

Madison Metropolitan Sewerage District Mercury Pollutant Minimization Program (PMP)

A) Summary

The surface water quality criterion for mercury as specified in NR 106 is 1.3 ng/l (ppt). In 2002, DNR determined that utilizing wastewater treatment technology to achieve discharge concentrations necessary to meet the 1.3 ppt water quality standard would result in substantial and widespread adverse social and economic impacts. DNR further concluded that appropriate mercury source reduction activities are environmentally preferable to wastewater treatment technology, in many cases. Provisions in NR 106 allow DNR to establish alternative mercury effluent limitations, conditioned in part on the permittee agreeing to develop and implement a mercury pollutant minimization program (PMP).

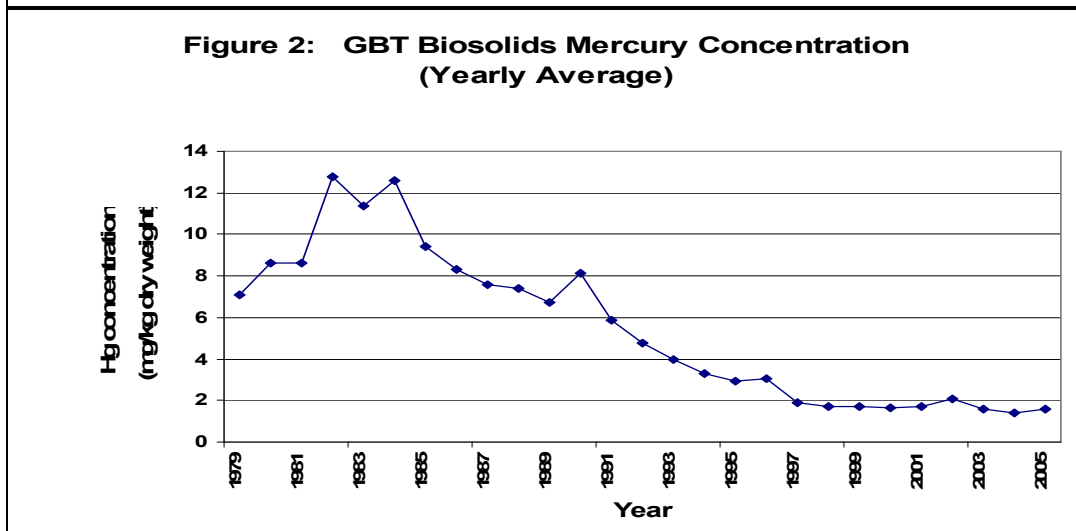
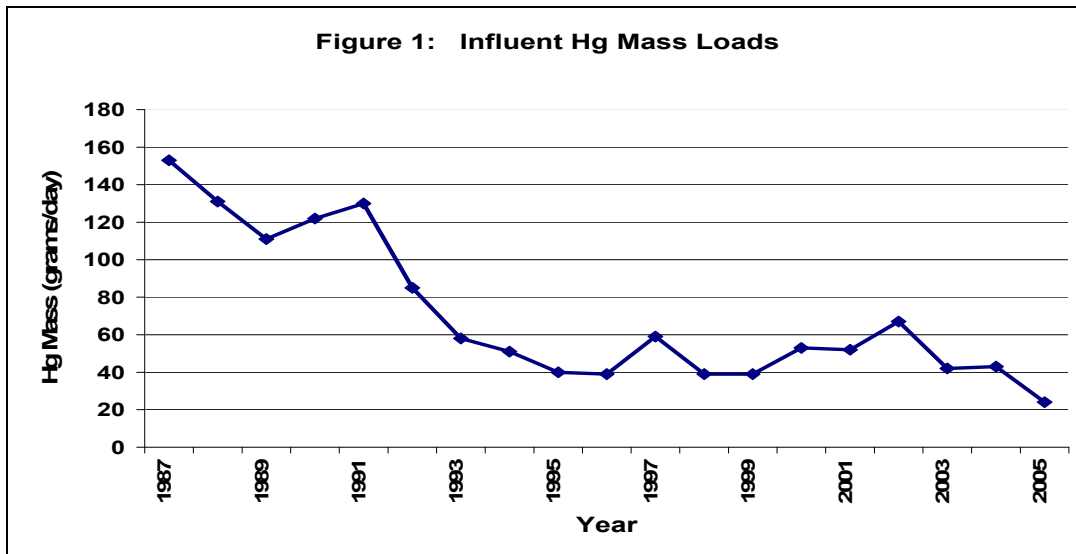
The District's WPDES permit anticipates that the District will not meet the 1.3 ng/l criterion and that an alternate mercury effluent limitation would be necessary. The permit requires that a draft PMP be submitted to DNR by March 31, 2007. PMP implementation must begin by September 30, 2007. In accordance with NR 106 and WPDES provisions, the District has developed and will implement a mercury pollutant minimization program.

B) Background

The District's PMP recognizes and builds upon the significant voluntary efforts already undertaken by the District to address mercury contributions to the collection system. These efforts began in 1997, when the District was one of three wastewater treatment facilities that agreed to work with DNR to perform community outreach and education. Their goal was to minimize mercury use. During this time, District staff members worked cooperatively with POTW and recycling staff throughout Wisconsin and the Midwest to reduce mercury product usage and to encourage recycling of existing products. Today, District staff members uphold the minimization efforts by continually providing assistance to POTW staff and others as they are able.

Prior to 1997, District staff members were aware of activities and devices within the treatment plant that were actual or potential sources of mercury to wastewater. Since 1997, the District has taken efforts to minimize the use of these sources. Staff members eliminated the use of a mercury compound as a catalyst in Kjeldahl nitrogen analysis and as the Nessler's ammonia reagent. The electrical department collected mercury containing tilt switches and float balls for proper disposal and have removed thermometers and manometers from plant equipment wherever possible. In 1998, a recycling program was established for recycling fluorescent lamps, and District staff members also assisted in the clean up of a comminuter water seal mercury spill in recent years.

The mass of mercury in the District's influent has decreased significantly since the late 1980's (Figure 1 and Appendix A). Factors contributing to this decrease include: product substitution, ordinance changes, mercury collection activities such as the Clean Sweep Program, and the additional outreach and education activities described in Appendix B. Biosolids mercury concentrations peaked in the mid 1980's and have significantly decreased since then (Figure 2).



The average biosolids mercury concentration for 2006 (through September) is 1.1 mg/kg, well below the 17 mg/kg concentration limit used by the Wisconsin Department of Natural Resources to define “High Quality” biosolids. Efforts to reduce influent mercury concentrations have also impacted effluent mercury concentrations.

The average effluent mercury concentration since testing began in March, 2004 using the EPA low level mercury method (Method 1631) is 2.3 ng/l (See Appendix C). While effluent concentrations are low, monthly grab samples have exceeded the 1.3 ng/l surface water criterion in all but one case since March, 2004. For comparison purposes, Appendix C also presents the monthly influent, effluent and biosolids mercury concentrations for the past 3 years and shows the average percent removal from the effluent.

C) Current sources of mercury to collection system

The daily influent mercury load to the Nine Springs Wastewater Treatment Plant in 2005 was 24.4 grams, based on an average flow of 39.3 MGD and an average influent mercury concentration of 164 ppt. Using analytical data when available, along with values found in the literature, mercury loads have been estimated from residential, commercial, industrial and infiltration contributions and these estimations are given in Table 1. The commercial category

accounts for about 81 percent of the daily influent mercury load. The commercial load includes contributions from dentists, hospitals, schools and other sources. The mercury load from hauled wastes (e.g. septage, holding tanks, grease traps) was estimated at 1.3 grams per day, but was not included in Table 1 since septage enters the treatment plant after the influent sampling point.

Table 1: Mercury Loads to MMSD influent

Sector	Flow (MGD)	% of Total	Hg conc. (ppt)	(grams/day)	% of base load
Residential	23.1	58.9	49	4.3	17.6
Commercial	11.3	28.7	461 ^a	19.7 ^a	80.7
Industrial	3.0	7.5	26	0.3	1.2
Infiltration	1.9	4.8	20	0.1	0.6
Subtotal	39.3	99.9		24.4	100.0

^a Grams by difference, from known contributions. Hg concentration back calculated.

D) PMP Focus

DNR has developed a guidance manual to assist agencies with PMP development. DNR states that the manual is “*intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are mentioned.*”

The guidance document specifically identifies dental clinics, hospitals, schools (primarily post secondary schools) and industry as sectors that should be addressed in a PMP. The District’s PMP focuses on controlling mercury contributions from all four of these sectors. The level of effort spent in addressing each of these sectors is commensurate with the magnitude of the contributions and the degree to which control can be accomplished using reasonable approaches. The PMP builds upon the considerable effort that the District has already voluntarily invested to control mercury contributions from these sectors. The District has also identified residential contributions as an additional targeted sector. The approach used to address mercury contributions from each of the above sectors is identified below:

(i) Dental Sector

The dental sector represents the largest controllable source of mercury to the District’s collection system, and therefore will receive the greatest focus in the initial PMP. Detailed sampling to characterize dental contributions has not been conducted, given the difficulties associated with sample collection and analysis. However, the District estimates that 45% to 68% of the total influent mercury load (56% to 84% of the commercial load) in 2005 was contributed by the dental sector (See Figures 3 and 4).

This estimate is based on data from a variety of sources, including the District’s 2005/2006 dental survey, information on “per dentist” mercury discharges reported in studies conducted by other agencies, and information on the mercury capture efficiencies of chair side traps and amalgam separators (60% and 98%, respectively). Actual contributions could be higher or lower, but the range is in reasonable agreement with figures cited by DNR and WDA.

Figure 3.

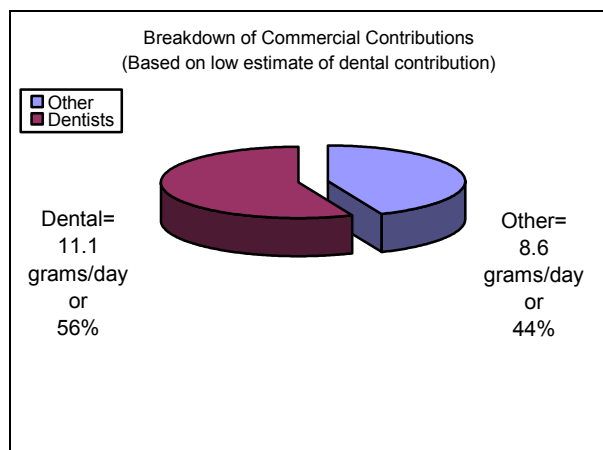
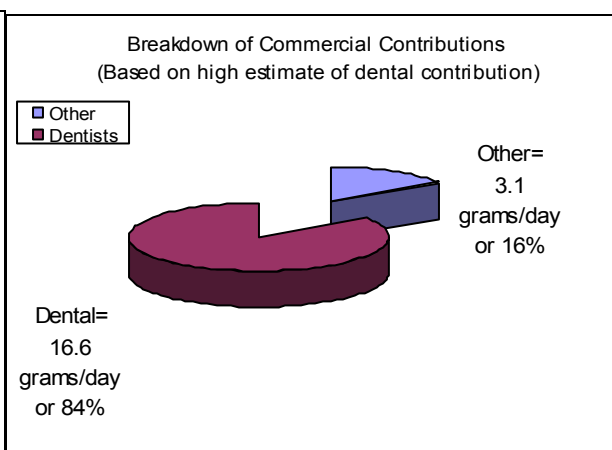


Figure 4.



The District will address mercury contributions from the dental sector through four approaches:

1. Require clinics that place or remove amalgam to follow WDA best management practices for amalgam wastes
2. Require clinics that place or remove amalgam to install and maintain amalgam separators
3. Conduct on-site inspections to evaluate BMP implementation and waste handling at dental facilities. Target will be 20% inspection rate of the dental clinics/year (100% during the five year WPDES permit cycle)
4. Require clinics to complete and submit an annual form summarizing the status of amalgam separator installation/maintenance and implementation of BMP.

Data from the District's 2005/2006 survey of dental clinics shows that there are 103 clinics in the service area that can be expected to place and/or remove significant amount of amalgam. These clinics are either general or pediatric clinics. Twenty three (23) of these clinics have already installed amalgam separators.

Prior to PMP implementation, the District will revise its Sewer Use Ordinance to require dental clinics that place or remove amalgam to properly install and maintain ISO 11143 certified amalgam separators by December 31, 2008. The SUO will also require that these dental clinics implement WDA best management practices by December 31, 2008. A copy of the draft SUO is given in Appendix D. On-site inspections and annual reporting by the dental clinics will be used to document compliance with these requirements. Annual reporting by the dental clinics will be accomplished by completing a form developed by the District (Appendix E). The District reserves the right to revise this form as necessary to ensure that relevant and useful information will be obtained from the dental clinics. District staff will work cooperatively with the Dane County Dental Society to accomplish the above initiatives.

(ii) Hospitals/Medical Sector

Limited sampling data from 2006 at three hospitals in the District's service area showed mean and median mercury concentrations of 394 ppt and 114 ppt, respectively. The median concentration is about 3.4 times higher than the median concentration from residential sources. There have been efforts within the medical sector to reduce mercury use. The District approach to addressing mercury contributions from the medical sector will focus primarily on information

and education efforts. District staff will initially meet with representatives from each of the four hospitals to determine each facility's current status relative to mercury minimization activities. Each facility will be asked to provide a brief initial report summarizing steps already taken to address mercury contributions to the collection system and any additional steps (if any) that they anticipate taking. As part of this initial report, they will be asked to complete a best management practices checklist. At least one meeting will be held each subsequent year with appropriate hospital staff. Each hospital will also be asked to submit a letter or report on an annual basis summarizing mercury related activities and initiatives which have been undertaken during the previous year.

(iii) School Sector

School sector related activities will focus primarily on the post-secondary schools within the District's service area. An emphasis will be placed on information and education activities, with the goal of minimizing mercury contributions to the collection system from these schools. District staff will initially meet with representatives from each of the three post-secondary schools in 2007 to discuss mercury related issues. Each facility will be asked to submit a brief report summarizing steps already taken to address mercury contributions to the collection system and any additional steps (if any) that they anticipate taking. Meetings will then be held with appropriate school staff on an annual basis. Each post-secondary school will be asked to submit a letter or report on an annual basis summarizing mercury related initiatives that they have taken during the past year.

Elementary, middle and high schools within the District's service area will initially be sent information on best management practices for mercury. Fact sheets to be sent to key staff members in public school districts will include: information on WDNR's "Green and Healthy Schools" criteria, potential hazards of mercury, possible sources of mercury, and how to safely dispose of and recycle mercury. The targeted audiences will include maintenance or buildings and grounds managers (spill response, demolition of science rooms, inspection of drains and traps), lead nursing staff (fever thermometers and sphygmomanometers), and science curriculum coordinators (elimination of mercury-containing devices and chemicals). Additional information and education activities for these schools will be conducted on an "as needed" basis as determined by District staff.

(iv) Industrial Sector

Analytical testing over the last several years (since low level testing was initiated at MMSD) has shown no significant mercury discharges from the industrial community in our service area. Contributions from this sector are estimated to be approximately 1% of the total mass of mercury entering the wastewater system (Table 1). At no point over the last 10 years has any regulated industry violated the mercury limit in the District's Sewer Use Ordinance. The District will continue to monitor the industrial sector as required by NR 211 for industrial pretreatment purposes. Permitted industries are inspected annually by the pretreatment coordinator. District staff will distribute informational materials to the industries during the annual inspection process. New industries/businesses that may be potential sources of mercury will be identified and addressed consistent with existing procedures in the District's pretreatment program.

(v) Residential Sector

Testing during 2005-2006 of residential only wastewater type samples indicates a contribution of mercury from this sector that could account for nearly 18% of mass loadings to our treatment plant (Table 1). Given the diffuse nature of contributions from this sector, PMP control

strategies will focus on information and education activities. The District will continue to take advantage of partnerships with Clean Sweep and the EnAct (Environmental Action Teams) program, which is organized by the Madison Environmental Group. EnAct teams are formed on a neighborhood basis, with a key objective of encouraging and empowering team members to take actions in their daily lives to reduce the environmental impact of their households. In accordance with NR106, District information and education activities will alert the sectors, particularly the public, to mercury recycling opportunities via Clean Sweep, vendors, and special programs (e.g. TRC-Thermostat Recycling Corporation) for lamps, thermostats, and other mercury-containing products.

Information and education activities deemed reasonable and appropriate will be undertaken by the District. Options include:

- Bill insert to customers
- Informational page insert in local newspapers
- Informational meetings
- Displays at Home Shows
- Interview with local TV
- Brochures provided at plant tours
- Participate in mobile collection events
- Establish informational web-site
- Partner with Dane County Department of Public Works and Recycling

The Wisconsin PMP guidance document identifies fluorescent bulbs, auto switches and thermostats as known sources of mercury. Fluorescent bulb recycling is already addressed in a Dane County ordinance and will not be addressed in the District's PMP other than as part of the publication of information on recycling opportunities. Auto switches and thermostats will be addressed through information and education activities.

Planned collection system monitoring is not being considered for the first years of the District mercury PMP. The PMP, as presented herein targets known major sources; collection system monitoring can be performed, as situations present themselves, for identifying general loadings from residential areas or perhaps from targeted business/industrial developments.

E) Data Management

A database developed in-house dedicated to the mercury PMP is functional and will be further developed to manage contact data, facility identification and practices, survey data, and report generation. Relevant summary data may be provided in annual reports submitted to DNR. Detailed information will be available upon request.

F) Resources

The District will allocate resources as necessary to effectively implement this PMP. PMP efforts will be led by the District's Pretreatment and Waste Acceptance Coordinator. Laboratory staff will play a key role in multiple areas, including sample collection/analysis, inspection of dental clinics, and information/education activities with other sectors. Database development to support PMP activities will be led by Information Services staff. Administrative Services staff will be responsible for administrative tasks including preparation of informational materials, plan evaluation, record keeping and annual reporting. Other staff will be involved in PMP related

activities on an as needed basis. Monetary needs will be identified during the District's annual budgeting process and allocations will be made as appropriate.

G) PMP Goals

Sector specific initial goals for the PMP are given below. The goals may be revised as experience is gained in implementing the PMP.

- 1) Dental Sector
 - a. 100% compliance with WDA BMPs by December 31, 2008
 - b. 100% compliance with the amalgam separator installation requirement by December 31, 2008
 - c. 20% inspection rate annually

- 2) Hospitals/Medical Sector
 - a. Hold annual meetings with hospital personnel
 - b. Receipt of Hg PMP and/or annual report received from all hospitals by December 31, 2007
 - c. Scheduled inspection rate of 25%

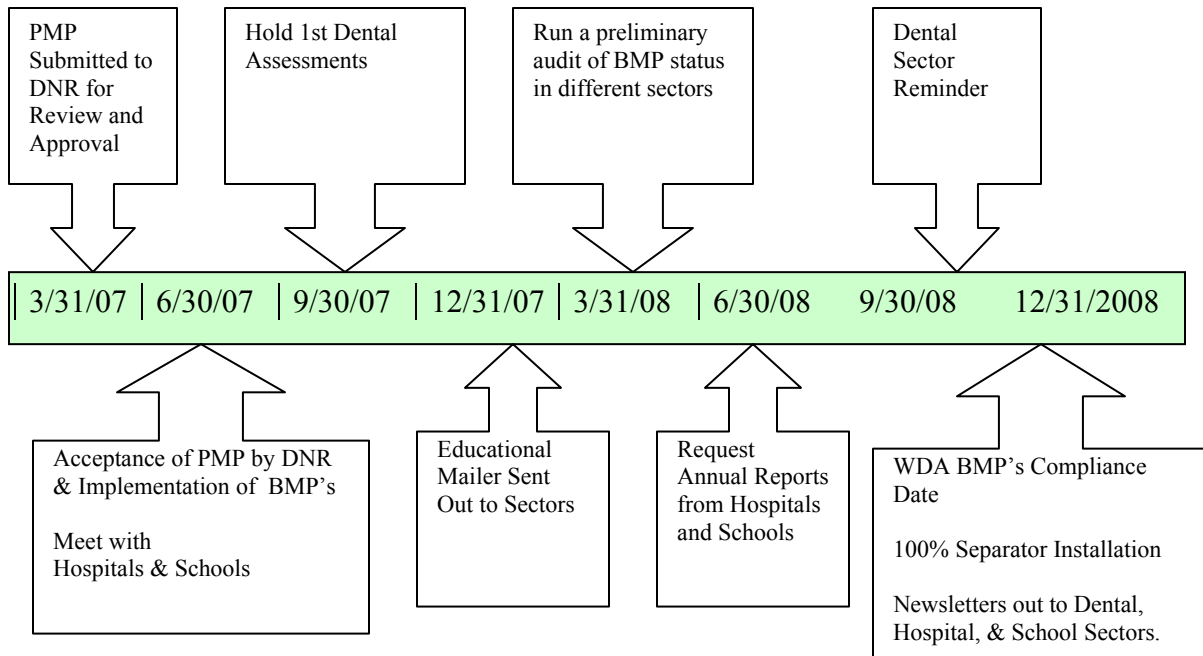
- 3) Schools
 - a. Hold annual meetings with each post-secondary facility
 - b. Receipt of Hg PMP and/or annual report received from all post-secondary schools by December 31, 2007
 - c. Send mercury fact sheets

- 4) Industrial
 - a. Distribute a mercury fact sheet to permitted industries during annual inspections

- 5) Residential
 - a. Provide mercury reduction resource information to ENACT on an annual basis for publication/distribution in newsletters
 - b. Cooperate in mercury reduction activities with the Clean Sweep Program
 - c. Participate in information and education activities as appropriate throughout the year. Examples could include posting information on the District's web site and providing mercury reduction information to District customers for inclusion in water and sewer bills

The timeline for key milestones (through December, 2008) of the PMP is given below. The dates shown for PMP submittal by the District, subsequent approval by DNR, and submittal of the first annual report are consistent with dates specified in the District's WPDES permit.

H) Timeline



I) Annual Report to DNR

An annual report summarizing PMP activities conducted by the District during the previous twelve (12) month period will be submitted to DNR by March 31st of each year. The first report will be submitted by March 31, 2008. Annual reports will include the following information:

- 1) Analytical data for effluent, influent and biosolids
- 2) Staffing and other resources allocated to the mercury PMP effort
- 3) Progress made towards reaching the goals within the specific sectors (See Section F)
- 4) New and/or revised PMP goals
- 5) District contact information

Where reasonable and appropriate, forms provided in DNR Mercury PMP Guidance Document or the functional equivalent will be used when submitting information in the annual report. Revisions/adjustment to the approaches identified in previous sections of this PMP may be necessary based on experience gained during implementation of the PMP. Revisions, if necessary, will also be identified in the annual reports.

Appendix A

Nine Springs Wastewater Treatment Plant Influent Mercury Loadings (1987-2005)

Year	Flow (MGD)	Average Mercury Concentration (ppb)	Influent Mercury Loading (grams/day)
1987	35.86	1.13	153
1988	34.94	0.99	131
1989	34.49	0.85	111
1990	34.92	0.92	122
1991	36.83	0.93	130
1992	36.77	0.93	85
1993	42.69	0.36	58
1994	39.53	0.34	51
1995	39.18	0.27	40
1996	39.56	0.26	39
1997	38.03	0.41	59
1998	41.16	0.25	39
1999	41.53	0.25	39
2000	42.10	0.33	53
2001	41.76	0.33	52
2002	40.14	0.44	67
2003	38.56	0.29	42
2004	42.96	0.27	43
2005	39.32	0.16	24

Appendix B

Summary of District Efforts to Reduce Influent Mercury Loadings

The following is a list of mercury reduction activities that the District has been involved in over the last fifteen years, in an effort to bring about reductions in the level of mercury entering wastewater.

- “Charter Member” DNR Community Mercury Reduction Group
- Informational insert distributed to Madison area residents (70,000+)
- Thermometer exchanges. (4900 collected). Included groundbreaking work at pharmacies
- Safety Saturday (collected 274 thermometers, 33 thermostats, 20 other)
- Dane County, and local ordinances to ban sale of thermometers, 2000
- Local ordinance requiring acceptance of fluorescent lamps and Hg thermostats at retailers
- 1997 Wisconsin Mercury Round Up
- P2 week
- Sierra Club letter
- NARI Home Remodeling Expo 2001
- 3/23/01 news conference at MMSD
- Informational newsletters
- Educational plant tours to UW and Edgewood Nursing students
- Talks given at elementary schools
- Brochures
- Cooperative work Clean Sweep
- WORT radio interview held
- Mailings distributed to schools
- Mailings distributed to medical facilities
- Several informational meetings with Dane County Dental Society (DCDS)
- Letters and other outreach published in DCDS monthly newsletter
- Surveys distributed to dental facilities in our treatment area, summer 2005
- Alternative laboratory method developed, eliminating use of mercury in our lab
- Elimination of mercury from chemical storage areas in lab
- MMSD electrical department identifying and recycling pressure and temperature gauges and tilt switches

Appendix C

Nine Springs Wastewater Treatment Plant Influent, Effluent and Biosolids Mercury Concentrations (March 2004* to September 2006)

Month	Year	Influent (ppt)	Effluent (ppt)	% Removal	GBT Biosolids (mg/kg dry wt.)
March	2004	253	2.16	99.1	1.0
April	2004	211	1.58	99.3	1.1
May	2004	314	2.89	99.1	1.2
June	2004	210	1.55	99.3	1.9
July	2004	213	2.64	98.8	1.7
August	2004	209	1.72	99.2	1.5
September	2004	164	1.54	99.1	1.5
October	2004				1.4
November	2004	176	2.80	98.4	1.6
December	2004	142	1.92	98.6	1.2
	2004-Ave	209	2.11	99.0	1.4
January	2005	227	1.95	99.1	1.5
February	2005	173	2.20	98.7	1.1
March	2005	149	2.04	98.6	1.1
April	2005	75	2.32	96.9	2.2
May	2005	246	1.97	99.2	1.1
June	2005	136	1.10	99.2	1.8
July	2005	161	2.17	98.7	2.5
August	2005	149	1.98	98.7	1.5
September	2005	236	1.89	99.2	1.5
October	2005	133	6.54	95.1	1.3
November	2005	160	2.68	98.3	1.5
December	2005	126	2.28	98.2	1.4
	2005-Ave	164	2.43	98.4	1.5
January	2006	110	4.96	95.5	1.0
February	2006	209	1.86	99.1	1.0
March	2006	136	1.86	98.6	1.0
April	2006	117	1.47	98.7	1.1
May	2006	98	2.42	97.5	0.9
June	2006	192	2.65	98.6	1.1
July	2006	128	1.82	98.6	1.3
August	2006	276	1.37	99.5	1.0
September	2006	181	2.93	98.4	1.1
	2006-Ave	161	2.37	98.3	1.1

* Low level testing of effluent by EPA Method 1631 began in March, 2004

Appendix D

Sewer Use Ordinance Language Regarding Amalgam Separator Installation/Maintenance and Implementation of Wisconsin Dental Association BMPs for Amalgam Waste

Section 5.1.6 Discharges from dental clinics

- (a) This section applies to discharges from dental clinics where amalgam is placed or removed. This section does not apply to the specialties orthodontics, periodontics, oral and maxillo-facial surgery, endodontics, prosthodontics or to other clinics that do not place or remove amalgam, or which are identified by the District as de-minimus contributors. For the purpose of this section, a dental clinic is defined as a non-mobile facility dedicated to the examination and treatment of patients by healthcare professionals specializing in the care of teeth, gums, and oral tissues.
- (b) Within the shortest reasonable time, but no later than (INSERT DATE if not December 31, 2008), dental clinics that place or remove amalgam shall implement best management practices for amalgam as established by the Wisconsin Dental Association.
- (c) Within the shortest reasonable time, but no later than (INSERT DATE if not December 31, 2008), dental clinics shall install, operate and maintain an amalgam separator meeting the criteria of the International Standards Organization (ISO 11143) for every vacuum system receiving amalgam waste. Amalgam separators shall be installed, operated, and maintained according to instructions provided by the manufacturer. The amalgam separator shall have a design and capacity appropriate for the size and type of vacuum system.
- (d) If a dental clinic is implementing the requirements in 5.2.5(b) and 5.2.5(c), any numerical discharge limit for mercury established in this chapter does not apply.
- (e) Starting (INSERT DATE if not June 1, 2007) and annually thereafter, dental clinics will submit reporting information to the District using forms provided by the District. Reporting information will include:
 - 1. The date the amalgam separator was installed
 - 2. The manufacturer name and model number of the separator
 - 3. Certification that the amalgam separator was installed and is being operated and maintained in accordance with instructions provided by the manufacturer.
 - 4. Certification that best management practices for amalgam as established by the Wisconsin Dental Association are being implemented.
 - 5. The person responsible for assuring compliance with the Amalgam Separator requirements in the District's Sewer Use Ordinance.
- (f) Dental clinics shall obtain records from the contractors used to remove amalgam waste for each shipment. The records shall show the volume or mass of amalgam waste shipped, the name and address of the destination, and the name and address of the contractor. Dental clinics shall maintain these records for a minimum of three years.

(g) Dental clinics shall allow the District to inspect the vacuum system, amalgam separator, amalgam waste storage areas, and other areas deemed necessary by the District to determine compliance with this section. Inspections shall occur by appointment during the normal operating hours of the dental clinic as long as advance notice does not impede enforcement of this section.

