identify additional sampling points, illegal discharges, non-point sources, CSOs and SSOs. It is also used as baseline information to determine the impact of spills and aid in the identification of the sources of contamination. This data is included with other data for water quality assessments of the conditions of the surface waters in Hamilton County.

Revisions

This plan will be subject to modification by the Director of MSD to account for changes in circumstances such as changes in the configuration of MSD facilities, the purchase of new equipment, changes in regulatory requirements, the development of new technologies, or changes in industry standards/best management practices. MSD shall report any such modifications to this Plan in the annual report required by Paragraph IX.C of the Consent Decree.

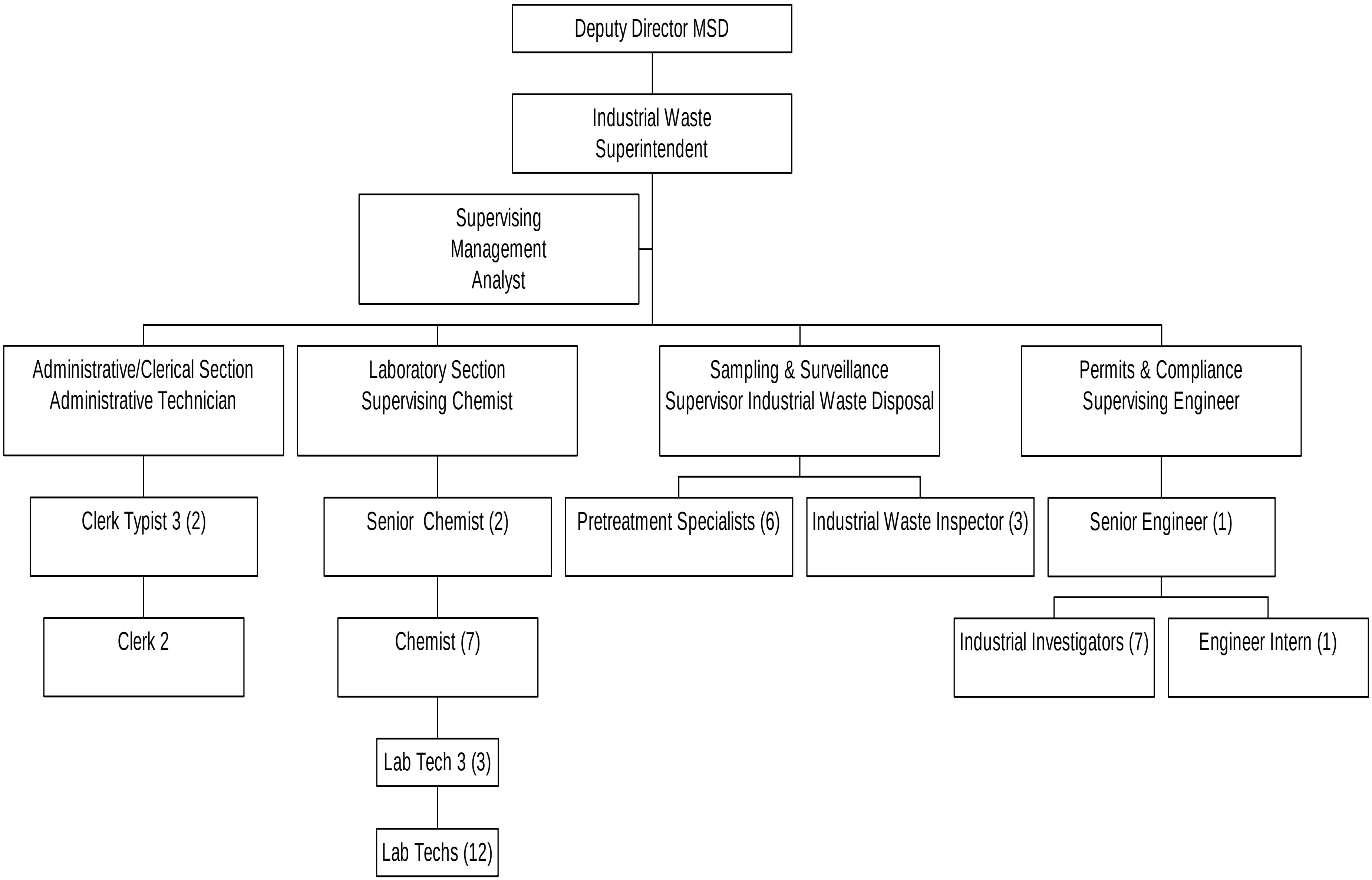
Resources Available in the Division of Industrial Waste

Equipment/instrumentation available to conduct the activities identified in this plan are included in Appendices J-K. Additional supporting documentation of all activities is included in the appendices attached to this document.

APPENDIX A

Organizational Charts

Industrial Waste Division



APPENDIX B

Pretreatment Program Classifications

General Monitoring Information

POTW: Little Miami WWTP Period Covered: January 1, 2000 to December 31, 2000

Industrial User Classification	POTW Industrial User Monitoring		Industrial User Self-monitoring	
	Inspection freq	Sampling freq	Sampling freq	Reporting freq
Average daily process flow - gallons	Investigation * frequency	Scheduled sampling frequency		
A greater than 250,000	At least once per year	Four per year	Monthly	Monthly
B 50,000 - 250,000	At least once per year	Two per year	Quarterly	Quarterly
C 10,000 - 50,000	At least once per year	Two per year	Semiannually	Semiannually
D less than 10,000	At least once per year	Two per year	Semiannually	Semiannually

* An annual investigation includes a thorough review of the Industrial User's Wastewater Discharge Permit conditions and requirements; an inspection of the Industrial User's processes, wastewater sources, pretreatment equipment, wastewater monitoring records, spill prevention plans; a review of the Industrial User's compliance status over the last year; an exchange of information and questions answered on such matters as new regulations or monitoring fees.

General Monitoring Information

POTW: Muddy Creek WWTP Period Covered: January 1, 2000 to December 31, 2000

Industrial User Classification	POTW Industrial User Monitoring		Industrial User Self-monitoring	
	Inspection freq	Sampling freq	Sampling freq	Reporting freq
Average daily process flow - gallons	Investigation * frequency	Scheduled sampling frequency		
A greater than 250,000	At least once per year	Four per year	Monthly	Monthly
B 50,000 - 250,000	At least once per year	Two per year	Quarterly	Quarterly
C 10,000 - 50,000	At least once per year	Two per year	Semiannually	Semiannually
D less than 10,000	At least once per year	Two per year	Semiannually	Semiannually

* An annual investigation includes a thorough review of the Industrial User's Wastewater Discharge Permit conditions and requirements; an inspection of the Industrial User's processes, wastewater sources, pretreatment equipment, wastewater monitoring records, spill prevention plans; a review of the Industrial User's compliance status over the last year; an exchange of information and questions answered on such matters as new regulations or monitoring fees.

General Monitoring Information
POTW: Mill Creek WWTP Period Covered: January 1, 2000 to December 31, 2000

Industrial User Classification	POTW Industrial User Monitoring		Industrial User Self-monitoring	
	Inspection freq	Sampling freq	Sampling freq	Reporting freq
Average daily process flow - gallons	Investigation * frequency	Scheduled sampling frequency		
A greater than 250,000	At least once per year	Four per year	Monthly	Monthly
B 50,000 - 250,000	At least once per year	Two per year	Quarterly	Quarterly
C 10,000 - 50,000	At least once per year	Two per year	Semiannually	Semiannually
D less than 10,000	At least once per year	Two per year	Semiannually	Semiannually

* An annual investigation includes a thorough review of the Industrial User's Wastewater Discharge Permit conditions and requirements; an inspection of the Industrial User's processes, wastewater sources, pretreatment equipment, wastewater monitoring records, spill prevention plans; a review of the Industrial User's compliance status over the last year; an exchange of information and questions answered on such matters as new regulations or monitoring fees.

General Monitoring Information

POTW: Sycamore WWTP Period Covered: January 1, 2000 to December 31, 2000

Industrial User Classification	POTW Industrial User Monitoring		Industrial User Self-monitoring	
	Inspection freq	Sampling freq	Sampling freq	Reporting freq
Average daily process flow - gallons	Investigation * frequency	Scheduled sampling frequency		
A greater than 250,000	At least once per year	Four per year	Monthly	Monthly
B 50,000 - 250,000	At least once per year	Two per year	Quarterly	Quarterly
C 10,000 - 50,000	At least once per year	Two per year	Semiannually	Semiannually
D less than 10,000	At least once per year	Two per year	Semiannually	Semiannually

* An annual investigation includes a thorough review of the Industrial User's Wastewater Discharge Permit conditions and requirements; an inspection of the Industrial User's processes, wastewater sources, pretreatment equipment, wastewater monitoring records, spill prevention plans; a review of the Industrial User's compliance status over the last year; an exchange of information and questions answered on such matters as new regulations or monitoring fees.

APPENDIX C

Examples of Language Used in Wastewater Discharge Permits

M S D

METROPOLITAN SEWER DISTRICT
OF GREATER CINCINNATI

Hamilton County - Managed
by the City of Cincinnati

1600 Gest Street
Cincinnati, Ohio 45204
513•244•5122

June 28, 1999

Michael S. Balster
Hull & Associates
4700 Duke Drive,Suite 172
Mason, Ohio 45040

MSD Permit No: OTD-909
Effective Date: 7/01/99
Expiration Date: 10/01/99

Dear Mr. Balster:

The Metropolitan Sewer District, Division of Industrial Waste (DIW) has reviewed your application, requesting to discharge 3, 600 gallons of groundwater, on behalf of BP Exploration & Oil, Inc. into the public sewer. DIW finds your project acceptable subject to the following conditions:

1) Groundwater shall be discharged into the sanitary sewer on the premises of BP located at 4545 Reading Road, Cincinnati, Ohio. The flowrate shall not exceed 10 gallons per minute. The groundwater shall not be discharge on a day when it is raining or up to two days immediately following the rain event.
2) On or before October 1, 1999 a written report shall be submitted to DIW. The following information must be included:

   a) Date(s) of discharge
   b) Time(s) and duration(s) of discharge
   c) Total quantity of discharge
   d) Discharge location description and/or sketch
   e) Results of a grab sample analysis taken during discharge and analyzed for pH, Lead, O&G, VSO.

3) The sewerage billing for one time of discharge is $170.00. An invoice is attached.

If you have any question or need additional information please contact Mr. Gian Nguyen at 557-7012.

BBH

GN

Cc: DIR, DIW, M. Anderson (WWA),
Mike Darr (BP, 200 Public Square, 7-A, Cleveland, OH 44114-2375)

M S D

Metropolitan Sewer District of Greater Cincinnati

Hamilton County - Managed by the City of Cincinnati

1600 Gest Street
Cincinnati, Ohio 45204
513•244•5122

August 16, 2001

Andrew McCorkle
Regional Environmental Manager
Sun Company, Inc.
3499 West Broad Street
Columbus, Ohio 43204

RE: **Wastewater Discharge Permit No. MIL-235**

Dear Mr Andrew McCorkle:

Enclosed is a wastewater discharge permit applicable to the discharge of wastewater from the Company's premises at 6745 Cornell Road to the wastewater treatment system of the Metropolitan Sewer District. The effective date of the enclosed permit is February 01, 1999.

The Company's specific effluent limitations are listed in Attachment A and specific monitoring requirements are presented in Table B-1 of Attachment B. Enclosed for your use and convenience are copies of MSD Report Form and guidance and the most recent Metropolitan Sewer District Rules and Regulations.

Please read the permit carefully as its issuance makes certain obligations and conditions the responsibility of the Company. If you have any questions regarding the issuance of this permit please contact Gian Nguyen at (513)-557-7012.

Sincerely,

Beverly B. Head
Superintendent
Division of Industrial Waste

GN/

cc: DIR/Reading, DIW/Reading, I.W.File(purple-IUN 415)
Mathew J. Lamb (ATC Associates Inc., 687 N. James Rd, Columbus,OH 43219)

Enclosures

WASTEWATER DISCHARGE PERMIT

Permittee:	Sun Company, Inc.	MSD Permit No.:	MIL-235
	Sun Company, Inc.	Effective Date:	02/01/1999
Address:	6745 Cornell Road	Expiration Date:	02/01/2002
	Cincinnati, Ohio 45242	Industrial Cat.:	N-5C

In accordance with the provisions of Article XV, Rules and Regulations in the Metropolitan Sewer District of Greater Cincinnati, Hamilton County, Ohio (known hereinafter as "MSD"), the Permittee is authorized to discharge into the Wastewater Treatment System of MSD subject to the conditions set forth herein.

Issuance of this permit does not constitute expressed or implied approval or permission for a violation of any provision of MSD Rules and Regulations, nor does issuance constitute a waiver by the Department of Sewers, City of Cincinnati, or the Board of County Commissioners of Hamilton County, Ohio, of the right to seek any lawful remedy or penalty for any such violation.

In case the permit makes reference to, or includes in its terms, a plan for pretreating wastewater before its discharge into the Wastewater Treatment System, the issuance of the permit shall not constitute expressed or implied agreement or guarantee that the pretreatment facility constructed in accordance with said plan will operate as intended or in compliance with applicable MSD Rules and Regulations, or that the wastewater so pretreated will be acceptable for discharge to the Wastewater Treatment System.

This permit may be modified by MSD, as required or authorized by MSD Rules and Regulations, or as required by the federal government or agencies thereof.

Failure on the part of the Permittee to fulfill any of the specified conditions shall be sufficient cause for immediate revocation of this permit. This permit is further subject to termination upon thirty (30) days written notice to the Permittee by an authorized representative of MSD.

Violations of this permit are punishable by civil penalties of up to $10,000 per violation and by criminal penalties of up to $25,000 per violation or six months in prison or both.

Any assignment or transfer of this permit shall automatically make it void.

Superintendent
Division of Industrial Waste

Director

PERMIT CONDITIONS

1.)The Permittee shall comply with the MSD Rules and Regulations or with federal regulations if more stringent. (Sections 204 and 402)*

2.)The Permittee shall allow MSD and any accompanying EPA personnel access to premises for inspection or sampling related to conditions of this permit. (Sections 201, 1507 and 1508)

3.)The Permittee shall promptly report to MSD any changes in locations, industrial processes, discharges (quantity or quality), or chemical storage procedures. (Sections 1503 and 1506)

4.)The Permittee shall notify MSD immediately in the event of any accident, negligence, or other occurrence having a reasonable probability of causing a discharge to the public sewer system of any wastes or process wastewaters not authorized by this permit; notifications shall be made immediately by telephoning MSD at 557-7000, 8:00 AM to 4:30 PM, Monday through Friday and 244-5500 at all other times, and shall include a description of the manner in which discharges in violation of this permit will be prevented including ceasing industrial discharges if necessary. Within 15 days of the date of any such occurrence, a detailed written statement describing the causes of the discharge and the measures being taken to prevent its future occurrence shall be submitted by Permittee to MSD, addressed to The Metropolitan Sewer District, Division of Industrial Waste, 1600 Gest Street, Cincinnati, Ohio 45204. (Sections 1525 and 1526)

5.)The Permittee shall discharge wastewater in conformance with the information contained in the permit application on file with MSD. (Section 1503)

6.)The Permittee shall retain and preserve for no less than three (3) years, any records, books, documents, memoranda, reports, correspondence, and any and all summaries thereof, relating to monitoring, sampling, and chemical analyses made by or in behalf of said Permittee. (Section 409)

7.)When the Permittee's monitoring of its wastewater discharge discloses a violation the Permittee must notify the Division of Industrial Waste of MSD within 24 hours and within 30 days shall submit to MSD in writing the results of repeat sampling and analysis. The 24 hour notification may be by telephone (557-7020).

8.)If the Permittee monitors its wastewater for any pollutant more often than is required by this Wastewater Discharge Permit, the results of the additional monitoring shall be included in the next periodic report to MSD.

9.)Of the following permit conditions, only those marked with an "X" are applicable to the Permittee:

(x) The Permittee's discharge shall conform to the wastewater flows and characteristics listed in Attachment "A". (Section 1503)

(x) The Permittee shall perform monitoring and submit signed reports as described in Attachment "B". (Section 1503)

( ) The Permittee shall comply with the pretreatment requirements and schedule in Attachment "C". (Sections 1503, 1520, 1521 and 1522)

*References are to the "Rules and Regulations Governing the Design, Construction, Maintenance, Operation, and Use of Sanitary and Combined Sewers in The Metropolitan Sewer District of Greater Cincinnati, Hamilton County, Ohio."

ATTACHMENT A

WASTEWATER FLOWS AND CHARACTERISTICS

PERMITTEE: **Sun Company, Inc.**
Sun Company, Inc.
MSD PERMIT NO.: **MIL-235**

The following limitations and conditions apply to the Permittee's effluent wastewater until such time as this Attachment is modified or revoked:

1. The Permittee shall maintain the **pH** of its wastewater discharged to MSD sewer system within the range of 6 to 10 standard units at all times in compliance with Sections 1518 (F) and 2204 Metropolitan Sewer District Rules and Regulations.

2. The Permittee shall not discharge to the MSD sewer system waste or wastewater of characteristics such that the aggregate concentration of organic substances in the vapor space exceeds 450 ppm (v/v) when a single grab sample of the waste or wastewater is tested using the "Final Procedure **Vapor Space Organics**" as published by MSD. During any 90 consecutive calendar days the average of the maximum values for five consecutive monitoring days shall not exceed 300 ppm (v/v).

3. The Permittee shall not discharge to the MSD sewer system waste or wastewater that contains pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, wastestreams with a **closed cup flashpoint** of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21.

4. At no time shall the wastewater flow rate to the MSD sewer system exceed 3,000 gallons per day (gpd).

5. The Permittee shall not discharge wastewater on a day when it is raining or up to two days immediately following the rain event.

ATTACHMENT A

WASTEWATER FLOWS AND CHARACTERISTICS

PERMITTEE: **Sun Company, Inc.**
Sun Company, Inc.
MSD PERMIT NO.: **MIL-235**

6. **Local Limits** The Permittee shall not discharge to the MSD sewer system waste or wastewater with concentrations of pollutants that exceed the following values:

Sun Company, Inc. Limits			
Pollutant	Column A	Column B	Column C
Cadmium (Total)	6.0	9.0	n.a.
Chromium (Total)	10.0	15.0	n.a.
Copper (Total)	10.0	15.0	n.a.
Lead (Total)	6.0	9.0	n.a.
Mercury (Total)	0.02	0.03	n.a.
Nickel (Total)	10.0	15.0	n.a.
Zinc (Total)	10.0	15.0	n.a.
Cyanide (Total)	n.a.	15.0	n.a.
Cyanide (Amenable)	n.a.	3.0	n.a.
Phenols	n.a.	50.0	n.a.
Oil & Grease	n.a.	50.0	n.a.
Temperature	n.a.	150°F	n.a.
Vapor Space Organics	n.a.	450 ppm	300 ppm

Column A = concentrations (mg/L, unless otherwise noted) of composite samples collected over the daily period of operation in proportion to flow so as to produce a representative sample.
Column B = concentrations (mg/L, unless otherwise noted) of samples collected over a time interval of not more than one minute so as to produce a grab sample.
Column C = **average** concentration (mg/L, unless otherwise noted) of at least 5 samples collected over a period of 90 days.
n.a. = sampling and analytical method and/or regulatory limit requires grab samples only.

ATTACHMENT B

MONITORING AND REPORTING REQUIREMENTS

PERMITTEE: **Sun Company, Inc.**
Sun Company, Inc.
MSD PERMIT NO.: **MIL-235**

The following provisions shall apply to the Permittee until such time as this Attachment is modified or revoked:

1. The Permittee shall monitor and record the pH of its wastewater at the sampling location(s) specified at the end of this Attachment according to the schedule in Table B-1. The Permittee shall retain these records so that on any day the Permittee will have on hand and available for inspection pH records for the previous three (3) years.

2. The Permittee shall perform periodic self monitoring of its wastewater at the sampling location(s) defined in this Attachment **according to the schedule specified in Table B-1** by collecting data representative of the quality and quantity of its wastewater effluent. The Permittee shall submit these data to MSD within 45 days of the last day of the month in which the monitoring was performed. The Permittee shall use MSD Report Form No. MSD IW 88-2 or a reasonable facsimile for the required report. The monitoring report shall include:

   A. Average daily wastewater flow rates and total flow for the previous quarter from each sampling location described in this Attachment.

   B. The chemical identities, concentrations, and methods of analysis of the regulated pollutants as listed in Item 6 Local Limits of Attachment A of this permit and **as required for periodic monitoring in Table B-1.**

   C. In the event of no discharge during a quarter a report must be submitted to MSD describing the cause and expected duration of cessation.

ATTACHMENT B

MONITORING AND REPORTING REQUIREMENTS

PERMITTEE: **Sun Company, Inc.**
Sun Company, Inc.
MSD PERMIT NO.: **MIL-235**

3. The Permittee shall periodically submit separate written reports of groundwater meter readings and wastewater discharge volumes for billing purposes to:

   Metropolitan Sewer District – Division of Administration
   1600 Gest Street
   Cincinnati, OH 45204
   Attn: Ms. G. Tokarsky

   The dates when the reports are due, and the reporting periods of the volumetric discharges, are normally specified on the billing notices from Cincinnati Water Works.
   All reports shall contain detailed information and follow specific submitting instructions. These are outlined in the confirmation letter from the Division of Wastewater Administration after the meter installation is inspected.

4. The Permittee shall use the following applicable sampling and analytical techniques for the monitoring:

   A. The **metal pollutants** shall be analyzed using approved test procedures of the appropriate EPA Method Number 200.7 through 289.2. The **cyanide pollutant** shall be analyzed using approved test procedures of the appropriate EPA Method Numbers 335.1, 335.2, or 335.3. The **organic pollutants** shall be analyzed using the approved test procedures of the appropriate EPA Method Numbers 601-613, 624, 625, 1624 and 1625. The **phenols pollutant** listed in Item 6 of Attachment A shall be analyzed using the approved test procedure of the appropriate EPA Method Number 420.1 or 420.2. The **oil & grease pollutant** listed in Item 6 of Attachment A shall be analyzed using the approved test procedure 5520F Hydrocarbons as set forth in the 17th edition of Standard Methods for the Examination of Water and Wastewater, 1989. Further information regarding approved sampling and test procedures may be found in Title 40 Code of Federal Regulations, Part 136 (40 CFR 136).

   B. For the pollutants listed in **Item 6 Local Limits of Attachment A** samples shall be collected by the following appropriate method. The samples for **metal pollutants, cyanide, phenols, oil & grease and Vapor Space Organics (VSO)** shall each be taken as a single grab sample.

ATTACHMENT B

MONITORING AND REPORTING REQUIREMENTS

PERMITTEE: **Sun Company, Inc.**
Sun Company, Inc.
MSD PERMIT NO.: **MIL-235**

5. Permittees seeking renewal of a Wastewater Discharge Permit shall apply in writing between 30 and 60 days before the expiration date of the current permit. The application for renewal shall state significant changes in the quantity and quality of the wastewater or shall certify that there are no such significant changes.

SAMPLING LOCATION(S)

Sample Location 1. Samples shall be taken from the ***'end-of-process'*** sampling and gauging station which is located after Carbon Filter of the facility. This sampling point is in reference to: Your Company's drawing Number #3 (Flow Schematic).

Table B-1 Schedule for periodic monitoring.

Sun Company, Inc.	pH	Periodic monitoring (number of monitoring days per period)	Required regulated pollutants for periodic monitoring.	
			Item 6 Local Limits Attachment A	
Sample Location 1	one grab sample each calendar quarter in which there is discharge	one grab sample each calendar quarter in which there is discharge	Vapor Space Organics, Oil & grease, Lead.	

APPENDIX D

Pretreatment Program Requirements Slug, Spill and Containment Guidance

(iii) If, by July 1, 1983, a POTW has begun the PRM 75-34 analysis but due to circumstances beyond its control has not completed it, Consistent Removal, subject to the approval of the Approval Authority, may continue to be claimed according to the formula in paragraph (h)(2)(i) of this section as long as the POTW acts in a timely fashion to complete the analysis and makes an effort to implement the non-structural cost-effective measures identified by the analysis; and so long as the POTW has expressed its willingness to apply, after completing the analysis, for a construction grant necessary to implement any other cost-effective Overflow controls identified in the analysis should Federal funds become available, so applies for such funds, and proceeds with the required construction in an expeditious manner. In addition, Consistent Removal may, subject to the approval of the Approval Authority, continue to be claimed according to the formula in paragraph (h)(2)(i) of this section where the POTW has completed and the Approval Authority has accepted the analysis required by PRM 75-34 and the POTW has requested inclusion in its NPDES permit of an acceptable compliance schedule providing for timely implementation of cost-effective measures identified in the analysis. (In considering what is timely implementation, the Approval Authority shall consider the availability of funds, cost of control measures, and seriousness of the water quality problem.)

(Information collection requirements are approved by the Office of Management and Budget under control number 2040-0009)

[49 FR 31221, Aug. 3, 1984, as amended at 51 FR 20430, June 4, 1986; 53 FR 42435, Nov. 5, 1987; 58 FR 9386, Feb. 19, 1993; 58 FR 18017, Apr. 7, 1993]

§ 403.8 Pretreatment Program Requirements: Development and Implementation by POTW.

(a) POTWs required to develop a pretreatment program. Any POTW (or combination of POTWs operated by the same authority) with a total design flow greater than 5 million gallons per day (mgd) and receiving from Industrial Users pollutants which Pass Through or Interfere with the operation of the POTW or are otherwise subject to Pretreatment Standards will be required to establish a POTW Pretreatment Program unless the NPDES State exercises its option to assume local responsibilities as provided for in § 403.10(e). The Regional Administrator or Director may require that a POTW with a design flow of 5 mgd or less develop a POTW Pretreatment Program if he or she finds that the nature or volume of the industrial influent, treatment process upsets, violations of POTW effluent limitations, contamination of municipal sludge, or other circumstances warrant in order to prevent Interference with the POTW or Pass Through.

(b) Deadline for Program Approval. A POTW which meets the criteria of paragraph (a) of this section must receive approval of a POTW Pretreatment Program no later than 3 years after the reissuance or modification of its existing NPDES permit but in no case later than July 1, 1983. POTWs whose NPDES permits are modified under section 301(h) of the Act shall have a Pretreatment Program within three (3) years as provided for in 40 CFR part 125, subpart G. POTWs identified after July 1, 1983 as being required to develop a POTW Pretreatment Program under paragraph (a) of this section shall develop and submit such a program for approval as soon as possible, but in no case later than one year after written notification from the Approval Authority of such identification. The POTW Pretreatment Program shall meet the criteria set forth in paragraph (f) of this section and shall be administered by the POTW to ensure compliance by Industrial Users with applicable Pretreatment Standards and Requirements.

(c) Incorporation of approved programs in permits. A POTW may develop an appropriate POTW Pretreatment Program any time before the time limit set forth in paragraph (b) of this section. The POTW's NPDES Permit will be reissued or modified by the NPDES State or EPA to incorporate the approved Program as enforceable conditions of the Permit. The modification of a POTW's NPDES Permit for the purposes of incorporating a POTW Pretreatment Program approved in accordance with the procedure in Sec. 403.11 shall be deemed a minor Permit modification subject to the procedures in 40 CFR 122.63.

+ (d) Incorporation of compliance schedules in permits. [Reserved].

(e) Cause for reissuance or modification of Permits. Under the authority of section 402(b)(1)(C) of the Act, the Approval Authority may modify, or alternatively, revoke and reissue a POTW's Permit in order to:

(1) Put the POTW on a compliance schedule for the development of a POTW Pretreatment Program where the addition of pollutants into a POTW by an Industrial User or combination of Industrial Users presents a substantial hazard to the functioning of the treatment works, quality of the receiving waters, human health, or the environment;

(2) Coordinate the issuance of a section 201 construction grant with the incorporation into a permit of a compliance schedule for POTW Pretreatment Program;

(3) Incorporate a modification of the permit approved under section 301(h) or 301(i) of the Act;

(4) Incorporate an approved POTW Pretreatment Program in the POTW permit; or

(5) Incorporate a compliance schedule for the development of a POTW pretreatment program in the POTW permit.

(6) Incorporate the removal credits (established under § 403.7) in the POTW permit.

(f) POTW pretreatment requirements. A POTW pretreatment program must be based on the following legal authority and include the following procedures. These authorities and procedures shall at all times be fully and effectively exercised and implemented.

(1) Legal authority. The POTW shall operate pursuant to legal authority enforceable in Federal, State or local courts, which authorizes or enables the POTW to apply and to enforce the requirements of sections 307 (b) and (c), and 402(b)(8) of the Act and any regulations implementing those sections. Such authority may be contained in a statute, ordinance, or series of contracts or joint powers agreements which the POTW is authorized to enact, enter into or implement, and which are authorized by State law. At a minimum, this legal authority shall enable the POTW to:

(i) Deny or condition new or increased contributions of pollutants, or changes in the nature of pollutants, to the POTW by Industrial Users where such contributions do not meet applicable Pretreatment Standards and Requirements or where such contributions would cause the POTW to violate its NPDES permit;

(ii) Require compliance with applicable Pretreatment Standards and Requirements by Industrial Users;

(iii) Control through permit, order, or similar means, the contribution to the POTW by each Industrial User to ensure compliance with applicable Pretreatment Standards and Requirements. In the case of Industrial Users identified as significant under 40 CFR 403.3(t), this control shall be achieved through permits or equivalent individual control mechanisms issued to each such user. Such control mechanisms must be enforceable and contain, at a minimum, the following conditions:

(A) Statement of duration (in no case more than five years);

(B) Statement of non-transferability without, at a minimum, prior notification to the POTW and provision of a copy of the existing control mechanism to the new owner or operator;

(C) Effluent limits based on applicable general pretreatment standards in part 403 of this chapter, categorical pretreatment standards, local limits, and State and local law;

(D) Self-monitoring, sampling, reporting, notification and recordkeeping requirements, including an identification of the pollutants to be monitored, sampling location, sampling frequency, and sample type, based on the applicable general pretreatment standards in part 403 of this chapter, categorical pretreatment standards, local limits, and State and local law;

(E) Statement of applicable civil and criminal penalties for violation of pretreatment standards and requirements, and any applicable compliance schedule. Such schedules may not extend the compliance date beyond applicable federal deadlines.

(iv) Require (A) the development of a compliance schedule by each Industrial User for the installation of technology required to meet applicable Pretreatment Standards and Requirements and (B) the submission of all notices and self-monitoring reports from Industrial Users as are necessary to assess and assure compliance by Industrial Users with Pretreatment Standards and Requirements, including but not limited to the reports required in § 403.12.

(v) Carry out all inspection, surveillance and monitoring procedures necessary to determine, independent of information supplied by Industrial Users, compliance or noncompliance with applicable Pretreatment Standards and Requirements by Industrial Users. Representatives of the POTW shall be authorized to enter any premises of any Industrial User in which a Discharge source or treatment system is located or in which records are required to be kept under § 403.12(m) to assure compliance with Pretreatment Standards. Such authority shall be at least as extensive as the authority provided under section 308 of the Act;

+ (vi)(A) Obtain remedies for noncompliance by any Industrial User with any Pretreatment Standard and Requirement. All POTW's shall be able to seek injunctive relief for noncompliance by Industrial Users with Pretreatment Standards and Requirements. All POTWs shall also have authority to seek or assess civil or criminal penalties in at least the amount of $1,000 a day for each violation by Industrial Users of Pretreatment Standardsand Requirements.

(B) Pretreatment requirements which will be enforced through the remedies set forth in paragraph (f)(1)(vi)(A) of this section,
will include but not be limited to, the duty to allow or carry out inspections, entry, or monitoring activities; any rules, regulations, or orders issued by the POTW; any requirements set forth in individual control mechanisms issued by the POTW; or any reporting requirements imposed by the POTW or these regulations. The POTW shall have authority and procedures (after informal notice to the discharger) immediately and effectively to halt or prevent any discharge of pollutants to the POTW which reasonably appears to present an imminent endangerment to the health or welfare of persons. The POTW shall also have authority and procedures (which shall include notice to the affected industrial users and an opportunity to respond) to halt or prevent any discharge to the POTW which presents or may present an endangerment to the environment or which threatens to interfere with the operation of the POTW. The Approval Authority shall have authority to seek judicial relief and may also use administrative penalty authority when the POTW has sought a monetary penalty which the Approval Authority believes to be insufficient.

(vii) Comply with the confidentiality requirements set forth in § 403.14.

(2) Procedures. The POTW shall develop and implement procedures to ensure compliance with the requirements of a Pretreatment Program. At a minimum, these procedures shall enable the POTW to:

(i) Identify and locate all possible Industrial Users which might be subject to the POTW Pretreatment Program. Any compilation, index or inventory of Industrial Users made under this paragraph shall be made available to the Regional Administrator or Director upon request;

(ii) Identify the character and volume of pollutants contributed to the POTW by the Industrial Users identified under paragraph (f)(2)(i) of this section. This information shall be made available to the Regional Administrator or Director upon request;

(iii) Notify Industrial Users identified under paragraph (f)(2)(i) of this section, of applicable Pretreatment Standards and any applicable requirements under sections 204(b) and 405 of the Act and subtitles C and D of the Resource Conservation and Recovery Act. Within 30 days of approval pursuant to 40 CFR 403.8(f)(6), of a list of significant industrial users, notify each significant industrial user of its status as such and of all requirements applicable to it as a result of such status.

(iv) Receive and analyze self-monitoring reports and other notices submitted by Industrial Users in accordance with the self-monitoring requirements in § 403.12;

(v) Randomly sample and analyze the effluent from industrial users and conduct surveillance activities in order to identify, independent of information supplied by industrial users, occasional and continuing noncompliance with pretreatment standards. Inspect and sample the effluent from each Significant Industrial

User at least once a year. Evaluate, at least once every two years, whether each such Significant Industrial User needs a plan to control slug discharges. For purposes of this subsection, a slug discharge is any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge. The results of such activities shall be available to the Approval Authority upon request. If the POTW decides that a slug control plan is needed, the plan shall contain, at a minimum, the following elements:

(A) Description of discharge practices, including non-routine batch discharges;

(B) Description of stored chemicals;

(C) Procedures for immediately notifying the POTW of slug discharges, including any discharge that would violate a prohibition under 40 CFR 403.5(b), with procedures for follow-up written notification within five days;

(D) If necessary, procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents), and/or measures and equipment for emergency response;

(vi) Investigate instances of noncompliance with Pretreatment Standards and Requirements, as indicated in the reports and notices required under § 403.12, or indicated by analysis, inspection, and surveillance activities described in paragraph (f)(2)(v) of this section. Sample taking and analysis and the collection of other information shall be performed with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions; and

(vii) Comply with the public participation requirements of 40 CFR part 25 in the enforcement of national pretreatment standards. These procedures shall include provision for at least annual public notification, in the largest daily newspaper published in the municipality in which the POTW is located, of industrial users which, at any time during the previous twelve months, were in significant noncompliance with applicable pretreatment requirements. For the purposes of this provision, an industrial user is in significant noncompliance if its violation meets one or more of the following criteria:

(A) Chronic violations of wastewater discharge limits, defined here as those in which sixty-six percent or more of all of the measurements taken during a six-month period exceed (by any magnitude) the daily maximum limit or the average limit for the same pollutant parameter;

(B) Technical Review Criteria (TRC) violations, defined here as those in which thirty-three percent or more of all of the measurements for each pollutant parameter taken during a six-month period equal or exceed the product of the daily maximum limit or the average limit multiplied by the applicable TRC (TRC=1.4 for BOD, TSS, fats, oil, and grease, and 1.2 for all other pollutants except pH.

(C) Any other violation of a pretreatment effluent limit (daily maximum or longer-term average) that the Control Authority determines has caused, alone or in combination with other discharges, interference or pass through (including endangering the health of POTW personnel or the general public);

(D) Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or to the environment or has resulted in the POTW's exercise of its emergency authority under paragraph (f)(1)(vi)(B) of this section to halt or prevent such a discharge;

(E) Failure to meet, within 90 days after the schedule date, a compliance schedule milestone contained in a local control mechanism or enforcement order for starting construction, completing construction, or attaining final compliance;

(F) Failure to provide, within 30 days after the due date, required reports such as baseline monitoring reports, 90-day compliance reports, periodic self-monitoring reports, and reports on compliance with compliance schedules;

(G) Failure to accurately report noncompliance;

(H) Any other violation or group of violations which the Control Authority determines will adversely affect the operation or implementation of the local pretreatment program.

(3) Funding. The POTW shall have sufficient resources and qualified personnel to carry out the authorities and procedures described in paragraphs (f) (1) and (2) of this section. In some limited circumstances, funding and personnel may be delayed where (i) the POTW has adequate legal authority and procedures to carry out the Pretreatment Program requirements described in this section, and (ii) a limited aspect of the Program does not need to be implemented immediately (see § 403.9(b)).

(4) Local limits. The POTW shall develop local limits as required in § 403.5(c)(1), or demonstrate that they are not necessary.

(5) The POTW shall develop and implement an enforcement response plan. This plan shall contain detailed procedures indicating how a POTW will investigate and respond to instances of industrial user noncompliance. The plan shall, at a minimum:

(i) Describe how the POTW will investigate instances of noncompliance;

(ii) Describe the types of escalating enforcement responses the POTW will take in response to all anticipated types of industrial user violations and the time periods within which responses will take place;

(iii) Identify (by title) the official(s) responsible for each type of response;

(iv) Adequately reflect the POTW's primary responsibility to enforce all applicable pretreatment requirements and standards, as detailed in 40 CFR 403.8 (f)(1) and (f)(2).

+ (6) The POTW shall prepare and maintain a list of its industrial users meeting the criteria in Sec. 403.3(u)(1). The list shall identify the criteria in Sec. 403.3(u)(1) applicable to each industrial user and, for industrial users meeting the criteria in Sec. 403.3(u)(ii), shall also indicate whether the POTW has made a determination pursuant to Sec. 403.3(u)(2) that such industrial user should not be considered a significant industrial user. The initial list shall be submitted to the Approval Authority pursuant to Sec. 403.9 as a non-substantial modification pursuant to Sec. 403.18(d). Modifications to the list shall be submitted to the Approval Authority pursuant to Sec. 403.12(i)(1).

(Information collection requirements are approved by the Office of Management and Budget under control number 2040-0009)

[46 FR 9439, Jan. 28, 1981, as amended at 49 FR 31224, Aug. 3, 1984; 51 FR 20429, 20430, June 4, 1986; 51 FR 23759, July 1, 1986; 53 FR 40612, Oct. 17, 1988; 55 FR 30129, July 24, 1990; 58 FR 18017, Apr. 7, 1993; 60 FR 33926, June 29, 1995; 62 FR 38406, July 17, 1997]

§ 403.9 POTW pretreatment programs and/or authorization to revise pretreatment standards: Submission for approval.

(a) Who approves Program. A POTW requesting approval of a POTW Pretreatment Program shall develop a program description which includes the information set forth in paragraphs (b)(1) through (4) of this section. This description shall be submitted to the Approval Authority which will make a determination on the request for program approval in accordance with the procedures described in § 403.11.

(b) Contents of POTW program submission. The program description must contain the following information:

(1) A statement from the City Solicitor or a city official acting in a comparable capacity (or the attorney for those POTWs which have independent legal counsel) that the POTW has authority adequate to carry out the programs described in § 403.8. This statement shall:

(i) Identify the provision of the legal authority under § 403.8(f)(1) which provides the basis for each procedure under § 403.8(f)(2);

Metropolitan Sewer District Rules and Regulations

SPILL CONTROL PLAN

Section 1524 Each user shall provide facilities for protection of the wastewater treatment system from accidental discharge of prohibited materials or other regulated wastes. Such facilities shall be provided and maintained at the User's expense. Detailed plans delineating such facilities and detailed operating procedures to provide this protection shall be maintained by the User and made available for inspection by the Department at any reasonable time, upon request of the Department.

Section 1525 Users shall notify the Department immediately of any slug loading or any other discharges of wastes or highway spills in violation of these Rules and Regulations.

This notification shall be followed, within 15 days of the date of occurrence, by a detailed written statement from the User describing the causes of the discharge and the measures being taken to prevent its future occurrence.

Such notification will not relieve Users of liability for any consequential expense, loss or damage, including without limitation any fines and/or penalties imposed on the Department which result from the violative discharge.

Users shall make available to their employees copies of these Rules and Regulation together with such other wastewater information and notices which may be furnished by the Director from time to time directed toward more effective water pollution control. A notice shall be furnished and permanently posted by the User in a conspicuous place advising employees whom to call in case of any discharge in violation of these Rules and Regulations.

General Pretreatment Regulations

SLUG CONTROL PLAN

Evaluate, at least once every two years, whether each Significant Industrial User needs a plan to control slug discharges. For purposes of this subsection {40 CFR 403.8(f)(2)(v)}, a slug discharge is any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge. ...the plan shall contain, at a minimum, the following elements:

(A) Description of discharge practices, including non-routine batch discharges;

(B) Description of stored chemicals;

(C) Procedures for immediately notifying the POTW of slug discharges, including any discharge that would violate a prohibition under 40 CFR 403.5(b), with procedures for follow-up written notification within five days;

(D) If necessary, procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site runoff, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents) and/or measures and equipment for emergency response.

APPENDIX E

Grease Control Program

GREASE INVESTIGATING PROCEDURE
Revised (modified 11-30-00 by DIW)

1. Initial investigation initiated by Service Request or MSD Personnel.

2. WWC takes all measures to remedy immediate situation- this may include an initial cleaning or flushing if needed.

3. Initial TV (1) investigation is performed to identify possible violations.

4. If no violations are found, investigation is complete. If violations are found WWC will notify DIW expeditiously in writing with the business identification (correspondence request from G. Stephen Minges to Beverly Head) including the Name, Street Address, and CAGIS map of affected sewers.

5. DIW will expeditiously contact business in writing with a copy of notice sent to WWC promptly. In the notice DIW will explain the situation and require within 30 days at business' expense that their private sewer lateral be jet cleaned and televised to verify that the lateral is clean. The business will be asked to keep a taped copy of their video inspection.

6. Approximately 40 days after the date of notice to the business, WWC will have the public sewer cleaned and televised. The TV (2) inspection will show that the main sewer has been cleaned in its entirely.

7. WWC will return in four to six months to re-inspect the public sewer. The public sewer will be televised (3) first to see if grease has returned to the sewer and where the grease is coming from. If no grease violations are found WWC will return in four to six months again for a second re-inspection. If no grease violations are found in this second re-inspection the investigation will be closed.

8. If grease is found and if it is determined that the grease is coming from the same business as identified from Step 3, WWC will clean (B) the sewer again, and televise (4), and notify DIW expeditiously with all applicable information to recover the costs of the investigation and cleaning. WWC will return to step 7. DIW will expeditiously prepare and send a NOV with proposed costs, fines, and CAM (Compliance Attainment Meeting) notice.

9. The CAM is held, and afterwards, a final decision of WWC/DIW is given to the business.

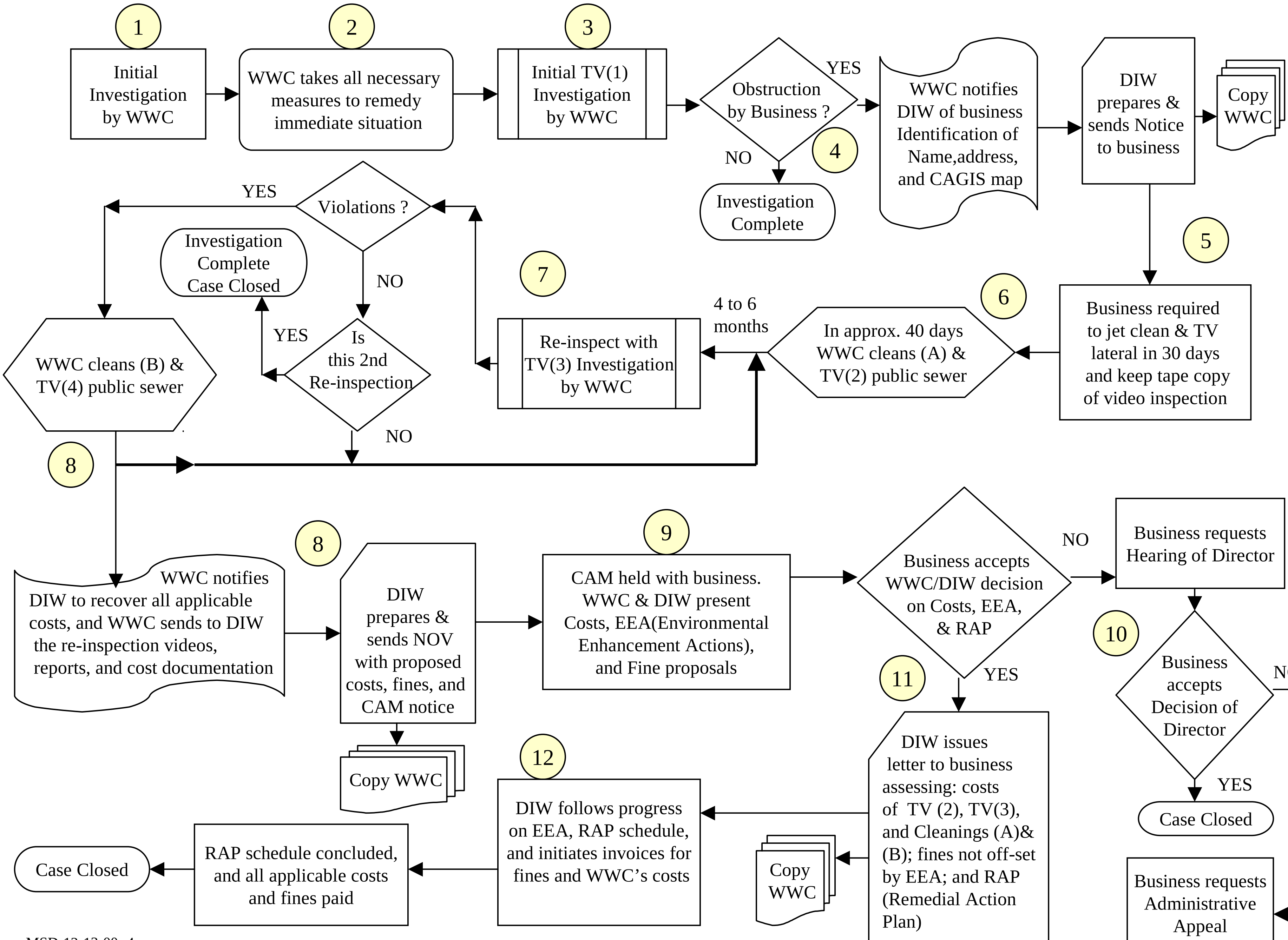
10. If the WWC/DIW decision is not accepted, business can request a Hearing.

11. If the business does accept the WWC/DIW decision, with all information available, DIW will within 30 days issue a letter assessing the business costs for investigating, cleaning, and televising the public sewer from TV (2), TV (3), Cleaning (B), and any applicable fines.

12. DIW will track progress on RAPs, and collection of costs and fines.

GREASE INVESTIGATION PROCEDURE

Revised



MSD-12-13-00 -4

M S D

METROPOLITAN SEWER DISTRICT
OF GREATER CINCINNATI

Hamilton County - Managed
by the City of Cincinnati

1600 Gest Street
Cincinnati, Ohio 45204
513•244•5122

July 11, 2001

Store Manager
Restaurant Name
Street address
City, State Zip

Dear Store Manager:

This letter is being sent to you as notification that on March 15, 2001 a light to heavy grease buildup was found in the public sewer and building sewer serving your facility. Preliminary evidence suggests that the source of the grease may be from current or previous operations at the above address. Metropolitan Sewer District Rules and Regulations, Section 1207 requires your company to maintain its building drain and building sewer grease-free. In addition, Section 1518(D) prohibits the discharge of materials capable of blocking the public sewer. Furthermore, Section 1523 requires your company to maintain its grease trap in continuously efficient operation. Failure to comply with any of these sections is a violation of MSD Rules and Regulations.

The Metropolitan Sewer District has temporarily halted the grease investigation to allow your company time to review its grease control procedures. At a minimum this review should include jet cleaning of your building drain, grease trap and building sewer. In addition the building sewer should be video inspected and taped from your building to the point of connection with the public sewer. Copies of the inspection tapes and related cleaning and repair invoices should be retained for at least three years. Whether your company chooses to take this opportunity for review or not, the District will restart its grease investigation approximately 30 days after the date of this letter. Your company is also requested to take any other actions necessary to ensure compliance.

Should the District conclusively determine that the source of the grease is your company, the District may choose to pursue some or all of the legal recourses available. These include recovery of investigation and repair costs, penalties of up to $10,000 per day per violation, elimination of service or referral to the Attorney General's office. The District urges you to preempt this action by ensuring that your grease handling procedures are adequate to protect the public sewer from impairment. If you have any questions or require additional information, please contact Michael Cappel, Industrial Investigator at 557-7013.

Sincerely,

Beverly B. Head
Superintendent
Division of Industrial Waste

BBH:MLC:mlc:example

cc: DIW/Reading File, IW File Manila(XXXX), Jerry Weimer WWC

APPENDIX F

Industrial Users Contributory to CSOs and SSOs

Metropolitan Sewer District of Greater Cincinnati
Division of Industrial Waste
CSO & SSO Maps

Prepared August 6, 2001

By Mike Nalley, MSD-IT

CSO Maps

MSD Industrial User (IU) Facilities tributary to CSO (includes Significant Industrial User (SIU) Facilities)

V-W-00-308-25 & 26
Items #34, #35, #36

Company Name	Premise Address	ZIP	Permit Type	IUN	Discharges to Sewer Segment	Contributes to CSO	SSO
Porter Guertin Company	2150 Colerain Avenu	45214	SIU	95	33016037-29404065	004	
Andrew Jergens Company	2535 Spring Grove A	45214	SIU	4	29411006-29411005	007	
Security Systems Equipment	3015 Garrard Ave	45225	SIU	1299	29506045-29506021	009	
Deaconess Hospital	311 Straight Street	45219	nonSIU	151	32911021-32910060	009	
Ken Meyer Meats, Inc.	2910 Sidney Avenue	45225	nonSIU	234	29505016-29504018	009	
New Horizons Meats and Distribution L	2842 Massachusetts	45225	nonSIU	232	29504024-29504021	009	
Oliver Chemical Co Inc	2908 Spring Grove A	45225	nonSIU	88	29506002-29503024	009	
Osborne Coinage/Doran Manufacturing	2851 Massachusetts	45225	nonSIU	913	29504016-29504015	009	
Queen City Sausage & Provision	1136 Straight St.	45214	nonSIU	327	29413012-29413009	009	
FBF Limited	2980 Spring Grove A	45225	nonSIU	466	29506014-29506013	011	
Klor Kleen, Inc.	3118 Spring Grove A	45225	SIU	186	29511011-29511012	012	
Good Samaritan Hospital	375 Dixmyth Avenue	45220	nonSIU	51	32811024-32810035	012	
U.S. Environmental Protection	26 W Martin Luther	45268	nonSIU	127	33808048-33808049	012	
Micro Metal Finishing LLC	3448 Spring Grove A	45225	SIU	82	29606008-29603025	015	
S. Lee Corporation	3241 Spring Grove A	45225	SIU	56	29515004-29515003	015	
Mutual Manufacturing & Supply	3300 Spring Grove A	45225	nonSIU	220	29603054-29603001	015	
Molded Pulp Products, Inc.	1780 Dreman Ave.	45223	SIU	202	29616023-29615009	017B	
Spaulding Lighting Inc.	1736 Dreman Ave	45223	SIU	112	29615009-29615010	017B	
Barrel & Drum Service, Inc.	1728 Powers St.	45223	SIU	9	29702033-29702034	018	
CINOX Corporation	4914 Gray Rd.	45232	SIU	269	32407005-32407004	025A	
Environmental Enterprises, Inc	4650 Spring Grove A	45232	SIU	42	32613044-32613045	026	
Phthalchem Inc.	266 West Mitchell A	45232	SIU	93	34101019-34101018	029	
Nutone Inc.	Madison and Redbank	45227	SIU	86	45304008-45303031	068	
Cincinnati Paperboard Corporattion	5500 Wooster Road	45226	SIU	22	45614005-45614004	085	
Richards Industries, Inc.	3170 Wasson Road	45209	SIU	67	42415024-42415023	136	
Kroger Co.	1240 State Avenue	45204	SIU	70	29216042-29216018	152	
V.I.P. Products, Inc.	1400 State Ave	45204	nonSIU	1063	29301013-29301012	152	
United Dairy Farmers, Plant	3955 Montgomery Roa	45212	SIU	129	37711010-37711011	170	
United States Playing Card Company	4590 Beech Street	45212	SIU	126	40503011-40503012	170	
360 North Pastoria Environment	2345 Langdon Farm R	45237	SIU	1462	40307011-40307007	181	
BFGoodrich Hilton Davis, Inc.	2235 Langdon Farm R	45237	SIU	57	40308012-40308011	181	
Fierro Technologies, Inc.	5624 Montgomery Rd	45212	SIU	1179	40414016-40414019	181	
Fusite Division - Emerson Electric Co	6000 Fernview Avenu	45212	SIU	41	40303001-40414018	181	
Imperial Adhesives Inc	6315 Wiehe Rd	45237	SIU	62	40316008-40316007	181	
John Gray Awards Co. Inc.	6222 Wiehe Rd.	45237	SIU	451	40309014-40309013	181	
Smith Electrochemical Company	5936 Carthage Court	45212	SIU	111	40308010-40301011	181	
U.S. Food & Drug Administration	6751 Steger Drive	45237	SIU	500	38016012-38016011	181	
Fusite Stamped Products	6265 Wiehe Road	45237	nonSIU	684	40316004-40316003	181	
GE Engine Services, Inc.	1201 E. Edison Rd.	45216	nonSIU	453	38016012-38016011	181	
Ohio Pulp Mills	2100 Losantiville R	45237	nonSIU	230	40207003-40207002	181	
Ashland Chemical Co.	1953 Losantiville A	45237	LTD	211	40201018-40201017	181	
Fusite Division - Emerson Electric Co	Lysle Lane	45212	LTD	1208	40414019-40414015	181	
CEEMCO Inc.	5313 Robert Ave	45248	SIU	1470	20609006-20609005	198	692
International Industrial Services	10520 Chester Road	45215	SIU	77	20608001-20608002	198	692
Stegner Food Products Co. Inc.	3640 Muddy Creek Ro	45238	SIU	119	20607021-20607020	198	692
Victory Plating, Inc.	3814 Olivette Avenu	45211	SIU	132	23701028-23701029	198	692
Franciscan Hospital Western Hiills Ca	3131 Queen City Ave	45238	nonSIU	114	23908025-23908026	198	692
Rock-Tenn Company	3347 Madison Rd.	45209	SIU	103	42514033-42514034	205	
Meier's Wine Cellars, Inc.	6955 Plainfield Roa	45236	nonSIU	1209	45005013-45005012	214	
Gray Road Fill, Inc.	5106 Gray Road	45232	nonSIU	319	32302002-32302001	217A	
Lindsey Motor Express, Inc.	3500 Southside Aven	45204	SIU	75	24708005-24708004	416	
Clark Oil Company	4000 Delhi Pike	45204	LTD	329	24815015-24815002	419	
Bodycote Metal Treating Inc.	710 Burns Street	45204	nonSIU	278	29208004-29208003	426A	

MSD Industrial User (IU) Facilities tributary to CSO (includes Significant Industrial User (SIU) Facilities)

Company Name	Premise Address	ZIP	Permit Type	IUN	Discharges to Sewer Segment	Contributes to CSO	SSO
Queen City Barrel Company	621 Evans Street	45204	nonSIU	227	29208012-29208009	427	
Cargo Clean, Inc - South	837 Depot St.	45204	SIU	447	28812062-28812063	428	
Consolidated Metal Products	920 Depot Street	45204	SIU	400	28812057-28812056	428	
Queen City Barrel Co.	1937 South Street	45204	SIU	100	29209022-29209023	428	
Bodycote Metal Treating Inc.	901 Evans Street	45204	nonSIU	330	29209030-29209029	428	
A&B Deburring Co., Inc.	525 Carr St.	45203	SIU	440	29204069-29113053	433	
Cincinnati Gas & Electric Company	2801 Eastern Avenue	45226	nonSIU	335	37413034-37413033	433	
Interstate Brands Corp.	747 W. 5th Street	45203	nonSIU	321	33215018-33215017	436	
Trigen/Cinergy Solutions of Ci	105 East Fourth Str	45202	nonSIU	1106	33501016-33501015	442	
Cincinnati Plating & Repair, Inc	331 E. 13th Street	45210	SIU	352	33516091-33516057	461	
Superior Linen & Apparel Servi	481 Wayne Street	45206	SIU	121	33705012-33705011	461	
Tru-Etch Company	2338 Boone Street	45206	SIU	125	33704010-33704009	461	
Bethesda Oak Hospital Inc.	619 Oak St	45206	nonSIU	142	33712018-33712017	461	
Mercy Hospital - Anderson	7500 State Road	45255	nonSIU	233	52010008-52010007	476	
Berghausen Corporation	4524 Este Avenue	45232	SIU	148	34109019-34108002	481	
Health Alliance of Greater Cincinnati	234 Goodman Street	45219	SIU	136	33806056-33806057	482	
Children's Hospital Medical Ce	3333 Burnet Ave.	45229	nonSIU	18	33811056-33811019	482	
Shriners Hospital for Children	3229 Burnet Ave	45229	nonSIU	47	33806014-33806015	482	
VA Medical Center	3200 Vine Street	45220	nonSIU	229	33809024-33809029	482	
BP Exploration & Oil Inc.	3983 Vine Street	45217	LTD	147	34007017-34007016	482	
Cincinnati Specialties, LLC	501 Murray Road	45217	SIU	89	36616011-36616004	485	
Alex Fries Inc.	10261 Chester Road	45215	SIU	272	39716003-39716002	486	
Alex Fries, Inc.	1000 Redna Terrace	45215	SIU	501	39609007-39609008	486	
Allwaste Container Services, Inc.	10671 Evendale Driv	45241	SIU	382	43509001-43509002	486	700
Aluminum Extruded Shapes, Inc.	10549 Reading Road	45241	SIU	5	43505001-43504007	486	700
American Metal Cleaning of Cincinnati,	475 Northland Blvd.	45240	SIU	425	35610003-35610004	486	700
Astro Container	2795 Sharon Road	45241	SIU	7	43602008-43602011	486	700
Avon Products, Inc.	175 Progress Place	45246	SIU	8	39015006-39015005	486	700
Best Solutions Environmental, Inc	120 Citycentre Driv	45216	SIU	163	38201008-38116005	486	
Borden Chemical, Inc.	630 Glendale-Milfor	45215	SIU	11	38704010-38704009	486	
Cargo Clean, Inc.	10300 Evendale Dr.	45241	SIU	1218	43501003-43416004	486	700
CDR Pigments and Dispersions	410 Glendale-Milfor	45215	SIU	13	38703013-38703012	486	
Celsus Laboratories, Inc.	12150 Best Place	45241	SIU	1279	43815004-43815001	486	700
CertainTeed Corporation	320 South Wayne Ave	45215	SIU	15	40016011-38313006	486	
Cincinnati Drum Service, Inc	400 Cavett Ave.	45215	SIU	20	39805002-39805001	486	700
City of Cincinnati - OEM	5700 Center Hill Av	45232	SIU	16	36401010-36401011	486	
Clippard Instrument Laboratory	7390 Colerain Ave	45239	SIU	158	25907010-25907011	486	
Club Chef, Inc.	630 Shepherd Lane	45215	SIU	25	38511013-38511012	486	
Color Intermediates, Inc.	5366 Este Ave.	45232	SIU	92	34211001-34207009	486	
CREANOVA INC.	620 Shepherd Drive	45215	SIU	58	38506016-38506015	486	
Daniel & Assoc. Inc.	10639 Chester Rd	45215	SIU	49	39610005-39610004	486	
DiverseyLever, Inc.	3630 East Kemper Rd	45241	SIU	38	44212001-44205002	486	700
ELDA Recycling & Disposal Faci	5701 Este Avenue	45232	SIU	144	34304002-34304001	486	
Ethicon Endo-Surgery, Inc.	4545 Creek Road	45242	SIU	692	48505003-48505002	486	700
Fierro Technologies, Inc.	635 Shepherd Lane	45215	SIU	123	38511013-38511012	486	
Floturn, Inc.	120 Progress Place	45246	SIU	332	39103001-39014001	486	700
Ford Motor Company	3000 Sharon Road	45241	SIU	44	43615019-43610013	486	700
Formica Corporation	10155 Reading Road	45241	SIU	46	43315006-43315004	486	700
GE Engine Services, Inc.	199 Container Pl.	45246	SIU	239	39101001-39101002	486	700
General Electric Company	1 Neuman Way N123	45215	SIU	52	39804016-39804015	486	
General Mills Operations, Inc.	11301 Mosteller Roa	45241	SIU	101	43702006-43615023	486	700
Georgia-Pacific Corporation	220 W. North Bend R	45216	SIU	341	36304001-36414016	486	
Gold Medal Products, Inc	10700 Medallion Dr.	45241	SIU	1302	43514001-43511001	486	700
Green Bay Dressed Beef, Inc.	3480 E. Kemper Road	45241	SIU	1479	44211010-44206001	486	700
Grippo Potato Chip Co Inc	6750 Colerain Ave	45239	SIU	139	25815019-25814026	486	
H. Meyer Dairy Company	415 John Street	45215	SIU	80	40010004-40010003	486	
Harland Drumm Enterprises, Inc	5366 Este Avenue	45232	SIU	35	34211001-34207009	486	
HTG/Aerobraze Corp.	940 Redna Terrace	45215	SIU	416	39609006-39609007	486	

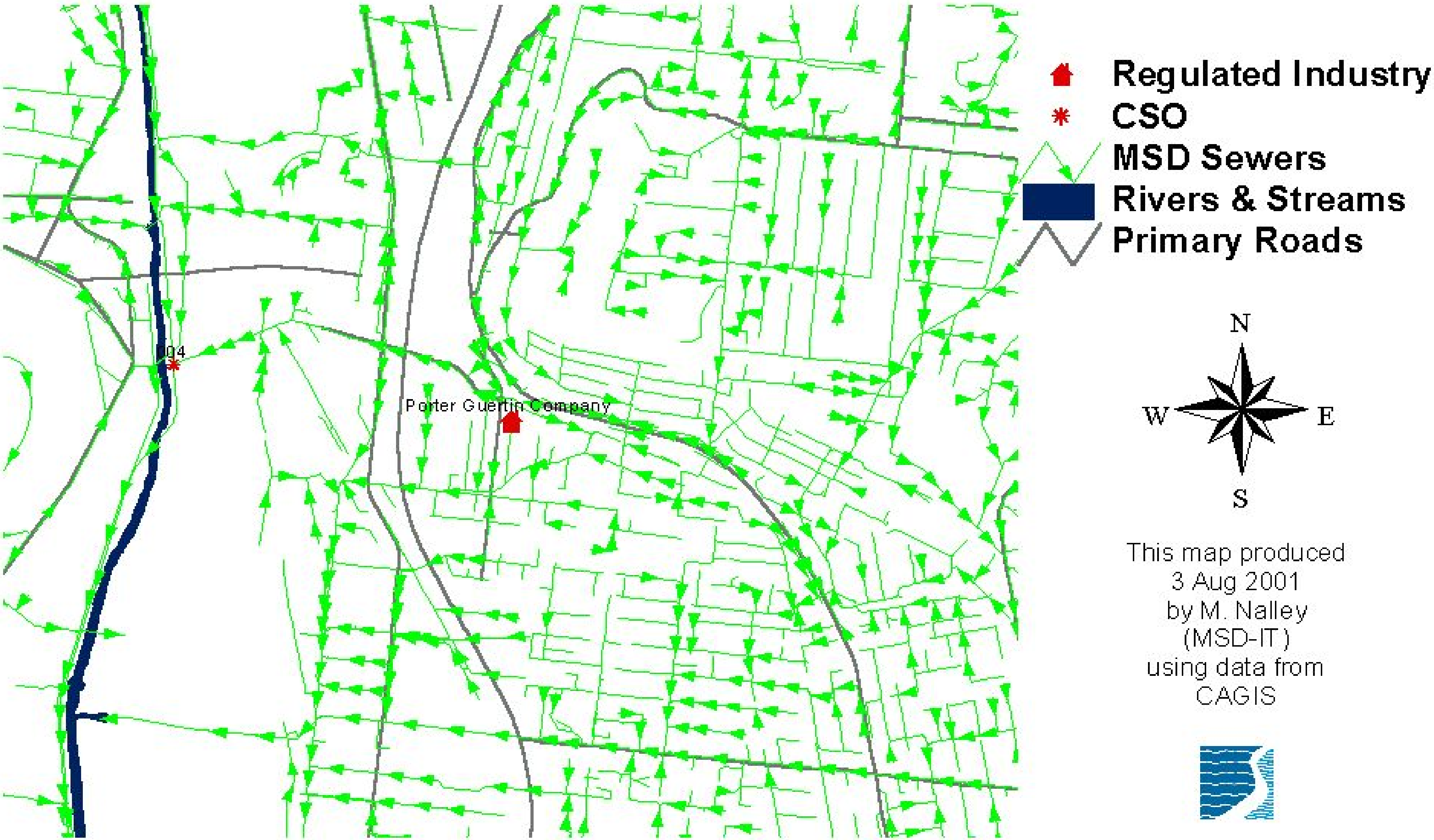
MSD Industrial User (IU) Facilities tributary to CSO (includes Significant Industrial User (SIU) Facilities)

Company Name	Premise Address	ZIP	Permit Type	IUN	Discharges to Sewer Segment	Contributes to CSO	SSO
John Morrell & Co.	801 East Kemper Roa	45246	SIU	30	39409006-39409007	486	700
Keco Industries, Inc.	11060 Kenwood Road	45242	SIU	289	49315004-49315003	486	700
Kroger Co.	11801 Chesterdale R	45246	SIU	69	39306005-39306004	486	700
Lehr Precision, Inc.	11230 Deerfield Roa	45242	SIU	1	53701007-53701003	486	700
Lehr Precision, Inc.	11495 Deerfield Rd.	45242	SIU	143	53709010-53709007	486	700
Leonhardt Plating Co.	5753 Este Ave.	45232	SIU	72	34213014-34213013	486	
Mechanical Finishing, Inc.	140 West 66th Stree	45216	SIU	188	36407006-36407003	486	
METLWEB Ltd.	3330 E. Kemper Road	45241	SIU	1464	44211004-44211003	486	700
Michelman, Inc.	9080 Shell Road	45236	SIU	156	48202009-48202008	486	603
Michelman, Inc.	3023 East Kemper Ro	45241	SIU	1500	44201007-44201005	486	700
Morton International, Inc.	2000 West Street	45215	SIU	84	39804011-39804010	486	700
National Starch and Chemical Compan	2960 Exon Ave	45241	SIU	85	43504003-43503010	486	700
Pepsi Cola General Bottlers, Inc	2121 Sunnybrook Dri	45237	SIU	91	40111007-40110009	486	
Picker International, Inc.	925 Redna Terrace	45215	SIU	1197	39609006-39609007	486	
Pilot Chemical Company	606 Shepherd Drive	45215	SIU	94	38505001-38505002	486	
Procter & Gamble Co	11510 Reed Hartman	45241	SIU	189	49215007-49210010	486	700
Procter & Gamble Company	6083 Center Hill Ro	45224	SIU	97	34311004-34311003	486	
R.A. Heller Company	10530 Chester Road	45215	SIU	55	39607002-39607001	486	
Richards Industries, Inc.	9070 Pippin Rd	45251	SIU	201	26105011-27608002	486	
Rumpke Sanitary Landfill, Inc.	10795 Hughes Rd.	45251	SIU	105	26501012-26501013	486	628
Sealtron, Inc.	9705 Reading Road	45215	SIU	109	43310012-43307021	486	700
Spring Grove Resource Recovery	4879 Spring Grove A	45232	SIU	113	34108005-34107002	486	
St. Bernard Polishing Co.	5560 Vine St.	45216	SIU	361	36508018-36508017	486	
Stearns Technical Textiles Co.	100 Williams Street	45215	SIU	116	39902015-39902016	486	1009
Steelcraft Div. of Ingersoll-Rand Co	9017 Blue Ash Rd.	45242	SIU	117	48114004-48114003	486	603
Sun Chemical Corporation	4526 Chickering Ave	45232	SIU	120	34110047-34110046	486	
Sun Chemical Corporation	4645 Este Avenue	45232	SIU	412	34116005-34116006	486	
Trans-Acc, Inc.	11167 Deerfield Rd.	45242	SIU	124	53616004-53701001	486	700
U.S. Filter Surface Preparatio	601 N. Wayne Ave	45215	SIU	474	38505015-38504008	486	
United Waste Water Services, Inc	11807 Reading Road	45241	SIU	413	44214002-44214001	486	700
Wood Graphics Inc.	1270 Hillsmith Dr	45215	SIU	135	39715001-39715002	486	
Wornick Company	10825 Kenwood Road	45242	SIU	317	49307002-49307003	486	700
Amko Plastics, Inc.	12025 Tricon Rd.	45246	nonSIU	242	39103003-39103002	486	700
Ashland Chemical Company	2788 Glendale-Milfo	45241	nonSIU	356	43503011-43506005	486	700
Cindus Corporation	515 Station Avenue	45215	nonSIU	340	38305012-40009002	486	572
Enerfab, Inc.	4955 Spring Grove A	45232	nonSIU	408	34110003-34107012	486	
EPCOR Foundries, Inc.	425 North Bend Road	45216	nonSIU	290	36410006-36410007	486	
Feintool Cincinnati Inc.	11280 Cornell Park	45242	nonSIU	252	49210006-49211001	486	700
Franciscan Hospital Mt Airy Campus	2446 Kipling Ave.	45239	nonSIU	98	27909004-27909005	486	
International Paper Company	100 Progress Place	45246	nonSIU	171	39014002-39014003	486	700
JACKSONLEA	7020 Vine Street	45216	nonSIU	391	36412009-36406019	486	
Japlar Acquistion Co	4500 Alpine Ave.	45242	nonSIU	249	48203003-48203002	486	682
Kin Products, Inc.,	1060 Skillman Drive	45215	nonSIU	149	39608001-39608002	486	
Premium Finishes, Inc.	10448 Chester Road	45215	nonSIU	279	39608005-39608006	486	
Ralph J. Stolle Co.	6954 Cornell Road	45242	nonSIU	172	53701008-53701007	486	700
Riverwood International Corp.	10600 Evendale Dr	45241	nonSIU	102	43508002-43508001	486	700
Sun Chemical Corporation	5020 Spring Grove A	45232	nonSIU	1148	34107008-34107009	486	
Trinity Industries, Inc.	11861 Mosteller Rd	45241	nonSIU	190	43802011-43802007	486	700
Xtek, Inc.	11451 Reading Road	45241	nonSIU	271	44202006-44202005	486	700
Englefield Oil Company	401 Glendale-Milfor	45215	LTD	685	39602011-39602004	486	
Evergreen Limited Partnership	Shepherd Drive	45215	LTD	366	38506023-38506013	486	
Marathon Oil Company	5571 Colerain Ave	45239	LTD	23	28009002-28009003	486	
Speedway SuperAmerica LLC	6430 Colerain Ave.	45239	LTD	219	25815011-25814008	486	
Sunoco, Inc.	6745 Cornell Rd.	45242	LTD	415	53701001-49204011	486	700
Aramark Uniform Services, Inc.	4936 Montgomery Roa	45212	SIU	6	40516015-40516014	487	
GE Engine Services, Inc.	1350 Tennessee Ave.	45229	SIU	50	37901012-37901011	487	
Health Alliance of Greater Cincinnati	3200 Burnet Avenue	45229	SIU	65	33806041-33806042	487	
Varland Metal Service	3231 Fredonia Avenu	45229	SIU	2	36908043-36908041	487	

MSD Industrial User (IU) Facilities tributary to CSO (includes Significant Industrial User (SIU) Facilities)

Company Name	Premise Address	ZIP	Permit Type	IUN	Discharges to Sewer Segment	Contributes to CSO	SSO
W.R. Grace & Co.-Conn.	4775 Paddock Road	45229	SIU	33	36611013-36611008	487	
Frisch's Restaurants, Inc.	3011 Stanton Ave	45206	nonSIU	1149	37016015-37016016	487	
Klosterman Baking Co., Inc.	1000 E. Ross Ave	45217	nonSIU	344	36603024-36603023	487	
Occidental Chemical Corporatio	4701 Paddock Road	45229	nonSIU	87	36612004-36605010	487	
BP Exploration & Oil, Inc.	4600 Paddock Road	45229	LTD	295	36604021-36604019	487	
CHEMCENTRAL Corporation	4619 Reading Road	45229	LTD	208	37902011-37902010	487	
Metro/Southern Ohio Regional Transit	4700 Paddock Rd	45229	LTD	218	36605011-37908023	487	
Unocal Corp.	4950 Paddock Road	45237	LTD	288	36504007-36504006	487	
Givaudan Roure Flavors Corp.	110 E. 70th Street	45216	SIU	262	36406010-36406011	488	
Givaudan Roure Flavors Corp.	1199 Edison Dr.	45216	SIU	1310	36513023-36404001	488	
Jim Beam Brands Company	7324 Paddock Road	45216	SIU	66	38109017-36412040	488	
Merrell Pharmaceuticals Inc.	2110 East Galbraith	45215	SIU	79	40003018-40003009	507	
Rosemont Industries Inc.	1700 West Street	45215	SIU	104	43216015-39913006	513	
Perkins Family Restaurants, L.P	24 Landy Lane	45215	nonSIU	1153	43301006-43301005	513	
Milacron, Inc.	4701 Marburg Avenue	45209	SIU	21	42609013-42610001	551	
Cast-Fab Technologies, Inc.	3040 Forrer Street	45209	nonSIU	14	42608002-42608005	551	
Kirk & Blum Mfg. Co.	3120 Forrer St	45209	nonSIU	165	42602009-42602008	551	
Duramed Pharmaceuticals, Inc.	5040 Duramed Drive	45213	SIU	36	42615017-42615018	552	
Cincinnati Machine	4701 Marburg Ave	45209	SIU	1318	42603033-42606001	553	
Hater Industries, Inc.	240 Stille Drive	45233	SIU	54	19708011-19708010	654	
Cintas Corporation	5570 Ridge Road	45213	SIU	24	42711001-42707018	656	
Coca-Cola Bottling Company of Cincinn	5100 Duck Creek Rd.	45227	SIU	141	45311020-45314019	656	
EM Science	2909 Highland Avenu	45212	SIU	39	42616007-42616014	656	
Forest Pharmaceuticals, Inc.	3941 Brotherton Roa	45209	SIU	45	45410021-45410022	656	
ILSCO Corporation	4730 Madison Rd	45227	SIU	61	45309003-45309002	656	
Kutol Products Co.	7650 Camargo Road	45243	SIU	71	50011008-50011009	656	1053
P-G Products Inc.	5200 Lester Road	45213	SIU	150	42702022-42701004	656	
Schulte Metal Finishing, Inc.	4909 Charlemar Driv	45227	SIU	108	45302027-45302026	656	
Shepherd Chemical Company	2803 Highland Ave.	45212	SIU	110	40513006-40513007	656	
Stat Processing Inc.	4821 Stafford Stree	45227	SIU	115	47603012-47603004	656	
Texo Corporation	2801 Highland Avenu	45212	SIU	122	40513004-40513005	656	
Cincinnati Steel Treating Company	5701 Mariemont Aven	45227	nonSIU	611	47408004-47408003	656	
CNW, Inc.	4710 Madison Road	45227	nonSIU	12	45308028-42605033	656	
Hadronics, Inc.	4570 Steel Place	45209	nonSIU	53	45301005-45301006	656	
Keebler Foods Company	One Trade Street	45227	nonSIU	210	47407001-47408006	656	
Witt Industries, Inc.	4454 Steel Place	45209	nonSIU	134	45301010-45302009	656	
Sunoco, Inc.	3905 Brotherton Roa	45209	LTD	243	45410019-45410020	656	
Advanced Technology	1910 Elm Street	45210	SIU	68	33011006-33011007	666	
Christ Hospital	2139 Auburn Ave.	45219	SIU	19	33616022-33616021	666	
Club Chef Central	800 Bank Street	45214	SIU	351	33016031-33016032	666	
Husman Snack Foods Co.	1621 Moore Street	45210	SIU	59	33005033-33004061	666	
Samuel Adams Brewery Company.	1625 Central Pkwy	45214	SIU	107	33007040-33007041	666	
Cincinnati Enquirer	1531 Western Ave	45214	nonSIU	237	29305006-29305005	666	
F.L. Emmert Company	2007 Dunlap Street	45214	nonSIU	248	33011022-33011021	666	
Hoffmann Sausage Co.	2111 Kindel Ave	45214	nonSIU	40	33016021-33016088	666	
Kaiser Foods, Inc.	2155 Kindel Ave.	45214	nonSIU	225	29313059-29313058	666	
Tri-State Beef Company	2124 Baymiller St	45214	nonSIU	418	33016023-33016080	666	

CSO 004


004
Porter Guertin Company
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
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This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 007

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by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 009

Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads

N
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by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 011


011
FBF Limited
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
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by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 012

This map produced
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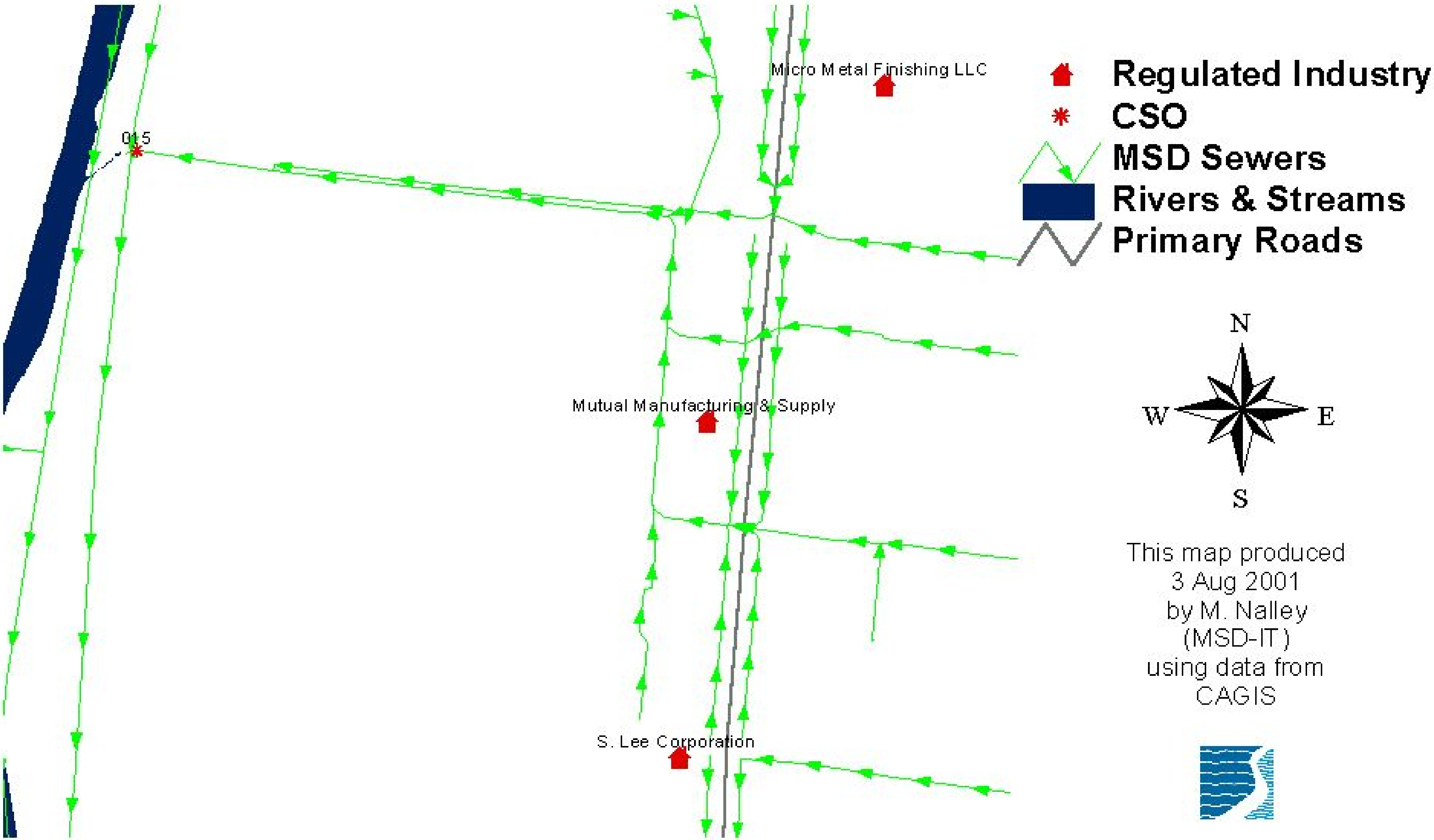
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 015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015
Mutual Manufacturing & Supply
S. Lee Corporation
Regulated Industry
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MSD Sewers
Rivers & Streams
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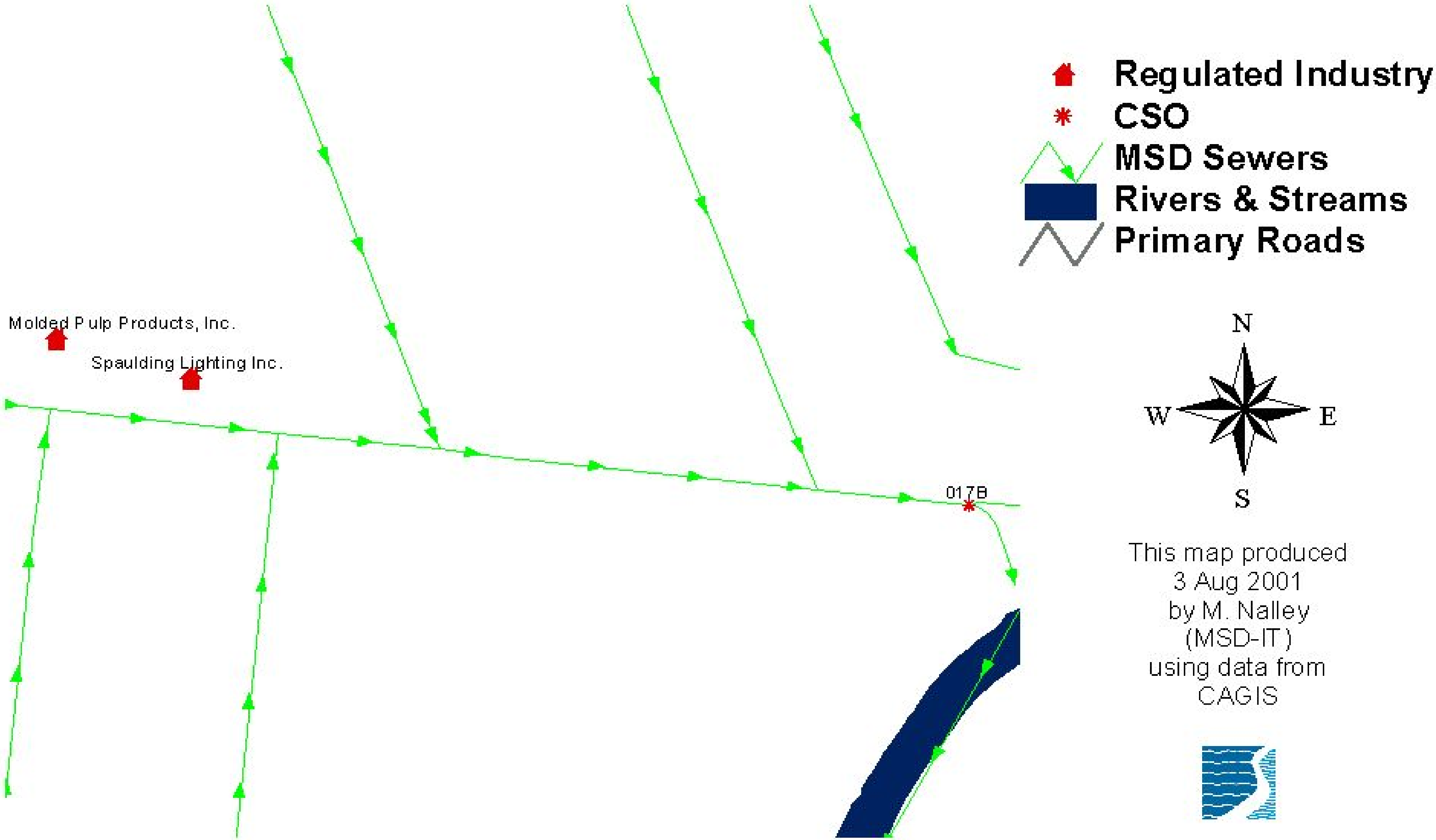
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 017b



Molded Pulp Products, Inc.
Spaulding Lighting Inc.
017B
Regulated Industry
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MSD Sewers
Rivers & Streams
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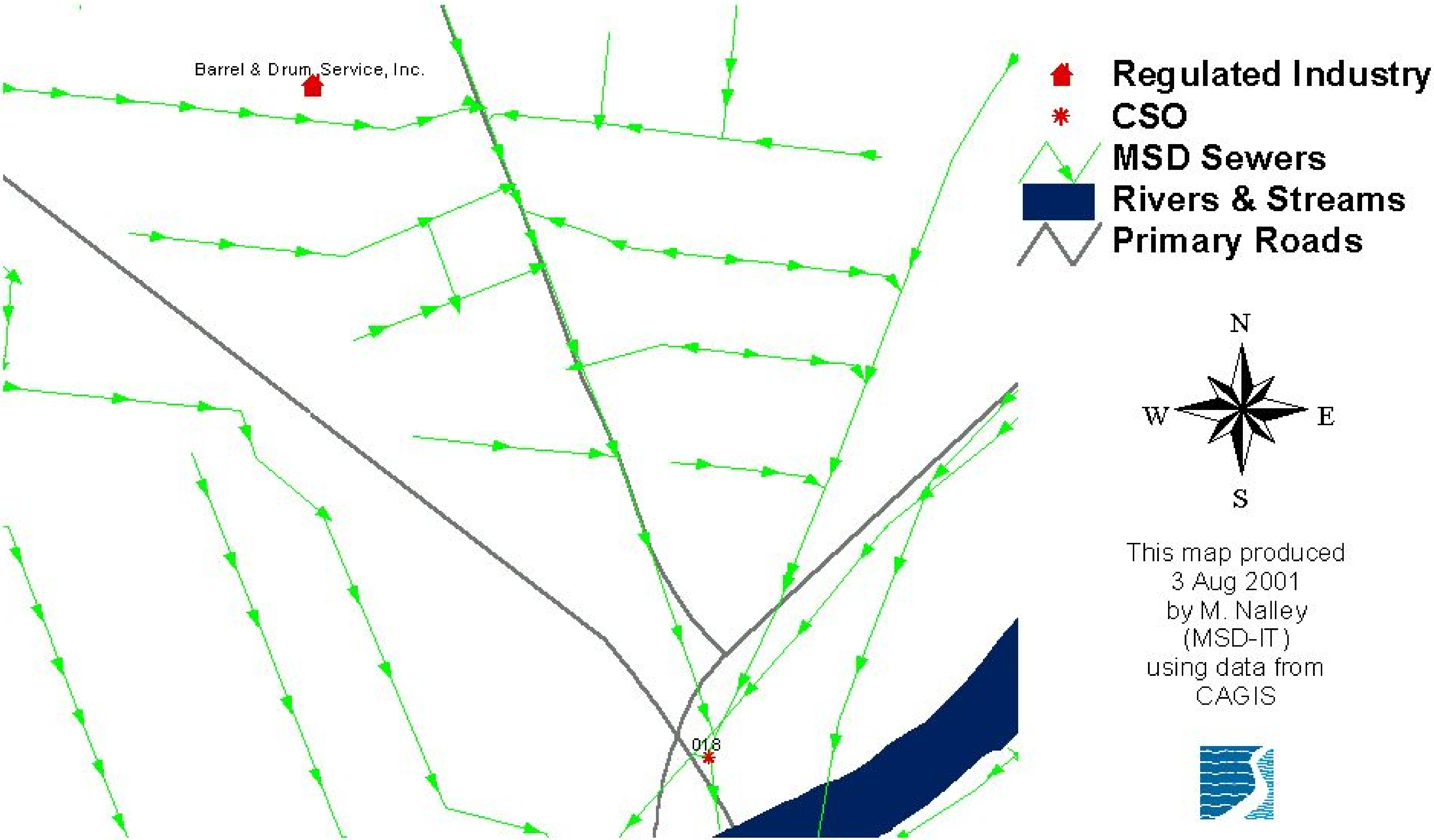
(MSD-IT)
using data from
CAGIS

CSO 018



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(MSD-IT)
using data from
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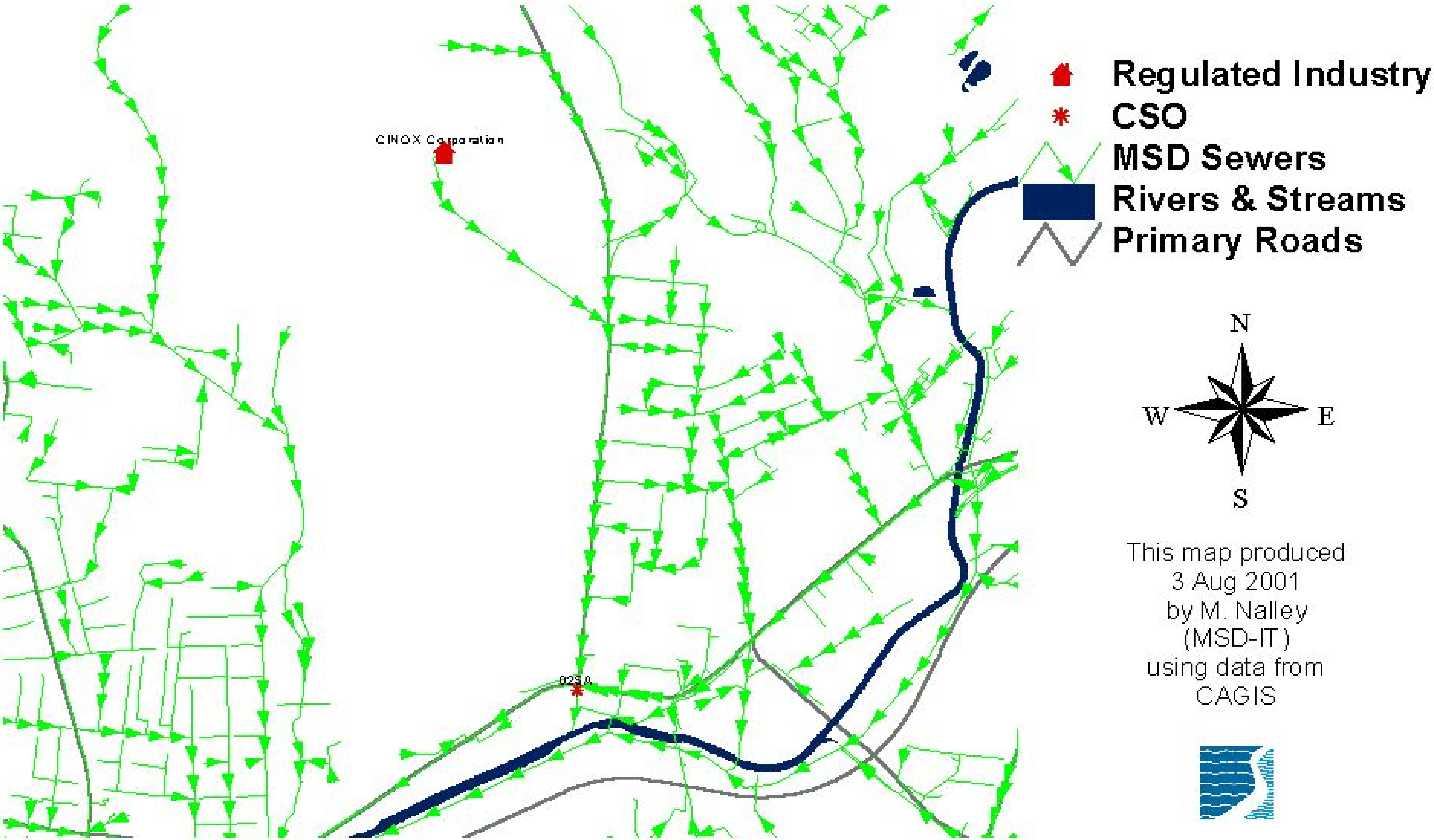
CSO 025a


CINOX Corporation
025A
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
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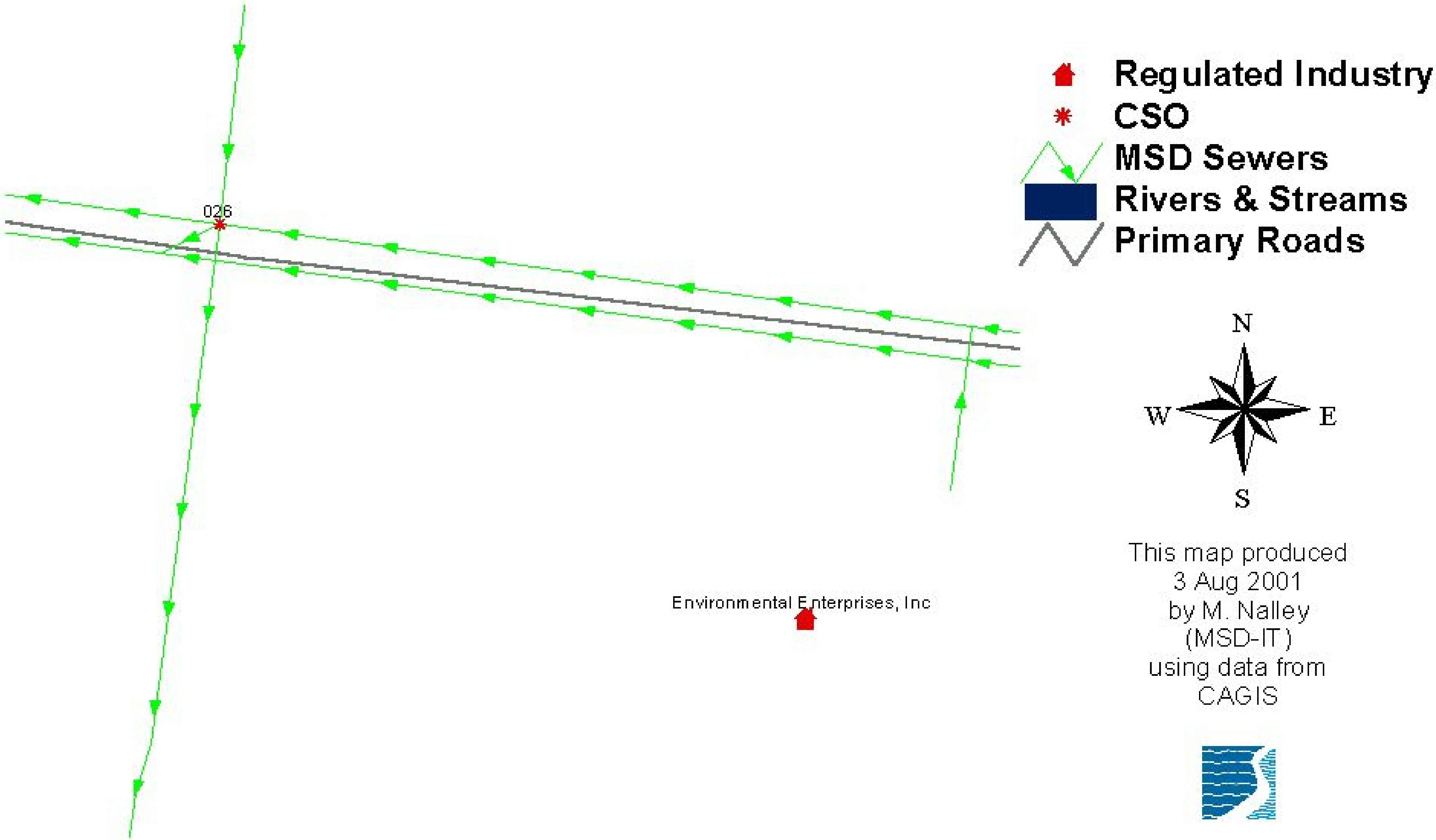
(MSD-IT)
using data from
CAGIS

CSO 026



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using data from
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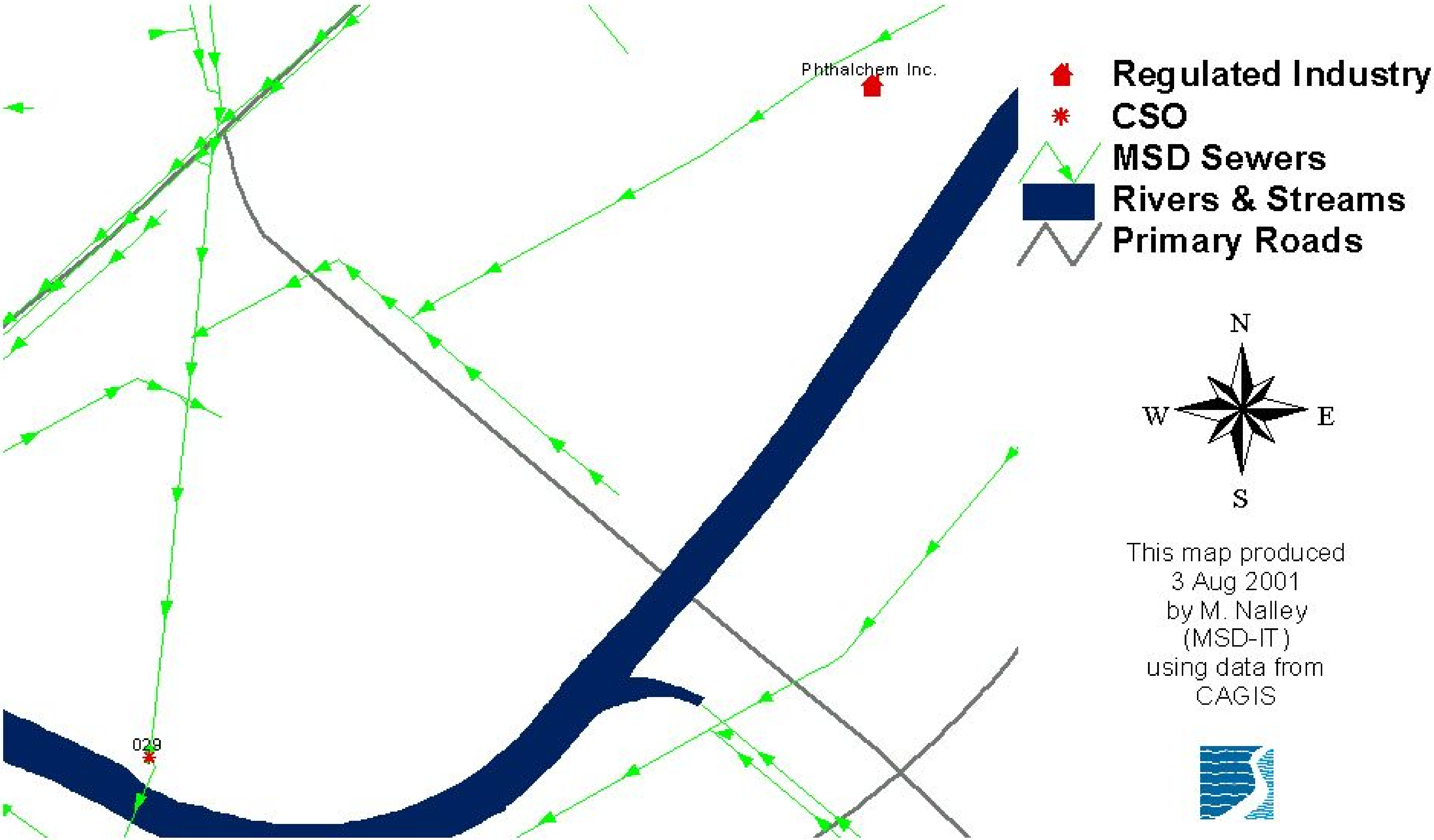
CSO 029



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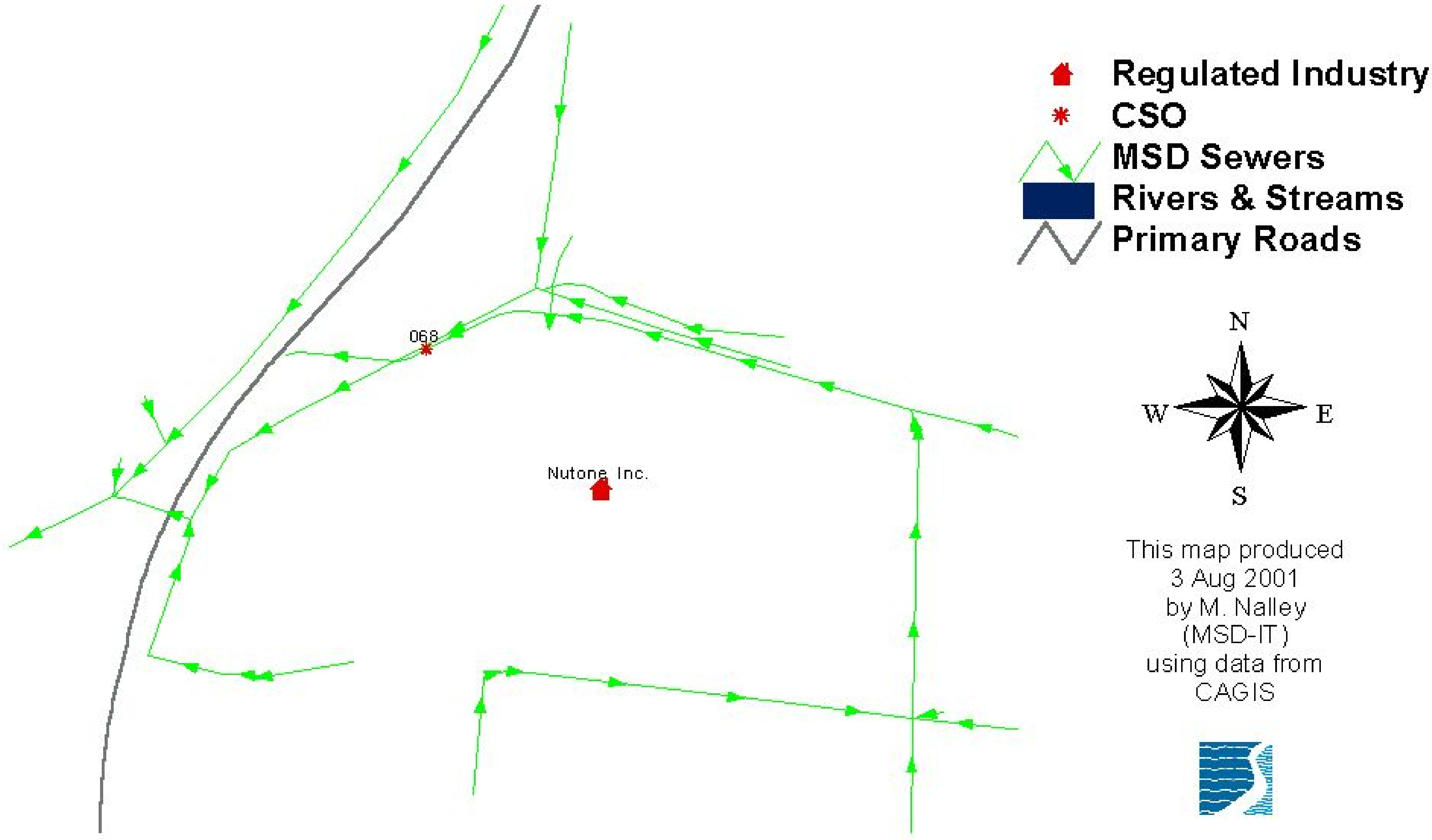
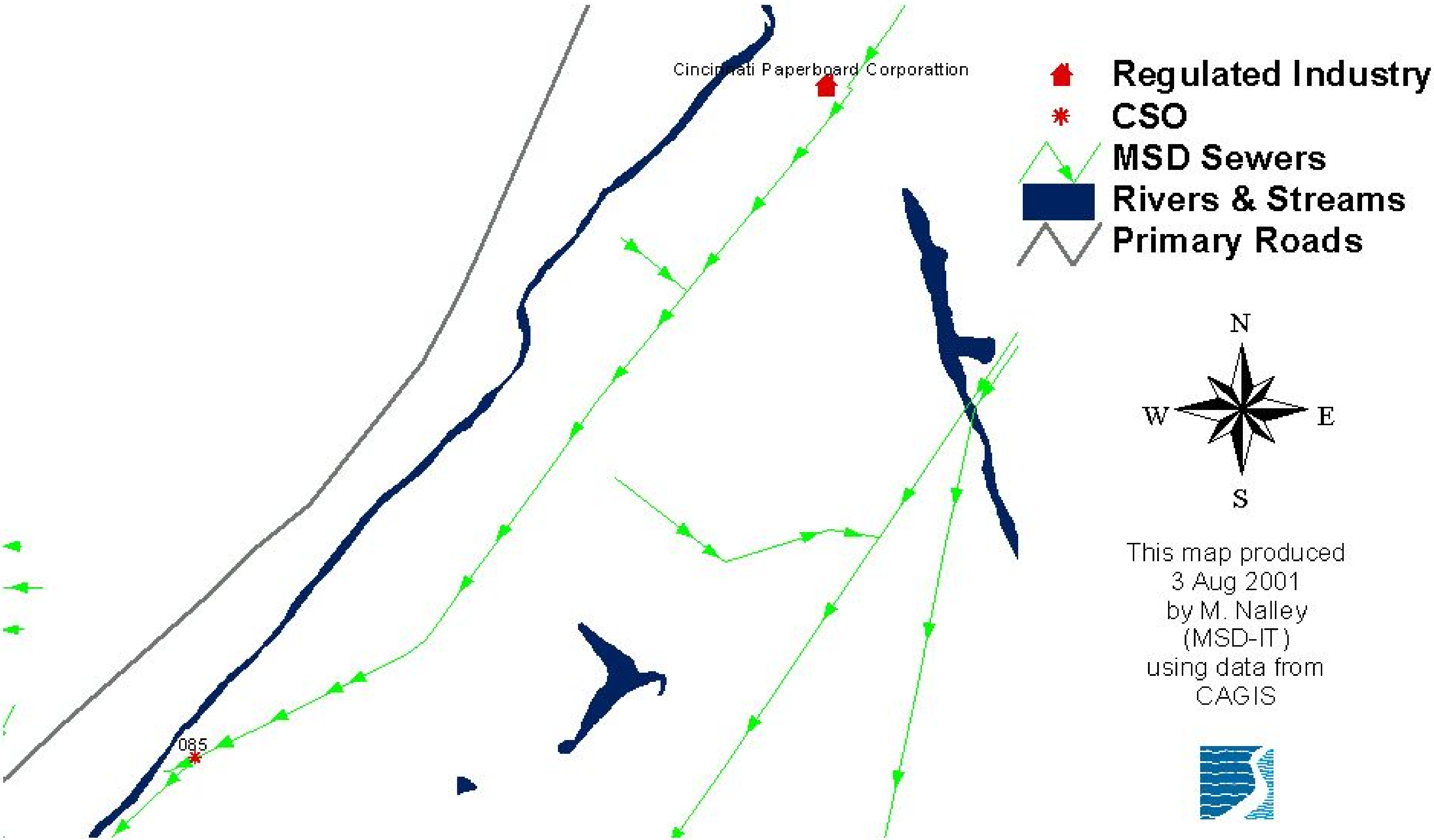
(MSD-IT)
using data from
CAGIS

CSO 068


Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
068
Nutone Inc.
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

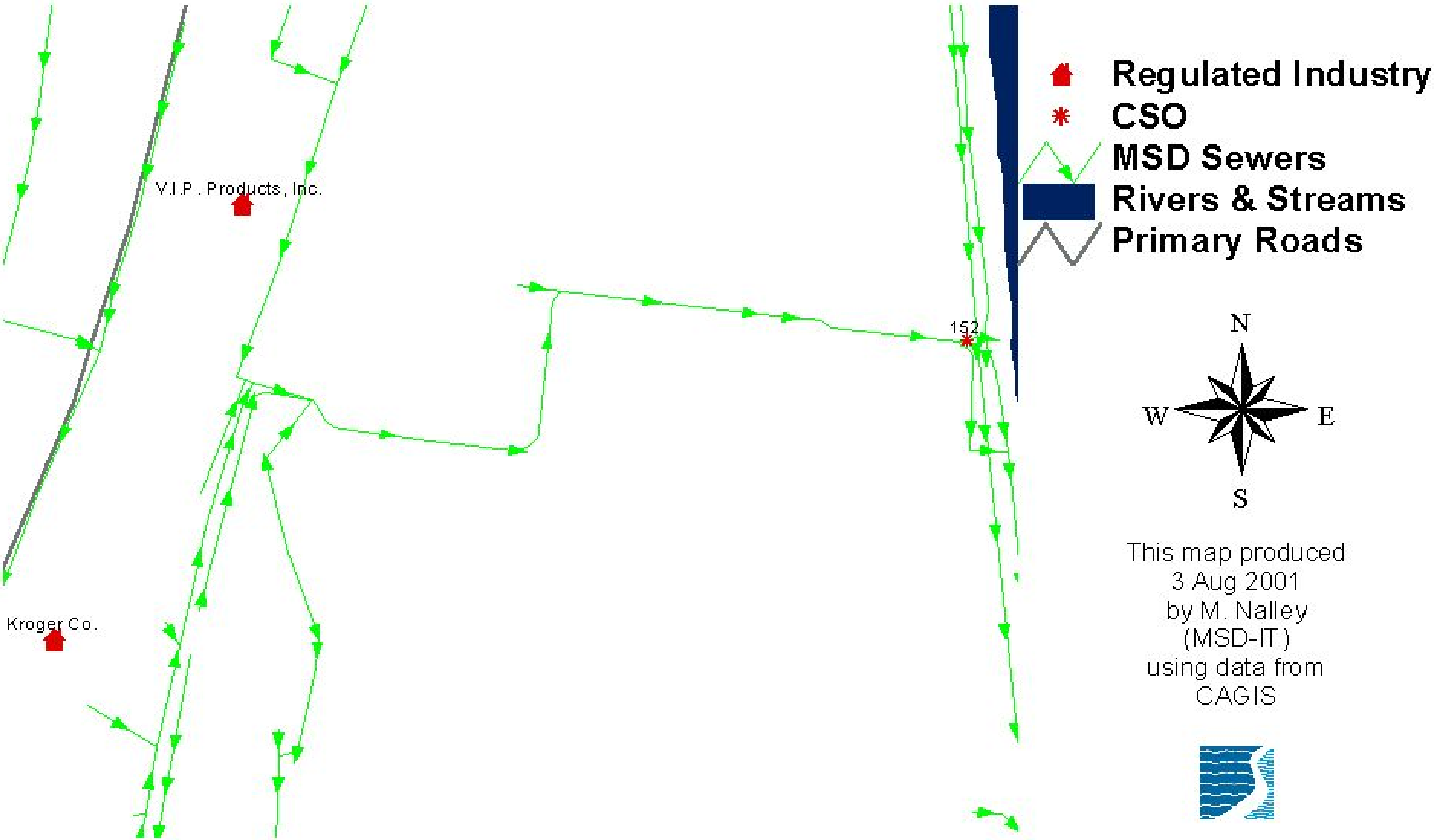
CSO 085


Cincinnati Paperboard Corporattion
085
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 136


Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
136
Richards Industries, Inc.
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

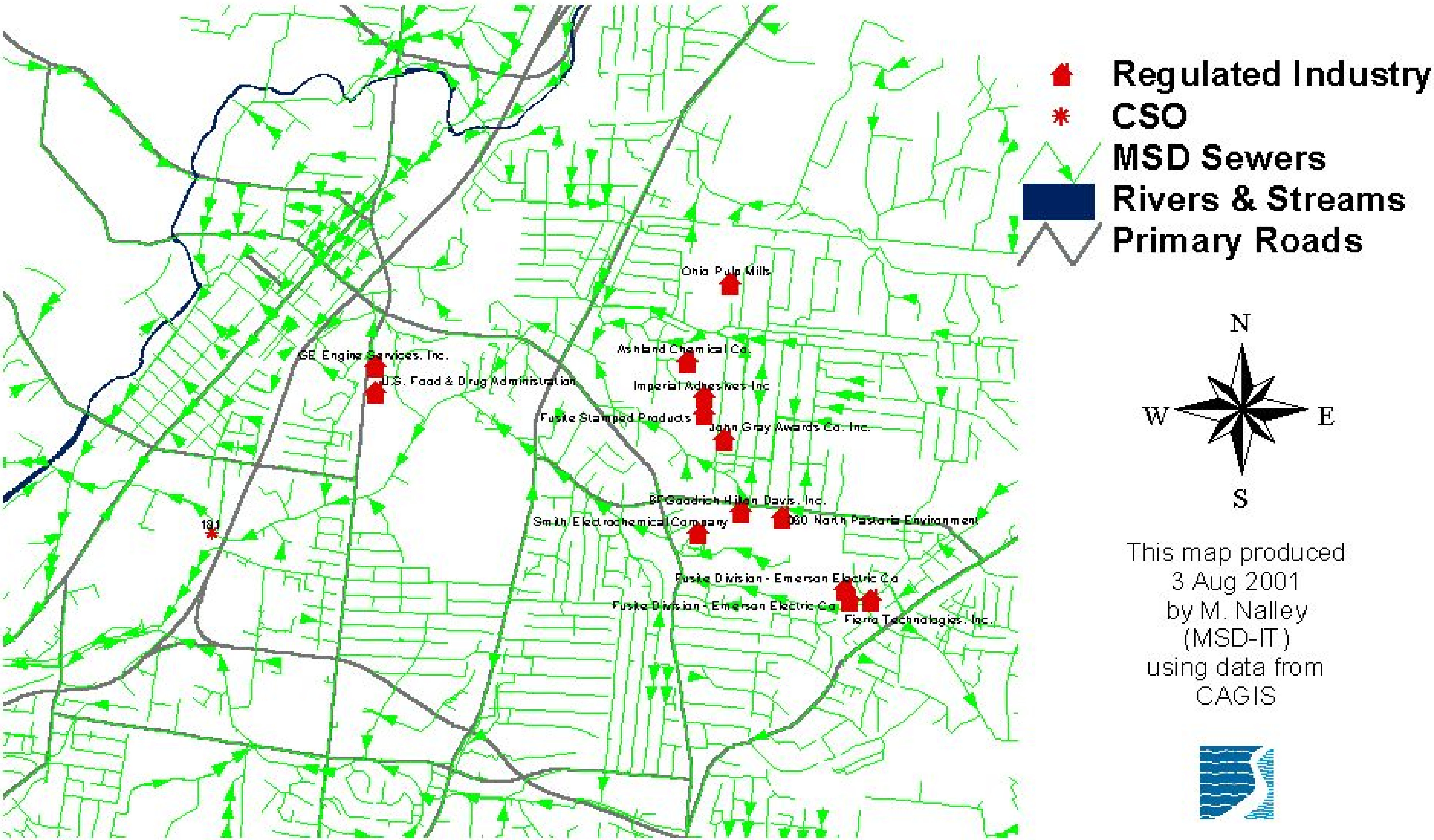
CSO 152


V.I.P. Products, Inc.
Kroger Co.
152
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 170

This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 181

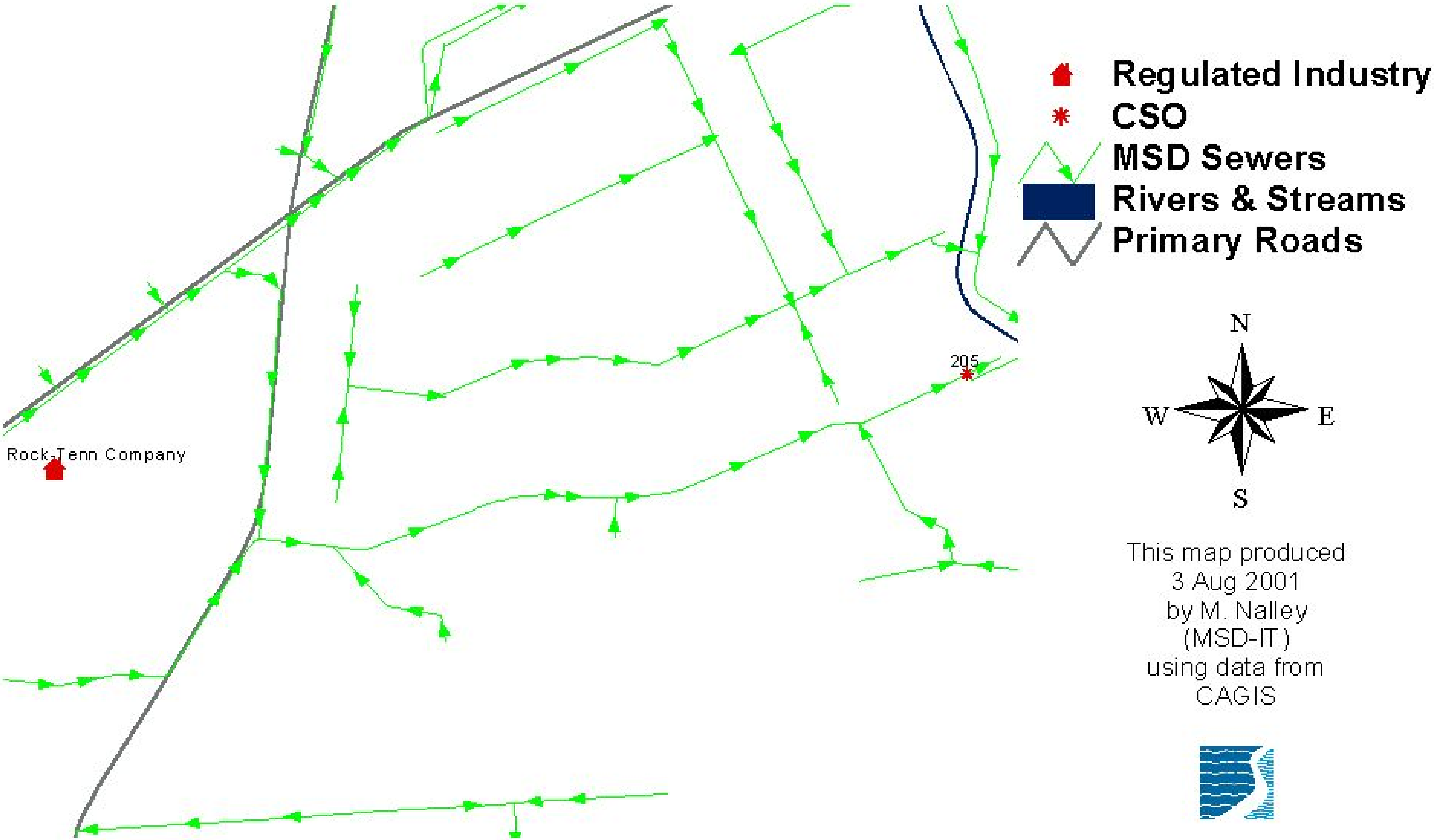


This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 198

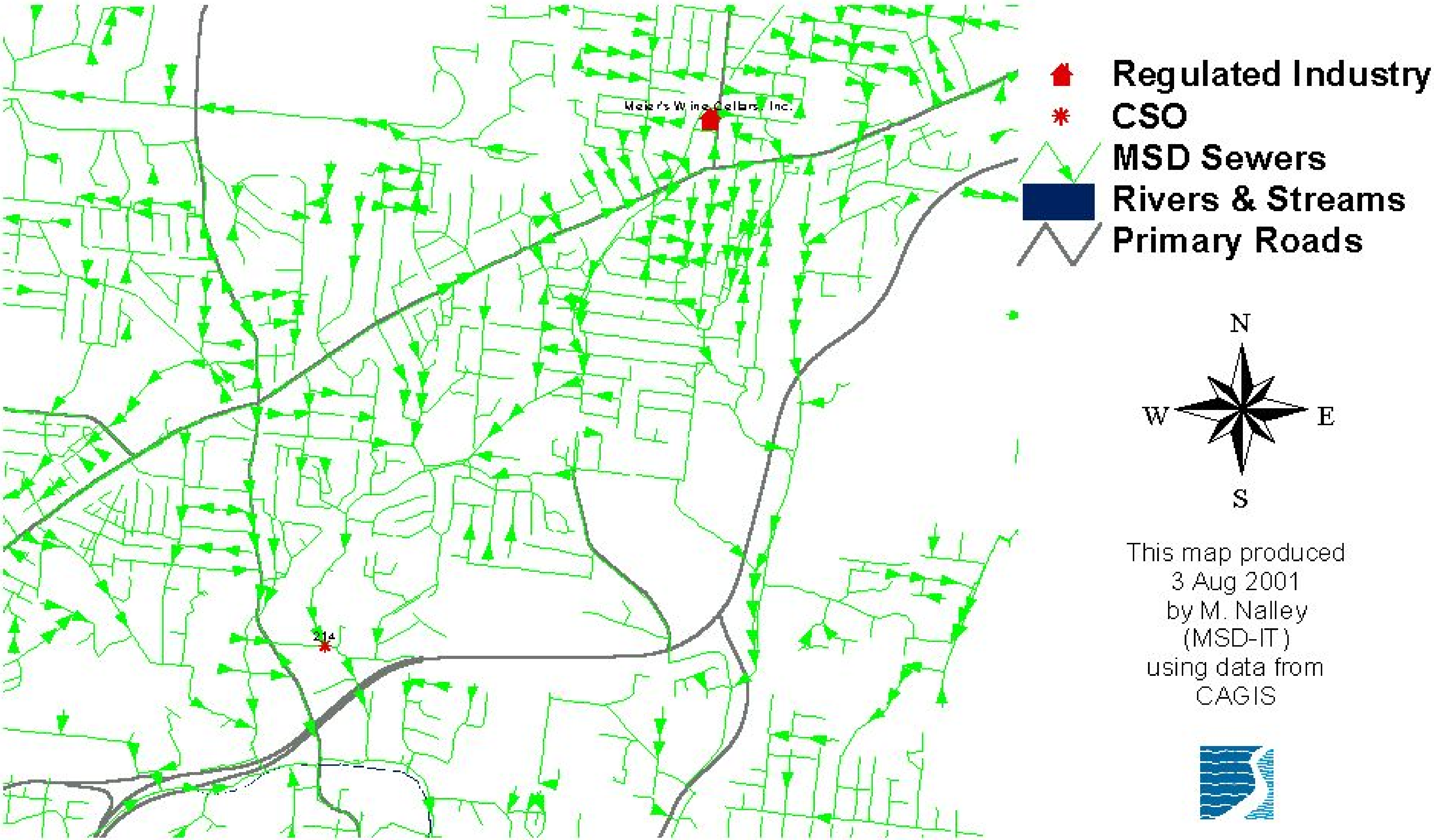
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 205



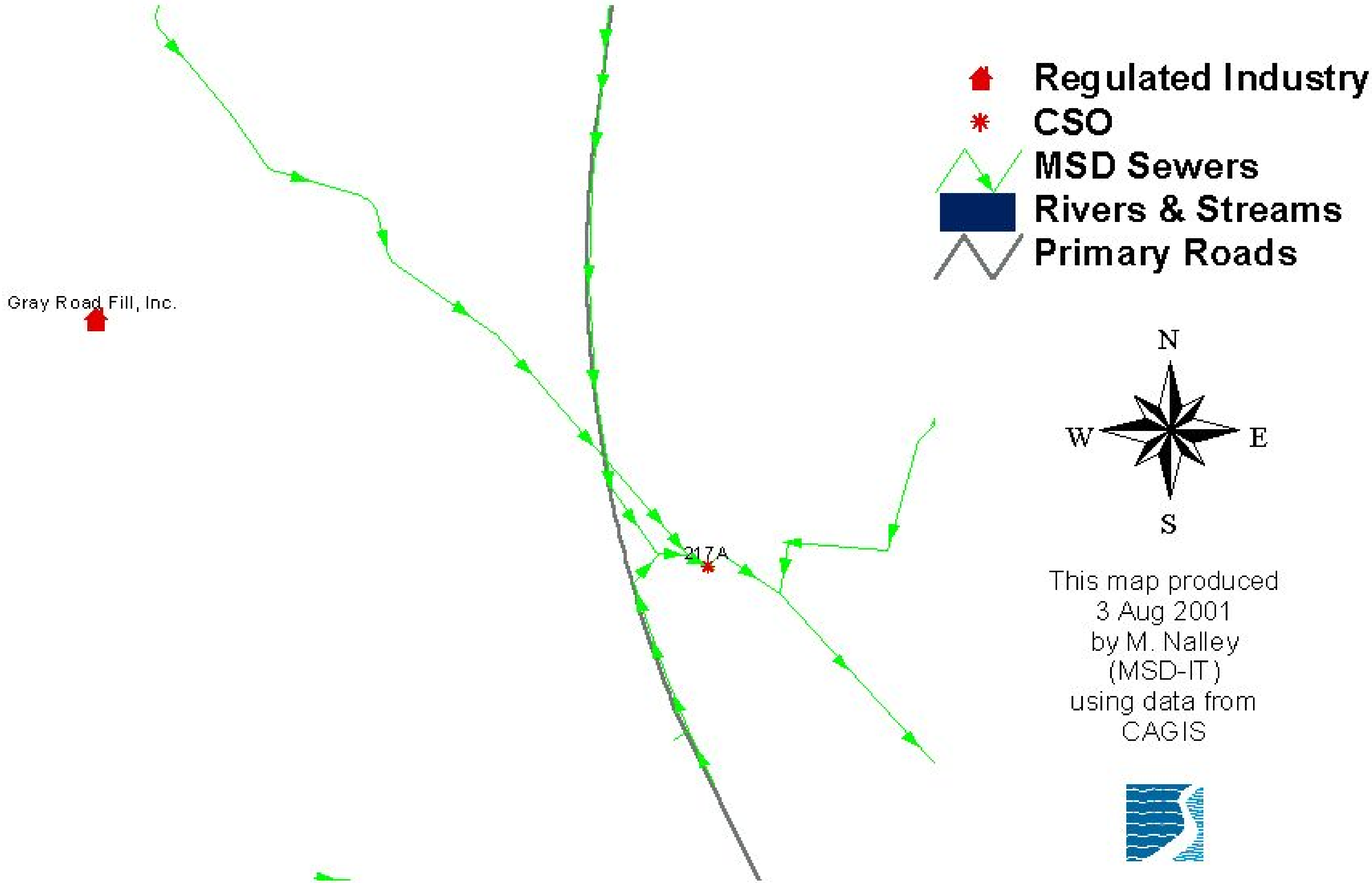
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 214

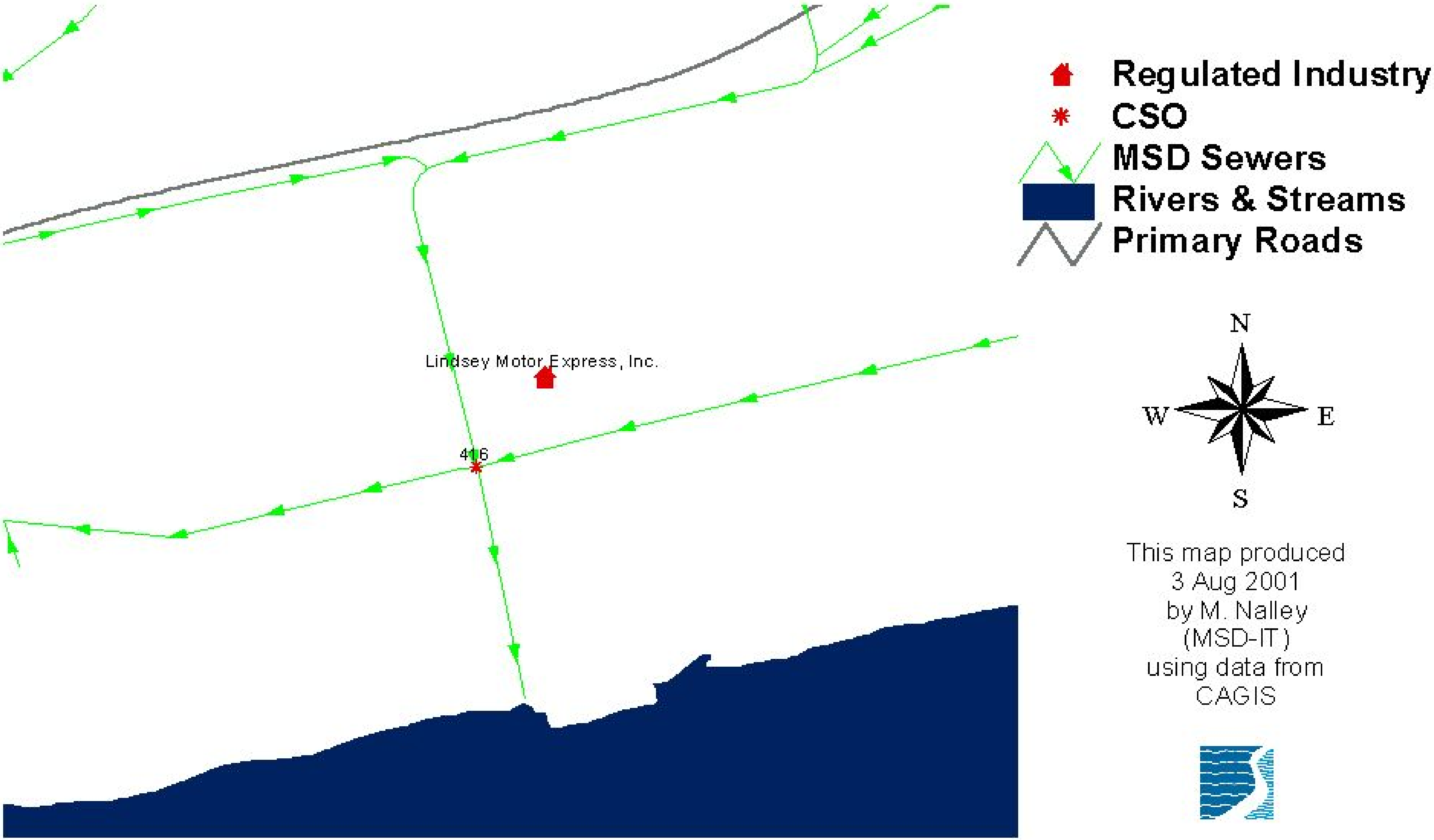


Meier's Wine Cellars, Inc.
214
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 217a


Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
Gray Road Fill, Inc.
217A
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 416



This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

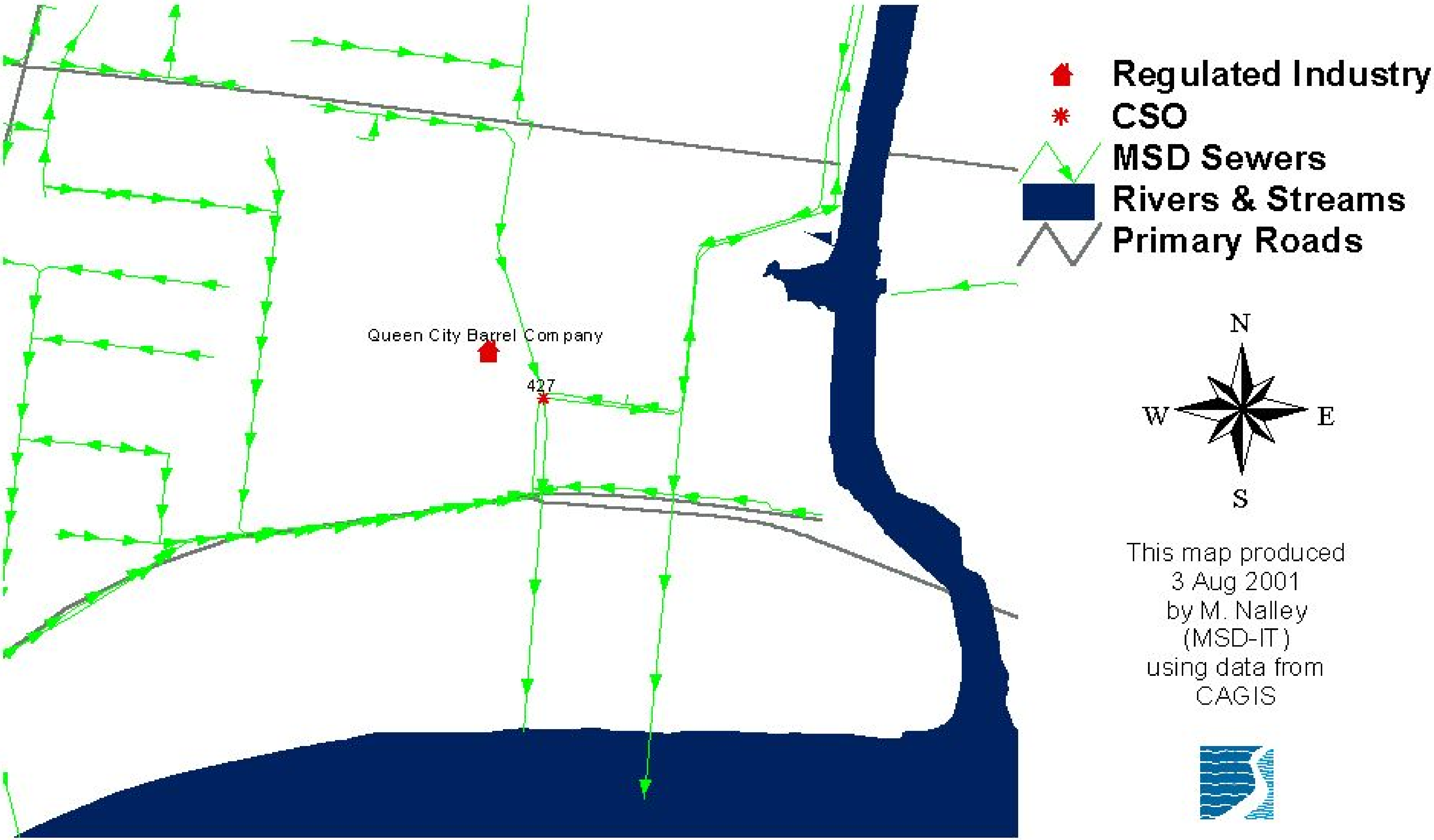
CSO 419

This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

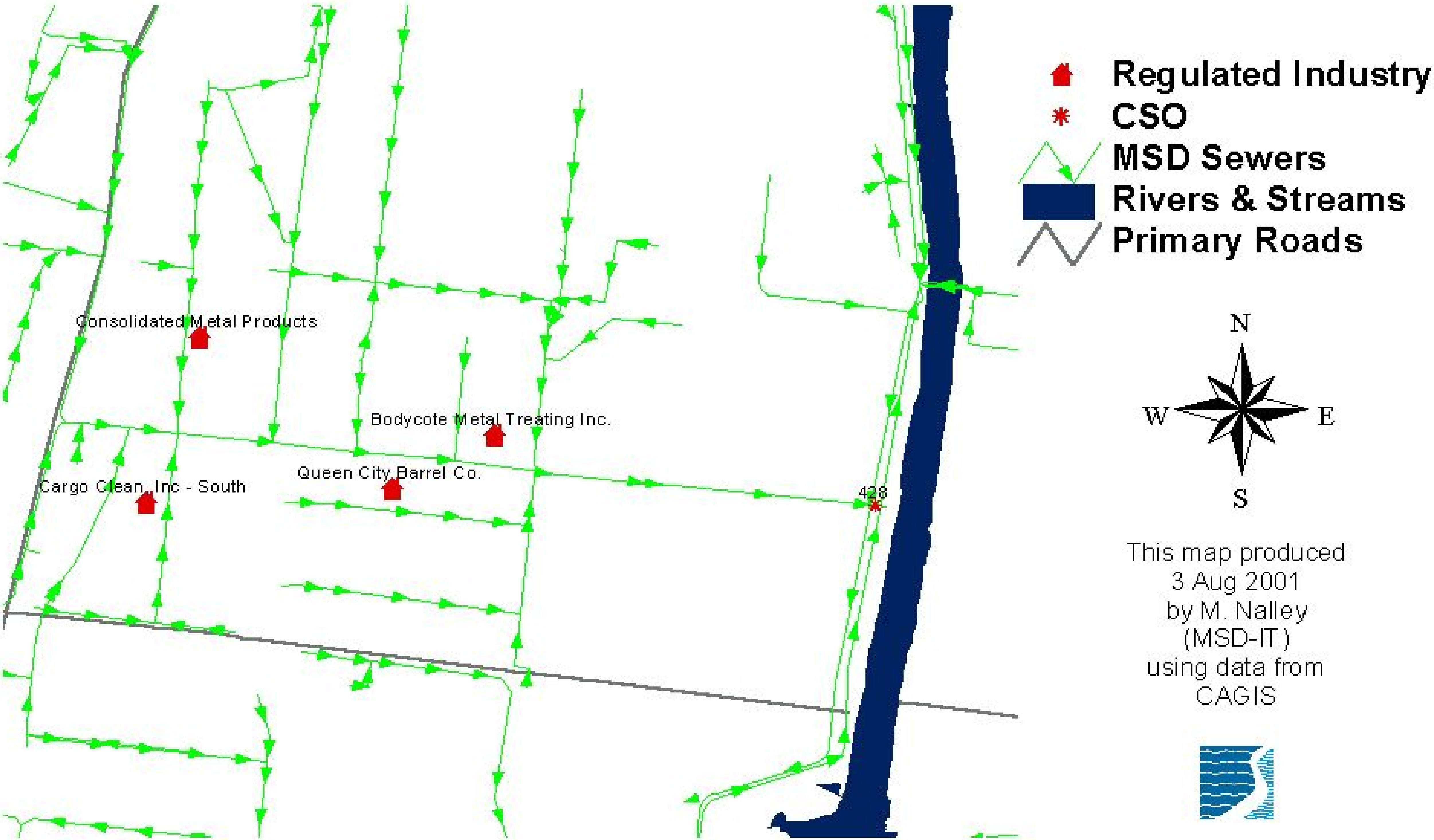
CSO 426a


Bodycote Metal Treating Inc.
426A
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

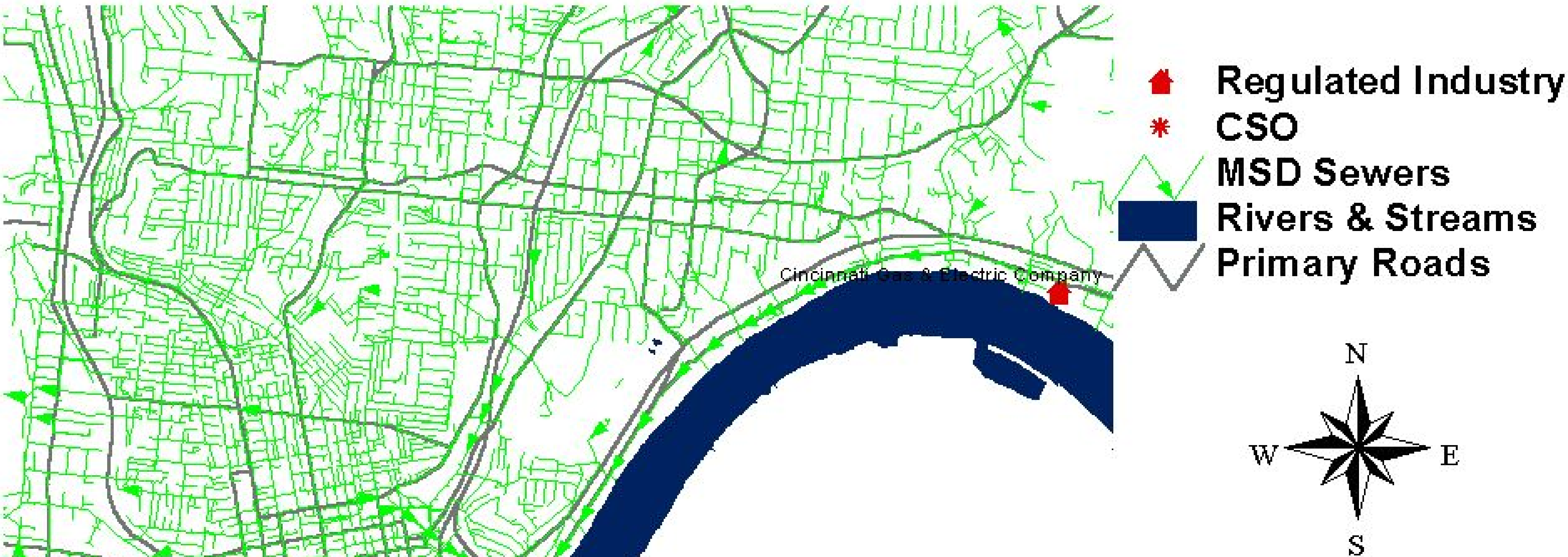
CSO 427


Queen City Barrel Company
427
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 428

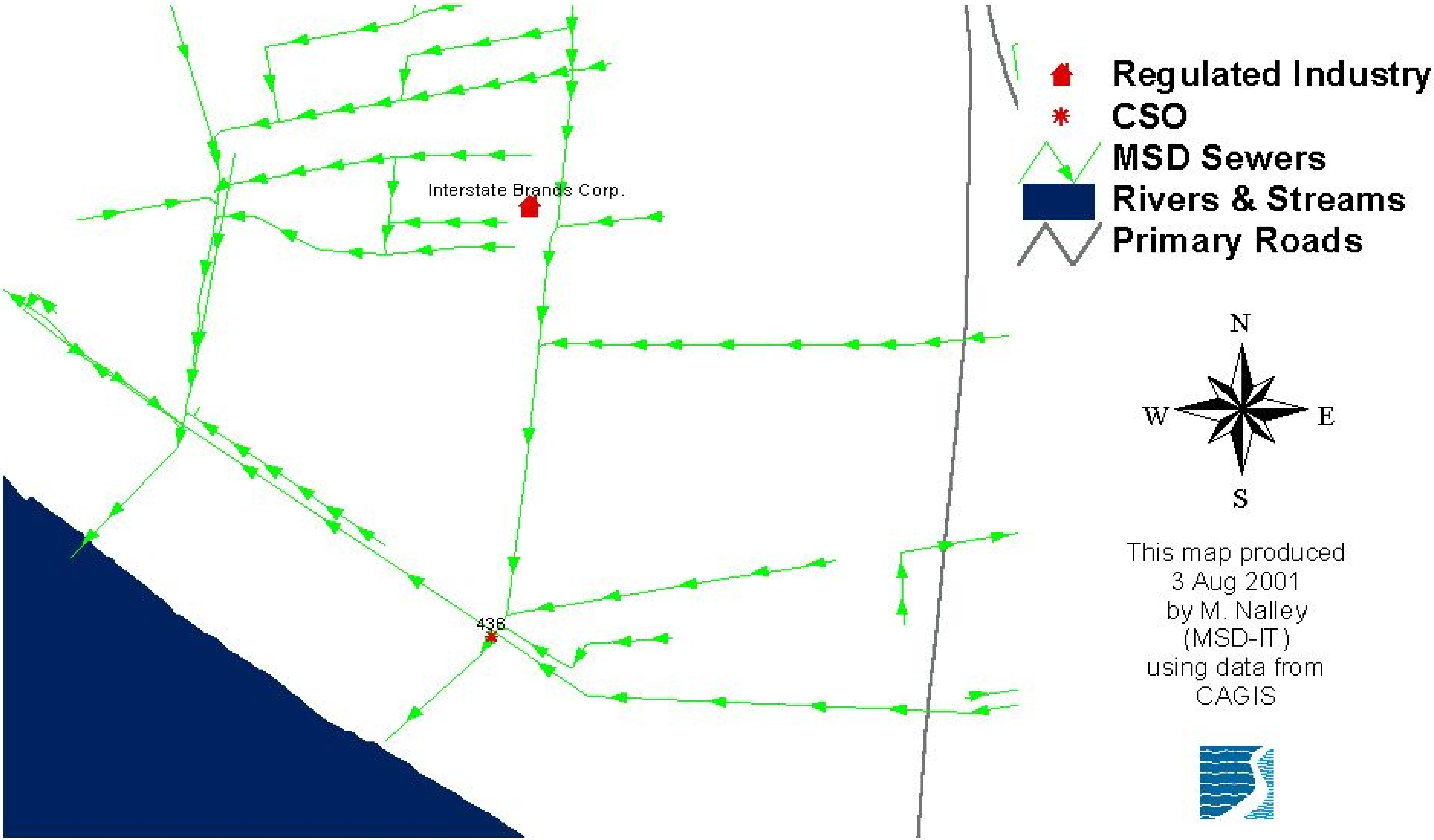

Consolidated Metal Products
Bodycote Metal Treating Inc.
Queen City Barrel Co.
Cargo Clean, Inc - South
428
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 433

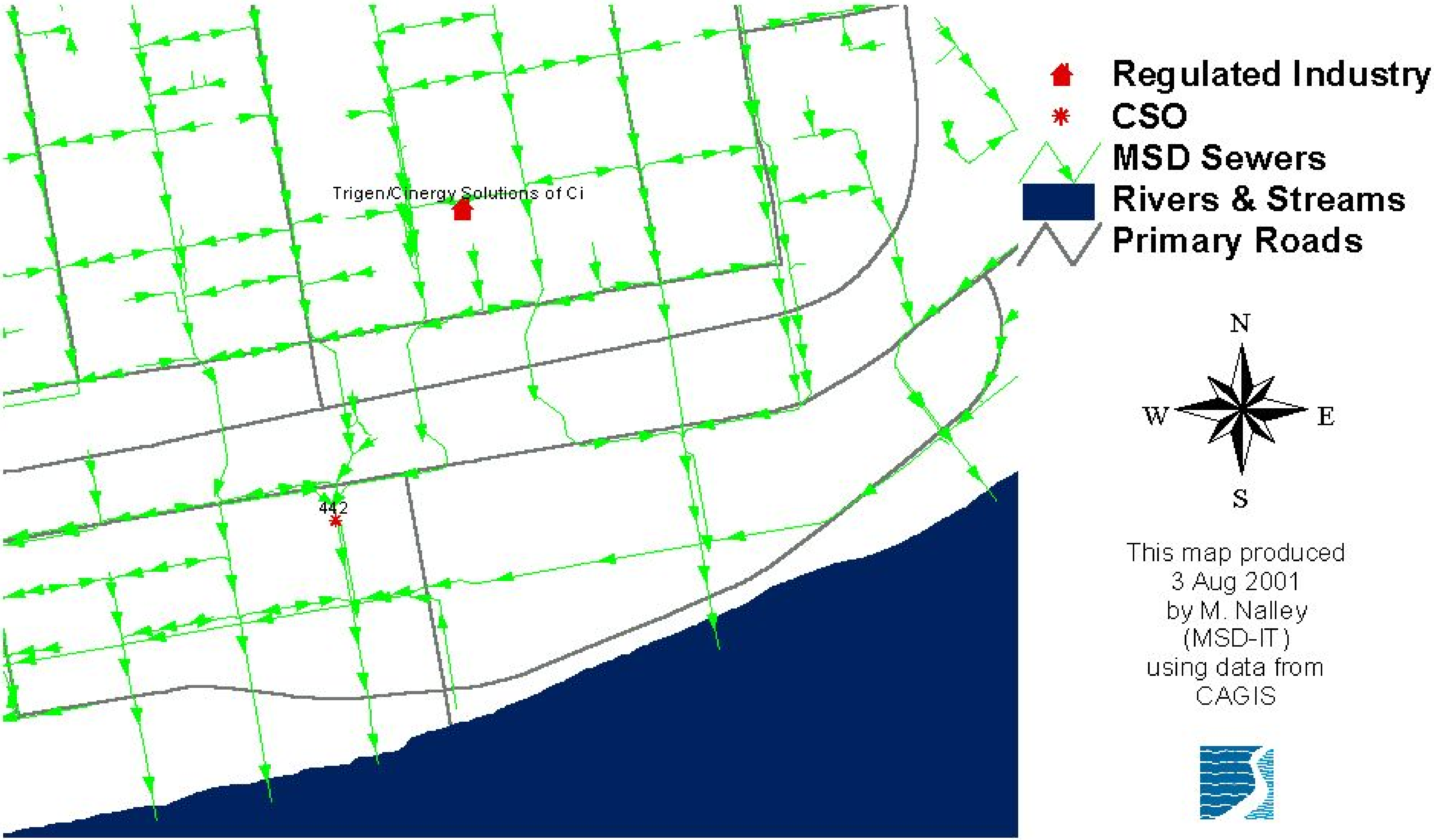


This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 436

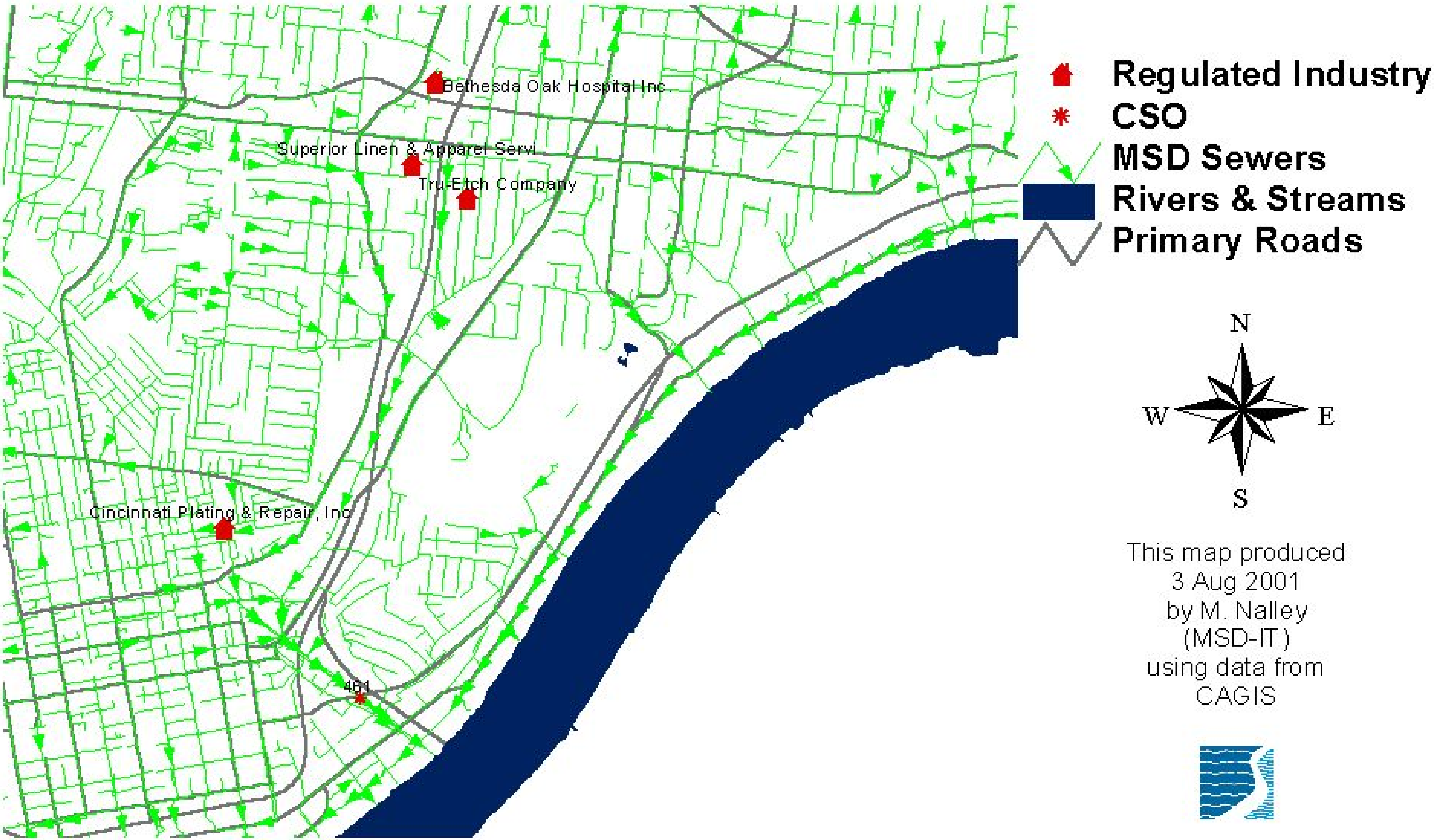

Interstate Brands Corp.
436
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 442



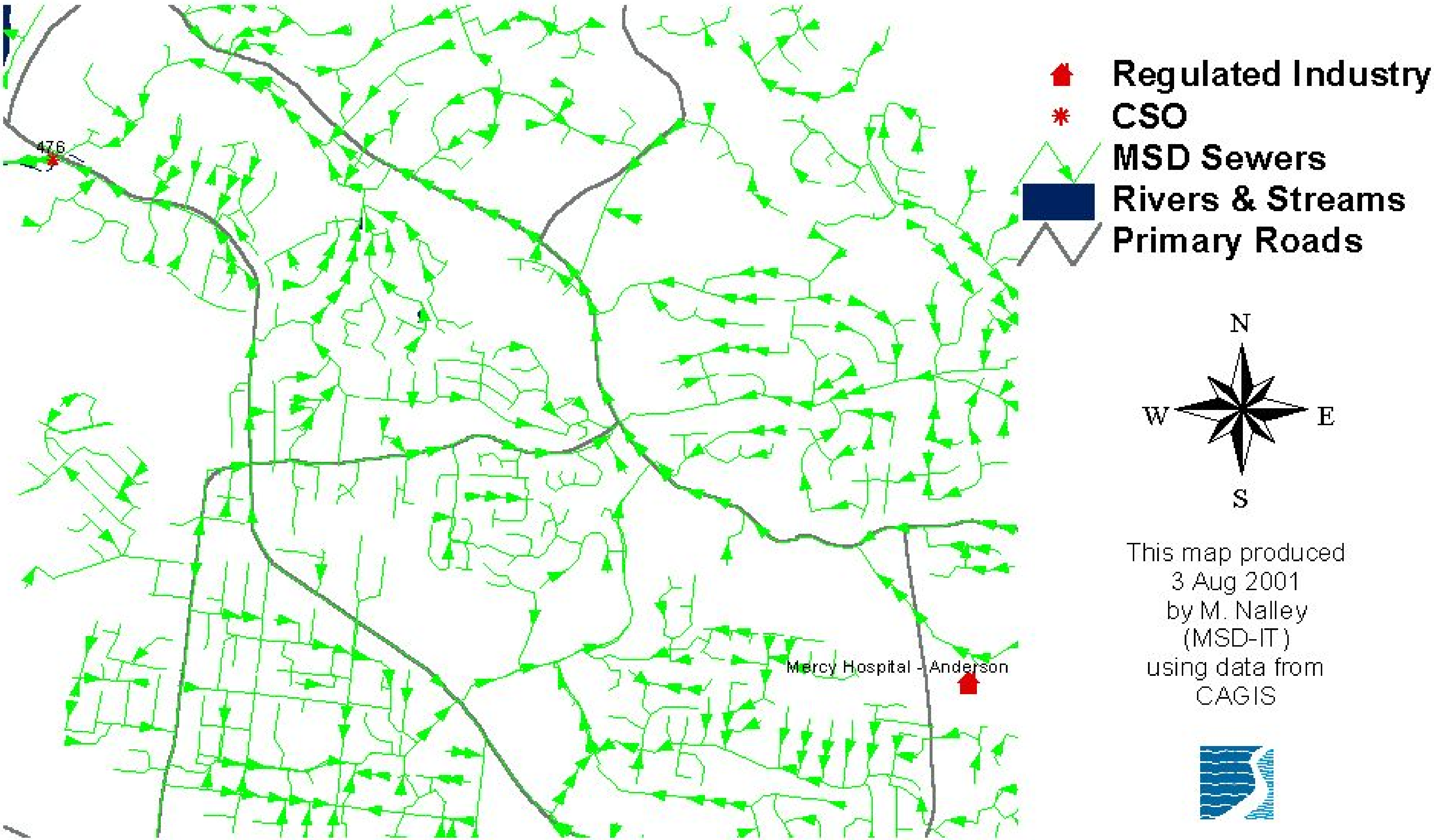
Trigen/Cinergy Solutions of Ci
442
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 461



This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 476

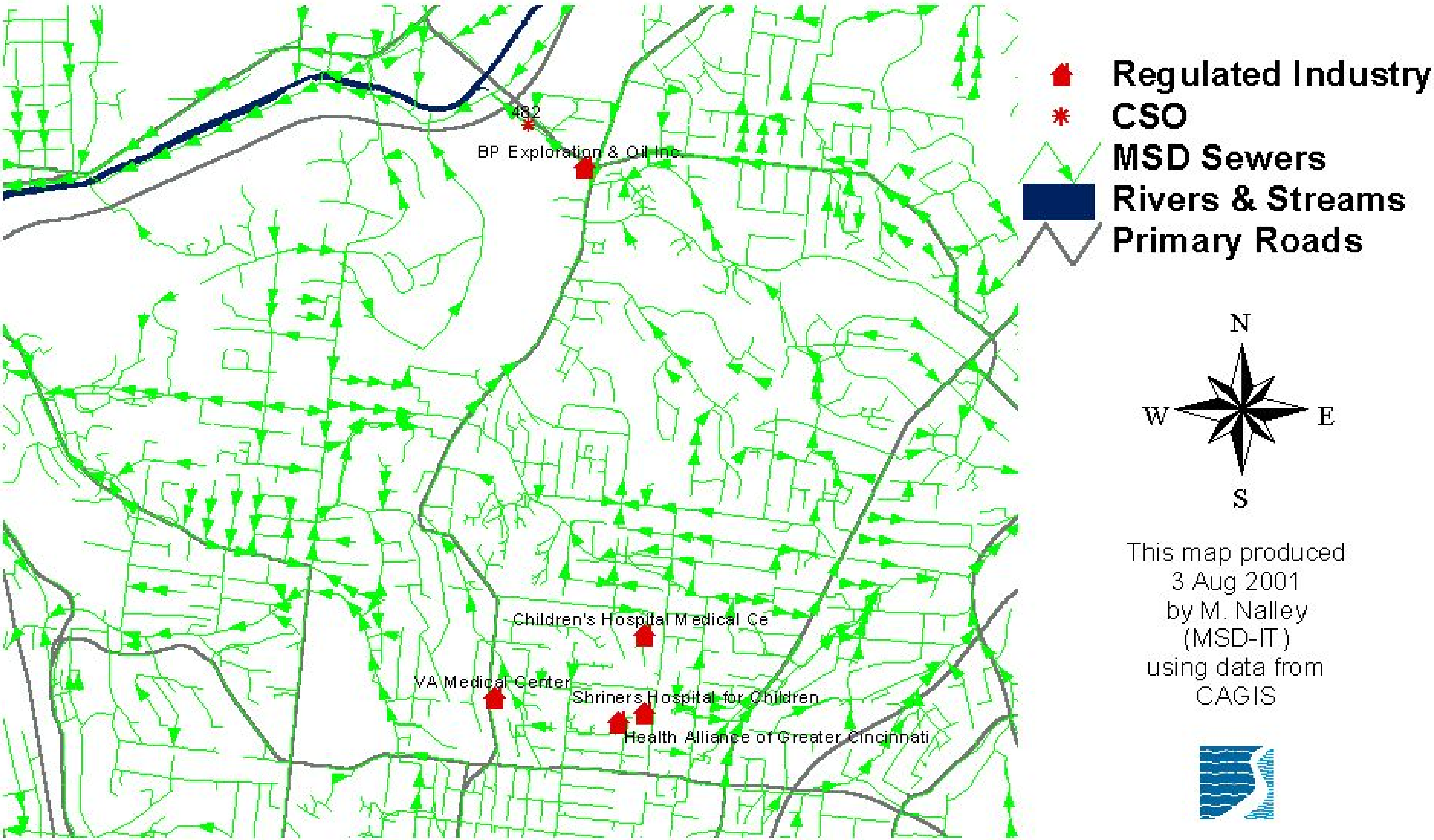


476
Mercy Hospital - Anderson
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 481

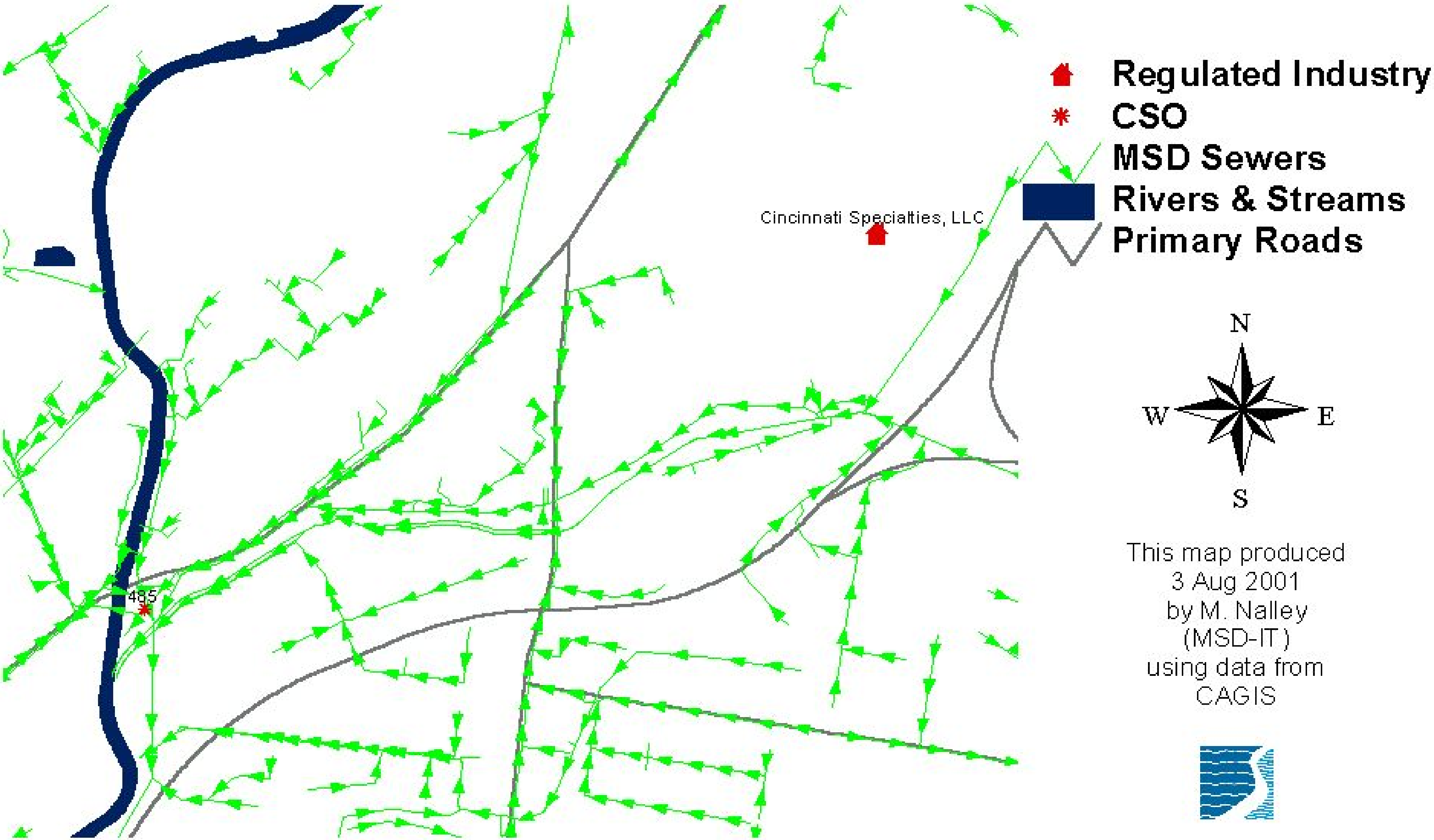

Berghausen Corporation
481
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 482



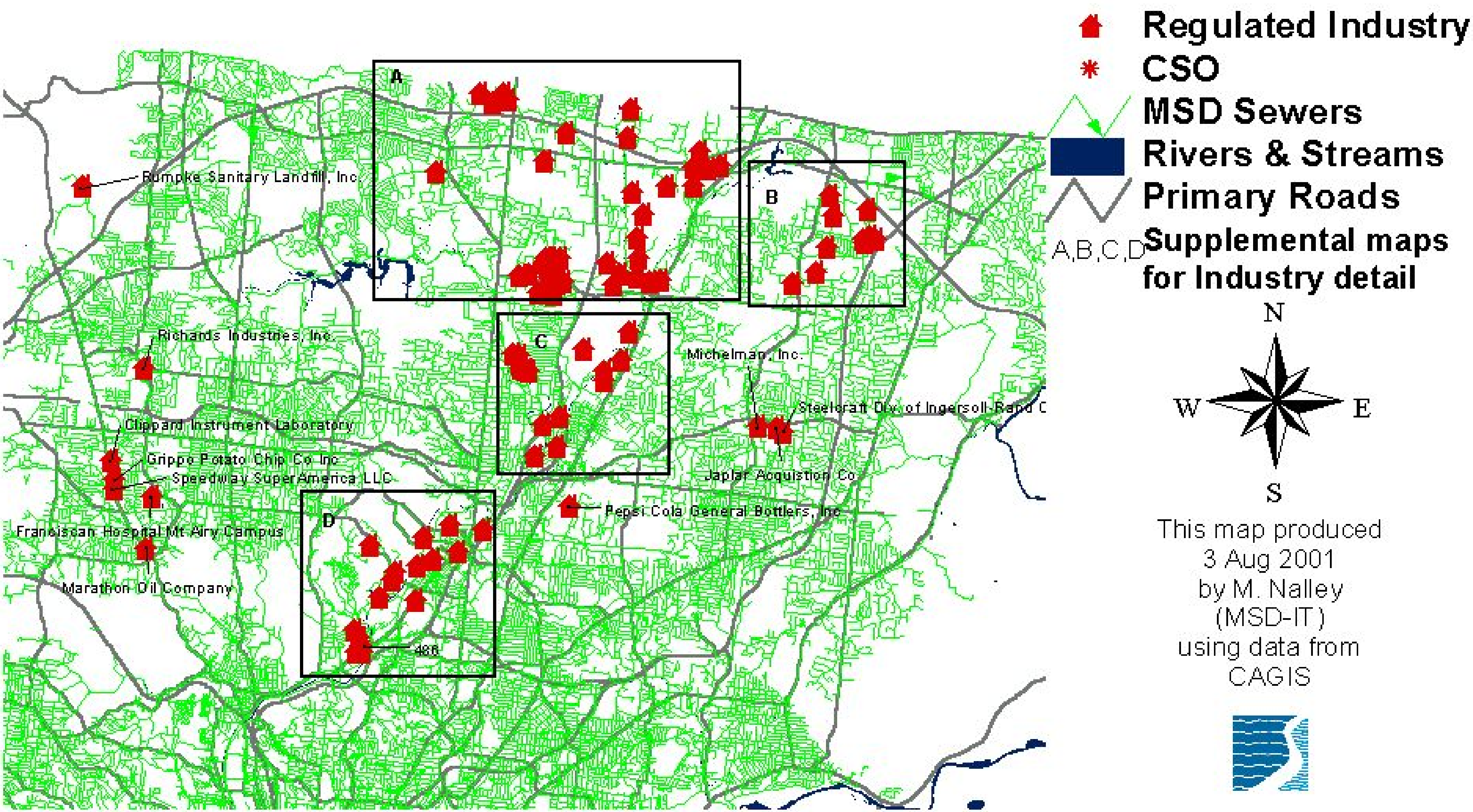
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 485



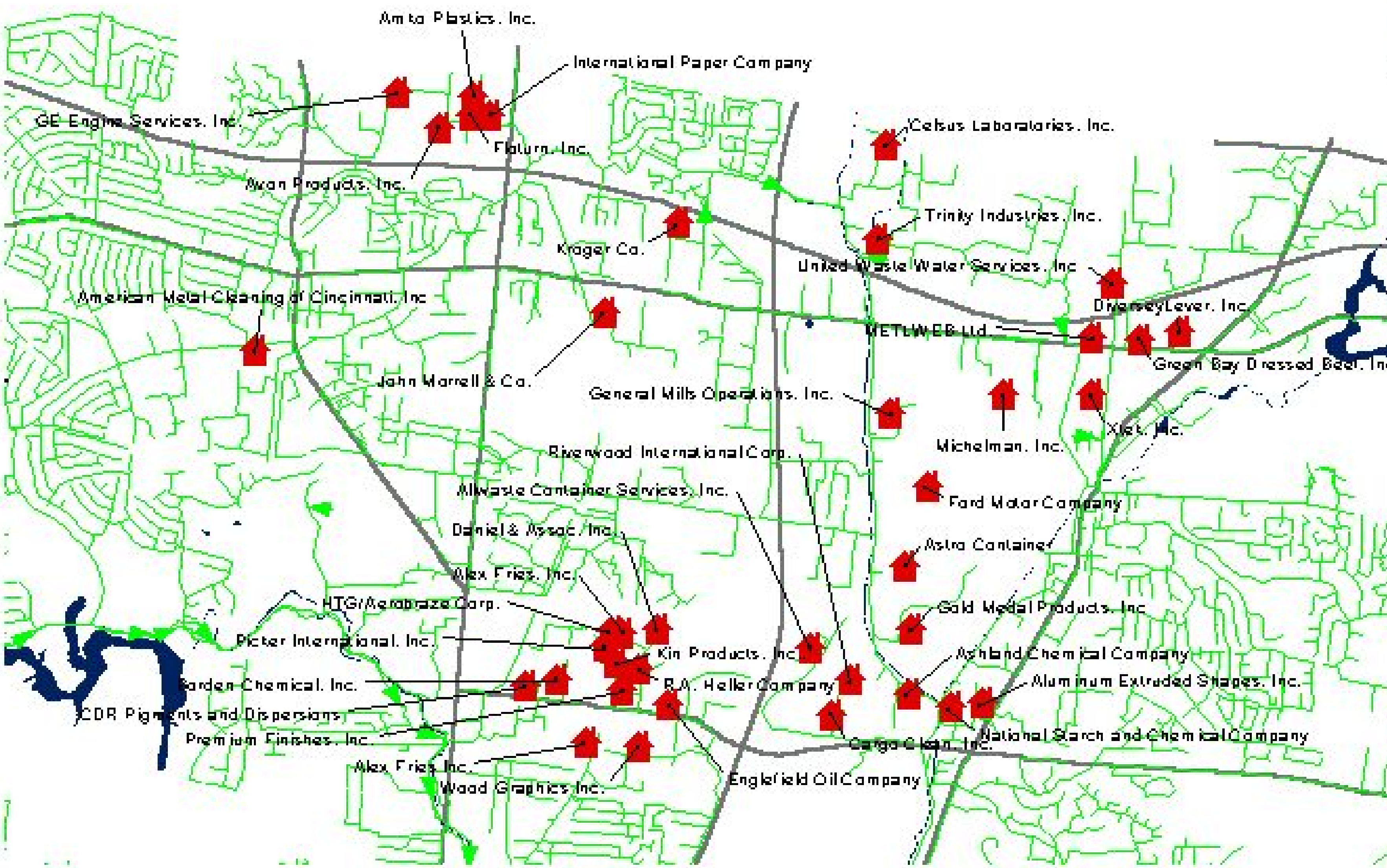
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 486



Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
A,B,C,D Supplemental maps for Industry detail
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS
A
B
C
D
Rumpke Sanitary Landfill, Inc
Richards Industries, Inc.
Clippard Instrument Laboratory
Grippo Potato Chip Co Inc
Speedway SuperAmerica LLC
Franciscan Hospital Mt Airy Campus
Marathon Oil Company
486
Pepsi Cola General Bottlers, Inc
Michelman, Inc.
Steelcraft Div. of Ingersoll-Rand C
Japlar Acquistion Co

CSO 486 (Sheet A)

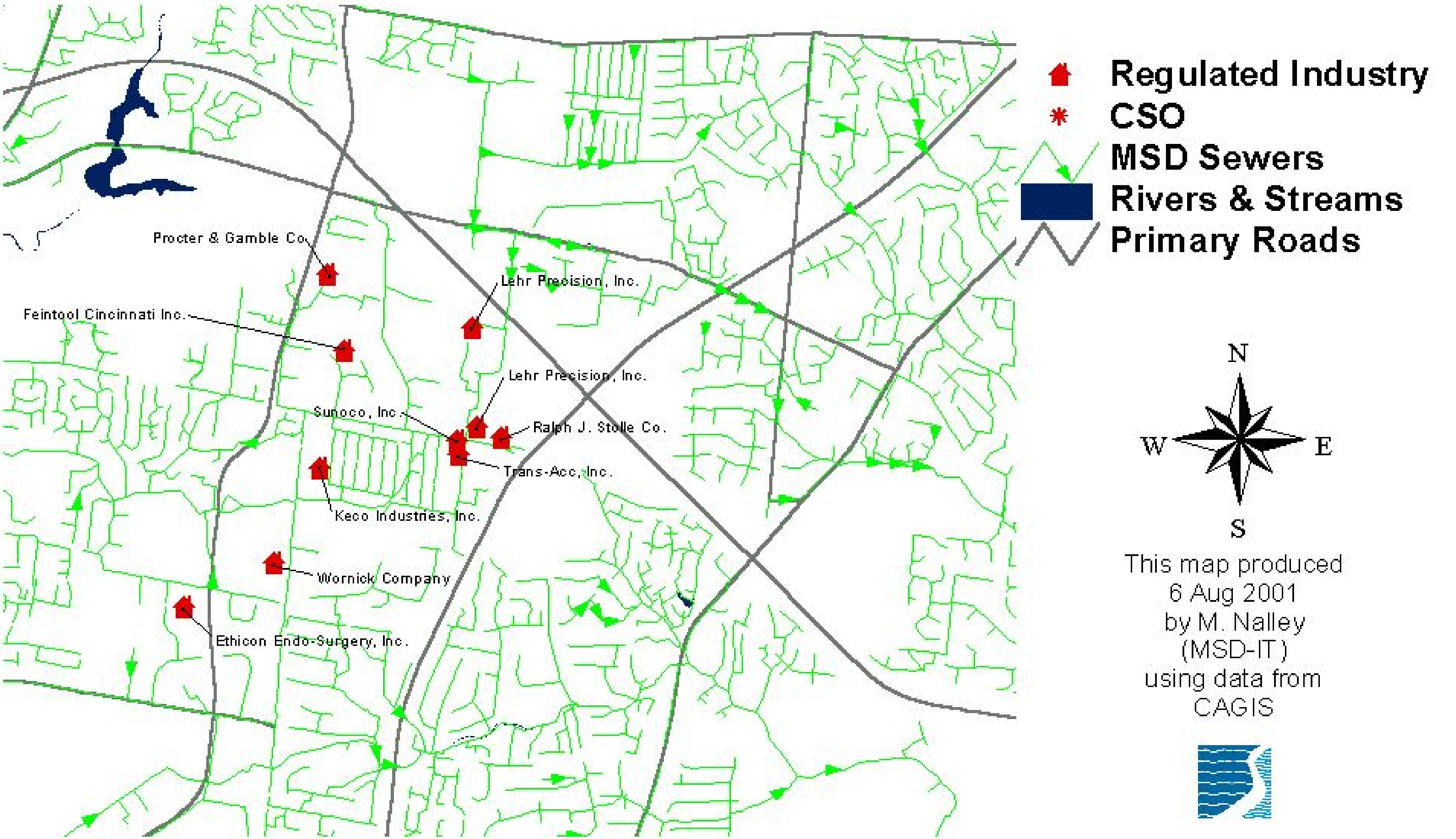


Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads

N
W E
S

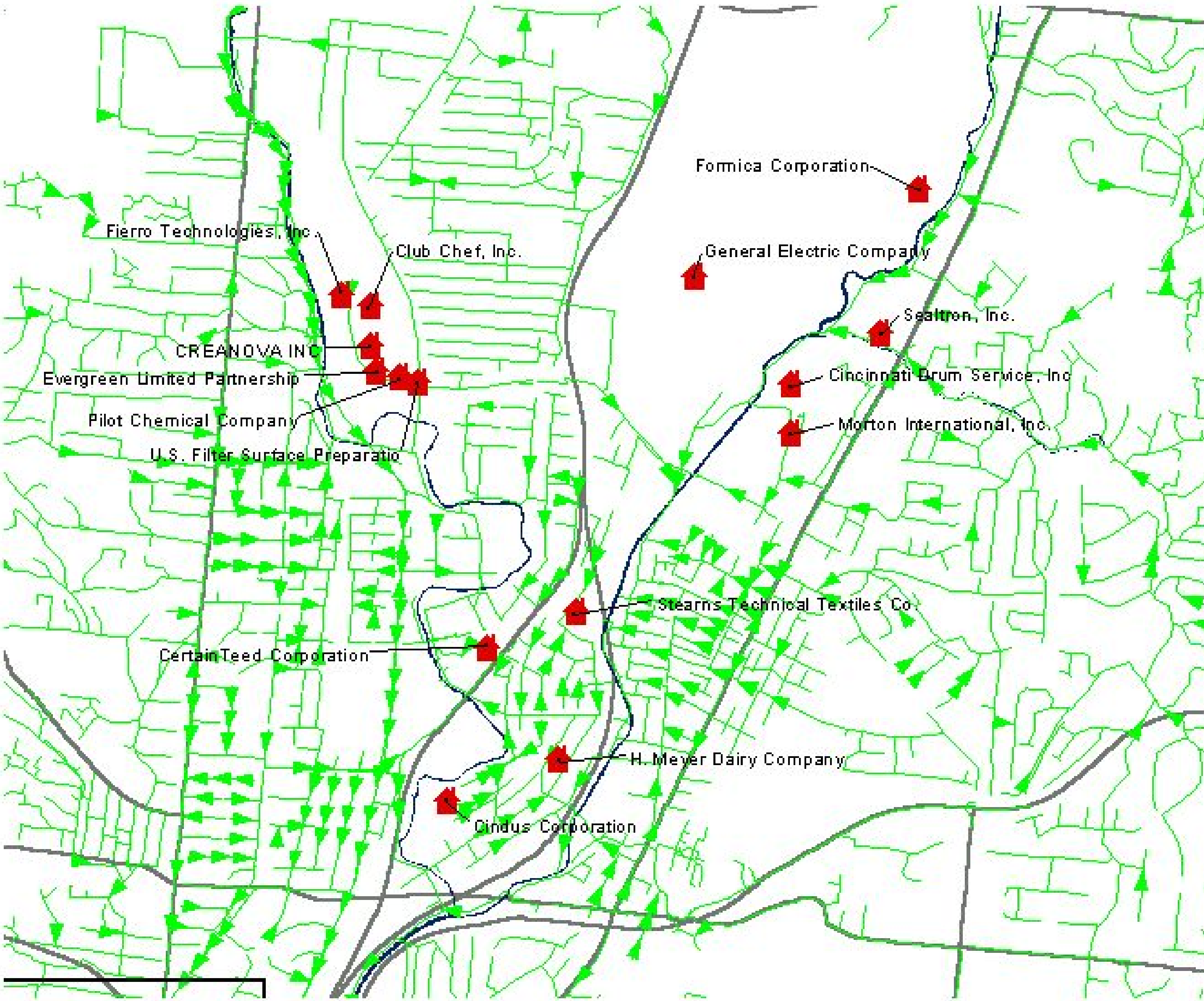
This map produced
6 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 486 (Sheet B)



This map produced
6 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 486 (Sheet C)

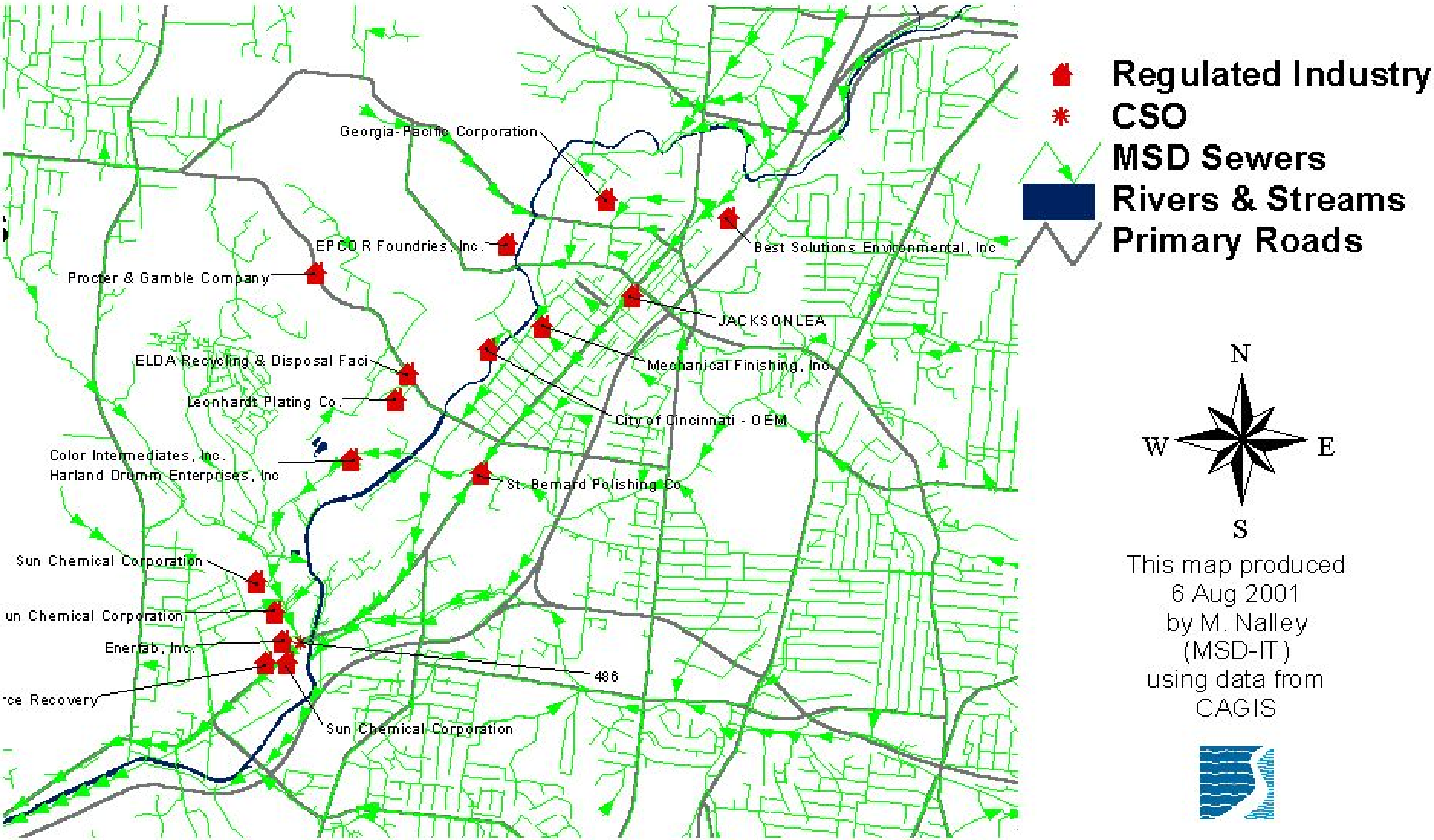


Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads

N
W
E
S

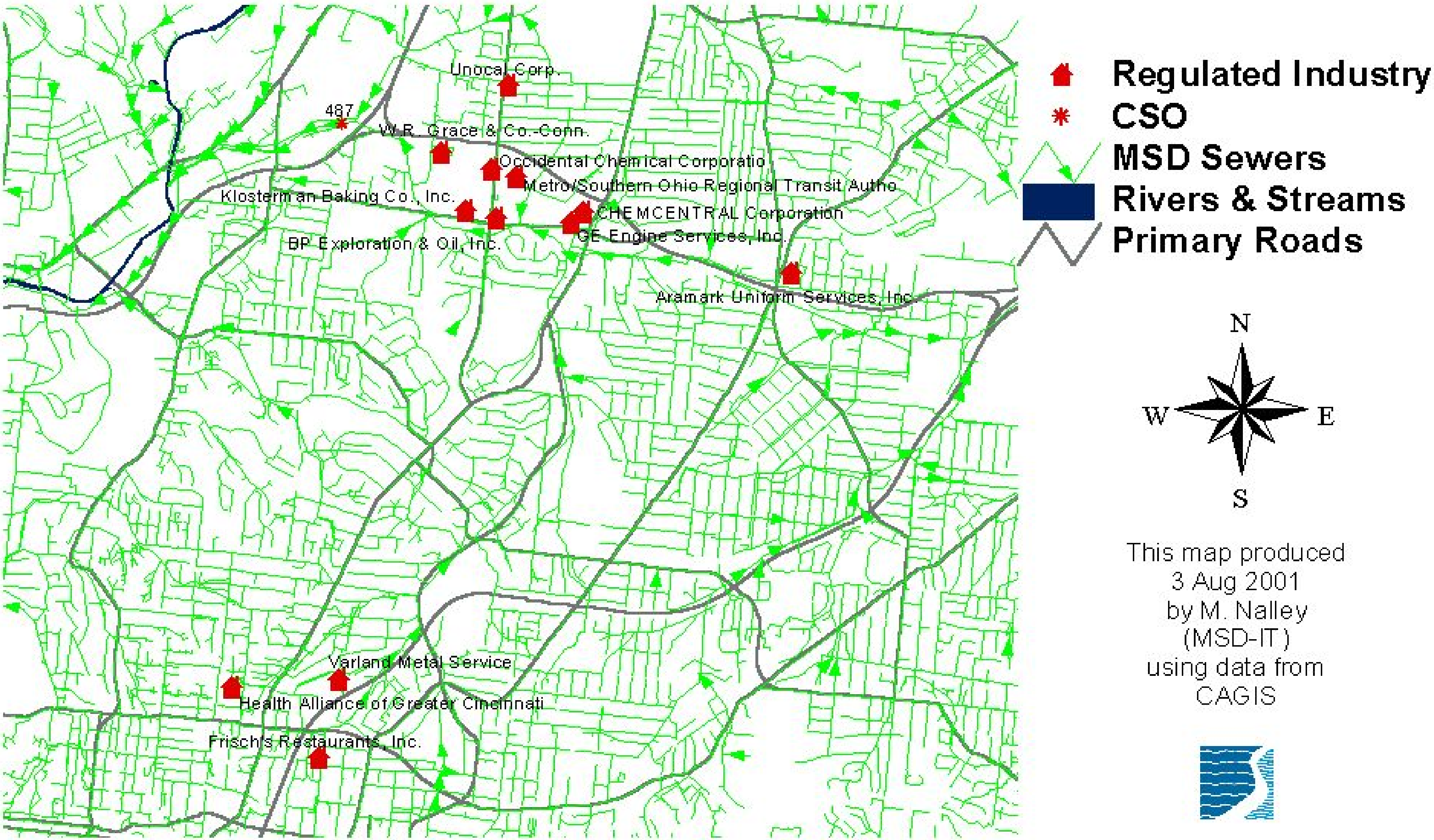
This map produced
6 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 486 (Sheet D)



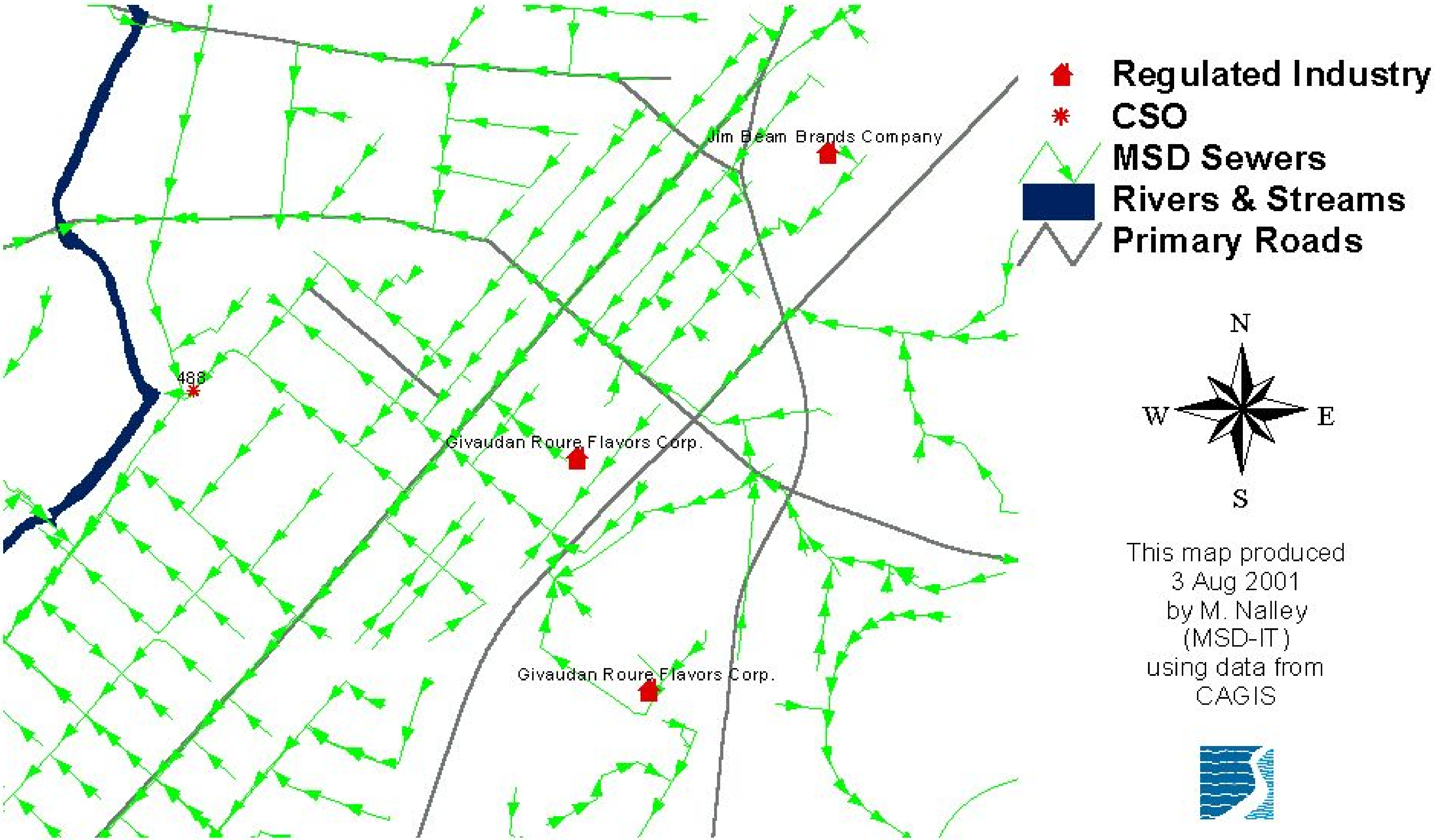
This map produced
6 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 487



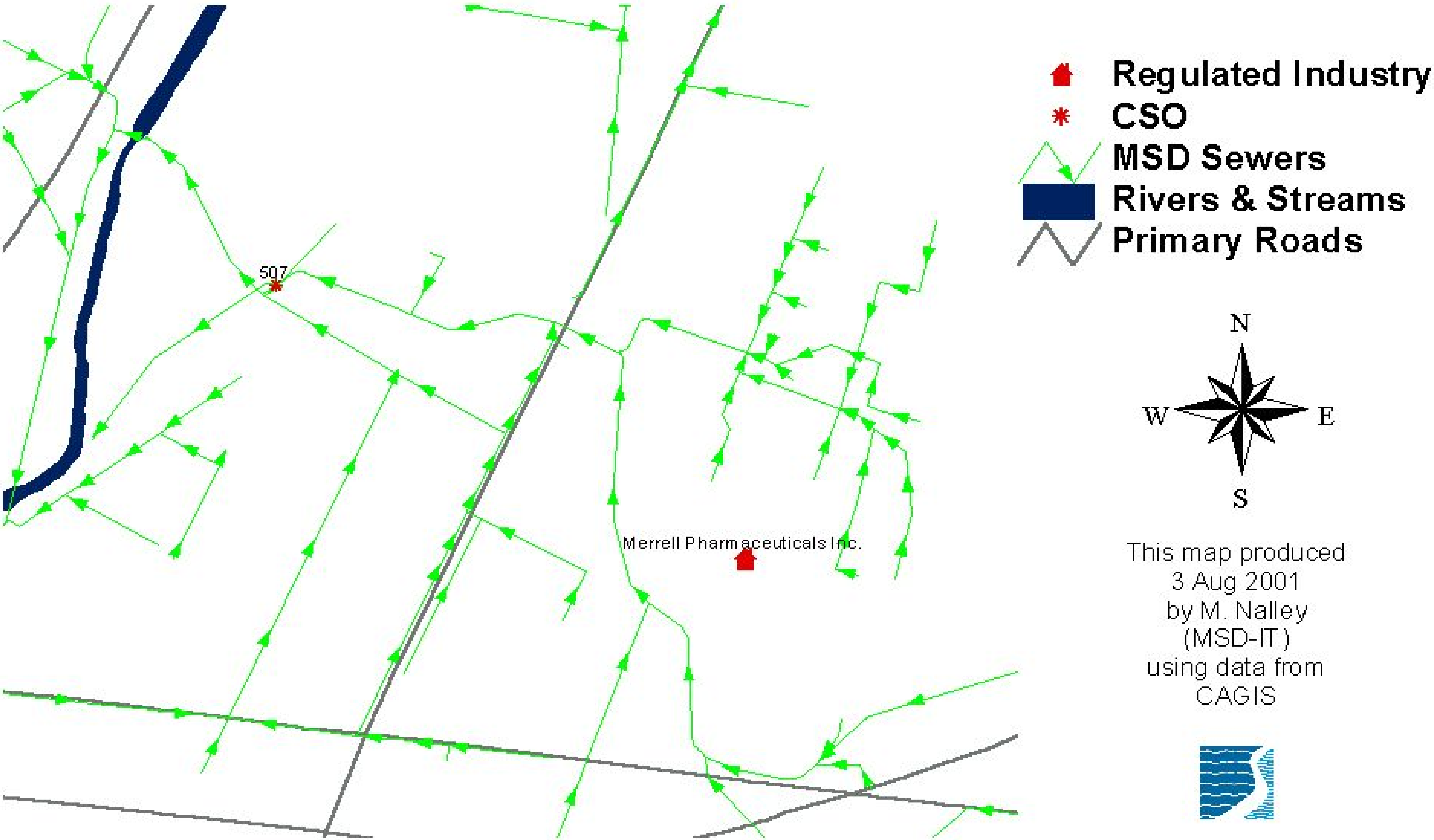
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 488



This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 507

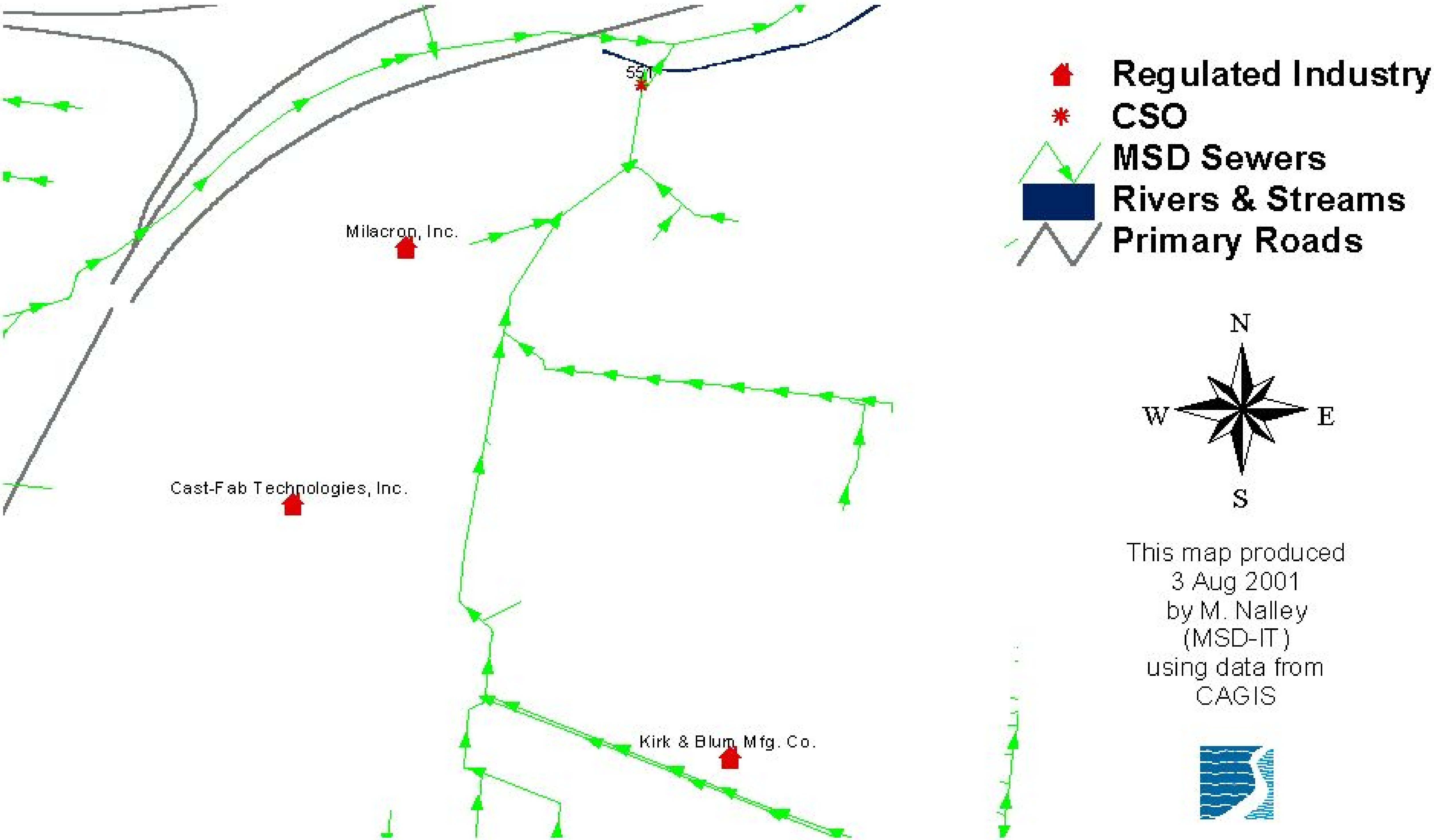


This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 513

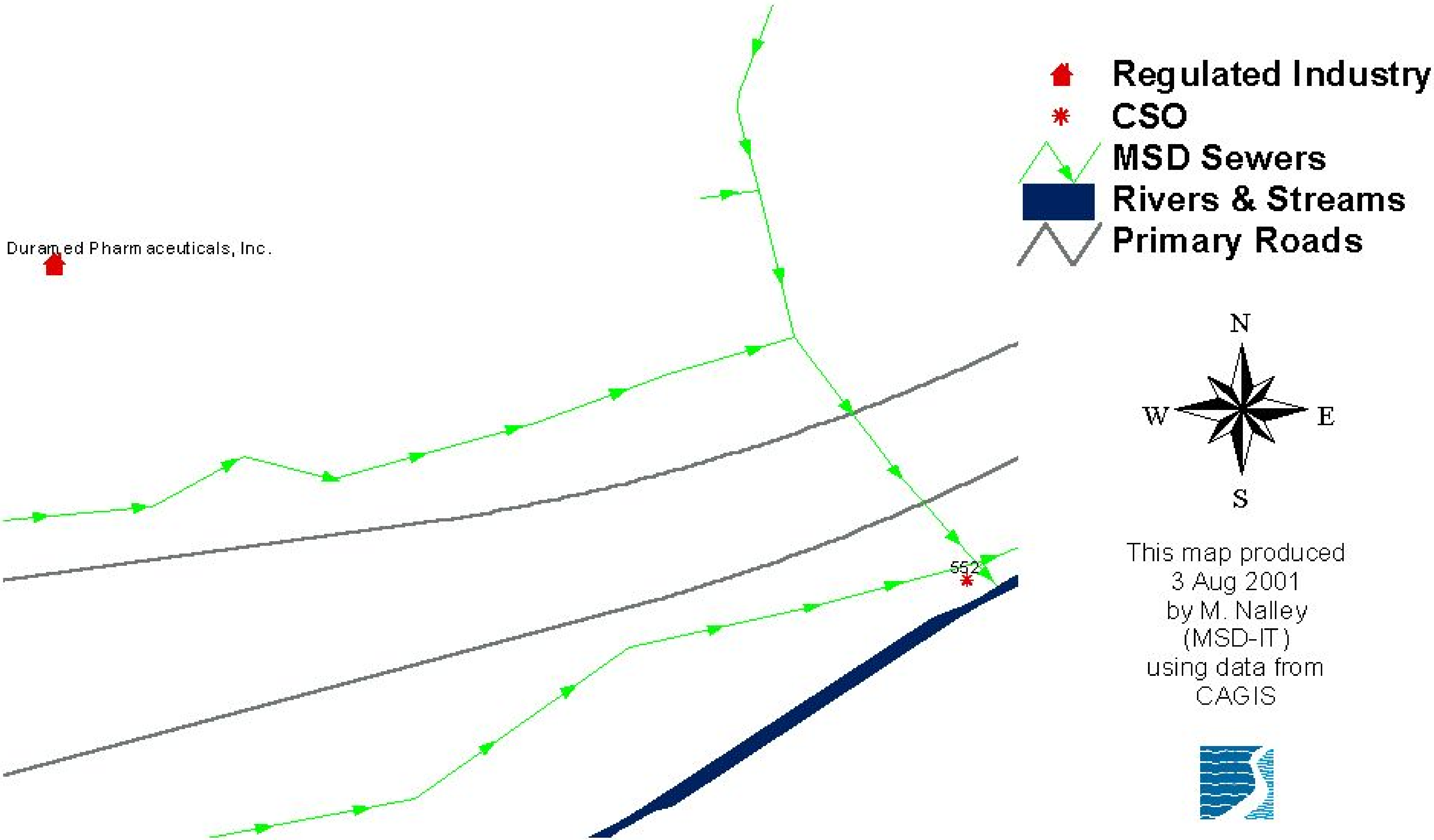

Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
Perkins Family Restaurants, L.P.
Rosemont Industries Inc.
513
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 551



This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 552


Duramed Pharmaceuticals, Inc.
552
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

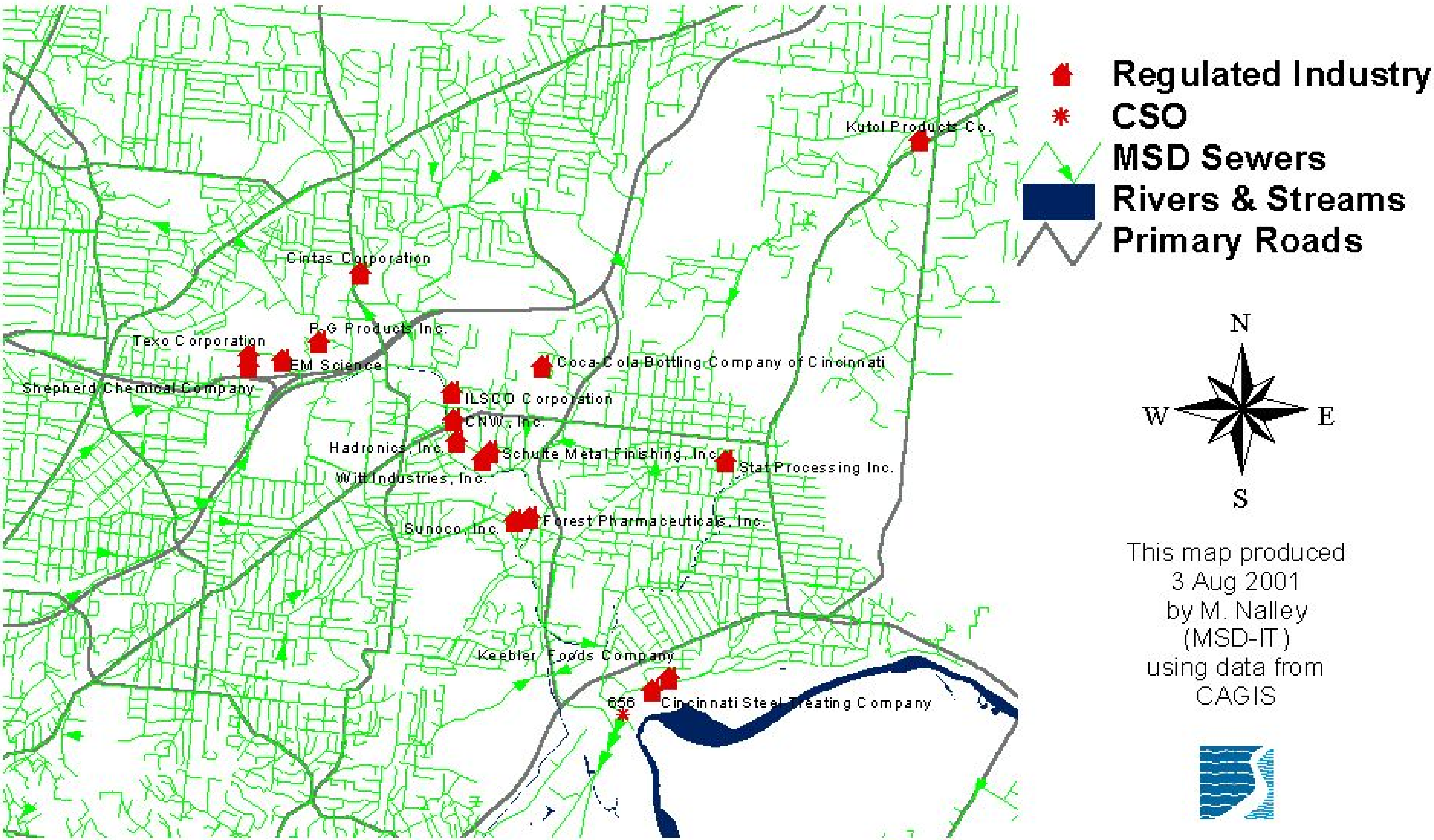
CSO 553

553
Cincinnati Machine
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 654

Hater Industries, Inc.
654
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

CSO 656


Kutol Products Co.
Cintas Corporation
P-G Products Inc.
Texo Corporation
EM Science
Shepherd Chemical Company
Coca-Cola Bottling Company of Cincinnati
ILSCO Corporation
CNW, Inc.
Hadronics, Inc.
Schulte Metal Finishing, Inc.
Stat Processing Inc.
Witt Industries, Inc.
Sunoco, Inc.
Forest Pharmaceuticals, Inc.
Keebler Foods Company
656
Cincinnati Steel Treating Company
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
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3 Aug 2001
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(MSD-IT)
using data from
CAGIS

CSO 666

Kaiser Foods, Inc.
Hoffmann Sausage Co.
Tri-State Beef Company
Club Chef Central
F.L. Emmert Company
Advanced Technology
Christ Hospital
Cincinnati Enquirer
Samuel Adams Brewery Company
Husman Snack Foods Co.
666
Regulated Industry
CSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

SSO Maps

MSD Industrial User (IU) Facilities tributary to SSO (includes Significant Industrial User (SIU) Facilities)

V-W-00-308-25 & 26
Items #34, #35, #36

Company Name	Premise Address	ZIP	Permit Type	IUN	Discharges to Sewer Segment	Contributes to CSO	Contributes to SSO
Stearns Technical Textiles Co.	100 Williams Street	45215	SIU	116	39902015-39902016	486	1009
Culligan Water Conditioning of Gr Cinc	10860 Millington Ct	45242	SIU	164	49305002-49305001	1052	
H.B. Fuller Company	4440/4450 Malsbary	45242	SIU	48	48306008-48311008	1052	
Jefferson Smurfit Corporation	9960 Alliance Road	45242	SIU	29	49509001-49509002	1052	
LSI Lighting Systems Inc.	10170 Alliance Road	45242	SIU	74	49516004-49401003	1052	
Xomox Corporation	4444 Cooper Rd.	45242-	SIU	200	48306009-48306008	1052	
Bethesda Hospital, Inc.	10500 Montgomery Ro	45242	nonSIU	10	54409008-54409013	1052	
Jewish Hospital	4777 E. Galbraith R	45236	nonSIU	255	48005012-48012005	1052	
Kutol Products Co.	7650 Camargo Road	45243	SIU	71	50011008-50011009	656	1053
Drew Graphics Division of CDR Pig & Di	11550 Gold Coast Dr	45249	SIU	369	53714006-53714005	565	
Green Bay Packaging Inc.	7660 School Road	45249	SIU	325	53810004-53810005	565	
Amano Cincinnati, Inc.	130 Commerce Blvd.	45140	nonSIU	263	58804010-59101001	565	
Combined Containerboard Inc	7741 School Rd	45249	nonSIU	628	53810007-53810006	565	
Cindus Corporation	515 Station Avenue	45215	nonSIU	340	38305012-40009002	486	572
Michelman, Inc.	9080 Shell Road	45236	SIU	156	48202009-48202008	486	603
Steelcraft Div. of Ingersoll-Rand Co	9017 Blue Ash Rd.	45242	SIU	117	48114004-48114003	486	603
Rumpke Sanitary Landfill, Inc.	10795 Hughes Rd.	45251	SIU	105	26501012-26501013	486	628
Japlar Acquistion Co	4500 Alpine Ave.	45242	nonSIU	249	48203003-48203002	486	682
DONISI MIRROR COMPANY	507 Loveland-Maderi	45140	SIU	34	60512011-60512012	690	
CEEMCO Inc.	5313 Robert Ave	45248	SIU	1470	20609006-20609005	198	692
International Industrial Services	10520 Chester Road	45215	SIU	77	20608001-20608002	198	692
Stegner Food Products Co. Inc.	3640 Muddy Creek Ro	45238	SIU	119	20607021-20607020	198	692
Victory Plating, Inc.	3814 Olivette Avenu	45211	SIU	132	23701028-23701029	198	692
Franciscan Hospital Western Hiills Ca	3131 Queen City Ave	45238	nonSIU	114	23908025-23908026	198	692
Allwaste Container Services, Inc.	10671 Evendale Driv	45241	SIU	382	43509001-43509002	486	700
Aluminum Extruded Shapes, Inc.	10549 Reading Road	45241	SIU	5	43505001-43504007	486	700
American Metal Cleaning of Cincinnati,	475 Northland Blvd.	45240	SIU	425	35610003-35610004	486	700
Astro Container	2795 Sharon Road	45241	SIU	7	43602008-43602011	486	700
Avon Products, Inc.	175 Progress Place	45246	SIU	8	39015006-39015005	486	700
Cargo Clean, Inc.	10300 Evendale Dr.	45241	SIU	1218	43501003-43416004	486	700
Celsus Laboratories, Inc.	12150 Best Place	45241	SIU	1279	43815004-43815001	486	700
Cincinnati Drum Service, Inc	400 Cavett Ave.	45215	SIU	20	39805002-39805001	486	700
DiverseyLever, Inc.	3630 East Kemper Rd	45241	SIU	38	44212001-44205002	486	700
Ethicon Endo-Surgery, Inc.	4545 Creek Road	45242	SIU	692	48505003-48505002	486	700
Floturn, Inc.	120 Progress Place	45246	SIU	332	39103001-39014001	486	700
Ford Motor Company	3000 Sharon Road	45241	SIU	44	43615019-43610013	486	700
Formica Corporation	10155 Reading Road	45241	SIU	46	43315006-43315004	486	700
GE Engine Services, Inc.	199 Container Pl.	45246	SIU	239	39101001-39101002	486	700
General Mills Operations, Inc.	11301 Mosteller Roa	45241	SIU	101	43702006-43615023	486	700
Gold Medal Products, Inc	10700 Medallion Dr.	45241	SIU	1302	43514001-43511001	486	700
Green Bay Dressed Beef, Inc.	3480 E. Kemper Road	45241	SIU	1479	44211010-44206001	486	700
John Morrell & Co.	801 East Kemper Roa	45246	SIU	30	39409006-39409007	486	700
Keco Industries, Inc.	11060 Kenwood Road	45242	SIU	289	49315004-49315003	486	700
Kroger Co.	11801 Chesterdale R	45246	SIU	69	39306005-39306004	486	700
Lehr Precision, Inc.	11230 Deerfield Roa	45242	SIU	1	53701007-53701003	486	700
Lehr Precision, Inc.	11495 Deerfield Rd.	45242	SIU	143	53709010-53709007	486	700
METLWEB Ltd.	3330 E. Kemper Road	45241	SIU	1464	44211004-44211003	486	700
Michelman, Inc.	3023 East Kemper Ro	45241	SIU	1500	44201007-44201005	486	700
Morton International, Inc.	2000 West Street	45215	SIU	84	39804011-39804010	486	700
National Starch and Chemical Compan	2960 Exon Ave	45241	SIU	85	43504003-43503010	486	700
Procter & Gamble Co	11510 Reed Hartman	45241	SIU	189	49215007-49210010	486	700
Sealtron, Inc.	9705 Reading Road	45215	SIU	109	43310012-43307021	486	700
Trans-Acc, Inc.	11167 Deerfield Rd.	45242	SIU	124	53616004-53701001	486	700
United Waste Water Services, Inc	11807 Reading Road	45241	SIU	413	44214002-44214001	486	700
Wornick Company	10825 Kenwood Road	45242	SIU	317	49307002-49307003	486	700

MSD Industrial User (IU) Facilities tributary to SSO (includes Significant Industrial User (SIU) Facilities)

Company Name	Premise Address	ZIP	Permit Type	IUN	Discharges to Sewer Segment	Contributes to CSO	Contributes to SSO
Amko Plastics, Inc.	12025 Tricon Rd.	45246	nonSIU	242	39103003-39103002	486	700
Ashland Chemical Company	2788 Glendale-Milfo	45241	nonSIU	356	43503011-43506005	486	700
Feintool Cincinnati Inc.	11280 Cornell Park	45242	nonSIU	252	49210006-49211001	486	700
International Paper Company	100 Progress Place	45246	nonSIU	171	39014002-39014003	486	700
Ralph J. Stolle Co.	6954 Cornell Road	45242	nonSIU	172	53701008-53701007	486	700
Riverwood International Corp.	10600 Evendale Dr	45241	nonSIU	102	43508002-43508001	486	700
Trinity Industries, Inc.	11861 Mosteller Rd	45241	nonSIU	190	43802011-43802007	486	700
Xtek, Inc.	11451 Reading Road	45241	nonSIU	271	44202006-44202005	486	700
Sunoco, Inc.	6745 Cornell Rd.	45242	LTD	415	53701001-49204011	486	700
Hater Industries, Inc.	240 Stille Drive	45233	SIU	54	19708011-19708010	654	701
Lindsey Motor Express, Inc.	3500 Southside Avenue	45204	SIU	75	24708005-24708004	416	701

SSO 565

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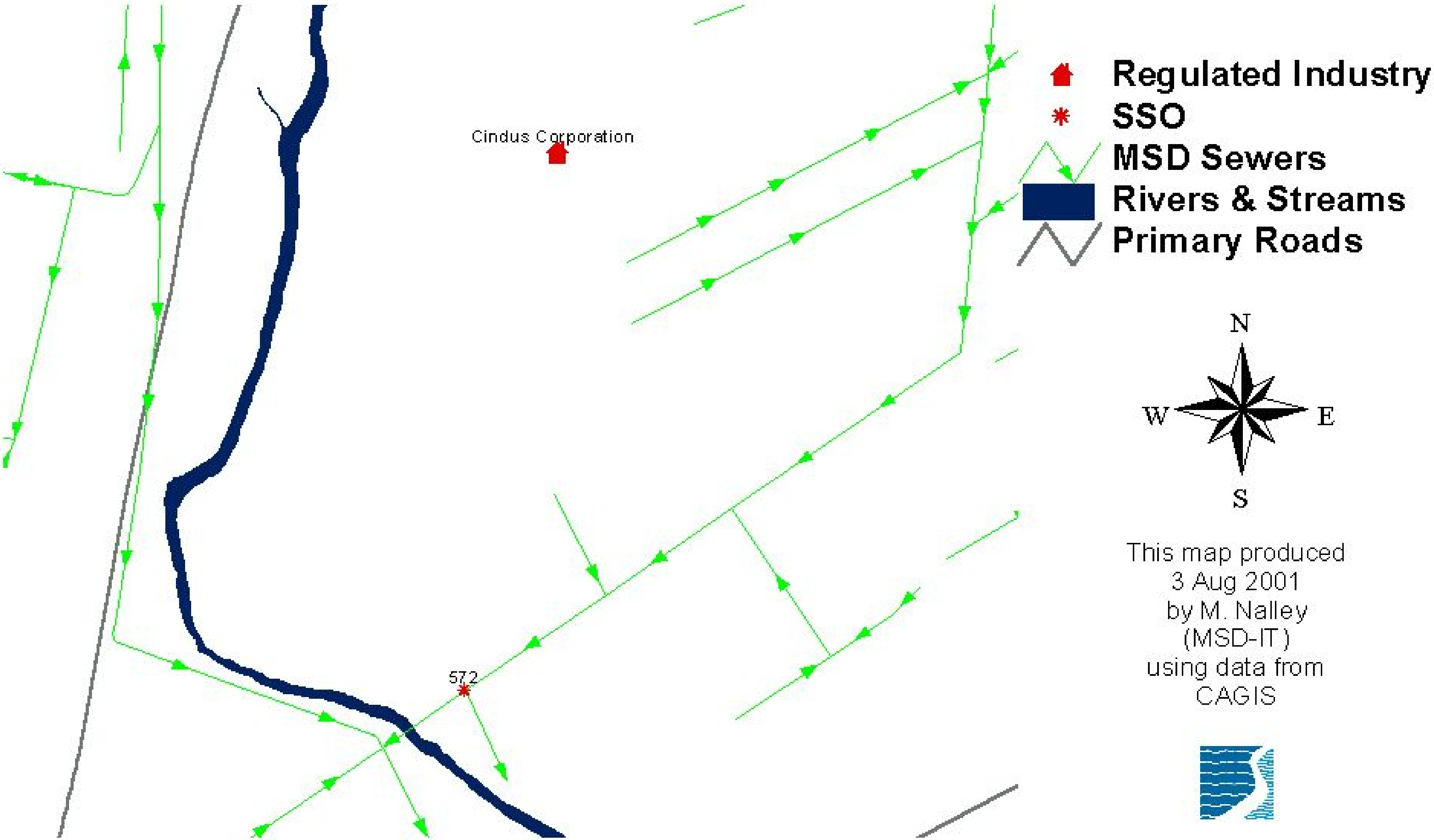
using data from
CAGIS

SSO 572


Cindus Corporation
572
Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
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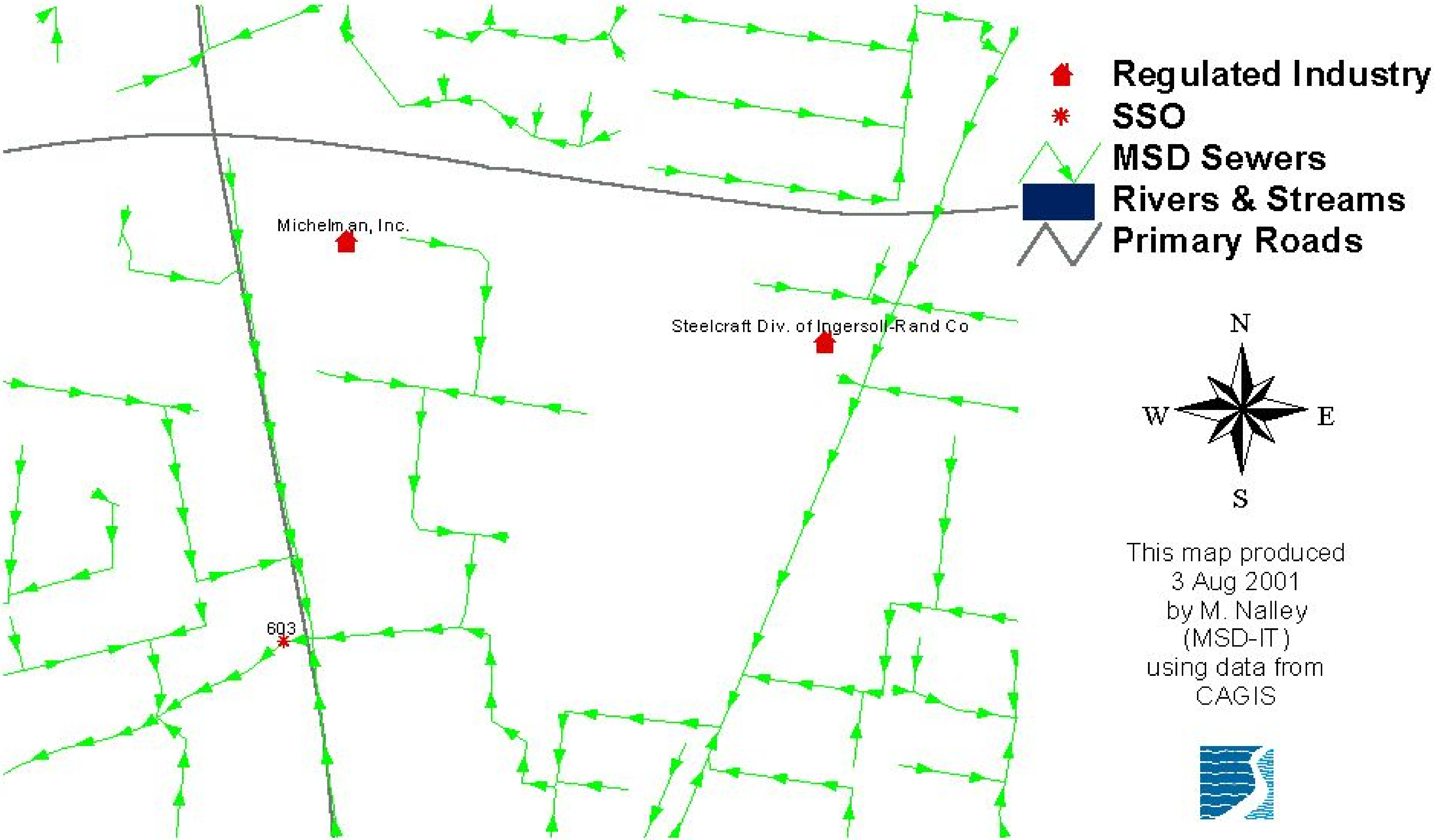
CAGIS

SSO 603


Michelman, Inc.
Steelcraft Div. of Ingersoll-Rand Co
603
Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
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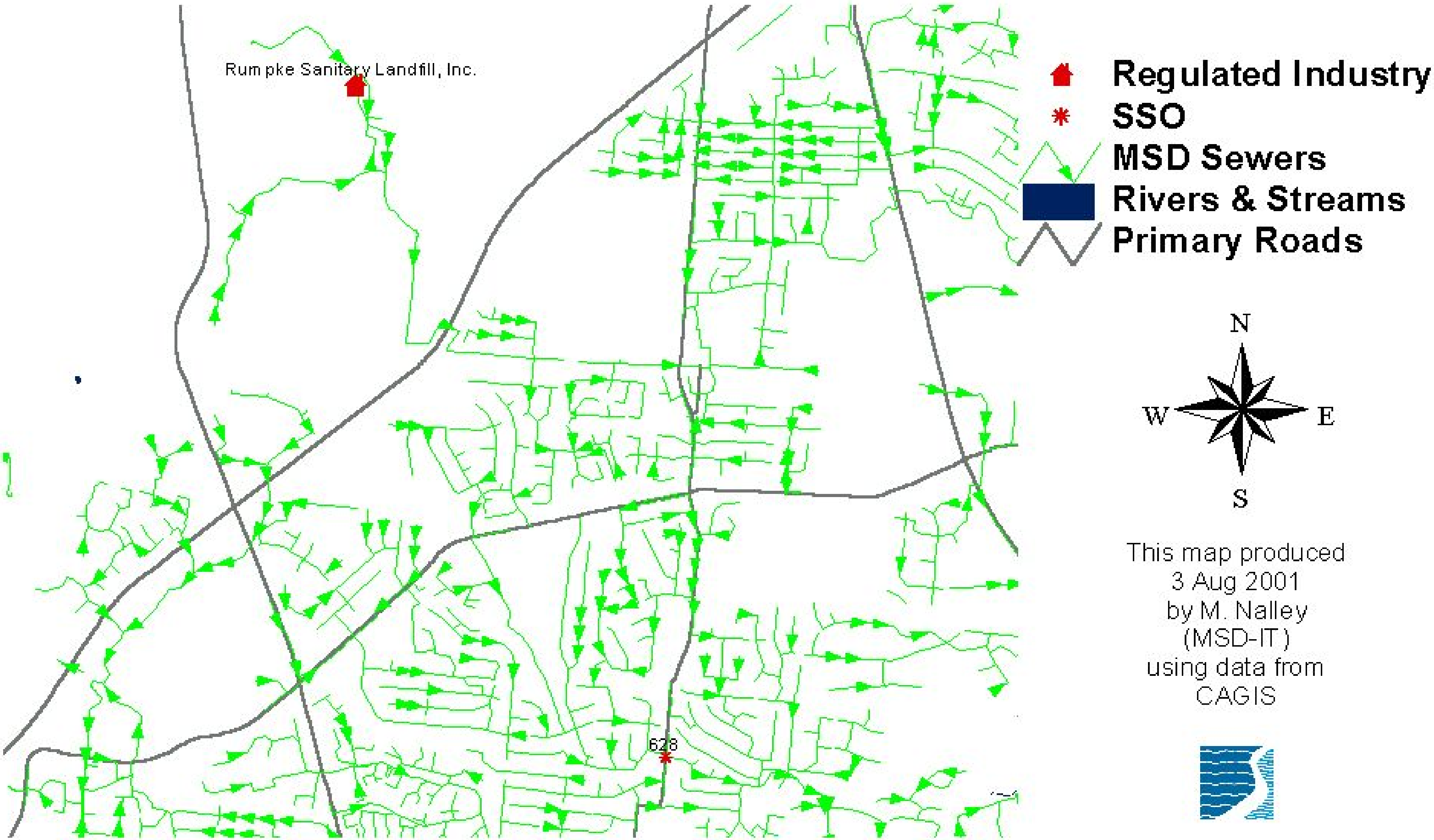
SSO 628


Rumpke Sanitary Landfill, Inc.
628
Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
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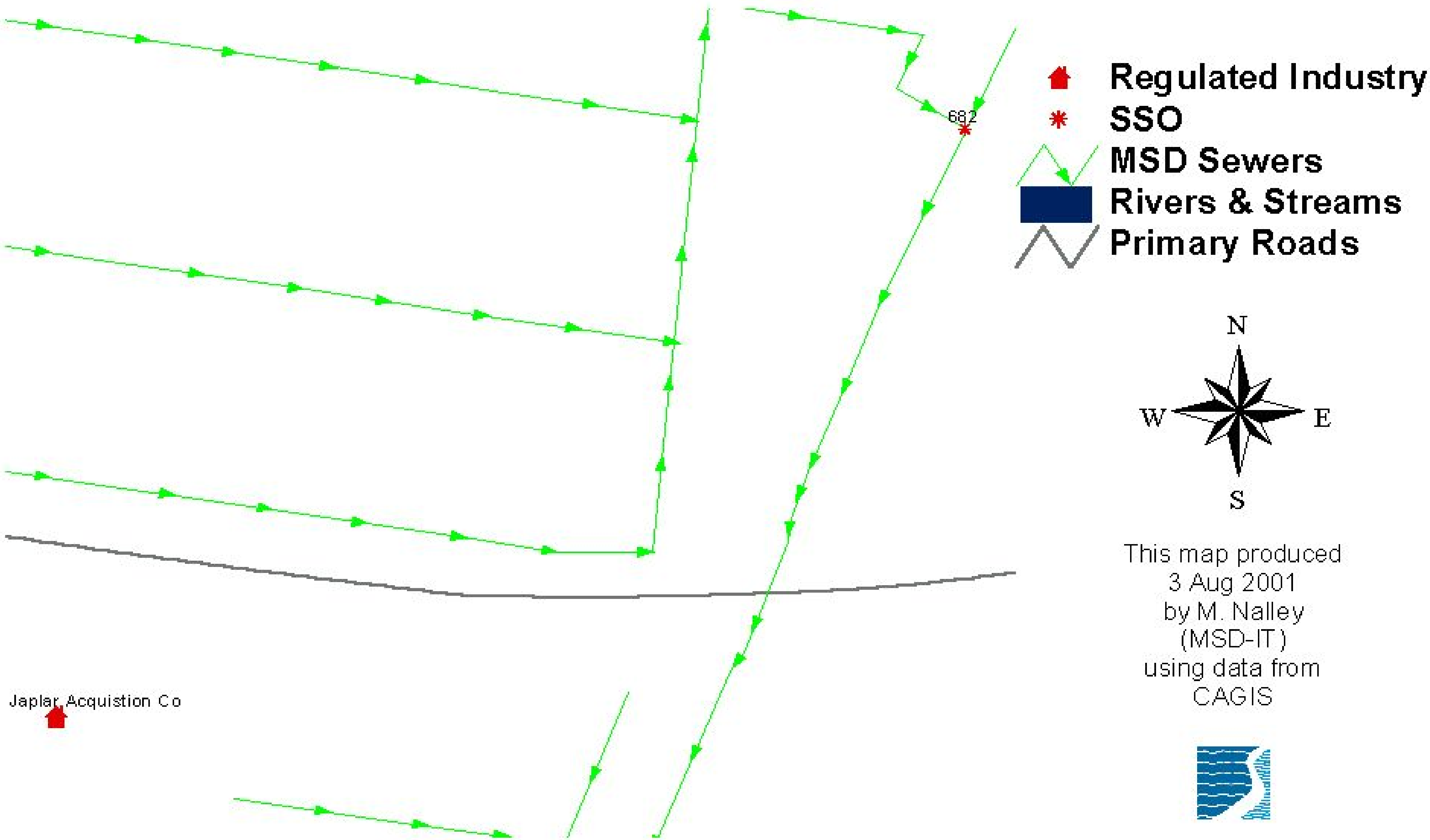
by M. Nalley
(MSD-IT)
using data from
CAGIS

SSO 682


682
Japlar Acquistion Co
Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
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SSO 690

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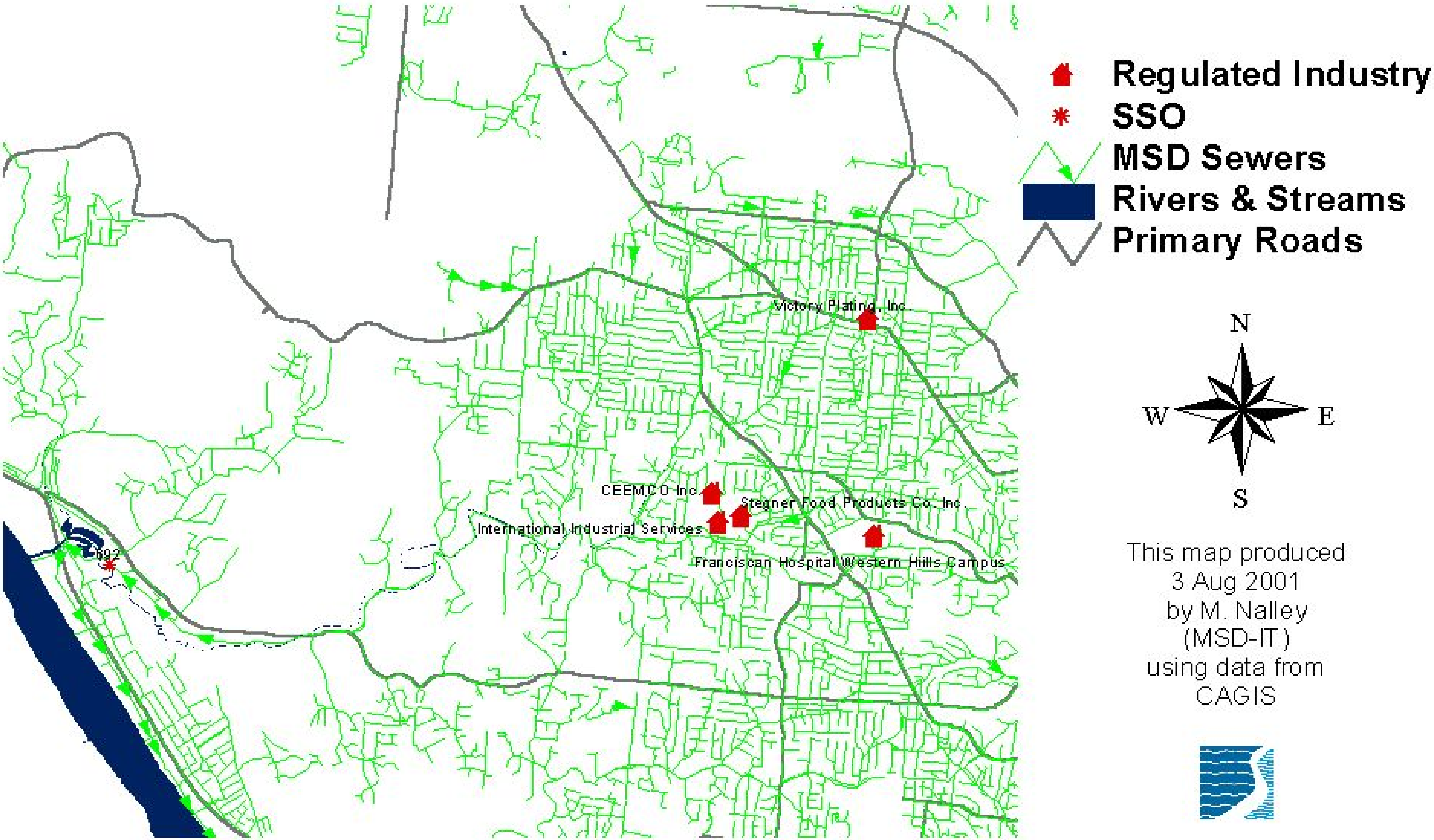
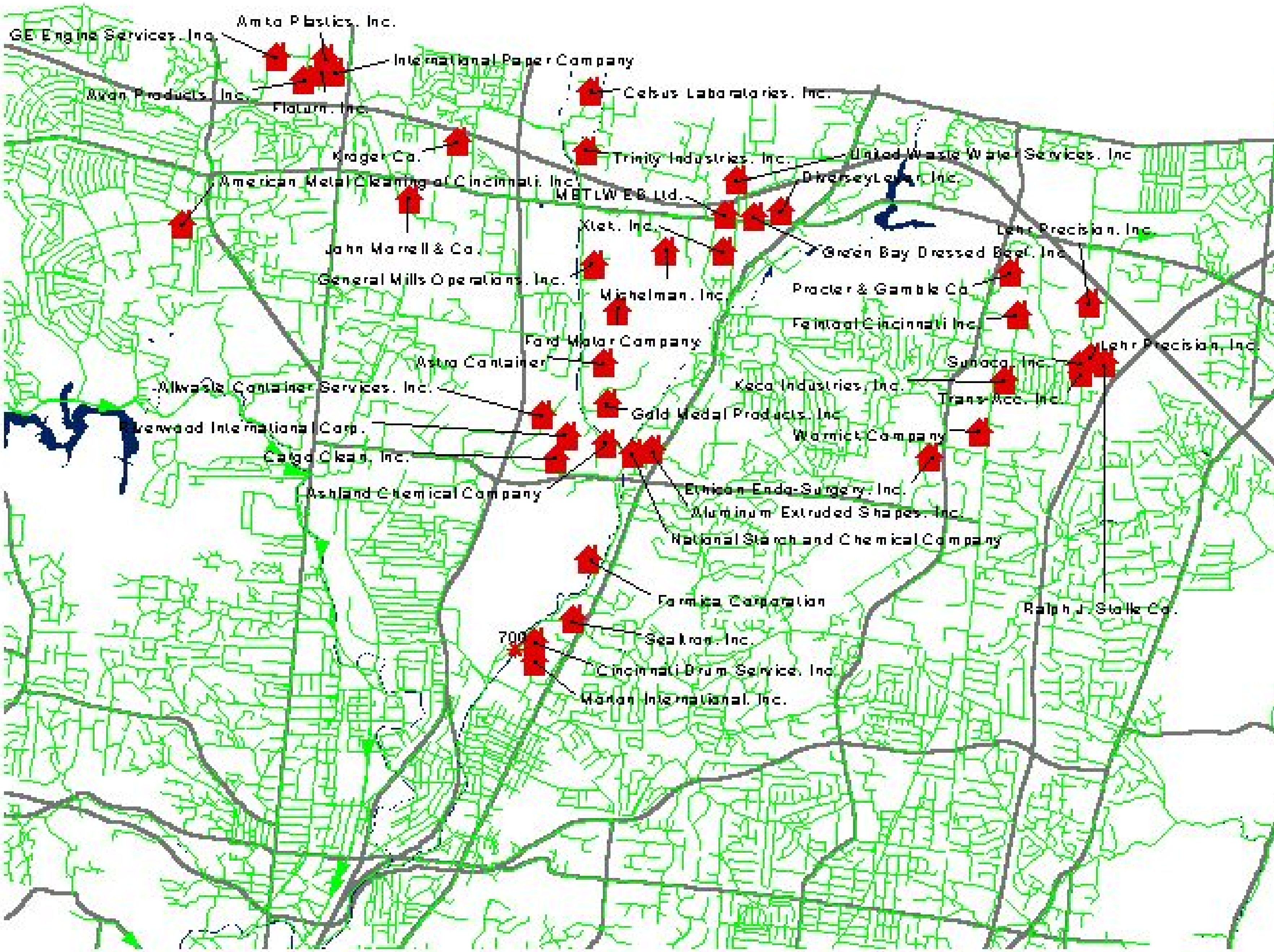
SSO 692



Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
Victory Plating, Inc.
CEEMCO Inc.
Stegner Food Products Co. Inc.
International Industrial Services
Franciscan Hospital Western Hills Campus
692
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

SSO 700



Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads

N
W
E
S

This map produced
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by M. Nalley
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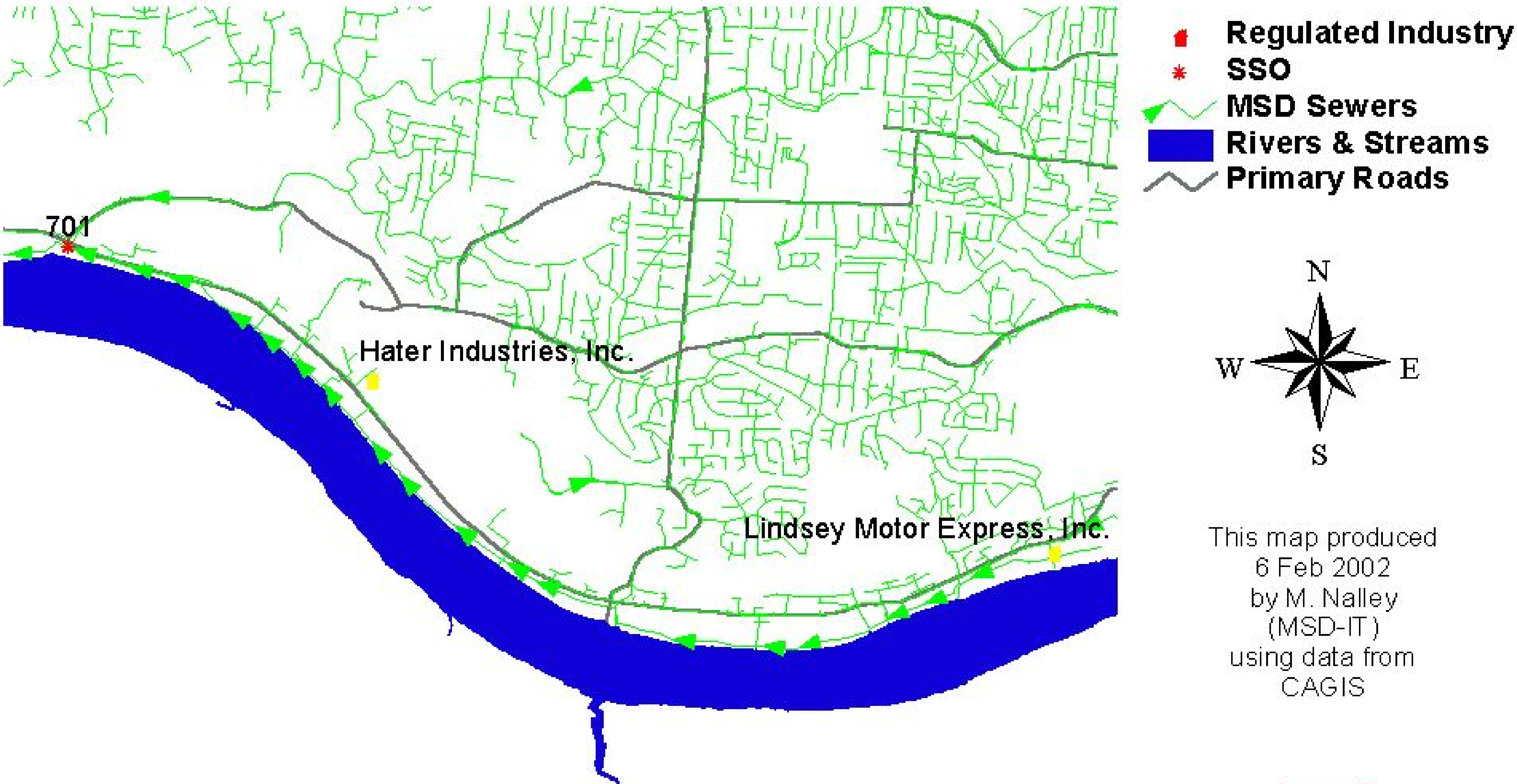
using data from
CAGIS

SSO 701



This map produced
6 Feb 2002
by M. Nalley
(MSD-IT)
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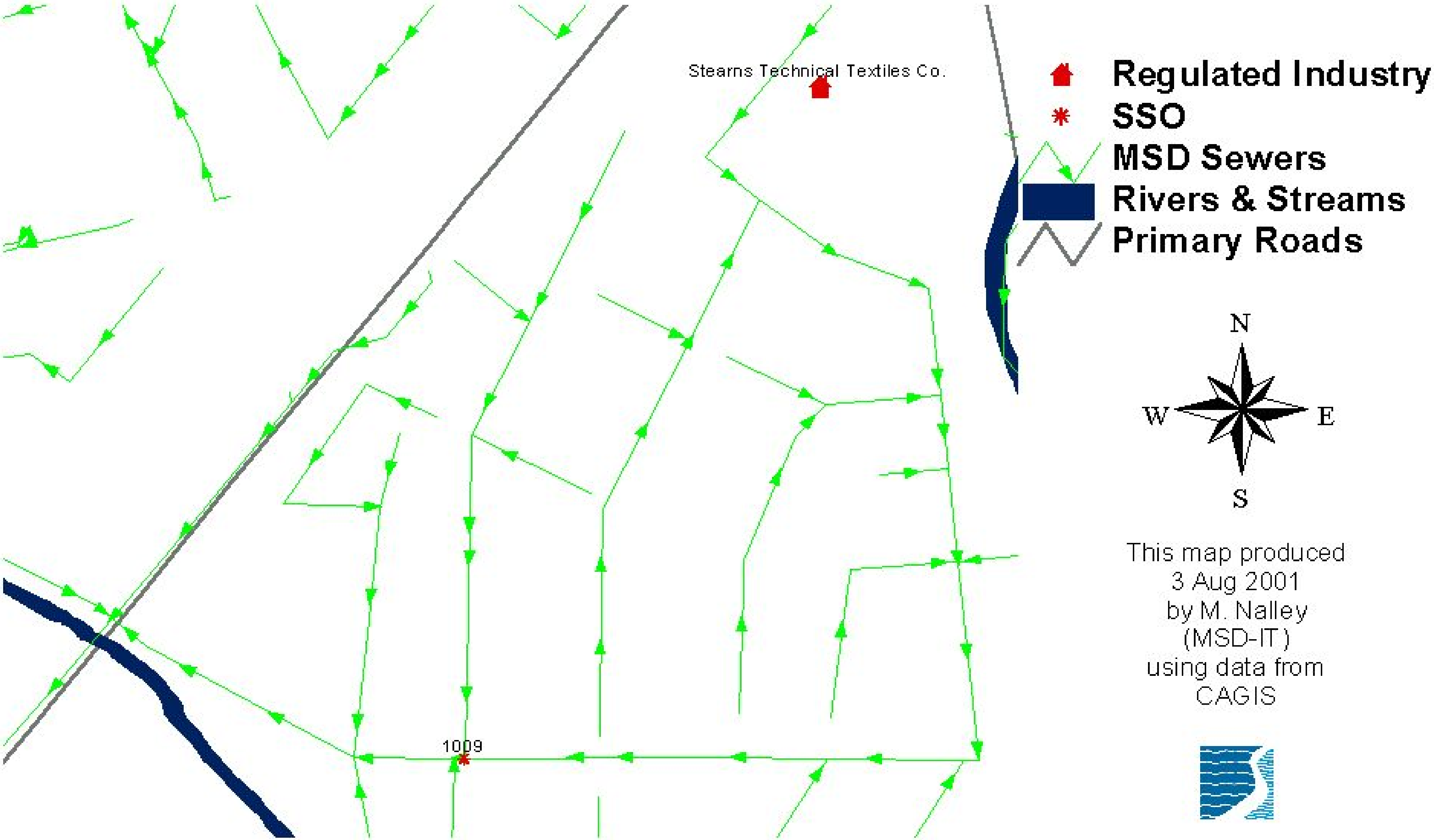
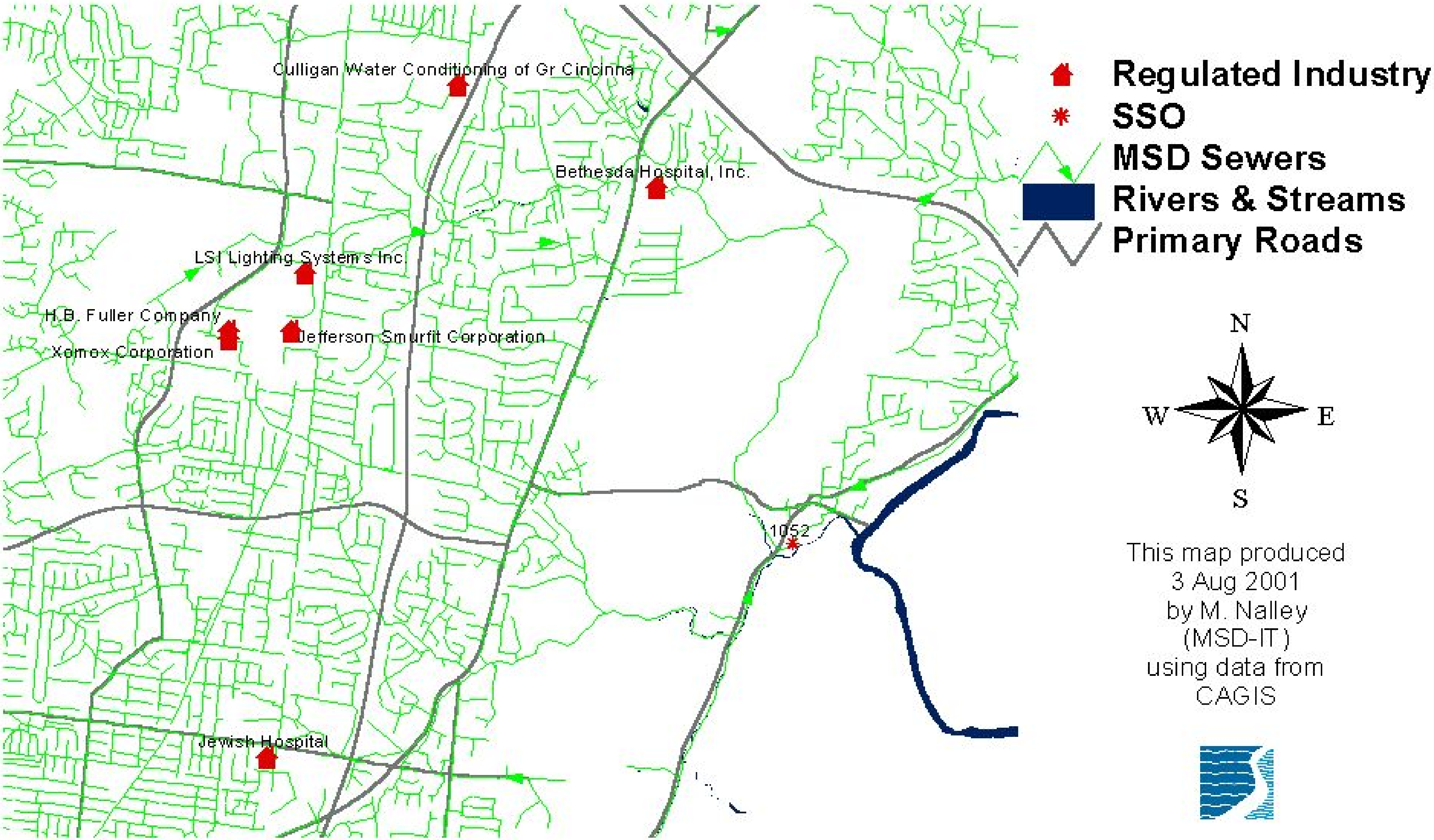
CAGIS

SSO 1009


Stearns Technical Textiles Co.
1009
Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads
N
W
E
S
This map produced
3 Aug 2001
by M. Nalley
(MSD-IT)
using data from
CAGIS

SSO 1052



This map produced
3 Aug 2001
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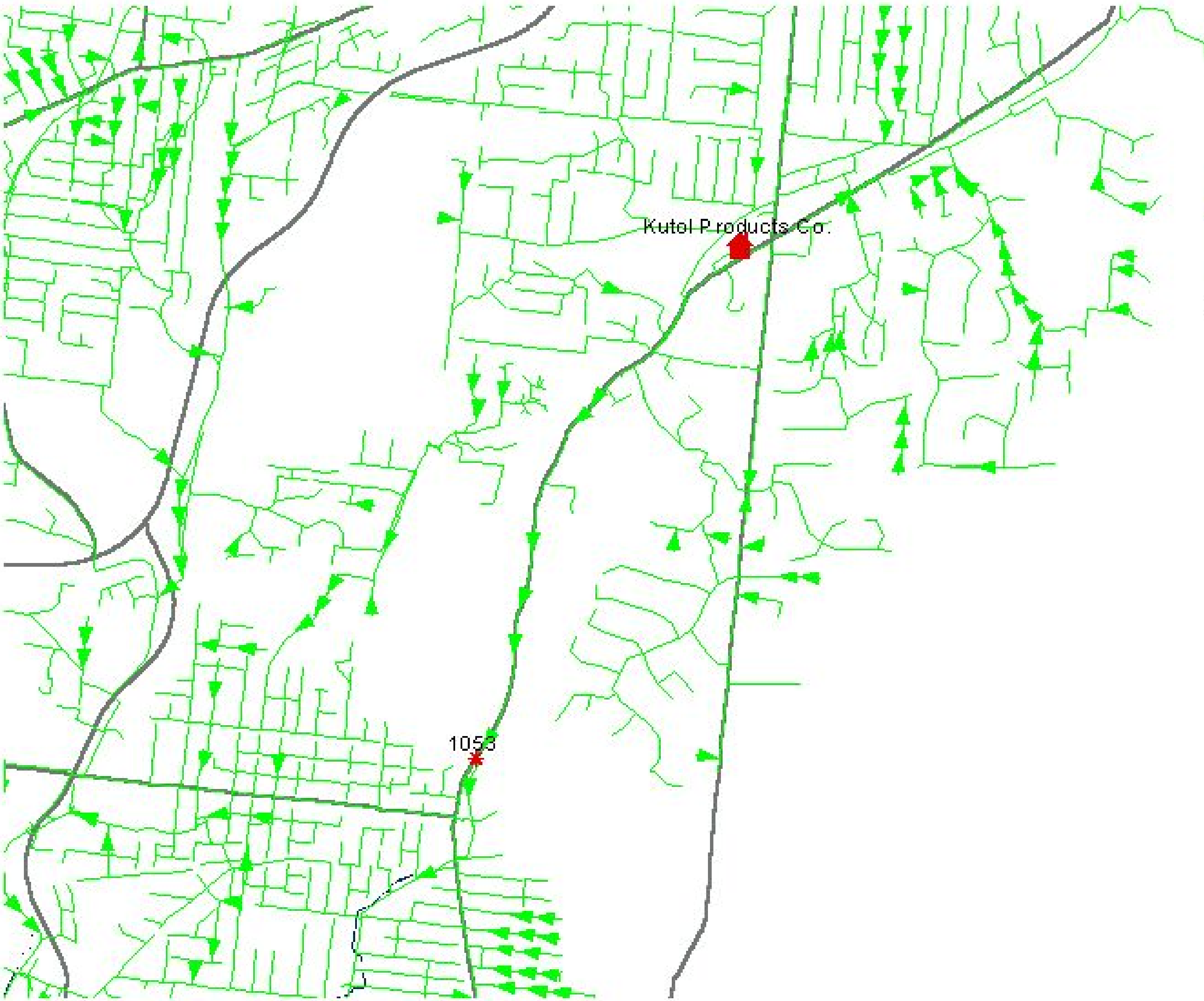
(MSD-IT)
using data from
CAGIS

SSO 1053



Regulated Industry
SSO
MSD Sewers
Rivers & Streams
Primary Roads

N
W E
S

This map produced
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CAGIS

APPENDIX G

Surface Water Monitoring Sampling Locations

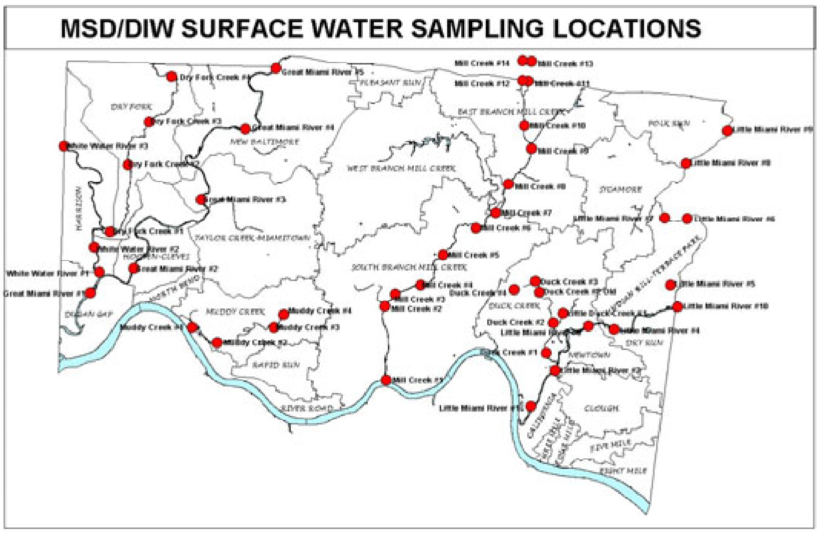
STREAM MONITORING PROGRAM
SUMMARY SHEET

Program Name:	SURFACE WATER MONITORING
Responsibility:	DIVISION OF INDUSTRIAL WASTE
Objective(s):	
To provide a baseline for assessing stream water quality during dry and wet weather conditions; To establish a database of historical data to be used as supporting information when evaluating limits established in mandated programs (NPDES discharge limits, TMDLs, water quality standards, Local Limits, etc.); To provide supporting documentation of the actual effectiveness/impact of the District's activities and programs on the environment; Provide information for responding to and resolving citizen's complaints; Identification of point and non-point sources that affect or have the potential to affect the water quality of the surface waters of Hamilton County to assist in special/investigative responses; Identification of illegal discharges to surface waters; Provide a baseline of data prior to extending sewer service to areas of Hamilton County;	
How long has this program been active?	Initiated in 1995
Program Activities:	• General description of activities • Where, how many sites? • Frequency of sampling? • Type of sampling (grab, composite, descrete)
The Division of Industrial Waste implemented a stream-monitoring program in late 1994. Full implementation was established in 1995. Sample locations on the major surface water sites in Hamilton County have been identified. The sample locations bracket known CSOs and SSOs in sewered areas; are located at the points where all water bodies enter and exit Hamilton County; may be located in areas identified as problems by the Division or other agencies; and upstream and downstream of the discharges of WWTP. At present, grab samples are taken in midstream at forty-six locations every three to four weeks. In 2001, sampling will be conducted monthly. Map of Sampling Locations attached.	
Analysis:	• Parameters • QA/QC Procedures (field, lab, assessment)
Samples are analyzed for metals, volatile and semi-volatile organics, phenols, oil and grease, and fecal coliform. Samples are included in the Division's established field and laboratory QA/QC program, which include field, trip, and sample blanks; precision and accuracy determination of at least 10% of all samples analyzed, etc.	
Data Management:	• Format (paper, electronic) • Is there historical data? • Where does the data resided? • Who has access?
At present data is maintained in both electronic and paper format in the Division of Industrial Waste's files and databases. Historical data dates back to 1995. Members of the Division's staff can access the data.	
Reporting:	• Who are you reporting too? Internal/External • Format • Frequency
Data is reported to the Superintendent of the Division of Industrial Waste if review reveals problems or distinct deviations from previous data. Investigations into causes generate follow-up activities that may include other divisions, local or state agencies. When data is required for follow-up of investigations involving other agencies, data is also reported to that agency, i.e. OEPA, in the format requested. Data has been published in the Department's Water Quality Report in 1998. Data has also been requested by a variety of groups, such as USGS, Green Acres Foundation, school programs, and several environmental organizations.	
Future Needs:	• Where is the program going? • Is there a need to expand/enhance? • When are these changes required • Are there regulatory needs coming?
The program is being expanded in 2001 to include the collection of physical and field data such as temperature, dissolved oxygen, conductivity, pH, and weather conditions. Also, due to previous staffing conditions, there is a preponderance of dry weather data. With the filling of a previously vacant position,	

plans are to increase the sampling frequency to include more wet weather sampling. Additional goals include the correlation of rainfall data with the sampling events; development of a model for tracing slug loadings in local surface waters; customization of the GIS to include improved functionality for accessing data on the sample locations; and more consistent review of the data to evaluate changes or additions to existing divisional programs and activities. Continuation of this program provides additional support for the proposed SSO rule, which includes an ambient water quality monitoring program in the CMOM requirements.

Comments: Map of Sampling Locations

1.1 Map of Sampling Locations



MSD/DIW OF GREATER CINCINNATI OHIO
SURFACE WATER SAMPLING LOCATIONS

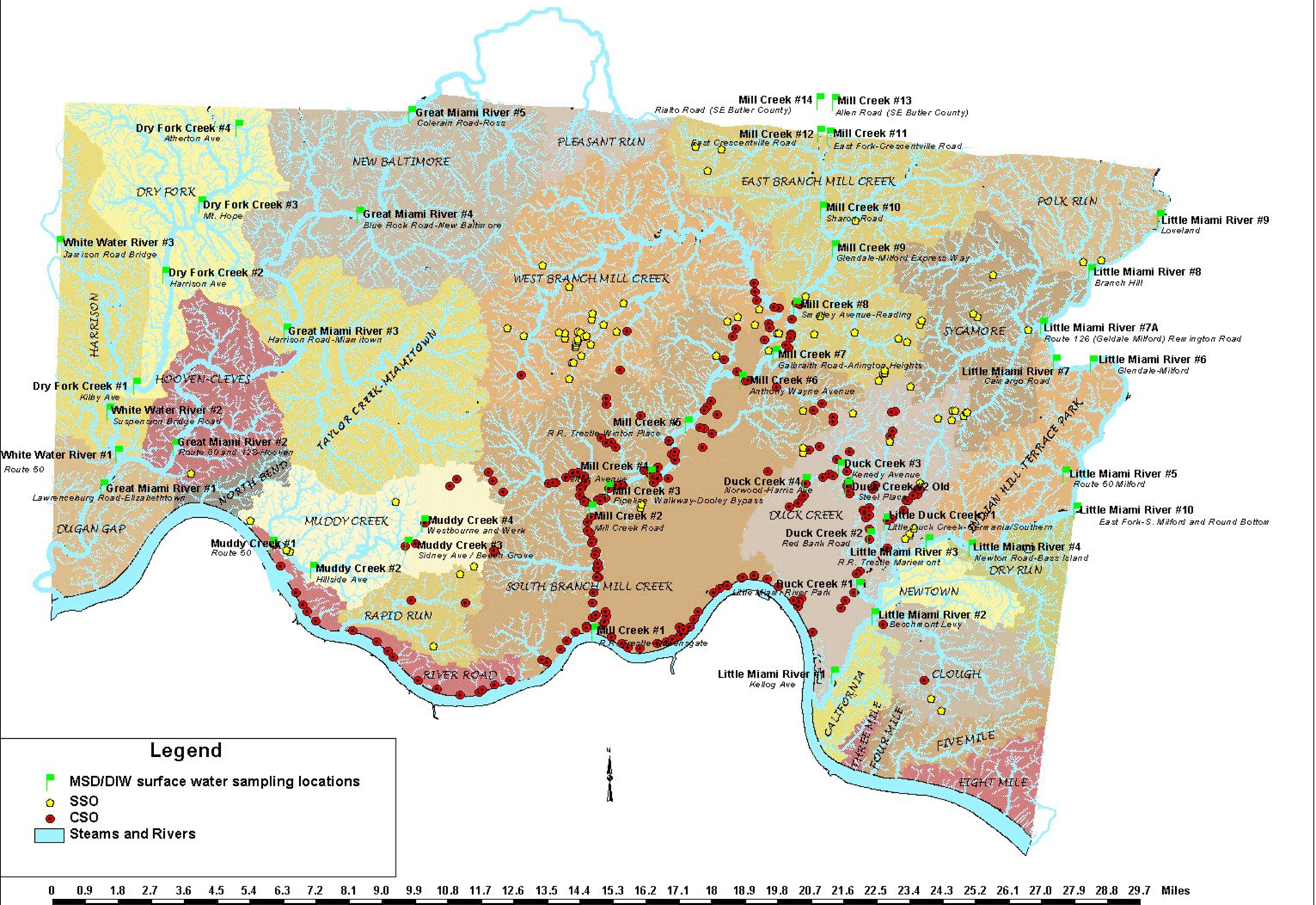
RIVER MILE	LOCATION CODE	SURFACE WATER LOCATION NAME	ADDRESS
0.52	DRY-CR	Dry Fork Creek #1	Kilby Ave
4.32	DRY-CR	Dry Fork Creek #2	Harrison Ave
6.95	DRY-CR	Dry Fork Creek #3	Mt. Hope
9.98	DRY-CR	Dry Fork Creek #4	Atherton Ave
5.45	GM-RV	Great Miami River #1	Lawrenceburg Road/Elizabethtown
8.40	GM-RV	Great Miami River #2	Route 50 and 128/Hooven
15.34	GM-RV	Great Miami River #3	Harrison Road/Miamitown
21.30	GM-RV	Great Miami River #4	Blue Rock Road/New Baltimore
26.14	GM-RV	Great Miami River #5	Colerain Road/Ross
1.07	LD_CR	Little Duck Creek #1	Little Duck Creek-Germania/Southern
1.10	LIT-RV	Little Miami River #1	Kellog Ave
3.32	LIT-RV	Little Miami River #2	Beechmont Levy
6.83	LIT-RV	Little Miami River #3	R.R. Trestle/Mariemont
8.15	LIT-RV	Little Miami River #4	Newton Road/Bass Island
12.98	LIT-RV	Little Miami River #5	Route 50 Milford/Water Street
17.41	LIT-RV	Little Miami River #6	Glendale-Milford
18.40	LIT-RV	Little Miami River #7	Camargo Road
19.40	LIT-RV	Little Miami River #7A	Route 126 (Glendale Milford) Remington Road
21.62	LIT-RV	Little Miami River #8	Branch Hill
24.18	LIT-RV	Little Miami River #9	Loveland
11.60	LIT-RV	Little Miami River #10	East Fork-S. Milford and Round Bottom
0.05	MIL-CR	Mill Creek #1	R.R. Trestle-Queensgate
3.50	MIL-CR	Mill Creek #2	Mill Creek Road
4.25	MIL-CR	Mill Creek #3	Pipeline Walkway/Dooley Bypass
5.52	MIL-CR	Mill Creek #4	Clifton Avenue
7.45	MIL-CR	Mill Creek #5	R.R. Trestle Winton Place
10.00	MIL-CR	Mill Creek #6	Anthony Wayne Avenue
11.30	MIL-CR	Mill Creek #7	Galbraith Road/Arlington Heights
12.88	MIL-CR	Mill Creek #8	Smalley Avenue/Reading
14.80	MIL-CR	Mill Creek #9	Glendale-Milford Express Way
16.00	MIL-CR	Mill Creek #10	Sharon Road
18.20	MIL-CR	Mill Creek #11	East Fork-Crescentville Road
18.20	MIL-CR	Mill Creek #12	East Crescentville Road
19.10	MIL-CR	Mill Creek #13	Allen Road (SE Butler County)
19.10	MIL-CR	Mill Creek #14	Rialto Road (SE Butler County)
0.16	MUD-CR	Muddy Creek #1	Route 50
1.95	MUD-CR	Muddy Creek #2	Hillside Ave
6.10	MUD-CR	Muddy Creek #3	Sidney Ave/Beech Grove
6.95	MUD-CR	Muddy Creek #4	Westbourne and Werk
0.17	WW-RV	White Water River #1	Route 50
1.52	WW-RV	White Water River #2	Suspension Bridge Road
8.30	WW-RV	White Water River #3	Jamison Road Bridge
0.80	DU_CR	Duck Creek #1	Little Miami River Park
2.45	DU_CR	Duck Creek #2	Red Bank Road
4.58	DU_CR	Duck Creek #2 Old	Steel Place
5.00	DU_CR	Duck Creek #3	Kennedy Avenue
6.10	DU_CR	Duck Creek #4	Norwood/Harris Ave

by Evring A. Francis
MSD/DIW/S+S

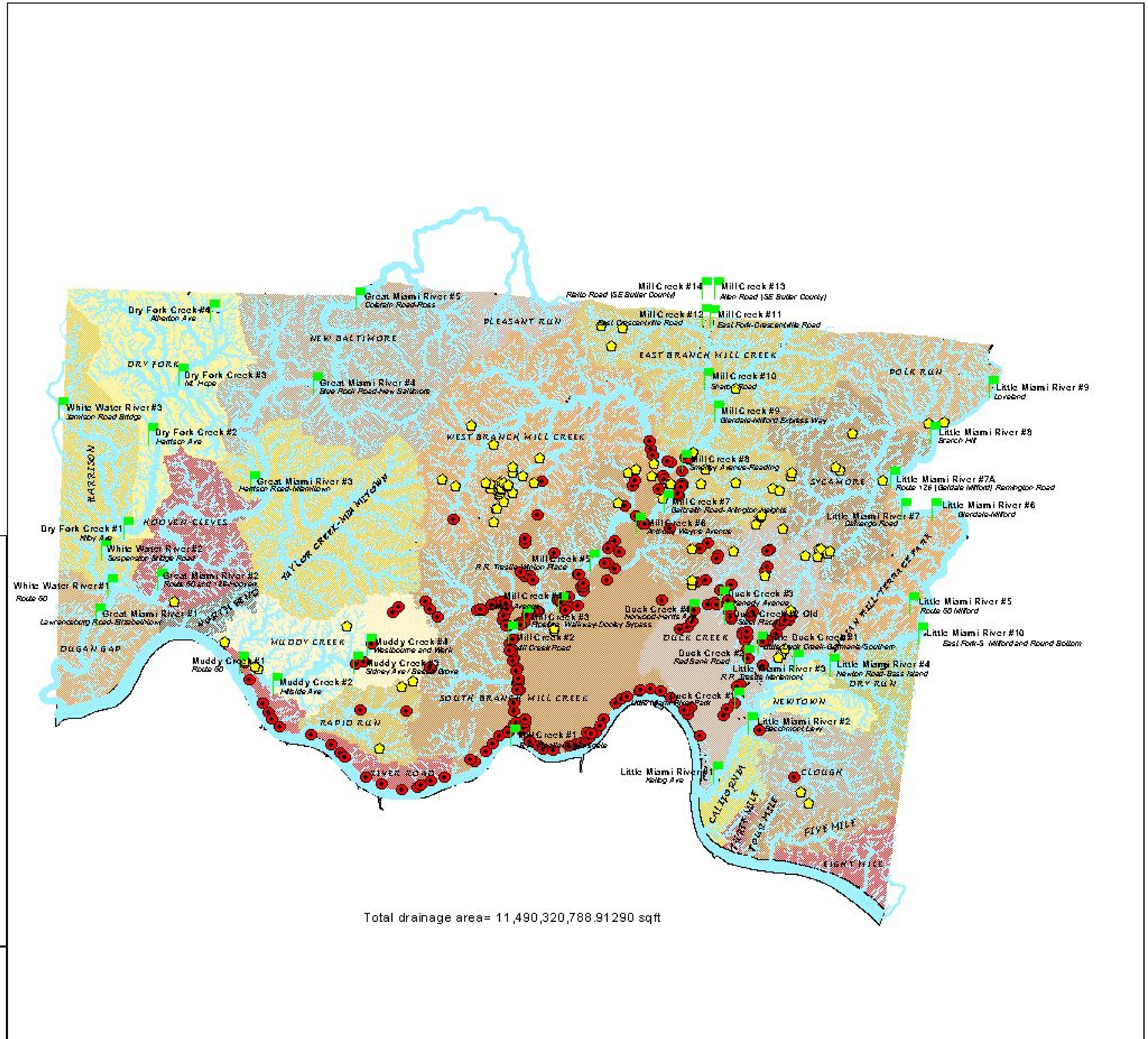
01/31/2002

YEAR 2001

Hamilton County Ohio Drainage Basin and Waterways



Hamilton County drainage basins



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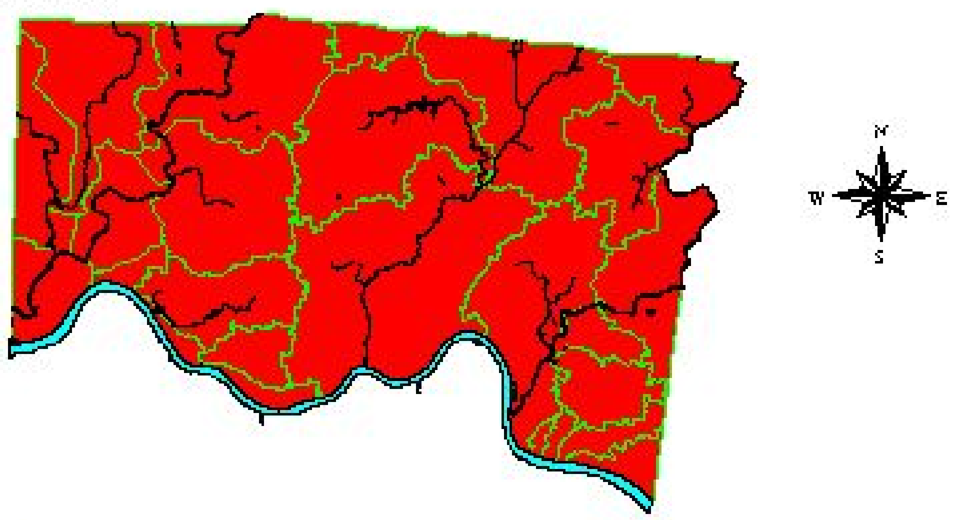


- MSD/DIW surface water sampling locations
- SSO
- CSO
- Steams and Rivers

0 1.5 3 4.5 6 7.5 9 10.5 12 13.5 15 16.5 18 19.5 21 22.5 24 25.5 27 28.5 Miles

A product of
MSD
from
CAGIS
data

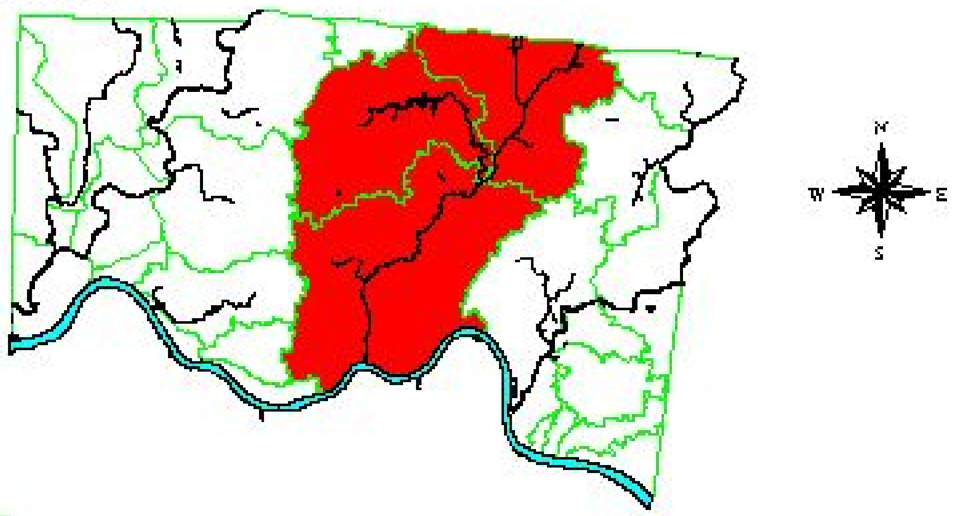
MSD
Greater Cincinnati Hamilton County

map by
Evring A. Francis
MSD/DIW/S&S
September 2000

Mill Creek drainage basin

NOTE: EAST BRANCHMILL CREEK extends futher north into Butler County across the Hamilton County boundary line.
Therefore, drainage area into the Mill Creek from Butler County is not represented on this map.

Legend

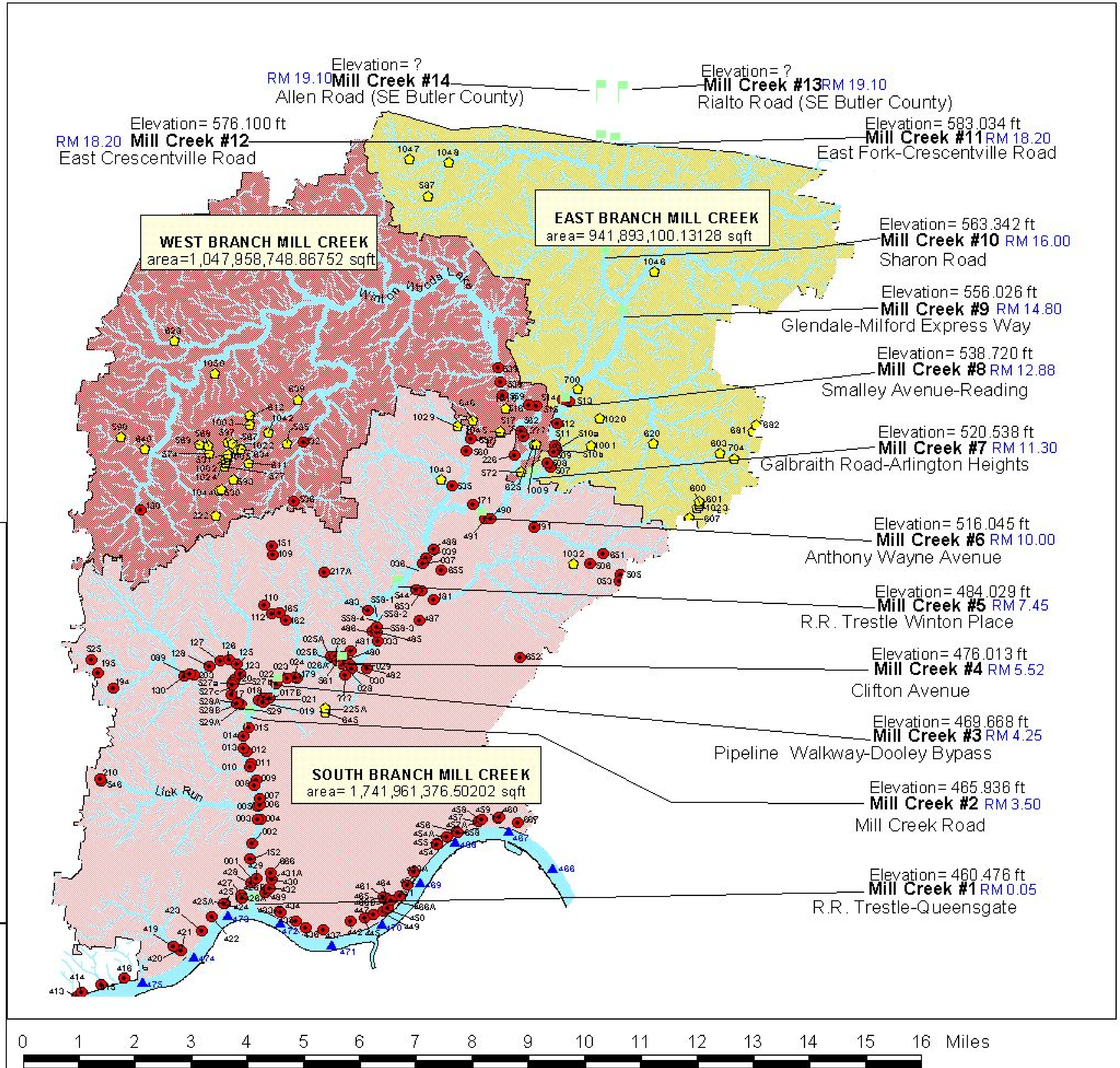


- MSD/DIW surface water sampling locations
- SSO
- CSO
- Ohio River mile mark
- Streams and Rivers

total basin acreage= 85,670.6 acres

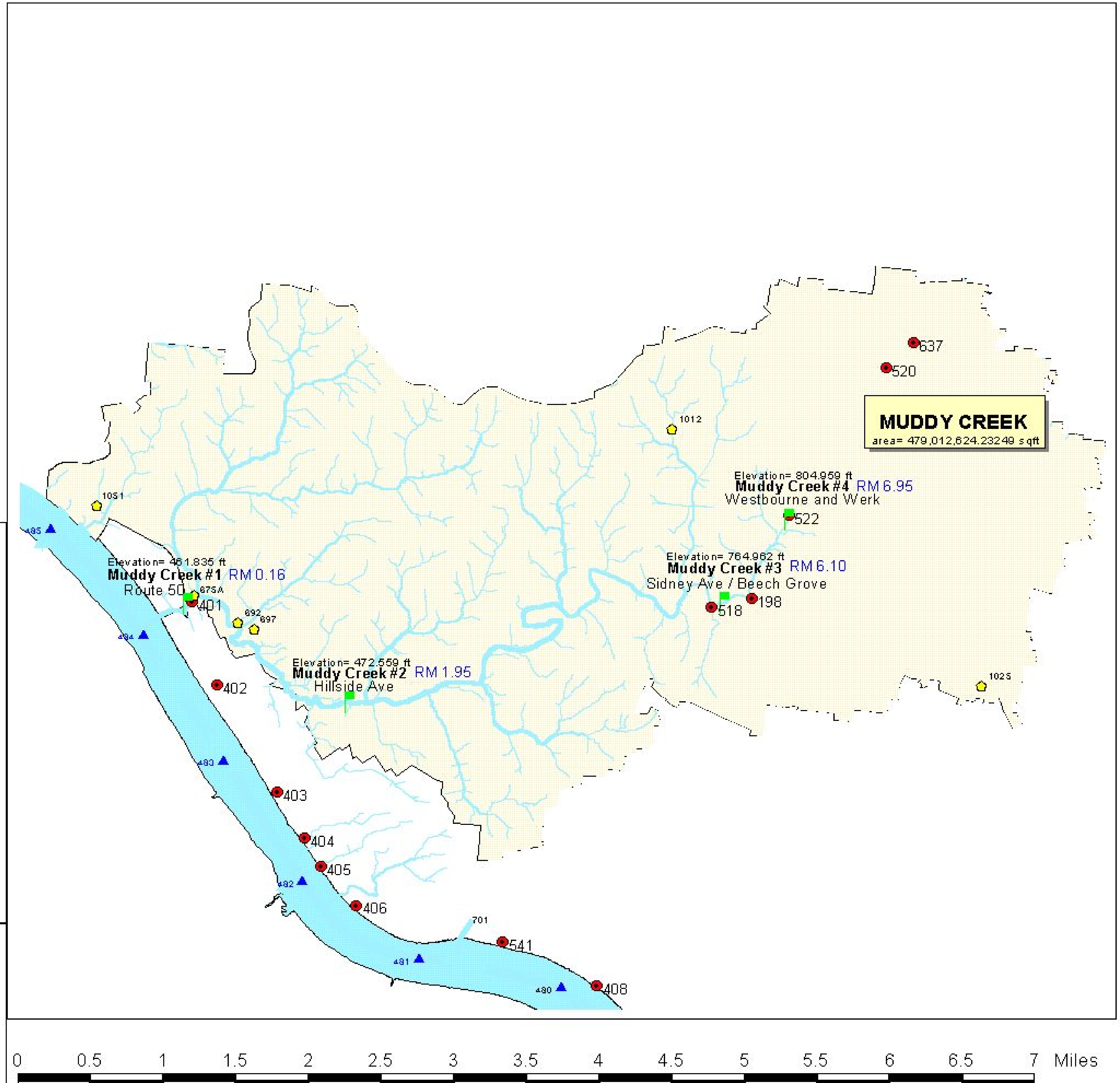
M S D
Greater Cincinnati Hamilton County

A product of MSD from CAGIS data



map by
Evring A. Francis
MSD/DIW/S&S
September 2000

Muddy Creek drainage basin



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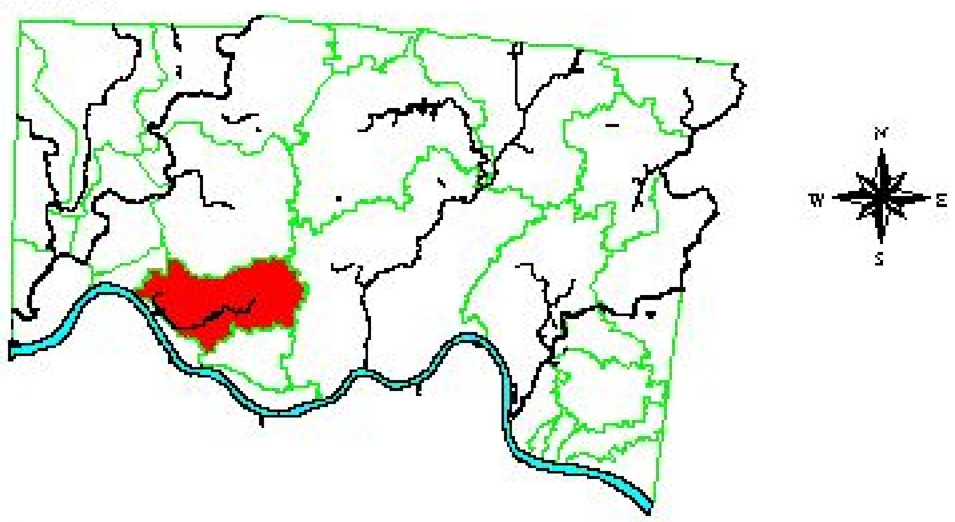

- MSD/DIW surface water sampling locations
- SSO
- CSO
- Ohio River mile mark
- Streams and Rivers

total basin acreage= 10,996.6 acres

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map by
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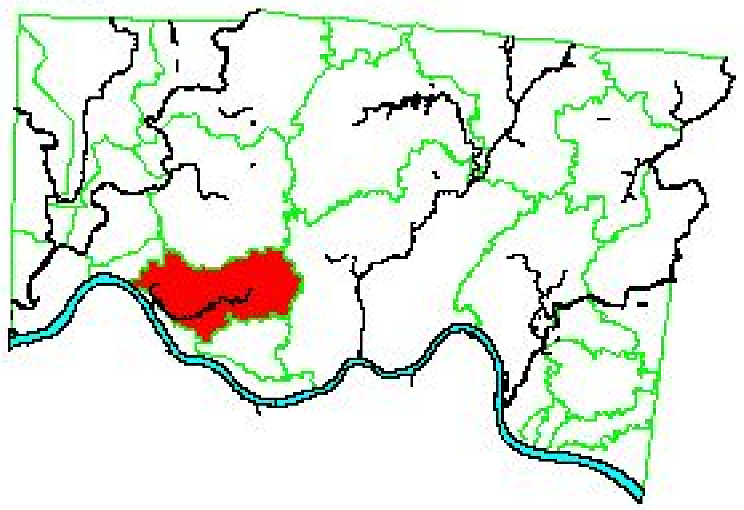
September 2000

Muddy Creek 3D drainage basin

Legend



- MSD/DIW surface water sampling locations
- SSO
- CSO
- Ohio River mile mark

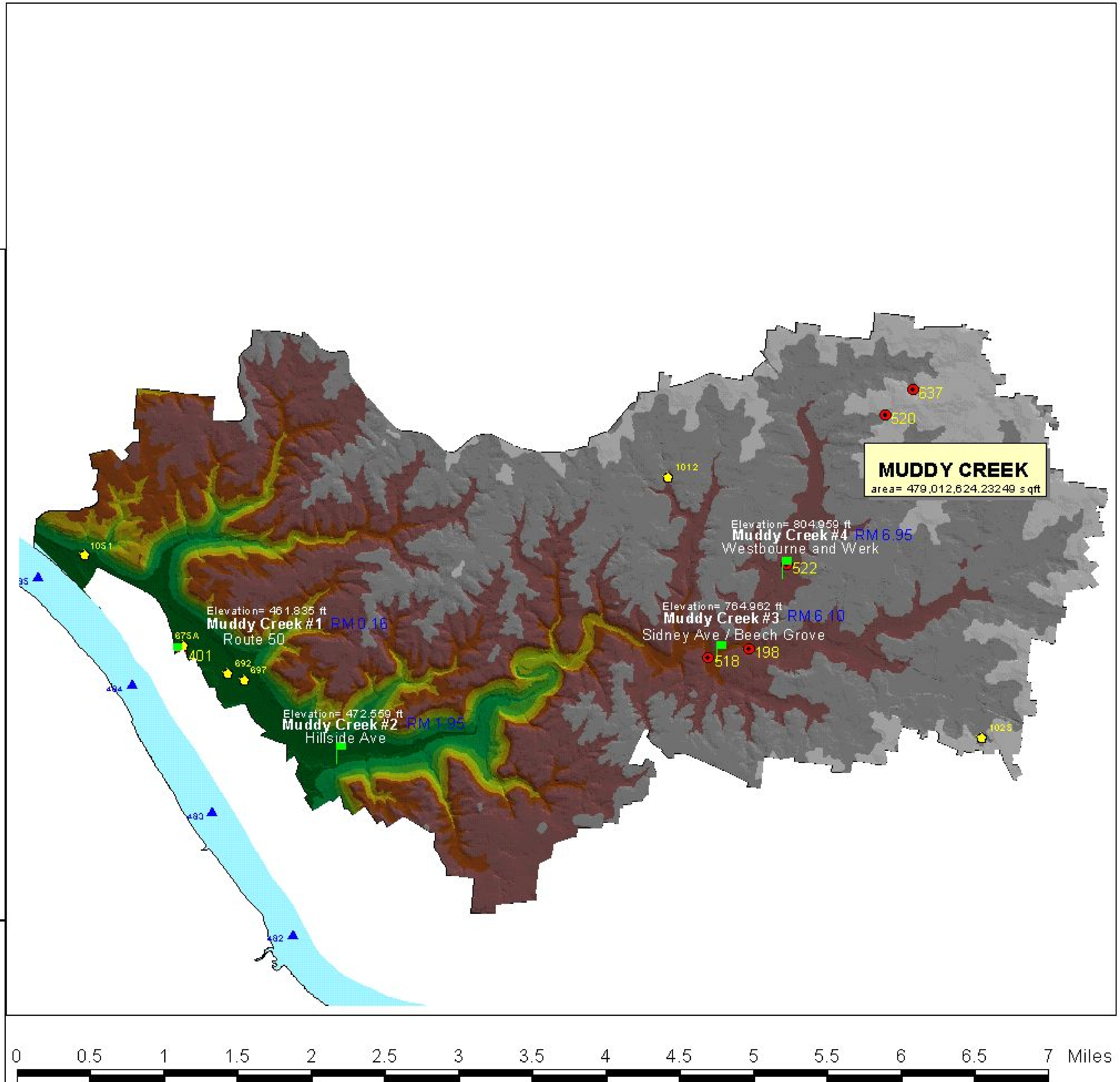
Muddy Creek basin TIN
Elevation Range

- 896.667 - 950
- 843.333 - 896.667
- 790 - 843.333
- 736.667 - 790
- 683.333 - 736.667
- 630 - 683.333
- 576.667 - 630
- 523.333 - 576.667
- 470 - 523.333
- Streams and Rivers

total basin acreage= 10,996.6 acres

MSD
Greater Cincinnati Hamilton County

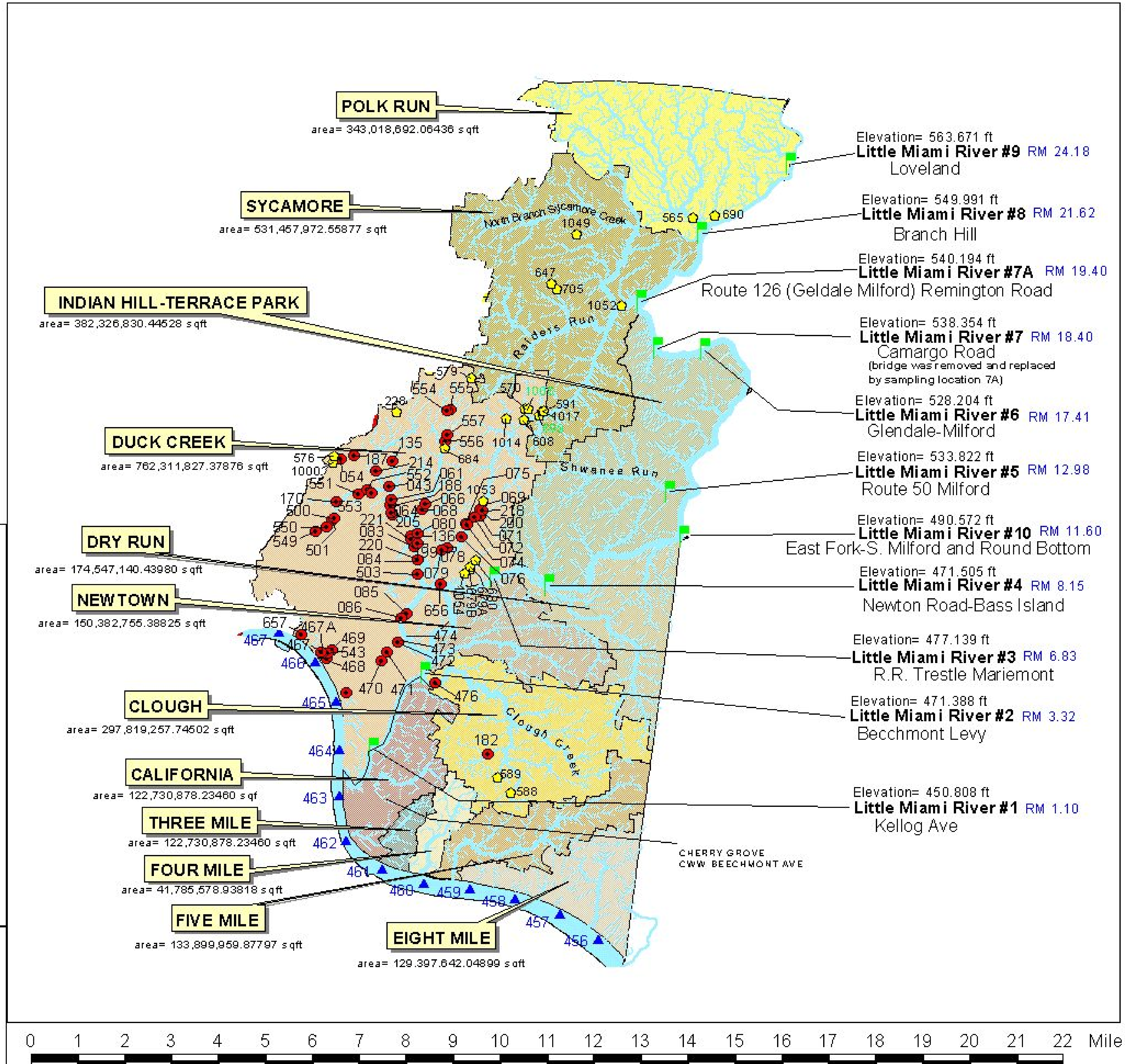
A product of MSD from CAGIS data



map by
Ewing A. Francis
MSD/DIW/S&S
September 2000

Little Miami drainage basins

NOTE: DUCK CREEK drainage basin surface water sampling locations is not included.



Legend

- MSD/DIW surface water sampling locations
- SSO
- CSO
- Ohio River mile mark
- Streams and Rivers

total basin acreage= 68,255 acres

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Greater Cincinnati Hamilton County

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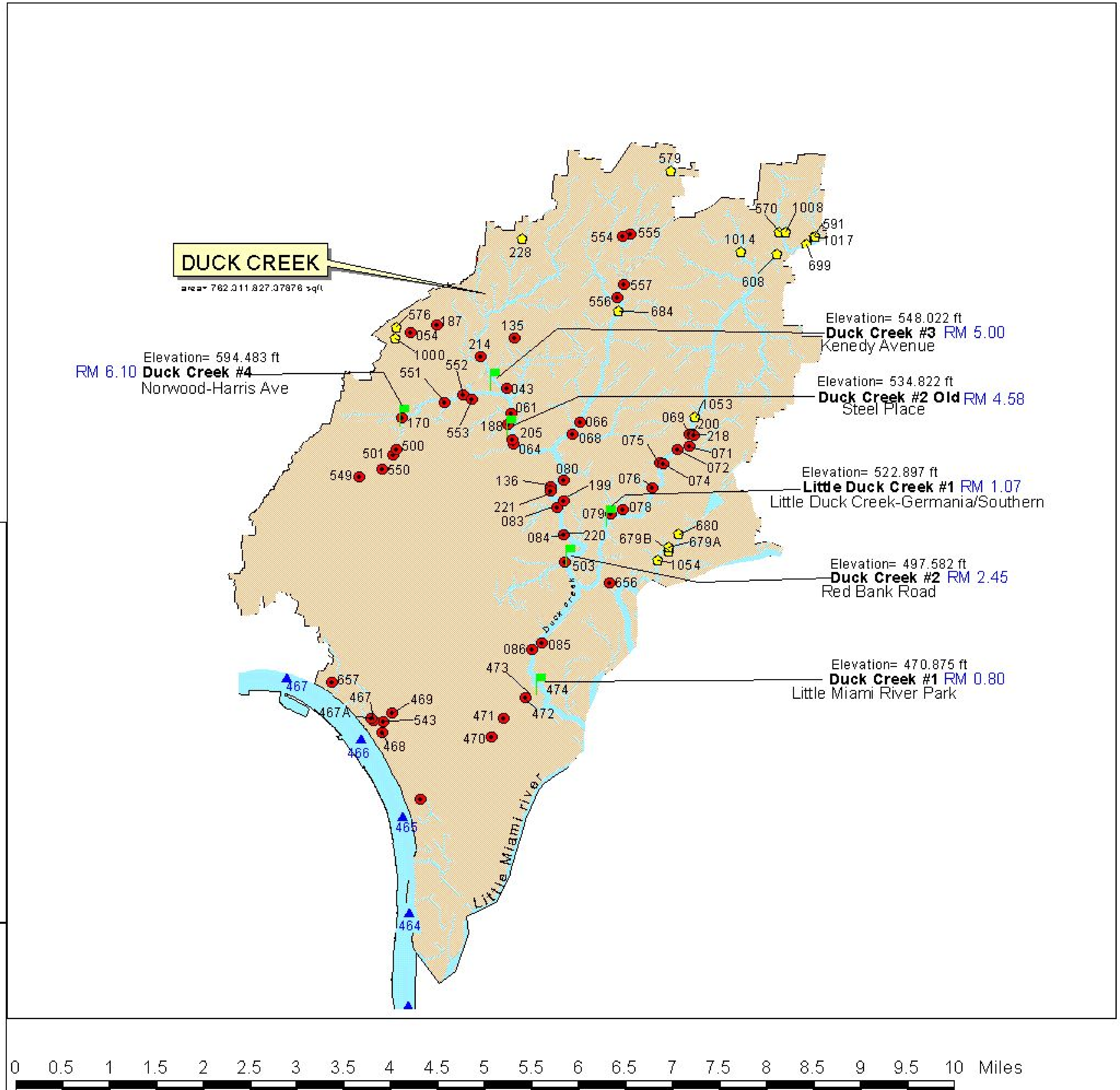
Duck Creek drainage basin



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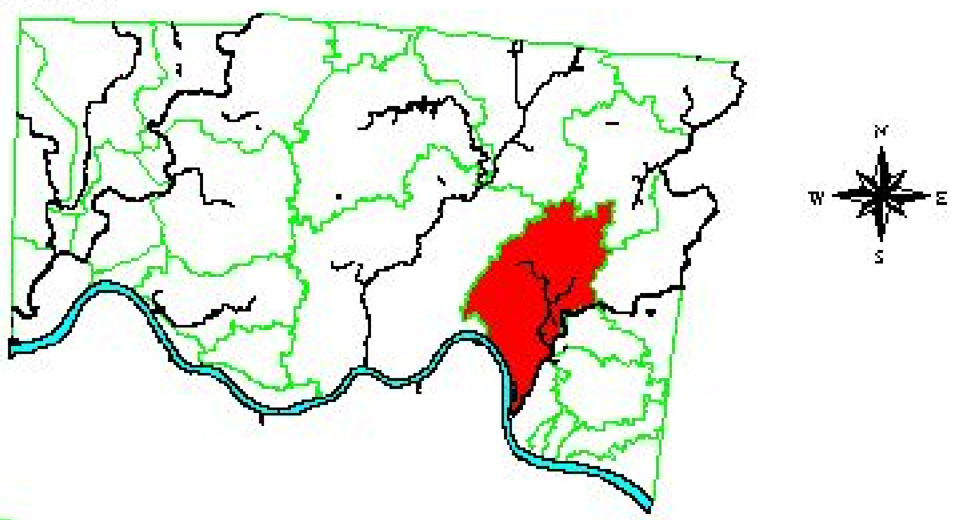

- MSD/DIW surface water sampling locations
- SSO
- CSO
- Ohio River mile mark
- Streams and Rivers

total basin acreage= 17,500.3 acres

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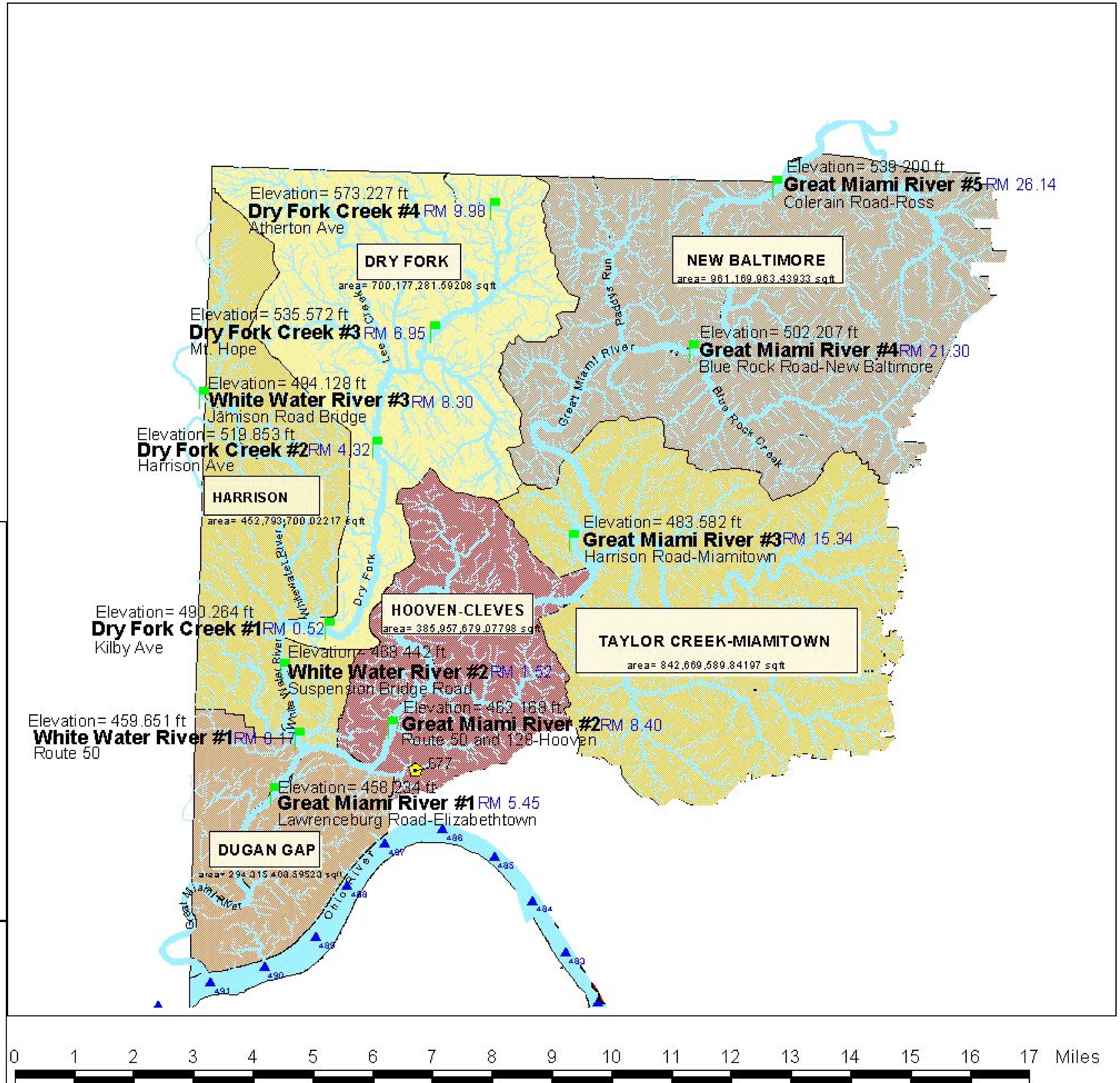
September 2000

Great Miami drainage basin

This basin includes Dry Fork Creek Which drains into White Water River Which drains into the Great Miami River at the DUGAN GAP basin before entering the Ohio River.
*Great Miami extends further into adjacent SW Butler and north into neighboring counties.



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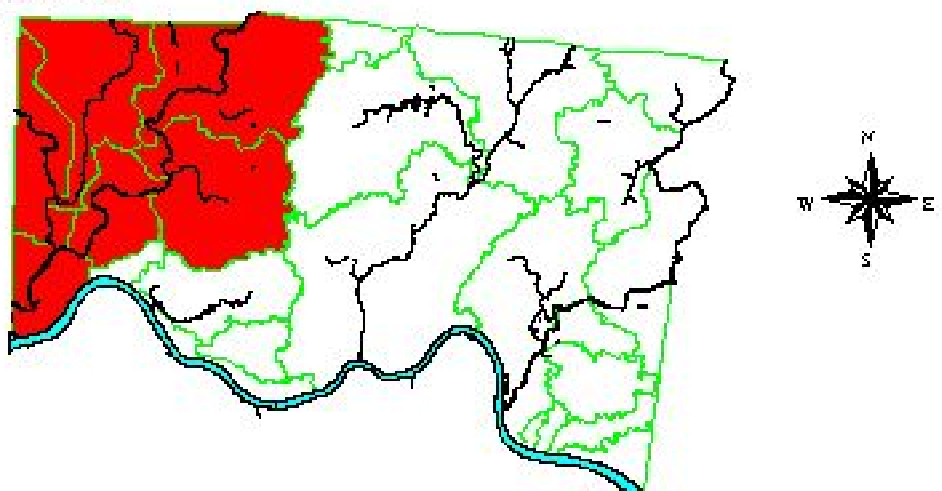

- MSD/DIW surface water sampling locations
- SSO
- CSO
- Ohio River mile mark
- Streams and Rivers

***total basin acreage= 83,496 acres**

MSD
Greater Cincinnati Hamilton County

A product of MSD from CAGIS data

map by
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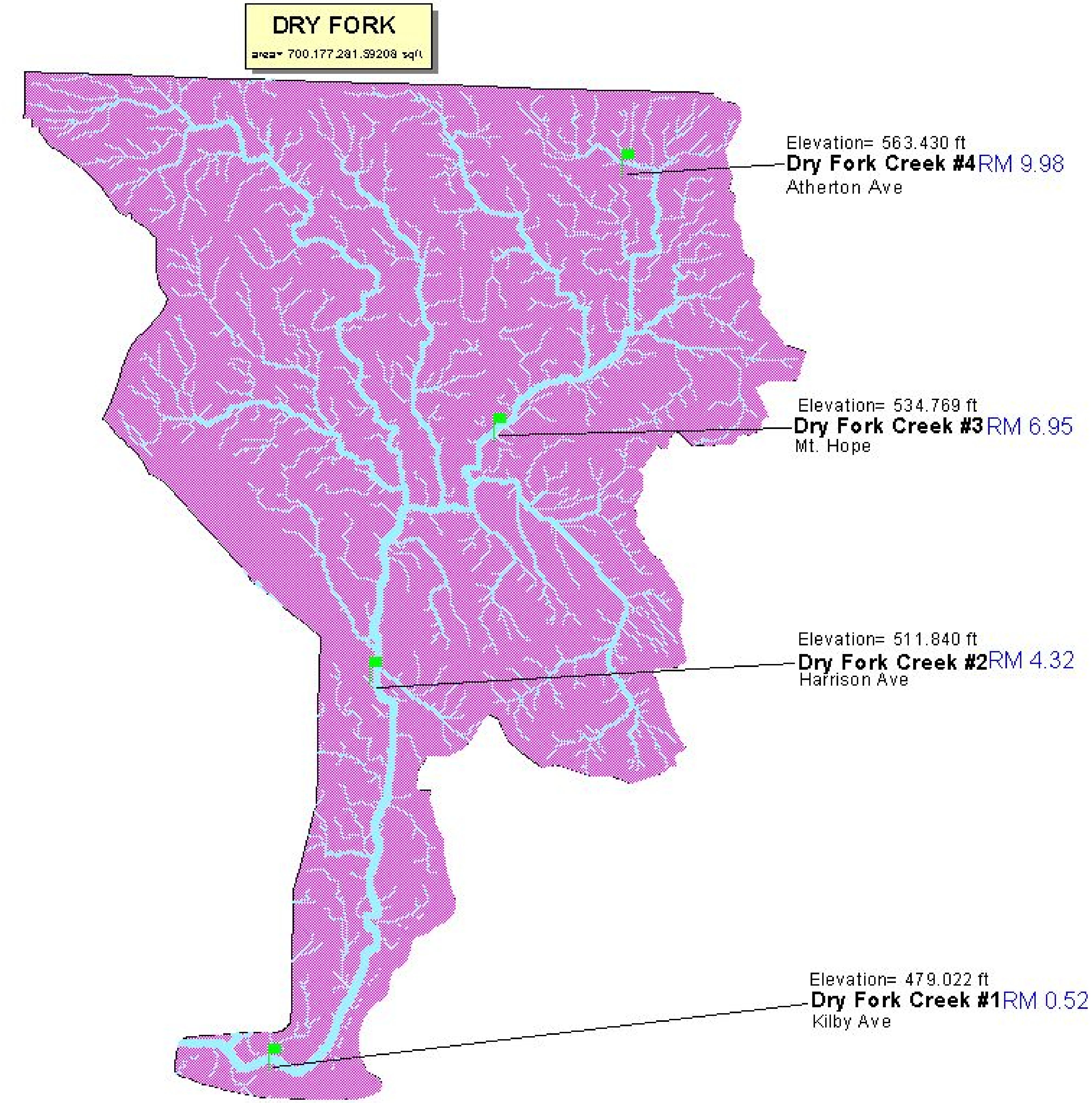
MSD/DIW/SSS
September 2000

Dry Fork drainage basin

NOTE: Dry Fork drainage basin does not have any SSOs or CSOs.



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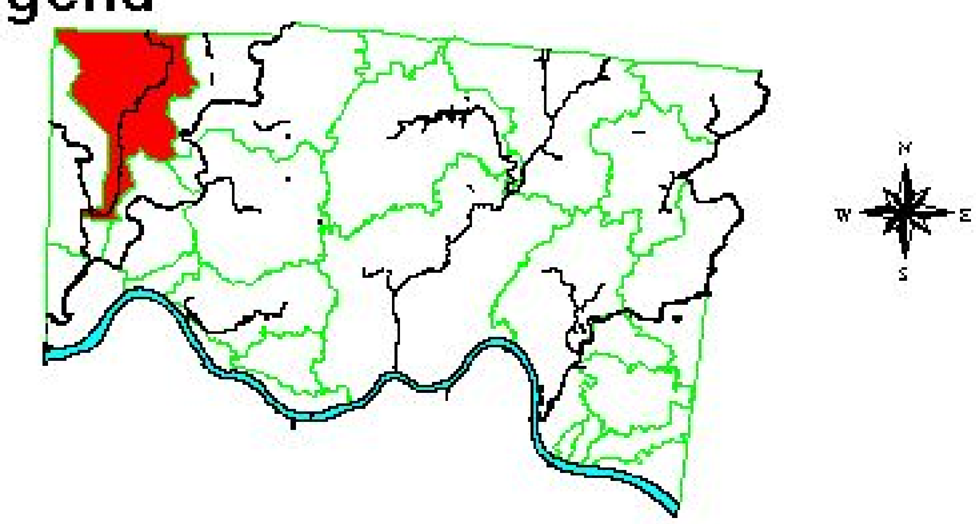
Legend



- **MSD/DIW surface water sampling locations**
- **SSO**
- **CSO**

total basin acreage= 16,073.9 acres

MSD
Greater Cincinnati Hamilton County

A product of MSD from CAGIS data

map by
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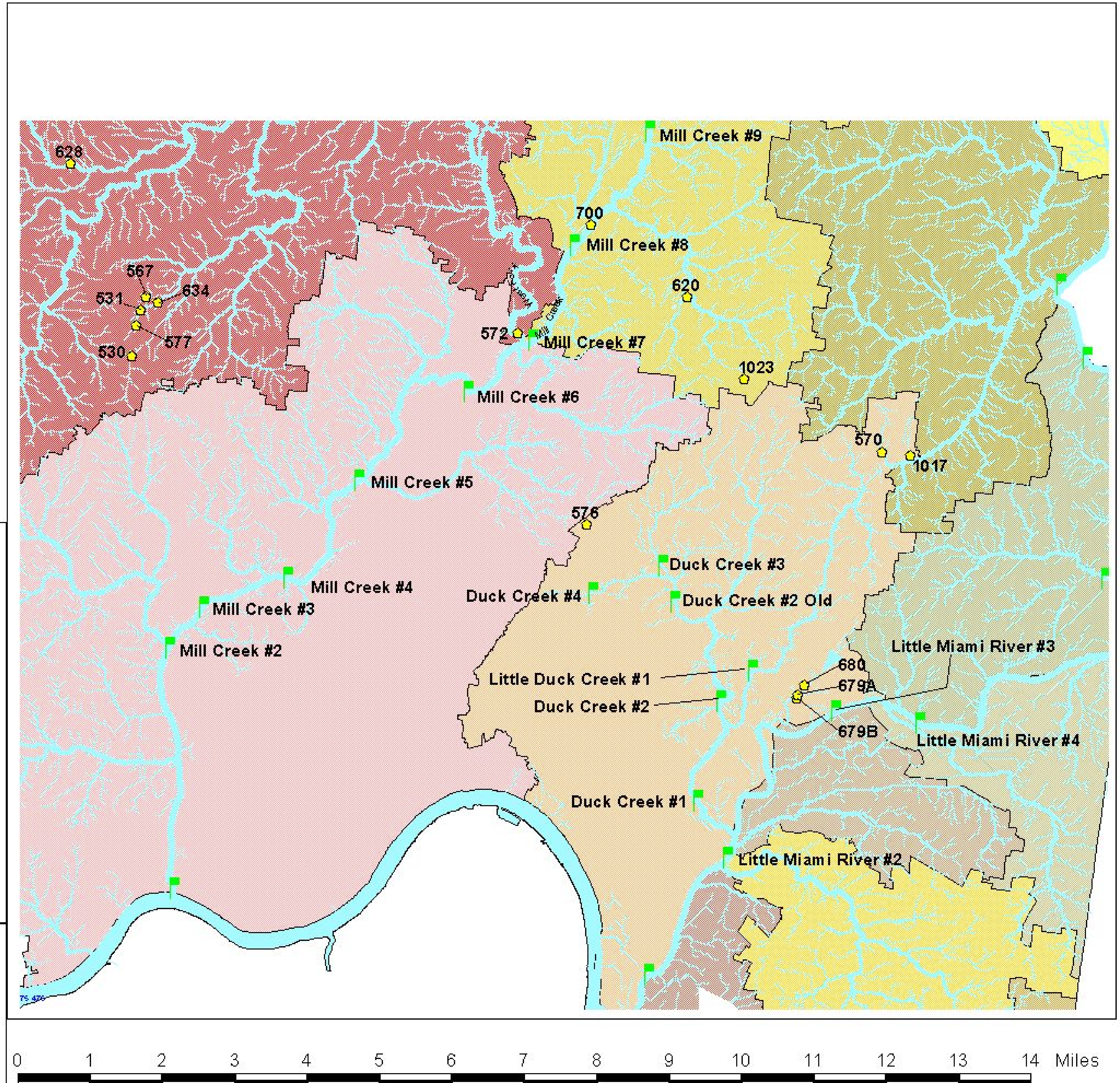
MSD/DIW/SSS
September 2000

2001 SSOs

SSOs

NOTE: MSD's most highly active SSOs within Hamilton County, Ohio

SSO#:
530, 531, 567, 570, 572, 576, 620, 628, 634, 679A, 679B, 680, 700, 1017, 1023.



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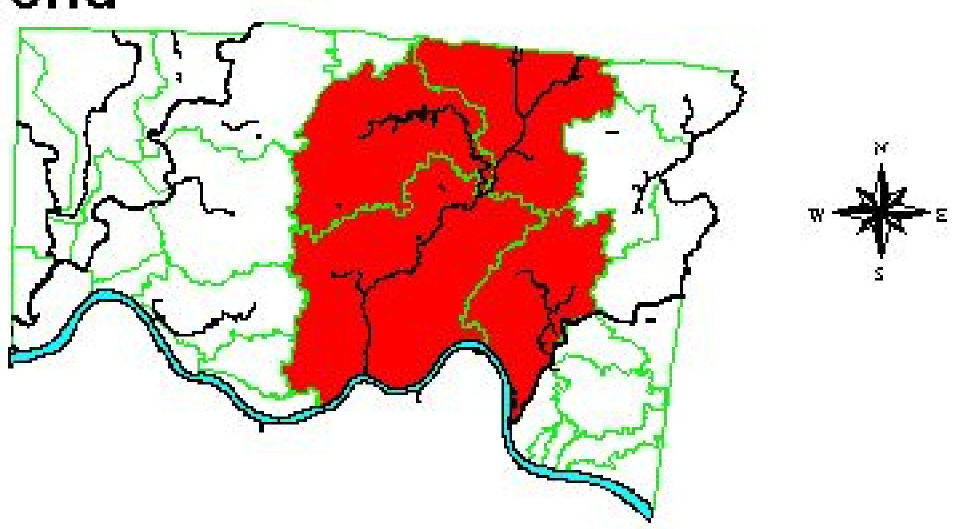


MSD/DIW surface water sampling locations

SSO

Streams and Rivers

MSD
Greater Cincinnati Hamilton County

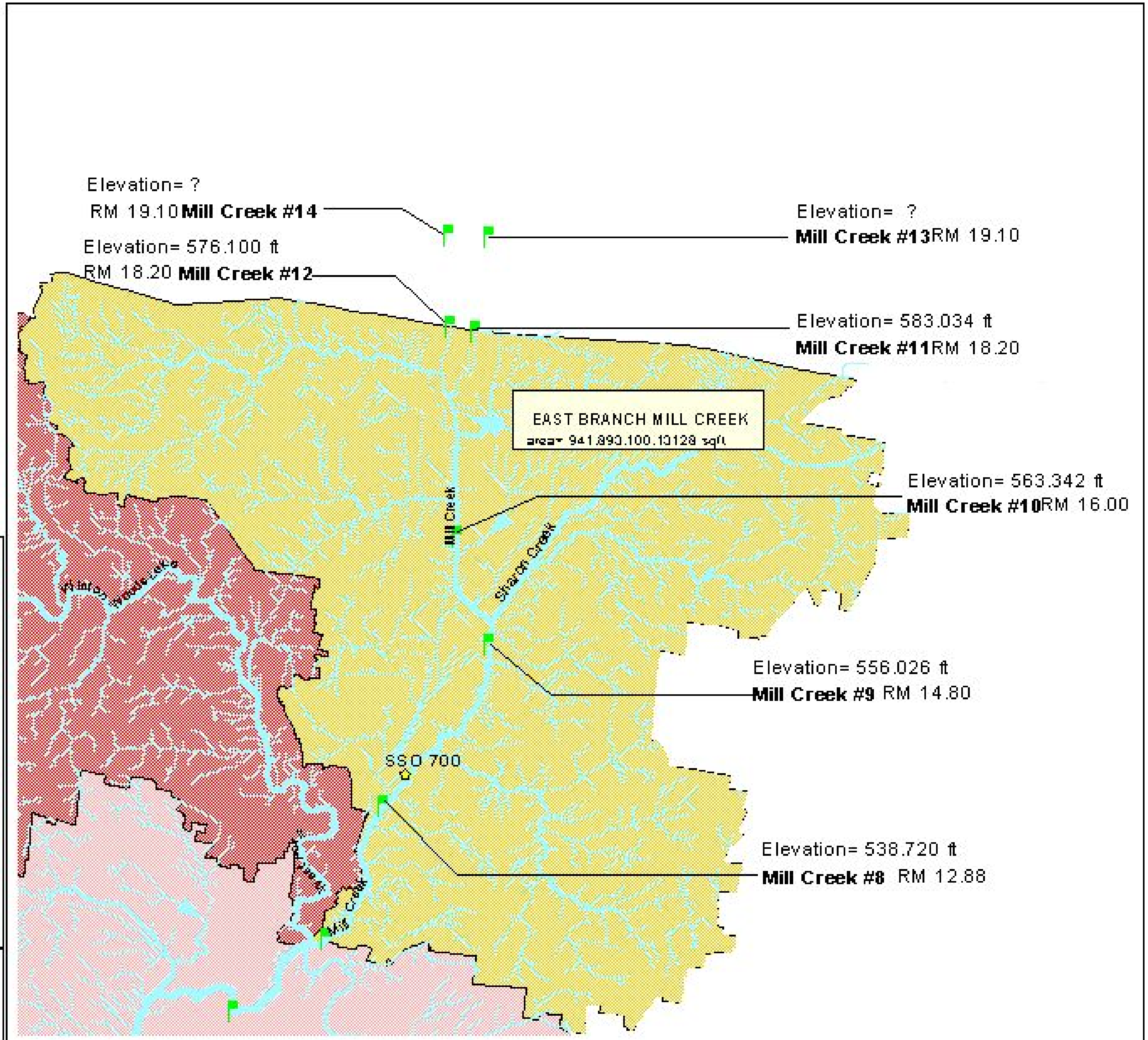
A product of
MSD
from
CAGIS
data

map by
Evring A. Francis
MSD/DIW/S&S
September 2000

SSO 700

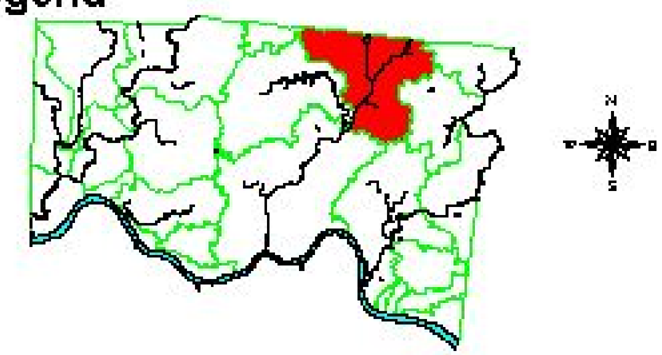
in relations to MSD/DIW
surface water sampling locations

NOTE: This SSO is within the
EAST BRANCH MILL CREEK
drainage basin.



0 0.7 1.4 2.1 2.8 3.5 4.2 4.9 5.6 6.3 7.0 7.7 8.4 9.1 9.8 Miles

Legend



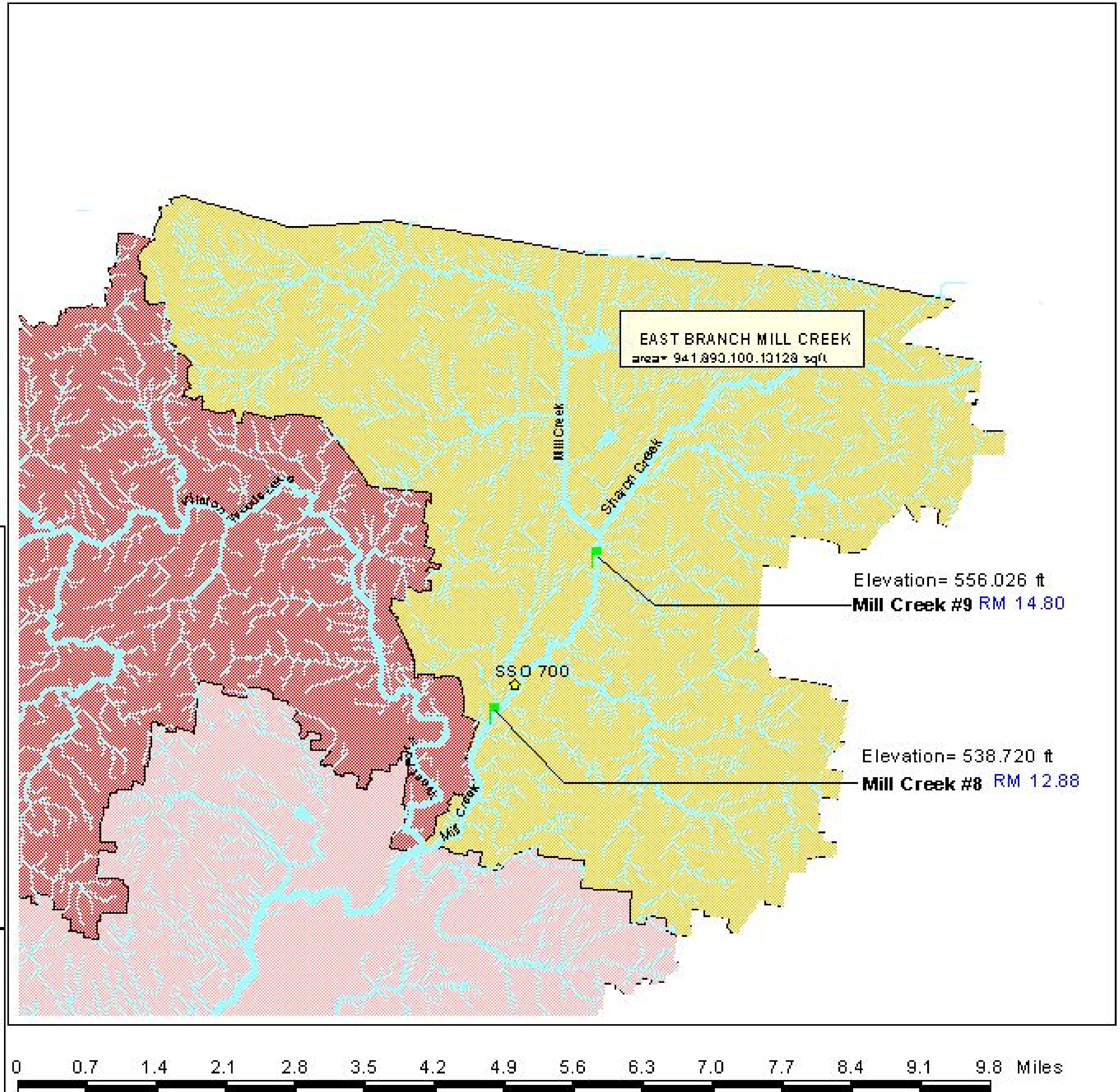
- MSD/DIW surface water sampling locations
- SSO
- Streams and Rivers

A product of
MSD
from
CAGIS
data

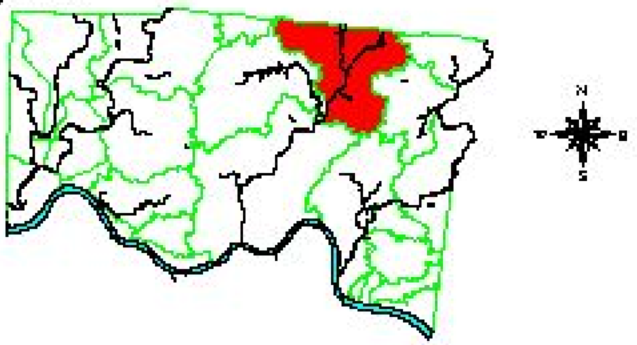
M S D
Greater Cincinnati Hamilton County

SSO 700

NOTE: This SSO is within the EAST BRANCH MILL CREEK drainage basin.



Legend



MSD/DIW surface water sampling locations

SSO

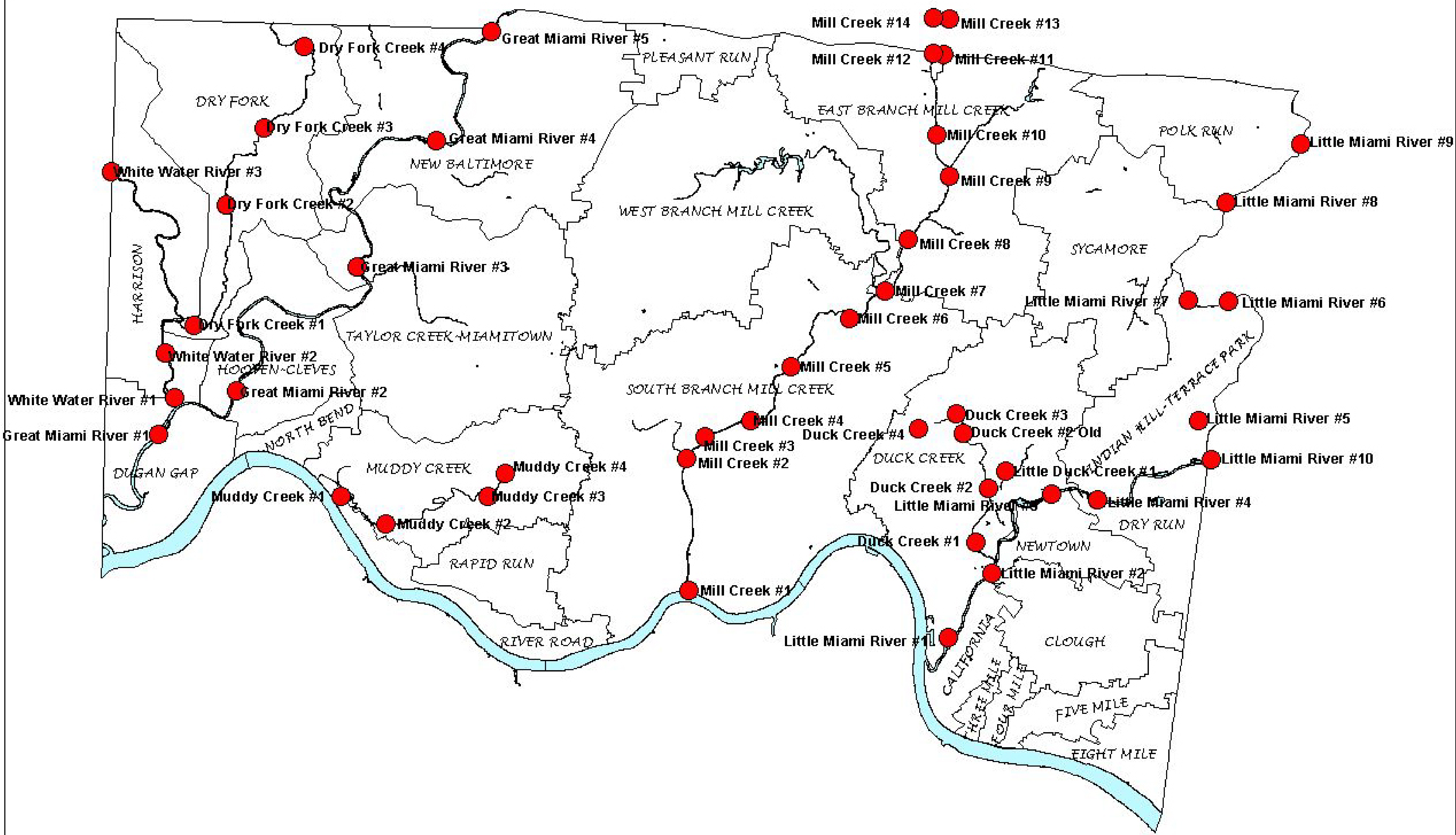
Streams and Rivers

M S D
Greater Cincinnati Hamilton County

A product of
MSD
from
CAGIS
data

YEAR 2000

MSD/DIW SURFACE WATER SAMPLING LOCATIONS



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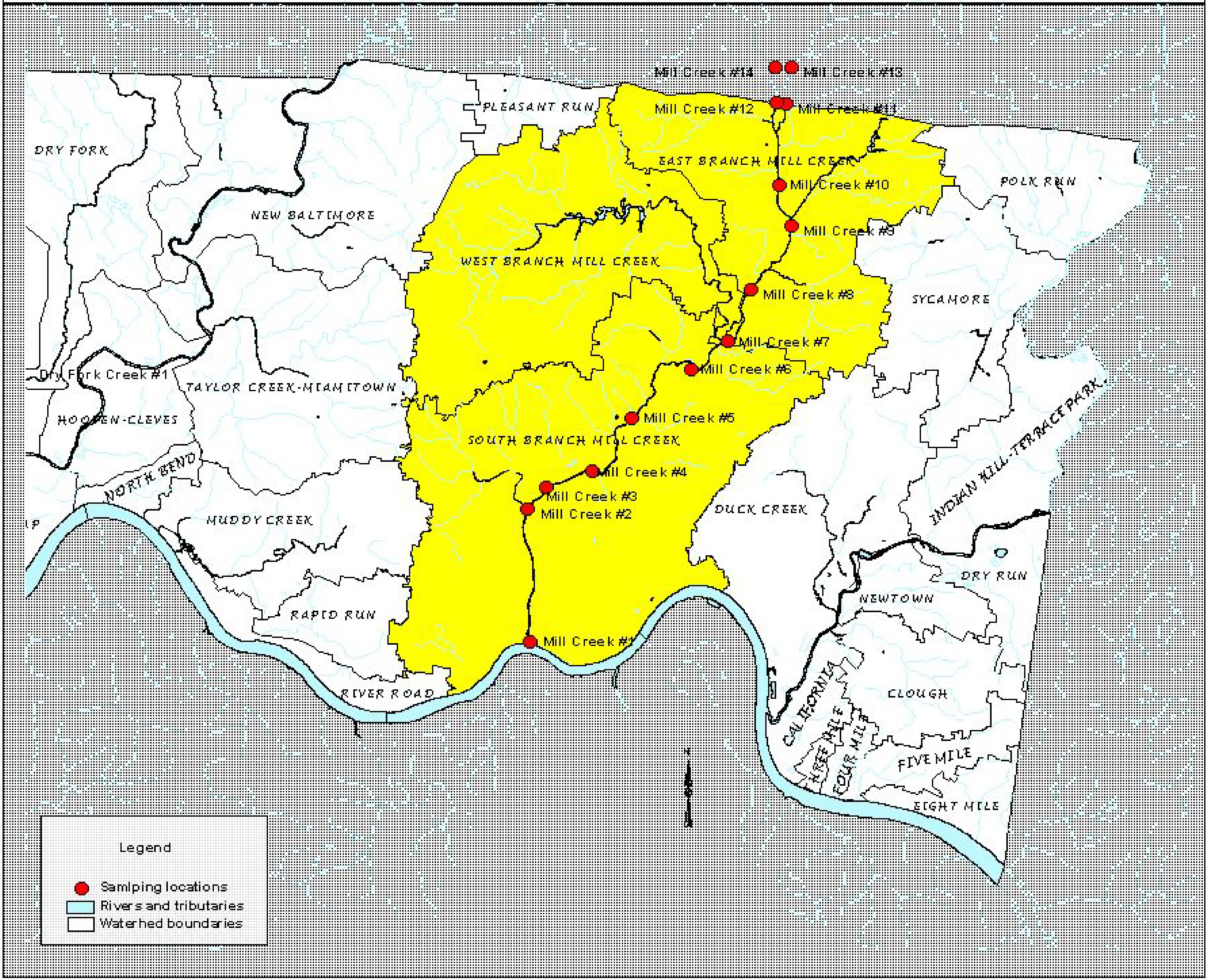

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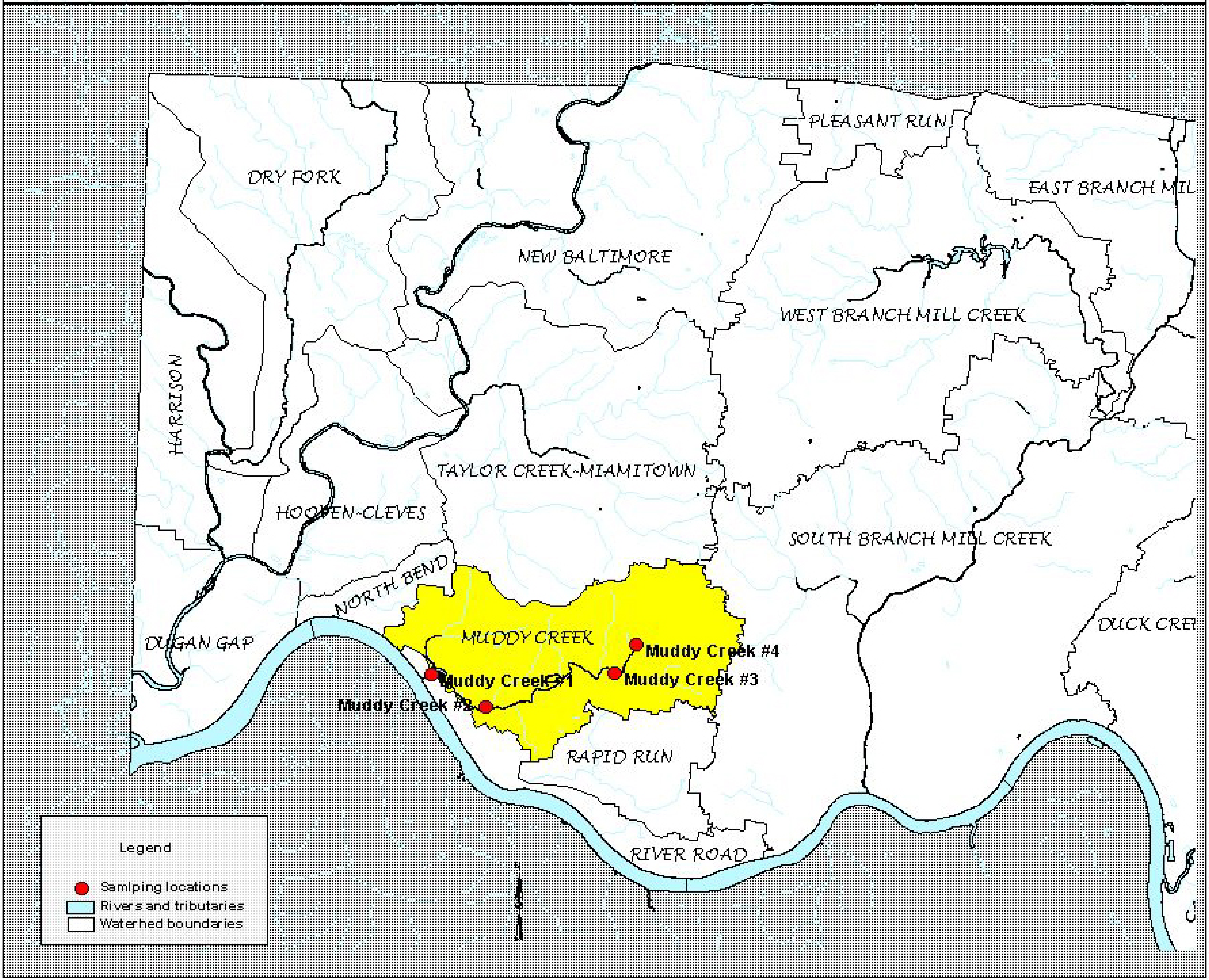

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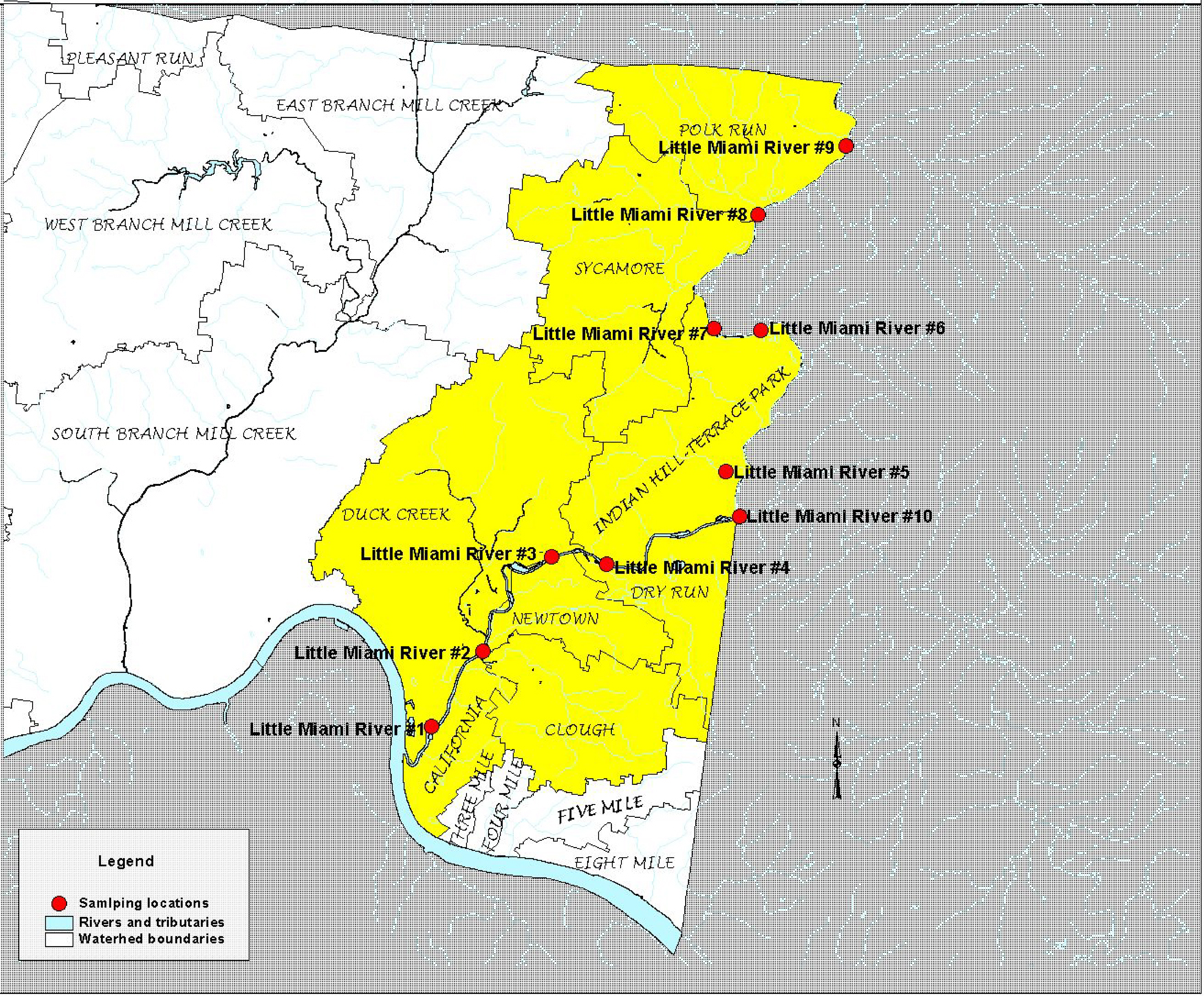

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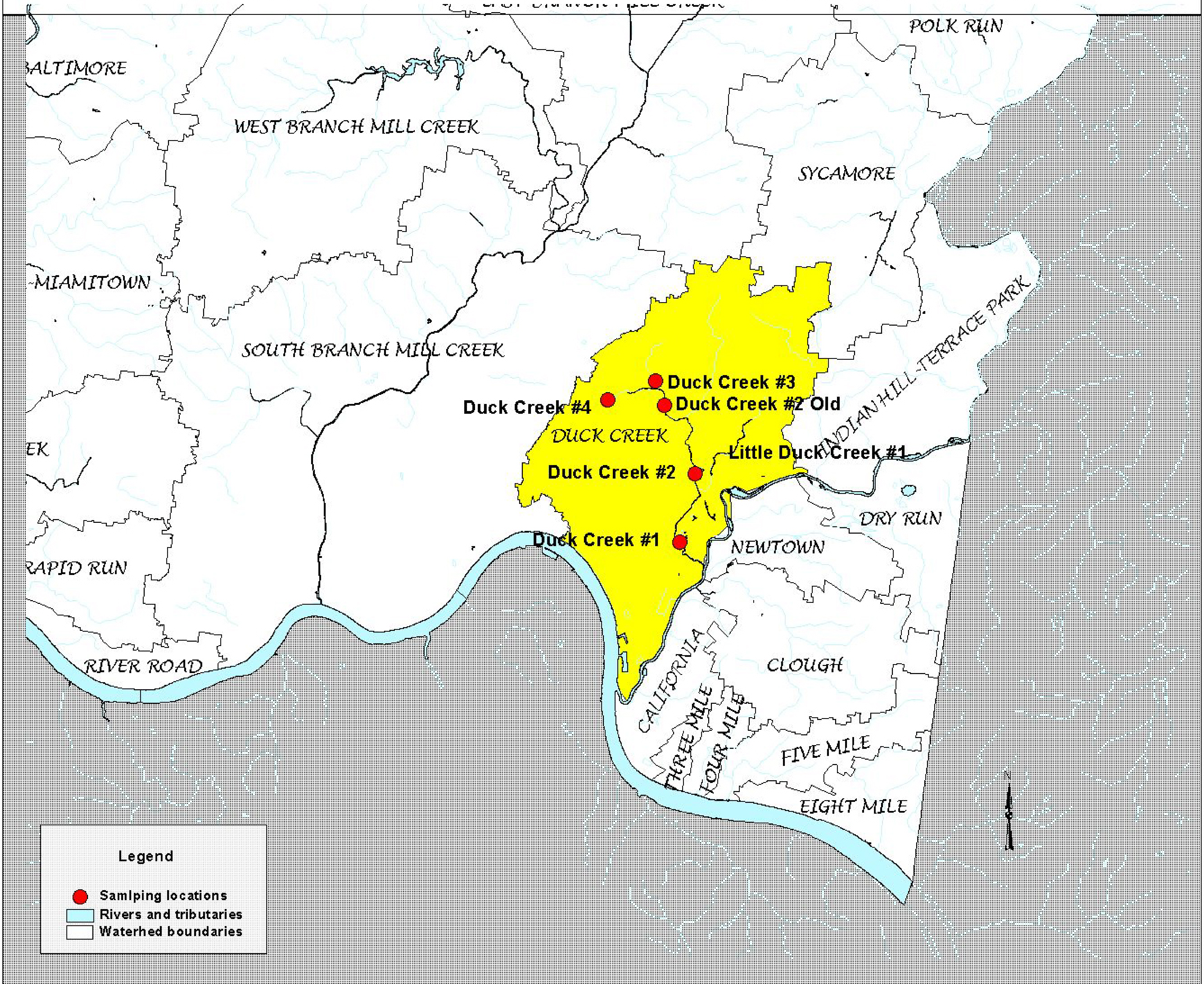

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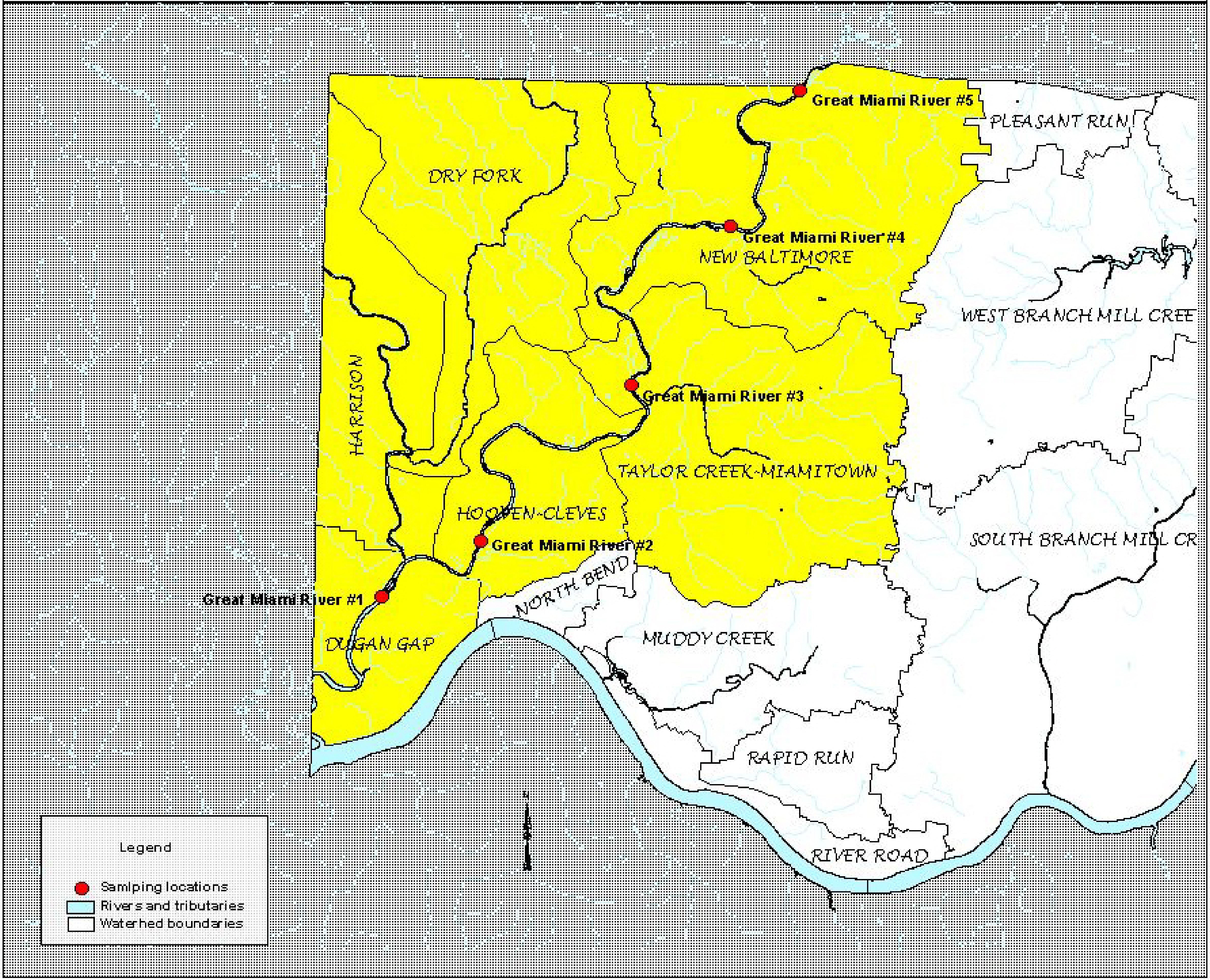

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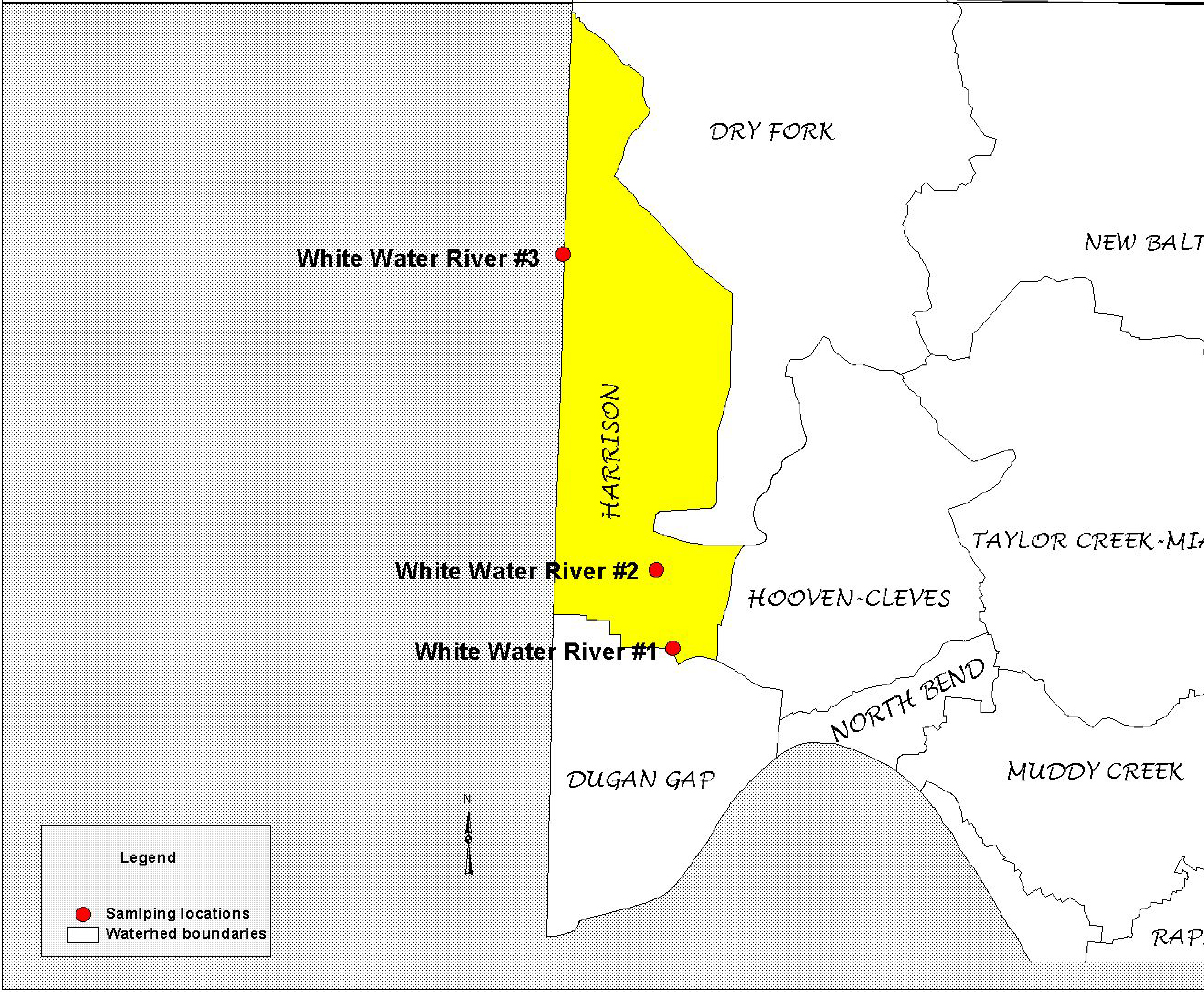

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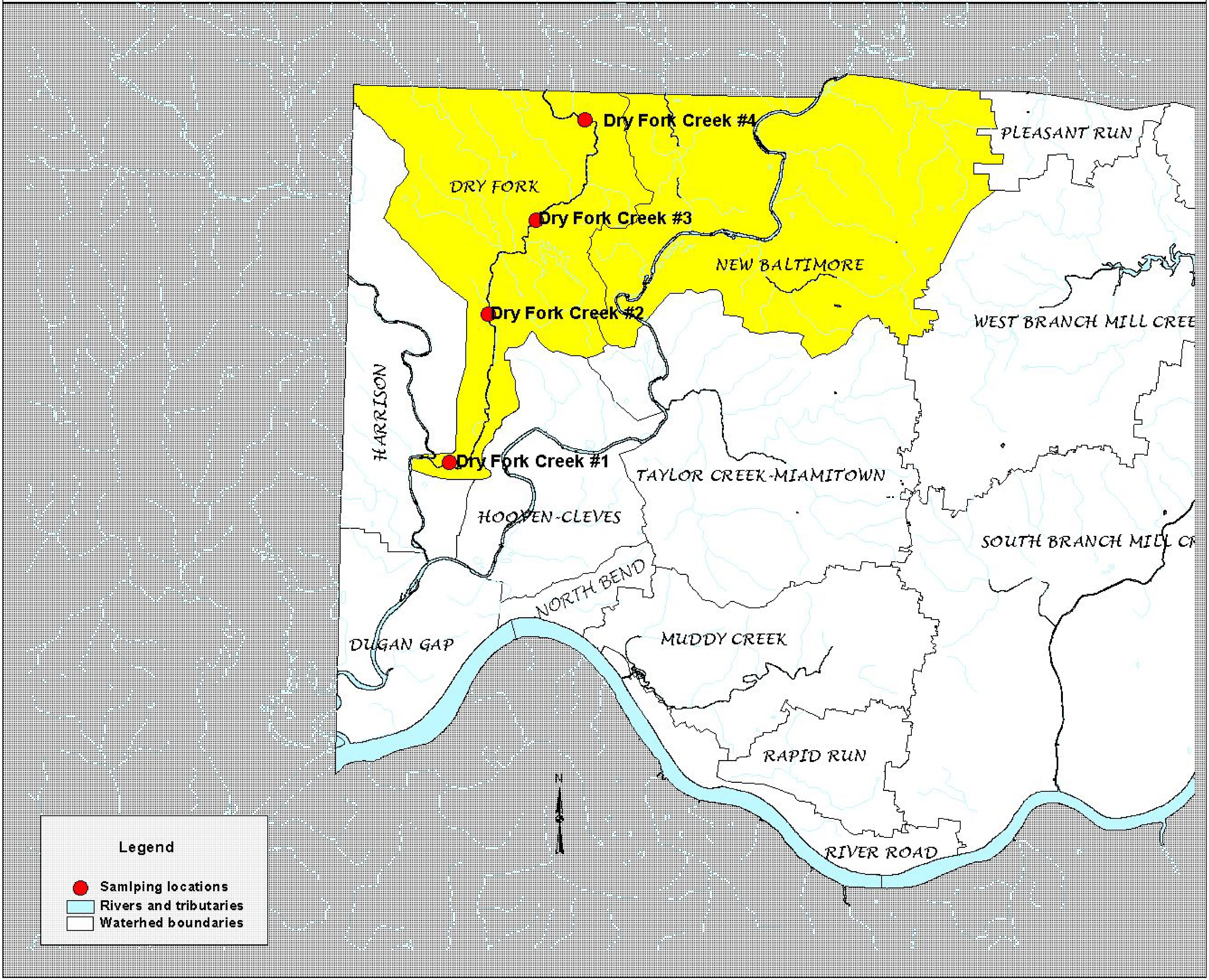

APPENDIX H

Enforcement Response Plan

THE METROPOLITAN SEWER DISTRICT
of Greater Cincinnati

ENFORCEMENT RESPONSE PLAN

EFFECTIVE DECEMBER 1, 1994

Pretreatment Program Enforcement Response Plan

Introduction

The Clean Water Act of 1977 has set forth basic requirements to regulate the nature and quantity of industrial wastes discharged to publicly owned treatment works; such legislation is found in 40 CFR part 403. The United States Environmental Protection Agency has revised part 403 pursuant to sections 307(b) and 402(b)(8) of the Act. The most recent revision to part 403 resulted in the promulgation of a final rule on July 24, 1990. Contained within part 403.8(f)(5) are a list of minimum requirements for the development of an Enforcement Response Plan (ERP).

The actions required of the Metropolitan Sewer District of Greater Cincinnati, as outlined in this document, are intended to satisfy the Ohio EPA requirement for the development of an ERP.

The principles of the Plan identified below describe a process to identify, document and respond to pretreatment violations in a timely and equitable manner consistent with relevant State and Federal law and with the legal authority contained in the Rules and Regulations.[1] The principles establish a framework for the management of enforcement matters and emphasize flexibility in controlling the overall operation.

The key principles of the Plan include:

a) Establishment of responsibilities, procedures and time-frames that provide information to all levels of the organization;

b) Maintenance of an accurate and complete industrial user inventory;

c) A systematic plan devised to inspect and sample industrial users;

d) Development of an enforcement response guide and compliance screening mechanism;

e) Performance of an enforcement evaluation where necessary;

[1] Where mentioned, "Rules and Regulations" shall refer to the Rules and Regulations Governing The Design, Construction, Maintenance, Operation And Use Of Sanitary and Combined Sewers In The Metropolitan Sewer District Of Greater Cincinnati, Hamilton County, Ohio and Issued by the Board of County Commissioners of Hamilton County, Ohio.

f) Institution of an enforcement action and follow-up where deemed appropriate.

Many of these principles have heretofore been incorporated into the District's existing approved pretreatment program. The goal of this Plan is to describe the manner in which the District enforces its pretreatment program in light of Federal legislation. The existing general pretreatment requirements are contained within the Rules and Regulations.

Industrial User Inventory

The District maintains a current inventory of its industrial users. The inventory consists of the industrial waste survey, baseline monitoring reports, periodic compliance reports, records of facility inspections, enforcement documentation and miscellaneous correspondence. The responsibility for maintenance of industrial user inventories has been assigned to specific pretreatment staff. The flow of information is organized to ensure that all relevant data is directed to the proper individual.

The control mechanism utilized by the District to monitor industrial user (IU) discharges is the Wastewater Discharge Permit, as provided for in Article XV of the Rules and Regulations. The Permits contain specific requirements for each industrial user concerning discharge limitations and reporting frequency.

In addition to industrial user self-monitoring, industrial users are monitored by the District. Significant Industrial Users (SIU) are inspected and monitored by the District at least one day per annum. Discretion will be exercised in determining whether sampling is necessary by District personnel for all other Users not in the significant industrial user category. Monitoring by the District is classified as scheduled, demand, unscheduled, additional or surcharge depending on the following criteria.

Scheduled Monitoring Undertaken to demonstrate continued compliance.

Demand Monitoring Intended to establish whether a violation(s) has been corrected once it has been detected. This may consist of one or more consecutive sampling days.

Unscheduled Monitoring Undertaken as a further check on industrial user compliance status.

Additional Monitoring Undertaken to aid in the assessment of Significant Industrial

User (SIU) status. Normally consists of grab samples taken on a given day.

Surcharge Monitoring Undertaken to develop surcharge billing costs.

Industrial User Self-monitoring Undertaken by the industrial user in fulfillment of federal, state and local pretreatment requirements.

The District then receives, evaluates and retains the data to ensure their availability when needed to make decisions on compliance activities, and, if necessary, as evidence in enforcement proceedings.

The District endeavors to inform the industrial users of changes in pretreatment requirements, results of inspections and other relevant information. The industrial users shall also be apprised of the enforcement principles outlined herein and the generalized responses to non-compliant episodes.

Pretreatment Staff

The Division of Industrial Waste comprises a staff to sample, analyze, and assure compliance of industrial waste discharges. Sampling is carried out for the division exclusive of industrial user self-monitoring. Its pretreatment responsibility lies chiefly in conducting the necessary sampling and field inspections.

The Division's Laboratory performs in-house analysis of the effluent samples. EPA-approved QC/QA procedures are employed.

Evaluation of compliance with the Wastewater Discharge Permit includes screening the analytical data to match applicable permit limits. Evidence of a violation is compiled at the investigator level. These individuals are then responsible for completing the initial notice of noncompliance covering the specific violation. The supervisor performs a cursory quality control check and then allows issuance. Level 1 notices of noncompliance, without proposed fines or penalties, are issued under the signature of the Superintendent of Industrial Waste; Enforcement actions with proposed fines or penalties require the Director's signature.

Compliance Review Process

The compliance review process includes review of all relevant data to screen out non-compliant industrial users for appropriate enforcement action.

The initial review confirms whether the discharge reports are submitted on time, encompasses the proper time period, are complete and properly signed. The secondary review assesses compliance with appropriate pretreatment standards (i.e. local or categorical) and any other information supplied by the industrial user in accordance with its Wastewater Discharge Permit.

To ensure a timely response the District will issue a form letter notice of noncompliance designated the NON. The NON is issued for all violations and forms the paper trail that is used to generate the quarterly Industrial User Violation Report; this report, which is updated frequently, is used for enforcement tracking and in assessing escalating enforcement.

Enforcement Evaluation

In general terms, the format used to enforce the Metropolitan Sewer District Rules and Regulations as they relate to pretreatment consists of the following:

a) All violations or permit occurrences outside limits disclosed by the District or industrial user monitoring are reviewed by appropriate staff;

b) The industrial user is notified by a form letter notice of noncompliance (NON) when an enforcement official becomes aware of a violation;

c) In the case of effluent violations, the industrial user is scheduled for demand monitoring. Generally, a facility inspection is also conducted;

d) Every notice of noncompliance requires the industrial user to take immediate action to prevent recurrence;

e) When necessary the notice of violation requires the industrial user to submit an explanation and/or plan to prevent recurrence;

f) The District will increase communications with the industrial user in response to violations. Additional inspections, meetings, and monitoring may be conducted;

g) If the violations persist or the explanation/plan submitted is inadequate, the District responds with escalating enforcement such as requiring commitments in the form of additional pretreatment equipment with a construction plan/schedule;

h) The District will issue fines in accordance with the Rules and Regulations using a series of fine schedules and EPA guidance documents.

In more specific terms, the District uses a tiered response approach geared to a twelve month time cycle to enforce its pretreatment program. A first occurrence of a violation triggers the cycle and sets it in motion. Multiple occurrences within a twelve month period (not necessarily related to the same violation) carry an escalating form of enforcement and extend the cycle. After twelve months have elapsed from the most recent violation, the cycle concludes. Subsequent violations begin a new cycle. However, the District will consider the user's previous history dating back to five or more years in setting the initial response level at the beginning of each new cycle. A user's compliance history will be considered to determine whether any pattern or trend in violations exists. This information is to be used not only to aid in diagnosing the cause of the violation but also to assist in selecting enforcement options and in imposing fines and penalties.

It is recognized that some egregious or flagrant violations may warrant a response beyond Level 1 despite a first occurrence in twelve months. Depending on such factors as the number and severity of violations disclosed and impacts on human health and safety, the general enforcement levels are applied in accordance with the enforcement action tier.

Generally, the District will review industrial user reports within five days of receipt and for violations issue the form letter notice of noncompliance with in an additional seven days. Formal notices of violation will generally be issued within 30 days of the initial notice of noncompliance.

Follow-up compliance activities such as inspections and monitoring will generally begin within 30 to 45 days after the initial enforcement response is taken. Should these activities disclose continued noncompliance the District will escalate enforcement within 60 to 90 days.

The District is expected to diligently discharge these duties. Failure to serve any required notice in accordance with the time periods set forth herein shall not invalidate any proceeding or action of the District. However, any delay in issuing notices which causes an industrial user prejudice shall be considered in mitigation of any fine or other enforcement action of the District.

Enforcement Action Tier

Frequency of Violation	Nature	Enforcement Action
First occurrence within twelve months	Moderate	Level 1
	Severe	Level 2
Second occurrence within twelve months	Moderate	Level 2
	Severe	Level 3
Chronic occurrence	Moderate	Level 3
	Severe	Level 4

Enforcement Action Characterization

Level 1 DIW issues a notice of noncompliance (NON) identifying the violation and its date of occurrence. It further requires a written response from the industrial user within 14 days of notification describing the cause of the violation and the corrective actions taken to prevent recurrence.

In order to monitor compliance, demand monitoring may be required. A follow-up investigation is conducted as necessary.

Level 2 A Compliance Attainment Meeting (CAM) is scheduled within which a Remedial Action Plan (RAP) or Interim Operating Procedures and Construction and Implementation Schedule (IOP/CIS) are developed within 30 days of the meeting. Included in the RAP as necessary will be increased self-monitoring and reporting; a Spill and Slug Control Plan (SSCP) within 30 days; Pretreatment system Operation and Maintenance/Standard Operating Procedures (SOP/O&M) within 60 days; and Pretreatment System Operator Training (POT) commitment within 60 days. Development of a Pollution Prevention Plan (PPP) at this level of enforcement may be required. Implementation of the plan may be required when it is a positive measure that protects environmental quality and is technically feasible. The Director has the discretion to modify this requirement to implement pollution prevention measures where the industrial user has demonstrated that the implementation will cause undue financial hardship and its proposed remedial alternative will not harm the environment. The PPP will describe alternatives for reducing pollutants at the source through process or operational changes or any other means which permanently reduce the amount of contaminants to be disposed of into any environmental medium (e.g., whether through releases to the sewer system, air, ground, or surface water or any other method of discharge).

In order to monitor compliance, a follow-up investigation and monitoring event are conducted by DIW after a review of the adequacy of the RAP and/or IOP/CIS is made.

Level 3 Administrative Orders requiring any of the following: increased self-monitoring and reporting; Interim Operating Procedures and Construction and Implementation Schedule (IOP/CIS); selection or modification of pretreatment technology; prepare and submit a Permit-To-Install (PTI) application; development of and implementation of Pollution Prevention Plan (PPP); a temporary cease and desist order.

In order to monitor compliance, a follow-up investigation and monitoring event are conducted by DIW after a review of the adequacy of the RAP and/or IOP/CIS is made.

Level 4 Issuance of orders to cease and desist, revoke permit to discharge or terminate service, or refer to City Solicitor.

Enforcement Response Guide

One of the minimum criteria set forth in 40 CFR 403.8 (f)(5) is a description of all anticipated types of industrial user violations, the prescribed form of enforcement to be taken and the time-frame within which the industrial user is required to respond. A predetermination of all types of violations is clearly not possible; however, a range of responses have been developed for the more common occurrences. Violations that occur but which are not contained in the Guide will be responded to on a case-by-case basis.

For the determination of the level of response necessary for a given violation or an occurrence outside permit limitations the District will carefully consider the number of occurrences in the current cycle and the Industrial User's history dating back five or more years, the number and severity of violations per occurrence and impacts on human health and physical structures, the presence of pretreatment technology and its adequacy for compliance, and the level of cooperation exhibited by the industrial user. The District's goal is ongoing compliance with all Rules and Regulations. To achieve this goal it is necessary to be flexible, yet even-handed in the implementation of the Guide, in a manner consistent with the Rules and Regulations, such that the resolution of any form of noncompliance is expedient and decisive.

Table 1 presents the Enforcement Response Guide for the Metropolitan Sewer District of Greater Cincinnati. The Guide incorporates the tiered approach to enforcement and all provisions set forth in the Rules and Regulations.

As noted in the Enforcement Response Guide, there are four (4) basic levels of response. In general, Level 1 means that the discharger has no prior violations during the preceding year; Level 2 means that prior violations have occurred but that the discharger is working cooperatively with the District in complying with regulations; Level 3 implies a lack of good faith efforts by the discharger and escalating enforcement by the District; Level 4 means a failure to address the issues in the informal administrative process.

Escalation from Level 1 to Level 2 is automatic when a second violation occurs within twelve months of a previous violation. The step from Level 2 to Level 3 is made when the remedial actions taken or proposed by the industrial user are deemed by the District to be inadequate or inappropriate and the industrial user appears unwilling to fully resolve the issue. The District will consider factors such as threat to human health, potential damage to environment by interference or pass-through, damage to the sewer system, the duration, type and severity of noncompliance, deterrence, and additional costs to the District in determining the adequacy or appropriateness of the enforcement actions. Level 3 actions by the District will generally be taken unilaterally. For example, the District may issue a temporary cease and desist order to the industrial user pending implementation of interim operating procedures or until installation of pretreatment technology. Level 4 actions may be taken upon consultation with the City Solicitor.

Where pretreatment equipment is to be installed, the District will coordinate with other agencies in order to track and discourage cross media shift; for example, an air permit with The Hamilton County Department of Environmental Services or a Permit-to-Install with the Ohio EPA.

Pollution Prevention

The District is developing a pollution prevention program. Reducing pollution at its source is the preferable method of obtaining compliance with effluent limitations. The District will assist the industrial user with technology transfer and other available means to reduce, at the source, pollutants in the user's process operations.

A strong preference will be given to remedial alternatives which achieve compliance through pollution prevention by means of source reduction. However, the shifting of emissions from one environmental medium to a different environmental medium in order to achieve compliance may be considered as an acceptable alternative only after all other processes have been investigated. A user will not be allowed to achieve wastewater compliance by causing a violation of any other environmental law.

Compliance Schedule Policy

In certain cases the District may negotiate with an Industrial User regarding occurrences outside of permitted limitations when the following circumstances apply:

a) The Industrial User has agreed to construct a pretreatment facility, place it in operation and achieve compliance with all of the following: the industrial user's wastewater discharge permit; the Metropolitan Sewer District Rules and Regulations; Chapter 6111 of the Ohio Revised Code; Ohio Administrative Code 3745-3-12; and the General Pretreatment Regulations 40 CFR 403 and Subchapter N as may be amended; and such other laws, rules and regulations that may apply; and

b) Where the Industrial User has demonstrated that the occurrences outside limitations do not pose a threat of pollution to the environment and/or jeopardize health, safety, welfare, and property; and

c) Where the Industrial User has demonstrated that the occurrences outside limitations, do not pose a threat of interference and pass through or damage to the POTW; and

d) Where no Alternative Interim Measures are available to reduce the discharges below permit limits. In such event, the agreement negotiated will include Alternative Interim Measures which minimize the amount by which the discharges exceed permit limits; and

e) Where the Industrial User has agreed to pay an assessment based on an economic benefit analysis.

The agreement negotiated shall include the Industrial User's adoption of Alternative Interim Measures to prevent or minimize the exceeding of limitations during the interim period.

The District and the Industrial User may agree upon a fine schedule for the interim occurrences outside limitations. The agreement shall include a time frame for the following: completion of a treatability study of the Industrial User's wastewater; selection of pretreatment technology; completion of pretreatment specifications; submission of a complete application for a permit to install including detailed plans and specifications for the installation of pretreatment facilities to the Ohio EPA; submission of purchase orders for the approved pretreatment equipment; beginning date for construction; date for completion of construction; and date for demonstration of compliance to the District.

Prior to entering into a compliance schedule which allows the discharge of contaminants beyond permit limits, the District will consider Alternative Interim Measures. These Alternative Interim Measures are temporary measures which reduce discharges into the sewer system below permits limits pending the implementation of the final remedy, such as the construction of a pretreatment facility.

Such Alternative Interim Measures may include temporary process or operational changes, or temporary volume reduction (i.e. reduction in production output). Such measures may also include off-site disposal or on-site holding or a temporary alternative pretreatment operation. Measures that involve media shifting will be discouraged and a preference will be given to measures which involve pollution prevention.

Cost Recovery

The user will be held liable for cleanup costs and/or damages resulting from discharges in violation of District limitations. These costs will be derived separate and distinct from imposed fines and are generally the actual cost of cleanup and/or repair/replacement.

In addition, a non-compliant user may be assessed the cost for increased inspection and monitoring events required by the District to evaluate the users's return to compliance.

Economic benefit of noncompliance may be assessed separate and distinct from imposed fines. The District will refer to State and Federal guidelines such as EPA's Guidance Manual for POTWs to Calculate the Economic Benefit of Noncompliance.

Significant Noncompliance

The "significant noncompliance (SNC)" concept shall also be utilized to set priorities for enforcement response. Article XV, Section 1512 contains a provision to publish the names of industrial users found in significant noncompliance with the Rules and Regulations during the previous twelve (12) months. The term "significant noncompliance" applies to an industrial user meeting at least one of the following criteria:

Chronic violations of the Wastewater Discharge Permit as described in the Rules and Regulations; Technical Review Criteria (TRC) violations as described in the Rules and Regulations; Any other violation that the District believes has caused interference or pass-through phenomena; or has caused eminent endangerment to human health/welfare; d)Violations of construction and/or implementation schedule milestones contained in administrative orders; Failure to provide reports in the allotted time; Failure to accurately report noncompliance.

More severe enforcement actions will be taken against industrial users that frequently exceed pretreatment requirements as opposed to those that report isolated violations. In any case, if compliance is not achieved, escalated forms of enforcement will be taken to attain compliance in a timely fashion.

Fine Schedule

Monetary penalties will also be used as part of the enforcement program. USEPA guidance offers four criteria that will be reviewed before penalties are assessed:

a) Recover the cost to the District of the noncompliance.

b) Size penalty to deter future incidence of noncompliance.

c) Maintain a program of fairness, equity and consistency.

d) Provide a logical and systematic basis for penalty calculation.

To implement the recommended criteria in setting penalties the District has developed a series of fine schedules to use as a guide for establishing proposed penalties. These schedules are presented in the following tables.

Occurrences Outside Permit Concentration Limits - TABLE 2 This fine schedule is used to determine fines for violation of effluent limits. The fines increase as the percentage over the limit increases and as the facility wastewater flow increases. The schedule includes an adjustment for history of violations which directly relates to the enforcement level determined by the District. (Flow values used in this table are long term average total facility flows certified by the user and generally obtained through the wastewater discharge permit process.)

Occurrences Outside Continuous pH Periods - TABLE 3 Discharge to the wastewater treatment system of wastewater in violation of Section 1518 (F) of MSD's Rules and Regulations (R&R) shall be subject to penalties for pH ranges and periods of flow as set forth in Table 3. Each occurrence for a range and period listed in Table 3 shall be a separate violation so long as the period for that occurrence contains no element of time in common with the period for any other occurrence charged as a violation in accordance with the standards of Table 3.

Occurrences Outside pH Excursion Limits - TABLE 4 Discharge to the wastewater treatment system of wastewater in violation of Section 1518 (F) of MSD's R&R shall be subject to penalties for pH excursion levels and frequencies of excursions greater than the frequencies set forth in Table 4. Excursion shall mean an occurrence wherein a wastewater pH changes in magnitude from a value within or closer to the range of 6.0 to 10.0 Standard Units to a value outside or further from that range, whether toward a lower pH or a higher pH. The frequency of excursion shall mean the number of excursions in any interval of eight consecutive hours. Violations of the standards for excursion set forth in Table 4 shall be cumulative even if containing common elements of time.

Late Report Filing - TABLE 5 These enforcement responses are applicable for late or incomplete filing of routine required reports (e.g., monitoring, permit application, permit renewals, etc.). Required enforcement reports (e.g., RAP, SSCP, SOP, POT, monthly progress or monitoring reports, IOP, CIS, etc.) that are late or incomplete, will accrue penalties from due date.

Other Violations - TABLE 6 As a number of other violations may be committed which warrant a fine but which cannot be easily quantified in a fine schedule this table is a guide to the District in setting fine levels based on deviation and seriousness.

Wastewater Discharge Permits

Wastewater Discharge Permits are issued to a specific User for specific operations, at a specific premise. A Wastewater Discharge Permit shall not be reassigned or transferred or sold to another owner, another User or different premises. A Wastewater Discharge Permit shall not be transferred to a new or significantly changed operation.

TABLE 1
Enforcement Response Guide

I. SAMPLING, MONITORING & REPORTING VIOLATIONS

1. Noncompliance Item: Reporting Violation

a.	Circumstance:	Routine report improperly signed/certified
	Action:	Level 1
	Specific Response:	Phone call/documentation to file (IU Response due in 2 weeks)
b.	Circumstance:	Routine report improperly signed/certified after notification by District
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 2 weeks)
c.	Circumstance:	Late submittal of routine report (less than or equal to 5 days)
	Action:	Level 1
	Specific Response:	NON, DIW issues telephone warning (IU Response due immediately)
d.	Circumstance:	Late submittal of routine report (greater than 5 days but less than 30 days)
	Action:	Level 2
	Specific Response:	NOV issued, IU informed of possible fines (IU response due immediately)
e.	Circumstance:	Late submittal of routine report (greater than 30 days)
	Action:	Level 3
	Specific Response:	NOV with fines of $100/day beginning with day 31 and accumulating until the report is received up to a maximum fine of $2,000 per late report. (IU response due immediately)
f.	Circumstance:	Incomplete submittal of routine report
	Action:	Level 1
	Specific Response:	Phone call/NOV (IU Response due in 2 weeks)

Pretreatment Program Enforcement Response Plan

TABLE 1 (continued)
Enforcement Response Guide

g.	Circumstance:	Failure to submit any required report
	Action:	Level 3/4
	Specific Response:	NOV/AO and/or fine subject to hearing (IU Response due in 30 days)
h.	Circumstance:	Failure to report spill or permit violation - no impact
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 2 weeks)
i.	Circumstance:	Failure to report spill or permit violation - impact present
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
j.	Circumstance:	Failure to report changed discharge - no impact
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 2 weeks)
k.	Circumstance:	Failure to report changed discharge - impact present
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
l.	Circumstance:	Falsification of documentation
	Action:	Level 4
	Specific Response:	Referral to City Solicitor
m.	Circumstance:	Late submittal of required enforcement report
	Action:	Level 3
	Specific Response:	NOV with fines of $100/day beginning with day 1 and continuing until date report received up to a maximum of $2,000 per late report.
n.	Circumstance:	Failure to provide telephone notice within 24 hour of knowledge of a self monitoring violation.
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 2 weeks)

TABLE 1 (continued)
Enforcement Response Guide

2. Noncompliance Item: Monitoring Violation

a.	Circumstance:	Failure to monitor all pollutants required by discharge permit
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 30 days)
b.	Circumstance:	Failure to install monitoring equipment within specified time
	Action:	Level 3/4
	Specific Response:	NOV/AO and/or fine subject to hearing (IU Response due in 30 days)
c.	Circumstance:	Failure to maintain monitoring equipment
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
d.	Circumstance:	Denial of access
	Action:	Level 3/4
	Specific Response:	NOV/AO and/or fine subject to hearing Obtain search warrant

3. Noncompliance Item: Sampling/Analytical Violation

a.	Circumstance:	Improper sampling location
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 2 weeks)
b.	Circumstance:	Improper analytical methods
	Action:	Level 2
	Specific Response:	NOV/CAM (IU Response due in 2 weeks)

II. PERMIT VIOLATIONS

1. Noncompliance Item: Exceeding Permit Effluent Limits

a.	Circumstance:	First occurrence - no impact
	Action:	Level 1
	Specific Response:	NOV requiring a return to compliance

TABLE 1 (continued)
Enforcement Response Guide

b. Circumstance: First occurrence - impact present
Action: Level 2/3
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

c. Circumstance: More than one occurrence in twelve month cycle
Action: Level 2/3/4
Specific Response: Dependent upon number of occurrences and their impact

2. Noncompliance Item: Dilution Of Wastestream As Substitute For Pretreatment

a. Circumstance: Willful or otherwise
Action: Level 3/4
Specific Response: NOV/fine subject to hearing/AO or referral to Solicitor (IU Response due in 30 days)

3. Noncompliance Item: Failure To Operate And Maintain Pretreatment Facilities

a. Circumstance: Willful or otherwise
Action: Level 2/3/4
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

4. Noncompliance Item: Violation Of Compliance Schedules

a. Circumstance: Late progress report (greater than 30 days)
Action: Level 3
Specific Response: NOV with fines of $100/day beginning with day 1 and continuing until date report received up to a maximum of $2,000 per late report.

5. Noncompliance Item: Violation of Periodic Reporting Requirements

a. Circumstance: Report interval exceeds 9 months
Action: Level 2
Specific Response: NOV/CAM (IU Response due in 30 days)

b. Circumstance: Late permit application
Action: Level 1
Specific Response: Phone call/documentation to file (IU Response due in 1 week)

TABLE 1 (continued)
Enforcement Response Guide

III. UNAUTHORIZED DISCHARGE:

1. Noncompliance Item: Discharge Prohibitions

a.	Circumstance:	No impact
	Action:	Level 1
	Specific Response:	NOV requiring a return to compliance
b.	Circumstance:	Impact present
	Action:	Level 2/3/4
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

2. Noncompliance Item: Expired Permit

a.	Circumstance:	Willful or negligent
	Action:	Level 1/2
	Specific Response:	NOV/Phone call (IU Response due in 2 weeks)

3. Noncompliance Item: Unauthorized bypass

a.	Circumstance:	Violates permit limits
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
b.	Circumstance:	Failure to notify District - no impact
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
c.	Circumstance:	Failure to notify District - impact present
	Action:	Level 2/3/4
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

4. Noncompliance Item: Slug load or accidental discharge

a.	Circumstance:	Failure to notify District - no impact
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

TABLE 1 (continued)
Enforcement Response Guide

b. Circumstance: Failure to notify District - impact present
Action: Level 3/4
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

5. Noncompliance Item: Operating Upset

a. Circumstance: Failure to notify District - no impact
Action: Level 2/3
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

b. Circumstance: Failure to notify District - impact present
Action: Level 2/3/4
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

IV. VIOLATIONS DETECTED DURING SITE VISITATION:

1. Noncompliance Item: Illegal Discharge

a. Circumstance: Failure to notify District - no impact
Action: Level 2/3
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

b. Circumstance: Failure to notify District - impact present
Action: Level 2/3/4
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

2. Noncompliance Item: Access to Records

a. Circumstance: IU refusal
Action: Level 2/3/4
Specific Response: NOV/CAM/AO and/or fine subject to hearing (IU Response due 30 days)

Pretreatment Program Enforcement Response Plan

TABLE 1 (continued)
Enforcement Response Guide

3. Noncompliance Item: Accidental Discharge

a.	Circumstance:	Failure to notify District - no impact
	Action:	Level 2/3
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
b.	Circumstance:	Failure to notify District - impact present
	Action:	Level 2/3/4
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)
c.	Circumstance:	Causes interference/pass-through
	Action:	Level 2/3/4
	Specific Response:	NOV/CAM/AO and/or fine subject to hearing (IU Response due in 30 days)

Note: ... In certain non-compliant episodes where a POTW response may come from a choice of Action Levels (i.e. Level 2/3/4), the industrial user Response time given pertains to the highest Action Level taken. The District reserves the right to require industrial users to respond more quickly in the event of an emergency or during other such times as the District deems necessary. the District Rules and Regulations confer on the industrial user certain rights which authorize specific response times.

TABLE 2
Fine Schedule:
Occurrences Exceeding Permit Concentration Limits

Evaluation Criteria	**Value**	**Fine Amount**
A. Magnitude of Occurrence		
0% to 20% over limit	$0 to 100[a]	
21% to 50% over limit	100	
51% to 100% over limit	200	
101% to 200% over limit	400	
201% to 300% over limit	600	
301% to 400% over limit	800	
401% or more over limit	1,000	
B. Volume of Discharge (gpd)		
10,000 of less	$200	
10,001 to 50,000	500	
50,001 to 250,000	1,000	
250,001 to 500,000	2,000	
500,001 to 1,000,000	3,000	
Over 1,000,000	4,000	
Subtotal - Base Fine		
C. Adjustment for History of Violations	Base fine multiplier	
Level 1[b]	1	
Level 2[b]	1.5	
Level 3[b]	2	
Total Fine		

[a] Use zero for single grab or daily composite sample; use $100 if occurrence is computed from average of two or more samples.
[b] Refers to Enforcement Action Tier in the District's Enforcement Response Plan.

Pretreatment Program Enforcement Response Plan

TABLE 3 Fine Schedule: Occurrences Exceeding Continuous pH Periods		
pH Range Standard Units	Continuous Period of Flow Minutes	Penalty Dollars
Less than 6.0	60	100
Less than 5.0	30	200
Less than 4.0	15	300
Less than 3.0	10	400
Less than 2.0	3	500
More than 10.0	120	100
More than 11.0	45	200
More than 12.0	15	300
More than 13.0	10	400

TABLE 4 Fine Schedule: Occurrences Exceeding pH Excursion Limits		
pH Excursion Level Standard Units	Allowable Frequency of Excursion Events in 8 Hours *	Penalty Dollars
Less than 6.0	No Limit	0
Less than 5.0	6	200
Less than 4.0	4	300
Less than 3.0	3	400
Less than 2.0	2	500
More than 10.0	No Limit	0
More than 11.0	4	200
More than 12.0	3	300
More than 13.0	2	400

TABLE 5 Fine Schedule: Late Report Filing	
Nature of Violation	Action
Level 1. Report late 1-5 days	Notice of Noncompliance issued
Level 2. Report late 6-30 days	Notice of Violation issued
Level 3. Report late 31+ days	Notice of Violation with fines of $100/day beginning with day 31 and continuing until date report received up to a maximum of $2,000 per late report.

TABLE 6 Fine Schedule: Other Violations			
Potential For Harm	Extent of Deviation		
	Major	Significant	Minor
Major	$10,000	$7,000	$4,000
Significant	6,000	3,500	1,500
Minor	2,000	1,200	300

APPENDIX I

Environmental Enhancement Action (EEA) Policy

ENVIRONMENTAL ENHANCEMENT ACTION

ENVIRONMENTAL ENHANCEMENT ACTION POLICY

Background

The Metropolitan Sewer District's (MSD), Division of Industrial Waste (DIW) is responsible for implementation of a Pretreatment Program. This program includes inspecting and sampling industrial users, reviewing monitoring results to determine compliance status, and taking enforcement actions. As required by the National Pretreatment Program, the Division of Industrial Waste developed an Enforcement Response Plan (ERP) in 1986. The ERP describes the process used by the District to identify, document, and respond to pretreatment violations in a timely and equitable manner as required by State, Federal, and local laws. In 1994, the District's Enforcement Response Plan was revised. The final approval was given by the Hamilton County Board of County Commissioners on July 13, 1994 and the document was given an effective date of December 1, 1994. A series of training seminars were provided for all Industrial Users in October and November of 1994. The full implementation of the revised ERP began December 1, 1994. Industrial Users under enforcement at the time were fazed into the new ERP tiered system.

The new ERP greatly enhanced opportunities to communicate between the IU and DIW concerning compliance issues. This is accomplished by requiring Compliance Attainment Meetings (CAM) be held and increasing inspections in response to enforcement. This increased communication has resulted in compliant discharges, greater accuracy in monitoring, protection against spills and implementation of pollution prevention measures by many. This plan and supporting policies developed to follow its guidance work well for the majority of our enforcement cases.

Prior to the development and implementation of the revised ERP, the potential problem an emphasis on fines and penalties alone would present and its impact on our primary goal was identified. Therefore a policy that would provide an impetus to insure compliance for the "long term" was needed. The ERP establishes the procedure to be used to determine fines and penalties to be assessed for violations of the conditions of the Pretreatment Program. It also allows for the use of innovation and creative solutions to environmental problems. As a result of the implementation of the revised ERP, MSD, DIW also developed the Environmental Enhancement Action (EEA) policy.

DIW's Environmental Enhancement Action policy uses, as its foundation, the USEPA's Supplemental Environmental Projects (SEP) policy. This allows for environmentally beneficial projects or activities that improve, protect or reduce risks to public health or the environment that are undertaken by the offending IU to be considered in settlement of enforcement actions to offset monetary penalties proposed by the DIW. The USEPA's SEP policy originally published in February 1991 was revised as of May 1, 1998. With this revision DIW's policy was also revised.

Procedure

As administered by the DIW, once a company reaches the ERP level that requires a fine, (In accordance with the ERP, a company is not fined on the first violation unless it is a reporting violation.) representatives are required to attend a Compliance Attainment Meeting (CAM). The purpose of this meeting is to identify the violation and begin to take steps to address and eliminate the cause of the violations. Once these actions have been identified, an Administrative Order is issued that specifies the portion of the total fine amount that is to be paid immediately, a compliance schedule, and any other SEP projects that must be completed. The remaining portion of the fine is held in abeyance until the project/projects are completed. In many cases, the elimination of the violations is not a quick or inexpensive solution. Fines and penalties may be added during this time if violations continue to occur. The user is required to implement measures that will minimize these occurrences while identifying a strategy for “long term compliance.” The user may be required to bear the cost of a study and installation of pretreatment equipment, additional monitoring (by MSD or self), study and implementation of pollution prevention practices, and/or funding an environmental project. Additionally, a user must demonstrate compliance after implementation of the solution. Once the installation or project has been completed, documentation of the costs incurred by the user must be submitted. In determining the final amount to be paid, the costs incurred as well as the length of time it took the company to become complaint is taken into consideration. The attached chart provides a description of the procedure followed when an enforcement action results in allowing for an EEA.

ENVIRONMENTAL ENHANCEMENT ACTION

ENVIRONMENTAL ENFORCEMENT ACTION

MSD LETTERS	NON/NONs	**NOV/CAM**	NON/**NOV/A0**	NON/**NOV**	NON/**NOV**	NON/**NOV**	NON/**NOV**
FINES ASSESSED			25%	25%	50%	75%	100%
FINES HELD			75%	75%	50%	25%	0%
ENFORCEMENT TIME			0 MONTHS	>>>>>>>>>>	12 MONTHS	18 MONTHS	>24 MONTHS **level 3

Once CS and items of the Order are complete, total remaining fines and make decision on what to assess according to expenses for compliance projects (assess 25% and evaluate 75%)

* If the length of AOs exceeds 12 months, heavier penalties may be sought.

* If like violations occur that should be resolved by the IU's existing AO/CSA then these would require no separate enforcement document but would proceed as part of the current Order, fines being assessed with that document timeline. However, if violations not related or resolved by current actions then a separate CSA would need to be agreed on and attached to the existing Order.

* MSD must be able to justify actions taken to offset fines. Inspections, files that identify costs for compliance items, and cost summaries from the IU as documentation of actions implemented which may include but are not limited to, purchase orders and invoices will be required prior to termination of the order.

* EEAs offset a maximum of 75% of the proposed fines. MSD may term these projects EEAs-Environmental Enhancement Actions. . Examples of EEAs are P2, Pretreatment, Audits (IAMS, consultant, internal), monitoring, construction/modification of a sample location.

** At ERP Level 3 MSD may examine the benefit of non-compliance

* The timeline for enforcement actions shall be explained in the CAM. Conditions pertaining to escalated enforcement actions are included in the Administrative Order.

APPENDIX J

Sampling/Field Investigation Capabilities

SURVEILLANCE CAPABILITY OF DIW

600, 700 ,800 SERIES SAMPLERS CAN BE USED FOR TREATMENT PLANTS AND SOME INDUSTERIAL USERS THAT REQUIRE A SIMPLE SET UP

600 5 AVAILABLE
700 1 AVAILABLE
800 11 AVAILABLE
800 7 AVAILABLE (STORM WATER SAMPLERS)

900 MAX SAMLPERS ARE USED FOR THE MORE INTERCATE SET UPS. THEY HAVE THE CAPABILITY TO DOWN LOAD THEIR DATA. THEY CAN MONITOR FLOW, PH, RAIN GAUGE ,AND SAMPLE .

900 MAX 10 AVAILABLE COMPOSIT,DISCRETE,PH/ORP,FLOW.
900 MAX 12 AVAILABLE COMPOSIT, DISCRETE, PH/ORP, FLOW, RAIN GUAGE

81002 SERIES BUBBLER FLOW METERS CAN ONLY BE USED FOR FLOW MEASUREMENT AND INITIATING A SAMPLER TO SAMPLE

81002 8 AVAILABLE

950 THIS BUBBLER FLOW METERS CAN ALSO MONITOR FOR Ph/ORP,TEMP, TRACK A RAIN GAUGE AND INITIATE A SIGNAL TO A SAMPLER TO TAKE SAMPLES.

950 15 BUBBLER , FLOW, PH
13 BUBBLER, FLOW, PH, RAIN GAUGE

STREAM MONITORING & SPECIAL STUDIES

960 FLOW METERS HAVE BUBBLER, AREA VOLICITY,ULTRA SONIC, MEASUREMENT. THEY CAN MONITOR FOR pH/ORP,TEMPATURE ,DISOLVED OXYGEN/CONDUCTIVITY, AND TRACK A RAIN GAUGE. THEY ALSO HAVE A MODEM WITH PHONE AND CAN BE PLACED AT A HAZERDOUS LOCATION AND BE MONITORED IN REAL TIME AT A REMOTE LOCATION USING COMPUTER LINKS

960 5 AVAILABLE with PHONES

DATASONDE 4/ MINISOND
HYDRO LABS ARE USED TO MONITOR RECEIVING STREAMS FOR PH ,DO TURBIDITY,TEMPATURE AND CONDUCTIVITY

MODEL 4 1 AVAILABLE

YSI MODEL 50 DISOLVED OXYGEN METER DO TESTING

50 MODEL 1 AVAILABLE

ORION MODEL 115 CONDUCTIVITY METER CONDUCTIVITY TEST

115 1 AVAILABLE

GX-86, STM2100,AND TMX412 GAS METERS ARE USED TO MONITOR FOR ,LEL, O2, H2S, CO. NOT ONLY ARE THEASE USED FOR CONFINED SPACE, THEY LET THE USER KNOW IF THEY MOVE INTO A DANGEROUS ATMOSPHERE OR IF THR ATMOSPHERE CHANGE S AT ANY LOCATION. SOME (STM2100) ARE USED TO MONITOR ATMOSPHERES IN SEWWERS OVER A PERIOD OF TIME, DATA CAN BE DOWN LOADED TO A COMPUTOR

GX-86 9 AVAILABLE

STM2100 4 AVAILABLE

TMX412 4 AVAILABLE

APPENDIX K

Analytical Capabilities

Metropolitan Sewer District
Division of Industrial Waste – Laboratory Section
Waste Water Analyses

Analysis

Alkalinity
Ammonia
Chromium hexavalent
Carbonaceous Oxygen Demand (COD)
Biochemical Oxygen Demand (BOD)
Cyanide, total
Cyanide, free
Cyanide, amendable
Fecal
Hardness
Metals
  Mercury
Metals GFAA
  Arsenic
  Selenium
  Lead
  Thallium
Metals ICP
  Cadmium
  Chromium
  Copper
  Nickel
  Lead
  Zinc
  Silver
  Barium
  Beryllium
  Cobalt
  Manganese
  Antimony
  Selenium
  Thallium
  Iron
  Aluminum
  Magnesium
  Arsenic
Nitrate
Nitrite
Oil & Grease
Volatile Organics (624)
  Bromochloromethane
  Chloromethane
  Vinyl Chloride
  Bromomethane
  Chloroethane
  Trichlorofluoromethane
  Acrolein

1,1-Dichloroethene
Acrylonitrile
Methylene Chloride
Trans-1,2-Dichloroethene
1,1-Dichloroethane
Chloroform
2-Bromo,1-Chloropropane
1,2-Dichloroethane
1,1,1-Trichloroethane
Carbon Tetrachloride
Benzene
Trichloroethene
2-Chloroethylvinylether
1,2-Dichloropropane
Bromodichloromethane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,1,2-Trichloroethane
Dibromochloromethane
Bromoform
1,4-Dichlorobutane
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Bromofluorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene

Semi-Volatiles (BNA 624)

n-Nitrosodimethylamine
2-Fluorophenol
Phenol
Bis(2-chloroethyl)ether
2-Chlorophenol
Bis(2-chloroisopropyl)ether
n-Nitrosodi-n-propylamine
Hexachloroethane
Naphthalene
Nitrobenzene
Isophorone
Decafluorobiphenyl
2-Nitrophenol
2,4-Dimethylphenol
Bis(2-chloroethoxyl)methane
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
1-Fluoronaphthalene

Hexachlorobutadiene
4-Chloro-3-methylphenol
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2-Chloronaphthalene
Dimethyl phthalate
Acenaphthylene
2,6-Dinitrotoluene
Acenaphthene
2,4-Dinitrophenol
4-Nitrotophenol
2,4-Dinitrotoluene
Diethyl phthalate
4-Chlorophenyl phenyl ether
Fluorene
4,6-Dinitro-o-cresol
n-Nitrosodiphenylamine
1,2-Diphenylhydrazine
2,4,6-Tribromophenol
4-Bromophenyl phenyl ether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
Di-n-butyl phthalate
Fluoranthene
Benzidine
Pyrene
Butyl benzyl phthalate
3,3’-Dichlorobenzidine
Benzo(a)anthracene
Chrysene
Bis(2-ethylhexyl)phthalate
Di-n-octyl phthalate
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Dibenzo(ghi)perylene
Dibenzo(a,h)anthracene

Pesticides/PCB

Aldrin
Dieldrin
Chlordane
4,4’-DDT
4,4’DDE
4,4’DDD
alpha endosulfan

- beta endosulfan
- endosulfan sulfate
- Endrin
- Endrin aldehyde
- Heptachlor
- Heptachlor epoxide
- alpha BHC
- Beta BHC
- Lindane (gamma BHC)
- Delta BHC
- PCB-1242
- PCB-1254
- PCB-1221
- PCB-1232
- PCB-1248
- PCB-1260
- PCB-1016
- Toxaphene
- Methoxychlor

PH
Solids
TKN
TKP
Volatile solids
Vapor Space Organics

Laboratory Information Management System (LIMS)

DIW has a laboratory Information Management System (LIMS) for tracking and managing its analytical data. The LIMS system is a personal computer based system and operates on a 32-bit client/server network. It has a windows based operating system on an Oracle database. The LIMS is installed on our LAN and have the potential for installation on a wide area network (WAN) linking two or more sites.

The system provides multilevel security on the LIMS as well as network security. This ensures that the data is secure and any changes are traceable. Samples can be logged into the LIMS using self-generated bar code labels. Samples may be logged in individually or as a group.

Each client is given a unique location identifier that includes testing required, invoice information (where required), maximum holding times, and location description. Each location code has upper and lower warning limits and target results. These specifications are checked each time a sample result for that location is entered or validated. Results that exceed the limits are immediately color coded on the screen.

Quality assurance package attached to the LIMS allows for statistical charts to be generated for all the QA parameters. The LIMS also has the capability to chart the results of individual parameters and to display and print the results immediately.

Reports maybe generated in Access, Excel, Word or any third party software package. The report can be exported to other programs or to the e-mail system.

The system has a project management component and an Industrial Pretreatment module. These modules allow tracking our industrial clients and issuing notice of violation to the managers. At present this module is not used. Pretreatment information is maintained in a separate database.

PREFACE

M.S.D.LAB. believes that the commitment of all within its organization to a comprehensive Quality Assurance Program Plan is a necessity to meet the objectives of this analytical laboratory. The following Laboratory Quality Management Plan is an embodiment of the current practices of quality assurance/quality control at M.S.D.LAB. The in-house quality assurance program is aimed at the production of data of known quality and integrity, while sustaining a minimum loss of data due to out-of-control conditions.

Each laboratory section is responsible for keeping an updated version of Standard Operating Procedures (SOP) applicable to that section. To ensure continuity of analysis throughout the laboratory, specifics in the areas such as sample handling, instrument calibration, quality control measures, injection technique, data acquisition, data processing, and autosampler procedures are thoroughly explained in each SOP. Following the guidelines stated in SOPs, M.S.D. obligations and method specifications can be met.

The practices of quality assurance/quality control presented in the following text are set forth as minimums, and any additional measures that M.S.D. requires can be incorporated into the quality assurance/quality control project plan. The minimums set forth should be considered, as such, minimums.

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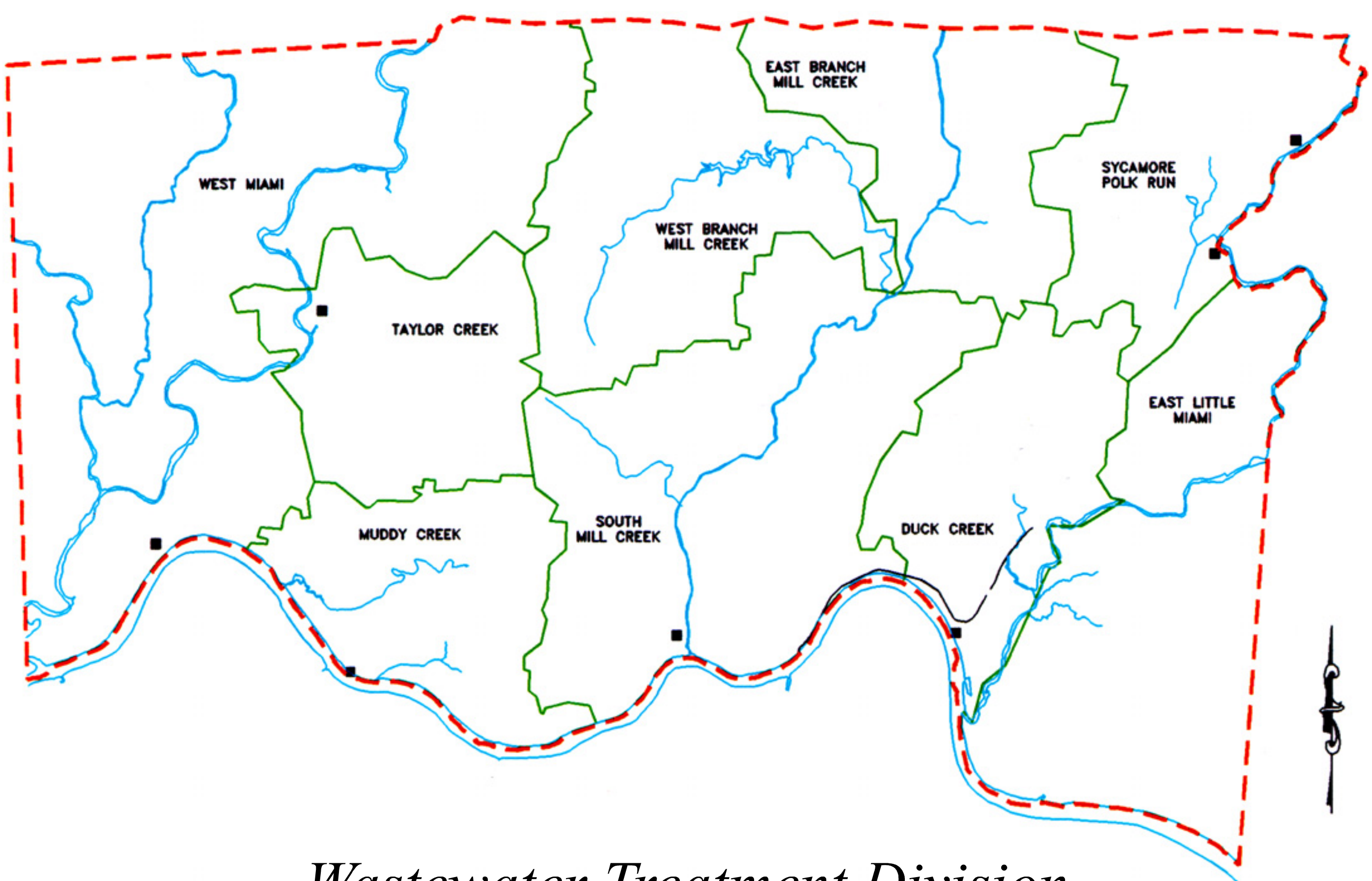
1 ICP
1 ICPMS
1 Graphite Furnace AA
1 Hg Atomic Fluorescence
1 Hg AA
Water bath for Fecals
2 Incubators

EXHIBIT 9

Metropolitan Sewer District
of
Greater Cincinnati

PUMP/LIFT STATION
OPERATION AND MAINTENANCE PROCEDURES



Wastewater Treatment Division

DECEMBER 1999

REVISED FEBRUARY 2002

MSD

MSD Division of Wastewater Treatment Pump/Lift Station Operation and Maintenance Procedures

Purpose:

Maintain all Pump and Lift stations in a reliable and ready condition. Respond and make repairs quickly to prevent or minimize any negative environmental impact, if a problem does occur. Take quick decisive action to (1) stop the incident and (2) to protect the public from potential health risks in the event of an overflow.

Definition:

For the purposes of this document, “Section” refers to the operating sections within Metropolitan Sewer District, Division of Wastewater Treatment. The sections involved in this procedure are, Little Miami Treatment Plant, Mill Creek Treatment Plant, Muddy Creek Treatment Plant, Polk Run Treatment Plant, Sycamore Treatment Plant, Taylor Creek Treatment Plant and Equipment Maintenance. Each of the treatment plant sections is responsible for the pump and lift stations in a geographic area. Equipment Maintenance provides service, as needed to all of the treatment plant sections. The Wastewater Treatment Division is in the process of forming a Pump Station/Lift Station (PS/LS) group. As the PS/LS group is staffed responsibility for pump/lift station inspection and preventive maintenance will be transferred from plant personnel to the PS/LS group.

Procedures:

Continuous monitoring of all pump/lift stations (Telemetering)

Each station is continuously monitored through the MSD radio telemetry system. Monitoring parameters include, but are not limited to:

- Power status (power failure)
- Wet well status (high well)
- Dry well status (where applicable)
- Generator status
- Entry alarm (on the Remote Terminal Unit)

The signals from the telemetering system are monitored at the following locations.

- The section responsible for the operation and maintenance of the station.
- Station 10 located at the Mill Creek Treatment Plant
- The Little Miami Treatment Plant

The telemetering system is maintained in proper working order. MSD employs a full time technician who with the aid of the electrical engineering staff and the electrical staff of the various treatment sections maintains the radio telemetry system.

Emergency Response Procedures

Each operating section has a procedure that includes the proper response for various alarm conditions from the pump and lift stations. How an alarm is dealt with is determined by the personnel availability in the operating section, weather conditions and the characteristics of the station involved. When called for, maintenance personnel are dispatched to the station to evaluate and correct the condition. If the operating section cannot make this response, personnel from an adjacent section or from the Wastewater Treatment Division's equipment maintenance staff are called in.

For any incident that involves an overflow, an Environmental Event Report is filled out. A sample is collected and sent to the laboratory along with an MSD Overflow Monitoring form. The incident is also reported in accordance with the Reporting Procedures listed below. Examples of an Environmental Event Report and an Overflow Monitoring form are located on pages 1 and 2 of Appendix B. Additionally, if a mechanical problem is the cause of the overflow, staff will respond so as to minimize overflow duration, and expeditiously schedule work to repair the mechanical problem.

Mitigation

Any area impacted by an overflow is flushed or cleaned as needed to remove debris, prevent odors and preserve the environment.

Reporting Procedures

All non-permitted overflows are reported to the Ohio EPA's 24 hour emergency response number 1-800-282-9378 and are followed up with a detailed letter, in accordance with the guidelines established by that agency. In addition, for any overflow that may affect public health or safety, the health department with local jurisdiction is notified.

In the event of a fish or wildlife kill attributed to the overflow, the Ohio Department of Natural Resources is notified.

The OEPA emergency response phone numbers are posted at each of the treatment facilities. Health Department and Ohio Department of Natural Resources numbers are available through the dispatcher at station 10.

Station inspection

In addition to the continuous monitoring, each station is inspected on a regular schedule. The frequency of these inspections is determined on a station by station basis, and is based on factors such as age, operating history, size and potential for negative environmental impact. The minimum frequency of the inspections ranges from daily for large stations to once every 2 weeks. Examples of station inspection sheets are located on pages 3-7 of Appendix B

Station Maintenance

Preventive maintenance:

A schedule listing the PM and inspection frequency is maintained for each station. PM activities typically include, but are not limited to the following:

- Periodic service and calibration of all instrumentation, such as flow meters, level sensors, alarms, elapsed time meters and telemetering equipment.
- Routine inspection and service for all station equipment including:
  - Engines and generators
  - Motors
  - Pumps
  - Wet wells
  - Impellers
  - Seals
  - Bearings

- Wear clearances
- Couplings
- Drives
- Air release valves
- Related equipment

Records of all PM activities are kept on file. Where available, these records are kept in a computerized maintenance management system (CMMS).

An example of an annual check sheet is on pages 8-9 of Appendix B

Corrective Maintenance:

A procedure for performing corrective maintenance is maintained in each operating section. This procedure includes, but is not limited to:

- Work order writing procedures
- Operator inspection procedures
- Emergency response procedures
- Call in procedures
- Notification procedures if an environmental incident is involved

Resources available to the operating section are described in Appendix A.

Training

MSD and the Division of Wastewater Treatment require that all employees receive OSHA required training that is related to their job. In the case of pump and lift station maintenance, this training includes confined space entry, CPR, first aid and emergency response.

In addition, employees are encouraged to attend skills training which is pertinent to their job duties.

Records Keeping

Each operating section keeps records of operation and maintenance performance indicators such as:

- Equipment run hours
- Reliability history
- Maintenance and calibration history

Revisions
This plan will be subject to modification by the Director of MSD to account for changes in circumstances such as changes in the configuration of MSD facilities, the purchase of new equipment, changes in regulatory requirements, the development of new technologies, or changes in industry standards/best management practices. MSD will report any such modifications to this Plan in the annual report required by Paragraph IX.C of the Consent Decree.

Additional References
MSD shall use appropriate procedures and implement work in accordance with appropriate schedules necessary to meet the purposes of this plan. MSD is currently following the plans and schedules in APPENDIX C and APPENDIX D.

The EPA and OEPA will be notified in an annual report if there are any changes to Appendix C or Appendix D.

APPENDIX C – Pump Station and Lift Station Inspection and Preventive Maintenance Summary – This appendix summarizes pump station and lift station inspection and preventive maintenance frequency in place as of the date of this document.

APPENDIX D - Pump Station and Lift Station Preventive Maintenance Procedures – This appendix includes copies of the preventive maintenance procedures in place as of the date of this document.

Appendix A

Resources Available to Operating Sections

Appendix A

Resources Available to Operating Sections

All operating sections have equipment such as boom trucks, general maintenance tools, pick-up trucks, vans and portable gasoline powered pumps. In addition, Taylor Creek section has three vacuum tankers and Mill Creek has two Vactor trucks. Trailer mounted portable hydraulic pumps are kept at the Muddy Creek and Sycamore Treatment Plants. In addition, the Division of Wastewater Collections has a number of larger hydraulic pumps available for bypass pumping in the event of an emergency.

EQUIPMENT MAINTENANCE SECTION SUPPORT

MSD has an Equipment Maintenance Section, which provides additional support. This Section has over 50 employees and provides mechanical, electrical, stand-by generator, telemetry, machine shop, weld shop, paint shop, HVAC, and engineering support. This support augments the capabilities of the operating sections. Equipment Maintenance has heavy equipment including a truck-mounted crane (60-foot boom), a back-hoe/loader with trailer and a skid-loader (Bobcat) with trailer. In addition, there are contracts in place for renting various types of heavy equipment.

Besides having seven electricians on staff, the Electric Shop has a specialist whose full-time responsibility is to repair or rebuild pumps and motors. In most cases this technician can quickly return units to service, saving days or weeks of delay. He has the services of a fully equipped machine shop to aid him. Larger pumps are sent to the MSD Machine Shop for repair while a contractor handles large motor repairs.

The Electric Shop also has a full-time generator technician. The generators are on a timer for weekly exercise to maintain readiness. The technician times his visits as much as possible to observe the satisfactory operation on the units. However, the units are also connected to the telemetry which keeps the operating staff informed of the status of the units at all times. The generator technician performs scheduled maintenance on his rounds. He also responds to emergency calls.

MSD has two trailer-mounted diesel generators. The generators can be transported to stations experiencing a power failure. The two generators are primarily for emergency use but are also used when station maintenance requires a shutdown of utility power. MSD also has a loadbank for load testing all generators on a preventive maintenance schedule.

In addition, MSD has a contract with a company that specializes in generators. They can be called in for emergencies that exceed the capabilities of MSD staff. This contractor is also used for scheduled maintenance.

Telemetry is required in all stations. The Telemetry System monitors several key functions at each station continuously, reporting to master consoles at the plants that are fully staffed. The signals from the sensors are transmitted by radio. The telemetry monitors the status of wet and dry wells, pumps, utility power, generator status and entry alarms. It also controls the operation of pumps at some stations. There is a full-time electrical engineer and technician who maintain the telemetry system.

For technical support the Treatment Division has one environmental, five mechanical and five electrical engineers. The engineering staff assists operating and maintenance personnel with design, installation, repair and troubleshooting of the stations, their equipment and their systems.

Appendix B

Sample Maintenance Check Sheets and Forms

ENVIRONMENTAL EVENT REPORT

Facility Name: ______________________________

Event Type: ________________ Area: ____________

Date Discovered: ____________ Time Discovered: ________

Date Began: ____________ Time Began: ________

Date Resolved: ____________ Time Resolved: ________

Cause of Event: ______________________________

Material Involved: ______________________________

Amount: ______________________________

What was done to correct problem? ______________________________

Was the event preventable? ___Yes ___No If yes, what steps should have been taken to prevent the event? ____________

What steps will be taken to prevent a recurrence? ____________

Was event reported? ___Yes ___No If yes, to whom and when was the event reported? ______________________________

Additional Comments: ______________________________

Completed by: ____________________ Date: ____________

Rev. 1/96

Distribution: WWT Division Office, Taylor Creek T.P., Tom Quinn, K. Stull, B. Head

M S D

OVERFLOW MONITORING

Date Sampled: ______________________ Time Sampled: ______________

Sampler's Name: ______________

Location Sampled: ____

____

____

Comments: ____

____

____

Received by: ____

Date: ____

Time: ____

Analysis: SS: ______________

BOD: ______________

____

Signature

1/24/95

STATION__P.R.C. CHECKED BY ____________________

WET WELL	DATE				
CHECK FOR GREASE AND DEBRIS					
MAIN FLOOR					
CHECK BUBBLER FOR OPERATION					
DRAIN CONDENSATE FROM FILTER					
RECORD PUMP OPERATING HOURS	1				
	2				
	3				
	4				
	5				
RECORD SEAL WATER PRESSURE	1				
	2				
AIR COMPRESSORS					
CHECK PRESSURE & RECORD					
RECORD HOUR METER	1				
	2				
CHECK OIL LEVEL	1				
	2				
DRAIN CONDENSATE FROM TANK					
CHECK ODOR CONTROL BLOWER					
CHECK EXHAUST FAN					
CHECK INLET FAN					
CHECK ALL LIGHTING					
VISUALLY INSPECT ALL MCC WIRING					
CHECK FURNACE OPERATION					
DRY WELL/VALVE CHAMBER					
CHECK PUMP OPERATION	1				
	2				
	3				
	4				
	5				
INSPECT CHECK VALVES	1				
	2				
	3				
	4				
	5				
CHECK SUMP PUMP					
HOUSE KEEPING					
POLICE UP AREA					
TELEMETERING					
CHECK RTU & VERIFY					

COMMENTS ____________________

STATION ARROW HEAD CHECKED BY ____________________

COMPRESSORS	DATE					
CYCLE TEST THE STATION						
CHECK AND ADJUST BELTS	1					
	2					
CHECK OIL LEVEL	1					
	2					
RECORD HOUR METER	1					
	2					
CHECK ALTERNATOR						
CHECK AIR PRESSURE, RECORD						
THREE WAY VALVE						
CHECK THE TIMER, RECORD						
CHECK BLOWBACK INTO W.W.						
ELECTRODE						
CHECK NO FAIL OPERATION						
HEATER, CHECK OPERATION						
EXHAUST FAN CHECK OPERATION						
CONTROLS						
CHECK PANEL LIGHTS						
VISUALY CHECK ALL WIRING						
TELEMETERING						
CHECK RTU AND VERIFY						
HOUSE KEEPING						
CLECN UP ALL SPILLS						
POLICE UP AROUND STATION						

COMMENTS ____________________

STATION CAMBERLY ACRES CHECKED BY ____________________

	DATE	____	____	____	____	____
WET WELL						
CHECK FLOAT OPERATION		____	____	____	____	____
CHECK FOR GREASE AND DEBRIS		____	____	____	____	____
CHECK PUMP OPERATION	1	____	____	____	____	____
	2	____	____	____	____	____
RECORD PUMP HOURS	1	____	____	____	____	____
	2	____	____	____	____	____
CHECK SEAL FAILURE LIGHT		____	____	____	____	____
INSPECT CHECK VALVES	1	____	____	____	____	____
	2	____	____	____	____	____
CONTROLS						
CHECK ALTERNATOR		____	____	____	____	____
VISUALLY CHECK WIRING		____	____	____	____	____
HOUSE KEEPING						
CLEAN UP ALL SPILLS		____	____	____	____	____
POLICE UP AROUND STATION		____	____	____	____	____
TELEMETERING						
CHECK RTU AND VERIFY		____	____	____	____	____

COMMENTS ____

____

____

____

STATION LASALLE PLACE

CHECKEDBY ____________________

	DATE	______	______	______	______	______
WET WELL						
CHECK FLOAT OPERATION		______	______	______	______	______
CHECK FOR GREASE AND DEBRIS		______	______	______	______	______
CHECK PUMP OPERATION	1	______	______	______	______	______
	2	______	______	______	______	______
	3	______	______	______	______	______
RECORD PUMP HOURS	1	______	______	______	______	______
	2	______	______	______	______	______
	3	______	______	______	______	______
CHECK SEAL FAILURE LIGHT		______	______	______	______	______
INSPECT CHECK VALVES	1	______	______	______	______	______
	2	______	______	______	______	______
CONTROLS						
CHECK ALTERNATOR		______	______	______	______	______
VISUALLY CHECK WIRING		______	______	______	______	______
HOUSE KEEPING						
CLEAN UP ALL SPILLS		______	______	______	______	______
POLICE UP AROUND STATION		______	______	______	______	______
TELEMETERING						
CHECK RTU AND VERIFY		______	______	______	______	______
GENERATOR						
RECORD HOUR METER		______	______	______	______	______
CHECK FUEL OIL LEVEL		______	______	______	______	______
CHECK LUBE OIL LEVEL		______	______	______	______	______
CHECK COOLING WATER LEVEL		______	______	______	______	______
CHECK BLOCK HEATERS		______	______	______	______	______
CHECK ALL HOSES, BELTS ECT.		______	______	______	______	______

COMMENTS ____

____

STATION PONDEROSA

CHECKED BY ____________

		DATE				
WET WELL						
CHECK FLOAT OPERATION						
CHECK FOR GREASE AND DEBRIS						
CHECK PUMP OPERATION	1					
	2					
RECORD PUMP HOURS	1					
	2					
CHECK SEAL FAILURE LIGHT						
INSPECT CHECK VALVES	1					
	2					
CONTROLS						
CHECK ALTERNATOR						
VISUALLY CHECK WIRING						
HOUSE KEEPING						
CLEAN UP ALL SPILLS						
POLICE UP AROUND STATION						
TELEMETERING						
CHECK RTU AND VERIFY						

COMMENTS ____________

TAYLOR CREEK TREATMENT PLANT

ANNUAL MAINTENANCE

PLEASANT RUN CENTRAL

ELECTRICAL

NAME_______________________

MAINTENANCE

NAME_______________________

DATE

CHANGE AIR COMPRESSOR OIL & FILTER	___________________
CLEAN/CHANGE ALL AIR FILTERS & LUBRICATORS	___________________
CHECK/CALIBRATE AIR GAGES	___________________
CHECK/CALIBRATE WATER PRESSURE GAGES	___________________
GREASE WET WELL BLOWER SHAFT	___________________
CHECK/CLEAN SEAL WATER SOLENOID	___________________
CLEAN SEAL WATER TANK	___________________
CHECK/ADJUST G.A. VALVE	___________________
GREASE INLET VALVES	___________________
GREASE OUTLET VALVES	___________________
CLEAN OUT SUMP PIT	___________________
GREASE FAN BEARINGS	___________________
CHECK/REPAIR MOTOR STARTER CONTACTS	___________________
TIGHTEN ALL ELECTRICAL CONNECTIONS	___________________
CLEAN /VACUME M.C. PANELS	___________________
CHECK/ADJUST MOTOR TIMERS	___________________
CHECK/CLEAN SOLENOID VALVES	___________________

CHECK/ADJUST PUMP PRESSURE SWITCHES ______________________

CHECK AUXILIARY POWER ______________________

CLEAN/VACUME AUXILIARY POWER PANEL ______________________

COMMENTS ____

____

____

____

____

____

WORD/WINWORD/PRCAPM

Appendix C

Pump Station and Lift Station Inspection and Preventive Maintenance Summary

Metropolitan Sewer District of Greater Cincinnati and Hamilton County
Wastewater Treatment Division
Pump Station and Lift Station Inspection and Preventive Maintenance Summary

The attached spreadsheet summarizes pump station and lift station inspection and preventive maintenance frequency. Inspections and preventive maintenance are performed to maintain the station in a reliable and ready condition. Each operating section determines how to best maintain the stations in their area based on factors, such as, age, operating/maintenance, history, size and potential for negative environmental impact. In addition to onsite inspections telemetering monitors all stations. Telemetering alerts the plant staff of problems that may require an immediate response.

Spreadsheet Notes

1. Plant names are abbreviated
    A. LiMi – Little Miami
    B. MiCr – Mill Creek
    C. MuCr – Muddy Creek
    D. PoRu – Polk Run
    E. SyCr – Sycamore Creek
    F. TaCr – Taylor Creek

2. Type – The type column designate the type of station
    A. Submersible – submersible pumps
    B. "DW" prefix – dry well station
    C. "JET" suffix – air lift station
    D. "SL" prefix – dry well station, suction lift
    E. CANTEX – brand name, type of dry well station
    F. Flush Valve – Similar to a toilet tank, chamber fills up, valves open and flow moves by gravity
    G. SIMPLEX – brand name, type of air station

3. A "JP" number is a cell indicates that a work description is entered in the computerized maintenance management system (CMMS)

4. An "X" in a cell indicates that a preventive maintenance (PM) process is documented but not entered in the CMMS.

Metropolitan Sewer District
Pump Station and Lift Station Inspection and Preventive Maintenance Summary

Revised: 01-Oct-01

	Pump Station	Plant	Type	Inspec. Freq.	PM 2/Week	Weekly	2-Weeks	Monthly	Quarterly	Semiann.	Annual
1	Anderson Woods	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
2	Berkley Woods	LiMi	DW-VERTICAL	2 / week		JP0178				JP0184	
3	Brittnay Acres	LiMi	DW-VERTICAL	2 / week		JP0178				JP0184	
4	Delta Avenue	LiMi	DW-HORIZONTAL	4 / day		JP0178				JP0184	
5	Dry Run	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
6	Eastern Avenue	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
7	Estates of Forest Hills	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
8	Fries Third	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
9	Harcourt Estates	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
10	High Meadows	LiMi	DW-VERTICAL	2 / week		JP0178				JP0184	
11	Lawyer Point	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
12	Mariemont Promenade	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
13	Mount Washington	LiMi	DW-VERTICAL	2 / week		JP0178				JP0184	
14	Newtown	LiMi	DW-VERTICAL	2 / week		JP0178				JP0184	
15	Prospect Woods	LiMi	MON-O-JET	2 / week		JP0179				JP0183	
16	Ravens Run	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
17	River Hills	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
18	Rustic Hills	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
19	St. James Park	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
20	Sanctuary of Ivy Hills	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
21	Stanberry Park	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
22	Treetops	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
23	Turpin Lake	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
24	Turpin Woods	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
25	Wayside	LiMi	SUBMERSIBLE	2 / week		JP0177				JP0181	
1	Bold Face	MiCr	DW-HORIZONTAL	1 / day		JP0194		JP0193			

Notes:
1. These notes apply to all the pump stations.
2. Inspections are performed by operations personnel. If no inspection frequency is noted, the inspection frequency is the same as the PM frequency.
3. PM is performed by maintenance personnel.
4. The PM number in a cell identifies the CMMS designation of the work description.
5. An "X" identifies a PM process is documented by has not been entered into the CMMS.

Revised: 01-Oct-01

No.	Pump Station	Plant	Type	Inspec.	PM						
				Freq.	2/Week	Weekly	2-Weeks	Monthly	Quarterly	Semiann.	Annual
1	Addyston	MuCr	DW-HORIZONTAL			X					X
2	Anderson Ferry	MuCr	DW-VERTICAL			X					X
3	Barrington Hills	MuCr	SUBMERSIBLE			X			X	X	
4	Barrington Hills Block F	MuCr	SUBMERSIBLE			X			X	X	
5	Bridgestone (Sanctuary Estates)	MuCr	SUBMERSIBLE			X			X	X	
6	Bruestle	MuCr	DW-VERTICAL			X					X
7	Centurion Estates	MuCr	SUBMERSIBLE			X			X	X	
8	Churchill Downs	MuCr	DW-VERTICAL			X					X
9	Cleves	MuCr	DW-HORIZONTAL	2 / day		X			X	X	
10	Country Club Estates	MuCr	MON-O-JET			X			X	X	
11	Dellers Glen	MuCr	SUBMERSIBLE			X			X	X	
12	Dellwood Estates	MuCr	MON-O-JET			X			X	X	
13	Diamond Oaks	MuCr	DW-VERTICAL			X					X
14	Durango Green	MuCr	SUBMERSIBLE			X			X	X	
15	Fithian	MuCr	DW-VERTICAL			X					X
16	Foley Forest	MuCr	SUBMERSIBLE			X			X	X	
17	Foley Road	MuCr	DW-VERTICAL			X					X
18	Gil Volz	MuCr	DW-VERTICAL			X					X
19	Glenview	MuCr	DW-VERTICAL			X					X
20	Hengehold 2nd	MuCr	MON-O-JET			X			X	X	
21	Hengehold 4th	MuCr	DW-VERTICAL			X					X
22	Homelawn Estates	MuCr	MON-O-JET			X			X	X	
23	Kirkridge Acres	MuCr	MON-O-JET			X			X	X	
24	Muddy Creek	MuCr	DW-VERTICAL	2 / day		X				X	X
25	North Bay Village	MuCr	SUBMERSIBLE			X			X	X	
26	Palisades #1	MuCr	DW-VERTICAL			X					X
27	Palisades #2	MuCr	MON-O-JET			X			X		
28	Palcid Meadows	MuCr	DW-VERTICAL			X					X
29	Rapid Run	MuCr	DW-VERTICAL			X					X
30	Regency Ridge (Harrison Ave.)	MuCr	SUBMERSIBLE			X			X	X	
31	Shady Lane (Addyston)	MuCr	SUBMERSIBLE			X			X	X	
32	Shady Lane Park (Quadrant)	MuCr	SUBMERSIBLE			X			X	X	
33	Streamwood	MuCr	SL-HORIZONTAL			X					X
34	Taylor Road	MuCr	SUBMERSIBLE			X			X	X	
35	Westport Village	MuCr	SUBMERSIBLE			X			X	X	
36	Windmere Third	MuCr	SUBMERSIBLE			X			X	X	
37	Yates Third	MuCr	MON-O-JET			X			X	X	

Pump Station and Lift Station Inspection and Preventive Maintenance Summary

No.	Pump Station	Plant	Type	Inspec. Freq.	PM 2/Week	Weekly	2-Weeks	Monthly	Quarterly	Semiann.	Annual
1	Acomb	PoRu	SUBMERSIBLE			X					
2	Harper Avenue	PoRu	DW-SELFPRI			X				X	
3	Huntingtion	PoRu	SUBMERSIBLE				X				
4	Polk Run	PoRu	SUBMERSIBLE			X				X	
5	Retwood Estates/Retview	PoRu	SUBMERSIBLE				X				
6	River Oaks	PoRu	SUBMERSIBLE				X				
7	Sheldon/Creekside	PoRu	SUBMERSIBLE				X				
1	Camargo Canyon	SyCr	SUBMERSIBLE				X				
2	Carpenters Run	SyCr	DW-VERTICAL				X				
3	Cornell Woods	SyCr	SUBMERSIBLE				X				
4	Elbroock	SyCr	MON-O-JET				X				X
5	Glens Landing	SyCr	SUBMERSIBLE				X				
6	Grooms Road	SyCr	SUBMERSIBLE				X				
7	Hageman Street	SyCr	DW-VERTICAL			X					
8	High Point	SyCr	SUBMERSIBLE			X					
9	Johnson Road	SyCr	MON-O-JET			X					X
10	Kemper Road Industrial	SyCr	SUBMERSIBLE				X				
11	Kenwood Road	SyCr	DU-O-JET				X				X
12	Kugler Mill	SyCr	SUBMERSIBLE				X				
13	Legends of Carpenters Run	SyCr	SUBMERSIBLE				X				
14	Rollman Estates	SyCr	SUBMERSIBLE				X				
15	Sharon Industrial Park	SyCr	CANTEX				X				
16	South Clippinger	SyCr	SUBMERSIBLE				X				
17	Tennyson	SyCr	SUBMERSIBLE				X				
18	Village Woods	SyCr	SUBMERSIBLE				X				
19	Weller Woods	SyCr	SUBMERSIBLE				X				
20	WynnBroock	SyCr	MON-O-JET				X				X

No.	Pump Station	Plant	Type	Inspec.	PM						
				Freq.	2/Week	Weekly	2-Weeks	Monthly	Quarterly	Semiann.	Annual
1	Arrowhead	TaCr	MON-O-JET			X					X
2	Arrowood	TaCr	MON-O-JET			X					X
3	Bahama Gardens	TaCr	DW-VERTICAL			X					X
4	Blanchetta	TaCr	SUBMERSIBLE			X					X
5	Camberly Acres	TaCr	DW-VERTICAL			X					X
6	Colerain-Bevis	TaCr	SUBMERSIBLE		X						X
7	Garden Hills	TaCr	DW-VERTICAL			X					X
8	Greenpine Acres	TaCr	DW-VERTICAL			X					X
9	Greenridge 5th	TaCr	DW-VERTICAL			X					X
10	Hampton Pointe	TaCr	SUBMERSIBLE			X					X
11	Henrianne Court	TaCr	MON-O-JET			X					X
12	Honnert Ridge	TaCr	SUBMERSIBLE			X					X
13	Hunterston	TaCr	DW-VERTICAL			X					X
14	Kemper Mill Village	TaCr	SUBMERSIBLE			X					X
15	Lasalle Place	TaCr	SUBMERSIBLE			X					X
16	Locust View	TaCr	SUBMERSIBLE			X					X
17	Marview Terrace	TaCr	SIMPLEX			X					X
18	Millbrook #1	TaCr	DW-VERTICAL			X					X
19	Millbrook #2	TaCr	MON-O-JET			X					X
20	North Bend Crossing	TaCr	SUBMERSIBLE			X					X
21	Orchard Gate	TaCr	SUBMERSIBLE			X					X
22	Orchard Hills #1	TaCr	DW-VERTICAL			X					X
23	Parkwoods	TaCr	SUBMERSIBLE			X					X
24	Pleasant Run Central	TaCr	DW-VERTICAL		X						X
25	Pleasant Run East	TaCr	DW-VERTICAL		X						X
26	Pleasant Run West	TaCr	DW-VERTICAL		X						X
27	Ponderosa	TaCr	DW-VERTICAL			X					X
28	Ponderosa Woods	TaCr	MON-O-JET			X					X
29	Ridgewood Arsenal	TaCr	FLUSH VALVE			X					X
30	Sherwood	TaCr	MON-O-JET			X					X
31	Spring Leaf	TaCr	SUBMERSIBLE			X					X
32	Stratford Lake	TaCr	SUBMERSIBLE			X					X
33	Taylor Creek	TaCr	SUBMERSIBLE	1 / day		X					X
34	Timbers	TaCr	DW-VERTICAL			X					X
35	Towers East	TaCr	DW-VERTICAL			X					X
36	West Chase	TaCr	SUBMERSIBLE			X					X
37	White Oak Estates	TaCr	MON-O-JET			X					X
38	White Oak Terrace	TaCr	MON-O-JET			X					X
39	Winton Woods #1	TaCr	DW-VERT			X					X
40	Winton Woods #2	TaCr	MONO-JET			X					X
41	Willow Ridge	TaCr	SUBMERSIBLE			X					X

Appendix D

Pump Station and Lift Station Preventive Maintenance Procedures

Metropolitan Sewer District of Greater Cincinnati and Hamilton County
Wastewater Treatment Division
Pump Station and Lift Station Inspection and Preventive Maintenance Procedures

This packet includes preventive maintenance procedures and checklists used to maintain pump and lift stations.

This packet has seven sections:

1. **Little Miami** – procedures are organized by “JP” number.
2. **Mill Creek** - procedures are organized by “JP” number.
3. **Muddy Creek** – Procedures are organized by frequency, weekly, quarterly, and annually.
   Please note the “Mu” number was added to the document to provide for easier identification and discussion of maintenance procedures. The “Mu” number is not part of a standard MSD numbering system and may be revised as procedures are entered into the CMMS.
4. **Polk Run** – procedures are organized by equipment number.
5. **Sycamore** – procedures are organized by frequency, weekly, biweekly and annual, and by equipment number.
6. **Taylor Creek** - Procedures are organized by frequency, weekly, annually. Please note the “Ta” number was added to the document to provide for easier identification and discussion of maintenance procedures. The “Ta” number is not part of a standard MSD numbering system and may be revised as procedures are entered into the CMMS.
7. **Generators**

Little Miami WWTP

JP0177 - LM SUBMERSIBLE PUMP STATION WEEKLY PREVENTIVE MAINTENANCE

SUBMERSIBLE PUMP STATION P.M.

WET WELL

1. NOTIFY STATION TEN THAT YOU WILL BE ENTERING STATION IF ALARMED.
2. CHECK PUMP FLOAT OPERATION - REPAIR IF NECESSARY.
3. CHECK FOR GREASE AND DEBRIS - SCEHDULE CLEANING IF NEEDED.
4. RECORD PUMP OPERATING HRS. IN LOG BOOK AND ON PM SHEET.
    A. HRS. PUMP #1________
    B. HRS. PUMP #2________

VALVE CHAMBER

1. INSPECT CHECK VALVE OPERATION
2. EXERCISE ISOLATION

VALVES CONTROLS

1. CHECK ALTERNATOR - REPAIR AS NEEDED
2. VISUALLY INSPECT CONTROL PANEL WIRING

HOUSE-KEEPING

1. CLEAN UP ALL SPILLS
2. CLEAN UP STATION SURROUNDINGS - SCHEDULE MAJOR CLEANING

TELEMETERING

1. LIFT HIGH WET WELL ALARM FLOAT AND CALL STATION TEN AND LMTP TO VERIFY PROPER OPERATION

.

GENERATOR

1. RECORD HOUR METER READING IN LOG BOOK AND ON PM SHEET.
    A. RUNNING HOURS________
2. CHECK FUEL OIL LEVEL AND RECORD. SCHEDULE FUEL DELIVERY IF NEEDED.
    A. FUEL OIL LEVEL________
3. CHECK GEN. OIL LEVEL AND RECORD.
    A. OIL LEVEL________
4. CHECK COOLING WATER LEVEL AND RECORD.
    A. WATER LEVEL________
5. CHECK BLOCK HEATER OPERATION.
6. 6. INSPECT ALL HOSES, BELTS ETC.

COMMENTS: ____
____
____
____
____

JP0178 - LM DRY PIT PUMP STATION WEEKLY PREVENTIVE MAINTENANCE

DRY PIT PUMP STATION P.M.NOTIFY STATION TEN AND LMTP THAT YOU WILL BE ENTERING THE STATION IF ALARMED.

WET WELL

1. CHECK PUMP FLOAT OPERATION - REPAIR IF NECESSARY.
2. CHECK FOR GREASE AND DEBRIS - SCHEDULE CLEANING IF NEEDED.
3. CHECK EXHAUST FAN (FROM THE TOP) REPAIR IF NEEDED.
4. RECORD PUMP OPERATING HRS. IN THE LOG BOOK AND ON THE PM SHEET.
    A. HRS. PUMP #1________
    B. HRS. PUMP #2________

DRY WELL/VALVE CHAMBER

1. CHECK PUMP OPERATION - REPORT ANY PROBLEMS.
2. CHECK SEALS FOR LEAKS - REPAIR AS NEEDED.
3. INSPECT CHECK VALVE OPERATION.
4. EXERCISE ISOLATION VALVES.
5. CHECK DRY WELL FLOAT AND REPAIR AS NEEDED. CALL STATION TEN AND LMTP TO VERIFY OPERATION.
6. CHECK DE-HUMIDIFIER/SCHEDULE REPLACEMENT IF NEEDED.
7. CHECK LIGHTING AND REPLACE AS NEEDED.
8. CHECK SUMP FLOAT.

CONTROLS

1. CHECK ALTERNATOR - REPAIR AS NEEDED.
2. VISUALLY INSPECT CONTROL PANEL WIRING.

HOUSE-KEEPING

1. CLEAN UP ALL SPILLS
2. CLEAN UP STATION SURROUNDINGS - SCHEDULE MAJOR CLEANING

TELEMETERING

1. LIFT HIGH WET WELL FLOAT AND CALL STATION TEN AND LMTP TO VERIFY PROPEROPERATION.GENENRATOR1.RECORD HOUR METER READING IN LOG BOOK AND ON PM SHEET.
    A. RUNNING HRS. _______
2. CHECK FUEL OIL READING AND RECORD. SCHEDULE FUEL DELIVERY IF NEEDED.
    A. FUEL OIL LEVEL______
3. CHECK GEN. OIL LEVEL AND RECORD.
    A. OIL LEVEL_______
4. CHECK COOLING WATER LEVEL AND RECORD.
    A. WATER LEVEL______
5. CHECK BLOCK HEATER OPERATION.
6. INSPECT ALL HOSES, BELTS ETC.

JP0179 - LM AIRLIFT STATION WEEKLY PREVENTIVE MAINTENANCE

AIR LIFT WEEKLY P.M.

COMPRESSORS

1. CYCLE TEST THE STATION
2. CHECK THE BELTS FOR WEAR AND ADJUST TENSION
3. CHECK COMPRESSOR OIL LEVEL AND TOP OFF AS NEEDED
4. CHECK ALTERNATOR OPERATION AND REPAIR IF NEEDED
5. CHECK AIR PRESSURE AND RECORD IN LOG AND ON PM SHEET
    - A. AIR PRESSURE________

THREE WAY VALVE

1. CHECK TIMER SETTING AND OPERATION
2. CHECK FOR AIR BLOWBACK INTO WELL

ELECTRODE

1. CHECK NO FAIL OPERATION (GROUND ELECTRODE)

HEATER

1. CHECK OPERATION AND CLEAN (COLD WEATHER ONLY)

EXHAUST FAN

1. CHECK OPERATION AND CLEAN. REPAIR IF NEEDED.

TELEMETERING

1. LIFT HIGH WET WELL FLOAT IN RECEIVER AND CHECK ALARMS. VERIFY PROPER OPERATION WITH STATION TEN AND LMTP.
2. CHECK FOR DEBRIS IN RECEIVER - SCHEDULE CLEANING IF NEEDED

CONTROLS

1. CHECK ALL WIRING VISUALLY AND REPAIR AS NEEDED.
2. CHECK PANEL LIGHTS IF NECESSARY.

HOUSE-KEEPING

1. CLEAN UP ALL SPILLS
2. CLEAN UP AROUND STATION - SCHEDULE MAJOR CLEANING

JP0181 - LM-SUBMERSIBLE PUMP STATION SEMI-ANNUAL P.M.

SEMI-ANNUAL SUBMERSIBLE PUMP STATION PM

WET WELL

1. ISOLATION VALVES AND TEST REPORT ANY CORROSION AND GENERATE PAINT LIST
2. TEST PUMP PERFORMANCE & RECORD PUMP HOURS FLOW
   A. P#1____ HOURS P#1____ FLOW
   B. P#2____ HOURS P#2____ FLOW
3. CHECK PUMP AMPS AND VOLTS
   A. P#1 AMPS____ P#1____ _ VOLTS
   B. P#2 AMPS____ P#2_____ VOLTS
4. MEGGER PUMP LEADS AND RECORD
   A. P#1 X____Y____Z____
   B. P#2 X____Y____Z____
5. CHECK PUMP FLOAT OPERATION AND REPAIR AS NEEDED
6. CHECK FOR GREASE AND DEBRIS – SCHEDULE CLEANING IF NEEDED
7. CHECK PUMP MECHANICAL SEAL OIL VALVE CHAMBER
8. CHECK PUMP PERFORMANCE
   A. FLOW____
   B. DISCHARGE PRESSURE____
9. INSPECT CHECK VALVE AND OPERATE EXERCISE

CONTROLS

1. CHECK ALTERNATOR AND REPAIR
2. VISUALLY INSPECT CONTROL PANEL WIRING
3. CLEAN STARTER CONTACTS

HOUSE-KEEPING

1. CLEAN UP ALL SPILLS
2. CLEAN UP STATION SURROUNDINGS - SCHEDULE MAJOR CLEANING

TELEMETERING

1. LIFT HIGH WET WELL FLOAT AND VERIFY OPERATION

GENERATOR

1. RECORD HOUR METER READING IN LOG BOOK AND ON PM SHEET
   A. RUNNING HOURS____
2. CHECK FUEL OIL LEVEL AND RECORD/SCHEDULE FUEL DELIVERY IF NEEDED
   A. FUEL OIL LEVEL____
3. CHECK GEN. OIL LEVEL AND RECORD
   A. OIL LEVEL____
4. CHECK COOLANT LEVEL AND RECORD
   A. COOLANT LEVEL____
5. CHECK BLOCK HEATER OPERATION
6. INSPECT ALL HOSES, BELTS ETC.

JP0183 - SEMI-ANNUAL AIR LIFT STATION PREVENTIVE MAINTENANCE

AIR LIFT SEMI-ANNUAL P.M.COMPRESSORS

1. CYCLE TEST THE STATION AND RECORD
2. CHECK BELTS FOR WEAR AND TENSION
3. CHANGE OIL AND RECORD MOTOR AMPS
    A. COMP#1 AMPS______ COMP#2 AMPS______
4. CHECK VOLTAGE AND RECORD
    A. VOLTAGE______
5. CHECK ALTERNATOR AND REPLACE IF NEEDED
6. CLEAN OR REPALCE AIR FILTERS ON COMPRESSORS
7. CHECK AIR PRESSURE AND RECORD
    A. PRESSURE______
8. BLEED AIR TANK OF CONDENSATION
9. CHECK REGULATOR AND REPAIR AS NEEDED

THREE WAY VALVE
1. CLEAN AND INSPECT THREE WAY VALVE
2. CHECK TIMER SETTING AND OPERATION

ELECTRODE
1. PULL ELECTRODE AND CLEAN OR CHANGE
2. CHECK NO FAIL OPERATION

HEATER
1. CHECK OPERATION AND CLEAN (COLD WEATHER ONLY)

EXHAUST FAN
1. CHECK OPERATION AND CLEAN

TELEMETERING
1. LIFT HIGH FLOAT IN RECEIVER AND CHECK ALARMS

CONTROLS
1. CHECK ALL WIRING CONNECTIONS
2. MEGGER COMPRESSOR MOTORS AND LOG
    A. COMP. #1______ COMP. #2______
3. CHECK PANEL LIGHTS
4. CLEAN STARTER CONTACTS ONCE PER YEAR
5. CHECK GFI OUTLETS FOR PROPER OPERATION

HOUSE CLEANING
1. CLEAN UP ALL SPILLS
2. CLEAN UP AROUND STATION
3. CHECK ANODE CONNECTIONS
4. REPORT ANY CORROSION OR PAINT NEEDS

JP0184 - DRY PIT PUMP STATION SEMI-ANNUAL P.M.

DRY PIT PUMP STATION SEMI-ANNUAL P.M.

WET WELL

1. TEST PUMP PERFORMANCE AND RECORD PUMP HOURS AND FLOWS
   A. PUMP #1____ HOURS PUMP #1____ FLOW
   B. PUMP #2____ HOURS PUMP #2____
2. CHECK PUMP AMPS AND VOLTS AMPS
   A. PUMP #1____ AMPS PUMP #1____ VOLTS____
   B. PUMP #2____ AMPS PUMP #2____ VOLTS____
3. MEGGER PUMP LEADS AND RECORD
   A. PUMP#1 X____ Y____ Z____
   B. PUMP#2 X____ Y____ Z____
4. CHECK PUMP FLOAT OPERATION
5. CLEAN GREASE AND DEBRIS (SCHEDULE MAJOR CLEANING)
6. CHECK EXHAUST FAN FROM TOP

DRY WELL

1. CHECK SEALS FOR LEAKS AND REPAIR OR SCHEDULE REPAIR
2. CHECK DRY WELL FLOAT AND REPAIR AS NEEDED
3. CHECK AND CLEAN DE-HUMIDIFIER
4. CHECK LIGHTING AND REPLACE AS NEEDED
5. REPORT CORROSION OR OTHER PAINTING NEEDS
6. INSPECT AND OPERATE CHECK VALVES
7. EXERCISE ISOLATION VALVES AND TEST
8. CHECK ANODE CONNECTIONS
9. CHECK SUMP PUMP (LIFT FLOAT) REPAIR IF NEEDED

CONTROLS

1. CHECK ALTERNATOR AND REPLACE IF NEEDED
2. VISUALLY INSPECT ALL WIRING - REPAIR AS NEEDED
3. CLEAN STARTER CONTACTS (ONCE PER YEAR)

HOUSE CLEANING

1. CLEAN UP ALL SPILLS
2. CLEAN UP STATION AND SURROUNDINGS

TELEMETERING

1. LIFT HIGH WELL FLOAT AND CALL IN TO VERIFY PROPER OPERATIONGENERATOR1. RECORD HOUR METER READINGS
   A. HOURS____
2. CHECK FUEL OIL LEVEL AND RECORD (SCHEDULE FILLING)
   A. LEVEL____
3. CHECK OIL LEVEL AND RECORD
   A. LEVEL____
4. CHECK COOLING WATER LEVEL AND RECORD
   A. LEVEL____
5. CHECK BLOCK HEATER OPERATION
6. INSPECT ALL HOSES, BELTS ETC.

Mill Creek WWTP

JP0193 - BOLDFACE MONTHLY PM

STANDARD JOB STEPS FOR THE MONTHLY PM AT BOLDFACE PUMP STATION

1. NOTIFY OPERATIONS THAT YOU ARE DOING THE PM ON THE STATION.
2. GREASE BEARINGS ON SEWAGE PUMPS. (188-2) A.BE SURE TO PURGE THE BEARING HOUSING WHEN GREASING.
3. LUBRICATE GUIDES ON CONE VALVES. (SPRAY MOLY OR EQUIVALENT)
4. NOTIFY OPERATIONS THAT YOU HAVE COMPLETED THE PM.

JP0194 - BOLDFACE WEEKLY PM

STANDARD JOB STEPS FOR THE WEEKLY PM ON BOLDFACE PUMPING STATION.

1. NOTIFY OPERATIONS THAT YOU ARE DOING THE PM AT BOLDFACE.
2. INSPECT SEWAGE PUMPS AND REPORT ANY PROBLEMS.
3. GREASE FITTING AT THE REAR OF THE CONE VALVE YOKE. (188-2)
4. FILL OIL CUPS ON THE EXHAUST AND SUPPLY AIR FANS. (167-225)
   - A. CHECK FAN BELT, IF IT NEEDS TO BE REPLACED, REPORT BACK TO YOUR SUPERVISOR.
   - **B. ***CHECK BOILER AND HOT WATER RECIRCULATING PUMP DURING THE HEATING SEASON ONLY. *****
5. DRAIN WATER FROM AIR TANKS AND BALANCE THE SYSTEM
6. CHECK HYDRAULIC FLUID IN MUFFIN MONSTER GRINDER ON LEVEL 3. ADD OIL AS NEEDED. (ARIES)
7. WHEN YOU ARE SATISFIED THAT ALL THE ABOVE STEPS ARE COMPLETED PROPERLY CLEAN UP ALL TOOLS AND DEBRIS.
8. DOCUMENT YOUR TIME, ADD COMMENTS AND CLOSE WORK ORDER IN THE CMMS.
9. NOTIFY YOUR SUPERVISOR WHEN ALL THE ABOVE IS COMPLETED.

Muddy Creek WWTP

MUDDY CREEK T.P. AREA AIR & DEEP STATION PREVENTIVE MAINTENANCE RECORD

FOR THE WEEK BEGINNING:_________________________ **COMPLETED BY:**__________________________________

		Anderson Ferry	Addyston	Bruestle	Churchill	Country Club	Dellwood	DIAMOND OAKS	Fithian	Foley Road	Gil Volz	Glenview	Hengehold 2	Hengehold 4	Homelawn	Kirkridge	Oakview	Palisades 1	Palisades 2	Placid Meadow	Rapid Run	Yates 3rd
Compressors	1) Check belt for wear and tension					X	X						X		X	X			X			X
	2) Check oil level 167-400					X	X						X		X	X			X			X
	3) Check oil pressure					X	X						X		X	X			X			X
	4) Check alternator					X	X						X		X	X			X			X
	5) Check air pressure					X	X						X		X	X			X			X
3-Way Valve	6) Test timer settings and operation					X	X						X		X	X			X			X
	7) Check air blowback into wetwell					X	X						X		X	X			X			X
Electrodes	8) Check no fail operation					X	X						X		X	X			X			X
	9) Check indicating lights					X	X						X		X	X			X			X
Raw Sewage	10) Lubricate drive shaft		X																	X		
Pumps	11) Adjust packing gland if necessary																			X		
	12) Backflush pump	X	X	X	X			X	X	X	X	X		X			X	X		X	X	
	13) Check hi & lo auto operating levels	X	X	X	X			X	X	X	X	X		X			X	X		X	X	
	14) Clean or replace seal water filter	X	X	X	X			X	X	X	X	X		X			X	X		X	X	
	15) Check alternator	X	X	X	X			X	X	X	X	X		X			X	X		X	X	
Sump pump	16) Check operation by lifting float	X	X	X	X			X	X	X	X	X		X			X	X		X	X	
Wetwell	17) Check pump start/stop floats	X	X	X	X			X	X	X	X	X		X			X	X		X	X	
	18) Check Hi wetwell float	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	19) Clean floats if necessary	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	20) Check channel for debris	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Heater	21) Heater working					X	X						X		X	X			X			X
Station	22) Police around station	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Exhaust Fan	23) Check operation	X		X	X			X	X	X	X	X		X			X	X			X	
************************ *	24) Visual Check Only	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

TOTAL MAN HOURS

REMARKS:____

MUDDY CREEK T.P. AREA SUBMERSIBLE STATION PREVENTIVE MAINTENANCE RECORD

FOR THE WEEK BEGINNING:__________________________ **COMPLETED BY:**____________________________________

		Barrington Hills	Barrington Hills F	Bridgestone	Centurion	Cleves	Dellers Glen	Durango Green	Foley Forest	Harrison ave.	Indian Creek T.P	Muddy Crk P.S.	Muddy Crk T.P.	North Bay Village	Shady Lane (A)	Shady Lane (Q)	Stream Wood	Taylor Rd.	Westport	Windmere
Raw Sewage Pumps	1) Pump #1 Hour Meter																			
	2) Pump #2 Hour Meter																			
	3) #1 Motor Amps																			
	4) #2 Motor Amps																			
	5) Check Alternator	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X
Wetwell	6) Check pump start/stop floats	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X
	7) Check High wetwell float	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X
	8) Clean floats if necessary	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X
	9) Check channel for debris	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X
Station	10) Police around station	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X
*************************	11) Visual Check Only	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X
Generator	12) Hour Meter Reading																			
	13) Fuel Level																			
	14) Engine Oil	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
	15) Engine Coolant	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
	16) Battery Condition	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
	17) Charging System	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
	18) Fan Belts	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
	19) Tellit "Generator Run" Signal	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
	20) Tellit "Transfer Switch" Signal	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transfer Switch	20) Check Operation		X									X					X		X	

TOTAL MAN HOURS

REMARKS:____

MUDDY CREEK

AIR _ QUARTR.rtf

R31 MU03

MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number __MCA_______

TITLE: MC, AIR-LIFT STATION QUARTERLY PM

Perform the _QUARTERLY___________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any **repairs.**

if you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK: -
COST CENTER OR EQUIPMENT NUN4BER: SEE LIST BELOW-
CRAFT: I 1 NUN4BER OF MEN 2
ESTIMATED HOURS: 2.@i @@____-t a

JOB STEPS

Standard job steps for the __QUARTERLY__________ PM on the
____AIR-LIFT STATIONS______________________ in the
MUDDY CREEK TP. AREA_________________________

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

.1) NOTIFY PLANT OPERATIONS AND CENTREX THAT YOU ARE DOING THE PM 2) PULL ELECTRODES AND CHECK/MPLACE TIEP
3) R&R 3-WAY VALVE
4) R&R AIR PRESSURE REGULATOR, CLEAN SCREEN.

Prepared by : JIN4COOPER/TOM MILLER -
Date: 1/27/2000- -, @

Master File Name PMDESCMS.DOC
7-9-98
File each new file as PM-MCA -.doc The space is for each plant use plant letters and then 4 digits. Once this procedure is entered into mapcon save as PM doc the spaces for Mapcon Number. Also enter Mapcon procedure number at the top of this form. Behind Procedure Number

QUARTERLY SUBMERSIBLE PM

		MEGGAR READINGS			TELLIT SIGNALS						
		A	B	C	CHECK WIRING	EXERCISE VALVES	HIGH WET WELL	PUMP RUN	EMERGENCY STOP	INTRUSION	POWER FAILURE
Barrington Hills	**Pump #1**										
	Pump #2										
Barrington Hills F	**Pump #1**										
	Pump #2										
Bridgestone	**Pump #1**										
	Pump #2										
Centurion	**Pump #1**										
	Pump #2										
Cleves	**Pump #1**										
	Pump #2										
	Pump #3										
	Pump #4										
Dellers Glen	**Pump #1**										
	Pump #2										
Durango Green	**Pump #1**										
	Pump #2										
Foley Forest	**Pump #1**										
	Pump #2										
Harrison ave.	**Pump #1**										
	Pump #2										
Indian Creek T.P.	**RSP #1**										
	RSP #2										
	RSP #3										
	RSP #4										
	RAS #1										
	RAS #2										
	RAS #3										
	Plant Drng #1										
	Plant Drng #2										
	Infl. Sample Pmp										
	Eff. Sample Pmp										
Muddy Crk T.P.	**Tank Drng #1**										
	Tank Drng #2										
	Tank Drng #3										
	DAF Sump #1										
	DAF Sump #2										
	Dewatering Sump #1										
	Dewatering Sump #2										
	Admin. Sump #1										
	Admin. Sump #2										
	Incin. Sump #1										

QUARTERLY SUBMERSIBLE PM

		MEGGAR READINGS A	B	C	TELLIT SIGNALS CHECK WIRING	EXERCISE VALVES	HIGH WET WELL	PUMP RUN	EMERGENCY STOP	INTRUSION	POWER FAILURE
	Incin. Sump #1										
	Preair Sump #1										
	Preair Sump #2										
North Bay Village	Pump #1										
	Pump #2										
Shady Lane (A)	Pump #1										
	Pump #2										
Shady Lane (Q)	Pump #1										
	Pump #2										
Stream Wood	Pump #1										
	Pump #2										
Taylor Rd.	Pump #1										
	Pump #2										
Westport	Pump #1										
	Pump #2										
Windmere	Pump #1										
	Pump #2										

MUDDY CREEK

SUBMRS_SEMI.rtf
MJ05

R~~Z~~

P M D E S C R I P T I O N
MILLCREEK TREATMENT PLANT
Page:1

PM: PM0119 **Type:** PM **Title:<E"** SUBMERSIBLE STATION SEMI ANNUAL PM

WO Status: P **Allow Multiple Wos:** I **Priority:** E

PM DESCRIPTION

PERFORM THE SEMI-ANNUAL PM FOR THE EQUIPMENT LISTED BELOW USING THE STANDARD JOB STEPS FOR THAT EQUIPMENT. IF ADDITIONAL WORK IS REQUIRED TO REPAIR THE EQUIPMENT OTHER THAN PM, INITIATE A SEPARATE WORK ORDER FOR THAT EQUIPMENT. COMPLETE ALL PM TASKS FIRST BEFORE ATTEMPTING ANY REPAIRS. IF YOU FIND ADDITIONAL JOB STEPS ARE NECESSARY TO COMPLETE THE PM, WRITE THE STEPS IN THE COMMENT SECTION AND ALERT YOUR SUPERVISOR OF THE ADDITIONAL STEPS.

Foreman Hrs	iCraftICrewiSHIMen			1xours	lest
	194	1	1 1	21	21 @-@ I	@-P *.g@

JOB STEPS

SEMI-ANNUAL SUMBERSIBLE PUMP STATION PM

'ET WELL

TEST PUMP PERFORMANCE & RECORD PUMP HOURS

FLOW P#1 HOURS P#1 FLOW P#2 HOURS P#2

P

P-#t-x

CHECK FOR GREASE AND DEBRIS - SCHEDULE CLEANING IF NEEDED
CHECK PUMP MECHANICAL SEAL OIL

VALVE CHAMBER
CHECK PUMP PERFORMANCE
FLOW DISCHARGE PRESSURE
INSPECT CHECK VALVE AND OPERATE
EXERCISE ISOLATION VALVES AND TEST
REPORT ANY CORROSION AND GENERATE PAINT LIST

rot?-, EAC44

CONTROLS
CHECK ALTERNATOR AND REPAIR
VISUALLY INSPECT CONTROL PANEL WIRING
CLEAN STARTER CONTACTS
C Wi $@-Cm &@ t@ r-r-F l-t, f C-i -f 0 $-Ji
HOUSE-KEEPING
LEAN UP ALL SPILLS
CLEAN UP STATION SUROUNDINGS - SCHEDULE MAJOR CLEANING

TELEMETERING
LIFT HIGH WET WELL FLOAT AND VERIFY OPERATION

GENEP,ATOR *Llilutte* ss--@@-ce

MUDDY CREEK

ANNUAL_PM.rtf

MU06

P M D E S C R I P T I O N

MILLCREEK TREATMENT PLANT

Page:1

PM: PM0025 **Type:** PM **Title:** ELECTRICAL GENERAL PM ANNUAL

WO Status: P **Allow Multiple WOs:** 1 **Priority:** E

PM DESCRIPTION

ANNUALLY - 1.CHECK STARTER AND ALL CONTROLS

2.TIGHTEN ALL SCREWS AND/OR ALL CONNECTIONS

3.GREASE MOTOR BRGS IF NOT SEALED BRGS

4. RECORD MEGGAR READING

|Craft|Crew|SH|Men

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Foreman 1xours lest

xrs

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C

1Eqp/Loc/CC/Route **IDescription**

ft/t APPROVAL INFORMATION

Polk Run WWTP

MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: POLK RUN PUMP STATION – WEEKLY PM PROCEDURE

Perform the ___WEEKLY__ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first Before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment Section and alert your supervisor of the additional steps.

DAY OF THE WEEK: __FRIDAY____________
COST CENTER OR EQUIPMENT NUMBER: _P01-01.01-A001__
CRAFT: 25 & 27 _ NUMBER OF MEN __2_____
ESTIMATED HOURS: __3.5

JOB STEPS

Standard job steps for the _WEEKLY___ PM on the
___POLK RUN PUMP STATION EQUIPMENT___ in the

_POLK RUN PUMP STATION BUILDING AND OUTSIDE AREA__
LOCATION :

FROM Loveland Madeira Road and Kemper Road.

Go (1/10) mile south on Loveland Madeira Road. The station is on the right. Fenced area.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

0) NOTE : SAFETY – CHECK VENTALATION FAN UNIT IN BACK OF STATION FOR CONTINUOUS OPERATION (BEFORE ENTERING) BUILDING. OPEN ACCESS DOOR IN FRONT OF BUILDING FOR POSSIBLE WATER IN BASEMENT (DRY WELL AREA). CHECK WET WELL FOR POSSIBLE FLOODING CONDITION. (RESET FOR VENTALATION FAN IS ONE LEVEL DOWN AT MOTOR CONTROL CENTER).

1) Check Foxboro level transmitter reading with control room operator level reading.
2) Open the equipment access hatch to the dry well and check for water or flooding condition. Report to Maintenance immediately.
3) Go one level down – Check Inverter for power. Check controller for power, during normal operation (RED) indicator for pump failure is (ON), selector dial for pump sequence is set on (1-3).

During normal operation the pump settings will have pump #3 (ON) with selector set to (VAR SPD) variable speed being controlled by computer analog signals and pump #1 will not be running selector set to (AUTO FS) auto full speed being controlled as a backup by bubbler system. Check control panel to ensure both air compressors set to (ON) position.

4) Check Regulated Battery Charger (SENS UNIT) for (25 volts reading).
5) Check Elevator light, replace if needed.
6) Check Elevator (PHONE FOR DIAL TONE), before using elevator.
7) Check (VFD's) lights (Push to Test) and air filters.
8) Check MCC (Motor Control Center) lights (Push to Test).
9) Air Compressors (2) – check pressure gauges (3) should read (80 PSI) each. Check (oil level, belts, air filter & oil filter).
10) Air Compressors (2) – Drain condensation from tanks.

11) Raw Sewage Pumps (3) – basement –Check (SEALS, SHAFTS, NOISE FROM PUMPS, GAUGES & CHECK ANTI-FREEZE LEVEL USED FOR SEAl LUBRICATION).

12) Check Sump Pumps (2) for proper operation & test floats.

13) Check lights in ceiling and emergency lighting units. Replace as needed.

Prepared by : ____________________________
Date: ____________________________

Master File Name PMDESCMS.DOC
7-9-98
File each new file as PM______.doc The space is for each plant use plant letters and then 4 digits.

Once this procedure is entered into mapcon save as PM____.doc the spaces for Mapcon Number.
Also enter Mapcon procedure number at the top of this form. Behind Procedure Number

MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ____________

TITLE: POLK RUN PUMP STATION – BI-YEARLY PM PROCEDURE

Perform the ___BI-YEARLY__ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first Before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment Section and alert your supervisor of the additional steps.

DAY OF THE WEEK: __FRIDAY____________
COST CENTER OR EQUIPMENT NUMBER: _P01-L001_______
CRAFT: 25 & 27 _ NUMBER OF MEN __2_____
ESTIMATED HOURS: __6.0

JOB STEPS

Standard job steps for the _BI-YEARLY___ PM on the
___LEVEL TRANSMITTER _-FOXBORO - one level down___ in the

_POLK RUN PUMP STATION BUILDING AND OUTSIDE AREA__
LOCATION :

FROM Loveland Madeira Road and Kemper Road.

Go (1/10) mile south on Loveland Madeira Road. The station is on the right. Fenced area.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

0) NOTE : SAFETY – CHECK VENTALATION FAN UNIT IN BACK OF STATION FOR CONTINUOUS OPERATION (BEFORE ENTERING) BUILDING. OPEN ACCESS DOOR IN FRONT OF BUILDING FOR POSSIBLE WATER IN BASEMENT (DRY WELL AREA). CHECK WET WELL FOR POSSIBLE FLOODING CONDITION. (RESET FOR VENTALATION FAN IS ONE LEVEL DOWN AT MOTOR CONTROL CENTER).

1) **Check Foxboro level transmitter reading with control room operator level reading.**
2) **Remove sensor from wet well to calibrate. Follow calibration procedure as outlined in Foxboro Maintenance Manual.**
3) **Use Transmation Calibrator to test full range of transmitter (0-100%) of range. (verify LEVEL readings with operator in control room)**
4) **Install Calibration Sticker on Level Transmitter.**
5) **Verify reading of Transmitter Level to level reading in control room with Operator.**

Prepared by : ______________________________
Date: ______________________________

Master File Name PMDESCMS.DOC
7-9-98
File each new file as PM______.doc The space is for each plant use plant letters and then 4 digits.
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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: POLK RUN PUMP STATION – BI-YEARLY PM PROCEDURE

Perform the ___BI-YEARLY__ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first Before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment Section and alert your supervisor of the additional steps.

DAY OF THE WEEK: __FRIDAY____________
COST CENTER OR EQUIPMENT NUMBER: _P01-F001_______
CRAFT: 25 & 27 _ NUMBER OF MEN __2_____
ESTIMATED HOURS: __4.0

JOB STEPS

Standard job steps for the _BI-YEARLY___ PM on the
___FLOW TRANSMITTER ____ for the

POLK RUN PUMP STATION – TRANSMITTER IN TUNNEL AT POLK RUN TREATMENT PLANT
LOCATION :

9744 EAST KEMPER ROAD / LOVELAND, OHIO 45140

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Check Foxboro chart recorder flow in Admin. Bldg. for movement and reading.(MGD) (verify flow (MGD) with control room computer screen)**
2) **Check Foxboro transmitter for reading that will match recorder reading. (MGD) (verify flow with control room computer screen)**
3) **Follow calibration procedure as outlined in Foxboro Maintenance Manual. (DO138NG / BK2891 FOXBORO MANUAL)**

4) **Use Transmation Calibrator to test full range of transmitter (0-100%) of range.(verify readings with control room computer screen).**
5) **Check Foxboro flow chart recorder when performing each calibration step.**
6) **Install Calibration Sticker on Flow Transmitter and Chart Recorder.**
7) **Verify reading of Transmitter Flow with Chart Recorder Flow reading to Flow reading in control room on computer screen.**

Prepared by : ____________________________
Date: ____________________________

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: HARPER PUMP STATION – WEEKLY PM PROCEDURE

Perform the ___WEEKLY__ PM for the equipment listed below using the
Standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM tasks first Before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment Section and alert your supervisor of the additional steps.

DAY OF THE WEEK : __FRIDAY____________
COST CENTER OR EQUIPMENT NUMBER : _P02-01.01-A001_______
CRAFT: 11 & 27.____ NUMBER OF MEN __2_____
ESTIMATED HOURS: __2.0

JOB STEPS

Standard job steps for the ___WEEKLY_- INSPECTION____ PM on the
___EQUIPMENT ____ in the

_HARPER PUMP STATION BUILDING AND OUTSIDE AREA__
LOCATION :

FROM WEST LOVELAND AVE. AND WALL STREET.
Go north on Wall St. and turn right on Harper Ave. The station is at the end of Harper Ave. To get to station go through Park, drive to end of road through Park, station is on right side.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Check Foxboro chart recorder for movement and reading.(gpm & ft) (verify level (FT) with control room operator)**
2) **Check Foxboro transmitter for reading that will match recorder reading. (GPM) (verify flow with control room operator)**
3) **Motor Control Center – Check all light bulbs on (VFD)& (MCC) panels and mechanical totalizer (6) for proper operation. (Push to Test)**

4) MCC – Check drive speed display for operation.
5) MCC – Check bearing temperature display (low bearing temperature) for pumps (1,2 &3).
6) MCC – Check logic controller for display operation and reading.
7) VFD's – Check and replace air filters as needed. (17 total)
8) Check and replace building air filters (2) as needed.
9) Check building exhaust damper for constant fan operation.
10) Check emergency light unit on wall for proper operation.(TEST)

11) MUFFIN MONSTER- #2 Hydraulic Power Unit checks.
Check power on lights and green run lights at panel.
Oil level in sight glass up to black line.
Temperature in sight glass between (60 & 140 Degrees F).
The pressure gauges should be less than (2000 PSI) – two gauges.
Oil filter gauges LESS THAN (15 PSI).
Check for oil leaks in hydraulic lines.

12) OUTSIDE – Check wet well for sewage build up or grease. Open access doors, USE PROPER SAFETY PROCEDURES.

13) At the Kohler Generator box on the wall next to MCC, check that the (System Ready) and (Line Power) lights are lit.

Prepared by : ______________________________
Date: ______________________________

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: HARPER PUMP STATION – BI-YEARLY PM PROCEDURE

Perform the ___BI-YEARLY__ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first Before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment Section and alert your supervisor of the additional steps.

DAY OF THE WEEK: __FRIDAY____________
COST CENTER OR EQUIPMENT NUMBER: _P02-L001_______
CRAFT: 25 & 27 _ NUMBER OF MEN __2_____
ESTIMATED HOURS: __5.5

JOB STEPS

Standard job steps for the _BI-YEARLY___ PM on the
___LEVEL TRANSMITTER ____ in the

_HARPER PUMP STATION BUILDING AND OUTSIDE AREA__
LOCATION :

FROM WEST LOVELAND AVE. AND WALL STREET.
Go north on Wall St. and turn right on Harper Ave. The station is at the end of Harper Ave. To get to station go through Park, drive to end of road through Park, station is on right side.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Check Foxboro chart recorder for movement and reading.(gpm & ft) (verify level (FT) & (GPM) with control room operator)**
2) **Check Foxboro Level transmitter for reading that will match chart recorder reading. (FT) (verify level with control room operator)**
3) **Remove sensor from wet well to calibrate. Follow calibration procedure as outlined in Foxboro Maintenance Manual.**

4) **Use Transmation Calibrator to test full range of transmitter (0-100%) of range. (verify LEVEL readings with operator in control room)**
5) **Check Foxboro chart recorder when performing each cailbration step.**
6) **Install Calibration Sticker on Level Transmitter and Chart Recorder.**
7) **Verify reading of Transmitter Level with Chart Recorder Level to Level reading in control room with Operator.**
8) **OUTSIDE – Check wet well for sewage build up or grease. Open access doors, USE PROPER SAFETY PROCEDURES.**

Prepared by : ____________________________
Date: ____________________________

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: HARPER PUMP STATION – BI-YEARLY PM PROCEDURE

Perform the ___BI-YEARLY__ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first Before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment Section and alert your supervisor of the additional steps.

DAY OF THE WEEK: __FRIDAY____________
COST CENTER OR EQUIPMENT NUMBER: _P02-F001_______
CRAFT: 25 & 27 _ NUMBER OF MEN __2_____
ESTIMATED HOURS: __4.0

JOB STEPS

Standard job steps for the _BI-YEARLY___ PM on the
___FLOW TRANSMITTER ____ in the

_HARPER PUMP STATION BUILDING AND OUTSIDE AREA__
LOCATION :

FROM WEST LOVELAND AVE. AND WALL STREET.
Go north on Wall St. and turn right on Harper Ave. The station is at the end of Harper Ave. To get to station go through Park, drive to end of road through Park, station is on right side.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Check Foxboro chart recorder for movement and reading.(gpm & ft) (verify flow (GPM) with control room operator)**
2) **Check Foxboro transmitter for reading that will match recorder reading. (GPM) (verify flow with control room operator)**
3) **Remove flow sensor to calibrate. Follow calibration procedure as outlined in Foxboro Maintenance Manual.**

4) Use Transmation Calibrator to test full range of transmitter (0-100%) of range. (verify readings with operator in control room)
5) Check Foxboro chart recorder when performing each calibration step.
6) Install Calibration Sticker on Flow Transmitter and Chart Recorder.
7) Verify reading of Transmitter Flow with Chart Recorder Flow reading to Flow reading in control room with Operator.
8) OUTSIDE – Check wet well for sewage build up or grease. Open access doors, USE PROPER SAFETY PROCEDURES.

Prepared by : ___________________________
Date: ___________________________

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: ACOMB PUMP STATION – WEEKLY PM
EQUIPMENT NO. – P03-01.01-A001
____

Perform the ____WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _P03-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_From Kemper Rd. & Loveland-Madeira Rd. go West on Kemper Rd.. After crossing Mckinney Rd. go an additional ½ mile and turn left on Weller Rd. Station is on the right ½ mile from the turn.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) PUMPS : *CHECK PUMP OPERATION*
3)* ELECTRICAL : *CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).
4) *: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.*
5) : *CHECK WELL FLOATS FOR DEBRIS BUILD-UP.*
6)
7) HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.
8) PUMP #1 :
9) *PUMP #2 :*
10) HOUSE CLEANING :
11) CHECK WELL FOR DEBRIS BUILD-UP
12) *CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA*
13)
14) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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7-9-98
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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: CREEKSIDE PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – P04-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _P04-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL.*** */ CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7) **:** ***TEST RUN PUMPS***
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: HUNTINGTON PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – P05-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _P05-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_From I-275 & Wards Corner drive north on Wards Corner Rd. for several miles to Huntington Drive. The pump station is located at the end of the street.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL.*** */ CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: RETVIEW PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – P06-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _P06-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_From Kemper Road & McKinney Road go north on McKinney Rd. and turn left on Enyart Rd. Turn right on Pinewood Drive. Turn right on Retview. The station driveway is 2/10 mile on the left. Note : Access to station is not on Pinewood.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL.*** */ CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: RIVER OAKS PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – P07-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _P07-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_From Rich Road & Fallis Road travel north on Fallis Rd. about 500 feet, until you reach Brentwood Lane on the right. The pump station is just before the end of Brentwood Lane on the right.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR : *CHECK FUEL LEVEL.*** */ CHECK HOSES*
3) **: *CHECK HEATER OPERATION***
4) **ELECTRICAL : *CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **: *CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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Sycamore Creek WWTP

MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: HAGEMANTOWN PUMP STATION – WEEKLY PM
EQUIPMENT NO. – S06-01.01-A001
____

Perform the ____WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S06-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_From Reading Rd. & I-275 go South on Reading Rd. and turn right on Grooms Rd. The station is near 11639 Grooms Rd.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
3) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
4) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
5) HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.
6) PUMP #1 :
7) PUMP #2 :
8) **RAW SEWAGE PUMPS :** ***CHECK MECHANICAL SEALS / LIBRICATE***
9) ***CHECK (HAND & AUTO) OPERATION / ALTERNATE***
10) **SUMP PUMP & EXHAUST FAN** ***: CHECK OPERATION OF SUMP PUMP***
: LISTEN TO EXHAUST FAN FOR NOISE.
11) HOUSE CLEANING :
12) CHECK WELL FOR DEBRIS BUILD-UP
13) CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA
14)
15) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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<u>MSD DIVISIONAL</u>
<u>PREVENTIVE MAINTENANCE FORM</u>

<u>Procedure Number</u> ___________

<u>TITLE:</u> HIGH POINT PUMP STATION – WEEKLY PM
EQUIPMENT NO. – S07-01.01-A001
____

Perform the ____WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S07-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __1.0_______

<u>JOB STEPS</u>

Standard job steps for the ______WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_Go West on Kemper Rd. from Montgomery Rd. & Kemper Rd. to Conrey and turn right. Turn on School Rd. The station is on the left just across the railroad tracks.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) GENERATOR : ***CHECK FUEL LEVEL. / TEST RUN GENERATOR****. / CHECK HOSES*
3) : ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) : CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.
6) : CHECK WELL FLOATS FOR DEBRIS BUILD-UP.
7) HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.
8) PUMP #1 :
9) PUMP #2 :
10) GENERATOR :
11) HOUSE CLEANING :
12) CHECK WELL FOR DEBRIS BUILD-UP
13) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
14)
15) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ______________________________/ NAME OF TEAM MEMBER :
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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: JOHNSON ROAD AIR LIFT STATION – WEEKLY PM
EQUIPMENT NO. – S21-01.01-A001
____

Perform the ____WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S21-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______WEEKLY_______ PM on the _AIR___PUMP STATION____ at the following location :
_From Kenwood Rd. & Euclid Rd. go South on Kenwood Rd. and turn right on Ckerokee Dr. Turn right on Johnson Rd. The station is three houses down in the front yard of 6052.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
3) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
4) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
5) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
6) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
7) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
8) **HOUSE CLEANING :**
9) ***CHECK WELL FOR DEBRI BUILD-UP***
10) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
11) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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7-9-98
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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: CAMARGO CANYON PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S01-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S01-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __1.0_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_Go south on Kenwood Rd. to Camargo Canyon and turn left. Bear left where the road splits. The station is on the left side of road.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. /*** *CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: CARPENTER'S RUN PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S02-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S01-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_Go West on Cooper Rd. and turn right on Carpenter's Run. Turn left on Trailbridge. The station is next to 22 address.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. / TEST RUN GENERATOR*** */ CHECK OIL LEVEL / CHECK HOSES* ***/ CHECK HEATER OPERATION***
3) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
4) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
5) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
6) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
7) **GENERATOR :**
8) **RAW SEWAGE PUMPS :** ***CHECK MECHANICAL SEALS / LIBRICATE***
9) ***CHECK (HAND & AUTO) OPERATION / ALTERNATE***
10) **SUMP PUMP & EXHAUST FAN** ***: CHECK OPERATION OF SUMP PUMP***
    : LISTEN TO EXHAUST FAN FOR NOISE.
11) **HEATER & DEHUMIDIFIER** ***: CHECK & CLEAN HEATER***
    CKECK AND CLEAN DEHUMIDIFIER
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)

16) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: CORNELL WOODS PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S03-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S03-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_Go West on Cornell Rd. to Cornell Woods Drive and turn right. Turn left on Classic Dr.
The station is on the left at 4485 Classic Dr.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR : *CHECK FUEL LEVEL. / TEST RUN GENERATOR*.** */ CHECK HOSES*
3) ***: CHECK HEATER OPERATION***
4) **ELECTRICAL : *CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
8) **PUMP #1 :**
9) **PUMP #2 :**
10) **GENERATOR :**
11) **HOUSE CLEANING :**
12) ***CHECK WELL FOR DEBRIS BUILD-UP***
13) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
14)
15) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : _____________________________/ NAME OF TEAM MEMBER :
Date: _____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: GLENS LANDING PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S04-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S04-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_From Kemper Rd. & Princeton Pike (Tri-County Mall) , Go south on Princeton Pike past Market Street. Continue travel about 100 feet. Pump station will be on the right.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. /*** *CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
8) ***GENERATOR :***
9) **HOUSE CLEANING :**
10) ***CHECK WELL FOR DEBRIS BUILD-UP***
11) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
12)
13) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ____________

TITLE: GROOMS ROAD PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S05-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S05-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_Go West on Kemper Rd. from Montgomery Rd & Kemper Rd. and turn right on Grooms Rd. The station is near 11639 Grooms Rd.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) GENERATOR : ***CHECK FUEL LEVEL. / TEST RUN GENERATOR****.* */ CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7) HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.
8) GENERATOR :
9) HOUSE CLEANING :
10) CHECK WELL FOR DEBRIS BUILD-UP
11) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
12)
13) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ______________________________/ NAME OF TEAM MEMBER :
Date: ______________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: KEMPER INDUSTRIAL PUMP STATION – BI-WEEKLY PM

EQUIPMENT NO. – S08-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S08-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_Go West on Kemper Rd. from Montgomery Rd & Kemper Rd. to the station which is on the left near 6949 Kemper Rd.Grooms Rd.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR : *CHECK FUEL LEVEL. / TEST RUN GENERATOR*.** */ CHECK HOSES*
3) ***: CHECK HEATER OPERATION***
4) **ELECTRICAL : *CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
8) ***GENERATOR :***
9) **HOUSE CLEANING :**
10) ***CHECK WELL FOR DEBRIS BUILD-UP***
11) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
12)
13) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ____________

TITLE: WELLER WOODS PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – P08-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _P08-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_From Montgomery Rd. & Weller Road go East on Weller and turn right on Bridgewater. Turn left on Capricorn. The plant is behind 8515 and shares a driveway with this house.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. /*** *CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ___________________________/ NAME OF TEAM MEMBER :

Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: KUGLER MILL PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S09-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S09-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_Go East on Kugler Mill Rd. from Miami Ave. to Kugler Mill Rd & East Galbraith Rd. appromimately 1 mile. The station is on the right at the intersection with Calderwood Lane.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. / TEST RUN GENERATOR****. / CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **EXHAUST FAN & SUMP PUMP :** ***CHECK SUMP PUMP OPERATION***
9) ***: LISTEN TO EXHAUST FAN FOR NOISE***
10) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
11) ***PUMP #1 :***
12) ***PUMP #2 :***
13) ***GENERATOR :***
14) **HOUSE CLEANING :**
15) ***CHECK WELL FOR DEBRIS BUILD-UP***
16) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
17)

18) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: LEGEND OF CARPENTER'S RUN PUMP STATION
– BI-WEEKLY PM
EQUIPMENT NO. – S10-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S10-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_From Cooper & Reed Hartman Highway, go West on Cooper Rd. and turn left on Mohler. Turn on Carpenter's Green Lane. The station is on the right next to 3608.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. /*** *CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ______________________________/ NAME OF TEAM MEMBER :
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<u>MSD DIVISIONAL</u>
<u>PREVENTIVE MAINTENANCE FORM</u>

<u>Procedure Number</u> ___________

<u>TITLE:</u> ROLLMAN'S ESTATES PUMP STATION –
BI-WEEKLY PM
EQUIPMENT NO. – S11-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S11-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

<u>JOB STEPS</u>

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_From Galbraith Rd. & Ridge Rd. , go East on Galbraith Rd. and turn right into Rollmans's Estates. Turn right on Ambercreek Dr. (First Right) turn left on Ridgeway (First Left) . Station is between 9064 & 9066.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) GENERATOR : ***CHECK FUEL LEVEL. /*** *CHECK HOSES*
3) : ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) : ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.
9) PUMP #1 :
10) PUMP #2 :
11) ***GENERATOR :***
12) HOUSE CLEANING :
13) CHECK WELL FOR DEBRIS BUILD-UP
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)

16) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: SHARON INDUSTRIAL PUMP STATION – BI-WEEKLY PM

EQUIPMENT NO. – S12-01.01-A001
____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S12-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the ____PUMP STATION____ at the following location :
_From Kemper Rd. & Readong Rd. go West on Kemper Rd. and turn left on Rockfield Court. The station is on the right at the end of the street.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
3) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
4) ***: CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
5) HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.
6) GENERATOR :
7) **RAW SEWAGE PUMPS :** ***CHECK MECHANICAL SEALS / LIBRICATE***
8) ***CHECK (HAND & AUTO) OPERATION / ALTERNATE***
9) **SUMP PUMP & EXHAUST FAN** ***: CHECK OPERATION OF SUMP PUMP***
: LISTEN TO EXHAUST FAN FOR NOISE.
10) HOUSE CLEANING :
11) CHECK WELL FOR DEBRIS BUILD-UP
12) CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA
13)
14) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ___________________________/ NAME OF TEAM MEMBER :

Date: ____________________________ / DATE OF WORK PERFORM :

Master File Name PMDESCMS.DOC
7-9-98
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Once this procedure is entered into mapcon save as PM____.doc the spaces for Mapcon Number.
Also enter Mapcon procedure number at the top of this form. Behind Procedure Number

MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ____________

TITLE: SOUTH CLIPPINGER PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S13-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S13-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_Go South on Drake Rd. from Drake Rd. & Shawnee Run Rd. to right on South Clippinger Rd. The pump station is on the left side at 8155 S. Clippinger Rd.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. / TEST RUN GENERATOR***. / *CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **EXHAUST FAN & SUMP PUMP :** ***CHECK SUMP PUMP OPERATION***
9) ***: LISTEN TO EXHAUST FAN FOR NOISE***
10) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
11) ***PUMP #1 :***
12) ***PUMP #2 :***
13) ***GENERATOR :***
14) **HOUSE CLEANING :**
15) ***CHECK WELL FOR DEBRIS BUILD-UP***
16) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
17)
18) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ______________________________/ NAME OF TEAM MEMBER :
Date: ______________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: VILLAGE WOODS PUMP STATION – BI-WEEKLY PM
EQUIPMENT NO. – S15-01.01-A001

____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S15-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
____PUMP STATION____ at the following location :
_From Route 42 & Fields Ertel Rd. go East on Fileds Ertel Rd. and turn right on Village Woods. Turn right onto Hickory Nut and left on Diamond View. The station is on the left across from 12029 Diamond view.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **GENERATOR :** ***CHECK FUEL LEVEL. /*** *CHECK HOSES*
3) **:** ***CHECK HEATER OPERATION***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) ***: CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **:** ***CHECK WELL FLOATS FOR DEBRIS BUILD-UP.***
7)
8) **HOURS METER READING : RECORD NUMBERS ON PM SHEET & LOG BOOK.**
9) ***PUMP #1 :***
10) ***PUMP #2 :***
11) ***GENERATOR :***
12) **HOUSE CLEANING :**
13) ***CHECK WELL FOR DEBRIS BUILD-UP***
14) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
15)
16) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: ELBROOK AIR LIFT STATION – BI-WEEKLY PM
EQUIPMENT NO. – S20-01.01-A001

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S20-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
_AIR___PUMP STATION____ at the following location :
_Go East on Section Rd. and turn left on Elbrook. The station is on the left in front of 7885. This is 2 houses before the road dead ends.

*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
3) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
4) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
5) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
6) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
7) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
8) **HOUSE CLEANING :**
9) ***CHECK WELL FOR DEBRI BUILD-UP***
10) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
11) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: KENWOOD AIR LIFT STATION – BI-WEEKLY PM
EQUIPMENT NO. – S22-01.01-A001

____

Perform the ____BI - WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S22-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the _____BI -_WEEKLY_______ PM on the _AIR___PUMP STATION____ at the following location :
_From Euclid Rd. & Kenwood Rd. go South on Kenwood Rd. The station is on the left next to 5868 Kenwood Rd.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
3) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
4) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
5) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
6) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
7) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
8) **HOUSE CLEANING :**
9) ***CHECK WELL FOR DEBRI BUILD-UP***
10) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
11) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: WYNBROOK AIR LIFT STATION – BI-WEEKLY PM
EQUIPMENT NO. – S23-01.01-A001

____

Perform the ____BI-WEEKLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S23-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______BI-WEEKLY_______ PM on the
_AIR___PUMP STATION____ at the following location :
_From Reed Hartmen Highway & Cornell Rd. go West on Cornell Rd. and turn right on Swing Rd. Turn left on Carriagelite Drive. The station is at 4125 Carriagelite Rd.
*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
3) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
4) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
5) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
6) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
7) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
8) **HOUSE CLEANING :**
9) ***CHECK WELL FOR DEBRI BUILD-UP***
10) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
11) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: ELBROOK AIR LIFT STATION – YEARLY PM
EQUIPMENT NO. – S20-01.01-A001

____

Perform the ____YEARLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S20-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __3_______

JOB STEPS

Standard job steps for the ______YEARLY_______ PM on the
_AIR___PUMP STATION____ at the following location :
_Go East on Section Rd. and turn left on Elbrook. The station is on the left in front of 7885. This is 2 houses before the road dead ends.

*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.
2) COMPRESSOR : CHANGE OIL (DYNA LUBE 30) AND AIR FILTER
3) COMPRESSOR : ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
4) ELECTRICAL : ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) : ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) THREE – WAY VALVE : ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
7) ELECTRODE : ***CHECK FOR PROPER OPERATION***
8) HEATER UNIT : ***CHECK HEATER OPERATION AND CLEAN UNIT.***
9) HOUSE CLEANING :
10) CHECK WELL FOR DEBRI BUILD-UP
11) CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA
12) WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.

Prepared by : ___________________________/ NAME OF TEAM MEMBER :

Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: JOHNSON ROAD AIR LIFT STATION – YEARLY PM
EQUIPMENT NO. – S21-01.01-A001
____

Perform the ____YEARLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S21-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __3_______

JOB STEPS

Standard job steps for the ______YEARLY_______ PM on the _AIR___PUMP STATION____ at the following location :
_From Kenwood Rd. & Euclid Rd. go South on Kenwood Rd. and turn right on Ckerokee Dr. Turn right on Johnson Rd. The station is three houses down in the front yard of 6052.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR : CHANGE OIL (DYNA LUBE 30) AND AIR FILTER**
3) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
7) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
8) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
9) **HOUSE CLEANING :**
10) ***CHECK WELL FOR DEBRI BUILD-UP***
11) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
12) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ___________

TITLE: KENWOOD AIR LIFT STATION – YEARLY PM
EQUIPMENT NO. – S22-01.01-A001
____

Perform the ____YEARLY________ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S22-01.01-A001 CRAFT: ___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __3_______

JOB STEPS

Standard job steps for the _____YEARLY_______ PM on the _AIR___PUMP STATION____ at the following location :
_From Euclid Rd. & Kenwood Rd. go South on Kenwood Rd. The station is on the left next to 5868 Kenwood Rd.
*** INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR : CHANGE OIL (DYNA LUBE 30) AND AIR FILTER**
3) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
7) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
8) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
9) **HOUSE CLEANING :**
10) ***CHECK WELL FOR DEBRI BUILD-UP***
11) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
12) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ___________________________/ NAME OF TEAM MEMBER :
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MSD DIVISIONAL
PREVENTIVE MAINTENANCE FORM

Procedure Number ____________

TITLE: WYNBROOK AIR LIFT STATION – YEARLY PM
EQUIPMENT NO. – S23-01.01-A001
____

Perform the ____YEARLY______ PM for the equipment listed below using the standard job steps for that equipment. If additional work is required to repair the equipment, other than PM, initiate a separate work order for that equipment. Complete all PM task first before attempting any repairs.

If you find additional steps are necessary to complete the PM, write the steps in the comment section and alert your supervisor of the additional steps.

DAY OF THE WEEK : FRIDAY_
COST CENTER OR EQUIPMENT NUMBER : _S23-01.01-A001 CRAFT:
___11 & 27____ NUMBER OF MEN ______2__________
ESTIMATED HOURS: __.7_______

JOB STEPS

Standard job steps for the ______YEARLY_______ PM on the
_AIR___PUMP STATION____ at the following location :
_From Reed Hartmen Highway & Cornell Rd. go West on Cornell Rd. and turn right on Swing Rd. Turn left on Carriagelite Drive. The station is at 4125 Carriagelite Rd.
*** VISUALLY INSPECT EQUIPMENT AND AREA AND NOTE ANY PROBLEMS ***

1) **Follow Safety Call in procedure when working alone at pump station. Carry Cell Phone.**
2) **COMPRESSOR : CHANGE OIL (DYNA LUBE 30) AND AIR FILTER**
3) **COMPRESSOR :** ***CHECK OIL LEVEL STICK / CHECK BELTS FOR WEAR & TENSION. / CHECK AIR PRESSURE GAUGES***
4) **ELECTRICAL :** ***CHECK ALL WIRING (VISUALLY FOR POSSIBLE PROBLEMS).***
5) **:** ***CHECK ALL PANEL LIGHTS FOR BURNT OUT BULBS / REPLACE.***
6) **THREE – WAY VALVE :** ***CHECK TIMER SETTING & OPERATION CHECK AIR BLOW BACK IN WELL / REPORT ANY VALVE CHATTERING.***
7) **ELECTRODE :** ***CHECK FOR PROPER OPERATION***
8) **HEATER UNIT :** ***CHECK HEATER OPERATION AND CLEAN UNIT.***
9) **HOUSE CLEANING :**
10) ***CHECK WELL FOR DEBRI BUILD-UP***
11) ***CLEANING UP AROUND STATION - MAINTAIN CLEAN AREA***
12) **WRITE WORK ORDER FOR ANY REPAIRS FOUND OR REPAIRS MADE.**

Prepared by : ____________________________/ NAME OF TEAM MEMBER :
Date: ____________________________ / DATE OF WORK PERFORM :

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Taylor Creek WWTP

Weekly Air lift Stations.

Ta G1

STATION CHECKED BY ____________________

COMPRESSORS		DATE	____	____	____	____	____
CYCLE TEST THE STATION			____	____	____	____	____
CHECK AND ADJUST BELTS	1		____	____	____	____	____
	2		____	____	____	____	____
CHECK OIL LEVEL	1		____	____	____	____	____
	2		____	____	____	____	____
RECORD HOUR METER	1		____	____	____	____	____
	2		____	____	____	____	____
CHECK ALTERNATOR			____	____	____	____	____
CHECK AIR PRESSURE, RECORD			____	____	____	____	____
THREE WAY VALVE							
CHECK THE TIMER, RECORD			____	____	____	____	____
CHECK BLOWBACK INTO W.W.			____	____	____	____	____
ELECTRODE							
CHECK NO FAIL OPERATION			____	____	____	____	____
HEATER, CHECK OPERATION			____	____	____	____	____
EXHAUST FAN CHECK OPERATION			____	____	____	____	____
CONTROLS							
CHECK PANEL LIGHTS			____	____	____	____	____
VISUALY CHECK ALL WIRING			____	____	____	____	____
TELEMETERING							
CHECK RTU AND VERIFY			____	____	____	____	____
HOUSE KEEPING							
CLECN UP ALL SPILLS			____	____	____	____	____
POLICE UP AROUND STATION			____	____	____	____	____

COMMENTS ____

____

____

____

Weekly Pump station

Ta02

STATION

CHECKED BY ______________________

		DATE				
WET WELL						
CHECK FLOAT OPERATION						
CHECK FOR GREASE AND DEBRIS						
CHECK PUMP OPERATION	1					
	2					
RECORD PUMP HOURS	1					
	2					
CHECK SEAL FAILURE LIGHT						
INSPECT CHECK VALVES	1					
	2					
CONTROLS						
CHECK ALTERNATOR						
VISUALLY CHECK WIRING						
HOUSE KEEPING						
CLEAN UP ALL SPILLS						
POLICE UP AROUND STATION						
TELEMETERING						
CHECK RTU AND VERIFY						

COMMENTS ____

WINWORD.DOC

Weekly Submersible

T-03

STATION

CHECKED BY ____________

		DATE				
WET WELL						
CHECK FLOAT OPERATION						
CHECK FOR GREASE AND DEBRIS						
CHECK PUMP OPERATION	1					
	2					
RECORD PUMP HOURS	1					
	2					
CHECK SEAL FAILURE LIGHT						
INSPECT CHECK VALVES	1					
	2					
CONTROLS						
CHECK ALTERNATOR						
VISUALLY CHECK WIRING						
HOUSE KEEPING						
CLEAN UP ALL SPILLS						
POLICE UP AROUND STATION						
TELEMETERING						
CHECK RTU AND VERIFY						
GENERATOR						
RECORD HOUR METER						
CHECK FUEL OIL LEVEL						
CHECK LUBE OIL LEVEL						
CHECK COOLING WATER LEVEL						
CHECK BLOCK HEATERS						
CHECK ALL HOSES, BELTS ECT.						

COMMENTS ____________

Weekly - PLEASANT RUN CENTRAL

Ta 04

STATION P.R.C. CHECKED BY ______

WET WELL DATE ______ ______ ______ ______

CHECK FOR GREASE AND DEBRIS ______ ______ ______ ______

MAIN FLOOR

CHECK BUBBLER FOR OPERATION ______ ______ ______ ______

DRAIN CONDENSATE FROM FILTER ______ ______ ______ ______

RECORD PUMP OPERATING HOURS
1 ______ ______ ______ ______
2 ______ ______ ______ ______
3 ______ ______ ______ ______
4 ______ ______ ______ ______
5 ______ ______ ______ ______

RECORD SEAL WATER PRESSURE
1 ______ ______ ______ ______
2 ______ ______ ______ ______

AIR COMPRESSORS

CHECK PRESSURE & RECORD ______ ______ ______ ______

RECORD HOUR METER
1 ______ ______ ______ ______
2 ______ ______ ______ ______

CHECK OIL LEVEL
1 ______ ______ ______ ______
2 ______ ______ ______ ______

DRAIN CONDENSATE FROM TANK ______ ______ ______ ______

CHECK ODOR CONTROL BLOWER ______ ______ ______ ______

CHECK EXHAUST FAN ______ ______ ______ ______

CHECK INLET FAN ______ ______ ______ ______

CHECK ALL LIGHTING ______ ______ ______ ______

VISUALLY INSPECT ALL MCC WIRING ______ ______ ______ ______

CHECK FURNACE OPERATION ______ ______ ______ ______

DRY WELL/VALVE CHAMBER

CHECK PUMP OPERATION
1 ______ ______ ______ ______
2 ______ ______ ______ ______
3 ______ ______ ______ ______
4 ______ ______ ______ ______
5 ______ ______ ______ ______

INSPECT CHECK VALVES
1 ______ ______ ______ ______
2 ______ ______ ______ ______
3 ______ ______ ______ ______
4 ______ ______ ______ ______
5 ______ ______ ______ ______

CHECK SUMP PUMP ______ ______ ______ ______

HOUSE KEEPING

POLICE UP AREA ______ ______ ______ ______

TELEMETERING

CHECK RTU & VERIFY ______ ______ ______ ______

COMMENTS ______

Weekly PRW + PRE PLEASANT RUN WEST + EAST

Ta05

STATION P.R.W. CHECKED BY

WET WELL DATE

CHECK FOR GREASE AND DEBRIS
CHECK BARRACK
CHECK CHANNEL MONSTER
MAIN FLOOR
CHECK HYDRAULIC UNIT FOR CHANNEL MONSTER. RECORD PRESSURES
CHECK HYDROGEN PEROXIDE PUMP
CHECK BUBBLER FOR OPERATION
DRAIN CONDENSATE FROM FILTER
RECORD PUMP OPERATING HOURS 1
2
3
4

AIR COMPRESSORS
CHECK PRESSURE & RECORD
RECORD HOUR METER 1
2

CHECK OIL LEVEL 1
2

DRAIN CONDENSATE FROM TANK
CHECK EXHAUST FAN
CHECK INLET FAN
CHECK ALL LIGHTING
VISUALLY INSPECT ALL MCC WIRING
CHECK FURNACE OPERATION
DRY WELL/VALVE CHAMBER
RECORD SEAL WATER PRESSURE 1
2

CHECK PUMP OPERATION 1
2
3
4

INSPECT CHECK VALVES 1
2
3
4

CHECK SUMP PUMP
HOUSE KEEPING
POLICE UP AREA
TELEMETERING
CHECK RTU & VERIFY

COMMENTS

Weekly PRW

TC-05

TAYLOR CREEK TREATMENT PLANT

PLEASANT RUN WEST PUMP STATION

TOTALIZER READINGS ________________ G.P.D. ______________ DATE __________

PUMP POSITION	STARTS	HOURS
1 ________	________	________
2 ________	________	________
3 ________	________	________

SIGNED ____________________

TOTALIZER READINGS ________________ GPD ______________ DATE __________

PUMP POSITION	STARTS	HOURS
1 ________	________	________
2 ________	________	________
3 ________	________	________

SIGNED ____________________

TOTALIZER READINGS ________________ GPD ______________ DATE __________

PUMP POSITION	STARTS	HOURS
1 ________	________	________
2 ________	________	________
3 ________	________	________

SIGNED ____________________

TOTALISER READINGS ________________ GPD ______________ DATE __________

PUMP POSITION	STARTS	HOURS
1 ________	________	________
2 ________	________	________
3 ________	________	________

SIGNED ____________________

TOTALIZER READINGS ________________ GPD ______________ DATE __________

PUMP POSITION	STARTS	HOURS
1 ________	________	________
2 ________	________	________
3 ________	________	________

SIGNED ____________________

Weekly

Taoc

STATION COLERAIN BEVIS

CHECKED BY ______________________

	DATE					
WET WELL						
CHECK FLOAT OPERATION						
CHECK FOR GREASE AND DEBRIS						
CHECK PUMP OPERATION	1					
	2					
	3					
	4					
RECORD PUMP HOURS	1					
	2					
	3					
	4					
CHECK SEAL FAILURE LIGHT						
INSPECT CHECK VALVES	1					
	2					
CONTROLS						
CHECK ALTERNATOR						
VISUALLY CHECK WIRING						
CHECK CHLORINE PUMP						
CHECK MUFFIN MONSTER						
ROTATE SCREEN						
HOUSE KEEPING						
CLEAN UP ALL SPILLS						
POLICE UP AROUND STATION						
TELEMETERING						
CHECK RTU AND VERIFY						
GENERATOR						
RECORD HOUR METER						
CHECK FUEL OIL LEVEL						
CHECK LUBE OIL LEVEL						

Ta06

CHECK COOLING WATER LEVEL _____ _____ _____ _____ _____

CHECK BLOCK HEATERS _____ _____ _____ _____ _____

CHECK ALL HOSES, BELTS ECT. _____ _____ _____ _____ _____

COMMENTS ____

TR07

TAYLOR CREEK TREATMENT PLANT MAINTENANCE

AIR LIFT STATIONS

ANNUAL P.M.

STATION____________________

ELECTRICAL

NAME____________________

MAINTENANCE

NAME____________________

DATE

CHANGE OIL IN COMPRESSORS	____________________
REPLACE V BELTS	____________________
REBUILD 3 WAY VALVE	____________________
CLEAN EXHAUST FAN	____________________
MOTOR STARTER CONTACTS CLEAN/REPLACE	____________________
TIGHTEN ALL ELECTRICAL CONNECTIONS	____________________
CHECK AND ADJUST PRESSURE SWITCHES	____________________
GREASE MOTOR BEARINGS	____________________
REMOVE AND CHECK ELECTRODE	____________________
CLEAN THE INSIDE OF THE STATION	____________________

COMMENTS____

____

____

____

Tc-08

TAYLOR CREEK TREATMENT PLANT MAINTENANCE

PUMP STATION

ANNUAL P.M.

STATION________________________

ELECTRICAL

NAME______________________

MAINTENANCE

NAME______________________

	DATE
CLEAN/LUBRICATE EXHAUST FAN MOTOR	
CHECK/REPAIR/REPLACE MOTOR STARTER CONTACTS	
TIGHTEN ALL ELECTRICAL CONNECTIONS	
CLEAN OUT SUMP PIT	
CLEAN STATION COMPLETELY	

PERFORM ANNUAL P.M. AS PER TAYLOR CREEK PUMP STATION CHECK LIST (ATTACHED)

COMMENTS____

Taco

TAYLOR CREEK PUMP STATION
CHECK LIST

STATION NAME____

DATE__________________

PUMP MAKE____

PUMP MODEL____

PUMP H.P.________________

PUMP VOLTAGE ______________________PHASE_________HZ_______

PUMP G.P.M.___________________

PUMP T.D.H.____________________

FLOATS (TAG) ______ ______ ______ ______ ______ ______

TRANSFORMER SIZE _________________________

MEASURE VOLTAGE BETWEEN PHASES

T1 TO T2 _________ _________ _________

T1 TO T3 _________ _________ _________

T2 TO T3 _________ _________ _________

RECORD THE AMPERAGE PULLED BY THE PUMP MOTORS

T1 _________ _________ _________ _________ _________

T2 _________ _________ _________ _________ _________

T3 _________ _________ _________ _________ _________

CHECK THE MANUAL OPERATION OF THE PUMPS

NO 1 Y ( ) NO ( )

NO 2 Y ( ) NO ( )

NO 3 Y ( ) NO ( )

NO 4 Y ( ) NO ( )

NO 5 Y ( ) NO ( )

CHECK THE AUTOMATIC OPERATION OF THE PUMPS. TIP THE FLOATS

NO 1 Y ( ) NO ( )

NO 2 Y ( ) NO ( )

NO 3 Y ( ) NO ( )

NO 4 Y ( ) NO ( )

NO 5 y ( ) NO ( )

CHECK THE AMOUNT OF FLOW COMING INTO THE WET WELL

DIA OF WET WELL __________ + 1 MIN. OF RISE __________ = AMOUNT

CHECK THE AMOUNT OF SEWAGE PUMPED

DIA OF WET WELL______ - 1 MIN PUMPING + I MIN RISE = AMOUNT

NO I__________

NO 2__________

NO 3__________

NO 4__________

NO 5__________

CHECK VALVES OPERATING PROPERLY Y ( ) N ( )

PLUG VALVES OPERATING PROPERLY Y ( ) N ( )

ARE ALL PUMPS SEATED PROPERLY Y ( ) N ( )

NAME__________________________

Ta08

WET WELL SIZES

3' WET WELL	4.41 GALLONS PER INCH
4' WET WELL	7.833 GALLONS PER INCH
6' WET WELL	17.624 GALLONS PER INCH
8' WET WELL	31.332 GALLONS PER INCH
10' WET WELL	48.956 GALLONS PER INCH

Taog

TAYLOR CREEK TREATMENT PLANT MAINTENANCE

SUBMERSIBLE PUMP STATIONS

ANNUAL P.M.

STATION____________________

ELECTRICAL

NAME____________________

MAINTENANCE

NAME____________________

DATE

CHECK/RERAIR/REPLACE MOTOR STARTER CONTACTS ____________________

TIGHTEN ALL ELECTRICAL CONNECTIONS ____________________

REMOVE PUMPS FROM WET WELL /CHECK OPERATION ____________________

CHANGE OIL IN PUMPS ____________________

PREFORM ANNUAL P.M. AS PER TAYLOR CREEK
PUMP STATION CHECK LIST. (ATTACHED) ____________________

COMMENTS____

____

____

____

____

Ta-09

TAYLOR CREEK PUMP STATION
CHECK LIST

STATION NAME____

DATE__________________

PUMP MAKE____

PUMP MODEL____

PUMP H.P.______________

PUMP VOLTAGE ____________________ PHASE________ HZ______

PUMP G.P.M.________________

PUMP T.D.H.________________

FLOATS (TAG) ______ ______ ______ ______ ______ ______

TRANSFORMER SIZE _______________________

MEASURE VOLTAGE BETWEEN PHASES

T1 TO T2 ________ ________ ________

T1 TO T3 ________ ________ ________

T2 TO T3 ________ ________ ________

RECORD THE AMPERAGE PULLED BY THE PUMP MOTORS

T1 ________ ________ ________ ________ ________

T2 ________ ________ ________ ________ ________

T3 ________ ________ ________ ________ ________

CHECK THE MANUAL OPERATION OF THE PUMPS

NO 1 Y ( ) NO ( )

NO 2 Y ( ) NO ( )

Ta 09

NO 3 Y ( ) NO ( )

NO 4 Y ( ) NO ( )

NO 5 Y ( ) NO ( )

CHECK THE AUTOMATIC OPERATION OF THE PUMPS. TIP THE FLOATS

NO 1 Y ( ) NO ( )

NO 2 Y ( ) NO ( )

NO 3 Y ( ) NO ( )

NO 4 Y ( ) NO ( )

NO 5 y ( ) NO ( )

CHECK THE AMOUNT OF FLOW COMING INTO THE WET WELL

DIA OF WET WELL __________ + 1 MIN. OF RISE __________ = AMOUNT

CHECK THE AMOUNT OF SEWAGE PUMPED

DIA OF WET WELL______ - 1 MIN PUMPING + I MIN RISE = AMOUNT

NO I__________

NO 2__________

NO 3__________

NO 4__________

NO 5__________

CHECK VALVES OPERATING PROPERLY Y ( ) N ( )

PLUG VALVES OPERATING PROPERLY Y ( ) N ( )

ARE ALL PUMPS SEATED PROPERLY Y ( ) N ( )

NAME____________________________

Ta09

WET WELL SIZES

3' WET WELL	**4.41 GALLONS PER INCH** .
4' WET WELL	**7.833 GALLONS PER INCH**
6' WET WELL	**17.624 GALLONS PER INCH**
8' WET WELL	**31.332 GALLONS PER INCH**
10' WET WELL	**48.956 GALLONS PER INCH**

Tc-10

TAYLOR CREEK TREATMENT PLANT

ANNUAL MAINTENANCE

COLERAIN BEVIS PUMP STATION

MAINTENANCE
NAME_______________________

ELECTRICAL
NAME_______________________

DATE

CHECK VALVES CHECK OIL AND ADJUST VALVES	______________
LUBRICATE BUFFER RODS	______________
CLEAN UP VALVES AND VALVE CHAMBER	______________
CHECK OIL AND ADJUST RELIEF VALVE	______________
CHECK ROOF MOUNTED EXHAUST FAN	______________
CHECK RADIANT HEATERS & THERMOSTATS	______________
CLEAN AND LUBRICATE SLUICE GATE	______________
CHECK, ADJUST, LUBE, ENTRANCE GATE CHAIN	______________
CHECK ALL ELECTRICAL CONNECTIONS IN M.C. CABINETS.	______________
CHECK ALL ELECTRICAL CONNECTIONS IN PUMP CONTROL CABINET.	______________
CHECK MOTOR STARTERS	______________
REMOVE PUMPS AND CHECK OPERATION & IMPELLERS.	______________
CHANGE OIL IN PUMPS.	______________
CHECK/REPLACE PUMP LIFTING CHAIN	______________
REPLACE CHAIN TIE CORD	______________
HYDRAULIC UNIT CHANGE OIL AND FILTER	______________
INSPECT HYDRAULIC LINES	______________

Ta 10

MUFFIN/CHANNEL MONSTER
INSPECT *AND* SERVICE UNIT AS PER P.M. SHEET ______________________

COMMENTS____

____

____

____

____

TC 11

TAYLOR CREEK

ANNUAL MUFFIN/CHANNEL MONSTER MAINTENANCE

GREASE MOTOR BEARINGS________________

INSPECT AND GREASE TOP AND BOTTOM SEALS____________________

INSPECT BEARINGS______________________

GREASE GEARS_____________________

INSPECT CUTTER STACK FOR TIGHTNESS________________

INSPECT CUTTERS____________________

INSPECT WIRING___________________

CHECK VOLTAGE

L1____________

L2____________

L3____________

CHECK AMPRAGE

L1____________

L2____________

L3____________

MAINTENANCE____________________

ELECTRICAL______________________

T... 12

TAYLOR CREEK TREATMENT PLANT

ANNUAL MAINTENANCE

PLEASANT RUN CENTRAL

ELECTRICAL

NAME______________________

MAINTENANCE

NAME______________________

DATE

CHANGE AIR COMPRESSOR OIL & FILTER ______________________

CLEAN/CHANGE ALL AIR FILTERS & LUBRICATORS ______________________

CHECK/CALIBRATE AIR GAGES ______________________

CHECK/CALIBRATE WATER PRESSURE GAGES ______________________

GREASE WET WELL BLOWER SHAFT ______________________

CHECK/CLEAN SEAL WATER SOLENOID ______________________

CLEAN SEAL WATER TANK ______________________

CHECK/ADJUST G.A. VALVE ______________________

GREASE INLET VALVES ______________________

GREASE OUTLET VALVES ______________________

CLEAN OUT SUMP PIT ______________________

CREASE FAN BEARINGS ______________________

CHECKIREPAIR MOTOR STARTER CONTACTS ______________________

TIGHTEN ALL ELECTRICAL CONNECTIONS ______________________

CLEAN/VACUME M.C. PANELS ______________________

CHECK/ADJUST MOTOR TIMERS ______________________

CHECK/CLEAN SOLENOID VALVES ______________________

Ta-12

CHECK/ADJUST PUMP PRESSURE SWITCHES ____________________

CHECK AUXILIARY POWER ____________________

CLEAN/VACUME AUXILIARY POWER PANEL ____________________

COMMENTS____

____

____

____

____

____

WORD/WINWORD/PRCAPM

Tx 13

TAYLOR CREEK TREATMENT PLANT

ANNUAL MAINTENANCE

PLEASANT RUN WEST J East

ELECTRICAL

NAME______________________

MAINTENANCE

NAME______________________

DATE

CHANGE AIR COMPRESSOR OIL & FILTER	______________________
CLEAN/CHANGE ALL AIR FILTERS & LUBRICATORS	______________________
CHECWCALIBRATE AIR GAGES	______________________
CHECWCALIBRATE WATER PRESSURE GAGES	______________________
CHECWCLEAN SEAL WATER SOLENOID	______________________
CLEAN SEAL WATER TANK	______________________
CHECK/ADJUST G.A. VALVE	______________________
GREASE INLET VALVES	______________________
GREASE OUTLET VALVES	______________________
CLEAN OUT SUMP PIT	______________________
GREASE FAN BEARINGS	______________________
CHANGE OIL IN HYDRAULIC UNIT	______________________
CHECK HYDRAULIC LINES	______________________
CHANNEL MONSTER INSPECT AND SERVICE UNIT AS PER P.M. SHEET	______________________
CHECK/REPAIR MOTOR STARTER CONTACTS	______________________
TIGHTEN ALL ELECTRICAL CONNECTIONS	______________________
CLEAN/VACUME M.C. PANELS	______________________

Ta 13

CHECK/ADJUST MOTOR TIMERS ______________________________

CHECK/CLEAN SOLENOID VALVES ______________________________

CHECK/ADJUST PUMP PRESSURE SWITCHES ______________________________

CHECK AUXILIARY POWER ______________________________

CLEAN/VACUME AUXILIARY POWER PANEL ______________________________

COMMENTS____

____

____

____

____

____

WORD/WINWORD/PRWAPM

Ta-13

TAYLOR CREEK

ANNUAL MUFFIN/CHANNEL MONSTER MAINTENANCE

GREASE MOTOR BEARINGS________________

INSPECT AND GREASE TOP AND BOTTOM SEALS_____________________

INSPECT BEARINGS______________________

GREASE GEARS_____________________

INSPECT CUTTER STACK FOR TIGHTNESS_________________

INSPECT CUTTERS____________________

INSPECT WIRING___________________

CHECK VOLTAGE

L1____________

L2____________

L3____________

CHECK AMPRAGE

L1____________

L2____________

L3____________

MAINTENANCE____________________

ELECTRICAL______________________

To 14

Weekly

TAYLOR CREEK TREATMENT PLANT

GENERATOR WEEKLY RUN REPORT

DATE________________

	TIME ON	TIME OFF
BLANCHETTA PUMP STATION		
COLERAIN BEVIS PUMP STATION		
HONNERT RIDGE PUMP STATION		
LASALLE PLACE PUMP STATION		
LOCUST VIEW PUMP STATION		
NORTHBEND CROSSING PUMP STATION		
ORCHARD GATE PUMP STATION		
SPRINGLEAF PUMP STATION		
STRADFORD LAKES PUMP STATION		
TAYLOR CREEK PUMP STATION		
TAYLOR CREEK TREATMENT PLANT		
TIMBER RIDGE PUMP STATION		
WILLOW RIDGE PUMP STATION		

COMMENTS____

PROCEDURES FOR INSURING OPERATION OF MSD STANDBY GENERATORS

Contract Services

MSD always has a long-term contract with a company that has expertise in generators. The contract requires three levels of service for all MSD generators. Level One Service calls for performing annual maintenance that includes visual inspection of the unit and its components, making any adjustments to fluid levels, belts, etc.

Level Two Service calls for annual maintenance that repeats Level One Service and these additional requirements: lube, oil & filter change; fuel filter change; engine tune-up (if required); lube oil analysis and load bank testing (if required).

The contract's third level of service calls for a two-hour response time for dealing with emergencies, 24 hours per day, 7 days per week. Emergency service includes troubleshooting, repair and replacement of parts as needed in order to restore operation.

MSD Staff Services

MSD personnel provide two levels of generator service. Plant personnel visit each facility weekly to perform routine maintenance on treatment equipment. Included in these visits is a visual inspection of the generators.

In addition to these visits, each generator is programmed for a 30-minute cycle of operation once each week. This exercises the equipment, keeping it in a state of readiness.

The MSD Telemetering System provides another level of protection. Each generator is linked to a terminal in a station manned 24 hours per day, 7 days per week. Any deviation from normal operation sounds an alarm alerting the operator who then dispatches someone to investigate and take appropriate action.

Lastly, MSD has one fulltime employee whose sole responsibility is to service and troubleshoot MSDs standby generators. This employee periodically checks all of the generators. Plant or operations personnel can contact him when trouble is observed; plus the CENTREX Operator who constantly monitors telemetering signals can also contact him. He also responds to trouble calls 24 - 7, same as the Contractor. He is MSDs primary contact person for the generator contractor and always accompanies the contractor when handling trouble calls.

EXHIBIT **10**

Program Documentation

BBS CORPORATION

Short Term Capacity Plan

Metropolitan Sewer District of Greater Cincinnati In Conjunction With BBS Corporation

November 2001

TABLE OF CONTENTS

Attachments

1.0 Introduction

Elimination of Sanitary Sewer Overflows (SSO's) is a high priority for the Metropolitan Sewer District. It will require complex and costly solutions which must be implemented over several years. In the interim, the impact of SSO's on local water quality must be mitigated in anticipation of continued development in tributary areas. Development credits for sewer system rehabilitation are a critical issue to both the Metropolitan Sewer District (MSD) and Ohio Environmental Protection Agency (OEPA). Over the past several years, MSD has committed a significant portion of the annual Capital Improvement Program budget to rehabilitation of the collection system. The incentive to commit these funds is not only to maintain a viable long term infrastructure, but to allow for continued development while improving water quality in Hamilton County. The Short Term Capacity Plan (STCP) provides the basis for how removed infiltration and inflow should be apportioned between allowance for development and improvements to water quality. This document is intended to outline the basis for agreement between MSD of Greater Cincinnati and OEPA for establishing appropriate development credits.

This STCP utilizes the criterion that a minimum five gallons of flow from a downstream SSO is to be removed for every gallon of flow added from a proposed new sewer, sewer extension or flow increase associated with new development upstream of the SSO. Design I/I conditions and estimated peak flows from the new development will be used in evaluating the proposed flow removals and additions.

This STCP Plan may be modified to incorporate new or revised flow figures or methodologies undertaken to remove extraneous water (I/I) from the sanitary sewer system, or to change the removal credit trade ratio. Any such modification to the criteria, formulae, or removal credit trade ratio, set out in the STCP shall be subject to the SCTP modification process defined in Section 5.0 of this STCP Plan.

2.0 Definitions

The following terms are used throughout this document and are listed here with a definition to clarify their use herein.

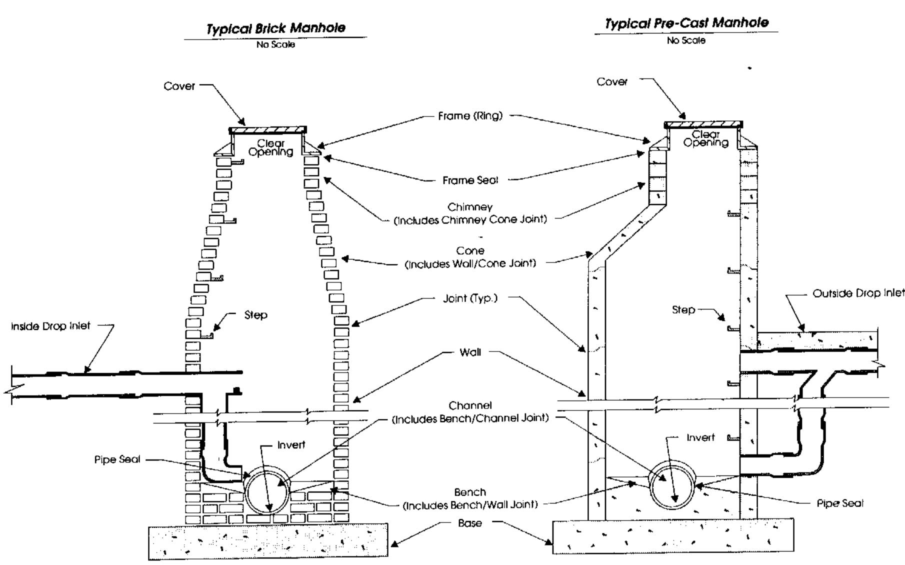
Basin – Sewershed area tributary to an MSD operated wastewater treatment plant.

Combined Sewer System - The portion of the MSD sewer system which conveys municipal sewage (domestic, commercial and industrial wastewaters) and stormwater runoff starting from the point of entry of pipes under public right-of-way through a single pipe system, to the MSD wastewater treatment plants.

ERC - The Equivalent Residential Connections available for trading based upon 400 gallons per day per single family residence. The trade ratio used is also factored in. As an example, 12,000 gpd of I/I removed with a trade ratio of 5:1 would equate to 6 ERC based on the following equation:

$$\frac{\text{12,000gpd removed}}{\text{400 gpd/residence x 5 gpd removed per gallon added}}$$

Manhole - Access points along the sewer system. Parts of the manhole referred to in this document are as follows:



Basic Manhole Components

Infiltration - the water entering a sewer system and service connections from the ground through such means as, but not limited to, pipes, pipe joints, connections, manhole walls or manhole joints.

Inflow - The water discharged into a sewer system, including service connections, from such sources as, but not limited to; roof leaders; cellars, yard and area drains; foundation drains; cooling water discharges; drains from springs and swampy areas; manhole covers; cross connections from storm sewers; surface runoff; street wash waters; or drainage.

I/I - The total quantity of water from both infiltration and inflow without distinguishing the source.

Residential Flow - The average daily flow contribution from a single family residence based on 4 persons per home and 100 gallons per day per person.

Riparian Area - The area immediately adjacent to streams. The width is determined by 2-1/2 times the stream width as measured from bank to bank during normal dry weather flow. The limits of the riparian zone shall be 2-1/2 times the stream width measured on each side of the stream centerline. Exceptions will be made where topography dictates a larger or smaller riparian area when sufficient documentation is provided. Documentation may include stream cross-sections or photographs of the area.

Sanitary Sewer Overflow or SSO - Any discharge to waters of the State or United States from MSD's sanitary sewer system through known point sources.

Sanitary Sewer System - All portions of MSD's sewer system that are not a part of the combined sewer system.

Sewer Inch-Mile - Term referring to sewer lines arrived at by multiplying the sewer diameter by the length in miles. Thus 1,500 feet of 12-inch sewer would be 1,500 / 5,280 x 12 = 3.4 in-mi.

Sewer Rehabilitation – Lining, sealing or grouting of a sewer line intended to improve the structural integrity of the sewer line and/or eliminate I/I from entering the system.

SSO Sewershed - The drainage basin above and contributing to an SSO.

SRP Program - Stormwater Removal Program initiated by the District in 1992 that reimburses homeowners for removing sources of I/I from the sanitary sewer including downspouts, driveway drains, area drains and stairwell drains.

Trade Ratio - The ratio of gallons of I/I removed from the system to additional gallons allowed for new development. The ratio is affected by both the confidence in the volume of I/I removed as well as the desire to improve water quality.

3.0 Credits Program

The credits program includes credits given for new development based on the following types of sewer system rehabilitation:

- Removal of downspout and/or driveway drain connections.
- Rehabilitation of deteriorated sewer lines.
- Rehabilitation of deteriorated manholes.

The credits in this STCP area a result of industry accepted numbers that have been modified based on a verification program performed by the District. The following are the resulting credits that have been negotiated with Ohio EPA.

3.1 Approved Credits

Credits are expressed in ERC units (equivalent residential connections). ERCs are calculated based on 1,600 gallons per day peak residential flow per single family residence and a 5:1 trade ratio between gallons of flow removed and new flow from proposed developments.

3.1.1 Downspout and Driveway Drain Removals

Credits for downspouts and driveway drains are as follows:

Downspouts	2 ERCs per downspout
Driveway drains	3 ERCs per driveway drain

3.1.2 Rehabilitation of Deteriorated Mainline Sewers

Credits for mainline sewer rehabilitation or replacement are as follows:

Riparian Areas	17 ERCs per inch-mile of rehabilitated pipe
Non-riparian Areas	.03 ERCs per inch-mile of rehabilitated pipe

3.1.3 Manhole Rehabilitation

Credits for manhole rehabilitation are divided into two categories, replacement of vented manhole lids and repair of manhole defects.

3.1.3.1 Replacement of Vented Manhole Lids

Replacement of vented manhole lids shall be with either the new modified solid lids (with only two pick holes), solid lids, or dish inserts. An interim approval of up to 200 ERCs per basin through the year 2003 is agreed upon herein. A review of this limit and the methodology for verification of values will be conducted by MSD and OEPA in accordance with Section 5. Credits for lid replacements or inserts will only be allowed for manholes that are in the riparian areas if installed prior to September 29, 1982.

Credits given are dependent upon their location and their susceptibility to inundation by rainwater during wet weather conditions. These are defined as follows:

- **1-inch Inundation** – Manholes will be considered to be subject to a 1" inundation when the top of casting is within two feet of the normal dry weather pool stage in the upper half of the basin or within four feet of the pool stage in the lower half of the basin.

- **1/8-inch Inundation** – Manholes in paved areas that completely lie within a distance of the curb no more than 1/4 of the width of the street as measured from curb to curb will be considered "1/8-inch inundation". Note that the street must have a formed curb to be considered for this category.

- **Splash** – Manholes in paved areas that lie outside the area defined in 1/8" inundation above or manholes in non-paved areas that are flush with the ground are considered "splash". Any manholes in paved areas where there is no formed curb will be considered as "splash".

- **Non-paved, Non-Riparian** – Manholes in these non-paved areas will be approved for credits on a case-by-case basis. Documentation of field conditions will be provided to OEPA for approval to include: actual topographic information, other supportive drainage calculations, or photographs showing the potential for over land inflow.

Credits given for vented manhole lid replacement are:

Splash	1/8-inch	1-inch
1 ERC	4 ERC	20 ERC

3.1.3.2 Repair of Manhole Defects

The second category for manhole credits is the rehabilitation of specific defects in the manhole structure. These defects will be logged on an inspection form as found in Appendix B. Credits are determined by severity and number of defects as logged as well as the location of the manhole. American Society of Civil Engineers, Manual of Practice No. 92 was used as the basis of classification with values adjusted to reflect actual field testing done to date. The credits tables on the following pages outline credits given for paved areas, riparian areas and non-riparian areas.

3.1.4 Foundation Drain Credits

Removal of foundation drain sump pumps from the sanitary sewer system are credited at 2 ERC per sump pump.

3.2 Credits Tracking

The District has been tracking credits earned from SRP corrections, sewer replacement and sewer rehabilitation. A running log is maintained, tracking available credits based on credits earned and used within each SSO sewershed. This tracking has been expanded to include credits earned through manhole rehabilitation and sump pump removals. This tracking report will be submitted to OEPA on a quarterly basis to update the status of the credits program.

The effective-retroactive date for credit claims is January 1, 2000.

Current Credit Table

Manholes in Riparian Areas

Credits Ratio 5:1

	Minor I/I			Moderate I/I			Heavy I/I			Severe I/I		
	gpm	gpd*	erc**	gpm	gpd*	erc**	gpm	gpd*	erc**	gpm	gpd*	erc**
Frame seal	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7	4.8	6,912	3.5
Chimney	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7	4.8	6,912	3.5
Cone	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7	4.8	6,912	3.5
Wall	0.3	432	0.2	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7
Pipe Seal	0.3	432	0.2	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7
Bench	0.3	432	0.2	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7
Channel	0.3	432	0.2	0.6	864	0.4	1.2	1,728	0.9	2.4	3,456	1.7

* gpd calculated based on gpm x 60 min/hr x 24 hr/day

** erc represents equivalent residential connections based on 400 gal/day/residence

Reserve the right to test a manhole to determine credits on a 5:1 ratio using infiltration method

Current Credit Table

Manholes in Non-riparian Areas

Credits Ratio 5:1

	Minor I/I			Moderate I/I			Heavy I/I			Severe I/I		
	gpm	gpd*	erc**	gpm	gpd*	erc**	gpm	gpd*	erc**	gpm	gpd*	erc**
Frame seal	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7	1.8	2,627	1.3
Chimney	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7	1.8	2,627	1.3
Cone	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7	1.8	2,627	1.3
Wall	0.1	164	0.1	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7
Pipe Seal	0.1	164	0.1	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7
Bench	0.1	164	0.1	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7
Channel	0.1	164	0.1	0.2	328	0.2	0.5	657	0.3	0.9	1,313	0.7

*   gpd calculated based on gpm x 60 min/hr x 24 hr/day

** erc represents equivalent residential connections based on 400 gal/day/residence

Reserve the right to test a manhole to determine credits on a 5:1 ratio using infiltration method

Current Credit Table

Manholes in Paved Areas

Credits Ratio 5:1

	Minor I/I			Moderate I/I			Heavy I/I			Severe I/I		
	gpm	gpd*	erc**	gpm	gpd*	erc**	gpm	gpd*	erc**	gpm	gpd*	erc**
Frame seal	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2	0.4	622	0.3
Chimney	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2	0.4	622	0.3
Cone	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2	0.4	622	0.3
Wall	0.0	39	0.0	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2
Pipe Seal	0.0	39	0.0	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2
Bench	0.0	39	0.0	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2
Channel	0.0	39	0.0	0.1	78	0.0	0.1	156	0.1	0.2	311	0.2

*   gpd calculated based on gpm x 60 min/hr x 24 hr/day

** erc represents equivalent residential connections based on 400 gal/day/residence

Reserve the right to test a manhole to determine credits on a 5:1 ratio using infiltration method

4.0 Credit Verification Program

The Credits Verification Program is a field program intended to quantify actual I/I removal rates for various types of manhole and sewer system rehabilitation. These program results will be used to adjust the credits program values where applicable. Modifications to credit values will be done in accordance with Section 5.0.

The Credits Vertification Program consists of two parts. The first is to verify credits given for manhole rehabilitation work. This part of the program is currently underway. The second is to verify credits given for main line rehabilitation and replacement work.

4.1 Manhole Testing

Manholes are currently being tested in three types of locations:

- Riparian areas
- Non-riparian areas paved
- Non-riparian areas not paved.

A total of fifteen manholes will be tested in each location type. No more than five will be on any single sewer line. This will ensure that an average manhole condition is tested. Manholes are being selected based on manhole inspection reports that have been completed as a part of other projects.

The testing procedure for each manhole shall be as follows:

1. Rinse manhole and spray with disinfectant. Plug the influent and effluent lines in the manhole with flow-through plugs to isolate the manhole from the sewer line. The use of flow-through plugs allows the flow of sewage to continue during the testing procedure to eliminate the possibility of sewage back-ups during the test.

2. Fill the manhole to the top of casting and maintain this level for a period of at least 30 minutes. This is to allow exfiltration out of the manhole to fill the voids in the soil surrounding the manhole in dry periods in order to simulate a high groundwater condition.

3. Pump the water from the manhole and begin recording the infiltration rate.

4. For a period of one hour, infiltration entering the manhole is pumped out of the manhole and the volume recorded along with the time. Infiltration rate will be measured in 15 unit increments.

5. The total volume removed from the manhole over the testing period is the infiltration rate the manhole experiences during high groundwater conditions. This rate can then be converted to a gallon per day rate.

Final credits will then be determined from the results from each location type and applying the trade ratio agreed upon by OEPA.

4.2 Mainline Sewer Rehabilitation Testing

Credits for mainline sewer rehabilitation in riparian and non-riparian zones will be evaluated over the next several months. Pre and post-rehabilitation flow monitoring will be conducted over a sufficient time to provide confidence in the credit calculations. An attempt will be made to isolate parts of the system to assure that credits are determined only for the mainline rehabilitation/replacement.

5.0 STCP Modifications

In a sewer system as large as that in Hamilton County, there are always some situations that cannot be represented by an average condition. In areas where severe deterioration has occurred, the District reserves the option of specific testing of either manholes or sewer lines to determine the actual I/I rate that will be removed by rehabilitation or replacement work. Where this site specific testing is performed, credits would be given based on the test results applied using the agreed upon trade ratio. This allows the District to receive a fair credit for these exceptional areas and still provide the positive impact on the environment.

The approval of credits in these extreme circumstances will be subject to an approval process by OEPA as described below.

In addition, future field tests or better documentation may result in the modification of the credits as set forth in this document. The interim removal credits for downspouts, driveway drains, sewer replacement/rehabilitation, and/or manhole rehabilitation as set forth above in Section 3.0 Credits Program, may be modified based on new or revised flow information. This data shall be documented as part of the credit verification program implemented pursuant to Section 4.0, provided that any such changes, together with the quantified supporting data, are submitted to Ohio EPA for review and receive written approval from Ohio EPA. Upon Ohio EPA approval of such modifications, the existing STCP shall be modified by MSD consistent with Ohio EPA's approval.

The STCP may be modified by the addition of removal credits from other sources of excessive infiltration/inflow as a result of the development of adequate flow figures and/or equations to properly reflect the impact from such projects in terms of a removal credit. In the event that such removal credit(s) are proposed to be added to the credits program MSD shall submit the proposed credits, together with the supporting data, and the proposed modifications to the credit verification program to Ohio EPA for review. Upon Ohio EPA approval of such modifications the existing STCP shall be modified by MSD consistent with Ohio EPA's approval.

ATTACHMENT A

Detailed Criteria of I/I Rate Given
for Each Defect

Table 5.2 from ASCE Manual of
Engineering Practice No. 92

Component	Rating/description/default flow (gpm)				
	No I/I **1**	**Minor I/I** **2**	**Moderate I/I** **3**	**Heavy I/I** **4**	**Severe I/I** **5**
Cover (1)	No evidence	Pick or other unsealed cover. No ponding.	Corroded bearing surface. No ponding.	Ponding < 1" with pick or other unsealed cover.	Ponding > 2" pick or other unsealed cover.
Frame seal	0.0 No evidence	0.2 Water marks	0.4 Some soil present at cracks	0.8 Heavy soil/roots/ 1/8" gap in drainage area.	$\geq$1.6 $\geq$1.8" gap in drainage area.
Chimney	0.0 No evidence.	0.2 Water marks. 1 location	0.4 Water marks. 2-3 locations or mineral deposits. Joint leak (<10%).	0.8 Multi water marks. Mineral deposits. Joint leak (<25%)	$\geq$1.6 Multi water marks. Mineral deposits. Drainage area. Joint leak (>25%).
Cone	0.0 No evidence.	0.2 Water marks. 1-2 locations.	0.4 Water marks. 3-4 locations or mineral deposits. Joint leak (10%).	0.8 Multi water marks or mineral deposits. Joint leak (25%).	$\geq$1.6 Multi water works. Mineral deposits or soil present. Join leak (>25%).
Wall	0.0 No evidence.	0.1 Water marks. 1-2 locations.	0.2 Water marks. 3-4 locations or mineral deposits. Joint leak (10%).	0.4 Multi water marks or mineral deposits. Joint leak (25%).	$\geq$0.8 Multi water marks. Mineral deposit or soil present. Joint leak (>25%).
Pipe seal	0.0 No evidence.	0.1 Water marks. 1-2 locations.	0.2 Water marks. 3-4 locations or mineral deposits. Soil leak (10%).	0.4 Multi water marks or mineral deposits. Seal leak (25%).	$\geq$0.8 Multi water marks. Mineral deposit or soil present. Soil leak (>25%).
Bench	0.0 No evidence	0.1 Water marks. 1-2 locations.	0.2 Water marks. 3-4 locations or mineral deposits. Joint leak (10%).	0.4 Multi water marks or mineral deposits. Joint leak (25%).	$\geq$0.8 Multi water marks. Mineral deposit or soil present. Joint leak (>25%).
Channel	0.0 No evidence.	0.1 Water marks. Hairline crack beneath flow.	0.2 Water marks. Mineral deposits or 1/18" crack beneath flow.	0.4 Water marks and mineral deposits. 1/8" crack beneath flow.	$\geq$0.8 Mineral deposits. Soil. 1/4" crack beneath flow.

NOTE: "%" refers to the percentage of circumference that contains the indicated observation.
(1) No default cover inflow provided since inflow depends on type of cover, condition of cover, and ponding depth. Calculate leakage using manufacturer's data or appropriate orifice equations for pick holes.

ATTACHMENT B

Manhole Inspection Form

MANHOLE INSPECTION FORM

Inspection Date:______________________ Inspector:______________________

Manhole No.: ______________________ Location ______________________

Sewershed: ______________________ Depth: ______________________

General

Status:
- ◯ Surface inspected
- ◯ Internal inspected
- ◯ Not found
- ◯ Buried

Location:
- ◯ Paved
- ◯ Non-paved
- ◯ Stream Areas

Structure Type:
- ◯ Manhole
- ◯ Flush Hole
- ◯ Siphon Box
- ◯ Junction Box
- ◯ Other __________.

Ground Condition:
- ◯ Dry
- ◯ Moderate
- ◯ Wet

Cover

Standard:
- ◯ Vented
- ◯ Vented-bolted
- ◯ Solid
- ◯ Solid-bolted #
- ◯ None

Fit:
- ◯ Good
- ◯ Tight
- ◯ Loose
- ◯ Rocking
- ◯ Cracked

Condition:
- ◯ Good
- ◯ No Gasket
- ◯ No Bolts
- ◯ Corroded/Pitted

No. of Holes:
- ◯ None
- ◯ Pick (1)
- ◯ Pick (2)
- ◯ 3- - 5
- ◯ 6 – 8
- ◯ > 8

Susceptibility to Flood:
- ◯ None
- ◯ Splash
- ◯ 1/8”
- ◯ 1” or greater

Nonstandard:
- ◯ Other

Cover No. / Type: [ ]

Casting

Size (In): [ ] / [ ] / [ ]

Cir.Opn’G / Cover Opn’G / Frame Depth

Offset (In): [ ]

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Casting Seal

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Inflow:
- ◯ None
- ◯ Low
- ◯ Moderate
- ◯ Heavy
- ◯ Severe

Chimney

Depth (In): [ ] **Min. Dia. (In):** [ ]

Const.:
- ◯ None
- ◯ Precast
- ◯ Brick
- ◯ Block
- ◯ Poured
- ◯ Other

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Observed Flow:
- ◯ None
- ◯ Low
- ◯ Moderate
- ◯ Heavy
- ◯ Severe

Cone

Shape:
- ◯ Concentric
- ◯ Eccentric
- ◯ Flat Top
- ◯ Other

Const:
- ◯ None
- ◯ Precast
- ◯ Brick
- ◯ Block
- ◯ Poured
- ◯ Other

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Inflow:
- ◯ None
- ◯ Low
- ◯ Moderate
- ◯ Heavy
- ◯ Severe

Defect Location:
- ◯ Wall/Cone Joint
- ◯ Cone Surface
- ◯ Chimney & Cone

Defect Quantity:
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ > 4

Wall

Minimum Dimensions (In): [ ] ***x*** [ ]

Bottom Dia. (In): [ ]

Const:
- ◯ None
- ◯ Precast
- ◯ Brick
- ◯ Block
- ◯ Poured
- ◯ Other

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Infiltration:
- ◯ None
- ◯ Low
- ◯ Moderate
- ◯ Heavy
- ◯ Severe

Defect Location:
- ◯ Wall Joint
- ◯ Top Half
- ◯ Bottom Half
- ◯ Entire Depth

Defect Quantity:
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ > 4

Bench

Const:
- ◯ None
- ◯ Precast
- ◯ Brick
- ◯ Block
- ◯ Poured
- ◯ Other

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor ◯ Moderate
- ◯ Deteriorated

Infiltration:
- ◯ None
- ◯ Low
- ◯ Heavy
- ◯ Severe

Channel

Const:
- ◯ None
- ◯ Precast
- ◯ Poured
- ◯ VCP
- ◯ Plastic
- ◯ Other

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Infiltration:
- ◯ None
- ◯ Low
- ◯ Moderate
- ◯ Heavy
- ◯ Severe

Hydraulics:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Step

Const:
- ◯ None
- ◯ Bar
- ◯ Iron
- ◯ Plastic
- ◯ Other

Condition:
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Deteriorated

Surcharge Evidence (ft): [ ]

Note 1 (Overflow Yes/No): [ ]

Note 2: [ ]

Memo

Notes:

ATTACHMENT C

Neenah Foundry Company's "A Report On Inflow Of Surface Water Through Manhole Covers"

A REPORT
ON INFLOW OF SURFACE WATER THROUGH MANHOLE COVERS

NEENAH

NEENAH
FOUNDRY COMPANY

TABLE OF CONTENTS

INTRODUCTION

With the current awareness of the ecological ramifications of water pollution, much effort and money is being directed towards the cost of effective upgrading of wastewater treatment facilities and distribution systems throughout the nation. This upgrading not only deals with requirements for higher levels of treatment for daily wastewater flows at treatment facilities, but is also directed at the reduction and eventual elimination of in-system bypassing of wastewater. This bypassing is largely a result of the intrusion of surface runoff waters and/or groundwater into sewer systems during wet weather periods of the year.

This joint report by Neenah Foundry Co. and staff members of American Consulting Services of Minneapolis, Minn. is an outgrowth of investigations conducted as part of one particular phase of the construction grants program, namely the Sewer System Evaluation Survey (SSES). As defined in the federal government's Title 40 Rules and Regulations, a Sewer System Evaluation Survey . . . "consists of a systematic examination of the sewer system to determine the specific location, estimated flow rate, method of rehabilitation and cost of rehabilitation versus cost of transportation and treatment for each defined course of infiltration/inflow". (1)

PURPOSE

With the investigations conducted in the field according to the SSES Program, one of the most common and costly sources of inflow identified in most of today's sewer systems, is manhole lids subject to surface runoff inflow. (See Figure 1 and other examples, Appendix B). There has been a general absence of information as to how much surface water could inflow into a system through manhole lids. It was this need that provided the stimulus for this report with the hope that some simple, effective method of rehabilitation could be designed.

This report, in particular, investigates:

(1) Quantities of surface runoff which enter the sewer system through different sized manhole lids.

(2) How surface runoff, manhole lid bearing surface, and pickhole and vent hole area affect the quantity of inflow through these lids.

(3) An effective, relatively inexpensive, alternative for the elimination of this source of inflow into the sewer system.

It is hoped that the information contained in this report will help to enlighten municipalities, their consultants and respective state or federal agencies to the magnitude of this problem and to the alternative available for its solution.

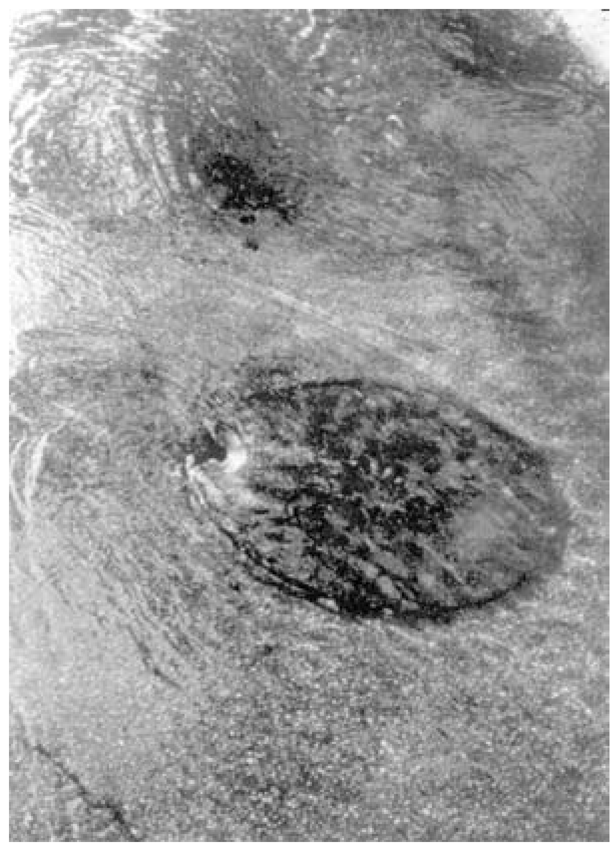


Figure 1
Inflow Through Manhole Lid

1. Infiltration/Inflow — *See* Definitions, **Appendix A**

APPARATUS

To conduct the tests a large cylindrical flooding tank was constructed. (See Figure 2). The tank had an inside diameter of 39½" was 15" deep and equipped with a 3" diameter outlet pipe which protruded from the bottom center of the tank. **A** rubber coated wooden plug was used as the stopper for this outlet. The tank was supported about 3 feet above the floor by four legs to accommodate an 18" **x** 36" x 15" deep receiving tank. To facilitate measurement of the inflow water collected in the tank after each trial, the receiving tank was equipped with casters which allowed it to be rolled out from under the flooding tank.

The manhole frames were bolted to the bottom of the test tank, using a flat rubber gasket as a seal, This provided a watertight joint between the tank and manhole frame, Water would then be introduced into the flooding tank by hose, filling it to the desired head.

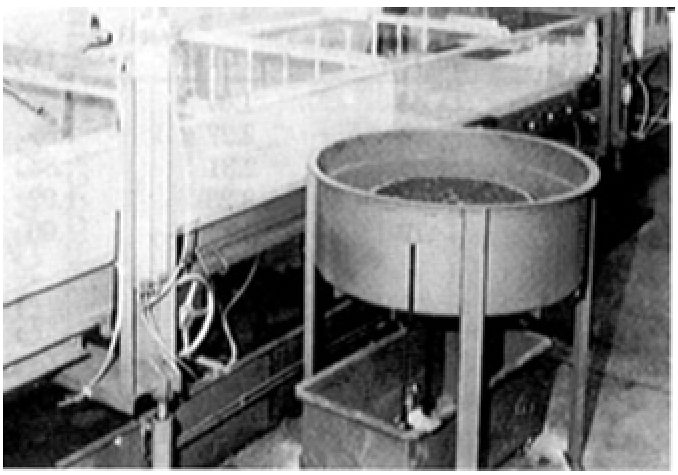


Figure 2
Flooding Tank

PROCEDURES

With the receiving tank empty and the outlet plugged, the test could begin at the time water began to flow through the top of the manhole cover. Duration of the test was one minute by stop watch and the water was allowed to flow into the receiving tank below. After one minute the outlet was plugged so no additional water could enter the receiving tank. The water collected in the receiving tank was then measured with a point gauge and recorded as the amount of inflow that the particular manhole lid would allow to enter during the one minute time period.

There are basically two locations in manhole lids through which surface runnoff can enter the manhole lid. One is by direct passage through open pick and vent holes, and the other is by seepage through the manhole lid and frame contact (bearing) surface along the perimeter of the manhole frame and lid. All of these sources would be affected directly by increased water head. In addition, the bearing surface itself will permit varying amounts of inflow depending on the quality of the seating surfaces and whether that surface is ground or commercially machined.

In order to more closely evaluate what part of the total manhole inflow can be associated with the bearing surface and vent and pickhole areas, the testing was set up to test each source separately.

To test for bearing surface inflow, solid manhole covers containing concealed pickholes were used. Five different sized manhole cover assemblies detailed in Appendix C and ranging in size from 22" to 26" in diameter were tested, first with a ground bearing surface and then these same sizes were again tested with a machined finish bearing surface. To overcome the variations expected from one set of castings to another, a total of 136 different casting sets were randomly selected from the Neenah Foundry stock. Over 2000 individual tests were conducted and averaged into 441 categorized separate data points, reproduced in Appendix D of this report.

To test for pickhole and venthole inflow, manhole lids were sealed to the frames to make watertight bearing surfaces. Each lid contained one hole either ¾", 1", 1¼", 1½", or 2" in diameter. Ten trials were run for each hole diameter to determine average values for plotting as shown in Appendix E.

Three water head conditions were simulated for each lid to reflect basic runoff situations for both bearing surface and vent and pick hole tests.

They are:

Test 1: Splashing water on lid simulating steady rainfall with no ponding.

Test 2: Water on cover allowed to accumulate to 1/8" head.

Test 3: Runoff simulation allowed to pond to a 1" head.

No attempt was made to introduce dirt, debris, sand or silt into the clear water or manhole lid and frame bearing surfaces and holes.

RESULTS

A. Bearing Surface Inflow

The results of the bearing surface inflow tests are summarized in the following tables 1 and 2, and are graphically presented in figures 3 through 7.

Table **1**

Non-Machined Bearing Surface Inflow

Manhole Type	Diameter Inches	Test 1		Test 2		Test 3	
		Avg. GPM	Std. Dev.	Avg. GPM	Std. Dev.	Avg. GPM	Std. Dev.
R-1090	22	3.88	1.10	9.81	2.12	15.99	3.74
R-1040	23	2.20	1.00	7.76	4.15	14.80	6.02
R-1670	24	3.97	1.21	12.08	2.34	17.34	3.88
R-1760	25	6.26	1.53	12.89	3.11	18.57	4.06
R-1642	26	3.65	1.14	10.62	3.79	17.29	5.57
Avg.		3.99		10.63		16.80	

Table **2**

Machined Bearing Surface Inflow

Manhole Type	Diameter Inches	Test 1		Test 2		Test 3	
		Avg. GPM	Std. Dev.	Avg. GPM	Std. Dev.	Avg. GPM	Std. Dev.
R-1090	22	.99	.37	1.27	.43	1.87	.56
R-1040	23	.82	.30	1.60	.99	2.27	1.67
R-1670	24	.93	.42	2.00	.54	2.81	.84
R-1760	25	1.43	.36	2.29	.70	3.23	1.02
R-1642	26	1.14	.50	1.87	.79	2.52	.96
Avg.		1.06		1.81		2.54	

The effect of machined bearing surfaces on the reduction of bearing surface inflow is very graphically pictured in figures 3 through 7. As the standard deviation computations reveal, individual manhole frame and lid combinations within the same manhole type and test condition can differ significantly in the amount of inflow they will allow.

B. Venthole and Pickhole Inflow

Figure 8, page 9 portrays the results of the pickhole/venthole tests conducted on ¾", 1", 1¼", 1½" and 2" diameter pick/vent holes. As might be anticipated, the results for all three of the test conditions closely approximate a straight line relationship between water head, hole area, and inflow received. The slopes of these curves are as follows:

Test	Inflow (GPM/in.^{2})
1	0.25
2	1.00
3	4.94

FIGURE 3

R1090 WITH CONCEALED PICK HOLES, LID DIAMETER 22"
INFLOW THROUGH BEARING SURFACES ONLY

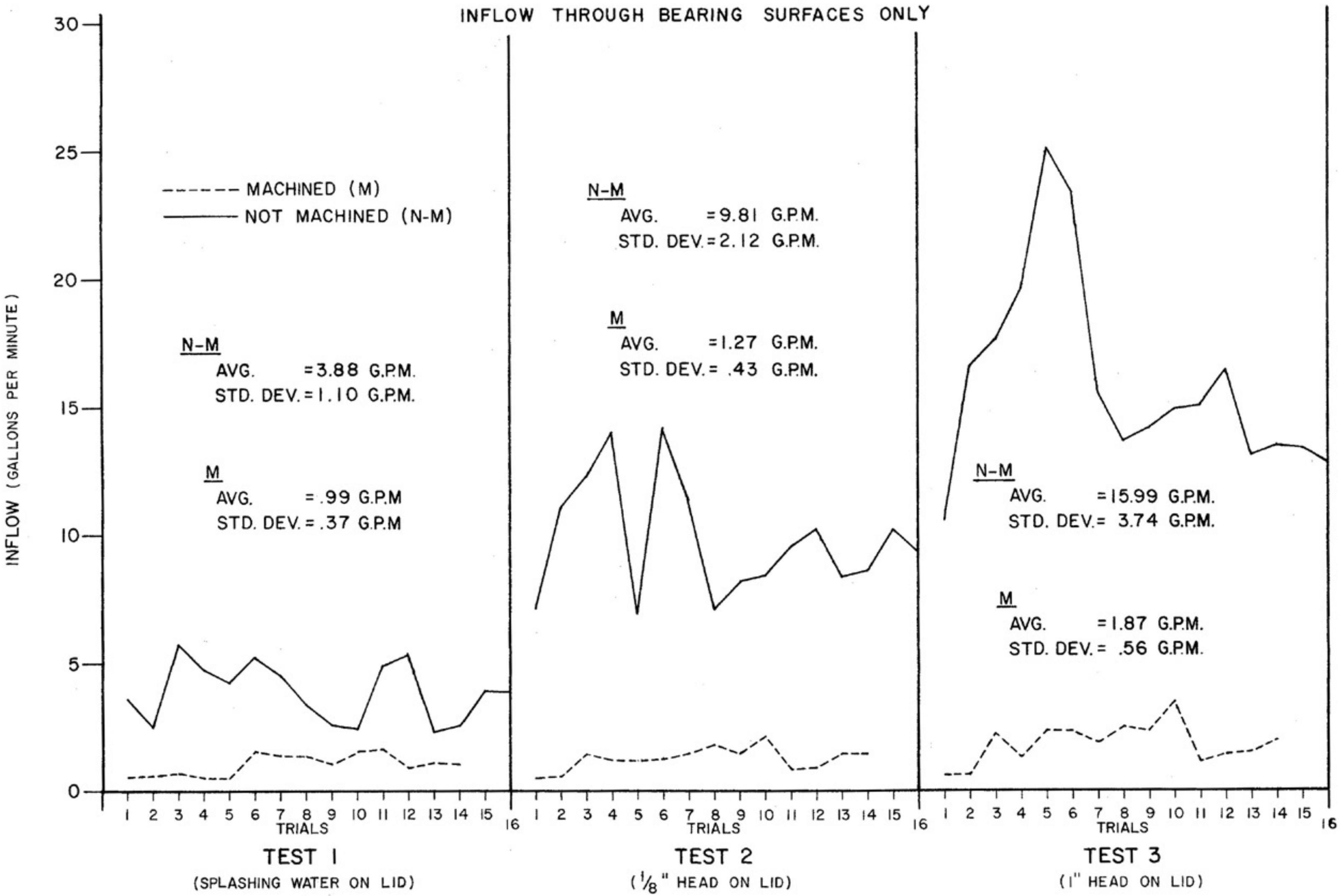


FIGURE 4

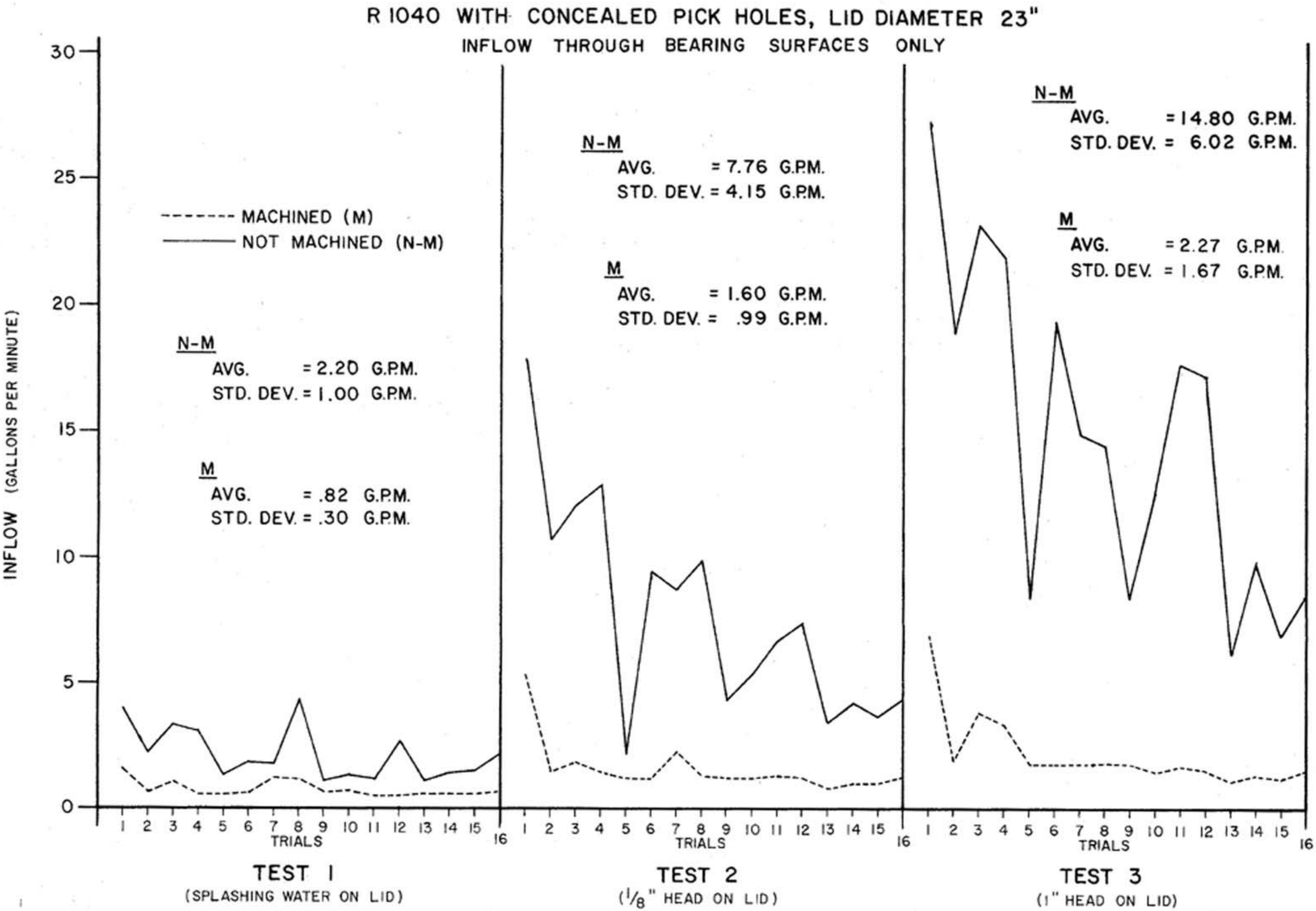

R 1040 WITH CONCEALED PICK HOLES, LID DIAMETER 23"
INFLOW THROUGH BEARING SURFACES ONLY
INFLOW (GALLONS PER MINUTE)
------- MACHINED (M)
——— NOT MACHINED (N-M)
N-M
AVG. = 2.20 G.P.M.
STD. DEV. = 1.00 G.P.M.
M
AVG. = .82 G.P.M.
STD. DEV. = .30 G.P.M.
N-M
AVG. = 7.76 G.P.M.
STD. DEV. = 4.15 G.P.M.
M
AVG. = 1.60 G.P.M.
STD. DEV. = .99 G.P.M.
N-M
AVG. = 14.80 G.P.M.
STD. DEV. = 6.02 G.P.M.
M
AVG. = 2.27 G.P.M.
STD. DEV. = 1.67 G.P.M.
TRIALS
TEST 1
(SPLASHING WATER ON LID)
TEST 2
(1/8" HEAD ON LID)
TEST 3
(1" HEAD ON LID)

FIGURE 5

R 1670 WITH CONCEALED PICK HOLES, LID DIAMETER 24"

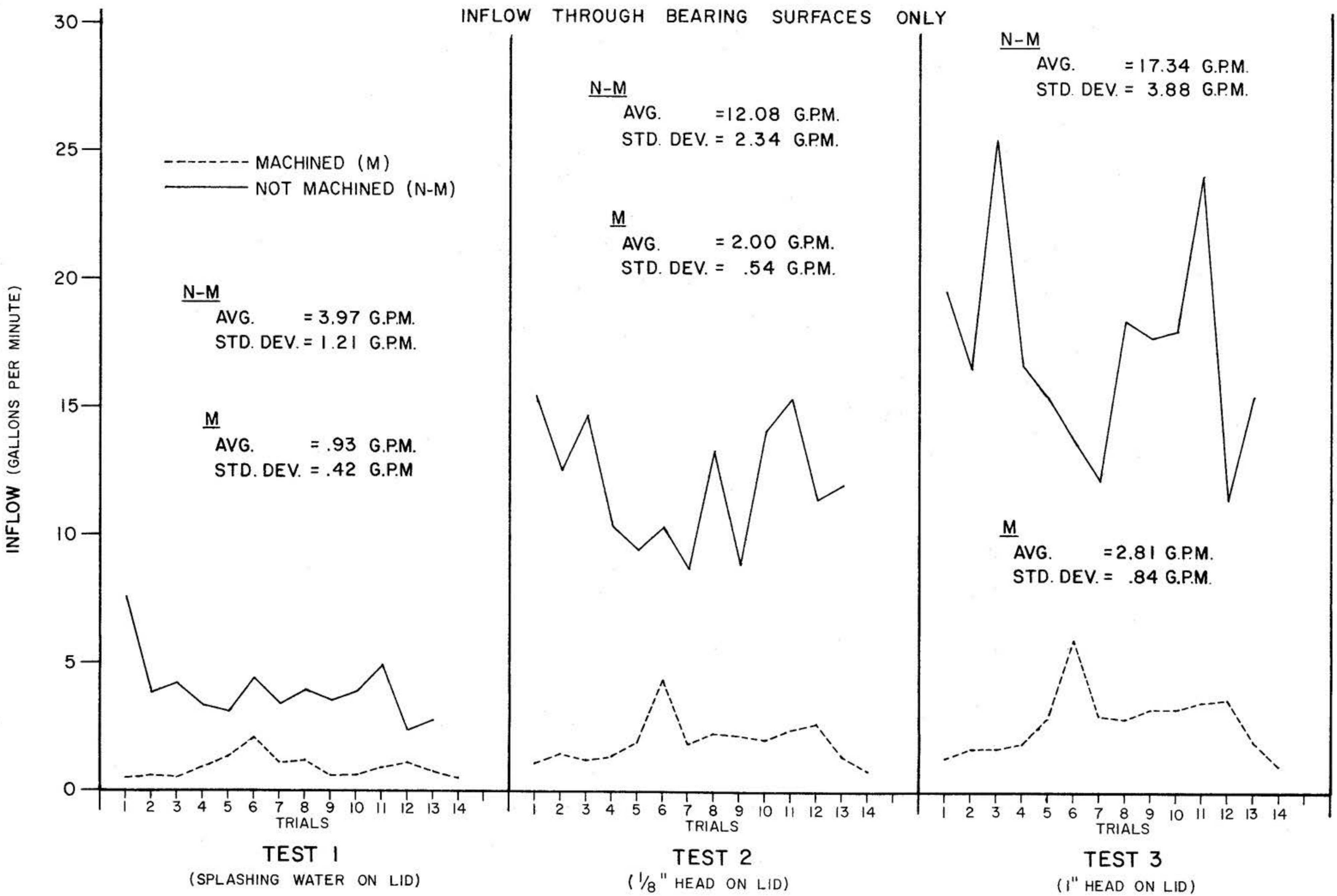


FIGURE 6

R 1760 WITH CONCEALED PICK HOLES, LID DIAMETER 25"

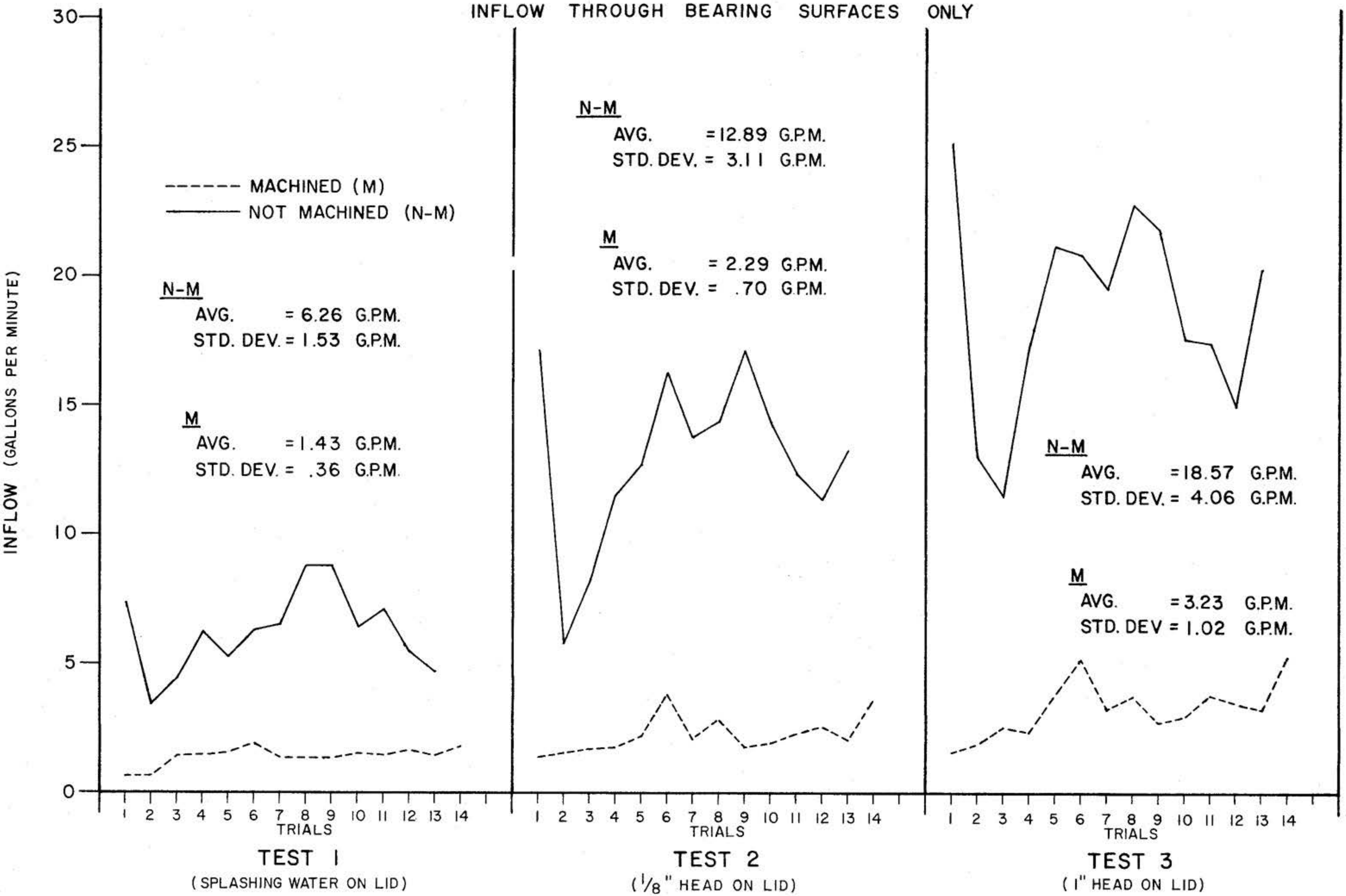


FIGURE 7

R 1642 WITH CONCEALED PICK HOLES, LID DIAMETER 26"

INFLOW THROUGH BEARING SURFACES ONLY

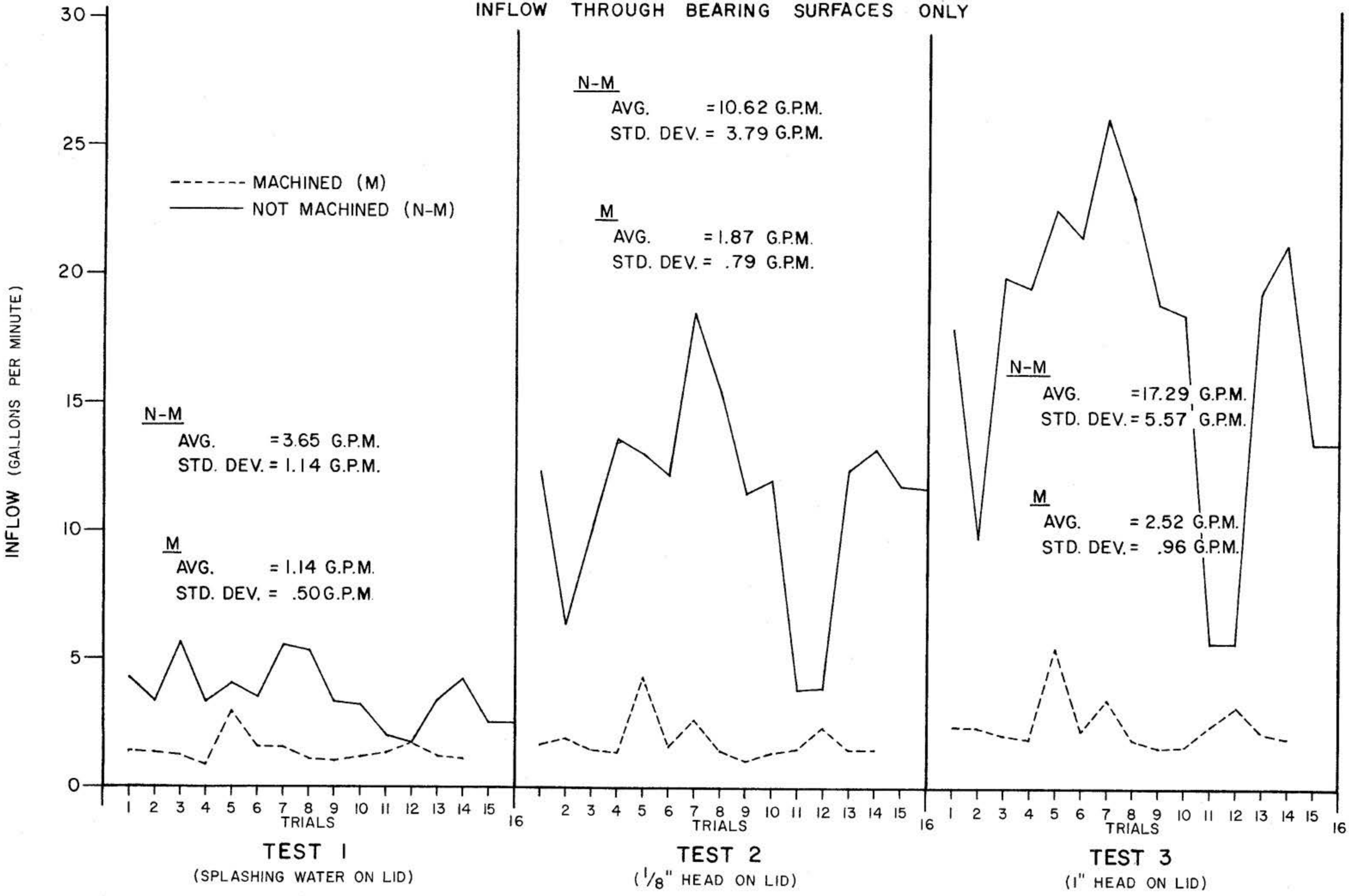
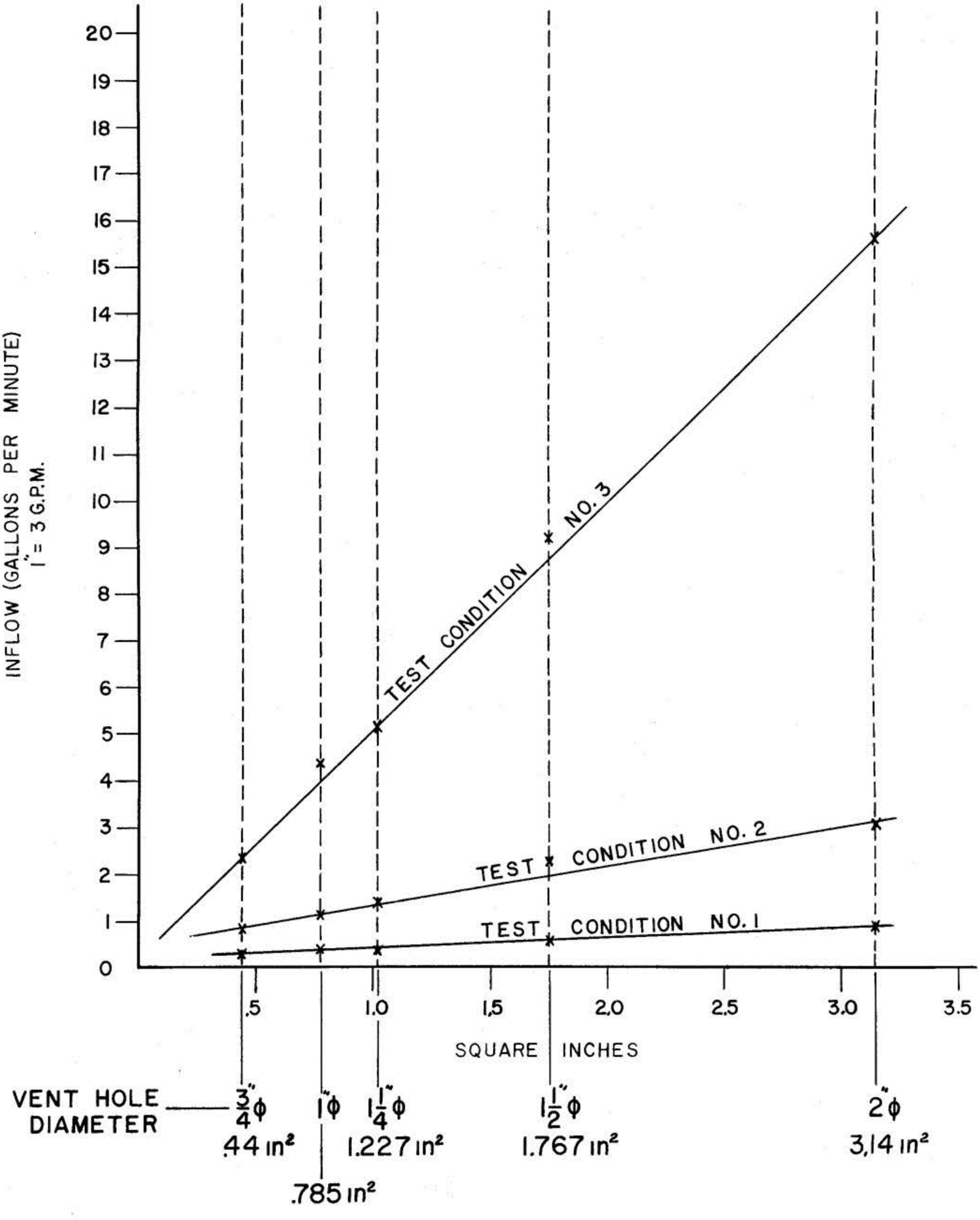


FIGURE 8

VENT HOLE / PICK HOLE INFLOW



CONCLUSIONS

It has been demonstrated as a result of this study that significant amounts of surface runoff water can enter a sanitary sewer system through vent holes, open pick-holes and the apparently invisible space which exists at the contact (bearing) surfaces between manhole frames and lids. The amount of inflow will vary depending on the runoff (waterhead), manhole cover circumference, the degree of machining of the bearing surfaces, and on the amount of open area provided by pickholes and ventholes.

The results from the machined bearing surface tests indicate a proper fit between frame and lid is important for reducing inflow. This leads one to conclude that extra care should be taken by maintenance personnel to ensure that bearing surfaces be given a thorough dusting to remove any foreign material which would open the joints between manhole frame and lid and allow inflow.

The main criteria for determining if a manhole lid is a significant contributor to the inflow problem of the community, should be whether or not the manhole is subject to surface runoff and not simply how many holes it has in its cover. This is obviously important for two reasons.

1. Without water reaching the manhole, there would be no inflow.

And,

2. As the bearing surface tests have revealed, even manholes without any holes can allow significant amounts of inflow to enter through the bearing surface alone.

It is felt that for those systems in which inflow is a significant problem, manholes located in run off areas should be one of the first areas of the system to be investigated for the identification of inflow sources cost-effective for removal from the system. Neenah Foundry Company has developed a new, "Self-Sealing" replacement lid containing a simple, built-in gasket sealing system and concealed pickholes. This lid, subjected to the tests as described in this report, is virtually watertight. (Figure No. 9). Providing the existing manhole frame is in serviceable condition, these "Self-Sealing" lids can be manufactured to fit any frame at a very minimal expense.

No attempt has been made to introduce debris such as sand, leaves, paper, gravel, etc. into either the test water or manhole frames and lids, since it would be virtually impossible to set up test standards for these variables. It is felt that this material could just as well seal the inflow source or worsen it by expanding the bearing surface gap. A point to consider is that a properly maintained system would have each manhole inspected and entered for cleaning purposes periodically throughout the year which would tend to maintain the manhole lids in a state more similar to the test data conditions.

Figure 9. Neenah Self-Sealing Lid
Pat. No. 4,101,236

RECOMMENDATIONS

There are many ways to use the data in this report so as to arrive at the quantity of inflow a community's manholes might allow. Although the empirical data from the testing is quite extensive, one must be cautious in its use because of recognized variations in field conditions. What this report has hopefully done, is to confirm for the reader, that even manholes located in marginal runoff areas can experience significant amounts of inflow through the lids.

The key recommendation then is to first **locate those manholes subject to runoff** and then use this report data or a version thereof to evaluate the inflow contribution to the system. Those lids which are identified as significant inflow contributors can then be economically and effectively replaced with the Neenah "Self-Sealing" type lids,

APPENDIX A

DEFINITIONS*

Infiltration -
The water entering: a sewer system and service connections from the ground, through such means as, but not limited to, defective pipes, pipe joints, connections or manhole walls. Infiltration does not include, and is distinguished from, inflow.

Inflow -
The water discharged into a sewer system and service connections from such sources as, but not limited to roof leaders, cellar, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, storm water, surface runoff, street washes or drainage. Inflow does not include, and is distinguished from, infiltration.

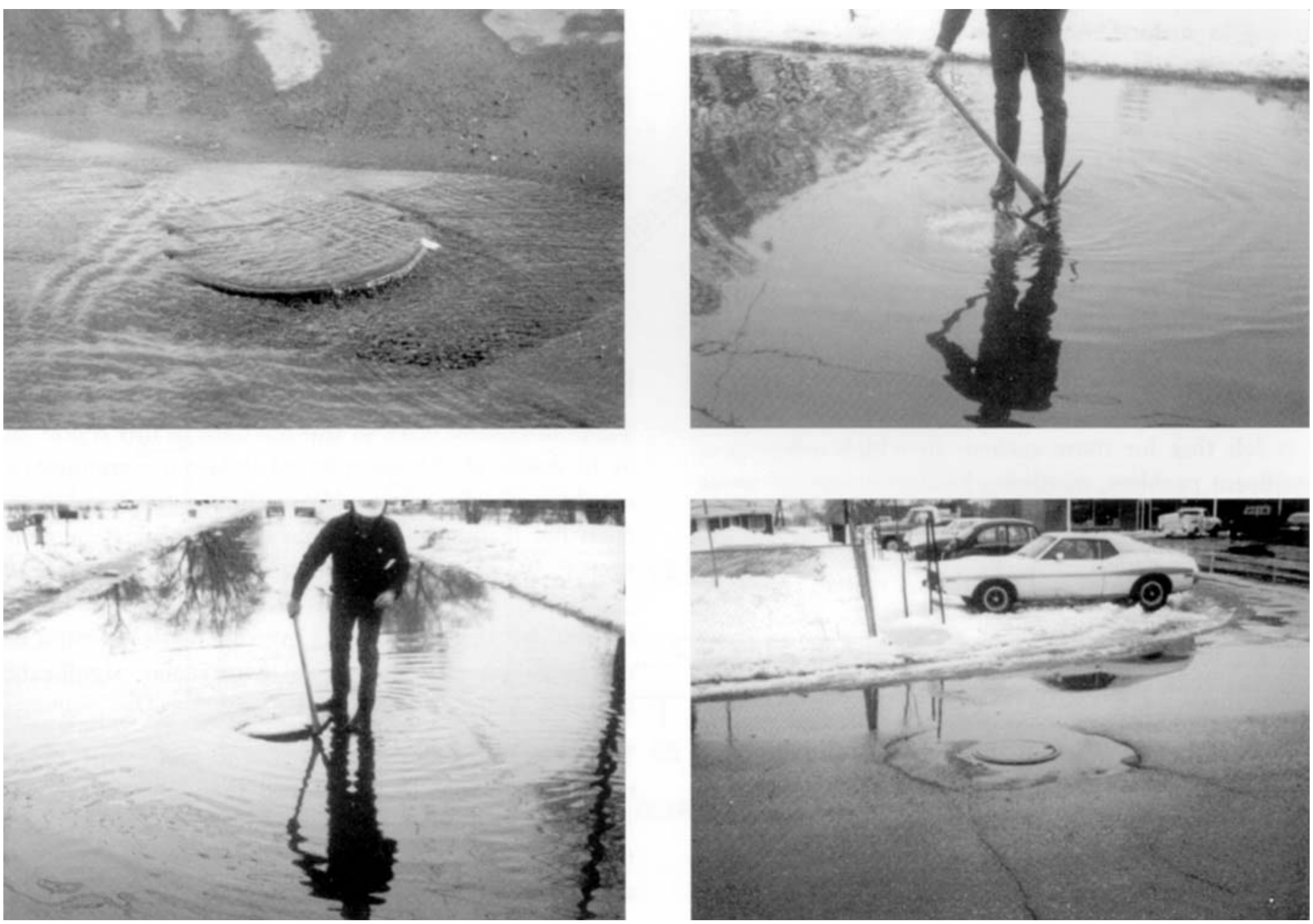
Infiltration/Inflow –
The total quantity of water from both infiltration and inflow without distinguishing the source

Excessive infiltration/inflow –
The quantities of infiltration/inflow which can be economically eliminated from a sewer system by rehabilitation, as determined by a cost-effectiveness analysis that compares the costs for transportation and treatment of the infiltration/inflow subject to the provisions in Section 35.927.

*As defined in the Title 40 Rules and Regulations and published in the Federal Register, Section 35.905, Volume 39, Number 29, February 11, 1974.

APPENDIX B

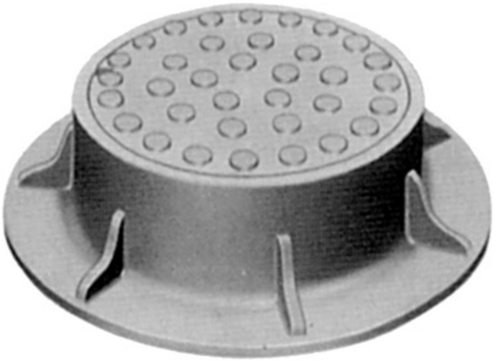
Examples of Manhole Lid Inflow



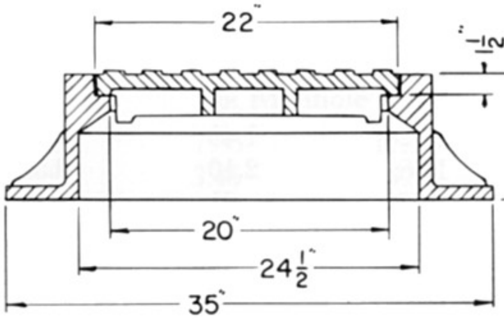
Copies of slides showing actual manhole lid inflow.

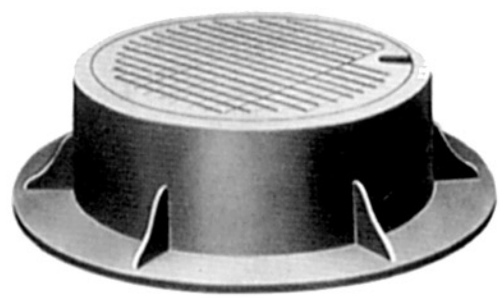
APPENDIX C

ILLUSTRATIONS AND DETAILS OF MANHOLE FRAMES AND LIDS TESTED WITH MACHINED AND NON-MACHINED BEARING SURFACES

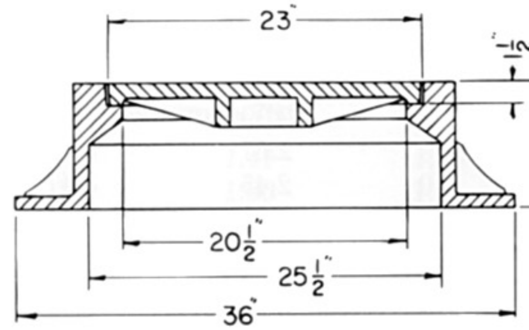


R-1090

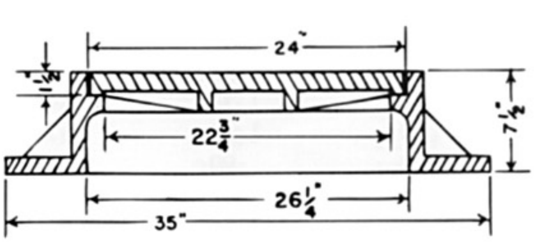


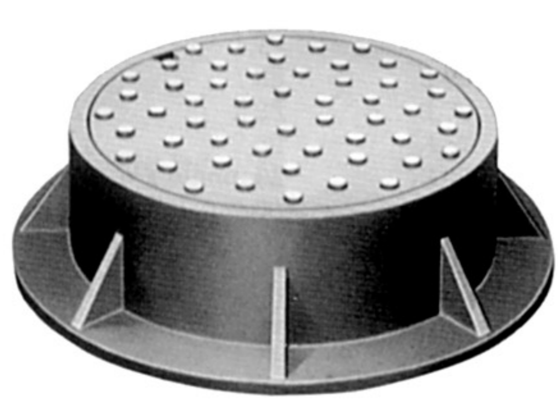


R-1040

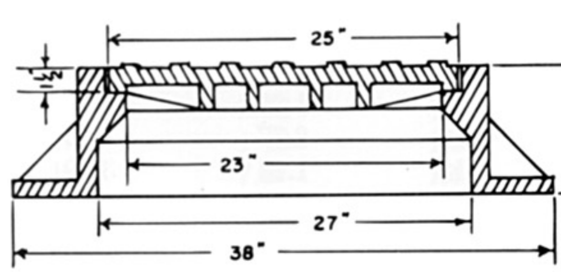


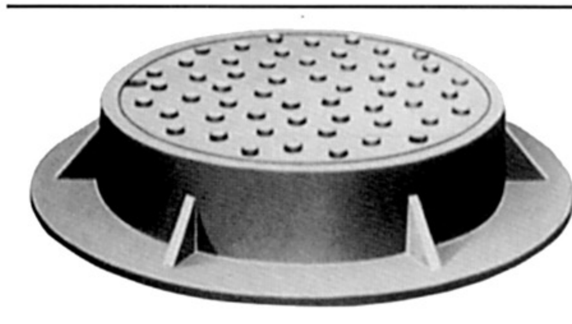
R-1670



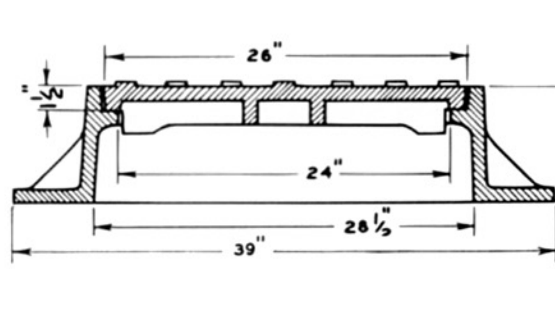


R-1760





R-1642



APPENDIX D

Tables Showing Inflow in GPM through Bearing Surfaces Only

(Data Points are Averages of Over 2000 Separate Tests)

High Values are Bold Face
Low Values are Bold Face ***Italic***
– No Test

Manhole Casting Size — R-1090, **Lid Circumference** 69.1"

	Ground Bearing (Not Machined)			Machined Bearing		
Trial	**Test 1**	**Test 2**	**Test 3**	**Test 1**	**Test 2**	**Test 3**
1	3.67	7.11	***10.60***	***.47***	***.47***	***.64***
2	2.52	11.03	16.69	.60	.64	.67
3	**5.74**	12.30	17.70	.75	1.46	2.20
4	4.74	14.00	19.96	.59	1.14	1.29
5	4.18	***6.89***	**25.04**	.59	1.11	2.38
6	5.16	**14.20**	23.31	**1.61**	1.22	2.31
7	4.59	11.35	15.53	1.41	1.51	1.96
8	3.39	7.09	13.72	1.42	1.88	2.53
9	2.67	8.13	14.17	1.02	1.49	2.31
10	2.45	8.47	14.96	1.58	**2.10**	**3.59**
11	4.93	9.52	15.04	.77	.91	1.11
12	5.33	10.20	16.45	.94	.99	1.54
13	***2.30***	8.38	13.06	1.09	1.44	1.61
14	2.62	8.77	13.53	1.02	1.44	2.00
15	3.94	10.13	13.42	–	–	–
16	3.91	9.41	12.86	–	–	–

Manhole Casting Size — R-1040, **Lid Circumference** 72.3"

Trial	**Test 1**	**Test 2**	**Test 3**	**Test 1**	**Test 2**	**Test 3**
1	4.09	**17.95**	**27.34**	**1.68**	**5.33**	**7.95**
2	2.24	10.81	18.96	.70	1.54	1.98
3	3.33	12.18	23.25	1.04	1.91	3.87
4	3.10	12.96	21.92	.56	1.57	3.33
5	1.41	***2.28***	8.92	.87	1.31	2.18
6	1.93	9.51	19.38	.52	1.26	1.79
7	1.78	8.77	14.92	.69	1.22	1.74
8	**4.34**	9.94	14.40	1.26	2.30	1.78
9	***1.11***	4.38	8.47	1.19	1.39	1.85
10	1.41	5.42	12.64	.70	1.22	1.83
11	1.26	6.78	17.79	.82	1.24	1.59
12	2.77	7.40	17.27	.57	1.34	1.74
13	1.14	3.49	***6.19***	***.50***	1.22	1.58
14	1.54	4.24	9.93	.67	***.89***	***1.17***
15	1.68	3.76	6.92	.65	1.01	1.39
16	2.13	4.31	8.50	.67	1.02	1.29
17	–	–	–	.79	1.27	1.54

High Values are Bold Face
Low Values are Bold Face ***Italic***
– No Test

APPENDIX D (Continued)

Manhole Casting Size — R-1670, **Lid Circumference** 75.4”

	Ground Bearing (**Not** Machined)			Machined Bearing		
Trial	**Test 1**	**Test 2**	**Test 3**	**Test 1**	**Test 2**	**Test 3**
1	**7.61**	**15.46**	19.66	***.44***	1.17	1.42
2	3.79	12.63	16.69	.64	1.57	1.81
3	4.21	14.76	**25.29**	.57	1.22	1.81
4	3.39	10.03	16.71	.96	1.44	1.99
5	3.09	9.49	15.48	1.29	1.99	2.93
6	4.43	10.41	13.78	**2.10**	**4.39**	**6.00**
7	3.44	***8.77***	12.21	1.14	1.93	3.05
8	3.99	13.35	18.53	1.27	2.33	2.97
9	3.57	8.95	17.84	.65	2.25	3.32
10	3.92	14.19	18.03	.74	2.08	3.39
11	4.92	15.43	24.05	.94	2.50	3.61
12	***2.38***	11.59	***11.59***	1.14	2.75	3.81
13	2.82	12.01	15.56	.84	1.53	2.03
14	–	–	–	.54	***.86***	***1.17***

Manhole Casting Size — R-1760, **Lid Circumference** 78.5”

Trial	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
1	7.35	**17.11**	**25.16**	***.61***	***1.41***	***1.68***
2	***3.45***	***5.84***	11.99	.71	1.66	1.94
3	4.46	8.17	***10.46***	1.38	1.78	2.60
4	6.27	11.54	17.32	1.48	1.85	2.38
5	5.35	12.76	21.18	1.59	2.48	3.82
6	6.32	16.22	20.88	**1.96**	**3.86**	5.18
7	6.57	13.82	19.49	1.39	2.03	3.20
8	8.87	14.35	22.81	1.33	2.88	3.81
9	**8.89**	17.04	21.88	1.38	1.79	2.78
10	6.47	13.38	17.66	1.61	1.98	2.99
11	7.09	12.31	17.30	1.53	2.28	2.78
	5.52	11.37	14.99	1.71	2.62	3.57
13	4.78	13.25	20.31	1.41	2.02	3.05
14	–		–	1.86	3.66	**5.30**

Manhole Casting Size — R-1642, **Lid Circumference** 81.7”

Trial	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
1	4.29	12.34	17.95	1.40	1.71	2.40
2	3.30	6.39	9.74	1.30	1.95	2.30
3	**5.77**	10.06	19.93	1.19	1.49	2.06
4	3.35	13.66	19.50	***.94***	1.38	1.95
5	4.01	13.01	22.61	**2.99**	**4.34**	**5.45**
6	3.62	12.14	21.53	1.63	1.68	2.20
7	5.63	**18.50**	**26.04**	1.64	2.66	3.57
8	5.27	15.51	23.09	1.07	1.46	1.95
9	3.29	11.50	18.87	1.02	***1.07***	***1.61***
10	3.19	12.00	18.40	1.16	1.39	1.76
11	2.01	***3.82***	***5.70***	1.39	1.63	2.50
12	***1.79***	3.94	5.74	1.85	2.35	3.25
13	3.39	12.38	19.47	1.21	1.54	2.23
14	4.21	13.20	21.18	1.14	1.54	2.00
15	2.68	11.76	13.43	–	–	–
16	2.60	11.64	13.45	–		

APPENDIX E

Raw Test Data for Vent/Pickhole Inflow

Table values shown are water depths in feet as measured in the receiving tank for each trial. Tests lasted one minute. By averaging the ten test trials in each column and multiplying this result by tank factor 33.5431 GPM per foot of depth, the average GPM for each hole diameter is obtained.

Test No. 1

Hole Diameter

Trial	¾"	1"	1¼"	1½"	2"
1	.007	.010	.014	.019	.029
2	.008	.012	.013	.017	.027
3	.007	.011	.013	.019	.026
4	.008	.009	.015	.018	.030
5	.007	.013	.014	.018	.025
6	.008	.011	.014	.018	.027
7	.007	.010	.013	.017	.027
8	.008	.012	.014	.019	.025
9	.008	.011	.015	.017	.029
10	.008	.011	.013	.017	.027
Ave. GPM	.354	.365	.462	.600	.912

Test No. 2

1	.023	.032	.044	.066	.098
2	.026	.036	.043	.072	.095
3	.023	.034	.047	.069	.094
4	.026	.035	.045	.071	.097
5	.022	.034	.046	.067	.092
6	.026	.038	.046	.072	.089
7	.025	.032	.043	.066	.091
8	.025	.037	.044	.070	.091
9	.024	.033	.048	.069	.097
10	.026	.033	.048	.071	.094
Ave. GPM	.224	1.153	1.522	2.324	3.145

Test No. 3

1	.071	.132	.186	.276	.463
2	.074	.133	.180	.277	.469
3	.072	.131	.187	.275	.467
4	.074	.127	.185	.277	.465
5	.071	.127	.186	.272	.468
6	.071	.129	.181	.276	.466
7	.072	.128	.178	.276	.460
8	.074	.132	.182	.277	.462
9	.071	.130	.185	.275	.467
10	.073	.133	.187	.375	.467
Ave. GPM	2.424	4.366	6.161	9.243	15.609

Test tank in which over 2000 separate inflow tests were conducted to develop data for this report.

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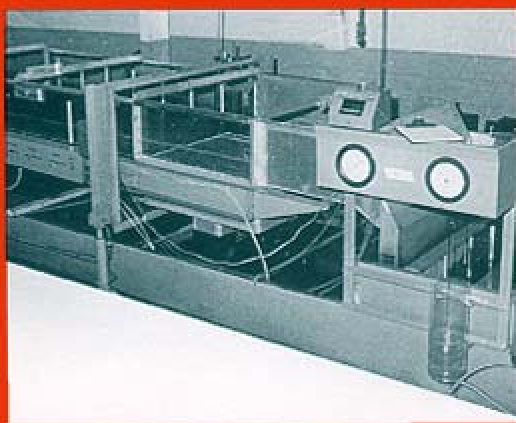

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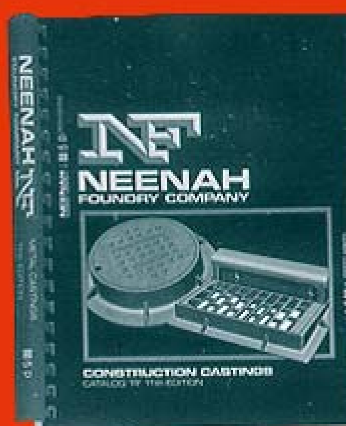

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