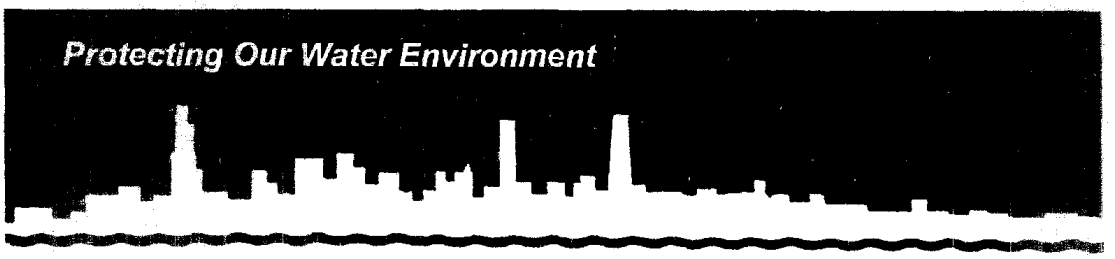

Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 01-10

RESEARCH AND DEVELOPMENT

2000

ANNUAL REPORT

May 2001

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

RESEARCH AND DEVELOPMENT
2000
ANNUAL REPORT

Research and Development Department
Richard Lanyon, Director

May 2001

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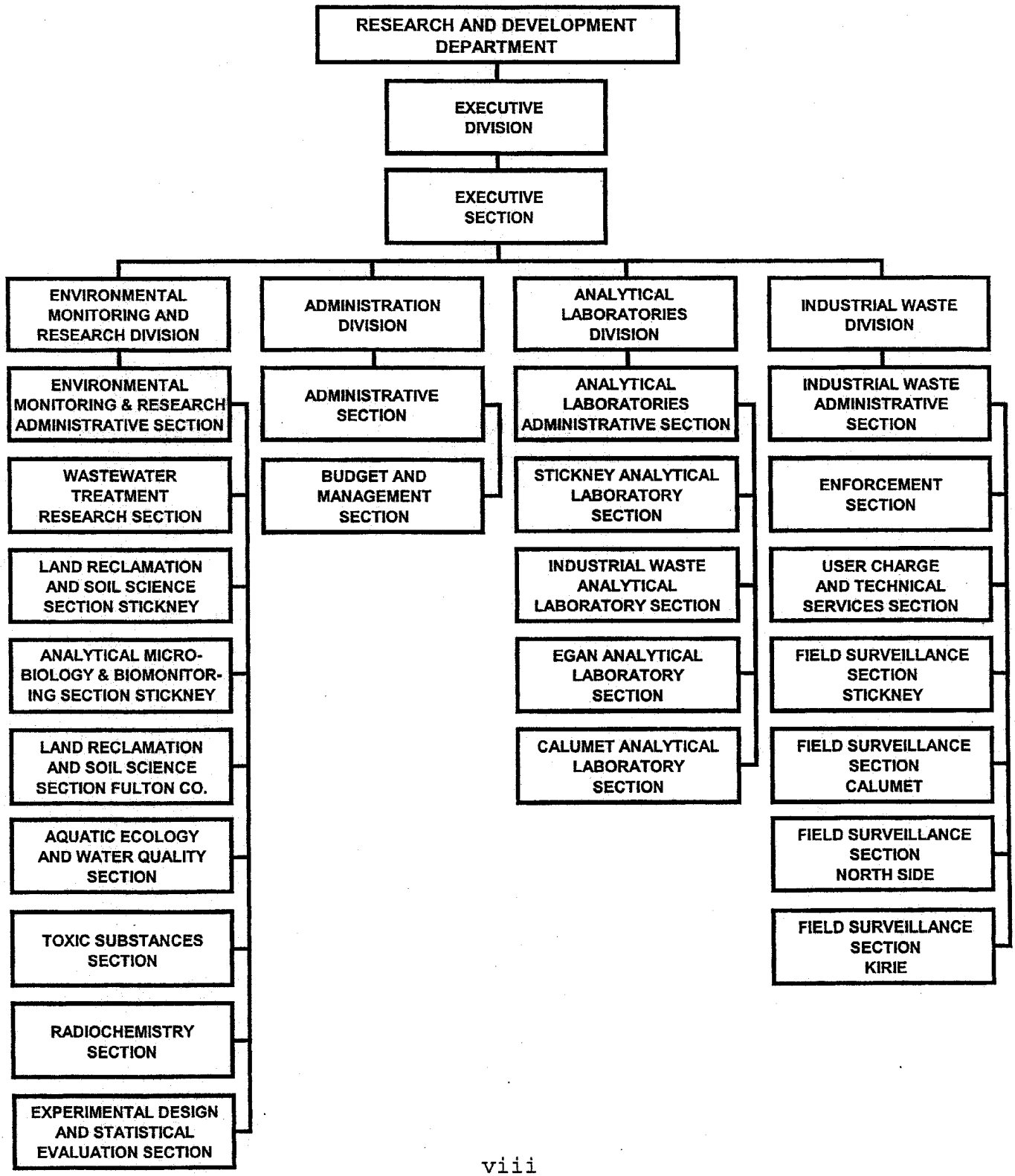
DISCLAIMER

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 2000



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 355 budgeted positions during 2000 with a total salary and wage appropriation of $19,591,737. 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 2000, the Department reviewed personnel actions relative to eight retirements. In

addition, as part of adopting the 2000 Budget and the District's attrition program, ten existing positions were designated for elimination when vacated during 2000. By year-end, actual positions eliminated upon vacancy by incumbents totaled eight. This decrease in positions led to an average expenditure to appropriation ratio of 95 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 located in the District offices. During 2000, 67 industrial site visits or assessments to provide technical assistance were conducted under GCP3.

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. For-

mal presentations on the GCP3 and pollution prevention were given to 4 organizations in 2000.

The Annual District Pollution Prevention Award program honors industrial and/or commercial dischargers for outstanding multimedia pollution prevention efforts.

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 2000, 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 2000, the District's financial, budgeting, procurement and human resource systems were replaced with a new District-wide integrated system or enterprise system. The new system replaced the legacy multiple systems with one system having several modules that feed data to one another, and eliminated the duplicate data entries required with the legacy

systems. The Administration Division coordinated the training on this new system for all R&D employees and coordinated its use throughout the department.

Budget Administration

A comparison of appropriations to expenditures for 2000 shows the following:

	Appropriation	Expenditure
Personnel (Line Item 101)	$19,591,737	$18,276,220
Other Line Items	4,805,063	3,784,359
Total	$24,396,800	$22,060,579

Purchasing Administration

During 2000, more than 500 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 2000, the Division was involved in the preparation and administration of 31 contracts for a total cost of approximately $2,438,722, 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) and processing of purchase requisitions and change orders.

The Division administered 23 consulting services agreements having a total value of approximately $2,966,341 during 2000. This involved processing purchase requisitions and change orders, preparation of Board letters, management of fund reservations, preparation and execution of agreements, preparation of requests for proposals, and coordination of the receipt and review of proposals.

Laboratory Accreditation

The Division is coordinating laboratory accreditation with the State of Illinois for six R&D laboratories. As an accrediting authority for the National Environmental Laboratory Accreditation Conference, the Illinois Environmental Protection Agency in January 2001 accredited the Calumet Analytical Laboratory (ALD) and the Toxic Substances Section (EM&R). The Calumet Analytical Laboratory has been accredited for inorganic analysis of wastewater. The Toxic Substances Section has been accredited for organic analysis of wastewater, and organic analysis of solid and hazardous waste.

Applications for accreditation of the three other ALD laboratories are pending. Applications for the Stickney and Industrial Waste Analytical Laboratories were submitted on April 26 and May 3, 2000, respectively. The Egan Laboratory application was submitted on December 9, 1999. All three laboratories are seeking accreditation for inorganic analysis of wastewater. On-site audits for these laboratories will be conducted in mid-2001 and decisions regarding accreditation are expected in 2001.

On July 20, 2000, the Radiochemistry Laboratory (EM&R) applied for certification with the Illinois Department of Nuclear Safety (IDNS). This certification program is administered by the IDNS under the USEPA guidelines for certification of laboratories engaged in the radiochemical analysis of drinking water and public water supplies. An on-site audit was conducted on February 16, 2001, and a decision regarding certification is expected in March or April 2001.

R&D has adopted the policy that departmental laboratories will seek accreditation (or certification) where appropriate accreditation programs are available. It should be noted that the Microbiology Laboratory (EM&R) has for many years maintained certification with the Illinois Department of Public Health (IDPH). This certification program is administered by the IDPH under the USEPA guidelines for certification of labo-

ratories engaged in the microbiological analysis of drinking water and public water supplies.

Departmental Reports

During 2000, 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 REPORTS PUBLISHED DURING 2000

	Report Title	Author (s)	Date	Organization or Conference Which Presented
2000-1	Calculation of User Charge Rates and Extraordinary Monitoring and Enforcement Costs and Charges for 2000	R&D Department	Jan-00	Internal District Report
2000-2	Effect of Additional Pumping on the Polymer Demand of Anaerobically Digested Sludge - a Laboratory Study	S. Soszynski, D.T. Lordi, B. Sawyer, P. Tata, C. Lue-Hing	Jan-00	Internal District Report
2000-3	1998 Annual Summary Report Water Quality Within the Waterways System of the Metropolitan Water Reclamation District of Greater Chicago	Z. Abedin, R.I. Pietz, P. Tata, G. Knafl	Feb-00	Internal District Report
2000-4	Virus Levels in the Des Plaines River Before and After Construction of the Middle Leg of the Des Plaines TARP System	J. Zmuda, S.J. Sedita, P. Tata, D.R. Zenz, C. Lue-Hing	Mar-00	Internal District Report
2000-5	Study of Zinc Concentrations in Calumet Water Reclamation Plant Digester Draw	B. Sawyer, B. Washington, T. Liston, S. Sopcak-Phelan, R. Sustich, T. Moscinski, D. Lordi, P. Tata	Mar-00	Internal District Report
2000-6	Quality Control Analyses of Polymers Delivered to the Stickney WRP	J. Kaschak, D.T. Lordi, S. Soszynski, B. Sawyer, P. Tata, C. Lue-Hing	Apr-00	Internal District Report
2000-7	Chemical Characteristics of Combined Sewer Overflow and Tunnel and Reservoir Plan Flows in 1995 through 1997	H. Zhang, J.S. Jain, B. Sawyer, P. Tata	Apr-00	Internal District Report

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1 (Continued)

RESEARCH AND DEVELOPMENT REPORTS PUBLISHED DURING 2000

	Report Title	Author (s)	Date	Organization or Conference Which Presented
2000-8	Biological Conditions in the Des Plaines River 1992-1993	S.G. Dennison, I. Polls, R. Gore, J.T. Zmuda, B. Sawyer, P. Tata	Apr-00	Internal District Report
2000-9	Water Quality in the North and South Branches of the River, Chicago River and Inshore Area of Lake Michigan During November and December 1999	I. Polls, B. Sawyer, P. Tata, R. Lanyon	May-00	Internal District Report
2000-10	Final Report on Evaluation of Potential Electrical Energy Savings Using On-Line Respirometry for Control of Aeration at the James C. Kirie Water Reclamation Plant	K.K. Patel, S. Soszynski, P. Tata, J.S. Jain, B. Sawyer, C. Lue-Hing, J.J. Bertucci, K. Carns, D. Perkins	May-00	Internal District Report
2000-11	Research & Development 1999 Annual Report	R&D Department	Jun-00	Internal District Report
2000-12	Radiological Monitoring of the Raw Sewage, Final Effluent, Sludges, and Biosolids of the MWRDGC 1998 Annual Report	A. Khalique, R. Pietz, P. Tata	Sep-00	Internal District Report
2000-13	Test Procedures for the Selection and Procurement of Polymers for Centrifugal Dewatering of Anaerobically Digested Sludge	S. Soszynski, P. Tata, C. Lue-Hing	Oct-00	Internal District Report
2000-14	Report on Elevated Levels of Copper in Hanover Park Water Reclamation Plant Effluent from December 1998 through July 1999	D.T. Lordi, B. Sawyer, P. Tata	Nov-00	Internal District Report
2000-15	The Impact of Zion Nuclear Power Plant Operation on Lake Michigan Water Quality	A. Khalique, R. Pietz, P. Tata	Dec-00	Internal District Report

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Table 2

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2000

Report Title	Author (s)	Date	Organization or Conference Which Presented
Fulton County Environmental Protection System Nov 1999	R&D Department	Jan-00	Illinois Environmental Protection Agency, United States Environmental Protection Agency (IEPA \ USEPA)
Fulton County Environmental Protection System Nov 1999 - Amended Report	R&D Department	Feb-00	IEPA \ USEPA
Fulton County Environmental Protection System Dec 1999	R&D Department	Feb-00	IEPA \ USEPA
Fulton County Environmental Protection System Jan 2000	R&D Department	Mar-00	IEPA \ USEPA
Fulton County Environmental Protection System Feb 2000	R&D Department	Apr-00	IEPA \ USEPA
Fulton County Environmental Protection System Mar 2000	R&D Department	May-00	IEPA \ USEPA
Fulton County Environmental Protection System April 2000	R&D Department	Jun-00	IEPA \ USEPA
Fulton County Environmental Protection System May 2000	R&D Department	Jul-00	IEPA \ USEPA
Fulton County Environmental Protection System June 2000	R&D Department	Aug-00	IEPA \ USEPA
Fulton County Environmental Protection System July 2000	R&D Department	Sep-00	IEPA \ USEPA
Fulton County Environmental Protection System Aug 2000	R&D Department	Oct-00	IEPA \ USEPA
Fulton County Environmental Protection System Sept 2000	R&D Department	Nov-00	IEPA \ USEPA
Fulton County Environmental Protection System Oct 2000	R&D Department	Dec-00	IEPA \ USEPA

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Table 2 (Continued)

RESEARCH AND DEVELOPMENT UNNUMBERED REPORTS PUBLISHED DURING 2000

Report Title	Author (s)	Date	Organization or Conference Which Presented
Hanover Park Water Reclamation Plant Fischer Farm Report for 4th Quarter of 1999	R&D Department	Feb-00	IEPA \ USEPA
Hanover Park Water Reclamation Plant Fischer Farm Report for 1st Quarter of 2000	R&D Department	May-00	IEPA \ USEPA
Hanover Park Water Reclamation Plant Fischer Farm Report for 2nd Quarter of 2000	R&D Department	Aug-00	IEPA \ USEPA
Hanover Park Water Reclamation Plant Fischer Farm Report for 3rd Quarter of 2000	R&D Department	Nov-00	IEPA \ USEPA
Groundwater Monitoring Report, Tunnel and Reservoir Plan Des Plaines Tunnel System 1999 Annual Report	R&D Department	Jul-00	IEPA \ USEPA
Groundwater Monitoring Report, Tunnel and Reservoir Plan Upper Des Plaines Tunnel System 1999 Annual Report	R&D Department	Jul-00	IEPA \ USEPA
Groundwater Monitoring Report, Tunnel and Reservoir Plan Mainstream Tunnel System 1999 Annual Report	R&D Department	Jul-00	IEPA \ USEPA
Groundwater Monitoring Report, Tunnel and Reservoir Plan Calumet Tunnel System 1999 Annual Report	R&D Department	Jul-00	IEPA \ USEPA
Groundwater Monitoring Report, Tunnel and Reservoir Plan O'Hare Cup Reservoir Water Quality Monitoring Wells 1999 Annual Report	R&D Department	Jul-00	IEPA \ USEPA

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Table 2 (continued)

RESEARCH AND DEVELOPMENT MISCELLANEOUS REPORTS PUBLISHED DURING 2000

Report Title	Author (s)	Date	Organization or Conference Which Presented or Prepared by
Biomonitoring Report for 2000 James C. Kirie Water Reclamation Plant - NPDES Permit Number IL0047741	J.T. Zmuda	Aug-00	IEPA \ USEPA
Biomonitoring Report for 2000 Hanover Park Water Reclamation Plant - NPDES Permit Number IL0036137	J.T. Zmuda	Dec-00	IEPA \ USEPA
Biomonitoring Report for 2000 Lemont Water Reclamation Plant - NPDES Permit Number IL0028070	J.T. Zmuda	Jan-01	IEPA \ USEPA
Ecosystematic Study Report: Biological Water Quality within the Des Plaines River During 1992 and 1993	S.G. Dennison, I. Polls, R. Gore, R. Gore, J.T. Zmuda, B. Sawyer, P. Tata, R. Lanyon	Mar-00	Internal District Report
USEPA Annual 503 Report - January - December 1999		Feb-00	USEPA
Controlled Solids Distribution Program - September 1999 - Amended Report		Jan-00	IEPA
Controlled Solids Distribution Program - November 1999		Jan-00	IEPA
Controlled Solids Distribution Program - December 1999		Feb-00	IEPA
Calumet East Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA
Calumet West Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA
John Egan Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Table 2 (continued)

RESEARCH AND DEVELOPMENT MISCELLANEOUS REPORTS PUBLISHED DURING 2000

Report Title	Author (s)	Date	Organization or Conference Which Presented or Prepared by
HASMA Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA
LASMA Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA
RASMA Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA
122nd Stony Island Sludge Drying Area - 4th Qtr 1999 (Oct-Dec)		Feb-00	IEPA
Controlled Solids Distribution Program - January 2000		Mar-00	IEPA
Controlled Solids Distribution Program - February 2000		Apr-00	IEPA
Controlled Solids Distribution Program - March 2000		May-00	IEPA
Calumet East Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
Calumet West Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
John Egan Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
HASMA Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
LASMA Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
RASMA Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
122nd Stony Island Sludge Drying Area - 1st Qtr 2000 (Jan-Mar)		May-00	IEPA
Controlled Solids Distribution Program - April 2000		Jun-00	IEPA

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Table 2 (continued)

RESEARCH AND DEVELOPMENT MISCELLANEOUS REPORTS PUBLISHED DURING 2000

Report Title	Author (s)	Date	Organization or Conference Which Presented or Prepared by
Controlled Solids Distribution Program - May 2000		Jul-00	IEPA
Controlled Solids Distribution Program - June 2000		Aug-00	IEPA
Calumet East Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Aug-00	IEPA
Calumet West Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Aug-00	IEPA
John Egan Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Jul-00	IEPA
HASMA Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Aug-00	IEPA
LASMA Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Aug-00	IEPA
RASMA Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Jul-00	IEPA
122nd Stony Island Sludge Drying Area - 2nd Qtr 2000 (Apr-June)		Aug-00	IEPA
Controlled Solids Distribution Program - July 2000		Sep-00	IEPA
Controlled Solids Distribution Program - August 2000		Oct-00	IEPA
Controlled Solids Distribution Program - September 2000		Nov-00	IEPA
Calumet East Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA
Calumet West Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA
John Egan Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

Table 2 (continued)

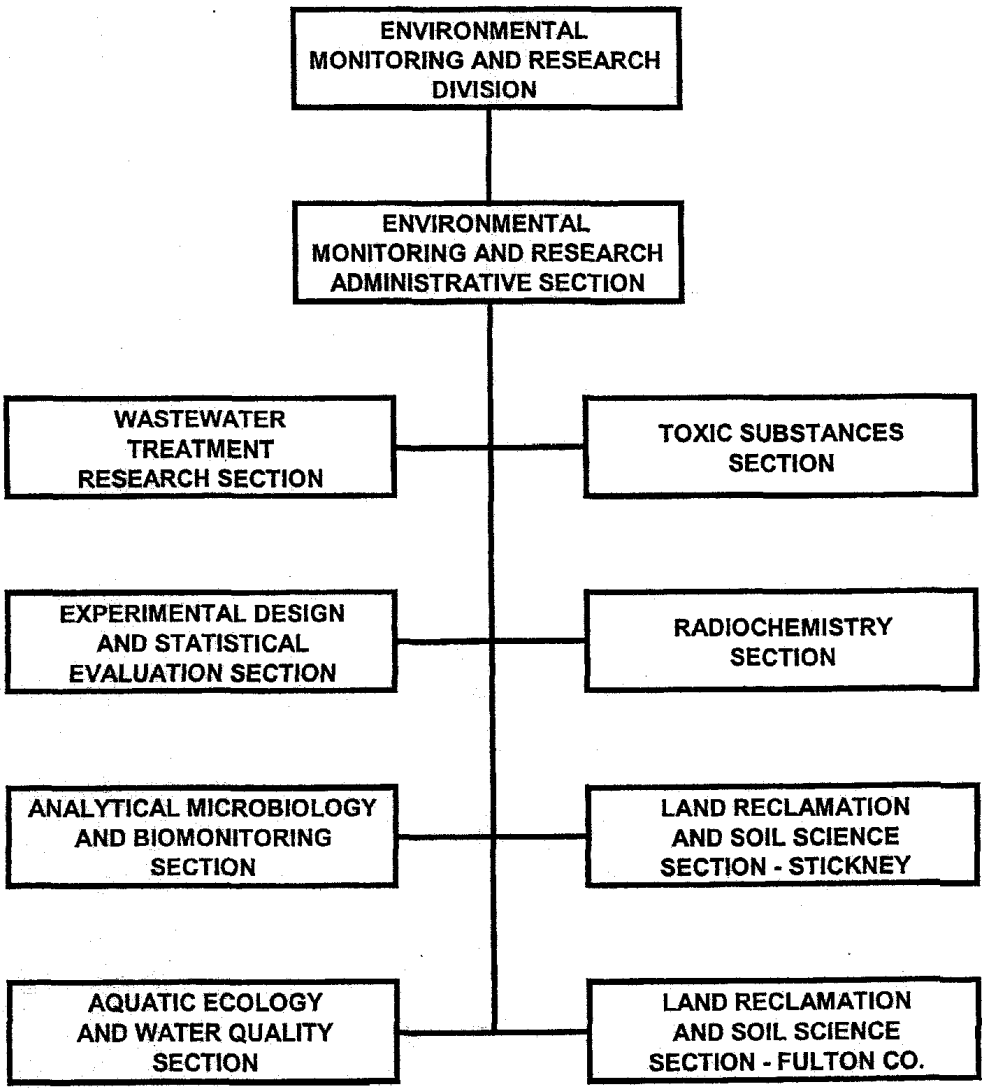
RESEARCH AND DEVELOPMENT MISCELLANEOUS REPORTS PUBLISHED DURING 2000

Report Title	Author (s)	Date	Organization or Conference Which Presented or Prepared by
HASMA Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA
LASMA Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA
RASMA Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA
122nd Stony Island Sludge Drying Area - 3rd Qtr 2000 (July-Sep)		Nov-00	IEPA
Controlled Solids Distribution Program - October 2000		Dec-00	IEPA
Controlled Solids Distribution Program - November 2000		Jan-01	IEPA
Controlled Solids Distribution Program - December 2000		Feb-01	IEPA
Calumet East Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Feb-01	IEPA
Calumet West Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Feb-01	IEPA
John Egan Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Jan-01	IEPA
HASMA Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Feb-01	IEPA
LASMA Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Feb-01	IEPA
RASMA Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Feb-01	IEPA
122nd Stony Island Sludge Drying Area - 4th Qtr 2000 (Oct-Dec)		Feb-01	IEPA

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 81 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 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 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:

CHEMICAL CHARACTERISTICS OF COMBINED SEWER OVERFLOWS (CSOs)

A report entitled, "Chemical Characteristics of Combined Sewer Overflows and Tunnel and Reservoir Plan Flows in 1995 through 1997," was prepared, which was published as R&D Department Report No. 2000-7. The report included priority pollutants in CSOs and TARP pumpback, and some conventional pollutants in the CSOs.

OXYGEN TRANSFER EFFICIENCY OF DIFFUSER PLATES

Tests were conducted to determine oxygen transfer efficiency (OTE) of the aeration tank diffuser plates at the North Side WRP during the summer and fall of 1999. The main objectives were (1) to evaluate the effectiveness of steam cleaning of diffuser plates on the OTE of the diffuser plates, and (2) to evaluate the OTE of diffuser plates in selected tanks of

Batteries A, B, and C. A preliminary report on the project has been completed.

TECHNICAL ASSISTANCE TO THE UNITED STATES ARMY CORPS OF ENGINEERS

Under a 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 proposed McCook Reservoir. This project involves desktop feasibility studies as well as some field work. Two reports, Part I and Part II, have been prepared. Part I contains comparison of different aeration technologies applicable to deep reservoirs, and Part II contains comparisons of washdown procedures for deep reservoirs.

AMMONIA SPIKE INCIDENTS AT THE STICKNEY WRP

A report entitled, "Investigation of Final Effluent Ammonia Spike Incidents on April 7 and July 22, 2000, at the Stickney Water Reclamation Plant and the Impact of Major Ammonia-Contributing Sources," was published.

EVALUATION OF SETTLING CHARACTERISTICS OF CSOs

A preliminary study was undertaken to evaluate the settling characteristics of CSOs under quiescent conditions, using two transparent PVC columns, each with a diameter of

6 inches and height of 10 feet. This study was undertaken to provide technical assistance to the ACOE in the design of the McCook Reservoir.

LOCAL LIMITS REEVALUATION

Based on USEPA guidance documents, the local limits developed by the District for nondomestic wastes are being reevaluated to see if the current local limits need revision and, if so, to what extent.

GROUNDWATER MONITORING OF THE TARP SYSTEMS

Groundwater monitoring reports for the year 1999 were prepared for the four TARP systems which included the Mainstream Tunnel System, the Calumet Tunnel System, the Des Plaines Tunnel System, and the Upper Des Plaines Tunnel System. These reports were submitted to the IEPA as well as to the USEPA. In addition, a report on O'Hare CUP Reservoir Groundwater Monitoring program for the year 1999 was also prepared and submitted to the IEPA and USEPA.

APPLICATION OF ON-LINE RESPIROMETER TO CONTROL AERATION IN THE ACTIVATED SLUDGE SYSTEM

A study on the application of an on-line respirometer to control aeration in the activated sludge system was completed and the results published in the R&D Department Report No.

2000-10. The experimental results showed that while aeration control by on-line respirometry is technically possible, further investigation is required with respect to operation and maintenance concerns. The potential for electrical energy savings was not realized at the James C. Kirie WRP because the current practice of aeration control by the use of automated on-line DO probes was found to be optimum.

ODOR MONITORING AT DISTRICT FACILITIES

A routine odor monitoring program at various locations in and around the District's WRPs was carried out. In addition, odor monitoring was also conducted at the District's biosolids management and air drying facilities, along with the determination of the odor potential of the dried biosolids.

POLYMER TESTING

An evaluation of the polymers to be used at the gravity belt thickener at the Hanover Park WRP was made in 2000. A comparison of the summer vs. winter polymers at the Stickney WRP postdigestion centrifuge complex was also conducted in 2000. The test procedures used by the District in the selection and procurement of polymers for the centrifugal dewatering of anaerobically digested sludges were published as R&D Department Report No. 2000-13.

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.

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 2000 the Section submitted 56 permit required reports to the IEPA, one report to the USEPA, and 12 reports to the M&O Department for reporting to IEPA.

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 reclamation of slag deposits, designing a demonstration site for growing woody trees in collaboration with Morton Arboretum, Lisle, Illinois, analyzing samples of urban street dusts and surface soils for their trace element content, and studying

the effect of soluble salts in biosolids 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 toxicity of trace elements to plants, and studying changes over time in 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 including the maintenance of experimental corn plots, which have received cumulative applications of 803 tons of biosolids per acre (maximum-amended plots) from 1973 through 2000. These plots are utilized to study changes in fertility of mine soil, uptake of trace elements into corn, and 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 Dr. Cecil 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 2000 the Analytical Microbiology and Biomonitoring Section was composed of 3 professional and 12 technical personnel. The Section was comprised of the following subgroups, which performed specific monitoring or research activities: Virology, Parasitology, Analytical Microbiology, Biomonitoring, and Toxicology. The activities of the Section are summarized below.

VIROLOGY AND PARASITOLOGY SUB-GROUPS

Air-dried biosolids (final product) were analyzed for viruses and viable *Ascaris* ova for compliance with the Part 503 *Standards for the use or Disposal of Sewage Sludge* (Standards). All biosolids produced from the District's codified sludge processing trains 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 43 percent (six samples), and the average recovery of spiked *Ascaris* ova was 39 percent (three samples).

Raw sewage and digester feed samples from the Stickney WRP were analyzed for viruses as requested by the USEPA Pathogen Equivalence Committee (PEC). The density of viruses in

Stickney raw sewage was determined to be <12 confirmed plaque forming units (PFUs) per L (6 samples). The density of viruses in the digester feed ranged from 0.1965 to 13.105 confirmed PFUs per 4 g (8 samples). These results were consistent with previous findings that the number of viruses in raw sewage entering the Stickney WRP is relatively low, and that viruses present in raw sewage are concentrated in the sludge fed to the anaerobic digesters. Virus levels in the samples were determined by both the USEPA method and the District's method. In each case, virus densities determined using the District's method were as equal or higher than the results obtained using the USEPA method.

A large composite sample of Stickney digester feed (20.35 L) and an equivalent amount of Stickney air-died final product were analyzed for viable *Ascaris* ova to demonstrate that a two-log reduction in viable *Ascaris* ova takes place in the Stickney sludge solids process train. Discussions with the PEC of the USEPA are still on-going to obtain Process to Further Reduce Pathogens (PFRP) equivalency to the District's sludge processing trains.

Two papers on the PFRP study were published in the Water Environment Research Journal in the July/August issue.

ANALYTICAL MICROBIOLOGY SUB-GROUP

A database was developed to determine the *E. coli* to fecal coliform (FC) ratio in water samples from Lake Michigan, District WRPs, and the Chicago area waterways. A total of 496 analyses were conducted for this study in anticipation of the adoption of new water quality standards that will specify *E. coli* instead of FC limits. FC and other microbiological analyses were conducted in support of monitoring studies of the following areas: Illinois Waterway; Chicago Area Waterways; Lake Michigan beaches; offshore waters of Lake Michigan; biosolids monitoring for Part 503 compliance; solids area monitoring wells; and TARP monitoring. Potable water at District facilities was monitored for total coliforms, FC, and total heterotrophic bacteria. The Analytical Microbiological Laboratory was re-certified by the Illinois Department of Public Health after a formal audit in November.

BIOMONITORING AND TOXICITY SUB-GROUPS

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. Biomonitoring reports for the Hanover Park, Kirie, and Lemont WRPs were submitted to the IEPA in compliance with the

respective NPDES permits. Effluents from all seven Districts WRPs were also monitored for toxicity using the basic Microtox™ test. No toxicity was observed in any of the effluents.

Aquatic Ecology and Water Quality Section

The newly formed Aquatic Ecology and Water Quality Section is responsible for assessing water and sediment quality in Chicago area waterways. An additional responsibility is to review emerging federal and state water quality regulations (e.g. antidegradation, nutrients, and TMDLs) that directly relate to District NPDES permits and the effects of District pollution control activities on instream water quality. Monitoring activities conducted during 2000 included the following:

BENTHIC INVERTEBRATE MONITORING

During August, sediment samples were collected from one station in the Chicago Sanitary and Ship Canal and nine stations in the lower Des Plaines River. These samples were washed, screened, and the benthic organisms were counted. The benthic data will be used by the IEPA for a Use Attainability Analysis (UAA) of the lower Des Plaines River.

CONTINUOUS DO MONITORING

Continuous hourly DO monitoring continued during 2000 at 20 stations in the Chicago Waterway System from the Wilmette Pumping Station in the North Shore Channel to the Lockport Lock in the Chicago Sanitary and Ship Canal. A report was prepared that summarized the DO values measured during August 1998 through July 1999.

FISH MONITORING

Fish were collected at 25 stations in the Chicago and Calumet Waterway Systems. Over 2000 fish were identified, weighed, measured for length, and examined for parasites and disease. Additionally, 44 composite fish fillet samples were prepared and sent to the IEPA for contaminant analysis.

ILLINOIS WATERWAY MONITORING

During May, August, and October, water samples were collected from 49 sampling stations along 133 miles of the Illinois Waterway System from the Lockport Lock to the Peoria Lock to determine the water quality from Chicago to Peoria. In order to characterize the chemical quality of the sediments, sediment samples were collected during October from 14 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 for non-listed organic compounds when the detected peaks are ten times higher than the background. The Section currently analyzes for more than 120 non-listed organic compounds.

Quality Assurance/Quality Control (QA/QC) requirements were conducted 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 554 samples were analyzed during 2000. These consisted of 6 samples from Lake Diversion, 144 from industrial users, 132 from WRPs, 7 from Toxicity Characteristic Leaching Procedure (TCLP), 2 from CSOs, 14 from the USX Demonstration Site, 33 proficiency testing samples, and 216 to meet QA/QC requirements.

ANALYSIS OF WRP SAMPLES

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

Biosolids and scum are analyzed using TCLP to ensure that they are safe for disposal.

Raw sewage samples are analyzed monthly for volatile organic compounds (VOCs) to estimate through the use of mathematical models, the VOC air emissions from the WRPs. The ability to directly measure 62 VOCs contained in ambient air samples collected at the WRPs is acquired.

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 Diversion, CSOs, and the USX Demonstration Site for organic priority pollutants.

Radiochemistry Section

The Radiochemistry Section is responsible for the radiological monitoring of waters, wastewaters, and biosolids, the maintenance of radiation safety at the District, and the performance of any special tasks involving the use of ionizing radiation and radioisotopes. The Section performed 4,561 tests in 2000.

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 the 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 wastewater, 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 effluent 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 final effluents from the District's seven WRPs do not adversely affect the radiological quality of the Chicago River Systems.

The Section also performs radiological monitoring of biosolids from the seven WRPs, and from the eight solids drying sites of the District. The monitoring data serve 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.

RADIATION SAFETY PROGRAM ACTIVITIES

The Section maintains the radioactive material license issued to the District by the Illinois Department of Nuclear Safety, 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,

and an x-ray fluorescent paint analyzer used by the M&O 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; soil samples were analyzed for potassium-40, cesium-137, bismuth-212, lead-212, bismuth-214, and lead-214 activity.

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 PCs and associated computing media. They also developed programs to interconnect SAS with Visual Basic 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 than before.

STATISTICAL AND COMPUTING SUPPORT

During 2000, an associate statistician and a statistical consultant in the Section 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 Land Reclamation and Soil Science Section to evaluate the effect of time after cessation of biosolids applications on the concentration of cadmium, copper, nickel, and zinc in soil, leaves, and grain of corn from fields at the District's Fulton County site.

2. Statistical support was provided to compare the odor threshold values (ED_{50}) in the District's 24-hour cake and lagoon aged cake at the WRPs.

3. Statistical support was provided to the Biology Section on the toxicity studies with *Pimephelas promelas*. Studies were conducted on the variation of a mortality rate due to age and the level of the toxicant. The studies began in the middle of 1999 and were completed in early April 2000.

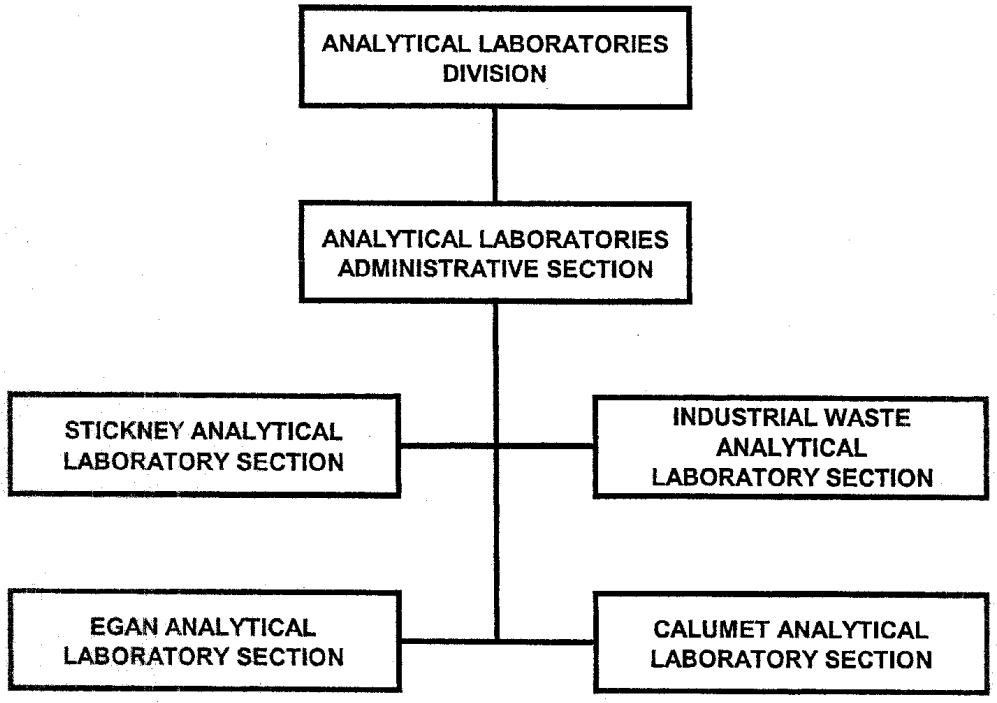
4. Statistical support was provided on the study of oxygen transfer efficiency (OTE) diffuser plates in aeration tanks. The project began in July 1999 and was completed in May 2000.

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 1999 were evaluated regarding compliance with water quality standards set by the Illinois Pollution Control Board (IPCB). In 1999, 28 water quality parameters (temperature, phenols, un-ionized ammonia, zinc, cadmium, copper, chromium, nickel, lead, mercury, boron, arsenic, selenium, barium, silver, soluble iron, gross beta activity, dissolved oxygen, pH, chloride, ammonium nitrogen, total dissolved solids, sulfate, fecal coliform, fluoride, weak acid dissociable cyanide, iron and manganese) were assayed. The first 17 parameters listed were in total compliance in General Use Waters of all river systems. A draft of the 1999 water quality annual report was prepared in 2000 and is currently under review.

Figure 2

ANALYTICAL LABORATORIES DIVISION ORGANIZATION CHART



ANALYTICAL LABORATORIES DIVISION

The Analytical Laboratories Division (ALD) functions as an analytical service to the District. The Maintenance and Operations (M&O) Department receives analytical support for operational control and process evaluations, and for the National Pollutant Discharge Elimination System (NPDES) reports to the USEPA, and the IEPA. The Engineering Department receives data necessary for the planning and design of future water reclamation plants (WRPs).

The Industrial Waste Division (IWD) receives analytical services pursuant to the monitoring of industrial discharges for verification of User Charge revenue, and for compliance with sewer discharge standards. Analytical support is supplied to the Environmental Monitoring and Research Division (EM&R) for a variety of long- and short-term studies and for environmental monitoring programs. In addition to these functions, analytical service is extended through intergovernmental cooperation to outside agencies such as the IEPA, the Illinois Attorney General, and various federal agencies.

In order to implement these functions, there are four laboratory sections, one each is located at the Calumet and John E. Egan WRPs and two are located at the Dr. Cecil

Lue-Hing Research and Development Complex (Lue-Hing R&D Complex) at the Stickney WRP.

The large number of analyses performed by the ALD, as shown in the table on the next page, could not be accomplished without automation and instrumentation. To automate data acquisition, storage and reporting from these instrument, the Laboratory Information Management System (LIMS) was in the process of being upgraded and improved in 2000 to increase processing and reporting speed, and take advantage of new functionality and ensure continued technical support.

Stickney Analytical Laboratory

This laboratory is located at the Lue-Hing R&D Complex and performed 715,182 solids, nutrients, and metals analyses on 48,095 samples in providing service for the following:

M&O DEPARTMENT

1. Analysis for Solids Management Areas at Harlem Avenue, Lawndale Lagoons, Ridgeland Avenue, Stony Island, and Calumet.
2. Process Control, Operations Monitoring, and NPDES Compliance Monitoring for the Stickney WRP.
3. USEPA and IEPA Split Sampling Program.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TOTAL NUMBER OF ANALYSES PERFORMED IN 2000

Program	Nutrients	Oxygen Demands	Metals	Solids	Others	Total Program
4652 Liquid Monitoring	99,461	84,731	185,744	62,926	63,573	496,435
TARP	3,745	736	1,283	1,372	2,806	9,942
Treatment Facilities	95,716	83,995	184,461	61,554	60,767	486,493
4653 Solids Monitoring	19,884	1,137	53,749	106,699	45,713	227,182
4666 Sewage & Waste Control	1,547	163	450,468	326	18,000	470,504
4663 User Charge	0	84,975	0	30,569	48,985	164,529
4671 Lake Michigan	219	182	0	221	336	958
4672 Waterways	11,028	2,458	23,629	3,125	58,294	41,006
4673 Inspection Events	0	0	18,183	0	2,505	20,688
4674 IPCB Water Quality	0	0	0	0	0	0
4681 Assistance to M&O	467	29	661	2,899	12,309	16,365
4682 Assistance to Others	0	0	0	0	749	749
4690 Operations & Research	9,725	682	5,973	568	5,431	22,379
Totals	142,331	174,357	738,407	207,333	215,655	1,478,083

4. Tunnel and Reservoir Project (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. Analytical Support for Biosolids Marketing.
4. Fish Survey of the Chicago Waterway System.
5. Biosolids Salinity Study.
6. Chicagoland Waterways Monitoring Program.
7. Illinois Waterways Monitoring Program.

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 such as lubricants, sodium hypochlorite, and ferric chloride purchased by the District for verification of contract requirements.

Analytical services for certain essential processes at the Stickney WRP are provided seven days a week. The following critical areas are supported: (1) the boiler water operation, (2) the raw sludge thickening process, and the biosolids dewatering operation.

In addition, technical assistance is extended to the M&O Department for short-term process control test programs.

The Stickney Analytical Laboratory submitted its application to the IEPA for laboratory accreditation in April 2000.

Industrial Waste Analytical Laboratory (IWAL)

The IWAL is located at the Lue-Hing R&D Complex and performed 255,881 analyses on 39,421 samples. The laboratory performs analysis for fats, oil and grease; 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.

IWD

Administration of the Sewage and Waste Control Ordinance and the User Charge Ordinance.

In 2000, the laboratory concluded a cyanide methodology study in conjunction with a Water Environment Federation Research Foundation study. The study was expanded to include other parameters, in order to give a better characterization of the samples analyzed. The laboratory also initiated a study in conjunction with the USEPA. This study assessed the recovery of cyanide from both inorganic and organic compounds using the Manual Distillation Method and the Kelada Automated System.

Calumet Analytical Laboratory

This laboratory is located at the Calumet WRP and performed 252,082 analyses on 28,778 samples in providing service 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.

John E. Egan (Egan) Analytical Laboratory

This laboratory is located at the Egan WRP and performed 255,131 analyses on 26,713 samples in providing service 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.
6. Polymer Testing for Raw Sludge Dewatering at the Egan and Hanover Park WRPs.
7. Soluble Copper Study at Kirie and Hanover Park WRPs.
8. Egan WRP Centrifuge Cake Testing for Application of Sludge to Land, Part 503 Reporting Requirements.
9. Hanover Park WRP Lagoon Sludge Testing for Application of Sludge to Land, Part 503 Reporting Requirements.

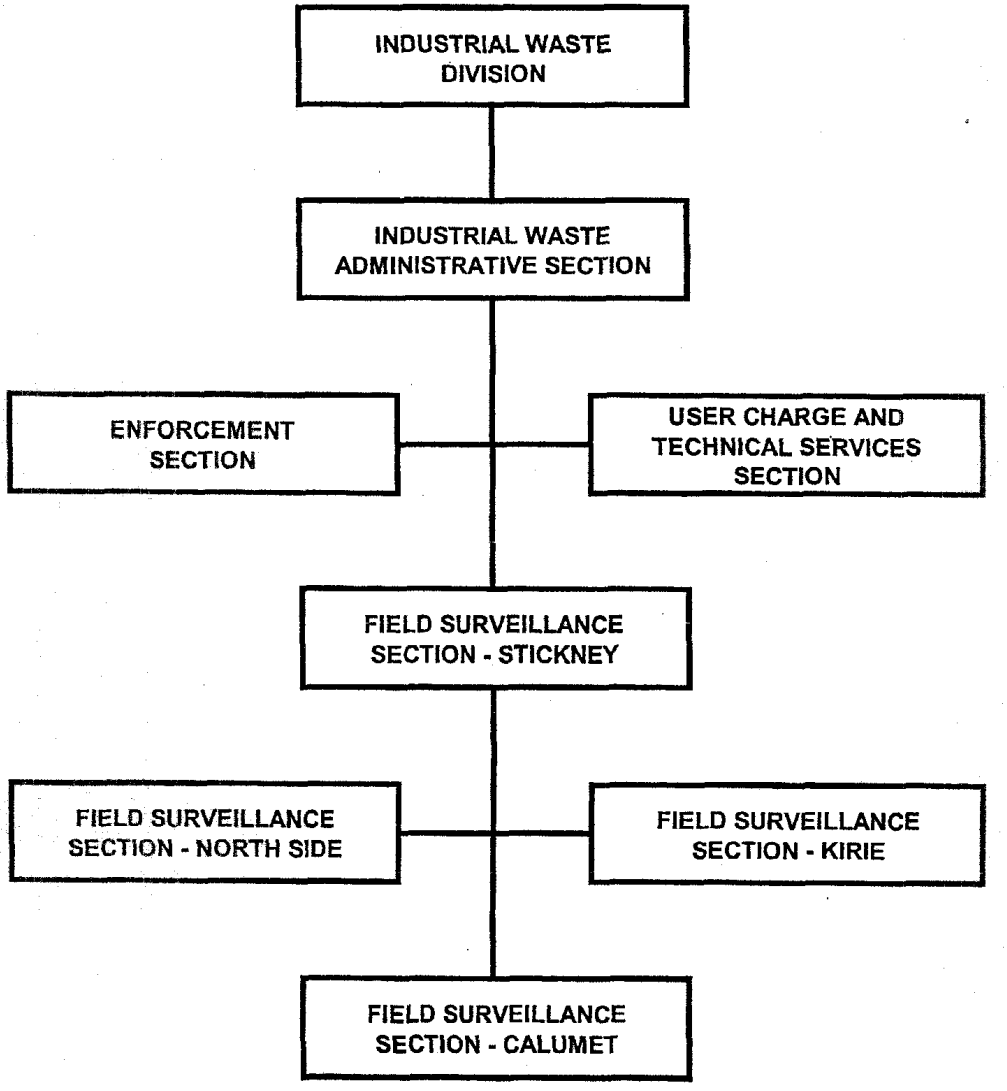
10. Development, Implementation and Support of LIMS Reports for Use by M&O Personnel at the Four North Area WRPs.

EM&R DIVISION

1. Analytical Support for Street Dust Study.
2. Monitoring of Biosolids Utilization Activities at Hanover Park WRP.
3. Hanover Park WRP Final Clarifier Bulking Study.
4. Analysis of CSO Samples for the Kirie and North Side WRPs.
5. Street Dust Characteristic Study.

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 De-

partment, 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 2000 included the issuance or renewal of 204 Discharge Authorizations, the review of 1,043 Continued Compliance Reports and the review of 36 Spill Prevention, Containment and Countermeasure Plans. Enforcement activities for the period from 1996 through 2000 are depicted in the following table.

Year	Cease and Desist Orders/Amendments	Board Orders	Legal Actions/Amendments
1996	657	6	139
1997	618	8	110
1998	512	4	70
1999	595	6	58
2000	462	2	0

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 1996 through 2000 is depicted in the following table.

Year	Effluent Limitations	Reporting Requirements	Other Re-quirements[1]	Total Number of Industrial Users Published
1996	91	98	3	192
1997	50	61	2	113
1998	30	28	1	59
1999	30	36	0	66
2000	22	59	1	79

[1]Other violations include 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 2000, the Section received and reviewed reported filed by 3,780 users (1,002 commercial-industrial and 2,778 tax-exempt users) containing calculations of their User Charge liabilities under the UCO and documentation corroborating their data. The Section classified 94 new commercial-industrial and tax-exempt users in 2000.

The Section requests verification sampling of certain facilities by the Field Surveillance and Studies Section, and determined the acceptability of the user's proposed sampling methodology. In 2000, the Section approved 34 user proposals for sampling, monitoring and/or installations, sealed 68 privately owned water meters used for reporting volume deductions or discharge volumes, and conducted 571 field inspections to verify user data and/or compliance with the UCO.

The following table shows the User Charge revenue, as reported by the District's Finance Department, collected over the period from 1996 through 2000.

Year	User Charge Revenue Collected
1996	$52,634,723
1997	$53,616,869
1998	$49,686,666
1999	$53,354,085
2000	$49,297,496

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 2000, 1,226 SWCO and 566 UCO inspection 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 2000, 12,996 water quality samples were collected. Further, all groundwater monitoring wells installed for the District's TARP were routinely sampled. In 2000, 583 samples were obtained at 114 TARP groundwater monitoring wells. Chemical toilet service companies who, under District permit, discharge cleanings at the

Stickney WRP are also monitored and sampled. During 2000, three chemical toilet service companies made 392 disposals at the Stickney WRP. For these disposal events, 72 samples were randomly obtained.

The Section is also responsible for the investigation of spills or 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 discharge incidents.

In 2000, 298 investigations were conducted in response to requests from federal, state and local agencies, municipalities and private citizens; 50 investigations were conducted in response to self-reported industrial activities; and 35 investigations were conducted in response to requests from the District's M&O Department.

MEETINGS AND SEMINARS 2000

1. American Electroplaters and Surface Finishers Society, Environmental Excellence Annual Meeting, Orlando, Florida, January 2000.

2. Annual Meeting of United States Department of Agriculture, Regional Research Committee W-170, Las Vegas, Nevada, January, 2000.

3. Illinois Environmental Protection Agency, Governor's Environmental Forum, Springfield, Illinois, January 2000.

4. Illinois Water Environment Association, Government Affairs in Water Pollution Control Seminar, Lisle, Illinois, January 2000.

5. Industrial Water, Waste, and Sewage Group Dinner Meeting, Chicago, Illinois, January 2000.

6. Lake Michigan Water Analysts Winter Meeting, Kenosha, Wisconsin, January 2000.

7. Water Environment Research Foundation Research Council Meeting, Washington, D.C., January 2000.

8. Illinois Chapter American Fisheries Society Annual Meeting and Workshop, Mt. Vernon, Illinois, February 2000.

9. Illinois Dental Waste Symposium, Chicago, Illinois, February 2000.

10. Illinois Environmental Protection Agency, Bureau of Water, TMDL Public Meeting, Springfield, Illinois, February 2000.

11. Northern Illinois Planning Commission, Tools for Urban Water Resource Management Conference, Chicago, Illinois, February 2000.

12. Perkin Elmer Midwest Inorganic Analysis Workshop, Oak Brook, Illinois, February 2000.

13. United States Environmental Protection Agency, Compliance Assistance Providers' Forum, Atlanta, Georgia, February 2000.

14. Water Environment Federation 2000 Program Committee Mid-year Meeting, Anaheim, California, February 2000.

15. Water Environment Federation National Biosolids Conference, Boston, Massachusetts, February 2000.

16. Illinois Association of Environmental Laboratories Inc. Meeting, Joliet, Illinois, March 2000.

17. Illinois Water Environment Association 21st Annual Conference, Peoria, Illinois, March 2000.

18. Industrial Water, Waste and Sewage Group Dinner Meeting, Chicago, Illinois, March 2000.

19. Lake Michigan Water Analyst Steering Committee Meeting, Kenosha, Wisconsin, March 2000.

20. National Biosolids Partnership, Environmental Management System Development Workgroup, Denver, Colorado, March 2000.

21. Ohio Environmental Protection Agency, Metal Finishing Sector Strategic Goals Program Workshop, Columbus, Ohio, March 2000.

22. Pittsburgh Conference 2000, New Orleans, Louisiana, March 2000.

23. Water Environment Federation, Water Quality 2000 Revisited Meeting, Washington, D.C., March 2000.

24. Water Environment Research Foundation Project Subcommittee Meeting, Washington, D.C., March 2000.

25. Agilent Technologies Metals Analysis Seminar, Naperville, Illinois, April 2000.

26. Biosolids Management in the 21st Century, College Park, Maryland, April 2000.

27. Central States Water Environment Association 5th Annual Education Seminar, Madison, WI, April 2000.

28. "Endocrine Disrupters in Drinking Water," Chicago, Illinois, April 2000.

29. Illinois Association of Wastewater Agencies 2000 Mini-Conference, Springfield, Illinois, April 2000.

30. Kansas Water Environment Association Annual Meeting, Lawrence, Kansas, April 2000.

31. National Organization of Black Chemists and Chemical Engineers 2000, Miami, Florida, April 2000.

32. "Practical Aspects of Nutrient Control Strategies," Madison, Wisconsin, April 2000.

33. TJA Solutions Seminar, Schaumburg, Illinois, April 2000.

34. United States Environmental Protection Agency, 19th Annual National Conference on Managing Environmental Quality Systems, Albuquerque, New Mexico, April 2000.

35. Water Environment Federation, Odors & VOC Emissions 2000 Specialty Conference, Cincinnati, Ohio, April 2000.

36. Whole Effluent Toxicity Training, Bloomington, Minnesota, April 2000.

37. Association of Metropolitan Sewerage Agencies, 2000 National Environmental Policy Forum & 30th Anniversary Annual Meeting, Washington, D.C., May 2000.

38. "Building a Data Warehouse Using SAS/Warehouse Administrative Software," Overland Park, Kansas, May 2000.

39. City of Chicago, Calumet Research Summit Meeting, Chicago, Illinois, May 2000.

40. Industrial Water, Waste and Sewage Group Dinner Meeting, Chicago, Illinois, May 2000.

41. Lake Michigan Water Analysts Spring Meeting, Chicago, Illinois, May 2000.

42. National Advisory Council for Environmental Policy and Technology, Compliance Assistance Advisory Committee Meeting, Washington, D.C., May 2000.

43. Siemens Critical Environments Educational Seminar, Chicago, Illinois, May 2000.

44. United States Environmental Protection Agency, Nutrient Criteria Development Stakeholders Meeting, Arlington, Virginia, May 2000.

45. Water Environment Research Foundation's Annual Subscriber Meetings, Chicago, Illinois, May 2000.

46. Air and Waste Management Association, 93rd Annual Conference, Salt Lake City, Utah, June 2000.

47. American Electroplaters and Surface Finishers Society Technical Exposition Surfin 2000, Chicago, Illinois, June 2000.

48. Annual Meeting North American Benthological Society, Keystone, Colorado, June 2000.

49. Government Finance Officers Association Annual Conference, Chicago, Illinois, June 2000.

50. University of Wisconsin, Analysis and Interpretation of Contaminated Sediments Short Course, Madison, Wisconsin, June 2000.

51. Water Environment Research Foundation Research Council Meeting, Seattle, Washington, June 2000.

52. Association of Metropolitan Sewerage Agencies Summer Meeting, Louisville, Kentucky, July 2000.

53. "Illinois Water Supplies: Is the Well Running Dry?," Chicago, Illinois, July 2000.

54. Lachat QC8000 Service Training, Milwaukee, Wisconsin, July 2000.

55. National Biosolids Partnership, Environmental Management System Development Workgroup, Portland, Maine, July 2000.

56. Advanced Composting Workshop, Bourbonnais, Illinois, August 2000.

57. Illinois Environmental Protection Agency, Bureau of Water Public Hearing Meeting, Springfield, Illinois, August 2000.

58. Lachat QC8000 Service Training, Milwaukee, Wisconsin, August 2000.

59. National Biosolids Partnership Steering Committee, Alexandria, Virginia, August 2000.

60. "Working with your Zymate System," Hopkinton, Massachusetts, August 2000.

61. Cole-Palmer Workshop, Vernon Hills, Illinois, September 2000.

62. "Ecological Assessment of Aquatic Resources: Application, Implementation, and Communication," Pellston, Michigan, September 2000.

63. Federation of Analytical Chemistry & Spectroscopy Societies 2000, Nashville, Tennessee, September 2000.

64. Illinois Association of Environmental Laboratories Inc. Meeting, Willowbrook, Illinois, September 2000.

65. Illinois Environmental Protection Agency, Illinois Association of Wastewater Agency's Annual Pretreatment Conference, Aurora, Illinois, September 2000.

66. Illinois Environmental Protection Agency, Watershed Management Committee Meeting, Springfield, Illinois, September 2000.

67. "Introduction to Basins," Rosemont, Illinois, September 2000.

68. Joint United States Environmental Protection Agency Region V and Water Environment Federation, Symposium on Innovative Uses of Biosolids, Chicago, Illinois, September 2000.

69. LabSystems World 2000, Fort Lauderdale, Florida, September 2000.

70. "Multivariate Statistical Methods: Practical Applications," Chicago, Illinois, September 2000.

71. National Biosolids Partnership, Environmental Management System Development Workgroup, Seattle, Washington, September 2000.

72. Radiation Safety Officer Refresher Training Course, Radiation Safety Associates, Inc., Hebron, Connecticut, September 2000.

73. United States Environmental Protection Agency, Introduction to BASINS Software Workshop, Chicago, Illinois, September 2000.

74. Western Pennsylvania Water Pollution Control Association Annual Meeting and Technical Conference, Pittsburgh, Pennsylvania, September 2000.

75. 2000 Midwest Workshop Tour, Chicago, Illinois, October 2000.

76. Endocrine Disrupter Briefing, United States Environmental Protection Agency, Region V, Chicago, Illinois, October 2000.

77. Hydrogen Sulfide Health Research and Risk Assessment Symposium, API, EPA, CIIT, Chapel Hill, North Carolina, October 2000.

78. Illinois Department of Public Health Environmental Laboratory Seminar, Springfield, Illinois, October 2000.

79. Lake Michigan Water Analysts Fall Meeting, Milwaukee, Wisconsin, October 2000.

80. Water Environment Federation 73rd Annual Conference, Anaheim California, October, 2000.

81. Association of Metropolitan Sewerage Agencies, United States Environmental Protection Agency, Pretreatment Coordinators' Workshop, Tucson, Arizona, November 2000.

82. Illinois Water 2000 Conference, Urbana, Illinois, November 2000.

83. Illinois Water Environment Association Industrial Pretreatment Committee Annual Meeting, Lombard, Illinois, November 2000.

84. National Advisory Council for Environmental Policy and Technology Meeting, Washington, D.C., November 2000.

85. Society of Environmental Toxicology and Chemistry Annual Meeting, Nashville, Tennessee, November 2000.

86. Soil Science Society of America Annual Meeting, Minneapolis, Minnesota, November 2000.

87. "Using Models to Develop Air Toxics Reduction Strategies: Lake Michigan as a Test Case," Lake Michigan Forum, The Delta Institute, Science Advisory Board of the International Joint Committee, Milwaukee, Wisconsin, November 2000.

88. American Chemical Society Short Courses, Chicago, Illinois, December 2000.

89. Illinois Pollution Control Board, Regulatory Hearing Antidegredation, Springfield, Illinois, December 2000.

90. The Midwest Environmental Laboratory Summit, Chicago, Illinois, December 2000.

PAPERS PRESENTED 2000

1. "An Update of Ongoing Research at the Metropolitan Water Reclamation District of Greater Chicago: Characterizing Zn Toxicity to Plants; Examining Trace Element Content of Urban Soils and Street Dusts; and Determining Changes in Phytoavailability of Metals in Biosolids Amended Soils Over Long Time Periods." Presented at Annual Meeting of United States Department of Agriculture Regional Research Committee W-170, Las Vegas, Nevada, January 2000, by Thomas Granato.

2. "Changes in Phytoavailability of Trace Elements Following Cessation of Biosolids Applications to Land." Presented at Annual Meeting of the Illinois Water Environment Association, Peoria, Illinois, March 2000, by Thomas Granato, Richard Pietz, George Knafl, Carl Carlson, Jr., Prakasam Tata, and Cecil Lue-Hing.

3. "Chicago River Fishery." Presented at Suburban Radio Association Meeting, Riverside, Illinois, March 2000, by Sam Dennison.

4. "Enhancement of Reductive Dechlorination of Perchloroethene by Adding Acclimated Cultures into Unacclimated Anaerobically Digested Sludge." Presented at the Illinois Water Environment Association Annual Conference, Peoria, Illinois, March 2000, by Heng Zhang.

5. "Fish Populations in Chicago's Waterways Benefit from Improved Wastewater Collection and Treatment Practices." Presented at Thirteenth Annual Meeting of the Illinois Water Environment Association, Peoria, Illinois, March 2000, by Sam Dennison, Irwin Polls, Bernard Sawyer, Prakasam Tata, and Richard Lanyon.

6. "Potential for the Use of On-Line Respirometry for the Control of Aeration." Presented at the Illinois Water Environment Association Annual Conference, Peoria, Illinois, March 2000, by Kamlesh Patel, Stanley Soszynski, Prakasam Tata, Jain S. Jain, and David T. Lordi.

7. "Trends in VOC Emissions from POTWs of the Metropolitan Water Reclamation District of Greater Chicago." Presented at the Water Environment Federation Specialty Conference Odor and VOC Emissions 2000, Cincinnati, Ohio, April 2000, by David T. Lordi, Prakasam Tata, and Stanley Soszynski.

8. "Macroinvertebrates and Fish in the Calumet River." Presented at Calumet Research Summit, Chicago, Illinois, May 2000, by Sam Dennison.

9. "Overview of the USX Slag Reclamation Demonstration Site." Presented at City of Chicago Department of Development and Planning Neighborhood Meeting, Chicago, Illinois, May 2000, by Thomas Granato.

10. "Fish in the Waterways." Presented at Senior Circle of Friends Meeting, Chicago, Illinois, July 2000, by Sam Dennison.

11. "Fish in the Chicago Waterway System." Presented at Alsip Sertoma Meeting, Crestwood, Illinois, August 2000, by Sam Dennison.

12. "Fish in Chicago's Waterways." Presented at Brookfield Rotary Meeting, Brookfield, Illinois, September 2000, by Sam Dennison.

13. "Using Biosolids as a Soil Substitute in Urban Areas." Presented at Joint United States Environmental Protection Agency, Region V, and Water Environment Federation Symposium on Innovative Uses of Biosolids, Chicago, Illinois, September 2000, by Thomas Granato, Richard Pietz, Prakasam Tata, and Cecil Lue-Hing.

14. "Evaluation and Testing of Analytical Methods for Cyanide Species in Municipal and Industrial Contaminated Waters." Presented at the Water Environment Federation Annual Conference, Anaheim, California, October 2000, by A. Zheng, D.A. Dzombak, R.G. Luthy, M. Delaney, S.M. Drop, J.M. Flaherty, B. Sawyer, J.R. Sebroski, R.S. Swartling, P. Tata, and L. Zilitinkevitch.

15. "Potential for the Use of On-Line Respirometry for the Control of Aeration." Presented at the Water Environment Federation Annual Conference, Anaheim, California, October 2000, by Prakasam Tata, Kamlesh Patel, Stanley Soszynski, Jain S. Jain, and David T. Lordi.

16. "Phytoavailability of Trace Elements Following Cessation of Biosolids Applications to Land." Presented at Annual Meeting of the Soil Science Society of America, Minneapolis, Minnesota, November 2000, by Thomas Granato, Richard Pietz, George Knafl, Carl Carlson, Jr., Prakasam Tata, and Cecil Lue-Hing.

17. "Advances in Conventional and Innovative Uses of Biosolids." Presented at Joint United States Environmental Protection Agency, Region V and Water Environment Federation Symposium on Innovative Uses of Biosolids, Chicago, Illinois, September 2000, by Prakasam Tata, Doris Berstein, Jain S. Jain, Richard Pietz, Cecil Lue-Hing, and Richard Lanyon.

PAPERS PUBLISHED 2000

1. Tata, P., C. Lue-Hing, and G.J. Knafl. "Statistical Evaluation of Pathogen Inactivation for a Conventional Low-Cost Technology Class A Biosolids Process," Water Environment Research, Washington, D.C., July/August 2000, Vol. 72, No. 4.

2. Tata, P., C. Lue-Hing, and G.J. Knafl. "Class A Biosolids Production by a Low-Cost Conventional Technology," Water Environment Research, Washington, D.C., July/August 2000, Vol. 72, No. 4.

3. "EPA, AMSA Surveys: Trend Shows Metal Concentrations Down," pages 9-15, In Biosolids Technical Bulletin, Volume 6, Number 1, Water Environment Federation, 2000.