Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 10-33

Monitoring and Research

2009

Annual Report

June 2010

Metropolitan Water Reclamation District of Greater Chicago
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MONITORING AND RESEARCH
2009
ANNUAL REPORT

Monitoring and Research Department
Louis Kollias, Director

June 2010

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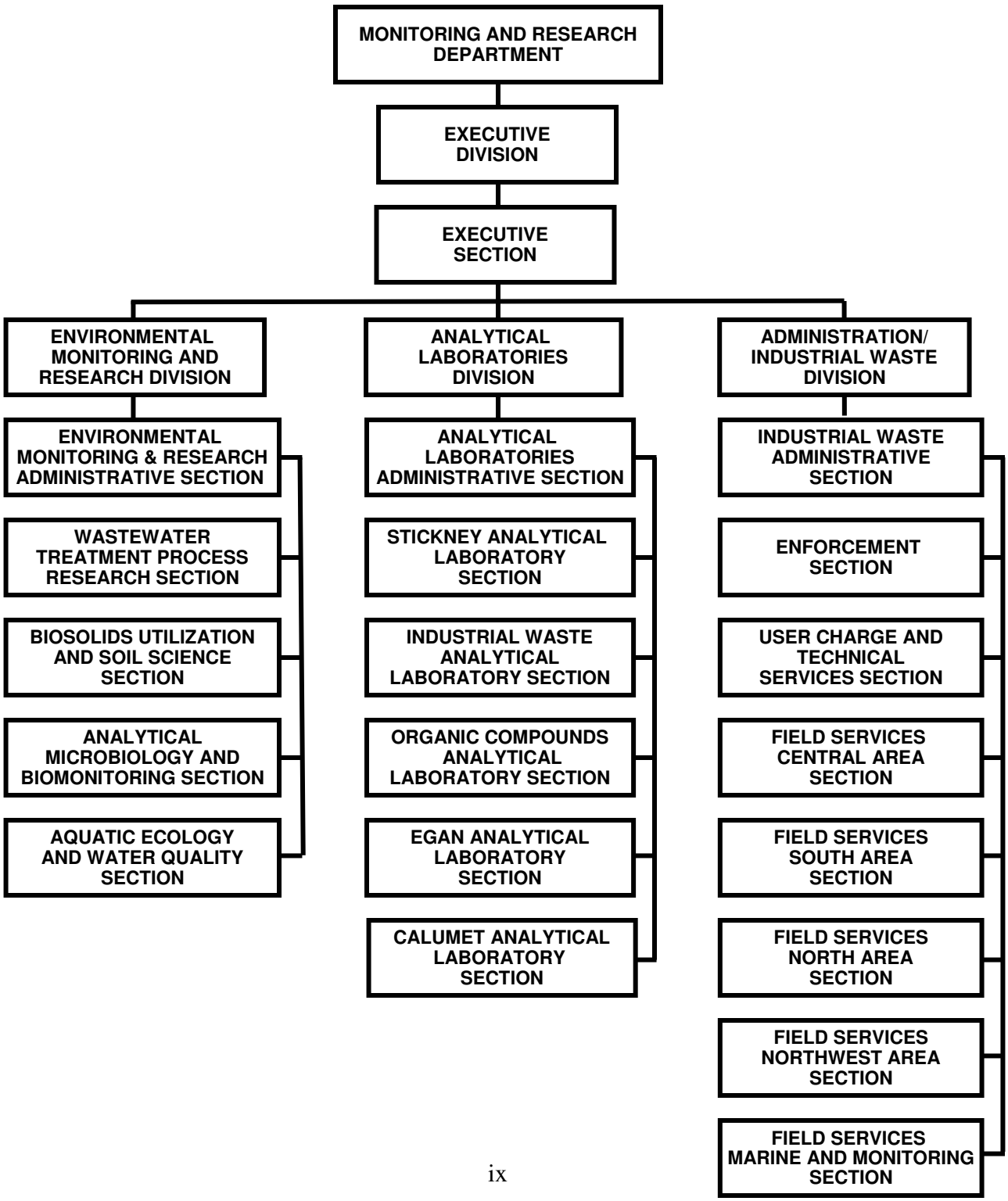
MONITORING AND RESEARCH DEPARTMENT
ORGANIZATION CHART FOR 2009



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; 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 308 budgeted positions during 2009 with an adjusted total salary and wage appropriation of $23,162,400. 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 2009, the Department reviewed personnel actions relative to 12 separations, including six retirements. In addition, three existing positions were eliminated through attrition when vacated during 2008, while two new positions were added in 2009, resulting in a net decrease of one position in the Department. This decrease in positions led to a 2009 salary 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).

Technical assistance is provided directly to companies requesting such assistance by a member of the Center's staff. In 2009, the District included referrals to the Center with all discharge authorizations.

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.

Computer Systems Administration

In 2009, with the assistance of the Information Technology Department (IT), the Administration Division continues its review of all departmental computer systems, local and wide area networks, software utilization, compliance with District security and access procedures, training requirements, etc.

The Enterprise System, which was implemented in 2000, proved inadequate for preparing the District's budget. Therefore, since April 2001, the District has used an IT-designed program for budget preparation. This Budget Preparation Tool was used to prepare the 2009 line item and position budgets.

Budget Administration

A comparison of appropriations to expenditures for 2009 shows the following:

	Appropriation	Expenditure
Personnel (Line Item 101) (Adjusted)	$23,162,400	$23,112,368
Other Line Items	8,286,000	6,110,302
Total	$31,448,400	$29,222,670

Purchasing Administration

During 2009, about 310 requisitions were reviewed and processed by the Administration Division, prior to being forwarded to the Procurement and Materials Management Department. This review verified the availability and proper use of department funds for all requisitioned items. The Division ensures that all departmental purchase orders are properly closed out at year's end and processes purchase order decreases or increases as appropriate.

Contract Administration

During 2009, the Division was involved in the preparation and administration of fourteen (14) contracts for a total cost of $1,527,347.60, including multiyear contracts. Also, the Division purchased consumables for laboratory and field operations totaling $134,721.88 under eight (8) purchase orders and analytical services for $42,000.00 under one (1) purchase order. To meet the growing technological needs of the Department's laboratories, the Division also entered into seven (7) agreements to purchase capital equipment for a total value of $500,790.50 and one (1)

purchase order for $19,956.00. These acquisitions involved the preparation of detail specifications, Board letters, advertisements, coordination of the receipt and review of bids, recommendations to award, processing of purchase requisitions, change orders, payment of invoices, release of bid deposits, and execution of agreements.

The Division prepared and administered thirty-one (31) consulting services agreements for a total value of $13,501,794.43 during 2009. Also, the Division prepared and administered fourteen (14) maintenance service agreements with an aggregate value of $622,974.85. The acquisition of these services involved preparation and processing of purchase requisitions, change orders, Board letters, and preparation and execution of consultant agreements, preparation of requests for proposals, and coordination of the receipt and review of proposals.

Laboratory Accreditation

In 2009, the seven Monitoring and Research (M&R) 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 assurance, improved analyst training, and increased accuracy and precision of test results.

The five laboratories of the Analytical Laboratories Division (ALD) 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, John E. Egan (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.

The ALD participates in four proficiency testing studies per year. The studies encompass both aqueous and soil matrices. Participation in these studies is a requirement of the NELAP accreditation program. Each laboratory must receive an acceptable result in two of the last three studies to maintain accredited status for each analyte.

In 2002, the State of Illinois created an advisory committee to review and evaluate the IEPA management of the NELAP accreditation program. Under the enabling Public Act, the District maintains a permanent member on the nine-person committee. The fee schedule for accredited laboratories established in 2002 remained unchanged in 2009. Fees for the five accredited District laboratories range from $3,400 to $4,400.

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

In June 2001, the Radiochemistry Laboratory was certified by the Illinois Emergency Management Agency (IEMA), Division of Nuclear Safety for the radiochemical analysis of potable water.

The certification programs administered by the IDPH and the IEMA follow guidelines contained in the United States Environmental Protection Agency (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.

Departmental Reports

During 2009, the Department published 76 formal reports dealing with various aspects of the District's operations. A list of these reports is given in Table 1.

TABLE 1: MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-1	Calumet East Solids Management Area Monitoring Report for Third Quarter 2008	M&R Department Lindo, P.	January 2009	Illinois Environmental Protection Agency (IEPA)
2009-2	Calumet West Solids Management Area Monitoring Report for Third Quarter 2008	M&R Department Lindo, P.	January 2009	IEPA
2009-3	Hanover Park Water Reclamation Plant Fischer Farm Monitoring Report, Third Quarter 2008	M&R Department Lindo, P. and Cox, A.	January 2009	IEPA
2009-4	Harlem Avenue Solids Management Area Monitoring Report for Third Quarter 2008	M&R Department Lindo, P.	January 2009	IEPA
2009-5	Lawndale Avenue Solids Management Area Monitoring Report for Third Quarter 2008	M&R Department Lindo, P.	January 2009	IEPA
2009-6	Ridgeland Avenue Solids Management Area Monitoring Report for Third Quarter 2008	M&R Department Lindo, P.	January 2009	IEPA
2009-7	122nd and Stony Island Avenue Solids Management Area Monitoring Report for Third Quarter 2008	M&R Department Lindo, P.	January 2009	IEPA
2009-8	Report of the Fulton County Environmental Protection System, 2008	M&R Department Tian, G. and Cox, A.	January 2009	IEPA
2009-9	Monthly Controlled Solids Distribution Report, July 2008	M&R Department Kumar, K.	February 2009	IEPA
2009-10	Annual Biosolids Management Report for 2008	M&R Department Cox, A., Lindo, P., Patel, M., and Granato, T. C.	February 2009	United States Environmental Protection Agency (USEPA), Region V

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-11	Monthly Controlled Solids Distribution Report, August 2008 - Revised	M&R Department Kumar, K.	March 2009	IEPA
2009-12	Monthly Controlled Solids Distribution Report, September 2008 - Revised	M&R Department Kumar, K.	March 2009	IEPA
2009-13	Calculation of 2009 User Charge Rates	M&R Department	November 2008	Internal District Report
2009-14	Calumet East Solids Management Area Monitoring Report for Fourth Quarter 2008	M&R Department Lindo, P.	March 2009	IEPA
2009-15	Calumet West Solids Management Area Monitoring Report for Fourth Quarter 2008	M&R Department Lindo, P.	March 2009	IEPA
2009-16	Harlem Avenue Solids Management Area Monitoring Report for Fourth Quarter 2008	M&R Department Lindo, P.	March 2009	IEPA
2009-17	Lawndale Avenue Solids Management Area Monitoring Report for Fourth Quarter 2008	M&R Department Lindo, P.	March 2009	IEPA
2009-18	Ridgeland Avenue Solids Management Area Monitoring Report for Fourth Quarter 2008	M&R Department Lindo, P.	March 2009	IEPA
2009-19	122nd and Stony Island Avenue Solids Management Area Monitoring Report for Fourth Quarter 2008	M&R Department Lindo, P.	March 2009	IEPA
2009-20	Hanover Park Water Reclamation Plant Fischer Farm Monitoring Report, Fourth Quarter 2008	M&R Department Lindo, P. and Cox, A.	March 2009	IEPA

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-21	Reporting Requirements for Site-Specific Equivalency to Procedure to Further Reduce Pathogens Designation of Metropolitan Water Reclamation District of Greater Chicago Biosolids Processing Trains at the Stickney and Calumet Water Reclamation Plants, August – December 2008	M&R Department Cox, A.	March 2009	USEPA, Region V
2009-22	Monthly Controlled Solids Distribution Report, December 2008	M&R Department Kumar, K.	April 2009	IEPA
2009-23	Monthly Controlled Solids Distribution Report, October 2008	M&R Department Kumar, K.	April 2009	IEPA
2009-24	Monthly Controlled Solids Distribution Report, November 2008	M&R Department Kumar, K.	April 2009	IEPA
2009-25	Microbiological Report of Bypass Samples in 2008	M&R Department	April 2009	Internal District Report
2009-26	Monthly Controlled Solids Distribution Report, January 2009	M&R Department Kumar, K.	April 2009	IEPA
2009-27	Monitoring and Research 2008 Annual Report	M&R Department	April 2009	Internal District Report
2009-28	Report on Biosolids Characteristics for 2008	M&R Department Lindo, P., Cox, A., and Granato, T. C.	April 2009	Internal District Report
2009-29	Monthly Controlled Solids Distribution Report, February 2009	M&R Department Kumar, K.	May 2009	IEPA
2009-30	Hanover Park Water Reclamation Plant Fischer Farm Monitoring Report, First Quarter 2009	M&R Department Lindo, P. and Cox, A.	May 2009	IEPA

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-31	Lawndale Avenue Solids Management Area Monitoring Report – Revised for First Quarter 2009	M&R Department Lindo, P.	June 2009	IEPA
2009-32	122nd and Stony Island Avenue Solids Management Area Monitoring Report for First Quarter 2009	M&R Department Lindo, P.	May 2009	IEPA
2009-33	Harlem Avenue Solids Management Area Monitoring Report for First Quarter 2009	M&R Department Lindo, P.	May 2009	IEPA
2009-34	Calumet East Solids Management Area Monitoring Report for First Quarter 2009	M&R Department Lindo, P.	May 2009	IEPA
2009-35	Tunnel and Reservoir Plan, Upper Des Plaines Tunnel System 2008 Annual Groundwater Monitoring Report	M&R Department Zhang, H. and MacDonald, D.	June 2009	IEPA
2009-36	Monthly Controlled Solids Distribution Report, March 2009	M&R Department Kumar, K.	June 2009	IEPA
2009-37	Tunnel and Reservoir Plan, Calumet Tunnel System 2008 Annual Groundwater Monitoring Report	M&R Department Zhang, H. and MacDonald, D.	June 2009	IEPA
2009-38	Calumet West Solids Management Area Monitoring Report for First Quarter 2009	M&R Department Lindo, P.	June 2009	IEPA
2009-39	Monthly Controlled Solids Distribution Report, April 2009	M&R Department Kumar, K.	July 2009	IEPA
2009-40	Ridgeland Avenue Solids Management Area Monitoring Report for First Quarter 2009	M&R Department Lindo, P.	June 2009	IEPA

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-41	Tunnel and Reservoir Plan, O'Hare CUP Reservoir Water Quality Monitoring Wells 2008 Annual Groundwater Monitoring Report	M&R Department Zhang, H. and MacDonald, D.	June 2009	IEPA
2009-42	Environmental Monitoring and Research Division Radiological Monitoring of the Raw Sewage, Final Effluent, Sludges, and Biosolids of the Metropolitan Water Reclamation District of Greater Chicago 2008 Annual Report	M&R Department Khalique, A.	June 2009	IEPA
2009-43	Tunnel and Reservoir Plan, Des Plaines Tunnel System 2008 Annual Groundwater Monitoring Report	M&R Department Zhang, H. and MacDonald, D.	June 2009	IEPA
2009-44	Effects of Potential Lemont Water Reclamation Plant Expansion on Phosphorus Levels in the Chicago Sanitary and Ship Canal	M&R Department Wasik, J. and O'Connor, C.	July 2009	IEPA
2009-45	Odor Monitoring Program at Metropolitan Water Reclamation District Facilities During 2008	M&R Department Oskouie, A. and Lordi, D.	July 2009	IEPA
2009-46	Water and Sediment Quality Along the Illinois Waterway from the Lockport Lock to the Peoria Lock During 2008	M&R Department Wasik, J. and Minarik, T.	July 2009	IEPA
2009-47	Tunnel and Reservoir Plan, Mainstream Tunnel System 2008 Annual Groundwater Monitoring Report	M&R Department Zhang, H. and MacDonald, D.	August 2009	IEPA
2009-48	Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir Water Quality Monitoring Wells 2008 Annual Groundwater Monitoring Report	M&R Department Zhang, H. and MacDonald, D.	August 2009	IEPA

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-49	Continuous Dissolved Oxygen Monitoring in Chicago Area Wadeable Streams During 2008	M&R Department Minarik, T., Wasik, J. Sopcak, M., and Dennison, S.	August 2009	IEPA
2009-50	Continuous Dissolved Oxygen Monitoring in the Deep-Draft Chicago Waterway System During 2008	M&R Department Minarik, T., Wasik, J., Sopcak, M., and Dennison, S.	August 2009	IEPA
2009-51	Monthly Controlled Solids Distribution Report, May 2009	M&R Department Kumar, K.	August 2009	IEPA
2009-52	Lawndale Avenue Solids Management Area Monitoring Report for Second Quarter 2009	M&R Department Lindo, P.	September 2009	IEPA
2009-53	Ridgeland Avenue Solids Management Area Monitoring Report for Second Quarter 2009	M&R Department Lindo, P.	September 2009	IEPA
2009-54	122nd and Stony Island Avenue Solids Management Area Monitoring Report for Second Quarter 2009	M&R Department Lindo, P.	September 2009	IEPA
2009-55	Calumet East Solids Management Area Monitoring Report for Second Quarter 2009	M&R Department Lindo, P.	September 2009	IEPA
2009-56	Calumet West Solids Management Area Monitoring Report for Second Quarter 2009	M&R Department Lindo, P.	September 2009	IEPA
2009-57	Harlem Avenue Solids Management Area Monitoring Report for Second Quarter 2009	M&R Department Lindo, P.	September 2009	IEPA
2009-58	Hanover Park Water Reclamation Plant Fischer Farm Monitoring	M&R Department Lindo, P. and	September 2009	IEPA

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
	Report, Second Quarter 2009	Cox, A.		
2009-59	Biomonitoring Report 2009, ChronicWhole Effluent Toxicity Test Results for the Hanover Park Water Reclamation Plant, Hanover Park, Illinois, National Pollutant Discharge Elimination System Permit No. IL0036137, July 2009	M&R Department Rijal, G.	September 2009	IEPA
2009-60	Levels of Triclocarban and Triclosan in the Influent, Effluent, and Waste-Activated Sludge from the Metropolitan Water Reclamation District of Greater Chicago's Seven Water Reclamation Plants	M&R Department Hundal, L., Kumar, K., Liao, A., and Cox, A.	September 2009	Internal District Report
2009-61	Monthly Controlled Solids Distribution Report, June 2009	M&R Department Kumar, K.	September 2009	IEPA
2009-62	Reporting Requirements for Site-Specific Equivalency to Procedure to Further Reduce Pathogens Designation of Metropolitan Water Reclamation District of Greater Chicago Biosolids Processing Trains at the Stickney and Calumet Water Reclamation Plants, January – July 2009	M&R Department Cox, A.	October 2009	USEPA, Region V
2009-63	2008 Annual Summary Report Water Quality Within the Waterways System of the Metropolitan Water Reclamation District of Greater Chicago	M&R Department Abedin, Z.	November 2009	IEPA
2009-64	Operating the Sidestream Elevated Pool Aeration Stations to Meet the Proposed Water Quality Standards	M&R Department Moran, J., Minarik, T., Sopcak, M., Zhang, H.,	November 2009	Internal District Report

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

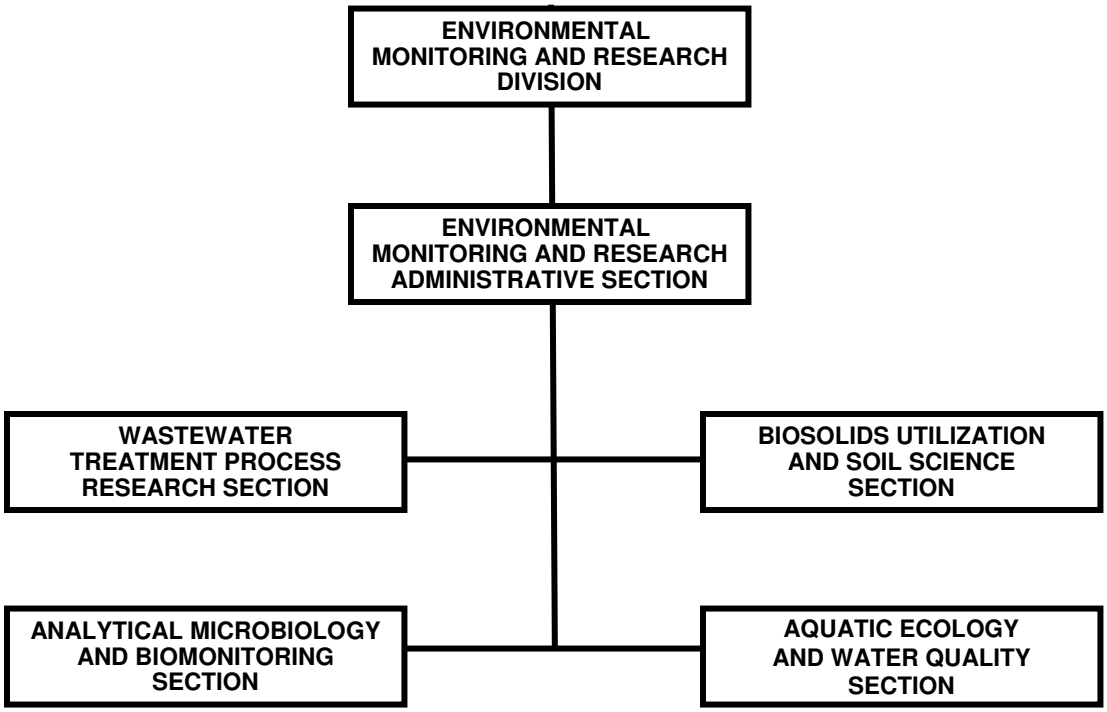
Report No.	Report Title	Author(s)	Date	Organization or Conference
		Dennison, S., O'Connor, C., and Granato, T. C.		
2009-65	Monthly Controlled Solids Distribution Report, July 2009	M&R Department Kumar, K.	December 2009	IEPA
2009-66	Calumet East Solids Management Area Monitoring Report for Third Quarter 2009	M&R Department Lindo, P.	December 2009	IEPA
2009-67	Calumet West Solids Management Area Monitoring Report for Third Quarter 2009	M&R Department Lindo, P.	December 2009	IEPA
2009-68	Hanover Park Water Reclamation Plant Fischer Farm Monitoring Report, Third Quarter 2009	M&R Department Lindo, P. and Cox, A.	December 2009	IEPA
2009-69	Harlem Avenue Solids Management Area Monitoring Report for Third Quarter 2009	M&R Department Lindo, P.	December 2009	IEPA
2009-70	Lawndale Avenue Solids Management Area Monitoring Report for Third Quarter 2009	M&R Department Lindo, P.	December 2009	IEPA
2009-71	Ridgeland Avenue Solids Management Area Monitoring Report for Third Quarter 2009	M&R Department Lindo, P.	December 2009	IEPA
2009-72	122nd and Stony Island Avenue Solids Management Area Monitoring Report for Third Quarter 2009	M&R Department Lindo, P.	December 2009	IEPA
2009-73	Monthly Controlled Solids Distribution Report, August 2009	M&R Department Kumar, K.	December 2009	IEPA
2009-74	Calculation of 2010 User Charge Rates	M&R Department	December 2009	Internal District Report

TABLE 1 (Continued): MONITORING AND RESEARCH DEPARTMENT NUMBERED REPORTS PUBLISHED DURING 2009

Report No.	Report Title	Author(s)	Date	Organization or Conference
2009-75	Environmental Monitoring and Research Division 2008 Annual Report	M&R Department	December 2009	Internal District Report
2009-76	Ambient Water Quality Monitoring in the Chicago, Calumet, and Des Plaines River Systems: A Summary of Biological, Habitat, and Sediment Quality Data During 2006	M&R Department Wasik, J., and Minarik, T.	December 2009	IEPA

FIGURE 1

ENVIRONMENTAL MONITORING AND RESEARCH DIVISION ORGANIZATION CHART



ENVIRONMENTAL MONITORING AND RESEARCH DIVISION

The Environmental Monitoring and Research Division (EM&RD) has 65 employees, and is comprised of five Sections, viz.,

1. Administrative
2. Wastewater Treatment Process Research
3. Biosolids Utilization and Soil Science
4. Analytical Microbiology and Biomonitoring
5. Aquatic Ecology and Water Quality

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 wastewater treatment and solids management 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 and biosolids utilization activities.
- Assessing the impacts of new or proposed regulations on District activities, with particular focus on the impacts to the District, of the proposed water quality standards for the Chicago Area Waterway System (CAWS) that were submitted to the Illinois Pollution Control Board (IPCB) by the IEPA.

Administrative Section

The Administrative Section provides technical guidance, scientific review, and administrative support for the work being carried out by the EM&RD staff. The Section also organizes a monthly seminar series, open to all District employees, that presents information on areas of

interest to the wastewater field. In 2009, 1,672 people attended these seminars. A list of the seminar topics is shown in Appendix IV.

In addition to the overall administrative and supervisory functions performed by the Administrative Section, the Experimental Design and Statistical Evaluation Group and the Radiochemistry Group, which are a part of the Administrative Section, provided the following support to the rest of the EM&R Division.

Experimental Design and Statistical Evaluation Group. The Experimental Design and Statistical Evaluation Group (EDSEG) is responsible for providing assistance in the design of laboratory and full-scale experiments, collection of appropriate data, development of guidelines for data collection methodology, and statistical analyses. Personnel in this Group also develop multistage automation programs to interconnect different software programs such as LaTeX, Visual Basic, SAS, Access, Excel, Outlook, and Power Point. This computer automation 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 2009, 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 Analytical Microbiology and Biomonitoring Section (AMBS) to study antibiotic resistant bacteria in wastewater. This work was published in the *Water Science and Technology Journal* in 2009.

2. Extensive statistical analyses support was provided on the reduction of sampling frequencies in the District's drying sites.

3. EDSEG provided data management support to the Biosolids Utilization and Soil Science Section to produce quarterly reports on biosolids management at the District's Biosolid*s* Management Areas in accordance with the IEPA permit requirements.

4. Drying site reports were produced for Harlem Avenue Solids Management Area (SMA), Lawndale Avenue SMA, Ridgeland Avenue SMA, 122nd and Stony Island SMA, Calumet East SMA, Calumet West SMA, and Hanover Park SMA for the first, second, and third Quarter of 2009.

5. Statistical support was provided for research investigating the availability of phosphorus in Biosolids.

6. Statistical support was provided for centrifuge analyses on polymer dose and the total solids of cake produced.

7. Support was provided to the Aquatic Ecology and Water Quality Section on the production of Continuous Dissolved Oxygen (DO) Monitoring Reports (Deep-Draft, and Wadeable) annually.

8. Statistical support was provided to Aquatic Ecology and Water Quality Section on the study of fish abundance in the District's waters.

9. Three Ambient Water Quality Monitoring (AWQM) Exceedance Reports were produced by this Group for last quarter of 2008 and first three quarters of 2009.

10. On numerous occasions, statistical support was provided to answer questions regarding the impact of proposed IEPA regulations.

11. Statistical support and consulting was provided on data management, automation of reports, etc., to various sections in the Division.

12. Numerous support was provided to clients who requested data and statistical analyses.

Water Quality Data. Each year, the EDSEG summarizes results of the District's AWQM Program for the CAWS. Surface water quality data for 2009 were evaluated regarding compliance with water quality standards set by the IPCB. In 2009, 67 water quality parameters were analyzed and reported.

Radiochemistry Group. The Radiochemistry Group is responsible for the radiological monitoring of waters, wastewaters, 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 Group performed 2,878 tests in 2009.

Radiological Monitoring of Waterways. The radiological monitoring of the CAWS is a part of the AWQM Program of the District. The waterways under the jurisdiction of the District include the Calumet, Chicago, and Des Plaines River Systems. The gross alpha and gross beta radioactivity was measured monthly at 45 sampling locations. The radioactivity concentrations in water samples analyzed from all three river systems were within the IPCB's General Use Water Quality Standards.

Radiological Monitoring of Wastewaters and Biosolids. The radiological monitoring of raw and treated wastewaters from the District's water reclamation plants (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 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 CAWS.

The Group also performs radiological monitoring of biosolids from the seven WRPs, Hanover Park WRP lagoons, and from the 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.

Radiation Safety Program Activities. The Group maintains a radioactive material license issued to the District by IEMA, Division of Nuclear Safety, assuring that activities are conducted according to the license conditions and regulations. These activities include the personnel monitoring for radiation exposure, operational checks of radiation survey meters, physical inventory of licensed radioactive materials, testing for leakage and contamination of nickel-63 detectors in gas chromatographs at the Monitoring and Research (M&R) laboratories, testing for leakage and contamination of nuclear gauges used by the Engineering Department, and testing for leakage and contamination of an X-ray fluorescent paint analyzer and an APD2000 Chemical Warfare detector owned by the Safety Section of the Human Resources Department.

Wastewater Treatment Process Research Section

The Wastewater Treatment Process Research (WTPR) Section is responsible for conducting basic, applied, and problem-solving research on the wastewater and sludge treatment processes currently utilized by the District and performing monitoring to meet certain regulatory requirements. The Section provides technical assistance to the M&O Department in solving WRP operating problems and supports the Engineering Department by providing technical information for planning and design. This Section also investigates innovative treatment processes for potential future use. The investigation of current operations may originate as the result of a WRP problem, or interest in arriving at new knowledge concerning some aspect of a wastewater treatment process.

Studies of new technologies 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-scale 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 in 2009 included the following.

Providing Technical Support to Maintenance and Operations Department for Plant Operation Needs. In 2009, the WTPR Section assisted the M&O Department in plant operations through the following projects.

Step Feed Evaluation at the James C. Kirie Water Reclamation Plant. Profiles of DO concentration, oxygen uptake rate (OUR), mixed liquor (ML) suspended solids (SS), ammonia, nitrate, nitrite, and phosphorus (P) were collected along the length of aeration tanks at the James C. Kirie (Kirie) WRP during the spring and summer of 2009. Aeration tank performance was evaluated to determine whether or not a potential for energy savings exists if operations were operated in step feed. The data showed that the Kirie WRP operates the aeration tanks with relatively low DO concentrations in Pass 1 and Pass 2, resulting in little nitrification occurring in Pass 1 due to low DO concentrations in this pass. Because of the minimal air use during current operations, it is unclear whether changing to step feed operations will result in energy savings as a result of decreased air use. A summary of the 2009 sampling results were provided to M&O. Additional sampling will be conducted at the Kirie WRP in 2010 involving a side-by-side comparison of tanks following current and step feed operations. An M&R report detailing the results of this study will be prepared in 2010.

Odor Management and Corrosion Control in Select Interceptors in the James C. Kirie Water Reclamation Plant Service Area. A full-scale study was initiated to obtain the important parameters that could be considered as precursors to hydrogen sulfide (H_2S) along the Upper Des Plaines (UDP) interceptors 14A, 14B, and 20B leading to Drop Shaft 5, and to analyze the data to determine the variation of these parameters along the interceptors. In 2009, the goal was accomplished by sampling from seven locations along these interceptors for eight water quality and air quality parameters. These data were analyzed using graphical and statistical methods to evaluate the significance of these parameters on the variation in oxidation-reduction potential (ORP) and total sulfide along the interceptors, as well as locate the hot spots for H_2S emissions along these interceptors. The results of the study indicate that Bioxide is effective at minimizing H_2S. Future study will be conducted to optimize Bioxide dosing and compare Bioxide with other technology solutions.

Polymer Tests at the Stickney and Hanover Park Water Reclamation Plants. During 2009, full-scale summer/winter polymer tests were not conducted at the Stickney WRP Post-Digestion Centrifuge Complex because the Stickney M&O staff did not request such tests.

Full-scale tests at the Hanover Park WRP gravity belt thickening complex were conducted during April/May 2009 for the selection and purchase of polymer used in the gravity belt thickening process of activated sludge.

All polymers that do not produce a minimum of six percent cake solids are disqualified from bidding on the polymer contract. The polymer that passes the test performance criteria as described in the bid documents, and has the lowest cost per unit mass of sludge is the polymer of choice for purchase. The full-scale tests are conducted once every three years, a few months

before the polymer purchase contracts are up for renewal after a two-year life. During 2009, a total of eight polymers from four manufacturers were tested and found to be eligible for bidding.

Investigation of 004 Excess Flow Discharge Suspended Solids Exceedance at the John E. Egan Water Reclamation Plant. On two occasions in 2009, SS concentrations in the Egan WRP 004 excess flow discharge exceeded the NPDES permit limit of 30 mg/L. Both of these incidents occurred during storms when the maximum design flow for the plant was surpassed. At the request of the M&O Department, the WTPR Section conducted a thorough investigation on the potential causes of the incidents and made recommendations on how to prevent future exceedance. A technical memorandum was prepared following each incident and transmitted to the M&O Department.

Excess Flow Discharge Disinfection Study for the John E. Egan Water Reclamation Plant. Between 2005 and 2008, fecal coliform (FC) concentrations in the Egan WRP 004 excess flow discharge exceeded the NPDES permit limit of 400 colony forming units (CFU)/100 mL for FC on three occasions. At the request of the M&O Department, the WTPR Section planned a laboratory bench-scale study to investigate the chlorine dose required to disinfect the primary effluent of the Egan WRP to achieve the permit limit consistently and to produce an effective monitoring strategy to ensure adequate disinfection of excess flow discharge. Bench-scale tests were conducted in 2009 in the WTPR Laboratory with the analytical support of the AMBS and the Analytical Laboratories Division (ALD). An M&R report detailing the results of this study will be prepared in 2010.

Support for Maintenance and Operation Department Plant Operations. The WTPR Section provides support to M&O plant operations on both a routine and emergency basis. Routine support to M&O plant operations includes weekly microscopic examination of ML samples from the Stickney, Calumet, North Side, Kirie, Egan and Lemont WRPs, and weekly or monthly personal visits to the Calumet, North Side, Kirie, and Lemont WRPs.

Emergency support to M&O in 2009 included technical support to the Kirie WRP after a serious power outage in which there was no aeration to the ML for approximately 13 hours. Quick laboratory bench tests were conducted in the Kirie Treatment Plant Operator Laboratory to confirm bioactivity after aeration was resumed. Technical advice was provided for the plant to restore full nitrification.

Also, during 2009, the Calumet WRP experienced digester foaming during the winter months. The causes of the foaming were investigated through microscopic analysis of ML, waste-activated sludge and digested sludge samples. Laboratory tests were also performed on whether the addition of poly-aluminum could alleviate the foaming problem.

Providing Technical Support to Engineering Department for Planning and Design Requests. In 2009, the WTPR Section conducted the following projects for providing the required technical support to the Engineering Department.

Digester Mixing Study at the Calumet Water Reclamation Plant. Mixing is one of the most important physical factors that affect the anaerobic digestion process. Adequate mixing has been related to several operational and performance benefits. Natural mixing of digester contents may not be enough to harness all of the benefits and external mixing devices augment natural sludge mixing.

Under Engineering Department Contract 02-818-2P, six new mechanical digester sludge mixers were installed, on an experimental basis, on the floating cover of digester number 5 at the Calumet WRP in order to compare digester performance with and without mechanical mixing. In response to a request by the Engineering Department, a full-scale performance evaluation study was proposed during 2006, with the cooperation of the M&O Department staff at the Calumet WRP. An approved study plan was planned to be implemented during 2007. The mixers have been operational for approximately the last two years. However, problems related to gas measurements could not be resolved until 2008. Therefore, sampling for this study began during February 2009 and was completed during late November 2009. The analytical and operational data were collected and are being analyzed. The report will be completed in May 2010.

Ultraviolet Disinfection Study at the Hanover Park Water Reclamation Plant. Under Engineering Department Contract No. 07-527-AP, the District is conducting a side-by-side evaluation of three different ultraviolet light (UV) disinfection technologies manufactured by leading manufacturers (Trojan Technologies, Inc., ITT Wedeco, Inc., and Severn Trent Water Purification, Inc.) at the Hanover Park WRP. The systems were installed outside of the tertiary treatment building at the Hanover Park WRP. Two systems were installed in October 2008 and became operational in November 2008. The third system has been operated since its installation in March 2009.

Each system was preassembled and placed in a fixed dimension channel. Each of the three systems is designed to treat 0.5 million gallons per day (MGD) of secondary unfiltered effluent, approximately 4.2 percent of the average design flow of 12 MGD. Each system was also stress tested at a one MGD flow rate.

The baseline tests at 0.5 MGD flow and stress tests at one MGD flow were conducted in 2009. The influent and effluent samples from all three units as well as filtered and unfiltered secondary effluent were collected for numerous physical, chemical, and microbiological analyses as outlined in the sampling plan. Additionally, related plant data and the economics of system operation and maintenance were documented but not limited to the system power requirements, bulb replacement, and life cycle of bulbs and system.

Sampling, analyses, and collection of related plant data took place from the end of November 2008 to October 15, 2009. Data compiled and analyzed for the period from November

18, 2008, to June 11, 2009, indicated that the Wedeco and Trojan units achieved comparable reduction of FC and *Escherichia coli* (EC). Data collected revealed that the Wedeco unit has been the most consistent and reliable with respect to FC and EC reduction. All three units, however, demonstrated the capability to meet the existing NPDES permit limit for FC of 200 CFU/100 mL as a monthly geometric mean. An evaluation to meet a daily FC limit of 400 CFU/100 mL will also be conducted.

The sampling is to continue in 2010. At the conclusion of the additional sampling and data collection, an appropriate system will be recommended and necessary design criteria will be established for full-scale system implementation at District WRPs.

Support to the Engineering Department for the Hanover Park Water Reclamation Plant Master Plan Study. The WTPR Section provided support to the Engineering Department for the Hanover Park WRP Master Plan Study. The commissioned study evaluates alternatives for improving and updating the infrastructure and process facilities to meet future needs. The support has included data mining of historical data, participating in workshops, coordinating sample collection, analysis, and review of documents.

Evaluating Two Different Aeration Systems at the John E. Egan Water Reclamation Plant. This project was initiated to compare the operational efficiency of two different aeration systems at the Egan WRP: full floor, fine bubble, disc ceramic diffusers in a tapered configuration in the North Aeration Battery and the original, spiral roll aeration system using square ceramic diffusers placed on one side of the aeration tank in the South Aeration Battery. Major field testing which included process oxygen transfer efficiency (OTE) measurement using the off-gas technique and profile sampling along the aeration tanks to evaluate OURs, nitrification, and DO distribution was completed in 2007. Supplemental field tests on process OTE measurements were conducted in 2008. Additional supplemental field tests on process OTE measurements with a modified off-gas collection hood were conducted in 2009. The supplemental tests could not be completed in 2009 due to an engineering contract to repair leaking sludge values in the south aeration tanks, and will be completed in 2010. An M&R report presenting the results of this study will be completed in 2010.

Stickney Permeable Pavements Evaluation. In 2008, the District initiated a plan to evaluate porous surface technology for stormwater flow and pollutant load reduction at the Stickney WRP. The Conservation Design Forum designed three test permeable surfaces and a control area in the parking lot on the northwest side of the Stickney WRP. The three test surfaces consisted of: 1) a porous asphalt; 2) a porous concrete; and 3) a porous paver system. The control area is traditional black top asphalt and is considered impervious.

In April 2009, efforts to evaluate the four surfaces with respect to flow and load reduction were initiated. Rainfall, subsurface water levels, infiltration, and total flow were continuously measured for each lot through November 2009. Additionally, water quality of the total flow collected at each lot was monitored after rainfall events. Due to equipment problems, a limited

amount of data could be quantified for the 2009 study period. However, the data collected shows that all three permeable lots had much lower runoff relative to the control. This was corroborated by site visits during rainfall events where standing water was only observed at the control lot. If the flow data for the first two rainfall events of April 2009 is assumed reliable, the permeable lots had over 82 percent less runoff than the control lot.

Additionally, the permeable lots showed much lower concentrations of select water quality parameters from collected samples. Based on the first flush of four rainfall events, the permeable lots' total SS and volatile SS concentrations were over 77 percent lower than the control lot. Furthermore, the permeable lots' chemical oxygen demand (COD) concentrations were over 56 percent lower than the control lot. Numerous troubleshooting efforts during the off season to retrofit the system design and flow measuring equipment will be performed in order to collect accurate flow data and stormwater samples in 2010.

Stickney Water Reclamation Plant Preliminary Sludge and North Side Water Reclamation Plant Sludge Settling Evaluation. Eight 80-foot diameter concentration tanks are planned for the Stickney WRP to thicken Stickney Preliminary Sludge (SPS) and North Side Sludge (NSS) as documented in the Stickney Master Plan. In order to assess if a combined sludge (CS) at a ratio of one part of NSS to seven parts of SPS can effectively be thickened in these tanks, WTPR conducted six phases of laboratory bench settling tests with CS in 2008 and 2009.

Based on these settling tests, flotation problems are of minimal concern. However, the 5–6 percent total solids (TS) benchmark for the designed concentration tanks was achieved in the passive settling tests only 5.3 percent of the time from all six phases of bench tests, i.e. seven of the 133 tests performed with CS. Increased volumes and water column heights (WCHs) did enhance sludge concentration up to certain limits, but diminishing returns were observed beyond these limits. Therefore, it was difficult to predict how significant the effect of the large volumes and WCHs of the design tanks would have on CS settling. As the depth:height ratio is a function of both WCH and test volume for the size of vessels used, it is difficult to use it as a stand-alone variable in predicting the effect on settling. Additionally, dilute mannich polymer addition was not observed to have a significant impact on the concentration of the settled sludge. The results of these settling tests are detailed in M&R Report No. 10-01.

Fulfilling Regulatory Monitoring Requirements. In 2009, the WTPR Section conducted the following activities to meet the regulatory requirements for biosolids management, monitoring of odor and hazardous air pollutants (HAPs) from the District WRPs and biosolids management facilities, and monitoring of groundwater surrounding the Tunnel and Reservoir Plan (TARP) tunnels and reservoirs.

Additional Digestion Tests for the Calumet and John E. Egan Water Reclamation Plants. The WTPR Section directs a continuous monitoring program that assesses whether the requirements for vector attraction reduction are met in the biosolids processing at the District WRPs employing Option 2 of Section 503.33(b) of the 40 CFR Part 503 Regulations (Option 2). Option 2

states that vector attraction reduction is demonstrated if after anaerobic digestion of the biosolids, the volatile solids (VS) in the biosolids are reduced by less than 17 percent in an additional 40 days of bench-scale anaerobic digestion at a temperature between 30° and 37°C. The additional anaerobic digestion tests in accordance with Option 2 are used as a supplemental monitoring program, in addition to the routine monitoring of anaerobic digestion performance. In 2009, in the M&R WTPR Laboratory a total of six additional anaerobic digestion tests were performed for the digester draw from the Calumet WRP and 21 tests were conducted for the Egan WRP. The combined monitoring results indicated that the requirements for vector attraction reduction for the biosolids generated at the Calumet and Egan WRPs were met throughout 2009.

Odor Monitoring Programs. As part of the District's continuing odor surveillance program, the WTPR Section conducts odor monitoring at Harlem Avenue SMA, Vulcan, Lawndale Avenue SMA, the Marathon Sludge Drying Area (SDA), and the Calumet SDAs. A similar odor monitoring program was initiated in the spring of 2001 at the Stony Island SDA and the Ridgeland Avenue SMA. The programs are required by NPDES permits for the SMAs. Odor monitoring is also conducted at the Calumet WRP, the Egan WRP, the Stickney WRP, the Kirie WRP, and the North Side WRP.

A similar protocol for monitoring odors is used at each location. Either M&R or M&O Department personnel (at some WRPs) visit various stations at each site on a regular basis. The frequency of odor monitoring can range from once per week (Egan WRP) to daily (Kirie WRP), depending on the program. The odor monitoring personnel make subjective observations regarding the character and intensity of odors at each of the stations. The odor intensities are ranked on a scale from 0, no odor, to 5, very strong odor. These data are tabulated monthly.

The objective of the program is to collect and maintain a database of odor levels within and around each WRP and associated solids processing areas. The data are used to study the trends in odor levels associated with WRP operations, and to relate odor levels to changing conditions within the WRP, such as installation of odor control equipment.

Since several residential areas surround the WRPs in the program, the odor monitoring activities also provide early warning of odorous conditions that develop within the WRPs, to allow for corrective action before they become a nuisance to area residents.

The details of the odor surveillance program and odors detected at or near District operations will be summarized in an M&R report entitled, "Odor Monitoring Program at Metropolitan Water Reclamation District of Greater Chicago Facilities during 2009," in 2010.

Tunnel and Reservoir Plan Groundwater Monitoring. Groundwater monitoring for the six TARP systems, which included the Mainstream, Calumet, Des Plaines, and UDP Tunnel Systems, the O'Hare Chicago Underflow Plan Reservoir, and the Thornton Transitional Flood Control Reservoir was conducted throughout 2009. The WTPR Section coordinates the groundwater sampling that is carried out by the Industrial Waste Division, handles the preparation of samples

that are analyzed by ALD for the required parameters, and performs data management. Groundwater monitoring reports summarizing the monitoring results for the year 2009 will be prepared and one report for each system will be published as an M&R report. All six reports will be submitted to the IEPA as well as the USEPA by June 2010.

Thornton Transitional Flood Control Reservoir Fill Events for 2009. One of the reporting requirements for the Thornton Transitional Flood Control Reservoir (Reservoir) as specified by the IEPA is to prepare a narrative report of fill events that have occurred during the year.

There were seven fill events at the Reservoir during the year 2009: February 27, 2009; March 8–12, 2009; April 28, 2009; May 15–16, 2009; October 23–24, 2009; October 30 through November 1, 2009; and December 25–26, 2009. During each fill event, samples were collected from the Reservoir, if water remained in the Reservoir, and the four water quality monitoring wells surrounding the Reservoir. The results of the analyses from the water quality monitoring wells were then compared with the statistical background concentrations from these wells. An M&R report summarizing these analyses will be published and submitted to the IEPA and the USEPA in 2010.

Pollutants Captured by Tunnel and Reservoir Plan. The one of main purposes of building the TARP system was to prevent CSOs from entering Lake Michigan and the CAWS. The M&R Department annually calculates the removal of certain pollutants, including SS, both carbonaceous and nitrogenous oxygen-demanding substances, and the volume of CSOs collected by the TARP system.

Calculating pollution removal gives an indication of how well TARP is serving its function, since the pollutants diverted to TARP would have otherwise been discharged into the area waterways. The results of the calculations will be published in the 2009 EM&RD annual report.

Estimation of Emission of Hazardous Air Pollutants from Metropolitan Water Reclamation District of Greater Chicago Water Reclamation Plants. Under Section 112 of Title I of the Clean Air Act, a publicly owned treatment works (POTW) is considered a major source of HAPs if it emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs. As part of the NPDES permits and regulations under the Clean Air Act, emission of HAPs from the wastewater treatment processes for each WRP was estimated.

Samples of the influent to each of the District's WRPs are collected twice a year and analyzed by the Organic Chemical Analytical Laboratory for 65 of the HAP compounds of concern to POTWs. Estimates of the emissions of these HAPs from the wastewater treatment process units are made using the Bay Area Sewage Toxics Emissions (BASTE) computer model developed by CH2M Hill. The average concentration of each HAP detected in the influent was used as input to the model along with the annual running average operating conditions. The physical properties of the individual compounds were taken from the USEPA database.

According to the BASTE model, all of the individual HAP emissions were less than the 10 ton/year criterion. Toluene and acetaldehyde were the predominant compounds emitted from the wastewater treatment processes at the Stickney WRP. Carbon disulfide was the predominant compound emitted from the Calumet WRP liquid stream. The total measured HAP emissions were substantially less than the 25 ton/year threshold at each of the three large WRPs. The wastewater treatment process units at the District's WRPs are not a major source of HAPs.

Conducting Applied Research on Process Optimization and Evaluation of New Technologies. The WTPR section conducted the following applied research projects in 2009.

Characterization of Recycle Streams at the Stickney and Calumet Water Reclamation Plants. In July 2008, the WTPR Section began sampling the recycle streams at the Stickney and Calumet WRPs in order to evaluate the nutrient load to the headwork contributed by these recycle streams. Sampling for this project continued through August 2009. The parameters analyzed in this study have been chosen such that a range of nutrient treatment strategies may be considered to address potential nutrient regulations for total nitrogen (TN) and total P (TP). Following this characterization, the feasibility of different technologies for removal of TN and/or TP from recycle streams will be evaluated. A report showing the details of the sampling plan and data collected, along with a set of recommended technologies for treatment of recycle streams, will be prepared during 2010 and presented at the December 2010 M&R Seminar.

Methane and Nitrous Oxide Emissions from Wastewater Treatment. According to a recent USEPA report (*Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2004*, USEPA 2006), domestic and industrial wastewater treatment is the sixth highest contributor to atmospheric methane (CH_4), and human sewage is the fourth highest contributor to atmospheric nitrous oxide (N_2O).

A short-term monitoring plan to evaluate the rate of emissions of CH_4, N_2O, and carbon dioxide (CO_2), was completed at the Stickney WRP in the fall of 2008. The highest CH_4 fluxes were found in the Imhoff tanks, anaerobic digester exterior, and aeration batteries. The highest N_2O fluxes were found in the aerated grit chamber, and aeration batteries. The highest CO_2 fluxes were found in the aerated grit chambers, aeration batteries, and the anaerobic digester exterior.

In 2009, a comprehensive monitoring study was performed in order to assess the CH_4 and N_2O flux from the selected locations of the Stickney WRP processes. This study concentrated on the spatial and diurnal variability with respect to the aeration batteries and aerated grit chambers. The off-gas sampling from the aeration batteries and grit chambers was performed in parallel with water quality sampling for TS, COD, pH, ORP, DO, and nitrogen species in order to determine if a relationship exists between wastewater characteristics and CH_4 and N_2O emissions. Exploratory monitoring was performed at the selected locations within the Egan and North Side WRPs, respectively. Approximately 481 samples were collected at the Stickney WRP, 190 sam-

ples were collected at the Egan WRP, and 158 samples were collected at the North Side WRP. Sample collection was completed in December 2009 and is currently being evaluated.

Ultraviolet Disinfection Laboratory Study. The WTPR Section conducted a number of laboratory-scale studies to determine the dose-response relationship for UV disinfection for the effluent from all seven WRPs in 2007 and 2008. The results of the studies indicated that elevated total iron (TFe) concentrations in the wastewater, which were caused by chemical P removal with ferric chloride ($FeCl_3$), could inhibit UV disinfection. Therefore, additional laboratory studies evaluating the influence of TFe concentration on UV disinfection with the effluents from the Egan WRP were conducted in 2008 and 2009.

These tests were performed in two stages: (1) during P removal via $FeCl_3$ in spring 2008 (Stage I); and (2) three months after discontinuation of $FeCl_3$ addition at the Egan WRP in spring 2009 (Stage II). $FeCl_3$ addition during Stage I resulted in lower total TP and higher TFe in the Egan WRP final effluent relative to Stage II. Minimal difference was seen with respect to UV transmittance (UVT) and FC concentrations for both Stage I and Stage II effluent types. However, the study results indicated that a higher UV dose was needed to achieve 2- and 3-log reductions in FC and the 400 CFU/100 mL permit limit during Stage I for both secondary effluent (before sand filters) and final effluent (after sand filters). Additionally, in both stages filtering the secondary effluent increased UVT only slightly but significantly decreased TSS, TFe, and FC concentrations. Upon filtration, a lower UV dose was needed to achieve desired log reductions and the 400 CFU/100 mL permit limit in both stages. Filtration may be required if $FeCl_3$ addition for nutrient removal is used at WRPs planned for UV disinfection due to the inhibitory effects of iron.

Chemical Phosphorus Removal at the John E. Egan Water Reclamation Plant. For the Salt Creek Phosphorus Reduction Demonstration Project, the TP concentrations in the final effluent of the Egan WRP were reduced to a target level of 0.5 mg/L of TP. Chemical precipitation of P with $FeCl_3$ was utilized. A full-scale chemical P removal test was conducted from February 2007 through December 2008. For P removal, $FeCl_3$ was injected to the end of the aeration tanks in February 7, 2007, through May 20, 2008, and to the influent of the primary settling tanks in May 21 through December 24, 2008. The liquid phase monitoring for the P removal test continued till the middle of January 2009. An M&R report describing this project in detail and presenting the results from the entire study was drafted in 2009 and will be finalized in 2010.

Potential Effects of Ferric Chloride Addition for Phosphorus Removal on Gravity Belt Thickener Performance at the John E. Egan Water Reclamation Plant. A full-scale study was undertaken at the Egan WRP to evaluate the impact of $FeCl_3$ addition to the ML on solids processing since January 2007. $FeCl_3$ was added to the ML to remove P to a target level of 0.5 mg/L of TP. This study corresponded to a study conducted in 2005 as part of the Water Environment Research Foundation Nutrient Removal Demonstration Project. In this earlier study, $FeCl_3$ was added to the ML for P removal and operational problems in gravity belt thickeners (GBTs) were reported during the thickening of waste-activated sludge (WAS). Therefore, thickening of WAS

by GBTs, sludge anaerobic digestion and centrifugal dewatering operations were monitored during the full-scale chemical P removal test and compared against background data. GBT operations were closely monitored due to a concern of possible operation interruption. The data collected showed no operational problems with the above solids processing operations. A draft final report was prepared during 2009.

Operating the Sidestream Elevated Pool Aeration Stations to Meet the Proposed Water Quality Standards. This project evaluated whether the Sidestream Elevated Pool Aeration (SEPA) stations located along the Calumet-Sag Channel could be operated to meet the water quality standards, specifically DO concentrations, proposed by the IEPA to the IPCB on October 26, 2007. During the spring, summer, and fall of 2008, the SEPA stations were operated according to the study operating schedule in an attempt to meet the proposed DO standards. Data analysis and a report summarizing the results of the study were completed in 2009. The study demonstrated that in some cases SEPA station operation alone will not provide enough supplemental DO so that the proposed standards are met 100 percent of the time. Temperature was found to greatly affect the amount of DO that SEPA stations can transfer to the water. In addition, an environmental cost in the form of CO_2 emissions was estimated for use of additional pumps at the SEPA stations to meet the proposed standards. Details of this study can be found in M&R Report No. 09-64.

GPS-X Modeling of the North Side Water Reclamation Plant. A steady-state model of the North Side WRP was developed by CTE|AECOM using the GPS-X software as part of a Master Plan study completed in 2007. The steady-state model was converted to a dynamic model by the University of Illinois at Urbana-Champaign (UIUC) through a District contract in 2009 to simulate wet weather impact. Upon the recommendations of the UIUC study, the WTPR Section planned special sampling to collect hourly data for the dynamic model. Special discrete sampling commenced in 2009 and will continue into 2010. Sample results will be used for further model development including calibration and validation as needed. When complete, the dynamic model will allow for the evaluation of plant capacity and plant operations and will assist in evaluating plant expansion options. An M&R report detailing the dynamic modeling of the North Side WRP will be prepared in 2010.

Responding to Other Requests for Technical Support. In 2009, the WTPR Section provided the following technical support to other requests.

Data Collection for Three-Dimensional Modeling of the Chicago Area Waterway System. A three-dimensional (3-D) hydraulic and water quality model of the CAWS is being developed by UIUC. In support of this modeling project, the WTPR Section conducted sampling and collected data for UIUC's use in calibrating the model. Sampling included five waterway locations as well as CSO discharge from the Racine Avenue Pump Station. A report on the 3-D model will be provided by UIUC.

Support for Studies Relating to Illinois Pollution Control Board Rulemaking on Dissolved Oxygen Standards for the Chicago Area Waterway System. In support to the studies relating to the IPCB rulemaking on DO standards for the CAWS, the WTPR Section provided data analysis on relation of DO concentrations in the waterway to urban wet-weather runoff and CSO events. In addition, the WTPR Section performed model simulations to evaluate the implementation of some water quality management alternatives for improving DO concentrations in the waterway.

Chicago Department of Transportation Blue Island Sustainable Streetscape Project. In order to minimize the impacts of urban nonpoint source pollution and associated costs of control associated with wet-weather flows, stormwater runoff volumes and pollutant loads must be reduced through stormwater management. In June 2010, the Chicago Department of Transportation (CDOT) plans to construct a Sustainable Streetscape Project (SSP) located on West Cermak Road between South Halsted Street and South Ashland Avenue, and South Blue Island Avenue between South Ashland Avenue and South Western Avenue. This SSP will include a number of control strategies referred to as best management practices (BMPs) to mitigate runoff volumes and associated pollution due to wet-weather flow. More specifically, it is envisioned that the SSP will provide the following: (1) CSO abatement, (2) reduction of wet weather flow and pollutant loading to treatment plants, and (3) improved aesthetics of the urban environment. The SSP BMPs include permeable pavers, infiltration basins, planters, and bioswales. These BMPs were designed to absorb the flow of a two-year storm event. The District has provided input to the CDOT as follows.

In 2008, the WTPR Section developed a long-term monitoring plan to assess the performance, effectiveness, and efficiency of a collection of BMPs and, if possible, individual BMPs relative to stormwater flow and pollutant load reduction in the Streetscape corridor.

Currently, the District (in collaboration with the United States Geological Survey) is monitoring rainfall at three locations, combined sewer flow at two locations, and groundwater levels at four locations in the project area for the background evaluation. Due to infrastructure limitations in the local collection system and site layout, the implementation of the monitoring equipment at the three projected catch basin locations, the final combined sewer location, and the single combined sewer water quality location have been delayed until 2010.

Additionally, in 2009 modeling efforts to characterize the hydrology and hydraulics (H&H) of Streetscape's pre- and post-BMP conditions, city-wide BMP implementation, and pollutant removal were completed by CH2M HILL. H&H model simulations for 2007 and 2008 annual rainfalls showed that the designed Streetscape BMPs were predicted to capture over 80 percent of the stormwater runoff, thereby bypassing the collection systems. The city-wide model suggested reduction in runoff entering the sewer system of 24–30 percent for the following design storms: two months, six months, one year, two years, five years, and ten years.

Biosolids Utilization and Soil Science Section

The role of the Biosolids Utilization and Soil Science Section is to provide scientific information and technical support to continuously improve the environmental stewardship and cost-effectiveness of the District's biosolids management programs in accordance with all applicable regulations and permit requirements, and to support the green initiatives relevant to the District's operations. The overall goals of the Section are:

1. To conduct monitoring and document compliance with permits and regulations governing the biosolids management programs and file all relevant reports in a timely manner.

2. To promote the beneficial use of biosolids and provide technical support to the biosolids users.

3. To conduct applied research and demonstrations to evaluate the environmental impacts of land application of biosolids, to showcase the benefits of land application of biosolids, and to evaluate the impacts of regulations on the District's biosolids land application programs.

4. Keep up-to-date with and review relevant regulatory issues to evaluate the impacts on the District's operations, and assist with the development of technically sound regulations.

5. To provide technical support on green initiatives relevant to the District's operations.

Environmental Monitoring. In 2009, the Section conducted the following monitoring and reporting activities to comply with the permits and regulations governing the biosolids management programs:

*Monitoring of Wells and Lysimeters at Biosolids Drying Facilities***.** This monitoring and quarterly reporting is conducted for six biosolids drying facilities according to permits issued by the IEPA. In 2009, the historical monitoring data were evaluated and a request was submitted to the IEPA to reduce the monitoring frequency. The IEPA approved reduction of monitoring frequency from monthly or biweekly to quarterly for most of the lysimeters. In 2009, a total of 24 quarterly monitoring reports were submitted to the IEPA.

*Environmental Monitoring at Hanover Park Fischer Farm***.** All biosolids generated at the Hanover Park WRP are land applied at the Fischer Farm located on the grounds of the WRP. The biosolids are temporarily held in lagoons then land applied by subsurface injection of the solids or supernatant according to the permit issued by the IEPA. The Biosolids Utilization and Soil Science Section is responsible for providing technical support to the monitoring program and for

preparing the quarterly monitoring reports required by the permit. In 2009, the historical well monitoring data were evaluated and a request was submitted to the IEPA to reduce the monitoring frequency. The IEPA approved the reduction of monitoring frequency from biweekly to quarterly for all but one of the monitoring wells. In 2009, four monitoring reports were submitted to IEPA.

*Biosolids Monitoring under Process to Further Reduce Pathogens Certification***.** The Section is responsible for maintaining the District's site-specific certification of processes that further reduce pathogens for biosolids processing trains at the Stickney and Calumet WRPs that was awarded by the USEPA. In this certification, the District's air-dried biosolids generated according to a codified operation is designated as Class A according to the pathogen standards of the USEPA Part 503 Rule. The monitoring program for this certification includes pathogen analysis of biosolids and semi-annual reporting to the USEPA. In 2009, two monitoring reports (as required by the certification) were submitted to the USEPA.

*Fulton County Land Reclamation Site***.** The Fulton County land reclamation site was used for land application of biosolids to reclaim strip-mined land during 1972 through 2004 under a permit issued by the IEPA. The site permit required monitoring of soil, crops, groundwater, and surface water. All environmental monitoring required by the permit was terminated in 2007 until such time that application of biosolids on the site resumes. Discretionary environmental monitoring on a limited number of fields and groundwater and surface water sites are collected every two years.

Promotion of Biosolids Beneficial Reuse and Technical Support to Biosolids Users. The Section assists in the local marketing of biosolids and providing technical support to biosolids users under the District's Controlled Solids Distribution Program. Biosolids marketing activities include the preparation of promotional documents, showcasing the District's biosolids management program at local trade shows and conferences, and presentations to potential biosolids users. In 2009, the Section conducted two exhibitions and one field day to promote beneficial use of the District's biosolids. During the year, the Section assisted in supplying biosolids technical support to a total of 40 users. These users include, park districts, schools, and suburban villages.

The Section also maintains continuous demonstrations of turfgrasses, prairie grasses, forage grasses, and wild flowers in a greenhouse at the Lue-Hing R&D Complex. In 2009, there were many tours of the greenhouse.

Applied Research on Benefits and Safety of Biosolids Land Application. The research and demonstration component of this program is aimed to support the local marketing of biosolids. Research consists of studies conducted (in collaboration with universities and the IEPA) to demonstrate that land application of biosolids in accordance with federal and state

regulations is beneficial and is protective to human health and the environment. These studies include:

1. A long-term applied research project at the District's land reclamation site in Fulton County to study the impact of biosolids land application activities at the site. This study consists of experimental corn plots which have received cumulative applications of over 1,000 dry tons of biosolids per acre (maximum-amended plots) from 1973 through 2009. These plots are utilized to study the uptake of trace elements into corn, and the fate of nutrients from continuous annual applications of biosolids.

2. Research plots in farmers' fields to demonstrate the benefits and safety of farmland application of biosolids.

3. Studies conducted at the Stickney laboratory and the Fulton County site to evaluate the availability of biosolids phosphorus to plants and potential for phosphorus runoff in biosolids-amended soils.

4. Evaluation of the beneficial effects of biosolids use on the growth of turf on golf courses and recreational fields.

5. Studies on the changes in the bioavailability of trace elements to plants over time in biosolids-amended soils.

6. Evaluation of the fate and environmental significance of organic contaminants in biosolids when applied to land.

7. Studies on the plant availability of biosolids nitrogen.

Review of Regulatory Issues. In 2009, the regulatory issues the section reviewed include the USEPA's hazard assessments of pollutants under consideration for regulation in the 40 CFR Part 503 Rule.

Support to District's Green Initiatives. The Section provided technical support in 2009 to the District's Native Prairie Landscape initiative and the District's stormwater management program. These include establishment of a native prairie research and demonstration plots and assistance on the permeable pavement research and demonstration project.

Analytical Microbiology and Biomonitoring Section

In 2009, the AMBS provided analytical monitoring of the final effluent, area rivers, lake, canals, and biosolids to document the effectiveness of the District's wastewater treatment operations. The Section was also involved in large public health research studies to generate data and

scientific information to inform policy, guide regulatory development, and improve operations. On a regular basis, the Section provided a number of ongoing public outreach services to promote public awareness and acceptance of District operations.

The Section's staff participated in the IPCB rulemaking hearings for the CAWS water quality standards and effluent limitations. Responsibilities in this civil/judiciary/legislative process included the review of testimonial documents and preparation of position statements, along with questions and comments. Professionally, the Section was involved in the USEPA and Water Environment Research Foundation (WERF) issue area team research in the fields related to microconstituents, biosolids risk assessment, and critical research and science needs for the development of national recreational water quality criteria.

Use Attainability Analysis Research Projects. The AMBS staff coordinated research studies to assess and report public health impacts of District operations on the CAWS. First, quantitative microbial health risk assessment (QMRA) methods were studied to model health risks based on measured concentrations of microorganisms, exposure, and microbial dose data. The final report, "Dry and Wet Weather Risk Assessment of Human Health Impacts of Disinfection vs. No Disinfection of the Chicago Area Waterways System," is posted on the District website (www.mwrd.org). The risk assessment model found that the microbial health risks associated with incidental contact recreational practices on the CAWS are below the risk threshold that USEPA applies to criteria for primary contact recreation. The microbiological finding from this study has been published in *Water Science and Technology Journal* (Rijal et al, 2009)[1].

Second, a public health epidemiological study, Chicago Health, Environmental Exposure and Recreation Study (CHEERS), is being conducted by a multidisciplinary team at the University of Illinois at Chicago School of Public Health, to verify the results of the QMRA study and to ascertain actual health impacts of recreational use of the CAWS. This research will be the first United States study to address the health of individuals who engage in incidental contact recreational activities, such as boating, fishing, canoeing, kayaking, and rowing. The water exposure assessment studies and microbial method development plan were approved by a WERF review panel, which was convened to peer-review the work. The study will generate scientific data on the quantification of water exposure by dermal, inhalation, and ingestion routes. The CHEERS study, which commenced on August 4, 2007, continued through 2009. The study is scheduled to be completed in 2010.

A study conducted in collaboration with the United States Geological Survey (USGS), Great Lakes Science Center (GLSC) at Porter, Indiana, addressed the non-point sources of the bacterial indicator load in the North Shore Channel (NSC). The study was to investigate the occurrence, distribution, and potential sources of fecal indicator bacteria along the NSC section of the CAWS. A final report, titled "Distribution of Escherichia coli and Enterococci in Water, Sediments, and Bank Soils Along North Shore Channel Between Bridge Street and Wilson

[1]Rijal, G. K., et al. "Dry and Wet Weather Microbial Characterization of the Chicago Area Waterway System." *Water Science and Technology Journal*, Vol. 60, No. 7, pp. 1847–1855 © IWA Publishing 2009 doi:10.2166/wst.2009.598. *2009*.

Avenue, Metropolitan Water Reclamation District of Greater Chicago," is posted on the District website (www.mwrd.org) which indicates the abundance of non-point sources of fecal indicator bacteria such as river basin soil, sediments, tributary flow, and storm sewers contributing to the overall fecal indicator bacteria load in the NSC.

Water Reclamation Plant Operation Monitoring and Research. The Section also conducted analysis and provided technical counsel for the following: (1) monitoring for FC and *E. coli* (EC) to evaluate UV light disinfection systems; (2) monitoring microbial densities on farm soil after application of biosolids; (3) high flow Egan WRP disinfection study; (4) Calumet digester mixing study; and (5) microbiological assessment to solve operational problems at the Egan and Calumet WRPs.

Specialized Laboratories Monitoring and Research. The Section consists of four dedicated state of the art laboratories performing a wide range of microbiological testing in the areas of bacteriology, environmental microbiology, parasitology, virology, and biomonitoring. An additional fifth laboratory, Molecular Microbiology Laboratory, is under construction and is anticipated to be in full operation by 2011. The specific activities of the laboratories are summarized below.

Analytical Microbiology Laboratory. The Analytical Microbiology Laboratory (AML) has been certified by the IDPH for the bacterial analysis of water since 1979. The AML is responsible for bacterial population density analyses used in WRP effluent monitoring mandated by NPDES permits. The laboratory completed proficiency testing and evaluation programs with acceptable results for the Discharge Monitoring Report – Quality Assurance (DMR-QA) Study 29, and seven microbial procedures for the examination of water from public water supplies and their sources.

Monitoring of Chicago's lake front harbor was conducted on three occasions of river reversals to Lake Michigan. The reversals were each the result of major rainstorm events in the Chicagoland area.

The AML conducted microbiological analyses to support the following monitoring and research programs: FC and EC for CAWS AWQM Program and Disinfection Study; FC for Part 503 Compliance Biosolids Monitoring, Calumet Digester Study, TARP Groundwater Monitoring Wells, and TARP Reservoir Monitoring; FC and *Salmonella* species for Biosolids Land Application Project. Potable water at District facilities was also monitored for total coliform, EC, and total heterotrophic bacteria.

An antibiotic resistant bacteria (ARB) research study, entitled "Monitoring the Total Numbers, Percentages, and Antibiotic Resistance Patterns of Antibiotic Resistance Fecal Coliforms in the Chicago Waterway System," continued in 2009. The monitoring of the density of ARB in the CAWS upstream and downstream of the Calumet WRP, as well as the final effluent

from the plant, was completed. The finding from the first phase of this study was published in *Water Science and Technology Journal* (Rijal et al, 2009)[2].

Biomonitoring Laboratory. Chronic whole effluent toxicity (WET) tests with fish (*Pimephales promelas)* and daphnids (*Ceriodaphnia dubia)* were conducted on effluent samples from the Hanover Park WRP. No chronic toxicity was observed. The biomonitoring report for Hanover Park WRP was submitted to IEPA in compliance with the NPDES permit. The laboratory successfully completed the DMR-QA Study 29 for WET tests as required under the Clean Water Act's NPDES program.

Parasitology Laboratory. Air-dried biosolids (final product) were analyzed for viable *Ascaris* ova for compliance with the Part 503 Standards. All biosolids produced from the District's codified process were determined to be Class A biosolids with respect to pathogens (less than 1 viable *Ascaris* ovum per four grams) as defined by the Part 503 Standards. The laboratory continued to monitor coliphages (male-specific and somatic) in class A biosolids and Calumet WRP digester samples.

Virology Laboratory. Air-dried biosolids (final product) were analyzed for culturable enteric viruses for compliance with the Part 503 Standards. All biosolids produced from the District's codified process were determined to be Class A with respect to pathogens (less than one enteric virus per four grams) as defined by the Part 503 Standards.

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 the CAWS. This Section also reviews and participates in regional work groups that formulate emerging federal and state water quality rules and regulations that directly relate to District NPDES permits and to water quality in the CAWS. These regulations include the 305(b) assessment reporting and 303(d) listing of impaired waters in the IEPA's Illinois Integrated Water Quality Report and Section 303(d) list, lower Des Plaines River UAA, CAWS UAA, total maximum daily loads for Salt Creek and the West Branch of the DuPage River, and the development of nutrient standards.

Field monitoring activities conducted during 2009 by the Aquatic Ecology and Water Quality Section included the following:

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[2]Rijal, G. K., et al. "Antibiotic Resistant Bacteria in Wastewater Processed by the Metropolitan Water Reclamation District of Greater Chicago System." *Water Science and Technology Journal*, Vol. 59, No. 12, pp. 2297–2304 © IWA Publishing 2009 doi:10.2166/wst.2009.270. 2009.

Benthic Invertebrate Monitoring. As part of the AWQM Program, benthic invertebrate abundance was assessed at 27 monitoring stations in the Chicago, Calumet, and Des Plaines River Systems during the period June through September of 2009. Samples were collected from 13 stations located on the deep-draft waterways and 14 stations on wadeable streams. Benthic invertebrates were collected using a 6- x 6-inch Ponar Grab sampler and a 3- x 3-inch Hester-Dendy artificial substrate. In the laboratory, the sediment samples were washed, screened, and the oligochaetes (sludge worms) were sorted out and counted. Other benthic invertebrates were sent to an outside contractor for identification. The benthic invertebrate data will be provided to the IEPA for their use in preparing the Illinois 305(b) assessment report.

Fish Monitoring. As part of the AWQM Program, fish were collected from June through September at 34 stations in the Chicago, Calumet, and Des Plaines River Systems. Twenty stations were located on the deep-draft waterways and 14 stations were on wadeable streams.

On the deep-draft waterways, fish were collected using an electrofishing boat. Electrofishing, using either a backpack electrofisher or a small electrofishing boat, and seining, using a 15-foot bag seine, were used to assess the fish population on wadeable streams. 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.

Also, during 2009, fish were collected by boat electrofishing from five Sidestream Elevated Pool Aeration Stations, Lake Calumet, and the Lake Calumet connecting channel.

Habitat and Sediment Quality Monitoring. From June through September, a physical habitat assessment was conducted at 27 monitoring stations in the Chicago, Calumet, and Des Plaines River Systems. In order to assess sediment chemistry and sediment toxicity, sediment samples were collected at 15 monitoring stations in the North Shore Channel and in the wadeable and deep-draft portions of the North Branch of the Chicago River. 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 2009, chlorophyll in phytoplankton was monitored monthly at 59 stations in the Chicago, Calumet, 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* is used to estimate the phytoplankton biomass and productivity and to determine the trophic status of surface waters.

Continuous Dissolved Oxygen Monitoring. Continuous DO monitoring continued during 2009 at 31 stations in the Chicago, Calumet, and Des Plaines River Systems, including 20 deep-draft stations and 11 wadeable stream stations. Deep-draft monitoring stations extended from Main Street on the North Shore Channel, Clark Street on the Chicago River, and Torrence Avenue on the Grand Calumet River, to Jefferson Street on the Des Plaines River below the

Lockport Lock and Dam. Water quality monitors were deployed and retrieved weekly at all monitoring stations. The 2009 reports are planned for publication in the second quarter of 2010.

Illinois Waterway Monitoring. During May, August, and October of 2009, 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. The 2009 annual summary report will be completed in the second quarter of 2010.

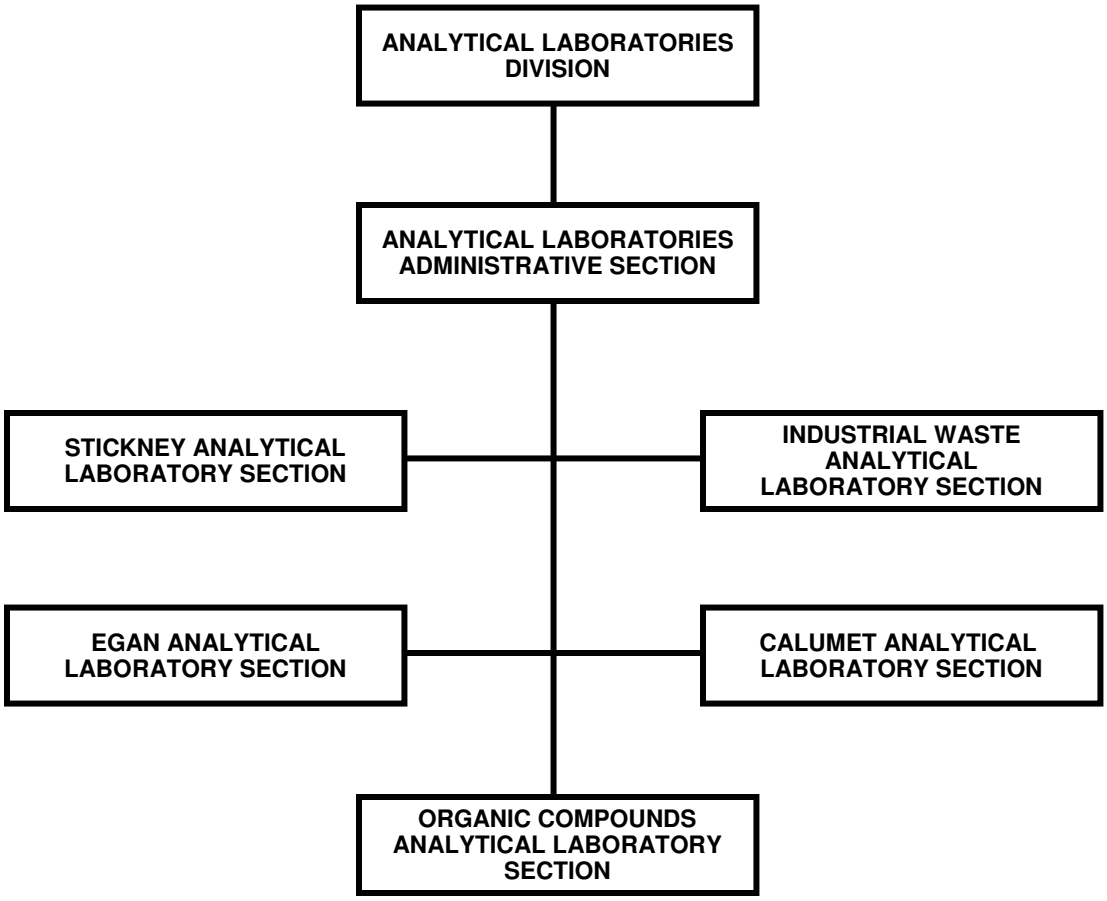
Endocrine Disrupting Compound Study. A three-year study began in March 2009 to conduct a comprehensive assessment of the potential for endocrine disrupting compounds (EDCs) to impact the reproductive potential of fish populations in the CAWS. The objectives of this study are to determine (1) the spatial and temporal occurrence of EDCs; (2) the occurrence of endocrine disruption in wild fish populations; and (3) the likely sources contributing to any occurrence of endocrine disruption.

Waterway samples were collected from 38 AWQM stations and final effluent samples were obtained from all seven District treatment plants. These water samples were analyzed each month for total estrogenicity and a subset of common estrogenic compounds. Caged fish were deployed in selected CAWS waterways for at least two weeks during two periods in 2009 (May/June and September/October). Wild fish were also collected in June and October using various gear. Wild and caged fish were examined for endocrine disruption using histopathology and plasma vitellogenin analysis. Results will be published at the conclusion of this study in 2012.

Chicago Area Waterway System Habitat Evaluation and Improvement Study. In order to provide aquatic habitat information for a UAA of the CAWS, the District conducted a CAWS habitat evaluation and improvement study which formulated a multi-metric habitat index applicable to the deep-draft waterways of the CAWS. For development of this habitat index, the District's consultant, LimnoTech, used fish, macroinvertebrate, and habitat data for the period 2001 through 2008 from 30 sampling stations on the CAWS. LimnoTech also included the analysis of collected digital video of bank conditions and habitats, as well as high resolution aerial imagery and bathymetry, to support the assessment of the habitat conditions, index development, and the classification of reaches within the CAWS according to their physical habitat. The final reports for the CAWS Habitat and Improvement Study are available on the M&R Department's M&R Data and Reports/UAA Study page on the District's website (www.mwrd.org).

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 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 and Illinois waterways.

- To assist the IW Division as it routinely regulates categorical industrial discharges to the sewer system and waterways to determine compliance with the Sewage and Waste Control Ordinance (SWCO) and the USEPA-approved Pretreatment Program.

A centralized laboratory located at the Stickney WRP and two other regional laboratories (a total of one organic and four inorganic analytical 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 2 on page 40, could not be accomplished without automation and instrumentation. Staff from the M&R and IT Departments worked together to further improve the Laboratory Information Management System (LIMS) to increase data processing and reporting, and to enhance data acquisition from automated instruments. Through its LIMS team, the ALD provided ongoing support during 2009 to the EM&R Division, IW Division, and M&O Department personnel.

In mid-2003, the ALD implemented a chemical hygiene plan (CHP) for the District laboratories, which was revised in 2009. The fifth round of annual audit inspections of the laboratories was completed during 2009. Each laboratory is in compliance with the requirements of the CHP.

The five analytical laboratories maintained laboratory accreditation by the IEPA during 2009 in accordance with NELAP.

Stickney Analytical Laboratory (SAL)

This laboratory is located at the Cecil Lue-Hing R&D Complex and performed 755,503 analyses for solids, nutrients, and metals on 55,869 samples in providing analytical services for the following:

TABLE 2: TOTAL NUMBER OF ANALYSES PERFORMED IN 2009

Program	Nutrients	Oxygen Demands	Metals	Solids	Organic Compounds	Others	Total Program
4652 Liquid Monitoring	121,750	74,029	229,614	55,074	22,287	61,295	564,049
TARP	4,337	1,076	20,376	682	0	3,878	30,349
Treatment Facilities	117,413	72,953	209,238	54,392	22,287	57,417	533,700
4653 Solids Monitoring	17,062	1,101	68,939	142,608	11,974	35,781	277,465
4666 Sewage & Waste Control	809	37	288,173	477	33,254	9,628	332,378
4663 User Charge	60	65,395	0	18,284	0	33,723	117,462
4671 Lake Michigan	324	120	1,377	151	1,962	176	4,110
4672 Waterways	11,884	1,955	86,131	3,527	79,671	17,277	200,445
4681 Assistance to M&O	2,944	607	1,466	5,800	7,771	14,846	33,434
4682 Assistance to Others	153	1,494	382	392	0	217	2,638
4690 Operations & Research	26,548	6,529	90,531	5,322	8,152	5,450	142,532
Totals	181,534	151,267	766,613	231,635	165,071	178,393	1,674,513

M&O Department.

1. Process Control, Operations Monitoring, and NPDES Permit Compliance Monitoring for the Stickney WRP.

2. Solids management areas at Harlem Avenue and Lawndale Lagoons.

3. Calumet, Stickney, and Egan WRPs Biosolids Centrifuge Cake Application to agricultural lands.

4. TARP Groundwater Monitoring Program.

EM&R Division.

1. Ambient Water Quality Monitoring Network Program.

2. Lysimeter samples from solids management areas at LASMA, Calumet East and West, Marathon, Vulcan, HASMA, Stony Island and RASMA.

3. Analytical support for biosolids marketing.

4. Illinois Waterways Monitoring Program.

5. Kirie – UPD14 Odor and Corrosion.

6. Chemical Phosphorus Removal at the Egan WRP.

7. Full-scale evaluation for GBT at Hanover Park WRP.

8. Fish Kill Response.

9. Notice and Necessary Information (NANI) Biosolid Study.

10. Thornton Transitional Reservoir and Monitoring Wells.

11. Disinfection Study of Egan Excess Discharge Flow.

12. WERF N-GHG Monitoring Study.

13. Egan UV dose Study.

14. Permeable Pavement Monitoring Plan.

15. CAWS Model Data Collection.

16. WRP Greenhouse Gas Monitoring.

17. Endocrine Disruptor Study.

18. Lab Test for Enhanced Primary Setting.

19. Characterization of Centrate and other recycle streams.

IW Division. Metals analyses are conducted on regulated categorical industrial discharges to determine compliance with the SWCO. The following 15 metals are regulated: arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium 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, polymer, and $FeC1_3$) 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) 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)

Located at the Lue-Hing R&D Complex, this laboratory performed 194,401 analyses on 21,702 samples. The laboratory performs analyses for fats, oils and greases (collectively, FOG); several species of cyanide (total, amenable to chlorination, and weak acid dissociable); phenols; total organic carbon (TOC); total and suspended solids; biochemical, carbonaceous biochemical, and chemical oxygen demands (BOD_5, $CBOD_5$ and COD) and all required support analyses; residual chlorine; pH; and DO in support of the following:

M&O Department.

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

2. Solids management areas at Harlem Avenue, Lawndale Lagoons, Stony Island, and Calumet.

3. Class B Biosolids Application to Farmlands.

4. TARP Groundwater Monitoring Program.

5. Racine Avenue Pump Station Flood Event.

EM&R Division.
Long-term environmental monitoring and research programs, such as:
1. AWQMN Program.

2. Illinois Waterways Monitoring Program.

3. CFAR Nutrient Study.

4. Fulton County Retention Basin Monitoring.

Short-term environmental monitoring and research projects, such as:
1. Hanover Park Ultraviolet Disinfection Systems Evaluation.

2. Analytical assistance during Fish Kill events.

3. Water Environment Research Foundation WRP Greenhouse Gas Monitoring Study.

4. Disinfection Study of Egan Excess Discharge Flow.

5. Permeable Pavement Monitoring Plan.

6. Endocrine Disruptor Study.

7. Enhanced Primary Settling Testing.

IW Division. The Section continued to provide analytical assistance for the administration of the District's SWCO and the User Charge Ordinance (UCO), in addition to compliance testing related to the categorical pretreatment limits. This includes: (1) maintaining evidentiary laboratory chain of custody for all samples obtained from various industrial dischargers; (2) providing records as required for various legal proceedings, hearings and/or Freedom of Information Act requests; (3) providing responses of a technical nature to dischargers' inquiries related to analytical methodologies. Vital technical and programming assistance continued to be provided for the interfacing of the new Sample Manager for Windows (SMW) LIMS upgrade to the Pretreatment Information Management System (PIMS).

Organic Compounds Analytical Laboratory (OCAL)

The OCAL is located at the Egan WRP and is responsible for analysis of organic compounds in samples primarily from the District's WRPs, industrial waste discharges, and Chicagoland and Illinois Waterways.

During 2009, the OCAL performed 165,071 analyses on 665 samples in providing analytical services to the following:

M&O Department.

1. Organic compounds in raw sewage, sludge, and final effluent samples from the seven District WRPs for monitoring NPDES compliance semi-annually.

2. Organic compounds for 503 compliance monitoring in sludge form the seven District WRPs.

3. Preparation for complying with the general storm water permit.

4. Organic compounds analyses for TARP and CSO events.

5. Organic compounds analyses for emergency spill and Fish Kill samples.

EM&R Division.

1. Emission study of volatile organic compounds in District raw sewage samples from the seven District WRPs semiannually.

2. Nonylphenols in Chicagoland and Illinois Waterways samples, either bi-monthly or quarterly.

3. Organic priority pollutants/BETX in Chicagoland and Illinois Waterway samples, including aqueous and sediment samples.

4. Organic priority pollutants in Kankakee County amended biosolids soil samples.

5. Organic compounds including herbicides in Lockport Powerhouse drinking water samples annually.

6. Culture or toxicity water samples from the Analytical Microbiology and Biomonitoring Section.

7. PAH analyses for the permeable pavement study at Stickney.

8. Low levels of diazinon in final effluents from the seven District WRPs semi-annually.

9. Coordination of the semi-annual analysis of triclosan and triclocarban in District WRP samples (effluent, raw sewage and sludge) by Johns Hopkins University.

10. Low level acrolein analyses in effluents from five of the District WRPs.

IW Division.

1. Organic priority pollutants analyses in discharges from industrial users as part of the District's Pretreatment Program to ensure compliance with the SWCO and USEPA categorical standards. Types of wastes included: electroplating, organic chemicals and plastics, cold forming, metal finishing, metal molding and casting, aluminum forming, and pharmaceuticals.

John E. Egan Analytical Laboratory (EAL)

This laboratory is located at the Egan WRP and performed 280,315 analyses on 29,744 samples in providing analytical services for the following:

M&O Department.

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

2. USEPA and IEPA Split Sampling Program.

3. Materials (Sodium Bisulfite, Sodium Hypochlorite, and Bioxide) and Boiler Water Testing Programs.

4. Soluble Phosphorus Study at the four North Area WRPs.

5. Waste Water Emergency Response Plan (WERP) samples.

6. Polymer Testing for Raw Sludge Dewatering at the Egan and Hanover Park WRPs.

7. Development, Implementation and Support of LIMS Reports for use by M&O Personnel at the four North Area WRPs.

8. Soluble Metals Analyses of the Influent and Outfall of the four North Area WRPs.

9. 503 Compliance Monitoring of Sludge from the four North Area WRPs.

10. Solids Monitoring of the Processing and Use of Sewage Biosolids.

11. Control of Nocardia and Microthrix Parvicella Filaments Analytical Support at the Egan WRP.

EM&R Division.

1. Study of Chemical Phosphate Removal at Egan WRP.

2. Hanover Park WRP Side by Side UV Disinfection System Evaluation.

3. Characterization of Egan Centrate.

4. Hanover Park Fischer Farm Wells and Biosolids.

5. Monitoring Step Feed Performance at the Egan WRP.

6. Full Scale Evaluation of the GBT at Hanover Park WRP.

7. Kirie UDP14 Odor and Corrosion Study.

8. Hanover Park WRP Stress Test.

IW Division.

1. Determination of pHs for grab samples collected by IW Division personnel.

2. Screen and preserve cyanide grab samples before holding time is exceeded.

Calumet Analytical Laboratory (CAL)

This laboratory is located at the Calumet WRP and performed 279,237 analyses on 33,285 samples in 2009 by providing analytical services for the following:

M&O Department.

1. Process Control, Operations Monitoring, and NPDES Compliance Monitoring for the Calumet and Lemont WRPs.

2. Provided assistance to the SAL to coordinate the sampling for Low Level Mercury of the Calumet and Lemont WRP effluents.

3. Calumet and Lemont WRP Wet Weather Events.

4. WEFTEC Operators Challenge BOD event.

5. Drying Bed samples from Stony Island at the request of LASMA.

6. District's Environmental Management System.

7. 503 Compliance Monitoring of Sludge form the Calumet and Lemont WRPs.

8. Soluble metals analysis of the Influent and Outfall of the Calumet and Lemont WRPs.

9. Odor and Corrosion Control at Kirie Interceptors.

EM&R Division.

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

2. Wastewater Research by measuring hydrogen sulfide in the profile study of the influent for Stickney and Calumet WRPs.

3. Sulfate analyses of Waterways, TARP, and Lysimeter samples.

4. Sulfate and Trace Metals analyses for the Stickney Greenhouse samples.

5. Characterization of Centrate and Other Recycle Streams Projects.

6. Materials testing for polymer and sodium hypochlorite purchased by the District for verification of Contract requirements.

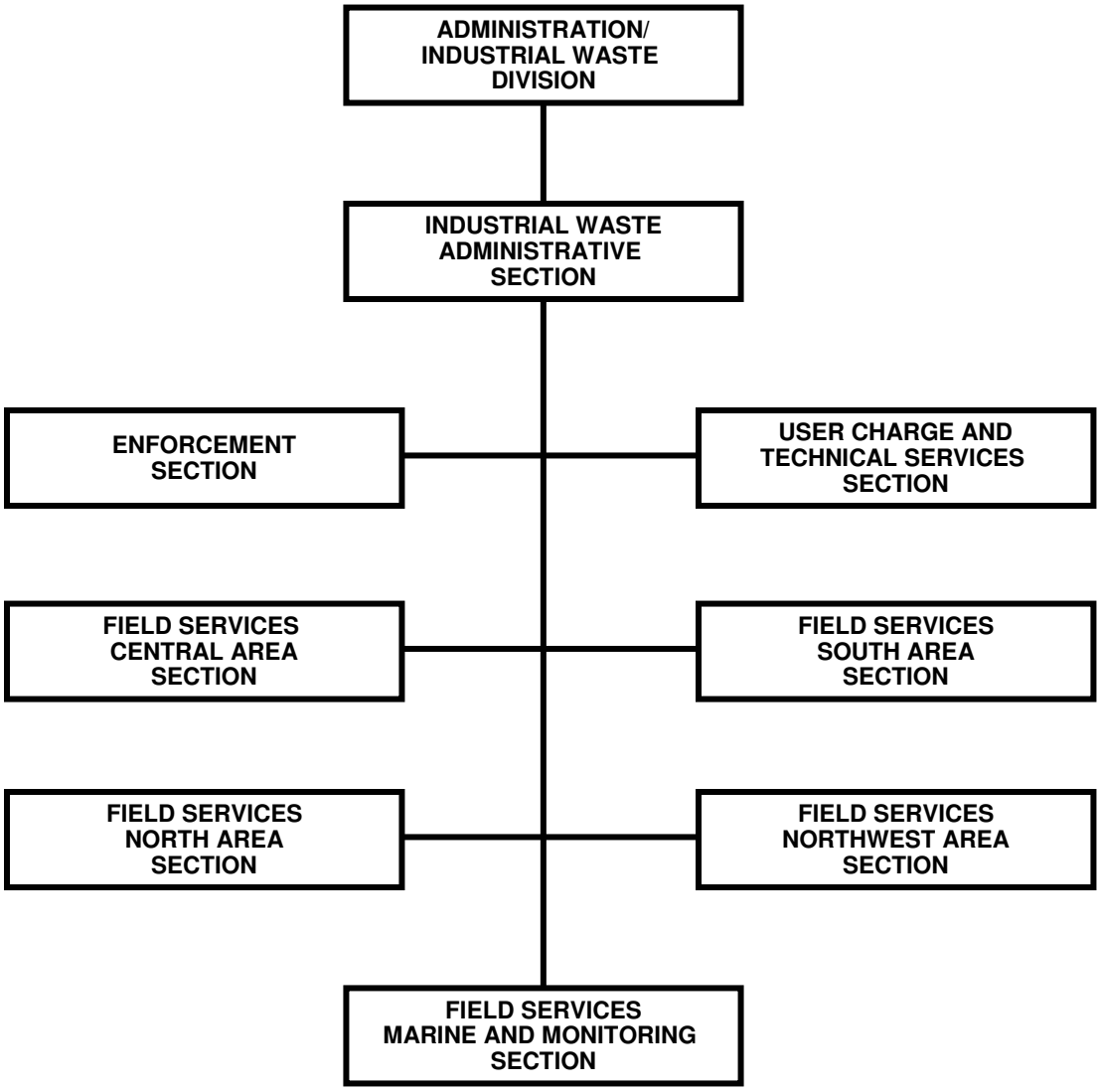
7. Notice and Necessary Information (NANI) Biosolid Study Samples.

IW Division.

1. Screen and preserve cyanide grab samples before holding time is exceeded.

FIGURE 3

ADMINISTRATION / 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 Services. The Division's primary responsibilities are the administration of the District's SWCO and UCO. It is responsible for the compilation and presentation of data pertaining to industrial users' discharges to the District's sewerage system. Additionally, 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 Services 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 M&R, 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 2009 included the issuance or renewal of 89 Discharge Authorizations; the review of 755 Continued Compliance Reports; and the review of 12 Spill Prevention, Containment and Countermeasure Plans. Enforcement activities for the period from 2004 through 2009 are depicted in the following table.

Year	Cease and Desist Orders	Board Orders	Legal Actions
2004	284	11	4
2005	152	2	0
2006	149	1	0
2007	132	1	0
2008	126	1	0
2009	88	1	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 a newspaper that provides meaningful public notice within the jurisdiction of the District. The trend for the period from 2004 through 2009 is depicted in the following table.

Publication Year[1]	Effluent Limitations	Reporting Requirements	Other Requirements[2]	Total Number of Industrial Users Published
2004	18	64	2	76
2005	21	55	0	72
2006	11	54	0	61
2007	12	44	0	51
2008	13	25	2	36
2009[3]	11	20	3	34

[1] For prior year's actions.

[2] 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.

[3] Data is projected. Publication will be completed by 3rd quarter of 2010.

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 2009, the Section manually reviewed 2,148 reports, including delinquent filings, for 1,946 users (789 commercial-industrial and 1,157 tax-exempt users) containing calculations of their User Charge liabilities under the UCO and documentation corroborating their data. The Section utilized an automated clearing process for 1,533 tax-exempt users approved to file under Section 7f of the UCO, which required no report submittal from the user or manual review by the District. The Section classified 95 new Large Commercial-Industrial and Tax-Exempt Users and 44 Small Nonresidential Commercial-Industrial Users in 2009.

The Section requests verification sampling of certain facilities by the Field Services Section, and determines the acceptability of the user's proposed sampling methodology. In 2009, the Section reviewed 744 District inspections and sampling reports from the Field Services Section; 86 user proposals for sampling, monitoring and/or installations; sealed 63 privately owned water meters used for reporting volume deductions or discharge volumes; and conducted 343 field inspections to verify user data and/or compliance with the UCO. As of the end of 2009, the Section had also identified 319 Users who were eligible for reduced reporting and self-monitoring requirements under Sections 7g, 7h, and 7i of the UCO. Granting reduced reporting requirements reduces the cost to industrial users for determining their fair share of User Charges and reduces the District's oversight costs related to these industrial users.

The costs for the administration of the SWCO and UCO are recovered from industrial users, through Minimum Pretreatment Requirements (MPR) charges, Noncompliance Enforcement (NCE) charges and User Charge Verification (UCV) charges. The recovery of MPR and UCV charges is administered through the UCO and the recovery of NCE charges is administered through the SWCO.

The following table shows the User Charge revenue, as reported by the District's Finance Department, collected over the period from 2004 through 2009.

Year	User Charge Receipts
2004	$48,007,510
2005	$44,571,653
2006	$53,616,772
2007	$50,828,451
2008	$54,442,493
2009	$48,253,267

Field Services Section

The Field Services 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 2009, 2,164 SWCO and 2,058 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 2009, 12,650 water quality samples were collected. Further, all groundwater monitoring wells installed for the District's TARP were routinely sampled. In 2009, 936 samples were obtained at 125 TARP groundwater monitoring wells. Chemical toilet service companies who, under District permit, discharge cleanings at the Stickney WRP are also monitored and sampled. During 2009, six chemical toilet service companies made 670 disposals at the Stickney WRP. For these disposal events, 161 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 2009, 178 investigations were conducted in response to requests from federal, state and local agencies, municipalities and private citizens; 64 investigations were conducted in response to self-reported industrial activities; and 34 investigations were conducted in response to requests from the District's M&O Department.

APPENDIX I

APPENDIX I

MEETINGS AND SEMINARS 2009

1. Emergency Communications Workshop, Naperville, Illinois, *January 2009.*

2. Illinois Association of Park Districts/Illinois Parks and Recreation Association Conference, Chicago, Illinois, *January 2009.*

3. Illinois Association of Wastewater Agencies, Technical Committee Meeting (and follow-up committee meetings throughout the year), Utica, Illinois, *January 2009.*

4. Illinois Water Environment Association and Central States Water Environment Association, Government Affairs in Water Pollution Control Conference, Willowbrook, Illinois, *January 2009*.

5. Illinois Water Environment Association, Laboratory Committee Meeting (and follow-up committee meetings throughout the year), Rockford, Illinois, *January 2009.*

6. Industrial Water, Waste, and Sewage Group Meeting (and follow-up committee meetings throughout the year), Chicago, Illinois, *January 2009.*

7. Midwest Water Analysts Association, Winter Expo 2009 (and follow-up committee meetings throughout the year), Kenosha, Wisconsin*, January 2009*.

8. The National Environmental Laboratory Accreditation Conference Institute, Forum on Laboratory Accreditation, Miami, Florida, *January 2009.*

9. The Seminar Group, Carbon Credits Seminar, Chicago, Illinois, *January 2009*.

10. United States Department of Agriculture, Regional Research Committee W-1170 Annual Meeting, Las Vegas, Nevada, *January 2009*.

11. United States Environmental Protection Agency, Aquatic Nuisance Species Barrier Advisory Panel Meeting (and follow-up committee meetings throughout the year), Chicago, Illinois, *January 2009*.

12. United States Fish and Wildlife Service, Hines Emerald Dragonfly Critical Habitat Planning Meeting, Romeoville, Illinois, *January 2009*.

13. University of Illinois at Urbana-Champaign, 18th Annual Research-Oriented Science Job and Information Fair, Urbana, Illinois, *January 2009*.

14. Battelle Fifth International Conference on the Remediation of Contaminated Sediment, Jacksonville, Florida, *February 2009*.

APPENDIX I

MEETINGS AND SEMINARS 2009

15. Illinois Chapter of the American Fisheries Society, Annual Meeting, Moline, Illinois, *February 2009*.

16. Illinois Pollution Control Board, Use Attainability Analysis Hearings (and follow-up hearings throughout the year), Chicago, Illinois, *February 2009.*

17. National Association of Clean Water Agencies, 2009 Winter Conference, Atlanta, Georgia, *February 2009.*

18. United States Environmental Protection Agency, Surface Water Monitoring and Standards (SWiMS), 8th Annual Meeting, Chicago, Illinois, *February 2009*.

19. University of Illinois at Chicago, Chicago Wilderness Wild Things 2009 Conference, Chicago, Illinois, *February 2009*.

20. Water Environment Federation, Specialty Conference: Disinfection, Atlanta, Georgia, *February 2009*.

21. Water Environment Research Foundation, Experts Scientific Workshop on Critical Research and Science Needs for the Development of Recreational Water Quality Criteria in Inland Waters, Dallas, Texas, *February 2009.*

22. Beyond the Web Page: An e-Government Workshop, Chicago, Illinois, *March 2009.*

23. DuPage River, Salt Creek Watershed Workgroup Meeting (and follow-up Chloride and Monitoring committee meetings throughout the year), Downers Grove, Illinois, *March 2009*.

24. Illinois Association of Wastewater Agencies, Mini-Conference, Springfield, Illinois, *March 2009*.

25. Illinois Section of the American Water Works Association, Incidental Command System Training, Whitington, Illinois, *March 2009.*

26. Illinois Water Environment Association and Illinois Section of the American Water Works Association, 2009 Joint Water Conference and Expo, Springfield, Illinois, *March 2009*.

27. National Association of Clean Water Agencies, National Pretreatment and Pollution Prevention Workshop, Charlotte, North Carolina, *March 2009.*

28. PITTCON, Conference and Expo 2009, Chicago, Illinois, *March 2009.*

APPENDIX I

MEETINGS AND SEMINARS 2009

29. Response to Biological Events, River Grove, Illinois, *March 2009.*

30. Water Environment Federation, 2009 Water and Wastewater Leadership Center, Chapel Hill, North Carolina, *March 2009.*

31. Water Environment Research Foundation, Research Council Meeting, Alexandria, Virginia, *March 2009.*

32. Agilent Technologies, LC-MS Training, Schaumburg, Illinois, *April 2009.*

33. Calumet Government Working Group Meeting, Chicago, Illinois, *April 2009*.

34. Central States Water Environment Association, Educational Seminar: Nutrient Removal, Madison, Wisconsin, *April 2009.*

35. Chicago Chromatography Discussion Group, 46th Annual Introductory Course in Gas Chromatography, Schaumburg, Illinois, *April 2009.*

36. Dionex, Autotrace Extraction System Demonstration, Bannockburn, Illinois, *April 2009.*

37. Emergency Support Function #3 Teleconference, Chicago, Illinois, *April 2009.*

38. Environmental Systems Research Institute, Geographic Information Systems Training, Chicago, Illinois, *April 2009*.

39. Illinois Chapter of the American Fisheries Society, Biology and Identification of Crayfish Workshop, Warsaw, Illinois, *April 2009*.

40. Pharmaceutical Waste Disposal Work Group Meeting, Chicago, Illinois, *April 2009.*

41. United States Environmental Protection Agency, National Beach Conference, Huntington Beach, California, *April 2009*.

42. Water Environment Federation, 2009 Member Exchange Meeting, Las Vegas, Nevada, *April 2009.*

43. American Society for Microbiologists, 109th General Meeting, Philadelphia, Pennsylvania, *May 2009*.

44. Chicago State University, Calumet Grand Challenges Symposium, Chicago, Illinois, *May 2009*.

APPENDIX I

MEETINGS AND SEMINARS 2009

45. Illicit Discharge Detection and Elimination, Wheaton, Illinois, *May 2009.*

46. Illinois Institute of Technology, Dewatering Using Hydrogel Demonstration, Chicago, Illinois, *May 2009*.

47. International Water Association, 15th International Symposium on Health-Related Water Microbiology, Naxos, Greece, *May 2009*.

48. Midwest Emergency Preparedness and Response Conference, Rockford, Illinois, *May 2009.*

49. National Association of Clean Water Agencies, 2009 National Clean Water Policy Forum, Washington, D. C., *May 2009.*

50. United States Environmental Protection Agency, Asian Carp Rapid Response Committee Meeting (and follow-up committee meetings throughout the year), Chicago, Illinois, *May 2009*.

51. Water Environment Federation, Residuals and Biosolids Conference, Portland, Oregon, *May 2009.*

52. Air and Waste Management Association, 102th Annual Conference, Detroit, Michigan, *June 2009*.

53. Chicago Metropolitan Agency for Planning, Sustainable Streets for Chicagoland Workshop, Chicago, Illinois, *June 2009*.

54. Illinois Water Environment Association, 2009 Joint Laboratory Seminar, Downers Grove, Illinois, *June 2009.*

55. Incident Command, River Grove, Illinois, *June 2009.*

56. National Operator Trainer Conference, Chicago, Illinois, *June 2009*.

57. Water Environment Federation, Specialty Conference: Nutrient Removal 2009, Washington, D. C., *June 2009*.

58. American Chemical Society, 51st Annual Rocky Mountain Conference on Analytical Chemist, Snowmass, Colorado, *July 2009.*

59. Customer Service Training Class, Chicago, Illinois, *July 2009.*

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MEETINGS AND SEMINARS 2009

60. HazMat IQ Training, Chicago, Illinois, *July 2009.*

61. Illinois Environmental Regulatory Group, 2009 Title V Compliance, Springfield, Illinois, *July 2009*.

62. Illinois Professional Turf Conference, Exposition, Lemont, Illinois, *July 2009*.

63. Illinois River Coordinating Council Meeting, Chicago Botanical Gardens, Chicago, Illinois, *July 2009*.

64. Illinois Water and Wastewater Agency Response Network, St. Charles, Illinois, *July 2009.*

65. National Association of Clean Water Agencies, 2009 Summer Conference, Milwaukee, Wisconsin, *July 2009.*

66. United States Department of Agriculture, Agricultural Research Service, International Symposium of Soil Organic Matter Dynamics, Colorado Springs, Colorado, *July 2009*.

67. Varian Gas Chromatography, Galaxie Chromatography Data System Course, Wood Dale, Illinois, *July 2009.*

68. Water Environment Federation, Microconstituents and Industrial Water Quality Conference, Baltimore, Maryland, *July 2009*.

69. Crystal Reports Training Seminar, Chicago, Illinois, *August 2009.*

70. EmCon, Second International Conference, 2nd International Conference on Occurrence, Fate, Effects, and Analysis of Emerging Contaminants in the Environment, Fort Collins, Colorado, *August 2009*.

71. Metropolitan Water Reclamation District of Greater Chicago, Laboratory Comparable Facility Tours, Phoenix, Arizona; Los Angeles, Sacramento, and San Diego, California, *August 2009*.

72. National Science Foundation, Industry University Cooperative Research Center Workshop, Milwaukee, Wisconsin, *August 2009*.

73. The National Environmental Laboratory Accreditation Conference Institute, Environmental Measurement Symposium NEMC 2009, San Antonio, Texas, *August 2009.*

APPENDIX I

MEETINGS AND SEMINARS 2009

74. American Society of Landscape Architects, Annual Meeting and Exposition, Chicago, Illinois, *September 2009*.

75. Enfo Tech and Consulting, iPACS User Group Meeting, Princeton, New Jersey, *September 2009.*

76. Illinois Emergency Management Conference, Springfield, Illinois, *September 2009.*

77. Illinois Section American Water Works Association, Pandemic Awareness and Planning for Water Utilities Seminar, Countryside, Illinois, *September 2009*.

78. iPACS User Group Conference, Trenton, New Jersey, *September 2009.*

79. American Institute of Chemical Engineers, Midwest Regional Conference, Chicago, Illinois, *October 2009*.

80. Chicago Local Emergency Planning Commission Table Top Exercise, Chicago, Illinois, *October 2009.*

81. Great Lakes Observing System Mapping Workshop, Chicago Illinois, *October 2009*.

82. Illinois Environmental Protection Agency, Pharmaceutical Disposal Summit, Springfield, Illinois, *October 2009.*

83. Leadership Skill for Middle Managers, Chicago, Illinois, *October 2009.*

84. Maine Benzodiazepine Study Group, Annual Conference, South Portland, Maine, *October 2009.*

85. Northern/Central Illinois Pipeline Association Training, Elmhurst, Illinois, *October 2009.*

86. University of Illinois at Chicago, 2009 e-Government Workshop, Chicago, Illinois, *October 2009.*

87. Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida, *October 2009*.

88. American Water Works Association, Water Quality Technical Conference and Exposition, Seattle, Washington, *November 2009.*

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MEETINGS AND SEMINARS 2009

89. Illinois Association of Wastewater Agencies, Pretreatment Subcommittee, Chicago, Illinois, *November 2009.*

90. Lake Michigan Section of the Air and Waste Management Association, 2009 Air Quality Management Conference, Downers Grove, Illinois, *November 2009.*

91. Midwest Water Analysts Association, 2009 Fall Meeting, Zion, Illinois, *November 2009*.

92. Soil Science Society of America, Annual Meeting, Pittsburg, Pennsylvania, *November 2009*.

93. Water Environment Research Foundation, Quantification of Pathogens and Sources of Microbial Indicators for QMRA in Recreation Waters Project Meeting, Sacramento, California, *November 2009*.

94. Management and Leadership Development Follow-Up Meeting, Schaumburg, Illinois, *December 2009.*

95. National Association of Clean Water Agencies, Hosted State/Regional Clean Water Advocacy Summit, Washington, D. C., *December 2009.*

96. Water Environment Research Foundation, Research Council Meeting, Alexandria, Virginia, *December 2009.*

97. World Resources Institute, Nutrient Trading Meeting, Chicago, Illinois, *December 2009*.

APPENDIX II

APPENDIX II

PRESENTATIONS 2009

1. "Concerns About Endocrine Disrupting Chemicals in Land-Applied Biosolids – An Overview?" Presented at the United States Department of Agriculture, Regional Research Committee W-1170 Annual Meeting, Las Vegas, Nevada, by L. S. Hundal. *January 2009.* PP

2. "The Carbon and Energy Footprint of Water Reclamation and Waterway Management in Greater Chicago." Presented at the Midwest Water Analysts Association, Winter Expo 2009, Kenosha, Wisconsin, by J. A. Kozak, C. O'Connor, and T. C. Granato. *January 2009.* PP

3. "Restoring Prairies and Managing Stormwater and Local Waterways with Environmental Stewardship Vision: The Metropolitan Water Reclamation District of Greater Chicago Leading by Example." Presented at the University of Illinois at Chicago, Chicago Wilderness Wild Things 2009 Conference, Chicago, Illinois, by S. Dennison. *February 2009.* PP

4. "An Overview of Climate Change, the Controversy, Proposed Legislation, and Projected Impacts on Wastewater Treatment Operations." Presented at the Illinois Water Environment Association and Illinois Section of the American Water Works Association, Joint Water Conference and Exhibition, Springfield, Illinois, by J. Moran, C. O'Connor, J. A. Kozak, and T. C. Granato. *March 2009.* PP

5. "Determination of Methane and Nitrous Oxide Emissions from the Stickney Water Reclamation Plant." Presented at the Illinois Water Environment Association and Illinois Section of the American Water Works Association, Joint Water Conference and Exhibition, Springfield, Illinois, by J. A. Kozak and A. Oskouie. *March 2009.* PP

6. "Environmental Management: Perspectives of a Regulated and Regulatory Agency." Presented at the Illinois Institute of Technology, Environmental Monitoring and Compliance Course of the Stuart School of Business, Chicago, Illinois, by L. Kollias. *March 2009.* PP

7. "Metropolitan Water Reclamation District of Greater Chicago's Role in Protecting Public Health and Chicago Area Waterways." Presented at the Illinois Water Environment Association and Illinois Section of the American Water Works Association, Joint Water Conference and Exhibition, Springfield, Illinois, by G. Rijal. *March 2009.* PP

8. "Phosphorous Reduction Demonstration Project at the John E. Egan Water Reclamation Plant." Presented at the Illinois Association of Wastewater Agencies, Mini-Conference, Springfield, Illinois, by H. Zhang. *March 2009.* PP

APPENDIX II

PRESENTATIONS 2009

9. "Operating the Sidestream Elevated Pool Aeration Stations to Meet the Proposed Water Quality Standards." Presented at the Illinois Water Environment Association and Illinois Section of the American Water Works Association, Joint Water Conference and Exhibition, Springfield, Illinois, by T. Minarik. *March 2009.* PP

10. "Stream Response to Phosphorus Reduction at the Metropolitan Water Reclamation District of Greater Chicago's Egan Water Reclamation Plant." Presented at the Illinois Water Environment Association and Illinois Section of the American Water Works Association, Joint Water Conference and Exhibition, Springfield, Illinois, by J. Wasik. *March 2009.* PP

11. "Microbial Risk Assessment of the Chicago Area Waterways." Presented at the United States Environmental Protection Agency, National Beach Conference, Huntington Beach, California, by G. Rijal. *April 2009.* PP

12. "A Novel Approach to *Ascaris* Analysis in Biosolids." Presented at the Midwest Water Analyst Association, 2009 Spring Meeting, Cicero, Illinois, by R. Gore. *May 2009.* PP

13. "Biosolids Use in Calumet Area Restoration – A Cost-Effective and Sensible Option." Presented at the Chicago State University, Calumet Grand Challenges Symposium, Chicago, Illinois, by L. S. Hundal. *May 2009.* PP

14. "Long-Term Assessments of Microconstituents Fate in Biosolids-Amended Soils." Presented at the Water Environment Federation, Residuals and Biosolids Conference, Portland, Oregon, by L. S. Hundal, K. Xia, K. Kumar, A. E. Cox, and T. C. Granato. *May 2009.* PP

15. "Microbial Health Risk Assessment of the Chicago Area Waterway System." Presented at the International Water Association, 15th International Symposium on Health-Related Water Microbiology, Naxos, Greece, by G. Rijal. *May 2009.* PS

16. "Occurrence of Endocrine Disrupting Compounds in Wastewater Effluent and Biosolids – An Overview." Presented at the Midwest Water Analyst Association, 2009 Spring Meeting, Cicero, Illinois, by L. S. Hundal. *May 2009.* PP

17. "Monitoring and Modeling of the CDOT Blue Island/Cermak Streetscape." Presented at the Chicago Metropolitan Agency for Planning, Sustainable Streets for Chicagoland Workshop, Chicago, Illinois, by J. A. Kozak. *June 2009.* PP

APPENDIX II

PRESENTATIONS 2009

18. "Management of Soil Organic Matter with Biosolids." Presented at the United States Department of Agriculture, Agricultural Research Service, International Symposium of Soil Organic Matter Dynamics, Colorado Springs, Colorado, by G. Tian, A. E. Cox, and T. C. Granato. *July 2009.* PP

19. "Overview of Biosolids Microconstituent Issues – A Municipal Perspective." Presented at the Water Environment Federation, Microconstituents and Industrial Water Quality Conference, Baltimore, Maryland, by T. C. Granato. *July 2009.* PP

20. "Using Stormwater to Make Great Places and Spaces." Presented at the American Society of Landscape Architects, Annual Meeting and Exposition, Chicago, Illinois, by J. Attarian, J. Wight, and J. A. Kozak. *September 2009.* PP

21. "Activated Sludge and BNR Process Control – Hands-on in the Real World: Wastewater Microscopy." Presented at the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Pre-Conference Workshop, Orlando, Florida, by T. Glymph. *October 2009.* PP

22. "Chicago's Sustainable Streetscape and Greenhouse Gas Emissions from Wastewater Treatment Processes." Presented at the American Institute of Chemical Engineers, Midwest Regional Conference, Chicago, Illinois, by J. A. Kozak. *October 2009.* PP

23. "Comparison of Fecal Coliform Concentrations and Trends in a Secondary Contact and General Use Urban River." Presented at the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida, by T. Glymph. *October 2009.* PP

24. "Implementing an Information Infrastructure to Support Biological Assessments in the Chicago Area Waterways System." Presented at the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida, by T. Minarik. *October 2009.* PP

25. "Methane and Nitrous Oxide Emissions from Wastewater Treatment Plant Processes." Presented at the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida, by J. A. Kozak, F. Belluci, C. O'Connor, T. C. Granato, L. Kollias, and N. Sturchio. *October 2009.* B

26. "Argonomic Effectiveness and Environmental Risk of Phosphorus in Biosolids." Presented at the Soil Science Society of America, Annual Meeting, Pittsburg, Pennsylvania, by G. Tian, A. E. Cox, K. Kumar, T. C. Granato, G. A. O'Connor, and H. A. Elliott. *November 2009.* PP

APPENDIX II

PRESENTATIONS 2009

27. "Nitrogen Mineralization in Centrifuge Cake and Lagoon-Aged Air-Dried Biosolids." Presented a the Soil Science Society of America, Annual Meeting, Pittsburg, Pennsylvania, by K. Kumar, L. S. Hundal, A. E. Cox, and T. C. Granato. *November 2009.* P

28. "Regulatory Update: Pretreatment and User Charge Issues." Presented at the Industrial Water, Waste, and Sewage Group Conference, Chicago, Illinois, by L. Kollias. *November 2009.* PP

29. "Uptake of Pharmaceutical and Personal Care Products by Plants-Potential Mechanisms." Presented at the Soil Science Society of America, Annual Meeting, Pittsburg, Pennsylvania, by K. Kumar, L. S. Hundal, S. C. Gupta, A. E. Cox, and T. C. Granato. *November 2009.* PP

30. "Climate Change Adaptation and Research." Presented at the Metropolitan Water Reclamation District of Greater Chicago, Board Study Session, Chicago, Illinois, by L. Kollias. *December 2009.* PP

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

APPENDIX III

APPENDIX III

PAPERS PUBLISHED 2009

1. Andrews, N., S. A. Deslauriers, D. Kerr, S. E. Lorenz, C. O'Connor, and R. C. Porter. "Protocols for Estimating Greenhouse Gas Emissions from Municipal Wastewater Sources." *Water Environment Federation, Technical Practice Update*. *2009.*

2. Kozak, J. A., C. O'Connor, T. C. Granato, L. Kollias, F. Bellucci, and N. Sturchio. "Methane and Nitrous Oxide Emissions from Wastewater Treatment Plant Processes." Proceedings of the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida. *2009*.

3. Rijal, G. K., Z. Abedin, J. T. Zmuda, R. Gore, B. Sawyer, and R. Lanyon. "Comparison of Fecal Coliform Concentrations and Trends in a Secondary Contact and General Use Urban River." Proceedings of the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida. *2009*.

4. Rijal, G. K., T. Glymph, R. Gore, T. C. Granato, C. Petropoulou, K. Tolson, C. Gerba, R. M. McCuin, L. Kollias, and R. Lanyon. "Microbial Health Risk Assessment of the Chicago Area Waterway System." Proceedings of the International Water Association, 15th International Symposium on Health-Related Water Microbiology, Naxos, Greece. *2009*.

5. Rijal, G. K., C. Petropoulou, J. K. Tolson, M. DeFlaun, C. Gerba, R. Gore, T. Glymph, T. C. Granato, C. O'Connor, L. Kollias, and R. Lanyon. "Dry and Wet Weather Microbial Characterization of the Chicago Area Waterway System." *Water Science and Technology Journal*, Vol. 60, No. 7: 1847-1855. *2009*.

6. Rijal, G. K., J. T. Zmuda, R. Gore, Z. Abedin, T. C. Granato, L. Kollias, and R. Lanyon. "Antibiotic Resistant Bacteria in Wastewater Processed by the Metropolitan Water Reclamation District of Greater Chicago System." *Water Science and Technology Journal*, Vol. 59, No. 12: 2297-2304. *2009*.

7. Sneen, M. E., K. S. Cummings, T. Minarik, and J. Wasik. "The Discovery of the Nonindigenous, Mottled Fingernail Clam *Eupera cubensis* (Prime, 1865) (Bivalvia:Sphaeriidae) in the Chicago Sanitary and Ship Canal (Illinois River Drainage), Cook County, Illinois." *Journal of Great Lakes Research*, 35: 627-629. *2009*.

8. Tian, G., T. C. Granato, A. E. Cox, R. I. Pietz, C. R. Carlson Jr., and Z. Abedin. "Soil Carbon Sequestration Resulting from Long-Term Application of Biosolids for Land Reclamation." *Journal of Environmental Quality*, 38: 61-74. *2009*.

APPENDIX III

PAPERS PUBLISHED 2009

1. Andrews, N., S. A. Deslauriers, D. Kerr, S. E. Lorenz, C. O'Connor, and R. C. Porter. "Protocols for Estimating Greenhouse Gas Emissions from Municipal Wastewater Sources." *Water Environment Federation, Technical Practice Update*. *2009.*

2. Kozak, J. A., C. O'Connor, T. C. Granato, L. Kollias, F. Bellucci, and N. Sturchio. "Methane and Nitrous Oxide Emissions from Wastewater Treatment Plant Processes." Proceedings of the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida. *2009*.

3. Rijal, G. K., Z. Abedin, J. T. Zmuda, R. Gore, B. Sawyer, and R. Lanyon. "Comparison of Fecal Coliform Concentrations and Trends in a Secondary Contact and General Use Urban River." Proceedings of the Water Environment Federation, 82nd Annual Technical Exhibition and Conference, Orlando, Florida. *2009*.

4. Rijal, G. K., T. Glymph, R. Gore, T. C. Granato, C. Petropoulou, K. Tolson, C. Gerba, R. M. McCuin, L. Kollias, and R. Lanyon. "Microbial Health Risk Assessment of the Chicago Area Waterway System." Proceedings of the International Water Association, 15th International Symposium on Health-Related Water Microbiology, Naxos, Greece. *2009*.

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6. Rijal, G. K., J. T. Zmuda, R. Gore, Z. Abedin, T. C. Granato, L. Kollias, and R. Lanyon. "Antibiotic Resistant Bacteria in Wastewater Processed by the Metropolitan Water Reclamation District of Greater Chicago System." *Water Science and Technology Journal*, Vol. 59, No. 12: 2297-2304. *2009*.

7. Sneen, M. E., K. S. Cummings, T. Minarik, and J. Wasik. "The Discovery of the Nonindigenous, Mottled Fingernail Clam *Eupera cubensis* (Prime, 1865) (Bivalvia:Sphaeriidae) in the Chicago Sanitary and Ship Canal (Illinois River Drainage), Cook County, Illinois." *Journal of Great Lakes Research*, 35: 627-629. *2009*.

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APPENDIX IV

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO
MONITORING AND RESEARCH DEPARTMENT 2009 SEMINAR SERIES

January 30, 2009 ***Anaerobic Co-digestion of Food Wastes and Biosolids at Municipal Wastewater Treatment Plants in Wisconsin*** Dr. Dan Zitomer, Marquette University, Milwaukee, WI

February 27, 2009 ***Update on the Metropolitan Water Reclamation District of Greater Chicago's (District) Stormwater Management Program*** Ms. Maureen Durkin, Principal Civil Engineer, Engineering Department, District, Chicago, IL

March 27, 2009 ***Sources and Ecology of E. coli in the North Shore Channel and North Branch of the Chicago River***
Dr. Muruleedhara Byappanahalli, United States Geological Survey, Lake Michigan Ecological Research Station, Porter, IN

May 1, 2009 ***Industrial Pretreatment: Where We Were, Where We Are, and the Challenges Ahead***
Dr. Cecil Lue-Hing, Cecil Lue-Hing & Associates, Burr Ridge, IL

May 29, 2009 ***Sustainable Water Use in Cities and Industry: Future Challenges and Promising Strategies***
Dr. Kimberly Gray, Northwestern University, Evanston, IL

June 26, 2009 ***Overview of the Benefits and Potential Risks Associated with Environmental Quality Applications of Nanotechnologies*** Dr. Rao Surampalli, United States Environmental Protection Agency (USEPA), Kansas City, MO

July 31, 2009 ***State of the Science on Cogeneration of Heat and Power from Anaerobic Digestion of Municipal Biosolids***
Dr. James Smith, USEPA, Cincinnati, OH

August 28, 2009 ***Evaluation of the Effectiveness of District Biosolids Compared with other Organic and Conventional Commercial Fertilizers for Turfgrass Management at Golf Courses and Parks***
Dr. Thomas Voigt, University of Illinois, Urbana, IL

September 25, 2009 ***Nitrogen Isotope Studies in the Illinois River***
Dr. Neil Sturchio, University of Illinois at Chicago, Chicago, IL

October 30, 2009 ***An Integrated Strategy for Meeting Dissolved Oxygen Standards Proposed for the Chicago Area Waterway System*** Dr. David R. Zenz, CTE Engineers/AECOM, Chicago, IL

November 20, 2009 ***Chicago Area Waterways Habitat Evaluation and Improvement Study***
Mr. Scott R. Bell, LimnoTech, Inc., Ann Arbor, MI

December 11, 2009 ***On the Road to 2040: A Progress Report on the Implementation of the District's Master Plans***
Mr. Thomas Kunetz, Assistant Director of Engineering, Engineering Department, District, Chicago, IL

RESERVATIONS REQUIRED (at least 24 hours in advance); PICTURE ID REQUIRED FOR PLANT ENTRY
CONTACT: Dr. Thomas C. Granato, Assistant Director of Monitoring and Research, EM&R Division, (708) 588-4264 or (708) 588-4059
LOCATION: Stickney Water Reclamation Plant, Lue-Hing R&D Complex, 6001 West Pershing Road, Cicero, IL 60804; TIME: 10:00 A.M.
NOTE: These seminars are eligible for Professional Development Credits/CEUs