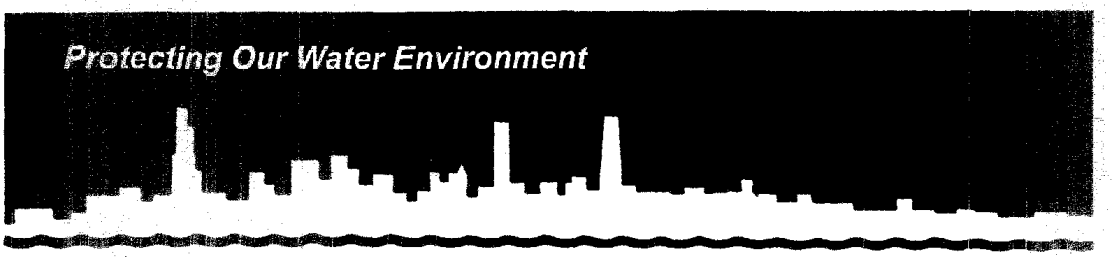


Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 03-9

RESEARCH AND DEVELOPMENT

2002

ANNUAL REPORT

March 2003

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street Chicago, IL 60611-2803 (312) 751-5600

RESEARCH AND DEVELOPMENT
2002
ANNUAL REPORT

Research and Development Department
Richard Lanyon, Director

March 2003

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

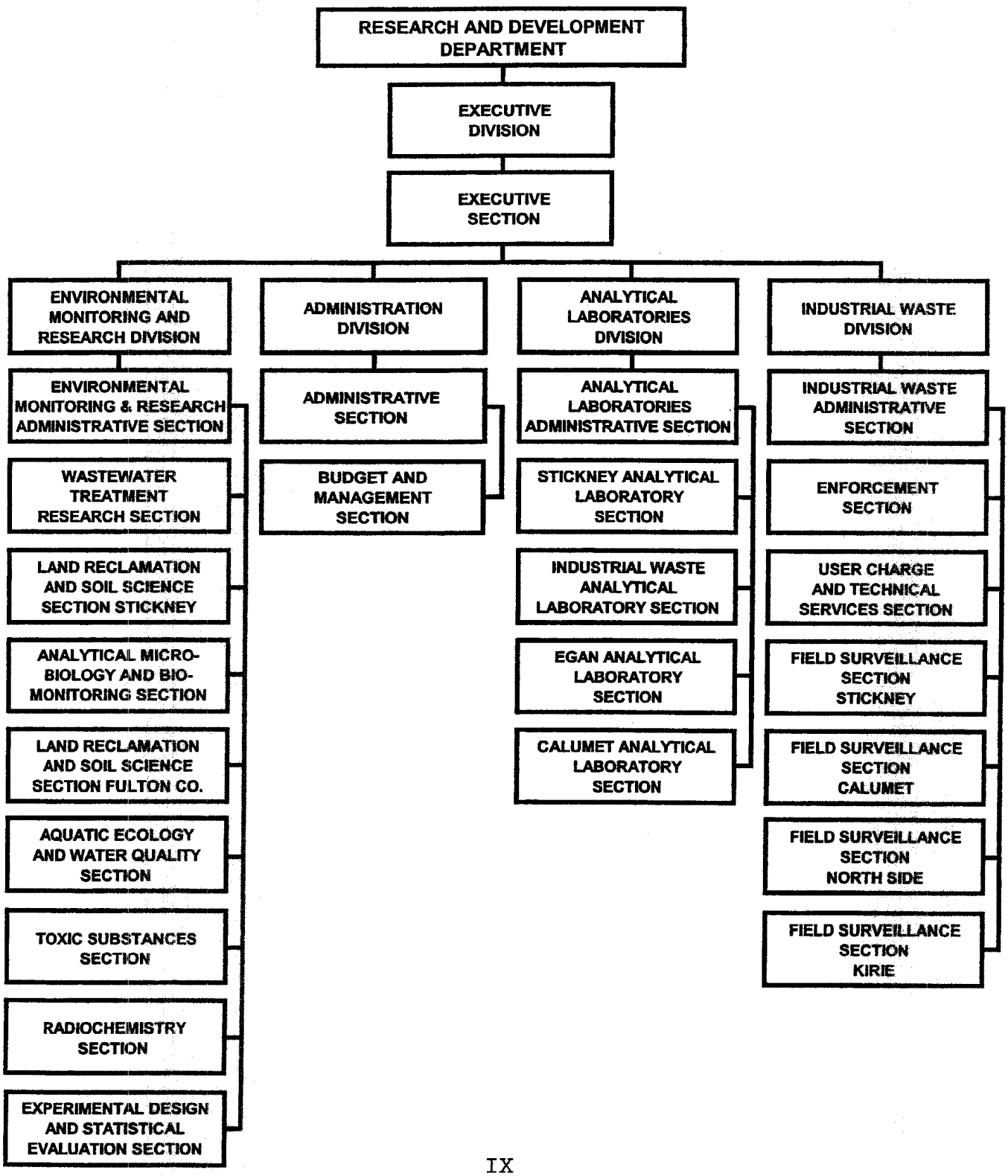
LIST OF FIGURES

DISCLAIMER

The mention of trade names of specific products does not constitute endorsement of them by the Metropolitan Water Reclamation District of Greater Chicago.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

RESEARCH AND DEVELOPMENT DEPARTMENT ORGANIZATION CHART FOR 2002



ADMINISTRATION DIVISION

ADMINISTRATION DIVISION

The Administration Division is responsible for the coordination of all departmental services pertaining to personnel administration, purchasing, computer systems, and administrative assistance to the Director. Primary functions of the Division include: coordination and preparation of budget documents; preparation and administration of contract documents; preparation and administration of consultant agreements; administration of requisitions and purchase orders; administration of departmental personnel actions; planning and coordination of departmental computer systems, training, and security requirements; liaison with other departments; and preparation of Board letters, correspondence, and reports, required by the Director.

Personnel Administration

The Department had 347 budgeted positions during 2002 with a total salary and wage appropriation of $20,203,800. All personnel transactions, including merit wage increases, personnel requisitions, service rating forms, personnel vacancy reports, overtime records, personnel transfers, appointments, resignations, leaves of absence, payroll changes, and disciplinary actions for the Department were either originated or coordinated by this Division. During 2002, the Department

reviewed personnel actions relative to 10 retirements. In addition, as part of adopting the 2002 Budget and the District's attrition program, 18 existing positions were designated for elimination when vacated during 2002. By year-end, actual positions eliminated upon vacancy by incumbents totaled seven. This decrease in positions led to an average expenditure to appropriation ratio of over 99 percent.

Greater Chicago Pollution Prevention Program

In January 1994, the Greater Chicago Pollution Prevention Program (GCP3) was initiated as a cooperative project between the Metropolitan Water Reclamation District of Greater Chicago (District) and the Illinois Waste Management and Research Center (Center), which is funded by a grant from the United States Environmental Protection Agency (USEPA).

Technical assistance is provided directly to companies requesting such assistance by a member of the Center's staff. During 2002, the Center provided onsite technical assistance to 34 companies, primarily metal finishers (CFR 413 and 433). Two of the companies, both metal finishers, have already implemented Center recommendations and have achieved measurable pollutant loading reductions, reduced water usage and/or improved their compliance records.

Most of the assistance provided has been for industry, but others, such as citizens community groups, schools, government, and trade associations have also benefited. Technical assistance includes pollution prevention, regulatory compliance, regulatory information, and guidance material.

The District and the Center are participating in the USEPA's Common Sense Initiative - Strategic Goals Program for Metal Finishers. This program includes commitments by industry to go beyond compliance, substantially reducing pollution from their operations. The Center, working with other local stakeholders, has developed a proposal for providing technical assistance to achieve these reductions to the participating metal finishers.

Computer Systems Administration

In 2002, the Administration Division continued a broad review of all departmental computer systems, local and wide area networks, software utilization, compliance with District security and access procedures, training requirements, etc.

In April 2001, the District implemented the use of an Information Technology Department-designed program for budget preparation. This Budget Preparation Tool (BPT) was used to prepare the 2002 line item and position budgets. It was determined that the Enterprise System, which was implemented in

2000, contained inadequacies for preparing the District's budget and BPT was developed to assist in this area. The Administration Division prepared the 2002 budget using this new system. Enhancements were made to this budgeting tool for preparation of the 2003 budget.

Budget Administration

A comparison of appropriations to expenditures for 2002 shows the following:

	Appropriation	Expenditure
Personnel (Line Item 101,) (Adjusted)	$20,302,800	$20,302,334
Other Line Items	4,755,100	3,023,511
Total	$25,057,900	$23,325,845

Purchasing Administration

During 2002, more than 380 requisitions were reviewed and processed by the Administration Division, prior to being forwarded to the Purchasing Department. This review verified the availability and proper use of department funds for all requisitioned items. The Division will ensure that all departmental purchase orders are properly closed out at year's end and will process purchase order decreases or increases as appropriate.

Contract Administration

During 2002, the Division was involved in the preparation and administration of 12 contracts for a total cost of approximately $867,174, including multiyear contracts. This involved the preparation of detail specifications, Board letters, advertisements, coordination of the receipt and review of bids, recommendations to award, and management of fund reservations (used to ensure availability of funds for items costing $10,000 or more), processing of purchase requisitions, change orders and payment of invoices. The department's requirements for contractual goods and services were lower than prior years due to a budgetary constraint to maintain an 85 percent expenditure rate.

The Division administered 10 consulting services agreements with individual values of $10,000 or more and having a total value of approximately $1,756,619 during 2002. The department's requirements for consulting services were also lower than in previous years due to the 85 percent expenditure rate budgetary constraint. The Division also administered 16 maintenance agreements with individual values of $10,000 or more and a total value of $735,148. This involved processing purchase requisitions and change orders, preparation of Board letters, management of fund reservations, preparation and exe-

cution of agreements, preparation of requests for proposals, and coordination of the receipt and review of proposals.

Laboratory Accreditation

In 2002, the seven Research and Development (R&D) Department laboratories previously accredited or certified with the State of Illinois maintained their status. The participation of our laboratories in these programs helps to ensure that the laboratories are operated in a manner that meets or exceeds the standards established by the applicable accreditation or certification program. Some benefits of maintaining the high standards required by these programs are better documentation of procedures, increased quality control and quality assessment, improved analyst training, and increased accuracy of test results.

The five laboratories of the Analytical Laboratories Division have been accredited under the National Environmental Laboratory Accreditation Program (NELAP) since 2001. The Illinois Environmental Protection Agency (IEPA) Division of Laboratories is the NELAP accrediting authority for the State of Illinois. The Calumet, Egan, Stickney and Industrial Waste Analytical Laboratories are accredited for inorganic analysis of wastewater. The Organic Compounds Analytical Laboratory is accredited for organic analysis of wastewater and solid waste.

In July 2002, the IEPA significantly raised the annual fees for NELAP accreditation to shift the major source of program funding from the State's general revenue fund to the accredited laboratories. The fees paid by each of our laboratories now range from $3,400 to $4,400. The fee increases will ensure that Illinois will be able to continue offering NELAP accreditation to qualifying laboratories.

Since 1979, the Analytical Microbiology Laboratory has been certified for microbiological analysis of drinking water and public water supplies by the Illinois Department of Public Health (IDPH).

In June 2001, the Radiochemistry Laboratory was certified by the Illinois Department of Nuclear Safety (IDNS) for the radiochemical analysis of potable water.

The certification programs administered by the IDPH and the IDNS follow guidelines contained in the USEPA *Manual for the Certification of Laboratories Analyzing Drinking Water.* These guidelines are compliant with regulations issued pursuant to the Safe Drinking Water Act. Currently, no fees are charged for certifications of the Analytical Microbiology Laboratory and the Radiochemistry Laboratory.

Use Attainability Analysis Study

The IEPA began the Chicago Area Waterways Use Attainability Analysis (UAA) Study in 2002 to determine if these waterways can support a higher use designation and meet the goals of the Clean Water Act. Most of these waterways are designated as Secondary Contact and Indigenous Aquatic Life Use and an examination of this use designation has been urged for several years by the USEPA. The District is committed in its National Pollutant Discharge Elimination System (NPDES) permits to participate in and support the UAA Study. The District is carrying out this commitment by making available all of the water quality and related data from its monitoring activities and is developing an unsteady-state hydraulic and water quality model of the waterway system. In addition, the District will be supplying technical support through review of study reports and proposals for water quality improvement projects.

Bubbly Creek Water Quality Improvement Demonstration Project

With the approval of the IEPA and the cooperation of the Maintenance and Operations (M&O) Department, the R&D Department conducted monitoring of Bubbly Creek during the summer 2002. This was performed to demonstrate if artificially creating flow in the creek during dry weather periods and follow-

ing the pumping of combined sewer overflow at the Racine Avenue Pumping Station would improve dissolved oxygen conditions. The result of the project showed a beneficial effect, and plans are underway to perform more work in 2003 to gain more information on the water quality dynamics of Bubbly Creek.

Departmental Reports

During 2002, the Department published 38 formal reports dealing with various aspects of the District's operations. A list of these reports is given in Tables 1 and 2.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1

RESEARCH AND DEVELOPMENT NUMBERED REPORTS PUBLISHED DURING 2002

	Report Title	Author (s)	Date	Report User
2002-1	R&D EM&R Division 2000 Annual Report	R&D Department	Jan-02	Internal District Report
2002-2	Evaluation of Odor Potential of Centrifuge Cake During Air-Drying Operations	Lordi, D.T., Patel, K.K., Sawyer, B., Tata, P.	Feb-02	M&O Department
2002-3	The Effects of Age on the Toxicity Response of Pimephales Promelas in Acute Whole Effluent Toxicity Tests	Zmuda, J.T., J. Yamanaka, Z. Abedin, B. Sawyer, P. Tata, C. Lue-Hing, G. Knafl	Feb-02	Internal District Report
2002-4	Calculation of User Charge Rates and Administrative Costs for 2002	R&D Department	Mar-02	Internal District Report
2002-5	R&D Annual Report	R&D Department	Mar-02	Internal District Report
2002-6	Publication List of Reports	R&D Department	Apr-02	Internal District Report
2002-7	Reductions in Metal Concentrations in Sludge and Biosolids from WRPs at the MWRDGC from 1982 Through 2000	Pietz, R.I., P. Tata, R. Sustich, G. Richardson, C. Lue-Hing	Jun-02	Internal District Report
2002-8	Annual Biosolids Management Report for 2001	Granato, T.C., G. Pump, R.I. Pietz, P. Tata	Jun-02	USEPA & IEPA

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1 (Continued)

RESEARCH AND DEVELOPMENT NUMBERED REPORTS PUBLISHED DURING 2002

	Report Title	Author (s)	Date	Report User
2002-9	2000 Annual Summary Report Water Quality Within the Waterways System of the MWRDGC	Abedin, Z., R.I. Pietz, P. Tata	Aug-02	Internal District Report
2002-10	Development of Correlation for Estimating BOD_5 and SS Loads Discharged to Rivers During CSO Events Based Upon CSO Discharge Volumes	Zhang, H., Z. Abedin, J.S. Jain, B. Sawyer, P. Tata	Nov-02	M&O Department and IEPA
2002-11	Continuous Dissolved Oxygen Monitoring from Wilmette to Lockport in the Chicago Waterway System During August 1998 through July 2000	Polls, I.	Nov-02	Internal District Report
2002-12	Investigation of the Role of Major Point Source Contributions to Peak Ammonia and Organic Nitrogen Loadings to the Stickney WRP	Zhang, H., J.S. Jain, B. Sawyer, P. Tata	Nov-02	M&O Department
2002-13	Report on O'Hare Cup Reservoir Fill Event Experiment Conducted from May 12, 2002 Through June 12, 2002	Jain, J.S., D. MacDonald, B. Sawyer	Nov-02	U.S. Army Corps of Engineers
2002-14	2001 Annual Summary Report Water Quality Within the Waterways System of the MWRDGC	Abedin, Z., R.I. Pietz, P. Tata	Dec-02	Internal District Report
2002-15	EM&R Division 2001 Annual Report		Dec-02	Internal District Report

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2002

Report Title	Author (s)	Date	Report User
Fulton County Environmental Protection System November 2001	R&D Department G. Pump, T.C. Granato	Jan-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System December 2001	R&D Department G. Pump, T.C. Granato	Jan-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System January 2002	R&D Department G. Pump, T.C. Granato	Mar-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System January 2002 (REVISED)	R&D Department G. Pump, T.C. Granato	Apr-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System February 2002	R&D Department G. Pump, T.C. Granato	Apr-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System March 2002	R&D Department G. Pump, T.C. Granato	May-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2002

Report Title	Author (s)	Date	Report User
Fulton County Environmental Protection System April 2002	R&D Department G. Pump, T.C. Granato	Jun-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System May 2002	R&D Department G. Pump, T.C. Granato	Jul-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System June 2002	R&D Department G. Pump, T.C. Granato	Aug-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System July 2002	R&D Department P. Lindo, T.C. Granato	Sep-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System July 2002 - AMENDED Table10	R&D Department P. Lindo, T.C. Granato	Jan-03	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Fulton County Environmental Protection System August 2002	R&D Department P. Lindo, T.C. Granato	Oct-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2002

Report Title	Author (s)	Date	Report User
Fulton County Environmental Protection System September 2002	R&D Department P. Lindo, T.C. Granato	Nov-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 4th Quarter of 2001	R&D Department G. Pump, T.C. Granato	Feb-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 1st Quarter of 2002	R&D Department G. Pump, T.C. Granato	May-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 2nd Quarter of 2002	R&D Department G. Pump, T.C. Granato	Aug-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Hanover Park Water Reclamation Plant Fischer Farm Report for 3rd Quarter of 2002	R&D Department P. Lindo, T.C. Granato	Dec-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Biomonitoring Report 2002 Kirie WRP NPDES Permit IL0047741 Includes Whole Effluent Toxicity (WET) test results for 1/02	J.T. Zmuda	Mar-02	IEPA Bureau of Water Agency, United States Environmental Protection Agency

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2002

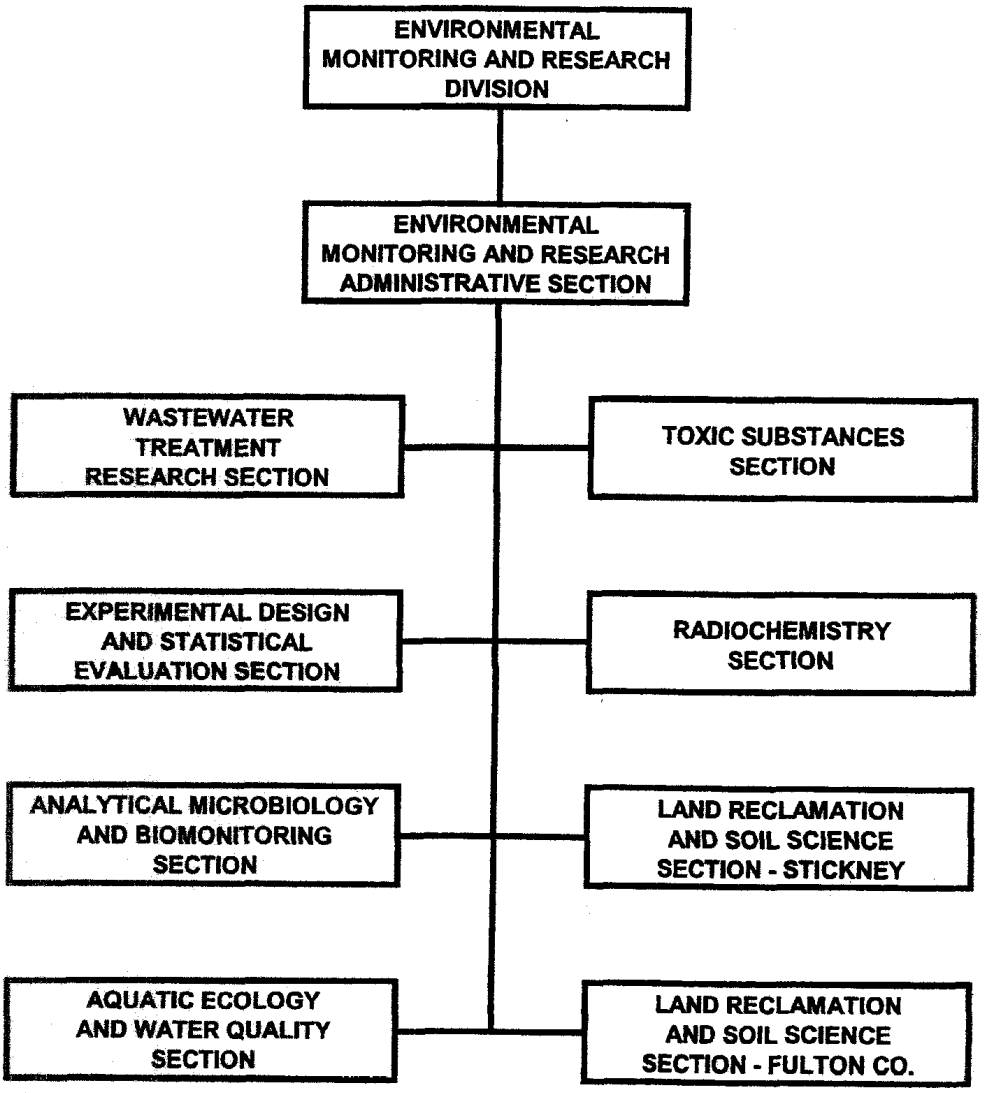
Report Title	Author (s)	Date	Report User
Groundwater Monitoring Report, Tunnel and Reservoir Plan - Calumet - 2001 Annual Report	R&D Department	Jun-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan - Des Plaines - 2001 Annual Report	R&D Department	Jun-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan - Mainstream - 2001 Annual Report	R&D Department	Jun-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan - O'Hare Cup Reservoir Water Quality Monitoring Wells - 2001 Annual Report	R&D Department	Jun-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency
Groundwater Monitoring Report, Tunnel and Reservoir Plan - Upper Des Plaines - 2001 Annual Report	R&D Department	Jun-02	Illinois Environmental Protection Agency, United States Environmental Protection Agency

ENVIRONMENTAL MONITORING AND RESEARCH DIVISION

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Figure 1

ENVIRONMENTAL MONITORING AND RESEARCH DIVISION ORGANIZATION CHART



ENVIRONMENTAL MONITORING AND RESEARCH DIVISION

The Environmental Monitoring and Research Division has 83 employees, and is comprised of nine sections, viz.,

1. Administrative
2. Wastewater Treatment Research
3. Land Reclamation and Soil Science - Stickney
4. Land Reclamation and Soil Science - Fulton County
5. Analytical Microbiology and Biomonitoring
6. Aquatic Ecology and Water Quality
7. Toxic Substances
8. Radiochemistry
9. Experimental Design and Statistical Evaluation

The major areas of focus of the Division were as follows:

- Monitoring the environmental quality of Lake Michigan, area rivers and canals, and the Illinois River to document the effectiveness of the District's wastewater treatment program.
- Assisting in the resolution of sewage treatment and solids disposal operation problems.
- Providing technical assistance to other departments and agencies with respect to issues related to wastewater treatment; combined sewer

overflow (CSO) management; waterways management; and solids processing, utilization, and marketing.

- Conducting applied and operations research to achieve improvement and cost reductions in District wastewater treatment, waterways management, and solids processing activities.
- Assessing the impacts of new or proposed regulations on District activities.

Wastewater Treatment Research Section

The Wastewater Treatment Research (WTR) Section is responsible for conducting basic, applied, and problem solving research on various wastewater and sludge treatment processes currently utilized by the District. Technical assistance is provided to the M&O Department for solving water reclamation plant (WRP) operating problems. This section also investigates innovative treatment processes for future use. The investigation of current operations may originate as the result of a WRP problem, or interest in arriving at new knowledge concerning certain aspects of a wastewater treatment process.

Studies of future operations are concerned with maximizing the efficiency of an existing process at the lowest cost

or the development of new processes. Investigations may take the form of surveys, literature reviews, laboratory bench testing, pilot plant studies, full-scale testing, special analyses, or a combination or progression of any or all of the above. Plans and specifications are also reviewed at the request of the Engineering Department for the purpose of optimizing process design criteria.

The major areas of study included the following.

AMMONIA AND TOTAL KJELDAHL NITROGEN (TKN) SOURCE INVESTIGATION FOR THE STICKNEY WRP

This project was a follow-up to an earlier study to investigate the magnitude of major point sources in contributing to peak ammonia and TKN loadings to the Stickney WRP. The field sampling for this study was completed in 2001. The data collected during the field sampling were analyzed, and a report for this project (R&D Department Report No. 02-12) was prepared in 2002. This study found that Tunnel and Reservoir Plan (TARP) pumpback, centrate from the Stickney post-digestion centrifuges, and discharge from Corn Products International (CPI) remained the major point sources of ammonia nitrogen to the Stickney WRP, while the overflow from LASMA contributed an insignificant amount of ammonia during the study period. Among the above-mentioned point sources, TARP

pumpback was the largest contributor of TKN loading to the Stickney WRP. Most of the peak hourly ammonia and TKN loadings to the Stickney WRP aeration tanks were not related to the discharges from the major point sources investigated during this study period.

OPERATING DIGESTERS TO PRODUCE CLASS A BIOSOLIDS

This project was undertaken to conduct a literature search, review District in-house full-scale test experiences, and to propose options for the District to produce a digester draw product that is "Class A" with respect to pathogens. For this study, a summary report entitled "Operating Digesters to Produce Class A Biosolids" was prepared. Three potential options were proposed in the report. These options are: (1) two-stage thermophilic digestion, (2) first-stage thermophilic followed by second-stage mesophilic digestion, and (3) sludge pasteurization before mesophilic digestion.

DEVELOPMENT OF BOD_5 AND SUSPENDED SOLIDS (SS) LOADINGS CORRELATION FOR CSO DISCHARGES

This project was undertaken to develop correlations between BOD_5 and SS loadings discharged to rivers with CSO discharge volume during CSO events. The data collected in three previous studies associated with CSO discharges were

used in this study. Statistical analyses for developing correlations between BOD_5 and SS loadings and CSO discharge volumes were performed. Two empirical equations were derived as a result of the statistical analyses. The background information, data used, methodology used, and the results arrived at from this study were presented in a report (R&D Department Report No. 02-10).

VECTOR ATTRACTION REDUCTION STUDY FOR THE CALUMET AND STICKNEY WRPS

This project was undertaken to examine whether the requirements of the 40 CFR Part 503 Regulations for vector attraction reduction could be met through sludge anaerobic digestion at the Stickney and Calumet WRPs, using Option 2 of Section 503.33(b) of the Part 503 Regulations. This option states that vector attraction reduction is demonstrated if after anaerobic digestion of the biosolids, the volatile solids in the biosolids are reduced by less than 17 percent in an additional 40 days bench-scale anaerobic digestion at a temperature between 30° and 37°C. Bench-scale tests for this study started in August 2001. The procedure proposed by the USEPA was followed in each test. The bench-scale additional anaerobic digestion tests were conducted once a month using digester draws from the Calumet and Stickney WRPs. A total of

25 (13 for the Calumet WRP and 12 for the Stickney WRP) tests were conducted and the study was completed in November 2002. The test results will be analyzed and reported in 2003.

ENHANCED PRIMARY SETTLING STUDY

The M&O Department requested assistance from the R&D Department in conducting a small-scale study on the use of polymer and ferric chloride in enhancing settling in the primary settling tanks. The purpose of this study was to see if increased solids removal in the primary settling tanks would reduce oxygen demand in the aeration tanks, thereby reducing the air requirement in the aeration tanks. The possibility of nutrient removal was also studied.

A bench-top study was conducted using primary influent to the Stickney Southwest and West Side plants. The objectives of this study was to determine the effectiveness of polymer and ferric chloride in enhancing settling in the primary settling tanks; to determine an optimum dosage of polymer and ferric chloride to optimize removal of suspended solids and BOD_5 in primary settling; and to evaluate removal efficiencies of Total-P, ammonia, and TKN during enhanced primary settling.

Initial test results have been promising and more work will be conducted in 2003.

GROUNDWATER MONITORING OF THE TARP SYSTEMS

Groundwater monitoring reports for the year 2001 were prepared for the five TARP systems which included the Mainstream Tunnel System, the Calumet Tunnel System, the Des Plaines Tunnel System, the Upper Des Plaines Tunnel System and the O'Hare CUP Reservoir. These reports were submitted to the IEPA as well as to the USEPA.

TECHNICAL ASSISTANCE TO THE UNITED STATES ARMY CORPS OF ENGINEERS

Under contract with the U.S. Army Corps of Engineers (ACOE), the R&D Department is providing technical assistance to support the design of the aeration and washdown systems of the McCook Reservoir. Regular monthly meetings between ACOE and District personnel are being held to review progress on the design. Alternative design criteria and technologies are being investigated to lessen the District's eventual operating and maintenance costs for this facility as well as the Thornton Reservoir.

LOCAL LIMIT REEVALUATION

The Environmental Monitoring and Research Division, working with the Industrial Waste Division, is evaluating the cur-

rent Pretreatment Program local limits based upon new USEPA methodologies. Local limits are intended to prevent site-specific plant passthrough and interference from various industrial pollutants. This new method requires a detailed analysis of the fate and transport of each regulated pollutant through the treatment process in order to determine the limiting criteria controlling its allowable concentration. A mass balance approach is used to convert criteria into allowable headwork loadings. This approach traces the routes of each pollutant through the treatment process, taking into account pollutant removals in upstream processes. The final report on this project will be completed in 2003.

O'HARE CUP RESERVOIR FILL EVENT EXPERIMENTS

Two full-scale experiments were conducted in 2002 to study the potential for odor formation during storage of CSOs without mechanical aeration. The objective of this experiment was to use the information collected in this full-scale experiment at the existing O'Hare CUP Reservoir in the evaluation of aeration systems of the future McCook and Thornton Reservoirs.

The first experiment was conducted during a fill event, which occurred on May 12, 2002. Combined sewer overflows were

stored without aeration for a 30-day period without noticeable odor formation.

The second experiment was conducted during a fill event, which took place on August 13, 2002. Combined sewer overflows were stored without aeration for one week without noticeable odor formation.

The results of these experiments are being provided to the ACOE to aid in their design process.

CONTINUOUS H_2S ODOR MONITORING STATIONS

Two continuous odor monitoring stations have been located at the Calumet WRP. The stations will monitor and record H_2S concentrations that may be emitted to the surrounding areas. One station is located south of the plant area on 130th Street. Another station is located north of the plant area inside the fence line. Each station is furnished with two types of hydrogen sulfide analyzers in a temperature-controlled shelter. The performances of both types of analyzers will be studied and compared to measure hydrogen sulfide in the very low part per billion range.

The continuously run hydrogen sulfide analyzers will be fully operational in spring 2003. The H_2S concentration data from each analyzer will be recorded and compared to determine

reliability of each in detecting hydrogen sulfide in the low part per billion range. Finally, one of the two types of H_2S analyzers will be chosen based on its reliability and maintenance record for installation at other locations at District facilities for odor monitoring purposes.

ODOR STUDIES FOR THE UPPER DES PLAINES 14 INTERCEPTOR SEWER

A comparison of the waste streams between Upper Des Plaines collection sewer 14 (UDP14) and Upper Des Plaines collection sewer 22 was conducted to determine the source of odor problems in the vicinity of Drop Shaft 5 (DS5) near the James C. Kirie WRP. The parameters evaluated were pH, temperature, ORP, BOD, FOG, suspended solids, conductivity, sulfides, and sulfates. Four sites were sampled for four weeks, three times a week for each sewer. The results showed a higher component of food industry type waste in UDP14. The food industry waste had increased BOD_5, FOG, and sulfides.

The reduction of the sulfides will alleviate the odor at DS5. The M&O Department determined a location upstream of DS5 on UDP14 to construct a ferric chloride dosing station for hydrogen sulfide removal. The dosing station is planned to be in operation in 2003. The R&D Department will monitor the

dosing operation, interceptor sulfide concentrations and odor emissions to optimize the effectiveness of the odor treatment.

POLYMER TESTING

Full-scale polymer tests for comparison of summer vs. winter polymer at the Stickney WRP postdigestion centrifuge complex were conducted in 2002. The test procedures are described in R&D Department Report No. 01-13.

Polymer testing was also carried out in 2002 at the Hanover Park WRP for the selection and purchase of polymers used in the gravity belt thickening of primary and waste activated sludge to obtain a cake solids of 5.5 percent.

POLYMER ENHANCED LAGOON DEWATERING

The M&O Department requested that a pilot study be undertaken to evaluate the use of polymers to enhance the lagoon dewatering of anaerobically digested sludge. Working with M&O Department personnel, several pilot lagoon tanks were designed and constructed by M&O Department trades at the Stickney WRP and set up at the Stickney WRP in 2001. The experimental studies were carried out during January through August 2002. Based upon these studies it was concluded that the addition of a cationic emulsion polymer would appreciably improve the dewatering of digested sludge and thereby increase emergency

lagoon storage capacity. It was estimated that 26 to 40 percent more sludge could be processed in the lagoons at a dose of 23 to 33 dry tons of polymer per dry ton of sludge. Although polymer addition gave faster water separation, it caused the solids to float over the separated water in the pilot-scale studies. Whether this phenomenon would occur in the full-scale lagoons has to be examined.

CERTIFICATION OF DISTRICT'S SLUDGE PROCESSING TRAINS (SPTs) AS EQUIVALENT TO A PROCESS TO FURTHER REDUCE PATHOGENS (PFRP) OR CLASS A PROCESS

The petition submitted to the USEPA's Pathogen Equivalence Committee (PEC) by the District was resubmitted to the USEPA Region V office in 2001. Numerous discussions were held with Region V staff and PEC members and a site-specific PFRP equivalency for the District's SPTs was issued by Region V on June 20, 2002, for a period of two years effective August 1, 2002 to July 30, 2004.

SOURCES OF POLYCHLORINATED BIPHENYLS (PCBs) TO THE ATMOSPHERE

The R&D Department is cooperating with Dr. Thomas M. Holsen of Clarkson University in a study to evaluate potential emissions of PCBs from sludge drying areas. Four air samplers were set up around the perimeter of selected drying cells at the Calumet WRP in order to collect upwind and downwind

samples. Air samples were collected using a HiVol sampler with a fiberglass filter followed by polyurethane foam filter (PUF) every 12 days over the summer period. The samples were sent to Clarkson University for analysis. Flux chamber measurements were also made twice during the summer. The sampling has been completed, and Clarkson University will be doing the analysis in 2003. The R&D Department's Toxic Substances Laboratory will also analyze a portion of the samples.

ODOR CONTROL TECHNOLOGY

During 2002, an inventory of the odor control technologies in use at the various District WRPs was developed in conjunction with M&O Department staff at the various WRPs. The main processes involve the use of ozone, activated carbon, hydrogen peroxide, and other operational practices. An evaluation of the effectiveness of these systems will be undertaken in 2003.

EMISSION OF HAZARDOUS AIR POLLUTANTS (HAPs) FROM DISTRICT WRPS

As part of the NPDES permits and regulations under the Clean Air Act, an estimate of the emission of HAPs from the wastewater treatment processes was made. Raw sewage samples were collected twice during 2002 at each of the District's seven WRPs and analyzed by the Toxic Substances Section for 87

compounds which are HAPs of concern for Publicly Owned Treatment Works (POTWs). Using the BASTE fate model and the raw sewage concentrations, the emissions of HAPs from the wastewater treatment processes were determined. All of the WRP total emissions for the Stickney WRP were below the 25 tons/year criterion and, thus, not considered a major source.

In addition, as part of the Stickney WRP Title V permit, the HAPs emission for the Stickney WRP during the summer period was calculated as part of the Emissions Reduction Marketing Systems reporting requirement.

ASSOCIATION OF METROPOLITAN SEWERAGE AGENCIES (AMSA) AIR QUALITY COMMITTEE

The EM&R Division staff also served on AMSA's Air Quality Committee. This committee addresses various issues regarding the Clean Air Act regulations which are pertinent to POTWs. During 2002, areas of work included the initiation of an evaluation of USEPA's WATER9 model for estimating emissions from POTW treatment processes. This updated version of the WATER8 model now includes a new section for estimating volatile organic compounds (VOCs) and HAPs emissions from wastewater collection systems. Work has been initiated to review and evaluate the modeling methodology used in WATER9. Future work will also include development of field data from interceptor

sewers and comparison with other POTW collection system models.

Another area of participation was an update of the proposed USEPA regulations regarding emissions from various combustion units. The WTR Section provided a review of the status of the regulations pertaining to boilers burning digester gas. Digester gas is included in the gaseous fuel category along with natural gas and other biogases. The proposed regulations have no MACT standards for existing gas-fired boilers, but do include a hydrogen sulfide standard for new boilers.

Land Reclamation and Soil Science Section

The Land Reclamation and Soil Science Section is responsible for determining, through monitoring and research activities, the environmental impact of the District's biosolids applications on agricultural fields, disturbed and urban lands, and landfill sites. The Section is also responsible for providing technical support for biosolids marketing, and oversight of technical aspects of biosolids land application contracts.

The environmental monitoring component of the program includes the sampling and analyses of waters, soils, plants, and

biosolids at land application sites, landfills, and solids drying facilities receiving biosolids. The results of this monitoring program are reported to the IEPA and the USEPA. In 2002, the Section submitted 56 permit-required reports to the IEPA, one report to the USEPA, 12 reports to the M&O Department for reporting to the IEPA, and 12 reports to the IEPA and the USX Corporation on monitoring at the USX biosolids demonstration project. Of the 81 reports indicated, 17 are formal printed reports and 64 are letters or memoranda.

The research component consists of studies to support local marketing of biosolids such as: screening plants for suitability to grow in biosolids used as a soil conditioner or soil substitute; establishing demonstration plots for the reclamation of slag deposits; designing a demonstration site for growing trees in biosolids in collaboration with Morton Arboretum, Lisle, Illinois; designing a test site for demonstrating the use of biosolids in final cover of landfill side slopes; establishing cooperative research with consulting engineers and soil scientists to characterize the geotechnical and physical properties of biosolids; studying mineralization and availability of biosolids nutrients to plants; and studying soluble salts in biosolids and their effect on plant growth. The research component also consists of studies to

demonstrate the protection afforded to human health and the environment by the USEPA's Part 503 biosolids regulations such as: studying the toxicity of trace elements to plants, and studying the changes over time in the bioavailability of trace elements to plants in biosolids-amended soils.

The Section also conducts applied research to support land reclamation activities at the District's 15,003-acre site in Fulton County. This includes maintaining experimental corn plots which have received cumulative applications of 863 tons of biosolids per acre (maximum-amended plots) from 1973 through 2002. These plots are utilized to study changes in the fertility of mine soil, the uptake of trace elements into corn, and the fate of nutrients from continuous annual applications of biosolids.

The Section also provides technical support for biosolids marketing by maintaining continuous demonstrations of turfgrasses, prairie grasses, forage grasses, and wild flowers in a greenhouse at the Lue-Hing R&D Complex, and provides technical information to biosolids users such as local landfill operators, golf course superintendents, park districts, and environmental consultants.

Analytical Microbiology and Biomonitoring Section

In 2002 the Analytical Microbiology and Biomonitoring Section was composed of 4 professional and 12 technical personnel. The Section was comprised of the following subgroups, which performed specific monitoring or research activities: Virology, Parasitology, Analytical Microbiology, and Biomonitoring. The activities of the Microbiology Section in 2002 are summarized below.

VIROLOGY AND PARASITOLOGY SUB-GROUPS

Air-dried biosolids (final product) were analyzed for viruses and viable *Ascaris* eggs for compliance with the Part 503 *Standards for the Use or Disposal of Sewage Sludge* (Standards). All biosolids produced from the District's codified process were determined to be Class A biosolids with respect to pathogens as defined by the Part 503 Standards. Positive recovery studies were performed on these samples for quality assurance purposes. The average recovery of spiked virus was 98 percent (22 samples), and the average recovery of spiked *Ascaris* eggs was 64 percent (seven samples). In 2002, the District began using microscopic image analysis (MIA) to document the presence of viable *Ascaris* ova in biosolids samples. A research program to investigate the use of automated MIA to

routinely analyze biosolids for viable *Ascaris* ova is currently underway.

ANALYTICAL MICROBIOLOGY SUB-GROUP

Fecal coliform (FC) and *E. coli* (EC) densities were measured in water samples from Lake Michigan, District WRP effluents, and the Chicago area waterways in order to determine the EC to FC ratio in each of these matrices. Monthly samples collected upstream and downstream of the Hanover Park, James C. Kirie, and John E. Egan WRPs were also analyzed for this study. A total of 1,374 analyses were conducted for this study in 2002. Work on developing the EC/FC database was begun in 2000 in anticipation of the adoption of new State of Illinois water quality standards that will specify EC instead of FC limits.

Fecal coliform and other microbiological analyses were conducted in support of the following monitoring studies: Illinois Waterway; Chicago Area Waterways; Lake Michigan beaches; offshore waters of Lake Michigan; biosolids monitoring for Part 503 compliance; solids drying areas monitoring wells; and TARP groundwater monitoring wells. Potable water at District facilities was monitored for total coliforms, FC, and total heterotrophic bacteria. In November, the Illinois

Department of Public Health conducted an onsite inspection and found the equipment and procedures employed in the microbiological analyses of water by the Analytical Microbiology Laboratory to be in compliance with the provisions of *Standard Methods for the Examination of Water and Wastewater* (18th Edition) and the Illinois Rules for Certification and Operation of Environmental Laboratories, Title 77, Part 465, with no deviations.

BIOMONITORING SUB-GROUP

Acute whole effluent toxicity (WET tests) with fish (*Pimephales promelas)* and daphnids (*Ceriodaphnia dubia)* were conducted on effluent samples from all seven of the District's WRPs. Chronic toxicity tests with these same organisms were conducted on effluent samples from the Hanover Park, Stickney, Calumet, and North Side WRPs. Biomonitoring reports for the Hanover Park and Kirie WRPs were submitted to the IEPA in compliance with the respective NPDES permits. Results of chronic tests conducted on the Stickney, Calumet, and North Side WRPs, which were conducted as part of a cooperative study with the USEPA, were submitted to the USEPA. No toxicity was observed in any of the effluents.

Aquatic Ecology and Water Quality Section

The Aquatic Ecology and Water Quality Section is responsible for monitoring and assessing the water and sediment quality in Chicago area waterways. An additional responsibility is to review and participate in regional work groups that bring about emerging federal and state water quality rules and regulations that directly relate to District NPDES permits and the effects of District pollution control activities on water quality in Chicago area waterways. These regulations include 305(b) assessment reporting, 303(d) listing of impaired waters, lower Des Plaines River UAA, Chicago River UAA, total maximum daily loads (TMDLs) for Salt Creek and the West Branch of the DuPage River, and development of nutrient standards.

Field monitoring activities conducted during 2002 by the Aquatic Ecology and Water Quality Section include the following.

BENTHIC INVERTEBRATE MONITORING

During the period July through September 2002, benthic invertebrates were assessed at 23 monitoring stations in the Calumet, Chicago, and the Des Plaines River Systems. Sixteen stations were located on the deep-draft waterways, and seven stations were on wadeable streams. Benthic invertebrates were

collected using a 6 x 6 Ponar Grab sampler and a 3 x 3 Hester-Dendy artificial substrate. In the laboratory, the sediment samples were washed, screened, and the benthic organisms counted and identified. The benthic invertebrate data will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

FISH MONITORING

Fish were collected during July through September 2002 at 23 stations in the Calumet, Chicago, and Des Plaines River Systems. Sixteen stations were located on the deep-draft waterways, and seven stations were on wadeable streams. On the deep-draft waterways, fish were collected using an electrofishing boat. A backpack electrofisher and seining were used to assess the fish population on wadeable steams. Fish were identified, weighed, measured for length, and examined for parasites and disease. The fish data will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

HABITAT AND SEDIMENT QUALITY MONITORING

In October and November 2002, a physical habitat assessment was conducted at 11 monitoring stations in the Chicago River, South Branch of the Chicago River, Bubbly Creek, and

the Chicago Sanitary and Ship Canal. In order to assess sediment chemistry and sediment toxicity, sediment samples were collected at the 11 monitoring stations. The results of the habitat assessments, chemical analyses of sediments, and sediment toxicity testing will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

CHLOROPHYLL MONITORING

During 2002, chlorophyll in plankton was monitored monthly at 59 stations in the Calumet, Chicago, and Des Plaines River Systems. Surface water samples were collected using a stainless steel bucket. In the laboratory, samples were analyzed for chlorophyll *a*, *b*, and *c*, and pheophyton *a*. The concentration of chlorophyll *a* will be used to estimate the phytoplankton biomass and productivity and to determine the trophic status of surface waters.

CONTINUOUS DISSOLVED OXYGEN (DO) MONITORING

Continuous hourly DO monitoring continued during 2002 at 31 stations in the Calumet and Chicago River Systems. Monitoring stations extended from the Wilmette Pumping Station on the North Shore Channel, the Chicago River Lock on the Chicago River, and the O'Brien Lock on the Calumet River to Jefferson Street on the Des Plaines River below the Lockport Lock. Wa-

ter quality monitors were retrieved and deployed weekly at the 31 stations. Annual summary reports will be prepared for DO data monitored in the Calumet and Chicago River Systems.

ILLINOIS WATERWAY MONITORING

During May, August, and October 2002, water samples were collected from 49 stations in six navigational pools along 133 miles of the Illinois Waterway System from the Lockport Lock to the Peoria Lock. The primary objective of the monitoring is to determine water quality and sediment trends along the waterway system from Chicago to Peoria. In order to characterize the chemical quality of the sediments, sediment samples were collected during October at 14 selected monitoring stations.

Toxic Substances Section

The Toxic Substances Section is responsible for the analysis of samples for all organic priority pollutants, including more than 100 organic parameters listed by the USEPA, and the analysis of non-listed organic compounds when the detected peaks have responses greater than or equal to 10 percent of the internal standards. In 2003, this section has been transferred to the Analytical Laboratory Division and its name has been changed to the Organic Compounds Analytical Setion.

The Toxic Substances Laboratory has renewed and maintained accreditation status under the National Environmental Laboratory Accreditation Program (NELAP) during 2002.

Quality Assurance/Quality Control (QA/QC) requirements were conducted by the Section in 2002 to guarantee the high quality of the laboratory analyses and results, and to evaluate the analytical performance for the numerous parameters analyzed.

A total of 1,112 samples were analyzed during 2002. These consisted of 15 samples from Lake Michigan diversion events, 160 from industrial users, 60 from WRPs, 14 from the Analytical Microbiology Section, 285 from the Chicagoland and Illinois Waterways studies, 40 from the USX Demonstration Project Site, 38 proficiency testing samples, and 500 to meet QA/QC requirements.

ANALYSIS OF WRP SAMPLES

Final effluent, raw sewage, and sludge samples from the seven District WRPs are analyzed twice annually.

Raw sewage samples are analyzed for VOCs to estimate, through the use of mathematical models, the VOC air emissions from the WRPs. Actual VOC emissions will also be estimated by the analysis of organics in air samples collected at the WRPs.

ANALYSIS OF INDUSTRIAL WASTE SAMPLES

The Section is also responsible for the analysis of organic priority pollutants in discharges from industrial users as part of the District's Pretreatment Program in order to ensure compliance with Discharge Authorizations and USEPA categorical standards.

ANALYSIS OF ENVIRONMENTAL MONITORING SAMPLES

As part of the District's monitoring of the quality of the environment, the Section analyzed samples collected from Lake Michigan Diversion events, the Chicagoland and Illinois Waterways studies, and the USX Demonstration Project Site for organic priority pollutants.

Radiochemistry Section

The Radiochemistry Section is responsible for the radiological monitoring of waters, wastewaters, and biosolids, and the maintenance of radiation safety at the District. It also performs any special tasks involving the use of ionizing radiation and radioisotopes. The Section performed 3,441 tests in 2002.

RADIOLOGICAL MONITORING OF WATERWAYS

The radiological monitoring of the area's waterways under the jurisdiction of the District includes the Calumet,

Chicago, and Des Plaines River Systems. The concentration of radioactivity in water samples analyzed from all three river systems were within the USEPA Drinking Water Standards for gross alpha and gross beta radioactivity.

RADIOLOGICAL MONITORING OF WASTEWATERS AND BIOSOLIDS

The radiological monitoring of raw and treated wastewaters from the District's WRPs was initiated in 1967 and continues to date. During the year, the radioactivity in the final effluent of all the WRPs was generally lower than the corresponding raw sewage of the WRP, indicating that the wastewater treatment process is removing radioactivity from the raw sewage. The amount of gross alpha and gross beta radioactivity in the final affluent is also less than the USEPA standards for gross alpha and gross beta radioactivity contaminant levels in the community water system. This shows that the discharge of final effluent from the District's WRPs is not likely to have an adverse effect on the radiological quality of the Chicago River Systems.

The Section also performs radiological monitoring of biosolids from the seven WRPs, the Hanover Park WRP lagoons, and from the eight solids drying sites of the District. The monitoring data serves as a measure of present-day radioactivity

levels in comparison to levels in the past years for gross alpha, gross beta, and gamma-emitting radionuclides in biosolids.

RADIOLOGICAL ANALYSES OF BIOSOLIDS-AMENDED SOILS AND CROPS

The soil and corn samples from long-term experimental plots in Fulton County, and soil samples from the Hanover Park Fisher Farm has been analyzed. The Section is writing a report on the impact of long-term and one-time high rate biosolids applications on the radioactivity concentration in biosolids-amended soil and uptake of radioactivity by corn.

RADIATION SAFETY PROGRAM ACTIVITIES

The Section maintains the radioactive material license issued to the District by the Illinois Department of Nuclear Safety (IDNS), assuring that activities are conducted according to the license conditions and regulations. These activities include radiological monitoring of personnel and work areas in the Radiochemistry laboratory, leak testing of nickel-63 detectors in gas chromatographs at the R&D laboratories, leak testing of nuclear gauges used by the Engineering Department, an X-ray fluorescent paint analyzer owned by the M&O Department, and an APD2000 CW detector owned by the Safety Section of the General Administration Department.

LABORATORY QUALITY ASSESSMENT PROGRAM ACTIVITY

The Section continued to participate in the U.S. Department of Energy, Environmental Measurements Laboratory's Quality Assessment Program. Water samples were analyzed for gross alpha, gross beta, tritium, cobalt-60, and cesium-137 activity; and soil samples were analyzed for potassium-40, cesium-137, bismuth-212, lead-212, bismuth-214, lead-214, and actinium-228 radioactivity.

This year the Section also participated in the Environmental Resource Associate RadChem proficiency testing program for gross alpha, gross beta, tritium, cesium-134, cesium-137, and cobalt-60 in water as required by the IDNS as a part of the radiochemistry laboratory certification.

Experimental Design and Statistical Evaluation Section

The Experimental Design and Statistical Evaluation Section is responsible for providing assistance in the design of laboratory and full-scale experiments, collection of appropriate data, development of guidelines for data collection methods, and statistical analyses. Since 1999, Section personnel have been performing these tasks using PC computing media. They also developed programs to interconnect SAS with Visual Basic, Access, and Excel software programs. This has enabled

the Section to produce reports, tables, and texts in suitable designs, and to respond to many requests in a shorter period of time.

STATISTICAL AND COMPUTING SUPPORT

During 2002, the Biostatistician provided statistical and computing support to various projects. The following is a description of some of the activities.

1. Statistical support was provided to the Wastewater Treatment Research Section on the development of a correlation for estimating BOD_5 and SS loads discharged to rivers during CSO events based upon CSO discharge volumes. The project was completed in October 2002.
2. Statistical support was also provided to the Wastewater Treatment Research Section on centrifuge analyses to study the effects of polymer dose (lbs/dry ton), feed sludge characteristics, and cake solids on sludge throughput (dry tons/day) by the centrifuges. The project is still in progress.
3. Statistical support was provided to the Analytical Microbiology and Biomonitoring Section

to study the trends and average fecal coliform concentrations in the Des Plaines River and the Chicago Sanitary and Ship Canal at Lockport for the 2000-2001 period.

4. Statistical support was also provided to the Analytical Microbiology and Biomonitoring Section to study the changes in EC or FC concentrations at different beaches of the Chicago Park District, and to develop models of EC or FC concentrations on the basis of their past concentrations and rainfall.

5. Statistical support was provided to the Land Reclamation and Soil Science Section on the concentration of metals in street dust collected from the drainage basins of the Stickney and Calumet WRPs. Statistical analyses were done to determine if there exists any significant differences in the mean concentrations of metals in the street dust, surface soil, auto graveyard, and scrap metal yards.

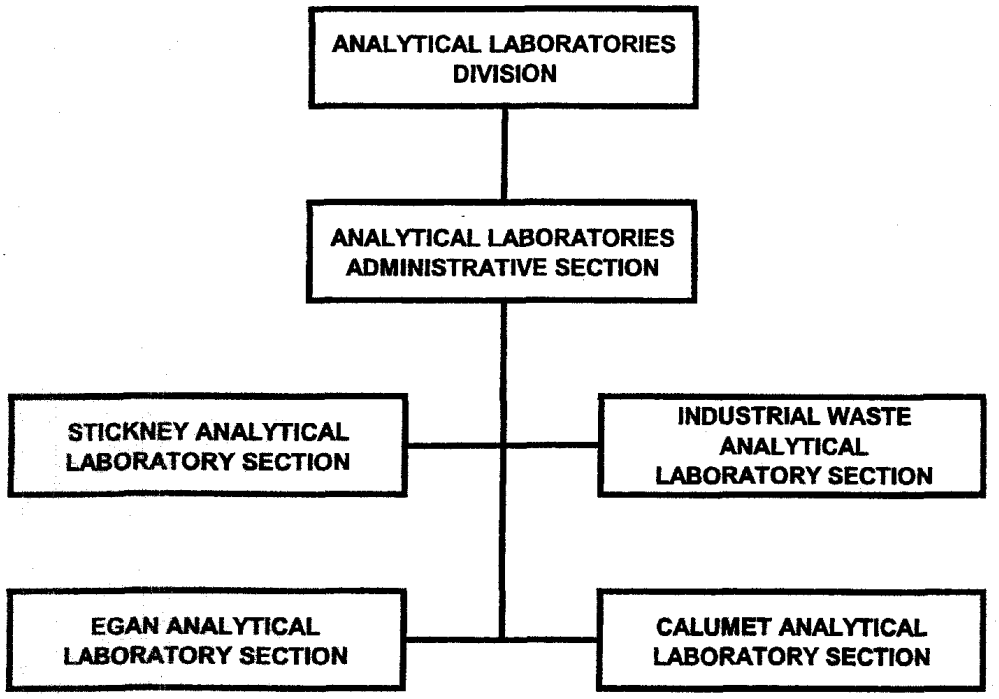
WATER QUALITY DATA

Each year, the Section prepares an annual report describing the water quality of the streams and channels within the District's jurisdiction for the preceding year. Surface water quality data for 2001 were evaluated regarding compliance with water quality standards set by the Illinois Pollution Control Board (IPCB). In 2001, 28 water quality parameters (temperature, phenols, ammonium nitrogen, un-ionized ammonia, total zinc, total cadmium, total copper, total chromium [trivalent and hexavalent], total nickel, total lead, total mercury, total boron, total arsenic, total selenium, total barium, soluble iron, total silver, gross beta activity, dissolved oxygen, pH, chloride, total dissolved solids, sulfate, fecal coliform, fluoride, weak acid dissociable cyanide, total iron, and total manganese) were assayed. Fifteen parameters (ammonium nitrogen, un-ionized ammonia, weak acid dissociable [WAD] cyanide, gross beta activity, phenols, and 10 metals (total arsenic, total barium, total boron, total chromium [trivalent and hexavalent], soluble iron, total nickel, total manganese, total mercury, total zinc, and total selenium) were in total compliance with General Use Waters of all river systems.

ANALYTICAL LABORATORIES DIVISION

Figure 2

ANALYTICAL LABORATORIES DIVISION ORGANIZATION CHART



ANALYTICAL LABORATORIES DIVISION

The Analytical Laboratories Division (ALD) provides daily analytical services to the District as follows:

- To the M&O Department for monitoring treatment process operations and NPDES permit compliance for the seven WRPs, for monitoring Biosolids processing activities, and the operation of the TARP project.
- To the Environmental Monitoring and Research (EM&R) Division for various applied and operations research to achieve improvements and cost reductions in District treatment process operations, and to assist in monitoring Chicagoland waterways.
- To assist the Industrial Waste Division (IWD) as it routinely regulates categorical industrial discharges to the sewer system and waterways to determine compliance with the Sewage and Waste Control Ordinance and the USEPA-approved Pretreatment Program.

A centralized laboratory and two regional laboratories (a total of four laboratory sections) are maintained in order to

consistently provide the needed analytical services in a timely manner.

The large number of analyses performed by the ALD, as shown in Table 3 on page 52, could not be accomplished without automation and instrumentation. To improve automated data acquisition, storage and reporting from these instruments, the Laboratory Information Management System (LIMS) upgrade to Windows continued in 2002. This migration to the Windows environment will increase processing and reporting speed, take advantage of new functionality, and ensure continued technical and software support for a less customized system.

During 2002, pertinent data for the Ambient Water Quality Monitoring Network Program were transferred to the national STORET to facilitate access by the IEPA and others.

The four analytical laboratories renewed laboratory accreditation by the IEPA during 2002 in accordance with National Environmental Laboratory Accreditation Conference standards.

Stickney Analytical Laboratory (SAL)

This laboratory is located at the Lue-Hing R&D Complex and performed 679,130 analyses for solids, nutrients, and metals on 49,139 samples in providing analytical services for the following:

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 3

TOTAL NUMBER OF ANALYSES PERFORMED IN 2002

Program	Nutrients	Oxygen Demands	Metals	Solids	Others	Total Program
4652 Liquid Monitoring	93,748	79,145	213,730	76,532	57,560	520,715
TARP	7,236	1,284	1,331	2,916	4,676	17,443
Treatment Facilities	86,512	77,861	212,399	73,616	52,884	503,272
4653 Solids Monitoring	19,525	1,740	56,172	119,042	38,060	234,539
4666 Sewage & Waste Control	1,394	208	342,670	1,082	9,476	354,830
4663 User Charge	0	62,677	0	22,569	36,560	121,806
4671 Lake Michigan	467	91	0	292	713	1,563
4672 Waterways	9,083	5,263	64,179	1,970	18,579	99,074
4673 Inspection Events	0	0	0	0	0	0
4674 IPCB Water Quality	0	0	0	0	0	0
4681 Assistance to M&O	326	0	5,919	8,046	10,032	24,323
4682 Assistance to Others	365	556	0	1,120	736	2,777
4690 Operations & Research	19,042	1,974	55,557	2,908	3,296	82,777
Totals	143,950	151,654	738,227	233,561	175,012	1,442,404

M&O DEPARTMENT

1. Process Control, Operations Monitoring, and NPDES Compliance Monitoring for the Stickney WRP.
2. Solids Management Areas at Harlem Avenue, Lawndale Lagoons, Ridgeland Avenue, Stony Island, and Calumet.
3. Calumet, Stickney, and Egan WRPs Biosolids Centrifuge Cake Application to Agricultural Lands.
4. USEPA and IEPA Split Sampling Program.
5. Tunnel and Reservoir Plan (TARP) Groundwater Monitoring Program.

EM&R DIVISION

1. Environmental and Permit Compliance Monitoring for the Prairie Plan Project in Fulton County involving biosolids quality, test well water quality, surface water quality, and plant tissues.
2. USX South Works Reclamation Demonstration and Slag Leachate Study.
3. Solids Management Areas at LASMA, Marathon, Vulcan, Egan, HASMA, and RASMA.

4. NANI analysis for Biosolids samples from LASMA, Marathon, Vulcan, HASMA, RASMA, SWRP Lagoons, and Stony Island Avenue.
5. Analytical Support for Biosolids Marketing.
6. Ambient Water Quality Monitoring Program.
7. Illinois Waterways Monitoring Program.
9. Enhanced Primary Settling Study.
10. Biosolids Salinity Study.

IWD

Metals analyses are conducted on regulated categorical industrial discharges to determine compliance with the Sewage and Waste Control Ordinance. The following 13 metals are regulated: arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc.

OTHER SERVICES

In addition to typical water, wastewater, and biosolids analyses, this laboratory also performs analyses on materials purchased by the District (such as lubricants, sodium hypochlorite, and ferric chloride) for verification of contract requirements.

Analytical services for certain essential processes at the Stickney WRP are provided seven days a week. The follow-

ing critical areas are supported: (1) monitoring of mixed liquor and return sludge concentrations, (2) the raw sludge thickening process; and (3) the biosolids dewatering operation.

Industrial Waste Analytical Laboratory (IWAL)

The IWAL is located at the Lue-Hing R&D Complex and performed 209,696 analyses on 28,687 samples. The laboratory performs analysis for fats, oils and greases (collectively, FOG); several methods for cyanide and phenols; total organic carbon; total and suspended solids; biochemical oxygen demand and dissolved oxygen in support of the following:

M&O DEPARTMENT

Process Control, Operations Monitoring, and NPDES Permit Compliance Monitoring for the District's seven WRPs.

EM&R DIVISION

Various environmental monitoring and research programs such as: (1) Ambient Water Quality Monitoring Network Program, and (2) Illinois Waterways Monitoring Program.

IWD

Analytical assistance for administration of the Sewage and Waste Control Ordinance and the User Charge Ordinance. This includes: (1) maintaining evidentiary laboratory chain of custody for all samples obtained from various industrial dischargers; and (2) providing records as required for various legal proceedings, hearings and/or Freedom of Information Act requests.

In 2002, the laboratory put into service an automated cyanide/phenol system. In addition, a new mididistillation system was put into operation for the phenol analysis. Also, staff completed review of a paper evaluating different cyanide species in municipal and industrial contaminated waters in cooperation with the Water Environment Research Foundation.

Calumet Analytical Laboratory

This laboratory is located at the Calumet WRP and performed 300,607 analyses on 31,819 samples in 2002 by providing analytical services for the following:

M&O DEPARTMENT

1. Process Control and Operations Monitoring and NPDES Compliance Monitoring for the Calumet and Lemont WRPs.
2. USEPA and IEPA Split Sample Study.

3. Monitoring of Hydrogen Sulfide Concentrations at the Kirie WRP.

4. Ongoing Assistance to Investigate Increased Zinc Loadings to the Calumet WRP.

EM&R DIVISION

1. Analytical Support for Calumet Biosolids Processing Operations and the Fulton County Prairie Plan Project.

2. Sulfate Analyses of Waterways, TARP, and Lysimeter Samples.

During 2002, this laboratory successfully completed an IEPA on-site accreditation audit in accordance with the National Environmental Laboratory Accreditation Conference standards.

John E. Egan Analytical Laboratory (EAL)

This laboratory is located at the Egan WRP and performed 252,971 analyses on 26,691 samples in providing analytical services for the following:

M&O DEPARTMENT

1. Process Control Analyses and NPDES Compliance Monitoring for Egan, Kirie, Hanover Park and North Side WRPs.

2. USEPA and IEPA Split Sampling Program.
3. Materials and Boiler Water Testing Programs.
4. Soluble Phosphorus Study at the Four North Area WRPs.
5. Process Stream Evaluations of Suspected Incidents of Toxic Interferences or Pass-Through Events.
6. Polymer Testing for Raw Sludge Dewatering at the Egan and Hanover Park WRPs.
7. Support of LIMS Reports for Use by M&O Personnel at the Four North Area WRPs.

EM&R DIVISION

1. Soluble Copper Study of Kirie and Hanover Park WRPs.
2. Egan WRP Centrifuge Cake Testing for Application of Sludge to Land, Part 503 Reporting Requirements.
3. Hanover Park WRP Lagoon Sludge Testing for Application of Sludge to Land, Part 503 Reporting Requirements.

IWD

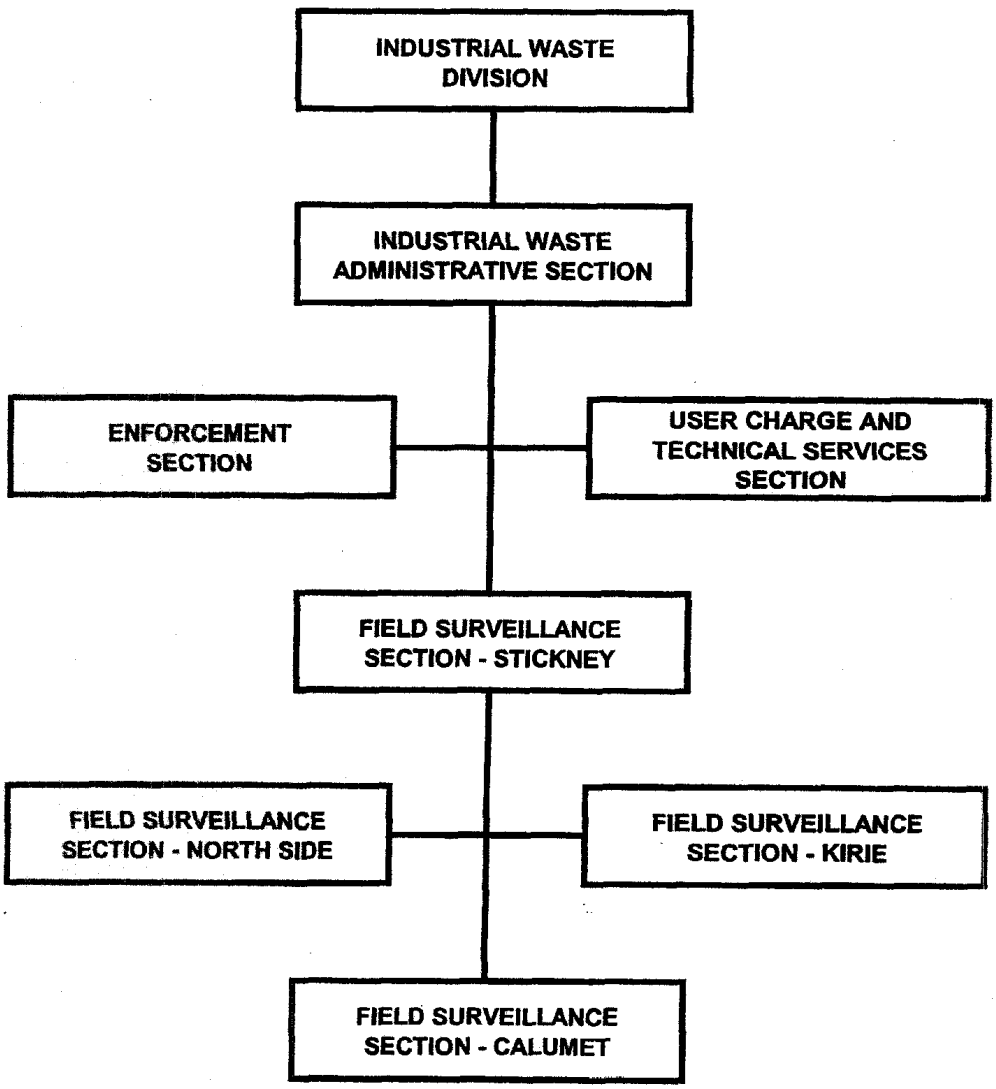
1. Determination of pH of Grab Samples Collected by IWD Personnel in North Service Area.
2. Preservation of Cyanide Grab Samples before Holding Time is Exceeded.

INDUSTRIAL WASTE DIVISION

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Figure 3

INDUSTRIAL WASTE DIVISION ORGANIZATION CHART



INDUSTRIAL WASTE DIVISION

The Industrial Waste Division consists of four sections: Administrative, Enforcement, User Charge and Technical Services, and Field Surveillance and Studies. The Division's primary responsibilities are the enforcement of the District's Sewage and Waste Control Ordinance (SWCO) and User Charge Ordinance (UCO). It is responsible for the compilation and presentation of data pertaining to industrial user discharges to the District's sewerage system. Finally, the Division executes the District's responsibility as a primary response agency for hazardous materials emergencies in Cook County.

Administrative Section

This Section is responsible for the general administration of the Division and for coordination and direction of the work of the Enforcement, User Charge and Technical Services, and Field Surveillance and Studies Sections. It is responsible for budgetary preparations and control, and prepares and maintains Division procedural manuals. The Section reviews and comments on pretreatment and wastewater regulations proposed by federal and state agencies.

The Administrative Section also coordinates the supply of technical data, technical support activities, and recommendations provided by the Division to other divisions of the R&D Department, and to other departments of the District. It presents data in report form for a variety of purposes and prepares illustrative charts and tables pertinent to those reports.

Enforcement Section

The Enforcement Section is responsible for the routine administration and enforcement of the SWCO, which incorporates the federal pretreatment regulations for certain industrial categories and specifies limits for concentrations of contaminants discharged to the District's sanitary sewerage system and to the waterways within the District's boundaries.

Administrative activities performed by the Enforcement Section during 2002 included the issuance or renewal of 341 Discharge Authorizations, the review of 981 Continued Compliance Reports and the review of 46 Spill Prevention, Containment and Countermeasure Plans. Enforcement activities for the period from 1998 through 2002 are depicted in the following table.

Year	Cease and Desist Orders/Amendments	Board Orders	Legal Actions/Amendments
1998	512	4	70
1999	595	6	58
2000	462	2	0
2001	456	1	6
2002	429	0	11

The Enforcement Section also prepares the District's list of significant violators of applicable pretreatment regulations, which is required to be published annually in the newspaper with the largest daily circulation within the jurisdiction of the District. The trend for the period from 1998 through 2002 is depicted in the following table.

Year	Effluent Limitations	Reporting Requirements	Other Requirements[1]	Total Number of Industrial Users Published
1998	30	28	1	59
1999	30	36	0	66
2000	22	59	1	79
2001	11	61	0	68
2002	15	49	0	62

[1] Other violations included dilution, failure to provide access for inspection purposes, failure to install adequate sampling facilities, failure to provide adequate spill containment, failure to install and maintain adequate pretreatment facilities.

User Charge and Technical Services Section

The User Charge and Technical Services Section administers the District's federally-approved User Charge system as authorized under the UCO.

In 2002, the Section received and reviewed reports filed by 3,725 users (1,000 commercial-industrial and 2,725 tax-exempt users) containing calculations of their User Charge liabilities under the UCO and documentation corroborating their data. The Section classified 39 new large commercial-industrial and tax-exempt users and 44 small nonresidential-commercial users in 2002.

The Section requests verification sampling of certain facilities by the Field Surveillance and Studies Section, and determines the acceptability of the user's proposed sampling methodology. In 2001, the Section reviewed 117 user proposals for sampling, monitoring and/or installations, sealed 82 privately owned water meters used for reporting volume deductions or discharge volumes, and conducted 368 field inspections to verify user data and/or compliance with the UCO.

Effective January 1, 2001, the UCO was comprehensively amended to provide for the direct recovery of costs for administration of the SWCO and UCO from industrial users through

Minimum Pretreatment Requirements charges, Noncompliance Enforcement charges and User Charge Verification charges.

The following table shows the User Charge revenue, as reported by the District's Finance Department, collected over the period from 1998 through 2002.

Year	User Charge Revenue Collected
1998	$49,686,666
1999	$53,354,085
2000	$49,297,496
2001	$50,037,292
2002	$47,061,518

Field Surveillance and Studies Section

The Field Surveillance and Studies Section investigates and surveys industrial facilities within the jurisdiction of the District, and samples their effluent discharges to determine their compliance with the SWCO and as verification of user data as required by the UCO. During 2002, 2,366 SWCO and 971 UCO inspections and sampling programs were performed.

The Section also performs the collection of samples to monitor the quality of Lake Michigan and District waterways, in order to detect and reduce the incidence of pollution. In 2002, 19,110 water quality samples were collected. Further, all groundwater monitoring wells installed for the District's TARP were routinely sampled. In 2002, 1,846 samples were ob-

tained at 119 TARP groundwater monitoring wells. Chemical toilet service companies who, under District permit, discharge cleanings at the Stickney Water Reclamation Plant (WRP) are also monitored and sampled. During 2002, three chemical toilet service companies made 801 disposals at the Stickney WRP. For these disposal events, 286 samples were randomly obtained.

The Section is also responsible for the investigation of spills and discharges of pollutants and hazardous, toxic or volatile materials to sewer systems and waterways within the District's boundaries, and initiates containment and cleanup activities pertaining to such events. Through such actions, Section personnel execute the District's role as primary response agency for hazardous materials emergencies in suburban Cook County, provide support to the Chicago Fire Department for such emergencies, and provide support to the Cook County Department of Environmental Control for toxic gas release incidents.

In 2002, 275 investigations were conducted in response to requests from federal, state and local agencies, municipalities and private citizens; 52 investigations were conducted in response to self-reported industrial activities; and 51 investigations were conducted in response to requests from the District's M&O Department.

APPENDIX I

MEETINGS AND SEMINARS 2002

MEETINGS AND SEMINARS 2002

1. Binational Great Lakes Workshop, Chicago, Illinois, January 2002.

2. Effective Risk Management of Endocrine Disrupting Chemicals Workshop, Cincinnati, Ohio, January 2002.

3. Illinois Water Environment Association, Government Affairs in Water Pollution Control Seminar, Lisle, Illinois, January 2002.

4. Industrial Water, Waste & Sewage Group Meeting, Chicago, Illinois, January 2002.

5. Midwest Water Analysts Association, Winter 2002 Convention, Kenosha, Wisconsin, January 2002.

6. National Advisory Council for Environmental Policy and Technology Meeting, Washington, D.C., January 2002.

7. Pembroke Township Board Meeting, Hopkins Park, Illinois, January 2002.

8. Association of Metropolitan Sewerage Agencies, Winter Conference, Orlando, Florida, February 2002.

9. Great Lakes Regional Pollution Prevention Roundtable, Chicago, Illinois, February 2002.

10. Illinois Chapter of American Fisheries Annual Meeting, Moline, Illinois, February 2002.

11. Illinois Environmental Protection Agency, Nutrient Standards Workgroup Meeting, Springfield, Illinois, February 2002.

12. United States Environmental Protection Agency, Midwest Surface Monitoring and Standards Meeting, Chicago, Illinois, February 2002.

13. United States Environmental Protection Agency, National Metal Finishing Strategic Goals Program Summit, Chicago, Illinois, February 2002.

14. Water Environment Federation, 2002 Specialty Conference, Disinfection 2002, Health and Safety Achieved through Disinfection, Saint Petersburg, Florida, February 2002.

15. Illinois Water Environment Association, 2002 Annual Conference, Rockford, Illinois, March 2002.

16. Industrial Water, Waste & Sewage Group Meeting, Chicago, Illinois, March 2002.

17. Midwest Water Analysts Association, Steering Committee Meeting, Gurnee, Illinois, March 2002.

18. National Organization of Black Chemists and Chemical Engineers, New Orleans, Louisiana, March 2002.

19. Pittsburgh Conference, New Orleans, Louisiana, March 2002.

20. United States Environmental Protection Agency, Storet Training Course, Falls Church, Virginia, March 2002.

21. Water Environment Federation, 16th Annual Residuals and Biosolids Management Conference, Austin, Texas, March 2002.

22. Central States Water Environment Association, 7th Annual Education Seminar, Madison, Wisconsin, April 2002.

23. Illinois Association of Wastewater Agencies Mini-Conference, Springfield, Illinois, April 2002.

24. National Pollution Prevention Roundtable, Portland, Oregon, April 2002.

25. Odors and Toxic Air Emissions Specialty Conference, Albuquerque, New Mexico, April 2002.

26. Perkin-Elmer Instruments-Optima Instrument Series with ICP WinLab Software Training Course and Open House, Oak Brook, Illinois, April 2002.

27. United States Environmental Protection Agency, Persistent Bioaccumulative and Toxic Monitoring Strategy Workshop, Raleigh, North Carolina, April 2002.

28. American Society for Microbiology, 102nd General Meeting, Salt Lake City, Utah, May 2002.

29. Association of Metropolitan Sewerage Agencies, 2002 National Environmental Policy Forum and 32nd Annual Meeting, Washington, D.C., May 2002.

30. Chicago Fire Department, Weapons of Mass Destruction Training, Chicago, Illinois, May 2002.

31. City of Chicago, Mayor's Office of Special Events, Food Vendor Training Program, Chicago, Illinois, May 2002.

32. EST Analytical Seminar, Chicago, Illinois, May 2002.

33. Illinois Chamber of Commerce, Environmental Regulations Seminar, Naperville, Illinois, May 2002.

34. Illinois Environmental Protection Agency, Nutrient Standards Workgroup Meeting, Springfield, Illinois, May 2002.

35. Illinois Water Environment Association, Laboratory Committee Meeting, St. Charles, Illinois, May 2002.

36. Illinois Water Environment Association, Public Education and Student Affairs Committee Meeting, Champaign, Illinois, May 2002.

37. Industrial Water, Waste & Sewage Group Meeting, Chicago, Illinois, May 2002.

38. National Monitoring Conference, National Water Quality Monitoring Council, Madison, Wisconsin, May 2002.

39. Purdue University, Project Subcommittee Meeting for Water Environment Research Foundation Project 99-CTS-2-UR - Numerical and Experimental Characterizations of Dose Distribution in UV Disinfection, West Lafayette, Indiana, May 2002.

40. Water Environment Research Foundation, Research Council Meeting, Alexandria, Virginia, May 2002.

41. Illinois Restaurant Association, Event Food Vendor Training Program, Chicago, Illinois, June 2002.

42. Illinois Water Environment Association, Ten Day Water Environment Committee Meeting, Villa Park, Illinois, June 2002.

43. Midwest Water Analysts Association, Spring Meeting, Lake Bluff, Illinois, June 2002.

44. National Advisory Council for Environmental Policy and Technology, Compliance Assistance Advisory Committee Meeting, Environmental Futures Workgroup Meeting, and National Environmental Technology Challenge Workgroup Meeting, Washington, D.C., June 2002.

45. North American Benthological Society, 50th Annual Meeting, Pittsburg, Pennsylvania, June 2002.

46. Perkin Elmer ICP-MS Techniques and Applications Workshop, Oak Brook, Illinois, June 2002.

47. Thermo LabSystem's Seminar, Rosemont, Illinois, June 2002.

48. Association of Metropolitan Sewerage Agencies, Summer Conference, Portland, Oregon, July 2002.

49. Interagency Task Force on *E. coli* Meetings, Portage, Indiana, July 2002.

50. National Advisory Council for Environmental Policy and Technology, Council Meeting, Washington, D.C., July 2002.

51. Water Environment Research Foundation, Primary Clarifier Performance Research Project OO-CTS-2 Progress Review Meeting, Walnut Creek, California, July 2002.

52. Interagency Task Force on *E. coli* Meetings, Portage, Indiana, August 2002.

53. City of Chicago, Department of Environment, Nature Week at Navy Pier, Chicago, Illinois, September 2002.

54. Friends of the Chicago River Urban River Monitoring and Recovery Initiative Colloquium, Chicago, Illinois, September 2002.

55. Illinois Association of Wastewater Agencies, Annual Conference, Champaign, Illinois, September 2002.

56. International Ion Chromatography Seminar, Baltimore, Maryland, September 2002.

57. Midwest Water Analysts Association, Fall 2002 Convention, Milwaukee, Wisconsin, September 2002.

58. Midwest Water Analysts Association, Steering Committee Meeting, Kenosha, Wisconsin, September 2002.

59. Northern/Central Illinois Pipeline Association, Public Awareness Training Program, Elmhurst, Illinois, September 2002.

60. Water Environment Federation 75th Annual Conference, Chicago, Illinois, September 2002.

61. American Chemical Society Short Courses, Chicago, Illinois, October 2002.

62. American Society of Civil Engineers Meeting, Chicago, Illinois, October 2002.

63. Calumet Heritage Conference, Chicago, Illinois, October 2002.

64. Federation of Analytical Chemistry and Spectroscopy Societies, 29th Annual Meeting, Providence, Rhode Island, October 2002.

65. Great Lakes Beach Conference 2002, Annual Meeting Great Lakes Recreational Water Quality Association, Chicago, Illinois, October 2002.

66. Illinois Department of Public Health, Annual Environmental Laboratory Seminar, Springfield, Illinois, October 2002.

67. Illinois Emergency Management Agency, Local Emergency Response Committees Annual Meeting, Matteson, Illinois, October 2002.

68. Illinois Environmental Protection Agency, Nutrient Standards Workgroup Meeting, Springfield, Illinois, October 2002.

69. International 5th Symposium on Sediment Quality Assessment, Chicago, Illinois, October 2002.

70. LabSystems World, San Antonio, Texas, October 2002.

71. Wonderful Outdoor World, Chicago, Illinois, October 2002.

72. American Society of Agronomy, 2002 Annual Meeting, Indianapolis, Indiana, November 2002.

73. Association of Metropolitan Sewerage Agencies, Law Seminar, Denver, Colorado, November 2002.

74. Association of Metropolitan Sewerage Agencies and Environmental Protection Agency, Pretreatment Coordinators' Workshop, Philadelphia, Pennsylvania, November 2002.

75. Illinois Water 2002 Conference, Champaign, Illinois, November 2002.

76. Illinois Water Environment Association, Hazardous Waste and Industrial Pretreatment Committee Meeting, Lombard, Illinois, November 2002.

77. Industrial Water, Waste & Sewage Group Meeting, Chicago, Illinois, November 2002.

78. Society of Environmental Toxicology and Chemistry, Annual Meeting, Salt Lake City, Utah, November 2002.

79. Water Environment Federation, National TMDL Science and Policy Conference, Phoenix, Arizona, November 2002.

80. Illinois Water Environment Association, Ten Day Water Environment Committee Meeting, Villa Park, Illinois, December 2002.

81. National Advisory Council for Environmental Policy and Technology, Compliance Assistance Advisory Committee Meeting, San Antonio, Texas, December 2002.

82. National Advisory Council for Environmental Policy and Technology, Council Meeting, Washington, D.C., December 2002.

83. United States Environmental Protection Agency, National Compliance Assistance Providers' Forum, San Antonio, Texas, December 2002.

APPENDIX II

PRESENTATIONS 2002

PRESENTATIONS 2002

1. "Land Application of Biosolids - The Straight Poop." Presented at the Pembroke Township Board, Hopkins Park, Illinois, by Thomas C. Granato, January 2002. PP*

2. "Biosolids Salinity: Chemical Composition, Sources, and Reduction through Metropolitan Water Reclamation District of Greater Chicago Process Trains, and Importance for Managing Land Application." Presented at the Illinois Water Environment Association 2002 Annual Conference, Rockford, Illinois, by Thomas C. Granato, Albert Cox, Odona Dennison, Richard I. Pietz, and Prakasam Tata, March 2002. B

3. "Illinois Water Environment Association Luncheon Presentation." Presented at the Illinois Water Environment Association 2002 Annual Conference, Rockford, Illinois, by Richard Lanyon, March 2002. P

4. Reevaluation of Pretreatment Program Local Limits of the Metropolitan Water Reclamation District of Greater Chicago." Presented at the Illinois Water Environment Association 2002 Annual Conference, Rockford, Illinois, by Doris Bernstein, Jain S. Jain, Bernard Sawyer, Prakasam Tata, Richard Sustich, and William Stuba, March 2002. B

5. "Systems Conversion, Expansion, and Upgrading of a Pretreatment Information Management System." Presented at the Illinois Water Environment Association 2002 Annual Conference, Rockford, Illinois, by Louis Kollias, March 2002. P

6. "Main Drivers for the Solids Management Practices at the Metropolitan Water Reclamation District of Greater Chicago - A Historical Perspective." Presented at the Water Environment Federation 16th Annual Residuals and Biosolids Management Conference, Austin, Texas, by Prakasam Tata, Richard Lanyon, and Cecil Lue-Hing, March 2002. B

7. "Uptake of Cd and Zn by Garden Vegetables Grown in Nu Earth Biosolids Amended Soil." Presented at the Water Environment Federation 16th Annual Residuals and Biosolids Management Conference, Austin, Texas, by Albert Cox, Thomas C. Granato, Richard I. Pietz, and Prakasam Tata, March 2002. P

PRESENTATIONS 2002

8. "Chicago Waterway System Use Attainability Analysis Study." Presented at the Industrial Water, Waste, and Sewage Group Meeting, Chicago, Illinois, by Richard Lanyon, May 2002. PP

9. "Continuous Dissolved Oxygen Monitoring in Urban Waterways in Chicago." Presented at the National Monitoring Conference, Madison, Wisconsin, by Irwin Polls, May 2002. PS

10. "Part 503 Compliance Monitoring of Biosolids for Pathogen Reduction Requirements at the Metropolitan Water Reclamation District of Greater Chicago." Presented at the 102nd General Meeting of the American Society for Microbiology, Salt Lake City, Utah, by Geeta Rijal, James T. Zmuda, Richard Gore, Bernard Sawyer, Prakasam Tata, Richard Lanyon, and Cecil Lue-Hing. May 2002. PS

11. "North Shore Channel." Presented at the Evanston Ecology Center, Evanston, Illinois, by Richard Lanyon, June 2002. PP

12. "Use Attainability Analysis Studies in Chicago Waterways." Presented at the Association of Metropolitan Sewerage Agencies Summer Conference, Portland, Oregon, by Richard Lanyon, July 2002. PP

13. "Beneficial Utilization of Biosolids at the Metropolitan Water Reclamation District of Greater Chicago." Presented at the Water Environment Federation 75th Annual Conference, Chicago, Illinois, by Thomas K. O'Connor, Richard Lanyon, Joseph T. Zurad, Bradley Schwartz, and Prakasam Tata, September 2002. B

14. "Continuous Dissolved Oxygen Monitoring in Chicago." Presented at the Water Environment Federation 75th Annual Conference, Chicago, Illinois, by Irwin Polls, Richard Lanyon, and Michael Sopcak, September 2002. B

15. "Innovative Partnerships with Industry via Project XL for an Effective Pretreatment Program." Presented at the Water Environment Federation 75th Annual Conference, Chicago, Illinois, by Richard Sustich, Richard Lanyon, and William Stuba, September 2002. B

16. "Meeting Water Quality Standards in Chicago Waterways." Presented at the Water Environment Federation 75th Annual Conference, Chicago, Illinois, by Richard Lanyon, September 2002. B

17. "Radiological Monitoring Activities at the Metropolitan Water Reclamation District of Greater Chicago." Presented at the Water Environment Federation 75th Annual Conference, Chicago, Illinois, by Abdul Khalique, Richard I. Pietz, Prakasam Tata, and Richard Lanyon, September 2002. B

18. "Demonstration of Plants Grown in Biosolids." Presented at the City of Chicago, Department of Environment Nature Week at Navy Pier, Chicago, Illinois, by Pauline Lindo, Lakhwinder Hundal, and Thomas C. Granato, September 2002. PS

19. "Urban River Monitoring and Restoration Initiative." Presented at the Friends of the Chicago River Urban River Monitoring and Recovery Initiative Colloquium, Chicago, Illinois, by Richard Lanyon, September 2002. PP

20. "Use Attainability Analysis Studies in Chicago Waterways." Presented at the Metropolitan Water Reclamation District of Greater Chicago Board of Commissioners' Meeting, Chicago, Illinois, by Richard Lanyon, September 2002. PP

21. "Use Attainability Analysis Studies in Chicago Waterways." Presented at the Use Attainability Analysis Stakeholders Meeting, Chicago, Illinois, by Richard Lanyon, September 2002. PP

22. "Reclamation of the USX Brownfield Site with Biosolids." Presented at the Calumet Heritage Conference, Chicago, Illinois, by Lakhwinder Hundal and Thomas C. Granato, October 2002. PS

23. "Comparison of Phosphorus Release Characteristics in Chicago Biosolids." Presented at the American Society of Agronomy 2002 Annual Meeting, Indianapolis, Indiana,

by Albert Cox, Thomas C. Granato, Richard I. Pietz, and Prakasam Tata, November 2002. PS

24. "Use of Biosolids to Establish Turf and Native Plants in Urban Reclamation Projects: Are Salinity and Sodicity a Problem?" Presented at the American Society of Agronomy 2002 Annual Meeting, Indianapolis, Indiana, by Thomas C. Granato, Albert Cox, Richard I. Pietz, and Prakasam Tata, November 2002. PS

25. "Illinois Nutrient Standards Development: The Science and Politics Behind Future New Water Quality Regulations." Presented at the Illinois Water 2002 Conference, Champaign, Illinois, by Richard Lanyon, November 2002. PP

26. "Methodology for Determining Dissolved Oxygen Impairment: A Case Study in Chicago Using Continuous Monitoring." Presented at the National TMDL Science and Policy Conference, Phoenix, Arizona, by Irwin Polls, November 2002. PP

27. "Regulatory Update: Pretreatment, User Charge and Water Quality Standards." Presented at the Industrial Water, Waste, and Sewage Group Meeting, Chicago, Illinois, by Richard Lanyon, November 2002. PP

---

*P = Available as a paper
B = Available as both a paper and PowerPoint Presentation
PP = Available as PowerPoint Presentation
PS = Poster Presentation

APPENDIX III

PAPERS PUBLISHED 2002

PAPERS PUBLISHED 2002

1. Cox, A., T.C. Granato, R.I. Pietz, and P. Tata, "Uptake of Cd and Zn by Garden Vegetables Grown in Nu Earth Biosolids Amended Soil." Proceedings of the Water Environment Federation 16th Annual Residuals and Biosolids Management Conference, Austin, Texas, 2002.

2. Khalique, A., R.I. Pietz, P. Tata, and R. Lanyon, "Radiological Monitoring Activities at the Metropolitan Water Reclamation District of Greater Chicago." Proceedings of the Water Environment Federation 75th Annual Conference, Chicago, Illinois, 2002.

3. Lanyon, R., "Meeting Water Quality Standards in Chicago Waterways." Proceedings of the Water Environment Federation 75th Annual Conference, Chicago, Illinois, 2002.

4. O'Connor, T.K., R. Lanyon, J.T. Zurad, B. Schwartz, and P. Tata, "Beneficial Utilization of Biosolids at the Metropolitan Water Reclamation District of Greater Chicago." Proceedings of the Water Environment Federation 75th Annual Conference, Chicago, Illinois, 2002.

5. Polls, I., R. Lanyon, and M. Sopcak, "Continuous Dissolved Oxygen Monitoring in Chicago." Proceedings of the Water Environment Federation 75th Annual Conference, Chicago, Illinois, 2002.

6. Rijal, G., J.T. Zmuda, R. Gore, B. Sawyer, P. Tata, R. Lanyon, and C. Lue-Hing, "Part 503 Compliance Monitoring of Biosolids for Pathogen Reduction Requirements at the Metropolitan Water Reclamation District of Greater Chicago." In Abstracts of the 102nd General Meeting of the American Society for Microbiology, Salt Lake City, Utah, pp. 430, May 19-23, 2002.

7. Sustich, R., R. Lanyon, and W. Stuba, "Innovative Partnerships with Industry via Project XL for an Effective Pretreatment Program." Proceedings of the Water Environment Federation 75th Annual Conference, Chicago, Illinois, 2002.

8. Tata, P., R. Lanyon, and C. Lue-Hing, "Main Drivers for the Solids Management Practices at the Metropolitan Water Reclamation District of Greater Chicago - A Histori-

cal Perspective." Proceedings of the Water Environment Federation 16th Annual Residuals and Biosolids Management Conference, Austin, Texas, 2002.

9. Zurad, J.T., J.P. Sobanski, J.R. Rakoczy, and R. Lanyon, "The Metropolitan Water Reclamation District of Greater Chicago; Our Second Century of Meeting Challenges and Achieving Success." Proceedings of the American Society of Civil Engineers 150th Anniversary, Annual Conference, Washington, D.C., pp. 22-33, November 3-7, 2002.