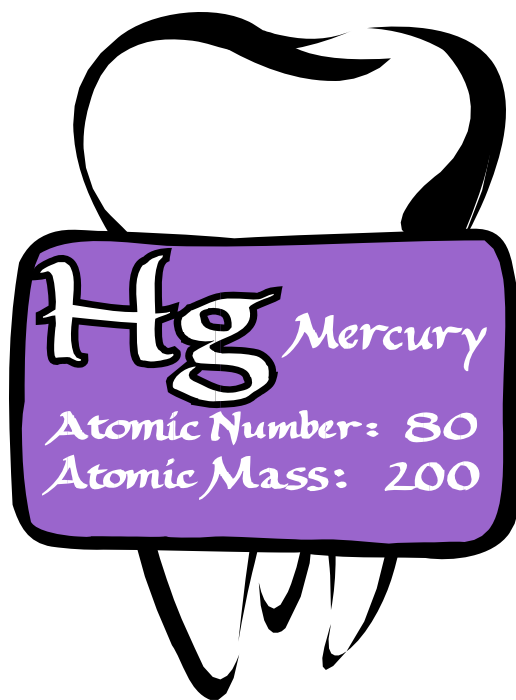




WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

Memorandum of Understanding Dental Compliance Follow-up Report

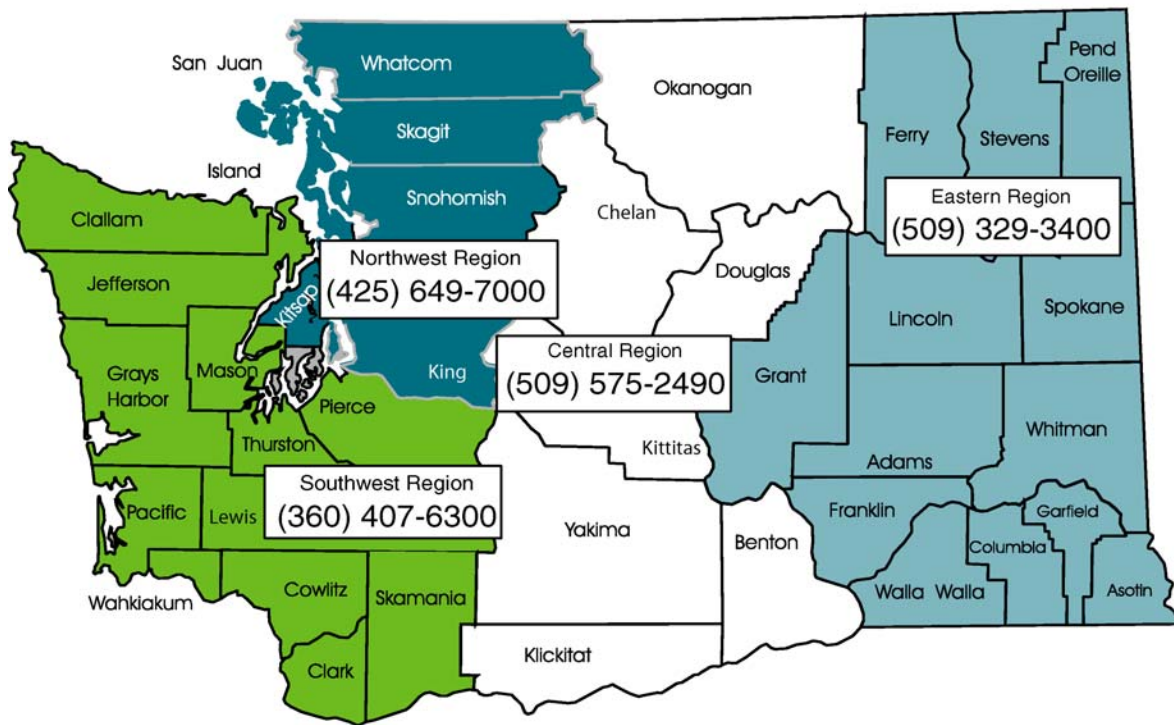


Washington state Department of Ecology
Hazardous Waste and Toxics Reduction Program
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Department of Ecology Regions

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Table of Contents

Executive Summary.....	1
Introduction.....	2
Compliance Follow-up.....	4
Final Results.....	7
Acknowledgements	12
<i>Figure 1 – Changes in Percentages Between the 2004 and 2005 Surveys.....</i>	<i>2</i>
<i>Figure 2 – Separator Installation</i>	<i>7</i>

Executive Summary

In August 2003, the Department of Ecology (Ecology) and the Washington State Dental Association (WSDA) signed a Memorandum of Understanding (MOU). This MOU dealt with the implementation of Best Management Practices (BMPs) in Washington state dental offices, including the installation of amalgam separators.

To determine the success of the MOU, Ecology asked dentists to send a provided form to Ecology once they had installed a separator. Two surveys were also performed, in 2004 and 2005. After the MOU period ended in August 2005, inspectors from the Hazardous Waste and Toxics Reduction Program visited dentists who had not installed separators.

Separator installation rates increased to 80% during the MOU period, and smaller but still significant improvements were seen in the percentages of dentists correctly performing other BMPs.

Depending on which estimate of the amount of mercury sent to wastewater by an average dentist is used, anywhere from 11 to 76 kilograms of mercury were removed from the environment due to the separators installed (outside of King County¹) during and after the MOU period. An unknown amount of hazardous wastes generated as a result of other processes was also eliminated because of improved compliance with the BMPs.

Five western Washington counties are working with dentists on a voluntary basis to increase BMP implementation, and Ecology will perform additional visits in the Eastern Region. In the future, Ecology may work toward full separator compliance or investigate compliance with non-separator BMPs among the dental community as a whole, possibly in concert with the WSDA.

¹ Most of King County was not included, since they have a local ordinance requiring separators that is enforced by county personnel.

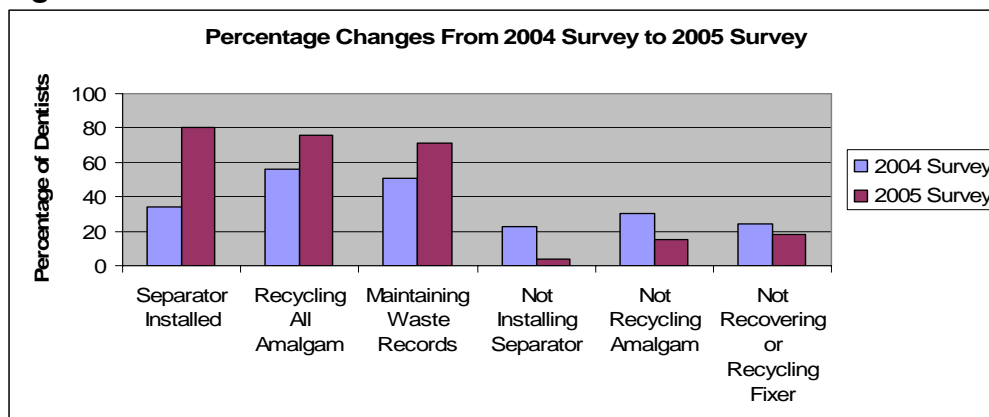
Introduction

In August of 2003, the Department of Ecology (Ecology) and the Washington State Dental Association (WSDA) signed a Memorandum of Understanding (MOU) regarding their mutual desire to protect Washington's environment by incorporating Best Management Practices (BMPs) into Washington state dental offices. In that MOU, the WSDA agreed to educate the Washington state dental community about these BMPs, including the use of amalgam separators and the proper disposal of amalgam and other dangerous wastes. In return, Ecology agreed to exercise enforcement discretion and deal with the dental community on a technical assistance basis until the MOU expired in August 2005. At that time, Ecology would evaluate the level of compliance with the MOU requirements among dentists and decide what actions to take next.

During the MOU period, dentists who placed or removed amalgam fillings on more than ten practice days per year were encouraged to install amalgam separators. Ecology asked them to send a provided notification form to Ecology once installation had occurred. Out of 2,340 non-King County dentists on the list provided to Ecology by the WSDA, 613 notified Ecology that they had installed a separator. Another 32 notified Ecology that they did not need to install a separator because they were exempt specialists². According to the notifications received, approximately 28% of dentists statewide installed separators by the deadline.

This project included two anonymous surveys of the dental population. Ecology developed and conducted a baseline survey in 2004 with a 37% response rate. Hebert Research, Inc. conducted a follow-up survey in summer 2005 with a 56% response rate. Again, neither of these surveys covered King County. The results of these surveys (Figure 1) indicate a considerable increase in compliance with the BMPs over the course of the MOU:

Figure 1



² Dentists specializing in orthodontics and dentofacial orthopedics, oral and maxillofacial surgery, oral medicine and pathology, oral and maxillofacial radiology, periodontics, and endodontics and prosthodontics did not have to install separators so long as they did not place or removal amalgam fillings on ten or more practice days per year.

- The percentage of dentists with an amalgam separator increased from 34% to 80%.
- The percentage of dentists recycling amalgam wastes from both chairside traps and vacuum filters increased from 55.7% to 76.2%.
- The percentage of dentists maintaining current waste disposal records increased from 50.9% to 71.3%.
- The percentage of dentists not planning to install an amalgam separator decreased from 23% to 4%.
- The percentage of dentists not recycling amalgam wastes from either chairside traps or vacuum filters decreased from 29.9% to 14.6%.
- The percentage of dentists not recovering or recycling fixer decreased from 24.1% to 18.2%. This includes dentists who do not use fixer on-site, and does not reflect the prevalence of inadequate treatment.

Compliance Follow-up

Ecology developed a compliance follow-up program to determine levels of compliance with MOU requirements among dentists who did not return the notification form and to bring non-compliant dentists into compliance.

Members of the compliance follow-up team visited one dentist who had not installed a separator in each county. These visits were pre-scheduled, but conducted as normal compliance inspections, with specific pre-written violation language to use when separators were missing.

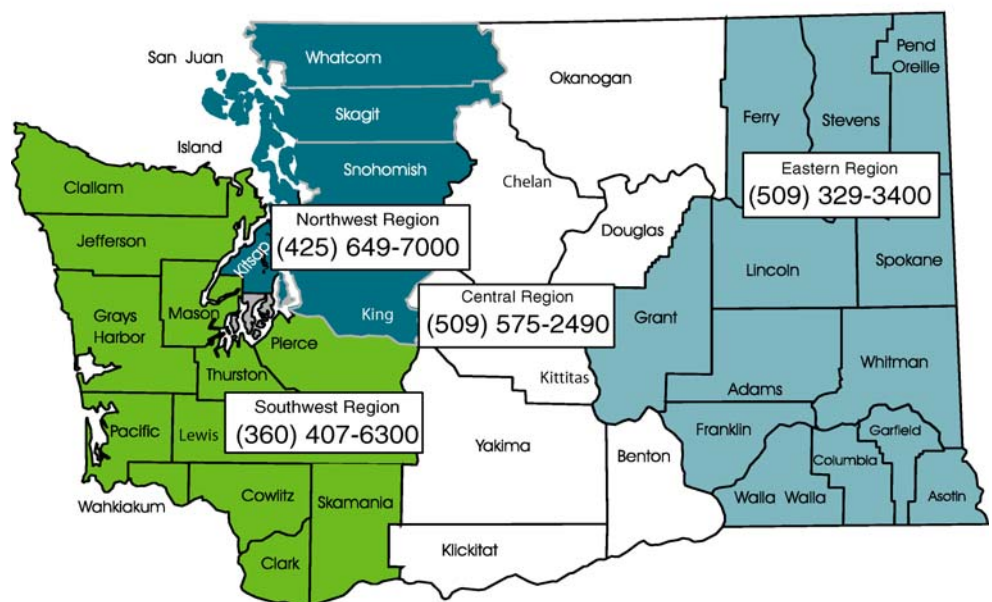
The same statewide list of dentists provided by WSDA used to record incoming notifications was used to locate dentists who had not installed separators. Ecology staff called these dentists and asked three questions: whether they had installed a separator and if yes, what kind of separator they had installed; and whether their office was on sewer or a septic system. (SWRO did not ask this last question.)

Ecology recorded the results of these calls, and scheduled an inspection when they found a dentist who did not have a separator. Even if there were more dentists in that county who had not notified, further calls beyond that point were not necessarily made. Ecology staff did not call any counties where all listed dentists had installed separators. Dentists covered by King County Metro or the City of Tacoma were also not contacted, due to the existence of local programs.

The next section compares the separator installation rates for each region. To note counties that are covered by each region, refer to this map. Although this process was not designed as a statistically valid data-gathering process like the Hebert survey, the results do tend to support each other. A summary table is included at the end of this section.

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Northwest Regional Office (NWRO)

Call Results

The NWRO received 170 contacts, including calls and notifications that came in after the deadline. 22 of them were specialists (exempt), 141 had installed separators, and 7 were scheduled for inspections. Excluding the 22 exempt specialists gives a separator installation rate of 95%. One dentist was disposing of dental waste to a septic system. These contacts included calls within King County, since it was discovered late in the process that there were dentists within unincorporated areas of King County that had not been visited by county personnel.

Inspection Results

Five dentists had installed their separators, and one of the remaining two had ordered theirs, by the time of the inspections. Two were handling fluorescent lamps inappropriately, one was disposing of waste amalgam with the biohazard waste, and three were putting waste glutaraldehyde down the drain without designation.

Southwest Regional Office (SWRO)

Call Results

The SWRO called 161 dental offices, of which 154 had an amalgam separator installed and scheduled 7 inspections, giving a separator installation rate of 96%. Skamania, Wahkiakum, Pacific, Mason, and Jefferson Counties were in 100% compliance with the separator installation requirement. Although SWRO did not ask whether dentists were on septic or sewer, Thurston County Public Health staff said they knew of 5 dentists in Thurston County using septic systems.

Inspection Results

Three dentists had installed separators by the time of the inspections. There were three dentists inappropriately disposing of waste amalgam, three dentists inappropriately disposing of used amalgam capsules, and two dentists inappropriately disposing of waste fixer. One dentist received an extension past the thirty-day period because replacing their entire vacuum system was required.

Central Regional Office (CRO)

Call Results

The CRO made 70 calls, resulting in 46 contacts. 14 dentists were exempt from the separator requirement, 24 already had separators installed, and 8 inspections were scheduled. (Once an inspection had been scheduled, all attempts to contact dentists who had not responded to phone messages ceased, so not all calls resulted in a determination of the dentist's separator status.) Removing the exempt specialists, this gives a separator installation rate of 75%. One dentist in Yakima County was disposing of dental waste to a septic system.

Inspection Results

Two dentists had installed their separators by the time of the inspections. Five dentists were disposing of used capsules inappropriately, six of used fixer, five of waste sterilant, and five of amalgam waste.

Eastern Regional Office (ERO)

Call Results

The Eastern Region made 64 calls. Eight dentists were exempt from the separator requirement, 47 had already installed separators, and nine inspections were scheduled. Removing the exempt specialists gives a separator installation rate of 84%. Ferry, Adams, Columbia, Garfield, and Asotin Counties were all in 100% compliance with the separator installation requirement.

Inspection Results

Five dentists had installed their separators by the time of the inspections. One dentist was disposing of lead foil inappropriately, five of cold sterilant, two of X-ray wastes, six of fluorescent lamps, four of amalgam waste (mostly extracted teeth with amalgam), and two of used capsules.

Follow-up Inspection Summary Table

	NWRO	SWRO	CRO	ERO
Contacts completed	170	161	46	64
Specialists	22	0	14	8
Separators already installed	141	154	24	47
Inspections	7	7	8	9
Septic systems	1	5	1	0
Mishandled fluorescents	2	0	0	6
Mishandled amalgam	1	3	5	4
Mishandled sterilant	3	0	5	5
Mishandled capsules	0	3	5	2
Mishandled fixer	0	2	6	2
Mishandled lead foils	0	0	0	1

Notification System

The notification system was not an effective way of determining compliance with the separator installation condition of the MOU. Both survey results and the results of inspectors' calls indicate that a significant number of dentists installed amalgam separators, but did not send a notification form for any one of a number of reasons:

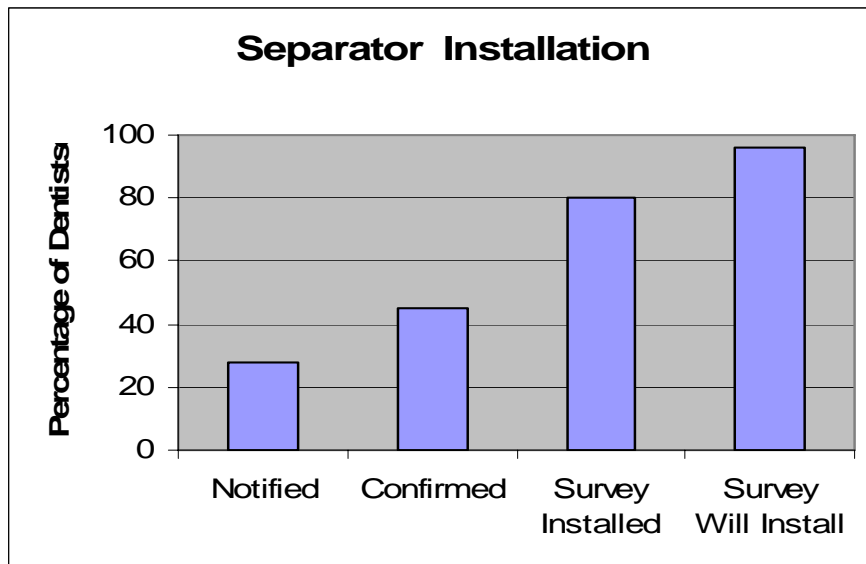
- Simple forgetfulness
- Not receiving a notification form
- Losing their form
- Offices with multiple dentists sending in only one form
- Specialists not sending in a form

Level of Compliance with the MOU

Separators (Figure 2)

The follow-up calls and visits done by Ecology after the MOU period ended increased the percentage of dentists who confirmed to the Department that they'd installed separators or were exempt from that requirement from 28% to 45%. Data from the 2005 survey indicates that 80% of contacted dentists had installed their separators and another 16% planned to install them by November 2005. Inspectors trying to find dentists without separators contacted 441 dentists to find 31 who had not yet installed separators. This result backs up the high rate of compliance indicated by the survey.

Figure 2



4% of the 2,102 dentists listed in the survey (approximately 84 dentists) do not plan to install a separator. Ecology personnel inspected 30 of these dentists, leaving approximately 50 dentists statewide without separators. This is approximately 2% of Washington state dentists, as compared to the 66% who had not installed separators as of the time of the first, Ecology-performed survey. A high percentage of the separators were installed late in the MOU period, and dental suppliers reported that they were very busy installing separators right around the August 2005 deadline.

Tacoma, who chose to run its own program and gave local dentists an extra year to comply, noted the same outcome. As of mid-January 2006, 65% of dentists in Tacoma had installed separators. If the pattern we saw in the statewide MOU holds true, this separator installation rate should increase to 80% or more by the August 2006 deadline.

Other BMPs

Inspection Results

Approximately 42% of the inspected dentists were still handling scrap amalgam inappropriately and putting waste sterilant down the drain, and approximately 32% were not handling waste fixer appropriately. In some cases they were disposing of fixer without treatment; in others, it was insufficiently treated because of inadequate maintenance or the use of only one silver recovery canister. The inspections also uncovered problems with the handling of fluorescent lamps, lead foils, and empty amalgam capsules. Whether these problems are representative of the dental community as a whole is unknown.

Survey Results

In the 2005 survey, a significantly higher number of dentists reported appropriate handling of waste amalgam (76.2% in compliance) and waste fixer (81.7% recycling³) than reported those behaviors in 2004. (Note that 42.6% of dentists reporting that they recycled fixer also reported that they used only one silver recovery canister, which may not be sufficient.)

Whether dentists who installed separators before the deadline were more attentive to the other waste management BMPs than those who missed the deadline is unknown, though it is a plausible explanation for the differing results. Anecdotally, dentists seemed to have gotten the message about the importance of separator installation more clearly than the messages about other BMPs.

Ecology's policy was that without extraordinary circumstances, refusal to install a separator or failure to do so before the compliance deadline would result in an order and penalty. Such formal enforcement was not necessary, though one dentist was given extra time due to their plans to replace their entire vacuum system.

³ Includes an unknown number of dentists who are not recycling because they have an all-digital X-Ray system.

Amount of Mercury Removed From the Environment by Separators

The amount of mercury removed from Washington's wastewater because of the installation of separators between the time of the first and second surveys can be estimated to be between 11 and 76 kilogram (kg) per year⁴. For comparison purposes, the Mercury Chemical Action Plan (MCAP) estimated that more than 404 lbs, or 183 kg, of mercury per year was discharged from Washington state dental offices, not including trap amalgam and pump filter waste.

Assumptions Used

- In Ecology's MCAP, the daily output of mercury into dental wastewater is estimated at 0.056 g/dentist/day. However, a draft internal document from the Massachusetts Department of Environmental Protection (MassDEP) obtained from Mark Smith through an e-mail listserv, discusses more recent studies. The draft document shows a range of outputs from 0.25 g/dentist/day to 0.8 g/dentist/day, with a most-likely figure of 0.4 g/dentist/day. 0.056 g/dentist/day was used as a lower estimation and 0.4 g/dentist/day was used as an upper estimation.
- Hebert reported a total of 2,102 dental offices in Washington state. For the purposes of this analysis, one dentist per office was assumed (an underestimate).
- Approximately 715 dentists (34% of 2,102) had a separator at the time of the 2004 baseline survey.
- Approximately 1,682 dentists (80% of 2,102) had a separator at the time of the 2005 Heber survey.
- Separators conform to the ISO 11143 standard, removing 95% of mercury from dental wastewater.

Other Ongoing Work

ERO

ERO will visit the majority of dentists in their region that were not visited yet. An intern, paid by the Spokane Aquifer Joint Board, will work with regional personnel to visit Spokane County dentists in winter 2006. Starting in the spring, dentists elsewhere in the region will be visited by other pollution prevention staff.

King County

In 2001, King County began enforcing wastewater discharge limits on dentists, allowing them to either test to prove they were meeting the limits or install an approved amalgam separator. By 2004, 97% of dentists had installed separators. Between 2000 and 2004, mercury levels in King County biosolids decreased by 50%, and have now leveled out to an annual median concentration level of between 1.2 and 1.4 mg/L.

⁴ Note that the 11-76 kilogram figure applies only to those areas impacted by this project. It does not include most of King County, which is covered by their county program. King County represents approximately half of all dentists statewide.

King County Industrial Waste continues to perform random inspections of dentists' offices, along with the monitoring of biosolids for mercury.

Kitsap County

Kitsap County continues to work with dentists through the voluntary EnviroStars program. Kitsap County dentists may apply to the county for reimbursement of up to 50% of dangerous waste-related equipment or services, to a maximum of \$350, not including the purchase of amalgam separators.

Pierce County

83 technical assistance visits to dental offices were performed by mid-January, mostly to offices located in the City of Tacoma and Gig Harbor. 65% had installed amalgam separators, and 84% disposed of their contact and non-contact amalgam through a collection service, though 29% had no policy for the disposal of teeth with amalgam fillings. 87% disposed of a glutaraldehyde sterilant to the sanitary sewer, 1% was using only a single CRC for silver recovery, and 1% disposed of lead foils as solid waste.

The Tacoma-Pierce County Health Department expressed some concern at the lack of a separator maintenance plan at many of these facilities.

Snohomish County

Snohomish County continues to work with dentists through the voluntary EnviroStars program. There has also been some discussion of a dental sector program in the City of Everett, though whether that will actually happen is unknown.

Thurston County

In all, Thurston County performed 65 technical assistance visits to dental offices in 2005, with 22 more pending. Approximately 95% of these offices had installed separators, and 28% were in complete compliance. Approximately 43% were improperly disposing of amalgam waste, and 45% were improperly treating their silver-bearing fixer waste with only one CRC. County personnel may work with SWRO to schedule compliance visits to approximately 6 dentists who have not responded to repeated attempts to schedule a technical assistance visit.

Whatcom County

Whatcom County continues to work with dentists through the voluntary EnviroStars program.

Possible Further Action

Four options for further action have been identified:

1. Full separator compliance

Not all of the non-notifying dentists have been contacted; Ecology could finish those calls and work to ensure that all non-exempt dentists have installed separators in their offices.

2. BMP compliance among dentists with separators

The follow-up inspections showed repeated evidence of dentists not following the non-separator BMPs, particularly when it came to improper disposal of scrap amalgam and waste sterilant and improper treatment and/or disposal of waste fixer. While the surveys indicate improvements in the number of dentists following these practices in the general population, these results have not been confirmed among dentists who installed separators before the deadline.

It would be valuable for Ecology to contact these dentists to determine whether they are complying with all BMPs, rather than just separator installation. These contacts could be compliance or TA in nature, and could consist of a visit, a phone call, or a follow-up letter.

3. Develop a new list of dentists

The list of dentists that the team worked with was compiled in late 2003/early 2004 and included multiple inaccuracies, due to retirements, the opening of new offices, sale of offices from one dentist to another, etc. Ecology could develop a more accurate in-house list using Department of Revenue or Department of Licensing databases.

4. Continued WSDA support

Ecology could work with WSDA to encourage them to establish a formal continuing education program related to BMP implementation and environmentally responsible dentistry.

Conclusion

The self-notification program, as conducted, was not successful. Ecology personnel spent a significant amount of time verifying the information, and yet a full accounting of the dental community was not made. In considering whether to use this tool in future MOUs or sector partnerships, Ecology should take a studied look at lessons learned from this experience.

The impact of the MOU on some of the targeted dental wastes, particularly used silver X-ray fixer, is unclear. Additional resources will be required if more than one or two BMPs are to be implemented in further MOUs or sector campaigns. However, the information gathered during and after the MOU period from surveys and visits shows that the number of dentists with amalgam separators installed increased significantly, as did proper management and disposal of amalgam wastes. Therefore, Ecology and WSDA achieved their joint goal to protect Washington's environment through increased use of amalgam separators and proper waste amalgam handling by the dental community.

Acknowledgements

Ecology's Dental MOU Team

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Ecology's Compliance Follow-up Team

- Katherin McArthur (team lead, Central Region)
- Arianne Fernandez (Eastern Region)
- Dick Granberg (Central Region)
- Trudy Harding (Northwest Region)
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