



State of Oregon
**Department of
Environmental
Quality**

2007-2011

DEQ MERCURY REDUCTION STRATEGY

Department of Environmental Quality

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Table of Contents

I. BACKGROUND AND PURPOSE	1
II. SOURCES OF MERCURY POLLUTION IN OREGON	2
III. SUMMARY OF 2002-2006 DEQ MERCURY ACTIONS	3
IV. 2007-2011 DEQ MERCURY COMMITMENTS	7
V. CONCLUSIONS	11
APPENDIX A: FUNDING-DEPENDENT MERCURY ACTIONS	13
APPENDIX B: SOURCES OF MERCURY IN THE WILLAMETTE BASIN	14
APPENDIX C: MERCURY FISH ADVISORIES IN OREGON SURFACE WATERBODIES	15
APPENDIX D: COLLECTIONS OF WASTE MERCURY FROM DEQ PARTNERSHIP PROJECTS 2002-2006	18

I. BACKGROUND AND PURPOSE

What is Mercury and Why is it a Problem?

Mercury is a metallic element that, in pure form, is a heavy liquid. Elemental mercury can evaporate even at ambient temperatures, but especially when heated. In addition to this pure form (known as elemental mercury), mercury reacts with other substances to form organic and inorganic compounds. Mercury occurs naturally in ores and other geologic formations, and is also released into the environment through human activities. Mercury can be found at low levels throughout the environment and is carried across continents by upper atmospheric air currents.

Mercury can have significant public health and wildlife impacts, primarily from consumption of mercury-contaminated fish. Mercury is released into the environment is primarily in an inorganic or elemental form. When in the environment, mercury is converted by bacteria to a methylated or organic form, which is the most toxic and bioaccumulative form of mercury. Once formed, methyl mercury can be readily passed through the food chain. Mercury's designation as a "persistent, bioaccumulative and toxic (PBT)" pollutant and its widespread prevalence in the environment has made mercury a high priority pollutant at both the state and national level.

Purpose of 2007 DEQ Mercury Strategy

The Oregon Department of Environmental Quality (DEQ) initially developed an agency-wide Mercury Strategy in 2002. The updated 2007 Mercury Strategy provides a summary of DEQ's mercury reduction and monitoring actions since 2002, and describes DEQ's continuing or new commitments. The overall goal of this Strategy is to protect human health and aquatic life by reducing exposure to potentially harmful levels of mercury. The actions that DEQ is planning over the next several years are specifically designed to:

- Limit mercury releases into the environment
- Reduce the amount of mercury pollution already in the environment
- Improve monitoring of mercury levels in the environment
- As funding allows, identify where fish tissue concentrations present risks to public health and, in cooperation with the Oregon Department of Human Services (DHS), establish fish consumption advisories for those areas
- Improve public and business awareness of mercury issues

The 2007 Strategy is intended to describe activities DEQ will implement over the next five years. New or changing needs, opportunities and agency priorities may arise prior to 2012 that result in modifications to this Strategy. Implementation of some existing opportunities to reduce or monitor mercury in Oregon's environment is dependent on additional resources becoming available. Although the focus of this Strategy is on definitive commitments that DEQ can make currently, additional activities dependent on supplementary funding are included in Appendix A. Other appendices to this document provide more detailed information on mercury in Oregon's environment and on DEQ's mercury programs and partnerships.

II. SOURCES OF MERCURY POLLUTION IN OREGON

Where Does the Mercury in Oregon's Environment Come From?

DEQ estimates that close to 48% of the contributions of mercury pollution in the Willamette River come from air deposition sources (either direct to water or overland runoff), and another 48% comes from the erosion of native soils with naturally-occurring mercury (see figure depicted in Appendix B). DEQ has determined that global sources account for most of the air deposition of mercury in the Willamette River. This is consistent with EPA's conclusion that approximately 89% of the mercury from atmospheric deposition in Oregon comes from sources outside the United States or Canada.¹

In contrast, local air deposition sources account for about 7% of the air deposition of mercury in the Willamette River. DEQ also estimates that local industrial or municipal wastewater discharges account for only about 4% of the total mercury pollution in the Willamette. Although a set of mercury pollution estimates has not been developed for the entire state, the major sources of mercury pollution to surface waters in other parts of the state are likely similar to those for the Willamette Basin.

Although DEQ's efforts to reduce Oregon sources of mercury pollution (outlined below) can make a positive impact on the state's environment, the significant contributions from global atmospheric and naturally occurring sources of mercury are not within the agency's direct control. If global atmospheric sources of mercury increase substantially, the total mercury pollution load in Oregon may increase despite major reductions in Oregon sources. Thus, the mercury reduction actions described in this Strategy should be coupled with efforts by state and local agencies to inform the public about ways to reduce exposure to mercury.

What are the Oregon Sources of Mercury Pollution?

Discharges of mercury pollution to the air, water or land from sources within Oregon include both "point" (regulated or permitted) sources and "nonpoint" sources. **Point sources** in Oregon include the following:

- Power generation and transmission
- Cement kiln
- Manufacturing facilities
- Combustion of fuels in boilers
- Crematoria
- Municipal waste incinerators
- Municipal wastewater treatment plants (effluent and biosolids)

The two largest single point sources in Oregon are a cement kiln and a coal-fired power plant, both located in the northeastern region of the state. Two municipal solid waste incinerators are operating in Oregon that serve surrounding local communities, but most solid waste generated in Oregon that is not recycled is disposed in landfills. In addition, there are numerous municipal wastewater treatment plants, fuel boilers, and crematoria throughout the state, each of which is likely to discharge small quantities of mercury.

The possible **nonpoint** mercury pollution sources in Oregon include the following:

- Erosion of, and runoff from, native soils
- Abandoned mercury mines
- Abandoned gold mines
- Air emissions from motor vehicles
- Urban stormwater runoff
- Environmental cleanup sites (not associated with mining)
- Improper disposal of mercury-containing consumer and industrial products

¹ EPA state-by-state mercury emissions and deposition spreadsheet (data were compiled from the emissions inventory and modeling used for the federal Clean Air Mercury Rule)

Accurate assessments of the total quantities of mercury pollution originating from each of these nonpoint sources are not available because of the difficulty in monitoring discharges from the sources. As referenced above, DEQ did develop an estimate of the relative contribution of nonpoint land runoff and soil erosion when setting total maximum daily loads (TMDLs) for the Willamette Basin.

III. SUMMARY OF 2002-2006 DEQ MERCURY ACTIONS

DEQ has initiated and implemented a number of mercury reduction, monitoring, collection, cleanup and awareness activities since development of the original agency-wide Mercury Strategy in 2002. A summary of the activities undertaken by each of DEQ's environmental programs between 2002 and 2006 is provided below.

Water Quality

The primary focus of DEQ's Water Quality mercury-related work has been on the Willamette Basin Total Maximum Daily Load (TMDL). DEQ has also worked closely with the Oregon Department of Human Services' (DHS) Public Health Division in determining whether fish consumption advisories are needed for waterbodies in various parts of the state.

a. Willamette TMDL Development

The purpose of DEQ's TMDL program is to determine the amount of specific pollutants a waterway can receive and still not violate water quality standards, and then allocate pollutant load limits for each contributing source of those pollutants. Between 2002 and 2006, DEQ developed and completed the Willamette Basin TMDL, which was approved by EPA in September 2006. Included within this TMDL is the first phase of a mercury TMDL for the Willamette, designed to reduce mercury levels in the Willamette Basin to a point where fish are no longer unsafe to eat.

The mercury TMDL development process involved a comprehensive monitoring effort throughout the Basin that included 18 ambient river and lake sites, as well as some monitoring near point source discharges. DEQ collected and analyzed water, fish and sediment samples throughout the Basin to determine where elevated levels of mercury exist and identify potential local sources of mercury contributions to surface waters in the Basin. Several fish tissue samples contained mercury concentrations that were above the health-based fish consumption benchmark of 0.35 milligrams per kilogram (mg/kg or parts per million).

An analysis of the range of potential sources of mercury in the Willamette was conducted, and estimates were developed with the help of modeling tools. As summarized previously, DEQ concluded that the vast majority of mercury loading to the Willamette comes from runoff from lands receiving atmospheric deposition of mercury (via land runoff or direct deposition to water) and erosion of native soils. Point sources in the Basin contribute a relatively small portion of the mercury loading.

DEQ established a water column guidance value for the concentration of total mercury in the Willamette River of 0.92 nanograms per liter (ng/L). In addition, DEQ's analysis suggests that a 27% reduction in total mercury pollution load is needed to reduce mercury concentrations in fish to a safe level. More specific mercury pollution load allocations for sources, or source categories, may be established upon the completion of Phase Two of the Mercury TMDL in 2011 as discussed in more detail in Section IV below. The TMDL mercury reduction strategies that will be implemented between 2007 and 2011 are also described in Section IV.

b. Fish Consumption Advisories

Fish consumption advisories are issued by DHS' Public Health Division when concentrations of particular toxic contaminants in fish caught in Oregon's rivers, lakes and reservoirs exceed specified thresholds. DEQ works closely with DHS' Environmental Public Health Division and the Oregon Department of Fish and Wildlife (ODFW) on these fish consumption advisories. Many fish consumption advisories are based on detection of

elevated levels of mercury in fish. Advisories are issued when mercury concentrations in fish exceed 0.35 milligrams per kilogram (or parts per million). In 2004, DHS issued modified fish consumption advisories and guidelines for Cottage Grove and Dorena Lake Reservoirs, based on fish tissue monitoring conducted by DEQ. In addition, DEQ worked with DHS and ODFW in 2005 and 2006 to assess mercury fish tissue concentrations in three lakes southeast of Ashland. One of those lakes, Emigrant Lake, was found to contain fish with very high levels of mercury, which resulted in the issuance of a DHS fish consumption advisory in early 2006. A full listing of these fish consumption advisories can be found in Appendix C.

c. Coastal Environmental Monitoring and Assessment Program (CEMAP)

Between 1999 and 2006, DEQ's Laboratory has partnered with EPA to monitor for a range of toxic pollutants, including mercury, in Oregon's coastal and estuary waters. This Coastal Environmental Monitoring and Assessment Program (CEMAP) work involved the collection of sediment, fish tissue and water column samples in various locations, including the Lower Columbia River. The CEMAP work is part of a national EPA effort, but results from the monitoring can be used to assist with basin-specific TMDL activities in coastal areas. Analytical results from CEMAP monitoring will likely be generated in 2007 and 2008.

Land Quality

The Hazardous and Solid Waste programs have partnered with trade associations and non-profit organizations since 2002 to collect and properly manage waste mercury and waste products containing mercury. The Cleanup program has worked with EPA on assessment and remediation of mercury-contaminated abandoned mines.

a. Household and Small Business Mercury Waste Collection Activities

In addition to collecting mercury wastes at numerous one-day household hazardous waste events throughout Oregon, DEQ's Solid and Hazardous Waste programs have initiated and implemented multiple specialized collection and exchange projects for mercury-containing products. A summary of the quantities of mercury collected through these projects through 2006 can be found in Appendix D.

- **Thermometers** – A thermometer exchange program was initiated to reduce the amount of mercury in homes and ensure proper disposal of mercury thermometers. DEQ provided free digital thermometers at collection events to citizens turning in a mercury containing thermometer. DEQ also supplied local governments with free digital thermometers to encourage them to implement their own exchange programs.
- **Thermostats** – The Thermostat Recycling Incentive project was initiated by DEQ, Portland General Electric (PGE), the Thermostat Recycling Corporation (TRC) and the Product Stewardship Institute to encourage recycling of mercury containing thermostats. Contactors participating in the program receive \$4 rebate coupons for each mercury-containing thermostat they return to a participating wholesaler for recycling. The coupons can then be used toward the purchase of mercury-free Energy Star ® qualified thermostats.
- **Dairy Manometers** – DEQ worked with dairy and agricultural organizations in 2005 and 2006 to replace mercury manometers (pressure-measuring devices) used in dairy farm milking operations with mercury-free digital vacuum gauges. The mercury-containing manometers were managed and disposed of properly by DEQ's hazardous waste contractor. An EPA grant provided \$300 to each participant to cover most of the costs associated with supplying and installing the mercury-free replacement pressure device.
- **Dental Mercury Wastes** – DEQ has been working with the Oregon Dental Association (ODA) and the Oregon Association of Clean Water Agencies (ACWA) since 2003 to improve the management of mercury-containing wastes, such as dental amalgam. DEQ, ODA and ACWA sponsor an annual mercury waste collection event held in conjunction with ODA's annual conference. DEQ's Solid Waste program funds the collection and disposal of the waste.
- **Mercury Auto Switches** – The Northwest Auto Trades Association (NATA), the Oregon Environmental Council, local governments, and DEQ have worked together since late 2001 to replace mercury-containing automotive light switches in consumer automobiles with mercury-free ball-bearing switches

free of charge. The Hazardous Waste program also developed and distributed a fact sheet on mercury switch removal for automobile dismantlers in Oregon.

- Suction Dredge Mining Waste Mercury – DEQ worked with a hobby mining association in 2002 and 2003 on various activities including sponsoring two mercury waste collection events in Myrtle Creek.
- Fluorescent Lamps – The DEQ Solid Waste program funded a fluorescent light take-back project in Eugene.

b. Household and Small Business Mercury Education and Reporting Activities

DEQ's Solid and Hazardous Waste programs have partnered with various organizations, local governments and non-profits to educate households and businesses about proper management of mercury-containing products and alternatives. DEQ has also initiated an effort to collect better data on mercury waste generated by businesses. Specific activities implemented between 2002 and 2006 include the following:

- Educational Materials – DEQ has developed educational fact sheets on the proper management of mercury-containing products and wastes, including cleaning up mercury spills.
- Dental Offices – At the Oregon Dental Association's annual conference DEQ staff assist with educational outreach to participating dentists. In addition, DEQ developed a simplified tax credit application and fact sheet for dentists installing amalgam separators.
- Fluorescent Lamps – The Hazardous Waste program participated in several lighting fairs sponsored by electric utilities to provide educational information on proper disposal of mercury-containing fluorescent lamps. In addition, DEQ worked with the Oregon Environmental Council to develop a lamp fact sheet for property management companies.
- Suction Dredge Miners – DEQ developed printed educational information for miners on proper mercury management.
- Reporting on Mercury Containing Hazardous Waste – DEQ's hazardous waste generation annual reporting form was modified to request specific information on the generation and management of mercury containing wastes from businesses and other entities required to submit these reporting forms.

c. Cleanup Program Activities

DEQ's Environmental Cleanup program has been involved in various site investigation and clean up activities associated with inactive and abandoned mines contaminated by releases of mercury. Mercury, as a commodity, was commercially mined in Oregon from about 1882 through 1970, and the first five of the mines listed below comprised over 90% of the total production in Oregon². The Cleanup program has collaborated with responsible parties and EPA in conducting these activities, which include site investigations, evaluations of potential cleanup levels and actions (feasibility studies), and the removal or treatment of contaminated materials. The extent of cleanup actions has been limited due to reduced availability of funds, most notably the Orphan Site program fund. Below is a summary of the noteworthy accomplishments at the mercury contaminated mine sites between 2002 and 2006:

- Several years of site investigation at the **Horse Heaven Mine** in Jefferson County resulted in a final Record of Decision (selecting remedial actions to be implemented) being issued by DEQ in 2005. The first phase of site cleanup was implemented by Sunoco, the property owner, in October 2006. These actions focused on physical hazards represented by open mine portals.
- DEQ is working with EPA in planning for remedial actions at the **Black Butte Mine**, which is a contributing source of mercury pollution to the Coast Fork of the Willamette River and Cottage Grove Reservoir.
- After the Cleanup program designated the **Bonanza Mine**, near Sutherlin, as an "Orphan Site", a removal action was performed in 2000 to prevent continued exposure of local residents to high levels of mercury and arsenic in soils.
- DEQ completed site investigation work at the **Opalite Mine** in southeast Oregon in 2004. This investigation identified physical hazards and mercury above human health and ecological action levels.

² Quicksilver Deposits in Oregon, State of Oregon, Department of Geology and Mineral Industries, 1971
Oregon Department of Environmental Quality

- A focused site investigation on the **Bretz Mine**, also located in southeast Oregon was completed by DEQ in 2004. As with the Opalite Mine, physical hazardous and mercury above human health and ecological actions levels were identified.
- Eastern Region Cleanup staff are currently conducting a “Phase 2” study of **Ochoco Mercury District** to establish basin-wide mercury levels, the connection to individual mine sites in the district, and the potential ecological impacts of the mercury contamination.

Air Quality

DEQ’s Air Quality program has focused recent mercury monitoring and reduction work on the development and adoption of the Clean Air Mercury Rule (CAMR) for coal-fired power generating facilities. Below is summary of the mercury air quality work DEQ has been involved with between 2002 and 2006.

a. CAMR Rule

The Environmental Quality Commission (EQC) adopted the Oregon Utility Mercury Rule for coal-fired power generating facilities on December 15, 2006. Currently, only one such facility is operating in Oregon, but it is the second largest point source of mercury air emissions in the state. The newly adopted rule requires that coal-fired power plants achieve 90% mercury control or meet a mercury emission limitation of 0.60 pounds per trillion Btu by July 1, 2012. The current mercury emissions from the Boardman plant range from 137 to 281 pounds per year. DEQ estimates mercury emissions from the plant will range from 18 to 35 pounds per year after installing controls.

An alternative mercury emission limit may be approved by DEQ if a facility demonstrates that the 90% control limitation is not technically achievable. The rule also requires coal-fired power plants to install continuous mercury monitoring equipment by 2008, and submit a Mercury Reduction Plan to DEQ for approval by 2009. The rule allows coal-fired power plants in Oregon to trade mercury emissions credits with coal-fired power plants located in other states between 2010 and 2018, but disallows trading after that date.

b. Ambient Air and Wet Deposition Mercury Monitoring

DEQ has ambient air quality monitoring stations Portland, Eugene, Medford and LaGrande that routinely collect samples for mercury and other metals. However, ambient air sampling and analysis methods are not optimized for mercury, like they are for the less reactive metals. Therefore, the accuracy of the results from the mercury air monitoring is questionable. More accurate continuous ambient mercury air quality sampling equipment is now available, but is not available to DEQ at this time because of the cost.

The United States Geological Survey (USGS) installed two monitoring stations in Oregon to assess “wet” deposition³ of mercury. One of these stations is in Beaverton and the other is in the H.G. Andrews Experimental Forest east of Eugene. DEQ partnered with USGS through 2005 to support the operation and maintenance of these wet deposition monitoring stations, and the monitoring results were used in the development of the Willamette Basin Mercury TMDL pollutant load estimates. Operations and maintenance of the monitors was funded through an EPA grant. As of 2006, these grant funds are no longer available, and the monitoring has been discontinued in Oregon. DEQ is currently evaluating possible funding sources to re-establish the wet deposition monitoring stations (see Appendix A: Funding-Dependent Mercury Actions)

c. Boiler Energy Efficiency Project

DEQ funded and participated in an Oregon Environmental Council (OEC) project designed to improve the energy efficiency of industrial and institutional boilers. This project involved conducting boiler tune-ups for 11 institutional facilities and boiler efficiency audits to 6 industrial facilities in the state, which resulted in reductions

³ Wet deposition occurs when reactive gaseous mercury, dissolved in precipitation, is deposited on the surface of the Earth (Mercury Deposition in Pennsylvania: Status Report, Penn State University, January 2001)

in both mercury and carbon dioxide emissions. OEC developed a white paper on the project's findings and held workshops for facility managers to promote implementation of project recommendations. Additional mercury reductions may occur as a result of the boiler efficiency information and assistance provided to the 83 boiler managers participating in the workshops.

d. Cement Plant Mercury Emissions

In 2006 a new mercury emissions estimate for the Ash Grove cement plant located in Durkee revealed that the plant was the single largest source of mercury air emissions in the state, with an estimated 1,500 pounds emitted in 2005. DEQ's current and planned actions in response to these emissions estimates are summarized in Section IV (see Air Quality Commitments).

IV. 2007-2011 DEQ MERCURY COMMITMENTS

DEQ's plans for mercury reduction, monitoring and awareness activities include continuation of existing projects and initiation of new mercury projects. Some of the new activities represent the next phase of a mercury regulatory program. Given possible changes in the availability of resources and policy priorities, DEQ's set of mercury commitments over the next 5 years may be modified over time. DEQ will update this Mercury Strategy to reflect these modifications as they occur. Mercury monitoring and reduction activities that may be initiated by DEQ if resources become available are outlined in Appendix A of this document.

Water Quality Commitments

Implementation of the mercury component of the recently-approved Willamette TMDL is a high priority for DEQ's Water Quality program. The two major elements of DEQ's Willamette Mercury TMDL in the next five years are implementation and enforcement of the first phase of the TMDL requirements for designated management agencies (DMAs) and industrial permittees, and continued monitoring of mercury in the Willamette Basin as part of the effort to complete the second phase of the Willamette Mercury TMDL.

a. Willamette Mercury TMDL Implementation and Refinement

Implementation and Enforcement of Mercury TMDL Requirements

The Willamette TMDL outlines mercury-related requirements for the following types of point sources:

- Municipal wastewater treatment plants classified as "major" permittees under DEQ's National Pollutant Discharge Elimination System (NPDES) permit program
- Industrial NPDES "major" and "minor" permittees that have the potential to discharge mercury to surface waters
- "Phase 1" Municipal Separate Storm Sewer Systems (MS4s). These are municipal entities or areas with populations over 100,000 that have been issued NPDES permits by DEQ for storm water discharges to surface water.

These regulated entities will be required to monitor effluent discharges for mercury and methyl mercury. The major municipal wastewater and industrial permittees will also be required to monitor wastewater entering their system (i.e., "influent") prior to treatment. The specific level, frequency, and timing of monitoring will vary depending on the type of permittee. In addition, major point sources will be required to submit a mercury minimization plan, describing how they will reduce mercury discharges.

Department staff will be working with the regulated community to ensure that these measures are fully implemented. DEQ's implementation tasks will include mercury data and plan evaluations, technical assistance, and compliance and enforcement activities.

DEQ will also work with management agencies in the Basin (e.g., state Departments of Forestry and Agriculture and local governments) on implementation of nonpoint source mercury reduction activities. The primary focus of these nonpoint efforts will be to reduce erosion of native mercury-containing soils from agricultural, urban and forested lands.

DEQ plans to complete a second phase of the Willamette Mercury TMDL in 2011, based on an analysis of data generated through the additional monitoring activities described below. This Phase Two Mercury TMDL may establish more specific pollutant load allocations for particular sources or source categories.

Ambient Mercury Monitoring in the Willamette Basin

DEQ has an EPA grant to conduct additional mercury monitoring in the Willamette Basin in 2007. This monitoring effort will focus primarily on collection of water column samples at various ambient monitoring locations throughout the Basin, including Willamette tributaries. The samples will be analyzed by a private contract laboratory that has enhanced analytical equipment to detect mercury and methyl mercury at very low concentrations.

DEQ has recently created and filled a new position in the Laboratory to coordinate mercury monitoring efforts. The purpose of this position is to help characterize sources of mercury, understand how mercury moves through the Willamette Basin and other basins, how it bioaccumulates in fish, and determine if mercury control measures are effective. This position will coordinate the ambient mercury monitoring in the Willamette described above, analyze data from point sources, identify data gaps and outline specific monitoring needs for the agency.

b. Mercury Water Quality Commitments Beyond the Willamette Basin

DEQ's Water Quality program will be implementing activities to reduce toxics outside of the Willamette Basin with mercury as a component. These efforts include:

- The **Reasonable Potential Analysis (RPA)** Internal Management Directive (IMD) provides Department staff and the regulated community with information on how to determine whether discharges of toxics are causing or contributing to violations of water quality standards. If such an analysis results in a determination that a permitted source's mercury discharge violates standards, DEQ could place mercury monitoring and control requirements into that source's permit. DEQ will be reviewing and evaluating toxics RPAs, and will take appropriate regulatory action based on the findings.
- The Water Quality program is working with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and EPA in 2007 and 2008 on a series of workshops leading to rulemaking on the **fish consumption rate** that DEQ established in development of water quality standards for toxics in 2004. After the workshops, DEQ then will conduct a formal rulemaking including the required public process, which will culminate in rule recommendations to the Commission regarding increasing the fish consumption rate.
- As funding allows, DEQ's Laboratory and Water Quality program will continue to work closely with the DHS and other agencies to identify waterbodies where fish tissue concentrations may pose risks to public health. When fish tissue test results show mercury concentrations at levels of concern, **fish consumption advisories** will be issued by DHS. DEQ will assist DHS in communicating information about these advisories to the public.

Land Quality Commitments

Land Quality programs will continue implementing several existing mercury collection, management and clean up activities in 2007 and beyond. Some mercury projects, such as the dairy monometer replacement project, were completed by or before the end of 2006.

a. Household and Small Business Mercury Waste Collection Commitments

DEQ's Solid Waste program will continue to sponsor periodic household hazardous waste collection events throughout the state, which help to increase the amount of mercury-containing wastes and other toxic materials diverted from Oregon's environment into safe management and recycling systems. In addition, the following mercury collection projects will be implemented:

- The Solid Waste program is working with Portland General Electric to determine how to proceed with the next phase of the thermostat collection and replacement program.
- DEQ will continue to offer free digital thermometers to residents in exchange for mercury thermometers brought to household hazardous waste collection events sponsored by DEQ or local governments.
- Participation in the mercury switch replacement project ("Switch-the-Switch") with the Northwest Auto Trades Association and commercial automotive repair businesses will continue over the next several years. DEQ's active involvement in the Eco-Logical Business Program, a recognition program for automotive shops demonstrating exemplary environmental performance, provides on-going opportunities to recruit new businesses to participate in the Switch-the-Switch program.
- Oregon is participating in the national End of Life Vehicle Solutions (ELVS) project, designed to ensure the removal of automotive mercury switches by vehicle dismantlers before scraped vehicles are crushed and smelted. The ELVS switch collection program is sponsored by auto manufacturers and the steel-making industry. DEQ will be coordinating Oregon's participation in the program in 2007 by obtaining participation of dismantlers in the state, and providing them with technical assistance. Dismantlers will fill collection buckets with switches removed from vehicles, and the ELVS program will pay dismantlers \$1.00 per switch that is recovered.
- DEQ's Solid Waste program will continue to fund a mercury waste collection program for conditionally exempt hazardous waste generators (CEGs) that allows these small businesses to dispose of mercury and mercury-containing wastes free of charge. The Solid Waste program will also, through a waste management contractor, provide pick up services for households that have over 3 pounds of elemental mercury and are unable to deliver the material to a designated facility.
- DEQ will continue to work with the Oregon Dental Association and the Association of Clean Water Agencies on the collection of dental amalgam and other mercury-containing wastes generated by dental offices. DEQ's Solid Waste program will continue to pay for the management and recycling of the collected mercury waste.
- DEQ will work with local government entities in Coos County to establish a household hazardous waste collection program in the county to divert mercury and other toxics away from the solid waste incinerator. Coos County has one of two municipal solid waste incinerators in the state. Although air emissions controls are installed and operating, small quantities of mercury and other toxic substances are still discharged from the incinerator⁴.

b. Household and Small Business Mercury Education Commitments

The agency's Solid and Hazardous Waste programs provide information to the public and businesses on mercury waste management through regular phone and email interactions, as well as specialized outreach efforts. Education also occurs as part of the promotion of the mercury waste collection efforts described above. Some other specific education and technical assistance efforts planned for 2007-2011 include the following:

- Expanded energy efficiency initiatives by electric utilities in the state are promoting the use of compact fluorescent light bulbs as an energy saving alternative to standard incandescent bulbs for homeowners. To ensure that the future large quantities of mercury-containing compact fluorescent lights (CFLs) are managed properly at the end of their life, DEQ will be developing and implementing strategies and possible partnerships to effectively communicate proper management of waste CFLs to the public.
- The Hazardous Waste program will continue to review and evaluate mercury waste data submitted by regulated hazardous waste generators in annual hazardous waste report forms. This data will help DEQ determine the business technical assistance and regulatory needs of businesses submitting these reports.

⁴ The second municipal waste incinerator in the state is located in Marion County. This facility has operated a hazardous waste collection facility since 2004. The collection program is focused to collect and properly manage mercury before it gets into the municipal solid wastestream.

- DEQ staff will also provide on-going technical assistance to businesses and institutional entities on the proper management of mercury-containing materials and wastes through site visits and periodic training sessions.
- In addition, DEQ will continue participation in the Oregon Dental Association's annual conference and other efforts to promote the use of best management practices for dental amalgam and other mercury wastes. These best practices are designed to prevent the discharge of mercury into the sanitary sewer.

c. Environmental Cleanup Program Commitments

DEQ's Environmental Cleanup program will continue to work with EPA and responsible parties on investigations and remedial actions of abandoned hard rock mines where mercury wastes have been generated and disposed. The extent of clean up work is dependent on the availability of funds, but the currently-planned efforts over the next few years include the following:

- Black Butte Mine - In the spring of 2007 EPA will conduct an interim soil removal which will entail excavating contaminated soil from the two furnace locations, and reducing the slopes of the tailings piles that are currently being eroded by the two creeks on site. DEQ will provide operations and maintenance (O&M) after the removal and will also conduct further evaluation of the responsibility of the current owner to conduct cleanup as well as potentially recovering costs from the current owner.
- Horse Heaven Mine - DEQ and Sunoco will be implementing the second phase of remedial action at the site in 2007. This phase of the remedy will address the remaining toxic hazard in a limited area around the D-tube furnace where mercury levels are slightly elevated. In addition, DEQ and Sunoco will address storm water retention and the institutional control components of the Record-of-Decision (ROD).
- Opalite and Bretz Mines – DEQ will explore joint funding options with the Vale District of the Bureau of Land Management (BLM) for the remedial actions recommended for these mine sites. No available funds currently exist in the Orphan Site Fund account.
- Ochoco Mercury District – DEQ's Eastern Region staff will complete the Phase 2 Abandoned Mine Lands study in 2007.

Air Quality Commitments

Air Quality's mercury-related actions for 2007-2011 will largely be focused on the coal-fired power plant in Boardman and the Ash Grove cement plant in Durkee – the two largest sources of mercury air emissions in the state. Other mercury air emissions projects could be initiated if new data or research warrants Department action.

a. Clean Air Mercury Rule (CAMR) Implementation

Implementation of the requirements of Oregon's recently-adopted Utility Mercury Rule by the Boardman coal-fired power plant operated by Portland General Electric (PGE) will begin in 2007. DEQ will oversee implementation of the requirements of the rule and ensure that compliance is achieved. Specifically, DEQ staff will review and evaluate the Boardman plant's mercury reduction plan, as well as mercury emissions data generated by the continuous emissions monitoring equipment installed and certified by 2009. Department evaluation and oversight of PGE's installation and operation of mercury emissions control technologies will also occur over the next five years to ensure that the Boardman plant is able to achieve emissions limitations mandated by the rule.

b. Cement Plant Regulatory Requirements

As mentioned in Section III, the 2005 mercury emissions estimate for the Ash Grove cement plant in Durkee was 1,500 pounds. This estimate is based on one short term stack test. DEQ's Air Quality Division observed mercury emission stack testing at the plant in December 2006 with results available sometime in late March or early April 2007. The plant will also analyze its raw materials to get a better understanding on where the mercury comes from. Based on this information, DEQ will assess the need for developing state-mandated mercury emission limits and/or control requirements for the plant.

c. Municipal Waste Combustor Rules

In conformance with new EPA rules, DEQ will modify its air emissions rules for municipal solid waste combustors 2008. The new rules establish more stringent emissions limits for mercury and other air pollutants from these facilities.

Agency-Wide Mercury Commitments

DEQ is an active participant in the **Quicksilver Caucus**, a multi-state mercury issue work group coordinated by the Environmental Council of the States (ECOS). Participation in the Quicksilver Caucus has allowed DEQ to have input on national EPA mercury programs and policies, and to help develop multi-state approaches to mercury concerns when appropriate. Developing a unified consensus among several states on mercury issues is generally a more effective strategy than individual states providing input to EPA independently. DEQ plans to continue involvement in the Quicksilver Caucus. In early 2007 the Caucus will complete its 2007-08 Mercury Action Plan, designed to outline the group's recommendations for strengthening states' capacity to reduce and manage mercury in the environment and for implementing EPA's Mercury Roadmap (issued in 2006).

One significant issue that individual states have little control over is whether the mercury waste collected throughout the country continues to be recycled and re-introduced into the global market, or whether the collected mercury is removed from the market and disposed. Currently, no approved land disposal method exists for mercury. However, DEQ is working through the Quicksilver Caucus to advocate for the development of a method for locking up or stabilizing mercury in a form that prevents it from being used in new products, while ensuring that the collected mercury will not be released into the environment in the future. DEQ is also working through the Quicksilver Caucus to reduce the international use of mercury in processes and products where mercury-free substitutes are readily available. Although Oregon, by itself, has little influence over the global market for mercury, working with other states and EPA to develop comprehensive strategies can have a major impact on reducing the amount of mercury that is used and emitted globally, thereby reducing the most significant source of mercury pollution in the state.

V. CONCLUSIONS

Summary of Strategy Findings and Actions

Mercury pollution in Oregon's environment remains a threat to human health and wildlife, as evidenced by elevated levels of the toxic metal detected in fish found in the Willamette Basin and other areas of the state. The majority of mercury pollution contaminating Oregon's lands and waterways is the result of atmospheric deposition from sources outside of the state and from the disruption of natural sediments that contain mercury. Smaller mercury loadings originate from point and nonpoint pollution sources within the state.

DEQ is committed to reducing the amount of mercury entering Oregon's environment from Oregon-based sources, and to removing mercury pollution from the environment where feasible through a variety of strategies. In addition, DEQ will continue to work with other states and EPA to address policies and actions that can reduce mercury pollution coming from other parts of the nation or world.

Monitoring for mercury in the environment is a critical part of a comprehensive mercury strategy to better characterize the sources of mercury in Oregon's environment and to determine if mercury reduction strategies are effective. DEQ's Mercury Strategy involves continued and improved monitoring of mercury in the ambient environment, as well as monitoring of specific point sources of mercury.

Measuring Effectiveness

According to EPA, dietary intake is by far the dominant source of exposure to mercury for the general population, and fish and other seafood products are the main source of exposure of methylmercury in the diet.⁵ As a result, the primary performance measure for success of DEQ's Mercury Strategy is the average concentration of methyl mercury in fish tissue in various water basins throughout Oregon. Given that the majority of mercury pollution in Oregon's environment is coming from sources outside of the state, demonstrating reductions in fish tissue concentrations will be a significant challenge. A secondary set of performance measures are the quantities of air, water or land discharges of mercury into the environment from Oregon sources of mercury. Measuring the mercury discharges from the larger Oregon point sources will occur over the next five years.

Although direct measurement of all nonpoint source contributions of mercury is not feasible, a combination of ambient monitoring and modeling can help improve estimates of the loading from such sources. The quantity of mercury waste collected as the result of various DEQ initiatives is an important measure of agency mercury reduction activity and will continue over the next five years. However, without information about the total quantities of mercury products in commerce or mercury waste generated in the state, no conclusions can be made regarding the overall environmental impact reductions from these efforts.

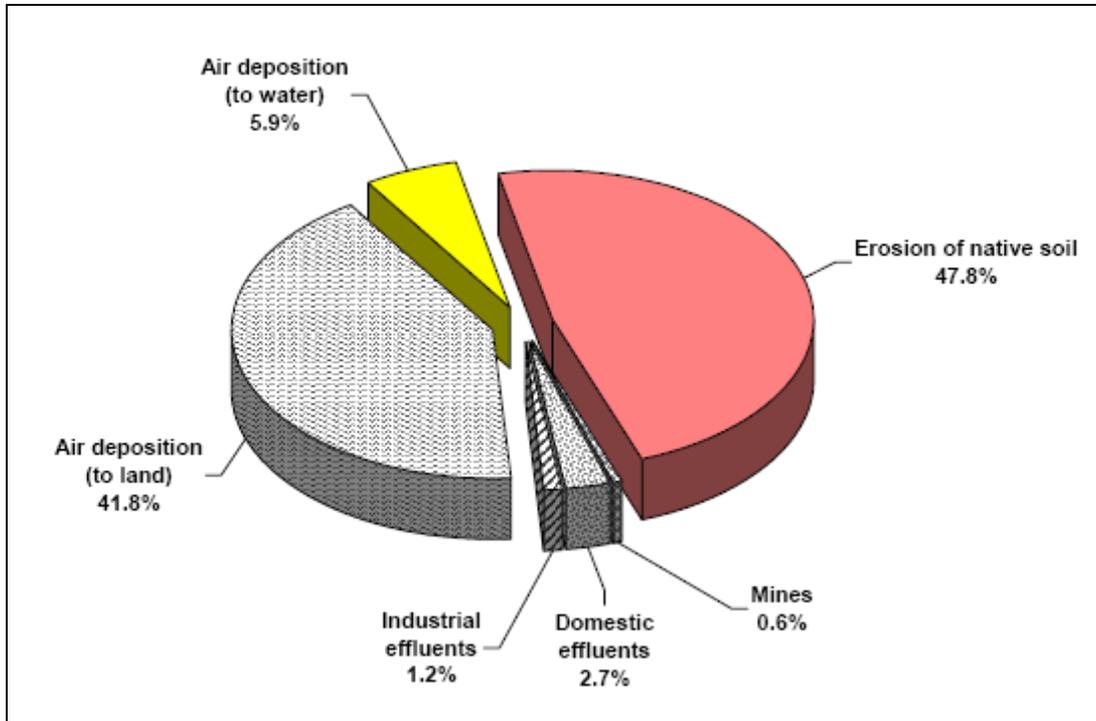
⁵ Mercury Update: Impact on Fish Advisories, EPA Office of Water (EPA-823-F-01-011), June 2001
Oregon Department of Environmental Quality

APPENDIX A: FUNDING-DEPENDENT MERCURY ACTIONS

DEQ PROGRAM AREA	POTENTIAL ACTION
Water Quality	<ul style="list-style-type: none"> The 2007 DEQ legislative budget proposal will include establishing a comprehensive water quality toxics monitoring program that would begin in the Willamette basin and would be sequenced around the state over time. The program would be designed to identify toxic pollutants that are the greatest threat to human health and the environment through an assessment of existing data, land uses and pollution sources. DEQ would then evaluate the monitoring results to determine where the toxic pollutants were coming from and how best to direct resources towards solutions. Mercury is one of many toxics that may or may not be included in the monitoring plan for a particular water basin, depending on the results of DEQ's initial assessment.
	<ul style="list-style-type: none"> DEQ is coordinating with EPA, Washington State Department of Ecology, and other regional partners in developing a plan for monitoring toxics in the middle segment of the Columbia River within the next few years. Mercury will likely be one of a limited number of high priority toxics that will be included in the monitoring plan. This plan will be included in a proposal submitted to EPA for federal Environmental Monitoring and Assessment Program (EMAP) funds. EPA is expected to issue a request for proposal for these funds during the first half of 2007. At this time, this monitoring plan is dependent on federal funding.
	<ul style="list-style-type: none"> As part of TMDL development efforts in the Umqua Basin, DEQ is evaluating the need to monitor for mercury in the Basin. The agency may apply for an grant funding to support such monitoring.
Air Quality and Water Quality	<ul style="list-style-type: none"> USGS and DEQ have partnered to install, operate and maintain mercury "wet deposition" monitoring stations in two locations in the Willamette Basin. DEQ used EPA grant funds to support the operation of these stations, but these funds were depleted in 2006 and the operation of the stations was discontinued. DEQ will continue to look for potential funding sources to support getting these stations back on-line.
Land Quality	<ul style="list-style-type: none"> Clean up actions on several abandoned mercury mines, such as the Bonanza mine, have been held up because sufficient funds no longer exist in DEQ's "orphan site" clean up fund. DEQ, in partnership with EPA and other entities, will continue to evaluate alternative funding sources that will allow for completion of these clean up actions.

APPENDIX B: SOURCES OF MERCURY IN THE WILLAMETTE BASIN

Relative Load Contributions for the Mainstem Willamette River by Source Category



Source: Department of Environmental Quality, Willamette Basin Total Maximum Daily Load (TMDL)

APPENDIX C: MERCURY FISH ADVISORIES IN OREGON SURFACE WATERBODIES

Source: Oregon Department of Human Services, Public Health Division

WATERBODY	CONTAMINANT & GUIDELINES
Antelope Reservoir (SE Zone)	Very high mercury levels <ul style="list-style-type: none"> • Women of childbearing age, children under 6, and people with liver and kidney damage should avoid eating fish from these waters. • Healthy adults should eat no more than one 8-ounce meal per month. • <u>Sport-fishing & methylmercury.</u>
Cooper Creek Reservoir (Willamette Zone)	High mercury levels <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every two months. • Women of childbearing age should eat no more than one 8-ounce meal every month. • Healthy adults should eat no more than one 8-ounce meal every two weeks. • <u>Sport-fishing & methylmercury.</u>
Cottage Grove Reservoir (Willamette Zone)	Very high mercury levels <ul style="list-style-type: none"> • Women of childbearing age, children under 6, and people with liver and kidney damage should avoid eating fish from these waters. • Healthy adults should eat no more than one 8-ounce meal per month. • <u>Sport-fishing & methylmercury.</u>
Dorena Reservoir (Willamette Zone)	High mercury levels <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every two months. • Women of childbearing age should eat no more than one 8-ounce meal every month. • Healthy adults should eat no more than one 8-ounce meal every two weeks. • <u>Sport-fishing & methylmercury.</u>

WATERBODY	CONTAMINANT & GUIDELINES
<p>East Lake (Central Zone) Do not eat brown trout 16" or larger</p>	<p>High mercury levels</p> <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every two months. • Women of childbearing age should eat no more than one 8-ounce meal every month. • Healthy adults should eat no more than one 8-ounce meal every two weeks. • <u>Sport-fishing & methylmercury.</u>
<p>Emigrant Lake (SW Zone)</p>	<p>Very high mercury levels</p> <ul style="list-style-type: none"> • Women of childbearing age, children under 6, and people with liver and kidney damage should avoid eating fish from these waters. • Healthy adults should eat no more than one 8-ounce meal per month. • <u>Sport-fishing & methylmercury.</u>
<p>Galesville Reservoir (SW Zone)</p>	<p>High mercury levels</p> <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every two months. • Women of childbearing age should eat no more than one 8-ounce meal every month. • Healthy adults should eat no more than one 8-ounce meal every two weeks. • <u>Sport-fishing & methylmercury.</u>
<p>Jordan Creek (SE Zone)</p>	<p>Very high mercury levels</p> <ul style="list-style-type: none"> • Women of childbearing age, children under 6, and people with liver and kidney damage should avoid eating fish from these waters. • Healthy adults should eat no more than one 8-ounce meal per month. • <u>Sport-fishing & methylmercury.</u>
<p>Owhyee Reservoir (SE Zone)</p>	<p>Very high mercury levels</p> <ul style="list-style-type: none"> • Women of childbearing age, children under 6, and people with liver and kidney damage should avoid eating fish from these waters. • Healthy adults should eat no more than one 8-ounce meal per month. • <u>Sport-fishing & methylmercury.</u>

WATERBODY	CONTAMINANT & GUIDELINES
Owhyee River upstream of the reservoir to Three Forks (SE Zone)	High mercury levels <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every two months. • Women of childbearing age should eat no more than one 8-ounce meal every month. • Healthy adults should eat no more than one 8-ounce meal every two weeks. • <u>Sport-fishing & methylmercury.</u>
Plat I Reservoir (SW Zone)	Moderate mercury levels <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every month. • Women of childbearing age should eat no more than one 8-ounce meal every two weeks. • Healthy adults should eat no more than one 8-ounce meal every week. • <u>Sport-fishing & methylmercury.</u>
Snake River, including Brownlee Reservoir (Snake River Zone)	Moderate mercury levels <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every month. • Women of childbearing age should eat no more than one 8-ounce meal every two weeks. • Healthy adults should eat no more than one 8-ounce meal every week. • <u>Sport-fishing & methylmercury.</u>
Willamette River and Coast Fork Willamette to Cottage Grove Reservoir	High mercury levels & PCB levels <ul style="list-style-type: none"> • Children under 6 should eat no more than one 4-ounce meal every two months. • Women of childbearing age should eat no more than one 8-ounce meal every month. • Healthy adults should eat no more than one 8-ounce meal every two weeks. • <u>Sport-fishing & methylmercury.</u>

APPENDIX D: COLLECTIONS OF WASTE MERCURY FROM DEQ PARTNERSHIP PROJECTS 2002-2006

Collection Project	Partners	Estimated Pounds of Mercury Collected
Household Thermometer Exchange	<ul style="list-style-type: none"> • Local governments 	5
Thermostat Recycling Incentive Project	<ul style="list-style-type: none"> • Portland General Electric • Thermostat Recycling Corporation • Product Stewardship Institute 	54
Dairy Manometer Replacement	<ul style="list-style-type: none"> • US EPA 	82
Household Hazardous Waste Collection Events	<ul style="list-style-type: none"> • Local governments 	27
Conditionally Exempt Generator (CEG) Collection Program	<ul style="list-style-type: none"> • Local governments 	98
Automotive Switch-the-Switch Project	<ul style="list-style-type: none"> • Northwest Auto Trades Association • Local governments • Oregon Environmental Council • Port of Portland 	20
Dental Mercury Amalgam Collection Project	<ul style="list-style-type: none"> • Oregon Dental Association • Association of Clean Water Agencies 	210