This DRAFT is being circulated for comment. Comments are due no later than June 15, 2005. Please send comments to the email address or physical address shown below.

DRAFT

May 9, 2005

POTW MERCURY CONTROL STRATEGY

Addendum to the Region 8 Strategy for the Development of Local Limits
U.S. EPA Region 8, Industrial Pretreatment Program

DISCLAIMER

The mention of trade names, commercial products, or organizations does not imply endorsement by the U.S. Government. The statements in this document are intended to provide technical support and guidance on the development of Local Limits to protect the POTW and implement provisions of the Clean Water Act, 40 CFR Part 403, and the POTW's NPDES permit for POTWs in EPA Region 8. This document is not intended, nor can it be relied on, to create any rights enforceable by any party in litigation with the United States. This document may be revised without public notice to reflect EPA policy and regulations.

EPA wishes to thank all of the reviewers for their technical review and input in the revision of this document.

This is intended as a working document. As the science improves and additional information becomes available, this document will be modified. Updates will be made available at: http://www.epa.gov/region08/pretreatment

For further information, you may contact Curt McCormick (8P-W-P), USEPA Region 8, Suite 300, 999 18th Street, Denver, CO 80202 or email the pretreatment program at: mccormick.curt@epa.gov

POTW MERCURY CONTROL STRATEGY
Addendum to the Region 8 Strategy for the Development of Local Limits

I. Summary

This Strategy has been developed to provide assistance to POTWs in addressing situations where mercury has been identified as a pollutant where controls are needed to reduce discharges to a Publicly Owned Treatment Works (POTW). POTWs, with or without an approved pretreatment program, are required to develop and implement local limits to address pollutant problems and protect their POTW (see 40 CFR Section 403.5 and the POTWs NPDES permit). Many POTWs have developed local limits for Significant Industrial Users (SIUs) and other non-SIUs. Region 8 has modified the Local Limits Strategy to provide specific guidance for developing local limits for all non-domestic users for those pollutants of specific concern to POTWs from the commercial (non-SIU) sectors.

In the past, POTWs had a method available for mercury that would quantify mercury concentrations at or above 200 parts per billion (µg/L). EPA has approved an analytical method that is used to measure mercury concentrations in the parts per trillion range (ng/l). This advance in the science of testing has allowed POTWs to generate low level, quantifiable mercury data. The new mercury data will result in some POTWs needing to revise local limits and implement controls to reduce mercury discharges to POTWs.

Region 8 details three approaches addressing mercury discharges where mercury is identified as a problem (see Section II. B.). The first approach is a traditional process of including numeric local limits in an enforceable control mechanism. The second approach allows the discharger to demonstrate through analytical data that it has adequately controlled its discharge for the pollutant. The third approach is the use of Best Management Practices (BMPs). The use of BMPs is at the POTW discretion and shall not be an expectation of any non-domestic user.

If a POTW is required to develop and implement an enforceable BMP program, the POTW will be required to specify how it intends to implement activities to identify and reduce POTW mercury loadings from the various sources. The goal of the mercury control program is to reduce POTW influent mercury loading and effluent mercury discharge to a level that assures the underlying NPDES permit limit and/or state water quality standard or other limiting criterion or standard is met.

This Strategy focuses on general and specific approaches to controlling mercury. While this document is intended as a source of information for POTWs in Region 8 developing and implementing mandatory mercury control programs, this Strategy also provides useful information that could be used in the implementation of voluntary programs. In addition, this Strategy is written with a focus on approved pretreatment programs. However, many POTWs without approved pretreatment programs will find the information and concepts in this Strategy useful. The reader is directed to Section VI of this document for references used in the development of this Strategy.

II. Mercury Program Evaluation

A. Applicability

Voluntary Programs

Many POTWs are evaluating whether to implement a voluntary or mandatory mercury control program. Voluntary programs are strongly supported and encouraged by Region 8 to address mercury before it becomes a problem. Voluntary mercury control programs may be developed and implemented where:

1. The POTW has no projected or actual violations of its mercury NPDES permit limit (interim or final limit);
2. The POTW does not have a compliance schedule in its NPDES permit for meeting a mercury limit;
3. The POTW influent monitoring is less than 90% of the MAHL;
4. The Water Quality Standard for the receiving water is not being exceeded (based upon calculations or observation); or
5. No other limitation (etc. Biosolids) or standard is being exceeded.

As a note: All non-domestic users are required to comply with all Pretreatment Standards and Requirements established by the POTW. If the POTW implements a voluntary program under the conditions specified above, the non-domestic user must comply with what the POTW requires.

Mandatory Programs

Mandatory POTW mercury control programs will be implemented where:

1. Projected or actual violations of its mercury NPDES permit limit (interim or final limit);
2. The POTW has a compliance schedule in its NPDES permit for meeting a mercury limit;
3. Influent monitoring is 90% or greater of the MAHL;
4. The water quality standard for the receiving water is being exceeded (based upon calculations or observation); or
5. A limitation or standard (e.g. Biosolids) is being exceeded.

B. Approaches to Controlling a Pollutant of Concern

EPA, Region 8 recognizes the following general approaches to controlling mercury for non-domestic dischargers:

1. **Issue a control mechanism to dischargers.** This is the process that POTWs have used to control discharges from Significant Industrial Users (SIUs) and specific non-SIUs. The requirement to control non-domestic users through the use of permits or orders is an existing pretreatment program regulatory requirement and an approved part of local programs. The permitting process establishes limits for specific pollutants, and requires sampling and reporting to the POTW. Permits can also contain other requirements that the POTW deems necessary for a particular discharger. Permit violations are enforced by the POTW according to its legal authority and implementing procedures for compliance.

2. **Monitoring to demonstrate no discharge of concern.** POTWs routinely gather pollutant information from non-domestic users to allow the POTW to determine whether specific pollutants need to be controlled. Typically, the POTW and/or non-domestic users monitor the discharge at a frequency sufficient to characterize the discharge. For highly variable discharges, the POTW may require a specific number of samples to be collected to account for differences in operations. This evaluation is also coupled with a review of raw materials used and waste management practices.

3. **Require specific BMPs.** POTWs may issue a control mechanism that defines the BMPs that a non-domestic user must implement as a condition of discharge to the POTW. For many non-SIUs, this may be effective at addressing specific pollutant contributions from individual waste streams. BMPs, by themselves, would require that the POTW and/or discharger demonstrate that the BMPs are effective at reducing the pollutant discharge. Where BMPs result in a zero discharge status for the pollutants of concern, no further analytical sampling is required. Similarly, where the BMPs include installation of adequate treatment on the pollutants of concern, additional effluent monitoring by the discharger may not be required.

All of the options listed above may be components of a mercury control program for the POTW. The POTW will make the decision of whether treatment is required for a discharger to meet limits and requirements, as it is required to do under its approved pretreatment program. A POTW is not required to adopt the BMP approach. This Strategy is not intended to interfere with existing POTW pretreatment program procedures and is not intended to suggest that a POTW must allow any option that is not part of its approved pretreatment program.

III. Mercury Control Program

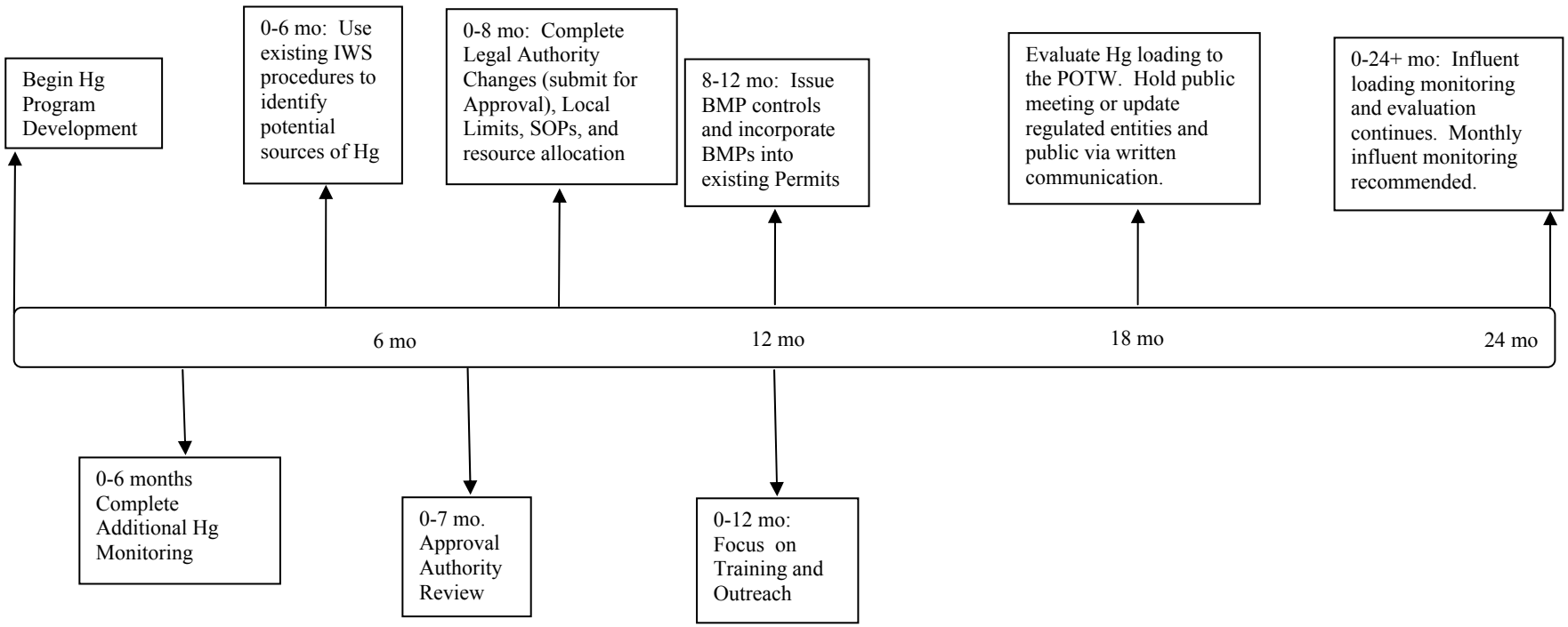
There are some general components to be considered when designing a mercury control program:

A. Define whether there is a problem. Monitor the POTW's influent, effluent, domestic contribution, non-domestic contribution and Biosolids;
B. Develop adequate legal authority and SOPs (submit to the Approval Authority as required);
C. Allocate adequate resources and staffing needed to implement the mercury control program;
D. Identify sources of mercury that contribute to POTW influent loadings;
E. Implement control measures for identified sources;
F. Public education program; and
G. Track and report mercury source reduction.

The following questions should be considered:

- What is the extent of the mercury loading problem, if any?
- Do you have adequate legal authority (ordinance or rules and regulations)?
- What changes to local limits need to be made to allow you to address non-SIU discharges?
- Do you have the necessary Standard Operating Procedures (SOPs), forms, etc?
- Do you have appropriate monitoring/reporting requirements developed?
- Do you have good data on commercial, domestic and influent mercury levels?
- Are you going to use permits, enforcement orders, or other control mechanisms for non-SIUs?

The following figure provides a timeframe that the POTW can use when designing its program.



BMP Program Implementation

Where a POTW is required to implement a mandatory mercury control program, the POTW will be required to carry out and track implementation of its source reduction strategies and conduct the specified monitoring. The POTW should consider the above general timeframes for development and implementation of the mercury control program. Where the POTW is violating its NPDES permit or other Standards, the individual steps should be completed in the shortest time possible. Many POTWs already have adequate legal authority in-place which would accelerate implementation of a program. The use of this Strategy does not establish an affirmative defense. It is provided as a tool for the POTW to use for design and implementation of a program.

A. Define the Problem – Data Review and Collection

The POTW must have the data on which to base its decisions. The most significant decision is whether there is a mercury problem to address. The POTW must ensure that its monitoring program (influent, effluent and biosolids) is completed with proper sampling and analysis procedures. POTWs with approved pretreatment programs and other major POTWs without approved programs already have a requirement to monitor for mercury in their influent and/or effluent. Depending on the disposal option, POTWs will also be monitoring biosolids for mercury.

Many POTWs have used a test method (245.1) that is generally not sensitive enough to allow the POTW to make a determination as to whether there is a mercury problem. The POTW needs reliable and accurate data to determine the appropriate removal efficiency for the POTW. The POTW is required to use the most sensitive analytical method necessary to allow the POTW to evaluate compliance.

If the POTW demonstrates through analytical data that no mercury loading problem exists, there is no need for a mandatory mercury control program, though the POTW has the option of implementing one. The POTW should continue to monitor and evaluate mercury influent and effluent data and opt to implement a voluntary program.

A couple of notes on mercury monitoring should be considered:

1. The frequency of monitoring must be adequate to evaluate mercury contributions to the POTW. Most POTWs will be looking most critically at the headworks loading to characterize contributions within the sewerage system. If the POTW performs sewer system monitoring, the POTW is encouraged to use sewer maps supported by on-site verification to assure that assumptions on contributors to a specific sampling point are correct.

2. Depending on the disposal option for biosolids, the POTW may have to initiate sampling to evaluate the level of mercury in the biosolids. The POTW should characterize the mercury in biosolids since removal efficiencies indicate that the majority of mercury received by the POTW are partitioned to the Biosolids.

3. The POTW should carefully evaluate whether a MDL of <0.2 ug/L is adequate. More POTWs are realizing that they must use Method 1631 (currently approved under 40 CFR Part 136) or Method 245.7 (expected to be approved) for mercury analyses. Failure to use these more sensitive methods may result in significant re-sampling requirements to obtain a definitive value for mercury.

4. The POTW should sample commercial and domestic contributions. The latter is especially important since the domestic contribution is generally considered uncontrollable under 40 CFR Part 403. POTW influent monitoring plus domestic monitoring plus SIU monitoring would allow the POTW to also calculate the contribution from the non-SIU sectors. However, if the POTW does not sample the domestic and commercial contributions, then the mass-balance for mercury loading at the POTW will be less useful. Targeting specific commercial dischargers or lift stations is most commonly done. See Section III.D. for more information on potential sources.

5. If Infiltration and Inflow (I&I) are of concern or significant, the POTW should design sampling programs for specific sewer lines that will allow an evaluation of the contribution from this source. These contributions are generally viewed as uncontrollable under the pretreatment program and reductions in I&I the sole responsibility of the POTW through infrastructure improvements and will not be a consideration in delaying or abandoning the adoption of local limits.

6. If the POTW has not been monitoring mercury in the influent and effluent, or doing so infrequently, EPA strongly suggests that the monitoring frequency be increased to a level of 6 influent/effluent samples over a six week period (alternating days) to better characterize the POTW influent mercury loading. The removal efficiency can have a major impact on the ultimate local limit that is calculated.

Mercury Methods and Source Characterization [8] [16] [17][19] [20][21]

Source	Typical Concentration	Method Options
POTW wastewater influent	21 - 500 ng/L	1631 (dilution) 1631 modified (245.7)
POTW wastewater effluent	1 – 51 ng/L	1631
POTW sludge or biosolids	0.2 – 30 mg/Kg (dry weight) – Generally on the lower end	SW846: 7471B
POTW Collection System	50 - 1000 ng/L	1631 (dilution) 1631 modified (245.7) 1631 modified (CVAAS) 245.1 (optimized & dedicated instrument)
Industrial Effluent - SIUs	138 ng/L	1631 1631 modified (245.7) 1631 modified (CVAAS)
Commercial Effluent	489 ng/L	1631 modified (245.7) 1631 modified (CVAAS) 1631 (dilution) 245.1
Residential	38 ng/L	1631 1631 modified (245.7) 1631 modified (CVAAS)
Trucked and Hauled Waste	3057 ng/L	1631 (dilution) 1631 modified (245.7) 1631 modified (CVAAS) 245.1 (optimized & dedicated instrument)
Surface Water	0.2 - 10 ng/L	1631
Dental office discharge (without separator treatment and no dilution by sanitary wastewater)	episodic discharges ranging to > 5,000,000 ng/L	245.1 1631 modified (CVAAS) 1631 modified (245.7)

POTW Mercury Contributions

Several POTWs have evaluated the relative contribution of mercury at their POTW headworks and at several sources within their sewer systems. Below is an analysis of the broad categories of mercury sources that were identified. The following data is intended to provide a general understanding, not a definitive headworks loading evaluation. Many of these numbers could be prefaced by placing the qualifier "up to" before these values. Region 8 expects that POTWs will be generating site-specific data for their POTWs.

Sources [1][8][16][20][21][22]	% of POTW Headworks Loading			
Dental Offices	60.2		Up to 53%	62.2
Human waste, human waste with amalgam, and residential products	26.5	14		18.4
Hospitals, Dentists, Universities		44		
Permitted Industry (incl University)	7	8		0.9
Stormwater:	4			
Other (Groundwater, I&I)	0.4			
Trucked and Hauled Septage				0.36
Commercial Sector				18
Uncharacterized		34		

B. Legal Authority

There are a number of areas of the POTW legal authority that must be reviewed. The POTW needs to have authority to implement local limits and BMPs for non-SIU contributors. The POTW can convert all non-SIU mercury contributors to SIUs and apply local limits through individual control mechanisms, though this may be resource intensive. POTWs have the general authority to control all non-domestic users through their ordinance and rules. More specific authority may be needed in the legal authority to specifically address:

1. Issuance of control mechanisms to non-SIUs. POTWs may adopt a variety of measures to control non-SIUs. Individual permits are generally limited to SIUs because of the resources involved in the SIU permitting process. The most common approach has been the use of "Specific Notice of Authorizations" (a letter based format), and "General Permits" (a permit that establishes similar conditions for all users that fall into a specific sector or business type).

2. Application of local limits and/or BMPs to all IUs. Some POTWs may adopt specific local limits or specific BMP requirements into their legal authorities for non-SIUs.

3. Enforceability of the controls. Depending on how the POTW chooses to implement its legal authority, the POTW may make modifications to its enforcement authority or procedures. The current enforcement, including penalty authority in approved programs, should be adequate to address violations of Pretreatment Standards and Requirements by all non-domestic dischargers.

The POTW should consult with their attorney and the Approval Authority on this issue if there are any questions. These changes may be a substantial modification to the POTWs legal authority.

C. Resources and Staffing

POTW pretreatment staff should carefully evaluate the resources and staffing necessary to carry out this program. The inclusion of an NPDES limit in a permit or a water quality standards related issue generally drives the POTW to look at mercury reductions. Pretreatment staff should coordinate with the city or district office that works with the state NPDES permits program. It is critical that the POTW Pretreatment Program not try to absorb increased costs and staffing needs without a careful evaluation. Discarding existing pretreatment requirements or activities may be critically scrutinized by the Approval Authority. It is strongly suggested that the POTW work closely with their management in addressing needed resources. EPA is available to provide support in these discussions (where EPA is the Approval Authority). As with other program activities, the POTW should evaluate whether cost recovery be considered for newly identified dischargers.

D. Identification of Mercury Sources

The Mercury Control Program requires that the POTW have a systematic approach for identifying and evaluating sources of mercury discharged to the POTW. There are numerous potential sources of mercury highlighting the need for the POTW to have a good database on commercial and industrial discharges to the POTW. The database typically already in-place for approved programs as a part of the Industrial Waste Survey procedures. Without a thorough industrial waste survey, the POTW may find it very difficult to develop and implement a sampling plan, interpret mercury data, or otherwise develop an overall strategy for controlling commercial businesses or sectors.

Note: Do not rely solely on MSDS for the purpose of defining components of commercial products (or any other activities that are designed to evaluate low level contaminants). MSDS are useful only for chemical constituents down to about 1%. The POTW/IU is strongly urged to perform direct chemical analyses on wastewaters or raw materials where the pollutant would be of concern at a level below 1%. For raw materials used by specific facilities a Certificate of Analysis will provide a more thorough and useful evaluation of chemical contaminants.

Following is a list of potential sources of mercury.

Identified Mercury Sources
Algae sample preservative
Auto salvage
Batteries: Hearing aids, pacemakers, defibrillators, fetal monitors, Hofler monitor, pagers, picker caliber, spirometer alarm, telemetry transmitter, temperature alarm, blood analyzer
Blood pressure cuffs (if they are not digital, they may contain mercury)
Boilers: commercial and industrial boiler maintenance
Cathodes
Chemicals: acetic acid, acetone, aldehyde, ammonia, arsenic, bleach, buffers, barbital, chloride, chlorine, citric acid, CO in gas, cystine, glucose, HCN, iron, ferric chloride, ferrous chloride, glucose, Kjeldahl nitrogen, manganese, mercury, mercury chloride, nitric acid and Utrex, organomercury catalysts, phenyl mercuric acetate, sodium hydroxide, standard mercury solutions, thiophene, vanadium, wine coloring, zinc.
Chlor-alkali industry: mercury cell processes: production of chlorine, caustic soda, sodium hydroxide and products manufactured with these raw materials.
Coloring: colored papers, horn, inks, linen, plastics, rubber, sealing wax, stain for wood (discontinued), mordant in dye for beaver and rabbit pelts.
Commercial Labs (5 ppb)
Contact lens solution, nasal spray containing preservative Thimerosal
Crematories: Ash Disposal
Dental offices, Dental amalgam
Disinfectants: phenyl mercuric acetate, thimerosol, Merthiolate, Mercurochrome
Electroplating Al

Etching steel/iron, fire gilding, blackening brass
Extracting Au from Pb and extraction of Au and Ag from Ore
Fish meat/waste
Fuel Oil – Eastern US Residential and Commercial
Fungicide/pesticides: paper mill slimicide, seed protectant, snow mold control at golf courses, root maggot control, imported undyed textiles, gold porcelain paint, corrugated cardboard glue.
Hospital: clinical, incinerator, laundry and research facilities discharge (0.3 to 5.4 ppb)
Household switches, industrial switches, mercury thermocouple, motion switches
Human Waste (ingestion of mercury containing foods and liquids) and leaching of mercury from dental amalgam fillings.
Incinerators: solid waste, medical waste, sewage sludge, cremation, coal, oil, natural gas, wood.
Industrial Laundries
Instruments/equipment – Medical/Scientific: barometers, hydrometers, manometers, pyrometers, sphygmomanometer, thermometers, defibrillators, esophageal dilators, cantor tubes, Miller Abbot tubes, feeding tubes, microwave ovens, nursing incubators, room temperature controls, refrigerators, Analytical instruments using mercury chloride as a reagent, electron microscope uses it as a vibration dampener.
Laboratories – commercial and testing: premixed tubes for COD analysis. Also see Chemicals
Lamps: fluorescent, high pressure sodium, mercury arc or vapor lamps, metal halide, neon, UV disinfectant, cathode ray tubes (CRT)
Landfill leachate – may range from 0.7 to 2 ppb
Laundry Gray water
Medical Laboratories: Thimerosal and Mercuric Chloride (preservatives in many reagents used in medical testing). Reagents containing these: Merthiolate, Mercury Nitrate, Mercury Iodide, Buffer, Mucolex, Stabilur Tablets, Immu-sal, Camco, B5 Fixitive, Zenker's Solution, Helly, Ohlamacher, Carnoy-Lebrum, Shardin, Mercuric Oxide, Mercurochrome, Mercurophyline, Mercury Sulfate, Millon's Reagent, Nessler's Solution, Phenol Mercuric Nitrate, Takata's Reagent, Gram Iodine, Carbol-Fuchin, Carbol Gentian Violet, Gomori's, Cajal's, Alum Hematoxylin (Solution A), Golgi's
Mining: Hg mines and where Hg is a secondary product
Paint – Latex – pre-1990 and some older marine paints
Petroleum Refining
Pharmaceuticals: anesthetic, antiseptic, antineoplastic agent, antisyphilitic, cathartic, diuretic, purgative.
Phosphate fertilizer production
Plastics: catalyst for curing; fireworks: Pharaoh's serpents and Bengal green lights; Photography intensifier (discontinued).
Pottery/Arts: up to 31 ppb; some ceramic glazes up to 41 ppb.
Preservatives: tanning, embalming (discontinued), anatomical specimens
Rectifiers, batteries (alkaline, button (Hg-Zn and Hg-Cd)).
Recycling: facilities doing fluorescent lamp recycling and thermostat recycling.
Residential (uncontrollable through 40 CFR Part 403)
Scrubber Water – 200 to 20 ppb (before and after treatment, respectively
Septage Haulers, portable toilets (62 ppb)
Spiritist Use: asogue, precipitado rojo (HgO), precipitado amarillo (HgO), precipitado blanco

(Hg2Cl2)
Stain used in laboratory slide preparation
Stormwater, Infiltration, groundwater
Switches: Silent wall switches (prior to 1991), wall-mounted office thermostats, airflow/fan limits, building security systems, pressure control, torque-arm alarm switches, float control (used for sump pumps).
Toys and games
Universities (labs, medical)
Veterinary (labs, treatment) broken thermometers and chemicals
Vaporization: landfill gas, petroleum refining, POTWs, smelting and roasting at mining operations.
Volcanos, cinnabar (mineralized bedrock).
Water supply; water supply residuals from treatment
Wood burning, esp bark
WWTP trickling filter arm

References for the table above include:

1. New Hampshire Mercury Reduction Strategy. www.des.state.nh.us
2. Blueprint for Mercury Elimination, 1997. Western Lakes Superior Sanitary District. http://www.wlssd.duluth.mn.us/
3. Massachusetts Water Resources Authority, MASCO Mercury Working Group www.masco.org and see Harvard University: www.uos.harvard.edu/ehs/
4. Palo Alto Regional Water Quality Control Plant, Mercury Pollution Prevention Plan, October 1997. http://www.city.palo-alto.ca.us/cleanbay/
5. Mercury in Massachusetts. 1996. Department of Environmental Protection. www.state.ma.us/dep/
6. Wastewater Practices: Mercury Discharge. www.uos.harvard.edu/ehs/
7 EPA Region 8 Pretreatment Program and POTWs.
8. Vermont Department of Environmental Conservation. Mercury Education and Reduction. http://www.anr.state.vt.us/dec/ead/mercury/merc.htm
9. Al Garcia, Littleton/Englewood Pretreatment Program. Evaluation of the Sources, Impacts, and Controls of Mercury. 2002. http://www.ci.englewood.co.us/wwtp/departments/PT/PT.htm
10. EPA. Mercury in Medical Facilities. http://www.epa.gov/seahome/mercury.html

E. Implement Control Measures

40 CFR Part 403 requires that enforceable local limits be developed and implemented for the control of any pollutant of concern. Section II.B. discusses the various approaches. Some pollutants may be effectively controlled through the implementation of Best Management Practices (BMPs). Region 8 supports the use and implementation of enforceable BMPs. The approved pretreatment POTW is required to use permits or orders if the discharger is classified as a SIU. Where the discharger is a non-SIU, the POTW may require specific controls through permits, orders, discharge authorizations, or other legally enforceable controls. The POTW should obtain a legal review from its attorney and adoption of these procedures and changes to the legal authority (ordinance or rules) may require approval from the Approval Authority (see Section III.B.).

Local Limits

The POTW shall use the latest revision of the Region 8 Local Limits Strategy and appendices for developing local limits where the POTW identifies the need to modify or develop local limits for mercury. EPA has also put out some general guidance for local limits (July 2004) that may also be of use. The following items will drive the development or modification of existing local limits:

1. The POTW only adopted a local limit for SIUs: Most POTWs originally developed local limits around this concept. The approved local limits package was approved and has additional loading data for non-SIUs. EPA Region 8's latest Local Limits Strategy moves away from this SIU-only approach to one that encourages POTWs to develop separate local limits for SIUs and Non-SIUs, the MAIL and MACL, respectively. In some cases, the POTW may choose to adopt a MAL and allocate the loading to all regulated users in lieu of adopting a separate MAIL and MACL.

2. The POTW used a less sensitive analytical method and had to rely on assumptions on the level of mercury (default data), including compliance with existing water quality standards.

3. The POTW has no local limit for mercury. Mercury is determined to be a pollutant of concern and a local limit is required to be developed. The POTW is required to apply the local limit as appropriate.

4. The state has adopted new or revised water quality standards for the receiving water for mercury (including a TMDL).

5. The POTW wants to use BMPs. Region 8 is requiring that the POTW adopt a local limit for mercury as the underlying, supporting limit for implementing BMPs (without treatment) or a monitoring-only approach for the non-SIU sector. POTWs will generally adopt a local limit for SIUs as a concentration (mg/L) or mass-based (lbs/day) limit. The local limit for non-SIUs should generally be in a mass based form (lbs/day). Concentration-based limits have been adopted for non-SIUs in limited cases (e.g. the silver program requiring the use of treatment technologies).

6. The POTW has been issued a permit that has more protective limits for mercury, either as an effective limit or a delayed limit.

7. The POTW wants to implement a voluntary program to avoid the mandatory program requirements (see Objectives of the Pretreatment Program at 40 CFR Section 403.2 and Applicability section of this Strategy).

BMPs

BMPs need to establish specific action items and specific dates that describe what activities need to be completed and/or reported. BMPs developed by POTWs to prevent Pass Through and Interference would be enforceable Pretreatment Standards under 40 CFR 403.5, where the POTW adopts the legal authority for BMPs and makes them enforceable through the issuance of a permit and/or other control mechanism.

POTWs usually implement BMP controls by three different approaches:

1. IU self reporting on BMP implementation;
2. POTW on-site inspections and site visits to verify compliance ; and
3. A combination of these approaches

Effectively requiring and managing BMP implementation for a specific discharger requires that the POTW be very explicit on what is being required. The POTW is urged to go over the requirements with the person responsible for compliance. Procedural and technical issues that should be addressed where appropriate include:

1. Specific Notice to IUs of requirements and enforceability
2. Installation of adequate treatment/wastewater prohibitions where necessary
3. BMPs addressing adequate O&M of treatment unit(s)* where required.
4. BMPs addressing all sources of mercury discharge
5. Reporting (or records retention) for O&M, monitoring and other activities
6. Certification of compliance by the IU (report to POTW)
7. Re-opener for a permit and local limits should a BMP approach be ineffective; and
8. Inclusion of other BMPs/requirements as determined by POTW.

* O&M procedures are based upon the type of treatment system used per the manufacturer's specifications. The approved type of treatment will depend on the form, concentration and physical characteristics of the mercury and the characteristic and volume of wastewater to be treated.

F. Public Education Program

Many POTWs have been implementing education programs for mercury and other pollutants (e.g. mercury thermometer collection programs, IU training, newsletters, household hazardous waste collection, etc). External groups also provide technical information on how to manage waste. The most up-to-date information can be identified by doing an Internet search for these activities (through common Internet search engines). EPA also has various programs for mercury waste management (www.epa.gov and search for mercury).

G. Tracking Reductions and Reporting to the Approval Authority (states or EPA)

Updates to mercury control efforts will be required to be submitted to the Approval Authority as part of the POTW Pretreatment Annual Report where the POTW is on a mandatory mercury control program. For other POTWs, the POTWs should report to the Permitting Authority and EPA as required in the POTW NPDES Permit or other control mechanism or regulatory reporting requirement. The content of the reports may include:

1. A summary of all mercury monitoring performed during the reporting period;
2. A summary of all legal authority changes made and a program description (if these were not previously provided to the Approval Authority);
3. A listing of resources being dedicated to the program;
4. A listing of actual/potential sources of the pollutant that have been identified;
5. A summary of all source control activities;
6. A graph showing mercury influent loadings to date (e.g. last three years); and
7. Other information as required by the Approval Authority.

The graph of influent loading over time (may also include effluent loading) is particularly important to allow the POTW to gauge the on-going effectiveness of its mercury control program. Specifically, the POTW should institute a data tracking and evaluation system that allows the POTW to evaluate changes in mercury loadings over time. This data will provide feedback on whether: (1) the mercury control program is effective; (2) increases in monitoring and/or inspections on IUs are needed; (3) enforcement is needed; or public education programs are needed.

IV. Dental Specific Information

This strategy is not requiring the POTW to treat dental dischargers any differently than other dischargers for mercury. Region 8 EPA is not requiring any POTW to mandate BMPs in lieu of issuing a control mechanism with specific limits. However, where a POTW opts to implement a BMP program for dental discharges, the following information should be reviewed.

If POTWs require BMPs + Treatment at dental facilities that use or discharge mercury, these controls are equivalent to a traditional permit (limits, monitoring, reporting). Where BMPs plus treatment are appropriately implemented, additional monitoring for mercury on dental facility discharges is not being required.

A. BMPs for a BMP Control Approach – Dental Facilities

Dental facilities BMP controls may be similar to other sources, except that treatment and management of wastes have been fairly well characterized. Control mechanisms for the Implementation of BMPs may include:

1. Specific notice to dentists regarding requirements and enforceability of the BMP controls;
2. Installation of treatment (e.g. an amalgam separator). (Note: Treatment other than an amalgam separator may be adequate. This decision must be based on analytical data for that treatment system and appropriate O&M procedures);
3. Specific requirement for adequate O&M of treatment unit(s) if treatment is required;
4. Specific requirements for applying BMPs to the discharge of mercury waste through other wastewater generating activities (e.g. sinks or other drains). Note: Dentists may be able to achieve compliance with limitations and requirements through the use of BMPs only. Monitoring mercury discharges will determine whether BMPs alone will be successful;
5. Reporting (or records retention) for O&M, monitoring and other activities
6. Certification of compliance by the dentist;
7. Re-opener for a permit and local limits at the POTWs discretion; and
8. Inclusion of other BMPs/requirements as determined by POTW.

B. Dental Amalgam

Dental amalgam is formed by the reaction of mercury with amalgam alloy (Ag, Sn, Cu) with a particle size of 0.1 micron to 3.15 microns. Amalgam may typically contain 50% metallic mercury, 35% silver, 9% tin, and 6% copper.

Average amalgam may contain as much as 450 mg Hg (mixed or prepared for placement). Excess amalgam is estimated at 25% or 112.5 mg/Hg. About 9% of mercury in amalgam placement is released to wastewater. Mercury in amalgam removal is about 300 mg/Hg/removal. 90% will be released to dental wastewater or 270 mg [(22)].

C. Dental Related Waste Streams that may Contain Mercury

Cuspitor (spit bowl) – Gravity flow – filter: chairside trap
Cuspitor – Liquid Ring vacuum – filter: chairside trap and vacuum filter
Cuspitor – Dry Vacuum – filter chairside trap and air/water separator
Saliva Ejector – Liquid Ring Vacuum – filter: chairside trap and vacuum filter
Saliva Ejector – Dry Vacuum – filter chairside trap and air/water separator
Mixing and tool cleaning wastes
Elemental or bulk mercury
Used amalgam caught on the chair-side trap (Contact Amalgam)
Amalgam sludge that settles in a vacuum pump trap
Non-contact amalgam (scrap)
Amalgam capsules

D. Separator Technology

Separators are manufactured by a number of companies and are the most commonly available commercial treatment systems used by dentists. The efficiency requirements for amalgam separators and their general acceptability are determined by a number of factors. This includes sizing of the units for the wastewater flow and whether the units have been certified by the test procedure (ISO 11143) developed by the International Organization for Standardization (American National Standards Institute – ANSI is the U.S. member) or ISO. The ISO does not oversee or certify labs conducting the test procedure nor does the ISO get involved with choosing or installing a separator.

E. Mercury Removal and Practices

Type of Treatment
Chair side traps 60-75%
Vacuum filters: 12-20%
Chair Side trap + Vacuum Filter: 72-95%
*Sedimentation, filtration and adsorption (non-detect using 1631)
*Filtration and ion exchange (95-96%)
*Sedimentation, filtration, ion exchange and adsorption (non-detect using std methods)
*Filtration and adsorption (chelation) 99.99%

* These are generally considered the best available treatment for amalgam removal that have been reviewed. Costs: Separators: $0-$4000 per dental facility; O&M annual cost: $300-$1800 per dental facility.

F. Miscellaneous BMP/Considerations*

Install ISO 11143 certified amalgam separator
Do not rinse screens or traps into the sewer
Keep records of amalgam waste shipments
Use of Air-Water separators for larger amalgam particles
Proper installation and O&M is required.
Collected waste shall be disposed of properly.
Certifications: certifies to proper installation. ID mfg and model, describe and show location, describe and show sampling point, ID owner and facility where unit was installed; ID the max flow the separator is designed to treat.
Use pre-capsulated alloys
Recycle used amalgam capsules and non-contact amalgam
Salvage amalgam pieces from restorations and recycle
Recycle trap, filters and separator waste
Recycle extracted teeth with amalgam restorations (after disinfection).
Don't put amalgam waste in biohazard/infectious waste bags (incineration and air release)
* These were provided by reviewers of previous drafts of this Strategy and other general sources [3][10][11][15]. These are provided for informational purposes only.
Authors note 1*: While exemptions for dentists that process 3 or fewer amalgams per year is being considered by some programs, serious complications of verifying the information (record reviews) may occur due to doctor-patient confidentiality.*

Section V Q&A's

The following are questions generated from the comments and questions received from various entities.

Q: When are mercury control programs mandatory?

A: In situations where mercury concentrations exceed the calculated amount of mercury that can be safely accepted, the POTW must take steps to reduce the mercury contributions. All non-domestic sources are potentially subject to mandatory control measures as determined by the POTW.

Q: Does Region 8 allow voluntary programs?

A: Region 8 supports and strongly encourages voluntary mercury reduction programs. There are a number of POTWs in Region 8 that are opting to control mercury through voluntary efforts before it becomes a pollutant of concern requiring mandatory controls.

Q: Is Region 8 requiring that dentists install amalgam separators?

A: No. The determination as to whether treatment is required is based upon the POTWs mercury control program, analytical monitoring data, and compliance with pretreatment standards. Amalgam separators are the most common, commercially available treatment systems currently available for dentists (see the note at Section IV.F). Region 8 allows for demonstration of other treatment where a discharger wishes to utilize another type of treatment system. This demonstration would require specific data on the treatment system (e.g. removal efficiency, O&M requirements, etc).

Q: Is this Strategy consistent with the National approach on local limits?

A: Yes. This Strategy is consistent with the National local limits.

Q: The mercury in a dental discharge may be in the range of 5 – 15 mg/L mercury in dental waste waters when working with new amalgam or removals of old amalgam. This seems to exceed the characteristic hazardous waste definition. Shouldn't these dental facilities be required to report under 40 CFR Part 403.12(p)?

A: The TCLP mercury maximum concentration for a characteristic hazardous waste is 0.2 mg/L (40 CFR Section 261.24). The pretreatment regulations require reporting where a discharge is greater then 15 kg/month. If the wastewater TCLP test exceeded the 0.2 mg/L level AND the facility discharges over 15 kg (approximately 4 gallons) in the month, then the facility is required to report under 40 CFR Section 403.12(p).

Q: Shouldn't EPA be required to consider cost-effectiveness of requiring treatment and minimize impacts on dentists?

A: POTWs are designed to treat domestic wastewater. To the extent non-domestic sources of wastewater can safely be handled, the POTW may agree to accept the wastewater. Cost-effectiveness to an industrial user of a POTW is not a factor when controls are needed to prevent discharges to a POTW that may cause pass through of pollutants to the receiving water, interfere with POTW operations, cause adverse impacts to worker health and safety, or interfere with the ability to recycle or reclaim solids.

Q: Isn't the problem with mercury in surface waters due to air deposition and runoff from historic mining activities and not dental offices?

A: The pretreatment program develops and implements local limits based upon, in part, water quality standards and NPDES permit limits. The setting of water quality standards and NPDES permit limits are established prior to the development of local limits by a POTW by states. The presence or absence of mercury from air deposition or mining sources is site specific and may be addressed when water quality standards are established.

Q: Isn't the discharge from dental offices highly variable? Aren't sampling costs high?

A: The discharge from dental offices and other businesses may be variable. However, POTWs have successfully identified mercury levels reflective of the various operating conditions at dental offices. POTWs commonly deal with non-domestic users that have variable discharges. If the discharger opts to sample a highly variable discharge, the sampling and analysis costs will be higher than for a facility that has a more consistent discharge. If the discharger opted to sample their effluent data on a daily basis for a year, the sampling costs would be significant reflecting the need to obtain a sample that is representative for the pollutant being discharged and not targeting sampling when the discharger knows that the pollutant would not be expected to be present. The sampling and analysis costs should be evaluated by the discharger and compare with the costs of keeping the pollutant out waste stream from the beginning.

Q: There is no legal basis for mandatory requirements for mercury limits on discharges into POTWs. What is the basis for requiring controls on internal waste streams?

A: 40 CFR Part 403 specifically sets requirements for discharges by non-domestic users into POTWs. Local Limits and categorical standards (40 CFR parts 405-699), specifically establish limits and prohibitions that apply to discharges to POTW sewerage systems. The term "internal waste stream" is more commonly used in the direct discharge NPDES program. POTWs have the authority to specifically limit or prohibit the discharge of any pollutant from any process that is ultimately discharged to the POTW. Most regulated users opt to treat waste water at the source of generation, rather than installing a treatment system to treat the entire wastewater discharge. Most POTWs would allow either option.

Q: Why isn't methyl mercury specifically addressed?

A: Current water quality standards are set for mercury. If states adopt water quality standards for methyl mercury for the NPDES program, EPA will incorporate an evaluation of methyl mercury into its local limits process.

Q: States are not reporting that mercury water quality standards (20-50 ug/L are common in Region 8) are being exceeded so why is EPA addressing mercury from POTWs?

A: Dischargers have only recently begun to implement a method to measure mercury in effluents below 0.2 ug/L. Therefore, data showing the levels of mercury in effluents has not been well characterized. With the implementation of the more sensitive test method, more data on actual mercury concentrations in effluents and surface waters will be reported. Region 8 agrees that many POTWs will not have effluent concentrations of mercury that require action. However, others will, and the Strategy is developed to assist those POTWs in addressing any problems.

Q: Why is EPA requiring amalgam separators over the ADA's BMPs and voluntary efforts?

A: Region 8 is not requiring amalgam separators over ADA BMPs and voluntary efforts. Region 8 agrees with the ADA's efforts to provide technical assistance to dischargers on BMPs to reduce mercury. Region 8 also supports and strongly encourages voluntary programs. However, where BMPS and other actions cannot effectively reduce the discharge of a pollutant, treatment is used to further reduce effluent levels.

Q: Distribution of the Region 8 Strategy has prevented interested parties from commenting on the draft.

A: Initial drafts of the Strategy were distributed to Region 8 POTWs and states, on two occasions, to identify implementation barriers. State and POTWs are co-regulators in the pretreatment program. The ADA was supplied with the draft document upon request. It was also sent to the state dental associations.

The final draft of the document is targeted for spring, 2005, and is intended for distribution to a broader audience, including the dental contacts. The draft will be posted on the Region 8 website for pretreatment (www.epa.gov/region08/pretreatment) for download.

Q: How can Region 8 require pretreatment programs and dentists to install amalgam separators though this guidance document?

A: Pretreatment programs in Region 8 have the existing legal authority and procedures to address mercury discharges from all non-domestic users through the use of permits, monitoring and reporting. This Strategy does not require POTWs or dentists to do anything, but rather provides guidance to allow non-traditional approaches (e.g. BMPs) to effectively control mercury discharges where needed.

Q: Why isn't Region 8 implementing variances for mercury water quality standards similar to that in the Great Lakes that take into account costs of requiring use of amalgam separators?

A: States set water quality standards. As with Region 5's mercury control guidance, Region 8 uses the water quality standards that are in effect for a specific receiving water when developing local limits. Where a variance exists, the POTW would use that state issued (and EPA approved) variance. POTW Pretreatment programs do not have the legal authority to apply variances to water quality standards. The Great Lakes Initiative addresses conditions unique to Region 5.

Q: Why does the strategy show two years for a POTW to implement mercury program controls?

A: Region 8 believes that mercury control programs at most POTWs can be fully implemented sooner than two years. However, two years was seen as a reasonable time frame where the POTW had to develop the program from scratch. It should be noted that most approved pretreatment programs already have most of the components in-place to address mercury. It should be noted that where the POTW is required to implement mercury controls, the POTW will be implementing the program efficiently to avoid violations of its NPDES permit or other standards that may have implications to industrial users that are causing or contributing to these violations.

Q: Discharges from dental facilities to POTWs is a minor source of mercury to the nation's surface waters. Why waste the resources?

A: Where mercury is not a problem at the POTW, the POTW is not required to do anything (though Region 8 supports voluntary programs). The contribution of mercury to a POTW and the receiving water may be significant in some cases. Where a discharge is above that level allowed by the underlying water quality standard, the mercury in the discharge must be reduced. The Pretreatment Program addresses these sources while other environmental programs address other sources of mercury. Implemented together, the various environmental programs will reduce the overall mercury load to the environment

Q: Amalgam separators may be less efficient than what the Strategy describes.

A: Region 8 acknowledges that individual treatment systems may be less efficient than currently described in the Strategy. However, implementation of BMPs plus treatment is highly effective at reducing mercury discharges to POTWs. A properly operated treatment unit will achieve removal efficiencies comparable with the treatment technologies outlined in the Strategy.

Q: Setting numerical limits for dental offices is infeasible.

A: Setting specific limits for non-SIU sectors is relatively straightforward. These limits are established on specific analytical data and standards. POTWs have extensive experience with calculating how much of a pollutant that they can accept from non-domestic users. This is completed by taking the maximum that a POTW can accept based upon the underlying standard, receiving water, and POTW operations. This maximum allowable headworks loading is further refined by subtracting out the residential (domestic-only) contribution. This maximum allowable non-domestic load is then divided up among the significant industrial users and the non-SIU (commercial) sectors. The non-SIU portion is then divided up among the commercial sectors of interest.

VI. References

(1) City of Palo Alto, CA: Mercury Headworks Analysis for 2002. March 2001, revised January 2002 and "Advanced Mercury Source Control Study", November 7, 2003, snf many other documents. Palo Alto, CA (http://www.city.palo-alto.ca.us/cleanbay/)

(2) Blueprint for Mercury Elimination, 1997. Western Lakes Superior Sanitary District. http://www.wlssd.duluth.mn.us/

(3) American Dental Association (www.ada.org)

(4) Bill Johnson, EIP Associates. Mercury Amalgam Treatment Technologies for Dental Offices. July 10, 2000. Technical Memorandum for Palo Alto Regional Water Quality Control Plant.

(5) Keith J. Linn. National Mercury Issues. Northeast Ohio Regional Sewer District. Presented at the AMSA/EPA Pretreatment Coordinators Workshop. November 21, 2003.

(6) Massachusetts Water Resources Authority, MASCO Mercury Working Group www.masco.org and see Harvard University: www.uos.harvard.edu/ehs/

(7) Peter Berglund. Metropolitan Council Environmental Services, St. Paul, MN. Use of the ISO Test Procedure to Evaluate Amalgam Separators. Presentation at AMSA/EPA Pretreatment Coordinators Workshop. November 19-21, 2003.

(8) Al Garcia, Littleton/Englewood, CO., Pretreatment Program. Evaluation of the Sources, Impacts, and Controls of Mercury. 2002.

(9) Mercury Study Report to Congress. EPA, 1997. http://www.epa.gov

(10) New Hampshire Mercury Reduction Strategy. www.des.state.nh.us

(11) Palo Alto Regional Water Quality Control Plant, Mercury Pollution Prevention Plan, October 1997. http://www.city.palo-alto.ca.us/cleanbay/

(12) Mercury in Massachusetts. 1996. Department of Environmental Protection. www.state.ma.us/dep/

(13) Wastewater Practices: Mercury Discharge. www.uos.harvard.edu/ehs/

(14) EPA Region 8 Pretreatment Program and POTWs, personal communications and POTW Annual Reports.

(15) Vermont Department of Environmental Conservation. Mercury Education and Reduction. http://www.anr.state.vt.us/dec/ead/mercury/merc.htm

(16) Wisconsin Department of Natural Resources and EPA Region 5 Draft Mercury Pollutant Minimization Guidance, NPDES Program Branch, February 2004.

(17) Stone, M., Pederson, E., Jones, R., *et al*. 2000. "Evaluation of an Integrated System to Remove Mercury from Dental-Unit Wastewater." *Journal of Dental Research*, 79:545, 3216.

(18) EPA. Mercury in Medical Facilities. http://www.epa.gov/seahome/mercury.html

(19) EPA Region 8, Biosolids Program. http://www.epa.gov/region08/water/wastewater/biohome/biohome.html

(20) City of Fort Collins, Colorado. Industrial Pretreatment Program. David Meyer. dmeyer@fcgov.com

(21) EPA, Region 5, Mercury Pollutant Minimization Program Guidance. www.epa.gov/region05/

(22) American Dental Association. November 16, 2004. Letter to EPA providing comments on the draft Region 8 Mercury Control Strategy. Reports that were provided include: *Assessment of Mercury in the Form of Amalgam in Dental Wastewater in the United States*, November 14. 2003; and, *Laboratory evaluation of amalgam separators*, Fan, P.L. et. al.; and, *Amalgam in dental office wastewater*, author not shown.