EIP
ASSOCIATES

TECHNICAL MEMORANDUM

TO: Bay Area Pollution Prevention Group
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DATE: April 7, 2000

SUBJECT: **Mercury Reduction Menu**

This mercury reduction menu is intended to help water agencies better understand the options that exist to reduce mercury discharges. It focuses on mercury reduction programs that have been implemented by water agencies and others, and includes some ideas for programs that have not yet been tried. This menu is not limited to direct wastewater discharges, but it is also not intended to contain an exhaustive list of all possible mercury reduction options. It is expandable, however, to allow additional programs to be added.

This menu focuses on mercury reduction programs implemented outside the San Francisco Bay Area. This is not intended to suggest that Bay Area agencies have not been implementing mercury reduction programs, but most Bay Area agencies are assumed to be familiar with Bay Area activities. Some Bay Area activities are included.

Mercury reduction programs can be characterized by the mercury sources they address or the mercury dischargers they address. Significant overlap exists within these two categories. For example, programs targeting hospitals and programs targeting the general public could involve similar measures; both could seek to discourage the use of mercury thermometers through outreach programs. Similarly, programs targeting dentists could provide liquid mercury disposal services or could encourage the replacement or cleaning of sink traps. Both types of programs could address one discharger category. For consistency of presentation, this mercury reduction menu is organized by source category and then by reduction activity.

Table 1 (page 3) summarizes the types of mercury sources that could be targeted and the activities that could be implemented to address these sources. Table 2 (page 4) provides more detail, with brief comments about programs and sources of additional information.

Table 3 (page 14) contains contact information for agencies mentioned in Tables 1 and 2. The agencies listed as having implemented specific programs in Tables 1 and 2 are only examples. Other agencies may also have implemented similar programs.

Table 4 (page 16) presents a prioritizing exercise that relates possible benefits of particular mercury reduction programs to their possible costs. Quantitative information about the costs and effectiveness of programs that have been implemented is difficult to obtain, especially in a manner that can be easily compared to other programs. Therefore, Table 4 categorizes possible costs and benefits qualitatively as low, medium, or high. The costs and benefits are then used to evaluate potential programs in terms of cost effectiveness. This exercise is subjective, and reasonable professionals will certainly disagree on some points. Hopefully, however, Table 4 provides a useful tool for discussion and planning purposes.

Table 4 suggests that the greatest opportunities for effective mercury reduction programs may focus on the following:

- Education / Outreach for Dental Offices,
- Voluntary Audits at Dental Offices, and
- Mercury Thermometer Sales Bans (assuming that government leaders are receptive).

Other good opportunities for mercury reduction programs are listed below:

- Education / Outreach for Hospitals / Medical Offices,
- Voluntary Audits at Hospitals / Medical Offices,
- Plumbing / Trap Cleaning at Hospitals / Medical Offices,
- Plumbing / Trap Cleaning at Dental Offices,
- Bulk Mercury Collection for Dental Offices,
- Amalgam Separators at Dental Offices,
- Education / Outreach for Laboratories,
- Plumbing / Trap Cleaning at Laboratories,
- Plumbing / Trap Cleaning at Educational Institutions,
- Education / Outreach for General Public (Households and Businesses),
- Bulk Mercury Collection for General Public (Households and Businesses),
- Mercury Thermometer Take-Back,
- Legislative Lobbying (assuming that legislators are receptive),
- Lobbying Professional Organizations (assuming that the organizations are receptive),
- Fluorescent Bulb Collection, and
- Promotion of City Policies to Reduce Mercury.

TABLE 1
SUMMARY OF MERCURY REDUCTION PROGRAMS IMPLEMENTED, BY TYPE OF DISCHARGER

Type of Discharger: / Type of Program:	Education/ Outreach	Voluntary Audits	Plumbing/ Trap Cleaning	Bulk Mercury Collection	Amalgam Separators	Thermometer Take-Back	Thermometer Sales Ban	Thermostat Take-Back	Permitting	Emissions Control	Chemical Review	Discharge Trading
Hospitals and Medical Centers	X	X	X									
Dental Offices	X	X	X	X	X							
Laboratories	X	X	X									
Educational Institutions	X	X	X									
General Public (Households and Businesses)	X			X		X	X					
Contractors								X				
Industrial Laundries									X			
Wastewater Treatment Plant Incinerators										X	X	
Contaminated Sites												X

TABLE 2
MERCURY REDUCTION MENU

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
Hospitals / Medical Offices			
Education/Outreach	Yes	Western Lake Superior Sanitary District	Sampling used to determine sources within hospitals. Worked with hospitals to make them mercury free. Emphasis placed on better waste management and use of mercury-free lab chemicals (e.g., elimination of mercuric chloride [B5 fixative]). Facilitated cooperation with Health Care Without Harm. Talks resulted in shutting down a hospital's medical waste incinerator. Stopped handing out mercury thermometers to patients. (WLSSD 1997; WLSSD 1998)
		Detroit Water and Sewerage Department	Work with Henry Ford Hospital lead to discontinuing use of mercury-containing equipment, no longer sending thermometers home with new parents, recycling fluorescent lamps and batteries, and implementing a mercury-free purchasing policy. (DWSA 2000)
Voluntary Audits	Maybe[a]	Western Lake Superior Sanitary District	Sampling and on-site visits used to identify mercury sources within hospitals. Efforts facilitated outreach. (WLSSD 1998)
Plumbing/Trap Cleaning	No	Massachusetts Water Resources Agency	Work with the Medical Academic and Scientific Community Organization (MASCO) provides guidance for replacing and cleaning traps and pipes. See www.masco.org/mercury.

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
		Western Lake Superior Sanitary District	Encouraged traps at nursing stations and laboratories to be cleaned. (WLSSD 1997)
Dental Offices			
Education/Outreach	Yes	Western Lake Superior Sanitary District	Emphasized mercury problem and proper waste handling (how to clean chair-side and vacuum traps). Good reductions with Best Management Practices (from 0.3 g Hg/dentist/day to 0.09 g Hg/dentist/day). (WLSSD 1997) Outreach encourages recycling and training and education (cross media transfer an issue when waste added to solid and medical waste streams). Visited 50 offices to provide training. Collected 35 pounds of mercury as a result of visit (existing free disposal program had not been sufficient). Convinced many dentists to switch to pre-mixed amalgam capsules. (WLSSD 1998)
		King County-Seattle, Washington	Incorporated waste management training in formal curriculum at community college. Posted waste management information on University of Washington Dental School web site. Published fact sheets. Gave presentations and conducted direct mail campaign. Seattle-King County Dental Society distributes poster for dentists annually. Publicly recognized pollution prevention efforts, implemented dental waste pick-up program, offered “no fault” inspections. (King Co. 2000)

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
		San Francisco Water Pollution Prevention Program	Developed outreach materials targeting dentists. Materials used by other Bay Area water agencies. (SFWPPP 1997)
Voluntary Audits	Maybe[a]	Western Lake Superior Sanitary District	Learned that amalgam often disposed of with solid and medical wastes. Facilitated outreach. (WLSSD 1998)
Plumbing/Trap Cleaning	No	City of Richmond	Encourages P-traps to be cleaned or replaced. (Richmond 1999)
Bulk Mercury Collection	Yes	Detroit Water and Sewerage Department	Statewide program developed to provide free mercury disposal. Collected 1,350 pounds of mercury in 6 months. More than 400 dentists participated. Costs reported as $6,500 plus staff time. Funded by U.S. EPA grant. (DWSD 1996)
		Northern Virginia Planning District Commission	Coordinated though state dental public health clinics with cooperation of Northern Virginia Dental Society and Virginia Dental Association. Collection locations in 13 cities. (NVPDC 1999)
Amalgam Separators	Maybe	King County-Seattle Washington	Tested 3 amalgam separation options in ’94, developed standard testing protocol in ’95. Certifies performance of separation equipment. (WEF 1999)
		Western Lake Superior Sanitary District	Tested 4 amalgam separation units and found 99% reduction in mercury that would otherwise pass through chair-side traps. (WLSSD 1998)

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
		Stockholm Water Company (Sweden)	Requires separators and best management practices to ensure maintenance. Requires water traps to be emptied periodically. Undertakes inspections. Reports costs per dental office to be $300 to $3,000. (WEF 1999)
		King County-Seattle Washington	Provides 50% up to $500 vouchers for services or equipment to reduce mercury discharges (e.g., amalgam separation equipment upgrades). Program actually applies to all conditionally except small quantity generators. (King Co. 2000)
Laboratories			
Education/Outreach	Yes	Detroit Water and Sewerage Department	Laboratory Task Force provided direction. Included fact sheets, audit inventory brochure, mercury alert for temporary storage in laboratories, workshops, coordination with laboratory representatives. Amnesty program planned. (DWSD 1999)
		Western Lake Superior Sanitary District	Developed pollution prevention suggestions for analytical labs. Mercury required for chemical oxygen demand test. Suggested microscale analyses when mercury is necessary. (WLSSD 1998)
Voluntary Audits	Maybe[a]	Western Lake Superior Sanitary District	Reviewed its own wastewater treatment plant laboratory operations. (WLSSD 1998)

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
		Detroit Water and Sewerage Department	Audited its own wastewater treatment plant laboratory operations. Developed a Laboratory Control Program. Disposed of excess bulk mercury. (DWSD undated)
Plumbing/Trap Cleaning	No	Western Lake Superior Sanitary District	Encourages P-traps to be cleaned or replaced, particularly in chemistry laboratories. (WLSSD 1998)
Educational Institutions			
Education/Outreach	Yes	Western Lake Superior Sanitary District	Work with secondary school students to collect 105 mercury thermometers in exchange for digital thermometers. Sampling at University of Minnesota – Duluth identified greatest mercury source to be chemistry department. (WLSSD 1998)
Voluntary Audits	Maybe[a]	Western Lake Superior Sanitary District	Determined that continued use of mercury at secondary school poses risk of release because mercury stored in open containers, mercury beads exposed on counter, and containers not provided secondary containment. Study at Art Institute found mercury in several glazes and clays. (WLSSD 1998)
Plumbing/Trap Cleaning	No	Western Lake Superior Sanitary District	10-20 ml of mercury found in 25% of chemistry department traps. Traps tested for mercury by "sniffing" with a Jerome meter. (WLSSD 1998)

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
General Public (Households and Businesses)			
Education/Outreach	Yes	Western Lake Superior Sanitary District	MercAlert program seeks to raise public awareness. Local public television station filmed and aired documentary; radio spots, slide program, and brochures developed. Cooperation with household hazardous waste program. (WLSSD 1997)
		Wisconsin Department of Natural Resources	Published Wisconsin Mercury Sourcebook, which explains how to develop a mercury minimization plan and provides specific information for 19 industries. See www.epa.gov/glnpo/bnsdocs/hgsbook/index.html.
		Michigan Department of Environmental Quality	Conducted stakeholder meetings. Listed planned action items. Reporting progress regularly. See www.deq.state.mi.us/ead/p2sect/mercury. Michigan Mercury Pollution Prevention Task Force published the Merc Concern brochure.
Bulk Mercury Collection	Maybe[b]	Northern Virginia Planning District Commission	Coordinates with household hazardous waste programs. (NVPDC 1999)
		Western Lake Superior Sanitary District	One-time free mercury disposal. Coordinated with household hazardous waste programs. Cooperated with Minnesota Pollution Control Agency. Event collected 217 pounds of mercury from 13 businesses and 27 households. (WLSSD 1997)

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
Thermometer Take-Back	Maybe[b]	Palo Alto Regional Water Quality Control Plant	Households given coupons for mercury-free thermometers in exchange for mercury thermometers. Operates household hazardous waste collection facility.
		Western Lake Superior Sanitary District	Households given mercury-free thermometers for their mercury-containing thermometers. Coordinates with household hazardous waste programs. (WLSSD 1997)
		Central Contra Costa Sanitary District	Households given mercury-free thermometers in exchange for mercury thermometers. Coordinates with household hazardous waste program.
Thermometer Sales Ban	Maybe	San Francisco Water Pollution Prevention Program	Promoted adoption of ordinance to ban commercial sale of mercury-containing thermometers for residential use.
Contractors			
Thermostat Take-Back	Maybe[b]	Palo Alto Regional Water Quality Control Plant	Contractors offered free disposal for mercury-containing thermostats.
		Western Lake Superior Sanitary District	Thermostats dropped off at wholesale locations and then turned in to Honeywell for mercury recovery. (WLSSD 1995)

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
Industrial Laundries			
Permitting	No	Detroit Water and Sewerage Department	One of 28 industrial laundries in service area is participating in a pilot project (mercury found at two laundries). Two chemicals replaced when found to contain mercury. Manhole bottom cleaned. Mercury in detergent and trap. (DWSD undated)
Wastewater Treatment Plants			
Incinerator Emissions Controls	No	Western Lake Superior Sanitary District	Wet scrubber installed. Process modified to separate scrubber water from wastewater treatment plant influent. (WLSSD 1997)
Chemical Review	No	Western Lake Superior Sanitary District	Treatment chemicals (particularly those derived from the mercury cell process) evaluated for mercury content, and changes made as necessary. (WLSSD 1997)
Contaminated Sites			
Discharge Trading	Maybe	Western Lake Superior Sanitary District	Superfund site able to off-set mercury discharges by funding dental office treatment systems. Program in infancy. (WLSSD 1999)
Other Possible Programs			
Full Regulation of Mercury Dischargers (Permits)	No		

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
End of Pipe Treatment	No		
Legislative Lobbying	Yes		
Lobbying Professional Organizations (e.g., dental practitioners and insurance companies)	Yes		
Reduction in Commercial Products (e.g., detergents and cleaners)	Yes		
Internal wastewater treatment plant review of gauges and switches, laboratory chemicals, and raw treatment chemicals	No		
Fluorescent Bulb Collection	Maybe[b]		
Restricting Releases from Crematories	Maybe[c]		

Type of Reduction Program	Opportunity for Regional Cooperation?	Examples of Implementing Agencies	Comments
Promotion of City Policies to Reduce Mercury (e.g., replacing mercury-containing equipment with mercury-free equipment when opportunities arise)	Maybe		

[a] Voluntary audits could be independently offered by various agencies, or agencies could work together to fund an audit team that could serve several agencies.
[b] Collection programs must rely on each areas hazardous waste collection programs, but outreach efforts related to collection programs offer opportunities for regional cooperation.
[c] Individual jurisdictions could restrict crematory emissions, or a regional effort could seek action by the Bay Area Air Quality Management District or the California Legislature.

DWSD 1996. A Collection Program for Raw Mercury Supplies from Michigan Dentists. September.
DWSD 1999. Joan Hughes. Telephone Conversation with Bill Johnson, EIP Associates. November 29.
DWSD 2000. Joan Hughes. Telephone Conversation with Bill Johnson, EIP Associates. January 24.
DWSD undated. Mercury Minimization Programs.
King Co. 2000. Cynthia Balogh. Telephone Conversation with Bill Johnson, EIP Associates. January 28.
NVPDC 1999. Exploring Opportunities to Reduce Mercury Discharges from Dental Offices (draft). August 5.
Richmond 1999. Steve Friday. Telephone Conversation with Bill Johnson, EIP Associates. November 22.
SFWPPP 1997. Never Down the Drain, Pollution Prevention Tips for Dental Offices. May.
WEF 1999. Water Environment Federation. Controlling Dental Facility Discharges in Wastewater.
WLSSD 1995. Zero Discharge Pilot Project Work Plan. January.
WLSSD 1997. Blueprint for Mercury Elimination. March.
WLSSD 1998. Mercury Zero Discharge Pilot Project-Prevention at Specific Sources. September 30.
WLSSD 1999. Tim Tuominen. Telephone Conversation with Bill Johnson, EIP Associates. November 29.

TABLE 3
AGENCY CONTACTS

Agency	Location	Contact	Phone / Fax	Web Site
Central Contra Costa Sanitary District	5019 Imhoff Place Martinez, CA 94553	Bart Brandenburg	(925) 229-7361 (925) 372-7635 fax	
Detroit Water and Sewerage Department	65 Cadillac Square, Suite 1800 Detroit, MI 48226	Joan Hughes	(313) 965-9770 (313) 965-9780 fax	
King County-Seattle, Washington, Local Hazardous Waste Management Program	130 Nickerson Street, Suite 100 Seattle, WA 98109	Cynthia Balogh	(206) 263-3075	www.metrokc.gov/hazwaste
Massachusetts Water Resources Authority	Charlestown Naval Yard 100 First Avenue Boston, MA 02129	Karen Rondeau	(617) 788-2347	www.mwra.state.ma.us
Metropolitan Council Environmental Services	Mears Park Centre 230 East Fifth Street Saint Paul, MN 55101	Peter Berglund	(651) 602-4708	www.metrocouncil.org/ environment/navigation/ menu_page.htm
Michigan Department of Environmental Quality	P.O. Box 30457 Lansing, MI 48909	Steve Kratzer	(800) 662-9278 (517) 335-4729 fax	www.deq.state.mi.us/ead/ p2sect/mercury
Palo Alto Regional Water Quality Control Plant	2501 Embarcadero Way Palo Alto, CA 94303	Stephanie Hughes	(650) 617-3165 (650) 494-3531 fax	www.city.palo- alto.ca.us/cleanbay
Richmond (City of) Wastewater Treatment Plant	601 Canal Boulevard Richmond, CA 94804	Steve Linsley	(510) 412-2014	

Agency	Location	Contact	Phone / Fax	Web Site
San Francisco Water Pollution Prevention Program	3801 Third Street, Suite 600 San Francisco, CA 94124	Daniel Rourke	(415) 695-7363 (415) 695-7388 fax	
Virginia Department of Environmental Quality and Northern Virginia Planning District Commission	7535 Little River Turnpike, Suite 100 Annandale, VA 22003	Rob Arner David Bulova, Melissa Hourigan	(703) 642-0700 (703) 642-5077 fax	www.nvpdc.state.va.us/es_pubs.htm
Western Lake Superior Sanitary District	2626 Courtland Street Duluth, MN 55806	Tim Tuominen	(218) 722-3336	wlssd.duluth.mn.us/index.html
Wisconsin Department of Natural Resources, Bureau of Watershed Management	P.O. Box 7921 Madison, WI 53707			www.dnr.state.wi.us www.epa.gov/glnpo/bnsdocs/hgsbook/index.html

TABLE 4
PRIORITIZING EXERCISE

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Hospitals / Medical Offices					
Education/Outreach	Medium	Mercury is used, but typically not intentionally discharged to the sanitary sewer.	Low	Outreach could piggyback on existing activities.	High
Voluntary Audits	Medium	Waste handling may be an issue.	Low	Voluntary audits could be independently offered or agencies could work together to fund an audit team.	High
Plumbing/Trap Cleaning	High	Mercury has been observed in traps, which lead directly to the sanitary sewer.	Medium	P-traps are simple to replace. Traps can be tested with a Jerome meter.	High
Dental Offices					
Education/Outreach	High	Mercury-containing amalgam particles make up a sizable fraction of mercury discharged to the sanitary sewer.	Low	Outreach could piggyback on existing activities.	Very High

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Voluntary Audits	High	Waste handling has been reported to be a source of confusion.	Low	Voluntary audits could be independently offered or agencies could work together to fund an audit team.	Very High
Plumbing/Trap Cleaning	High	Mercury has been observed in p-traps, which lead directly to the sanitary sewer.	Medium	P-traps are simple to replace. Traps can be tested with a Jerome meter.	High
Bulk Mercury Collection	High	Potentially large quantities of bulk mercury, but not typically discharged to the sanitary sewer.	Medium	Programs for conditionally exempt small quantity generators exist, but agency-sponsored waste transport could be costly.	High
Amalgam Separators	High	Amalgam separators can remove over 90% of the mercury dentists discharge to the sanitary sewer.	Medium	Most dentists are unlikely to install separators unless mandated. Subsidies may be appropriate.	High

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Laboratories					
Education/Outreach	Medium	Mercury is used, but typically not intentionally discharged to the sanitary sewer, although some reagents could be.	Low	Outreach could piggyback on existing activities.	High
Voluntary Audits	Medium	Handling mercury-containing reagent waste may be an issue.	Medium	Voluntary audits could be independently offered or agencies could work together to fund an audit team. There may be a large number of labs to audit.	Medium
Plumbing/Trap Cleaning	High	Mercury has been observed in p-traps, which lead directly to the sanitary sewer.	Medium	P-traps are simple to replace. Traps can be tested with a Jerome meter.	High

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Educational Institutions					
Education/Outreach	Medium	Mercury is used (e.g., in higher education), but typically not intentionally discharged to the sanitary sewer, although some reagents could be.	Medium	Outreach could piggyback on existing activities. Turnover at educational institutions is relatively high, increasing the need for ongoing outreach efforts.	Medium
Voluntary Audits	Medium	Handling mercury and mercury-containing reagent waste may be an issue.	Medium	Voluntary audits could be independently offered or agencies could work together to fund an audit team. There may be a large number of labs to audit.	Medium
Plumbing/Trap Cleaning	High	Mercury has been observed in p-traps (e.g., in chemistry labs).	Medium	P-traps are simple to replace. Traps can be tested with a Jerome meter.	High
General Public (Households and Businesses)					
Education/Outreach	High	The public makes numerous decisions that affect mercury use.	Medium	Outreach could piggyback on existing activities. Costs are higher than other outreach programs because target is larger.	High

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Bulk Mercury Collection	High	Bulk mercury may or may not be discharged to the sanitary sewer.	Medium	Programs for household hazardous waste generators exist, but agency-sponsored waste transport could be costly.	High
Thermometer Take-Back	High	Some thermometers may break in sinks, which lead directly to the sanitary sewer.	Medium	Programs for household hazardous waste generators exist, but agency-sponsored exchanges could be costly.	High
Thermometer Sales Ban	High	Some thermometers may break in sinks, which lead directly to the sanitary sewer. Ban could be more effective than take-back program.	Low	Local governments could ban the sale of mercury-containing thermometers; however, some jurisdictions may not be receptive to such proposals at any cost.	Very High
Contractors					
Thermostat Take-Back	Medium	Many contractors probably dispose of mercury as solid waste.	Medium	Programs for conditionally exempt small quantity generators exist, but existing outreach activities may overlook contractors.	Medium

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Industrial Laundries					
Permitting	Low	Aside from a few detergents (apparently), relatively little mercury appears to come from industrial laundries.	Low	Laundries with mercury problems can test their detergents for mercury and switch if necessary.	Medium
Wastewater Treatment Plants					
Incinerator Emissions Controls	Low	Controlling air emissions transfers mercury from air to wastewater.	Low	Standard scrubbers probably capture mercury.	Medium
Chemical Review	Low	Wastewater treatment chemicals are probably not significant sources of mercury in the Bay Area.	Low	Laboratory specifications for treatment chemicals can be obtained from manufacturers.	Medium

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Contaminated Sites					
Discharge Trading	Low	Although contaminated sites are significant sources of mercury in San Francisco Bay, this mercury does not flow through sanitary sewers, so the potential quantity of mercury that could be involved is considered low.	High	This may not be relevant to the Bay Area because wastewater from few contaminated sites is discharged to the sanitary sewer. These sites could off-set their mercury discharges by supporting programs elsewhere. The potential for controversy could drive up costs.	Very Low
Other Possible Programs					
Full Regulation of Mercury Dischargers (Permits)	High	Dental offices could be regulated, which could capture a substantial source of mercury discharges to the sanitary sewer.	High	Regulating non-regulated dischargers would require an ongoing commitment of staff resources.	Medium
End of Pipe Treatment	Low	Aside from dental offices (amalgam separators are discussed above), end of pipe treatment would probably be ineffective.	High	Aside from dental offices (amalgam separators are discussed above), end of pipe treatment, if effective, would probably be prohibitively expensive.	Very Low

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Legislative Lobbying	High	The legislature could accomplish mercury bans or develop mechanisms that discourage the use of mercury in commercial products. For example, mercury thermometers could be banned or a surcharge could be placed on mercury amalgam fillings to make them more competitive with composite fillings.	Medium	A persistent, unified approach could be cost effective, but the process would take time, and legislators may not be receptive at any cost.	High
Lobbying Professional Organizations (e.g., dental practitioners and insurance companies)	High	Insurance agencies could provide full coverage for composite fillings in addition to amalgam fillings.	Medium	A persistent, unified approach could be cost effective, but the process would take time, and organizations may not be receptive at any cost.	High
Reduction in Commercial Products (e.g., detergents and cleaners)	Low	Many commercial products may contain traces of mercury.	High	Identifying and restricting or reformulating nationally marketed products would be costly.	Very Low

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*
Internal wastewater treatment plant review of gauges and switches, laboratory chemicals, and raw treatment chemicals	Low	Mercury use at wastewater treatment plants is limited, but readily controllable by the plants.	Low	Wastewater treatment plants can most easily address issues directly within their control.	Medium
Fluorescent Bulb Collection	High	San Francisco Bay Regional Water Quality Control Board considers fluorescent bulbs a major source of mercury in San Francisco Bay.	Medium	California's Universal Waste Rule should make collecting fluorescent bulbs easier.	High
Restricting Releases from Crematories	High	San Francisco Bay Regional Water Quality Control Board considers crematories a major source of mercury in San Francisco Bay.	High	Restricting crematory emissions would place new requirements on these facilities and may require action by the Bay Area Air Quality Management District or state or local governments.	Medium
Promotion of City Policies to Reduce Mercury (e.g., replacing mercury-containing equipment with mercury-free equipment when opportunities arise)	Medium	Cities may be able to reduce mercury purchases or limit mercury levels in the products they buy.	Low	Adopting simple policy statements is fairly inexpensive.	High

Type of Reduction Program	Potential Quantity of Mercury	Notes	Potential Cost	Notes	Cost Effectiveness*

* Cost effectiveness is evaluated as follows:

High Quantity +	Low Cost =	Very High
High Quantity +	Medium Cost =	High
High Quantity +	High Cost =	Medium
Medium Quantity +	Low Cost =	High
Medium Quantity +	Medium Cost =	Medium
Medium Quantity +	High Cost =	Low
Low Quantity +	Low Cost =	Medium
Low Quantity +	Medium Cost =	Low
Low Quantity +	High Cost =	Very Low